



3

Vermont Better Roads Grant Program Application

Please complete one application per category and/or project you are applying for. You may make copies of the application for multiple applications per category and/or multiple categories.

Please check the Category you are applying for:

- B. Correction of a Road Related Erosion Problem and/or Stormwater Mitigation Retrofit for both gravel and paved roads
- C. Correction of a Stream Bank or Slope Related Problem
- D. Structure/culvert upgrades

Town/Organization: Town of Warren

Project Name: Brook Road Culvert

Road Name: Brook RD TH #: 4 Structure # (if applicable): _____

Road Type: Paved or Unpaved (circle one) Curbed or Uncurbed (circle one)

Class 1 Class 2 Class 3 Class 4 (circle one)

Watershed: _____

Please provide a thorough description of the problem (ex. Roadway has steep slope with no ditch which is causing roadway erosion):

Roadway has a steep slope. The channel is moderate to steep. It is somewhat incised upstream with step pool geomorphology. Coarse sediment + debris transported to site. Downstream is the Freeman Brook. Invert is rusted to about 8' up pipe w/ a large hole in bottom that rusted out.

Description of Project and how you plan to complete the work (ex. Stone line 500' of ditch by reshaping ditch and stone lining, working from the top of the project down to the bottom):

Replace with a steel 16-6 x 8-4 open bottom, single radius Arch. This will meet AOP standards as it drains to the Kids Brook Fishing Area.

Expected Effects (+ & -) on water quality (ex. Erosion will be eliminated by placing the stone ditch):

Stone fill will be added Type IV to protect and channel banks or roadway slopes. By upgrading it will allow better filtration from the coarse sediment + debris running to the stream and eliminate the water running underneath that is currently undermining the road sending material to the stream.



Distance from end of project to nearest water (stream, lake, or stormwater system that outlets directly to water). Please circle one: 0-50' 50-250' 250'+

Progress to Date:

Engineering has been done. Engineer has met with A.N.R River Management Engineer, Jaron Borg. Hydraulics has been done.

Is there an emergency reason this project must be completed quickly? If yes, please explain:

This is TH1 a class 1, which leads to Waitsfield, Roxbury and is used as much as RT 100.

Has this project been identified through a municipal road inventory, capital budget plan, tactical basin plan, culvert inventory, or other management plan? If yes, please list which.

Yes: Culvert inventory and RSM

No

Please list any professionals you may have contacted for assistance with this project (ANR River Management Engineer, Army Corps of Engineers, VTtrans District Technical staff, Basin Planner etc.):

Jaron Borg, ANR River Management Engineer
Doug Newton - Newton Technical Services
Fish + Wildlife - Jamie Masterson

Is the project located in the town "Right of Way?" Yes, No, Both (if "Both" please explain further).

Will the town road crew complete this work? Yes, No, Some (if "some" please explain further).

Culvert is too large + too deep - Town does not have necessary equipment to handle a culvert + this size.



Describe how the grant funds will be spent and/or attach a project budget: _____

See Attached

How do you plan to meet the required 20% match on this grant?:

Amount has been planned for in town budget.

Requested Grant Amount (\$20,000 max Category B, \$40,000 max Categories C & D): 40,000

Estimated Total Project Cost (including 20% local match): 238,666.13

Estimated Completion Date: 9/30/16 or 9/30/17

REQUIRED ATTACHMENTS:

- Itemized Cost Estimate (labor, equipment, materials)
(For assistance, call Better Backroads at 802-828-4585)
- Project Location Map
(Please show location of affected water; 1:12,000 USGS map, if possible)
- Sketch of proposed erosion control measures, including:
 - Distances (ft.)
 - Estimate of waste & borrow quantities
 - Approx. location of town/other right-of-way and/or property lines
- Photo(s) of the project area.
- Agreement for Entry and/or Deed of Easement (if project is outside Town ROW).
- If project involves stream or river/road conflict, include documentation of consultation with a River Management Engineer.
- Other appropriate supporting documents.

N/A

Engineer Plans, Hydraulics

By signing this application I certify that all the information provided is accurate to the best of my knowledge. We will comply with all the requirements of the grant including making our books available for audit if required.

SIGNATURE OF APPLICANT: (Must be Town Administrator/Manager or Select Board Chair)

Name: _____

Title: Town Administrator

HYDRAULICS UNIT

TO: Dick Hosking, District 5 Project Manager

FROM: Leslie Russell, P.E., Hydraulics Project Manager

DATE: 20 November 2015

SUBJECT: Warren TH 1 (Brook Road) BR 2 over unnamed stream
Site about 1 mi. east of School Road
GPS coordinates: N 44.1065° W 72.8345°

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 to mountainous drainage basin. It is a mixture of forest and fields. The total contributing drainage area is about 1.7 sq. mi. The stream slope at the site was estimated to be about 5%. Using several hydrologic methods, we selected the following design flow rates:

<u>Annual Exceedance Probability</u> (% AEP)	<u>Flow Rate in Cubic Feet per Second</u> (CFS)
43	120
10	230
4	320
2	390 - Minor Collector Design Flow
1	470 - Check flow

Channel Morphology

The channel is moderate to steep gradient. It is somewhat incised upstream with step pool geomorphology. There is likely coarse sediment and debris transport at the site. The channel upstream is affected by the driveway and roadway fill. Directly downstream of the structure is the confluence with Freeman Brook. **This area of Freeman Brook is designated as a kids only fishing area.** Field measurements of bankfull width varied from 12' – 15' or a little more upstream. The Vermont Hydraulic Geometry Relationships anticipate a bankfull width of 17' for stream channels in equilibrium at this watershed size. Those curves may not be valid for this size drainage area.

Existing Conditions

The existing structure is a 7' wide by 8' high structural metal plate pipe with mitered ends. There is a cradle headwall at the outlet of the pipe. There is about a 3' drop at the outlet to Freeman Brook. The pipe provides a waterway area of about 44.0 sq. ft. The invert is rusted to about 2' up the pipe. With the large drop at the outlet, currently this pipe does not provide AOP.

Our calculations, field observations and measurements indicate the existing structure just barely meets the current standards of the VTrans Hydraulic Manual. However, it does not meet the existing state stream equilibrium standards for bankfull width (span length). The existing structure constricts the channel width, resulting in an increased potential for debris and ice blockage.

This structure results in a headwater depth of about 8.5' at 2% AEP and about 10.3' at 1% AEP. There is a low spot in the driveway that water may flood into and then down the road before it reaches the 1% AEP flood height.

This analysis was performed without backwater from Freeman Brook. If Freeman Brook is at flood stage, headwater depths for this structure will be even higher than reported here.

Liner Comments

The request asked us to analyze a concrete invert. This option would raise the water surface elevations even higher and would force water over the driveway sooner. We do not recommend a concrete invert or a pipe liner as both would increase water surface elevations at the inlet and have faster velocities at the outlet. **AOP cannot be provided with an invert repair or a liner.** The drop would be even higher into Freeman Brook than it currently is. **ANR would need to approve either an invert repair or a liner and since both options restrict AOP and increase outlet velocities into Freeman Brook, neither may be approved.** If either of these options is approved and chosen, the mitered ends should be removed from the pipe. We provide the following information regarding a concrete invert and a liner:

1. A 1' concrete invert can be installed in the pipe as long as **a full beveled headwall is provided at the inlet.** This will provide a waterway opening of 38.5 sq. ft. **It will not cover all the rust up the sides of the pipe.** Headwater depths will now be 8.7' above the new invert for the 2% AEP and 10.5' above the new invert for the 1% AEP, a rise of 1.2' above current headwater depths in both cases. This will force water over the driveway at lower flows than the existing pipe does. Also, the outlet velocities will increase resulting in increased scour at the outlet of the pipe. **We do not recommend this option as the private driveway could be adversely affected by increased flood damage, as well as, increased debris blockage for the pipe. This option will not provide AOP.**
2. A 1.5" thick liner can be installed in the pipe as long as **a full headwall is provided at the inlet.** It would provide approximately 41.3 sq. ft. of waterway area. Headwater depths will now be 8.4' at the 2% AEP and 9.9' at the 1% AEP. Again, the driveway will be overtopped at lower flows than with the existing pipe and outlet velocities will be higher. Debris blockage will increase with this options, as well. **We do not recommend this option. This option will not provide AOP.**

Replacement Recommendations

In sizing a new structure we attempt to select structures that meet both the current VTrans hydraulic standards, state environmental standards with regard to span length and opening height, and allow for roadway grade and other site constraints. **The results reported here are without backwater from Freeman Brook.**

Based on the above considerations and the information available, we recommend any of the following structures as a replacement at this site:

1. A bridge with a 16' wide by 6' high minimum waterway opening, providing 96 sq. ft. of waterway area. This structure will result in a headwater depth of 3.8' at 2% AEP and of 4.3' at 1% AEP.
2. A concrete box with a 16' wide by 9' high inside opening. The box invert should be buried 3'. That will result in a 16' wide by 6' high waterway opening above streambed, providing 96 sq. ft. of waterway area. Bed retention sills should be added in the bottom. Sills should be 12" high

across the full width of the box. So the top of the sills will be buried 24" and not be visible. 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. The box should be filled up to the stream bed level with stone graded to match the natural stream bed material. This structure will result in a headwater depth of 3.8 at 2% AEP and of 4.3' at 1% AEP, with no roadway overtopping up to 1% AEP.

3. Any similar structure with a minimum clear span of 16' and at least 96 sq. ft. of waterway area, that fits the site conditions, could be considered. Any structure with a closed bottom should have bed retention sills and a buried invert as described above.

Prior to any further action toward implementation of any of the above recommendations, structure size and type must be confirmed, and may be modified, by the VT ANR River Management Engineer to ensure compliance with state environmental standards for stream crossing structures.

Other regulatory authorities including the US Army Corps of Engineers may have additional concerns or requirements regarding replacement of this structure.

General Comments

If a new bridge is installed, the bottom of abutment footings should be at least six feet below the channel bottom, or to ledge, to prevent undermining. Abutments on piles should be designed to be free standing for a scour depth at least 6' below channel bottom.

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.

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 IV 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.

Please note 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 replacement of this structure must comply with state regulatory standards, and should take into consideration matching natural channel conditions, roadway grade, environmental concerns, safety, and other requirements.

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

LGR

cc: Jaron Borg, A.N.R. River Management Engineer
Hydraulics Project File via NJW

Warren TH 1, (Brook Road) Bridge 2, over Brook

Remove Existing 8' CGMP and Replace with New 16'-0" x 8'-4" x 94'-0" Single Radius Arch

Item No.	Item Name	Quantity	Unit	Unit Price	Total
201.10	Clearing and Grubbing Incl. Individual Trees and Stumps	1	LS	\$ 1,500.00	\$ 1,500.00
203.15	Common Excavation	59	CY	\$ 8.99	\$ 530.41
203.16	Solid Rock Excavation	20	CY	\$ 31.56	\$ 631.20
203.27	Unclassified Channel Excavation	95	CY	\$ 12.87	\$ 1,222.65
203.28	Excavation of Surfaces and Pavements	18	CY	\$ 21.02	\$ 378.36
204.25	Structure Excavation	1330	CY	\$ 23.58	\$ 31,361.40
204.30	Granular Backfill for Structures	800	CY	\$ 37.95	\$ 30,360.00
301.15	Subbase of Gravel	51	CY	\$ 27.38	\$ 1,396.38
406.25	Bituminous Concrete Pavement	40	TON	\$ 115.53	\$ 4,621.20
501.34	Concrete, High Performance Class B	146	CY	\$ 540.48	\$ 78,910.08
507.15	Reinforcing Steel	12150	LBS	\$ 1.03	\$ 12,514.50
514.10	Water Repellent, Silane	10	GALS	\$ 75.56	\$ 755.60
529.15	Removal of Structure	1	EA	\$ 1,500.00	\$ 1,500.00
601.0005	12" Corrugated Steel Pipe	6	LF	\$ 51.87	\$ 311.22
608.25	All Purpose Excavator Rental	6	HRS	\$ 74.70	\$ 448.2
613.13	Stone Fill, Type IV	110	CY	\$ 42.04	\$ 4,624.40
616.305	Bituminous Concrete Curb, Type A	40	LF	\$ 5.53	\$ 221.20
621.60	Anchor for Steel Beam Rail	4	EA	\$ 681.39	\$ 2,725.56
621.75	Remove and Reset Guardrail (Modified)	1075	LF	\$ 8.05	\$ 8,653.75
621.76	Replace Guardrail Post Assembly	6	EACH	\$ 29.85	\$ 179.10
621.77	Replace Guardrail Beam Unit	3	EACH	\$ 89.04	\$ 267.12
635.11	Mobilization/Demobilization (4.5 %)	1	LS	\$ 10,275.00	\$ 10,275.00
641.10	Traffic Control (signs, barricades, etc. for closing road)	1	LS	\$ 2,500.00	\$ 2,500.00
649.31	Geotextile under Stone Fill	150	SY	\$ 2.26	\$ 339.00
	Temporary Diversion of Stream	1	LS	\$ 1,500.00	\$ 1,500.00
	Turf Establishment	1	LS	\$ 1,500.00	\$ 1,500.00
	Footing Design by CONTECH	1	LS	\$ 2,000.00	\$ 2,000.00
	16'-0" Span x 8'-4" Rise x 94'-0" Single Radius Arch (12 ga. steel)	94	LF	\$ 260.00	\$ 24,440.00
	Assembly of Pipe Arch, Headwalls & Wingwalls (CONTECH)	1	LS	\$ 13,000.00	\$ 13,000.00
				Total	\$ 238,666.33

Cindi Jones

From: Borg, Jaron [Jaron.Borg@vermont.gov]
Sent: Friday, January 08, 2016 2:08 PM
To: Cindi Jones
Subject: RE: Brook Road Culvert

Cindi,

Thank you for the question on last conversation with Doug it was suggested that the structure would have a cross section of 16' x 7'11". If this is still the case the structure will meet the requirements of the State of Vermont's Stream Alteration General Permit.

Sincerely,

Jaron

Jaron Borg, River Management Engineer
Watershed Management Division, Rivers Program
Vermont Department of Environmental Conservation
1 National Life Drive, Main 2
Montpelier, VT 05620-3522
802-371-8342 / Jaron.Borg@vermont.gov
On the Web @ <http://www.anr.state.vt.us/dec/waterq/rivers.htm>

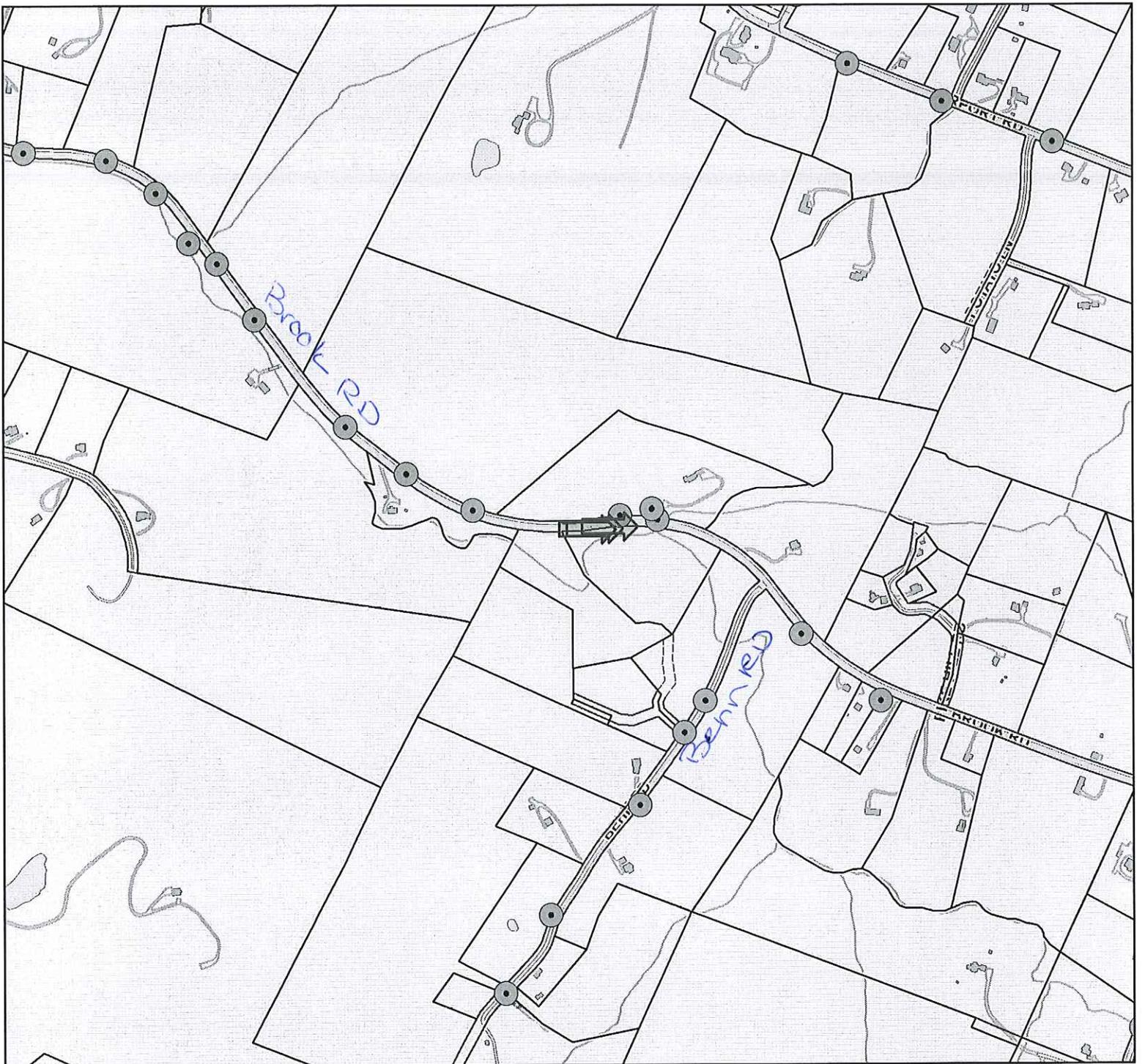
From: Cindi Jones [mailto:cjones@warrenvt.org]
Sent: Friday, January 08, 2016 1:04 PM
To: Borg, Jaron <Jaron.Borg@vermont.gov>
Subject: Re: Brook Road Culvert

Hi Jaron,

Can you submit to me that you were working with Doug Newton on the Brook Road Culvert replacement as I am going to be pursuing some grants That we will be meeting the river management standards.

Thanks

Cindi -



Town of Warren, VT Brook Road Culvert

Disclaimer

This map is a public resource of general information. The Town of Warren shall assume no liability for:

1. Any errors, omissions, or inaccuracies in the information provided regardless of how caused; or
2. Any decision made or action taken or not taken by the reader in reliance upon any information or data furnished hereunder.

Legend

-  Culvert
-  Other
-  Lot Line
-  Trails
-  Right Of Way



1 inch:943 Feet



CENTRAL VERMONT REGIONAL PLANNING COMMISSION



Cindi Jones
Town Administrator
P.O. Box 337
Warren, VT 05674

1/27/16

Dear Cindi,

The Central Vermont Regional Planning Commission supports your application to the 2017 VTrans Better Roads Program. The Brook Rd. Culvert Replacement was inventoried by CVRPC in 2014.

The proposed application is also consistent with the following regional goals and policies:

Support efforts to minimize negative environmental impacts associated with the transportation system (including air quality, noise levels, surface water, vegetation, agricultural land, fragile areas, and historical/archaeological sites).

Please call me if I can be of further assistance in the preparation of your grant application.

Sincerely,

A handwritten signature in black ink, appearing to read 'S. Gladczuk'.

Steve Gladczuk
Transportation Planner

Cindi Jones

From: Masterson, Jaime [jaime_masterson@fws.gov]
Sent: Thursday, December 10, 2015 10:04 AM
To: Cindi Jones
Subject: Re: Trib to Freeman Brook

Thanks Cindi!

It would be great to know how big the span is that your engineering suggests. I think this is a project we could help on financially, even more so if was 2017. That would give us the time to apply for some grants!

My office will be sitting down in January sometime to go over new projects and what funding we're going to put where. Please keep us informed on this project as your designs come together!

On Thu, Dec 10, 2015 at 9:50 AM, Cindi Jones <cjones@warrenvt.org> wrote:

Oh and I forgot, the hydraulics says it not adequate for the flows and does not meet AOP requirements.

From: Masterson, Jaime [mailto:jaime_masterson@fws.gov]
Sent: Thursday, December 10, 2015 8:59 AM
To: Cindi Jones; Friends of the Mad River
Subject: Trib to Freeman Brook

Hi Cindi,

I went and checked out the trib on Freeman Brook and I had a few questions.

Why is this culvert a high priority for the Town? Does have flooding issues, structural issues? When did you plan to go to construction..... 2016,2017?

The stream up to the next culvert was great. Perfect brookie habitat!

The other, smaller culvert on Lincoln Gap Rd wouldn't be something that we could help with though. There is a driveway culvert right upstream and the owner has put a rock dam behind that.

--

Jaime Masterson

Fish Biologist

US Fish and Wildlife Service

Lake Champlain Fish and Wildlife Resource Office

11 Lincoln Street

Essex Junction, VT 05452

(802) 872-0629 x14

Jaime_Masterson@fws.gov

<http://www.fws.gov/lcfwro/>

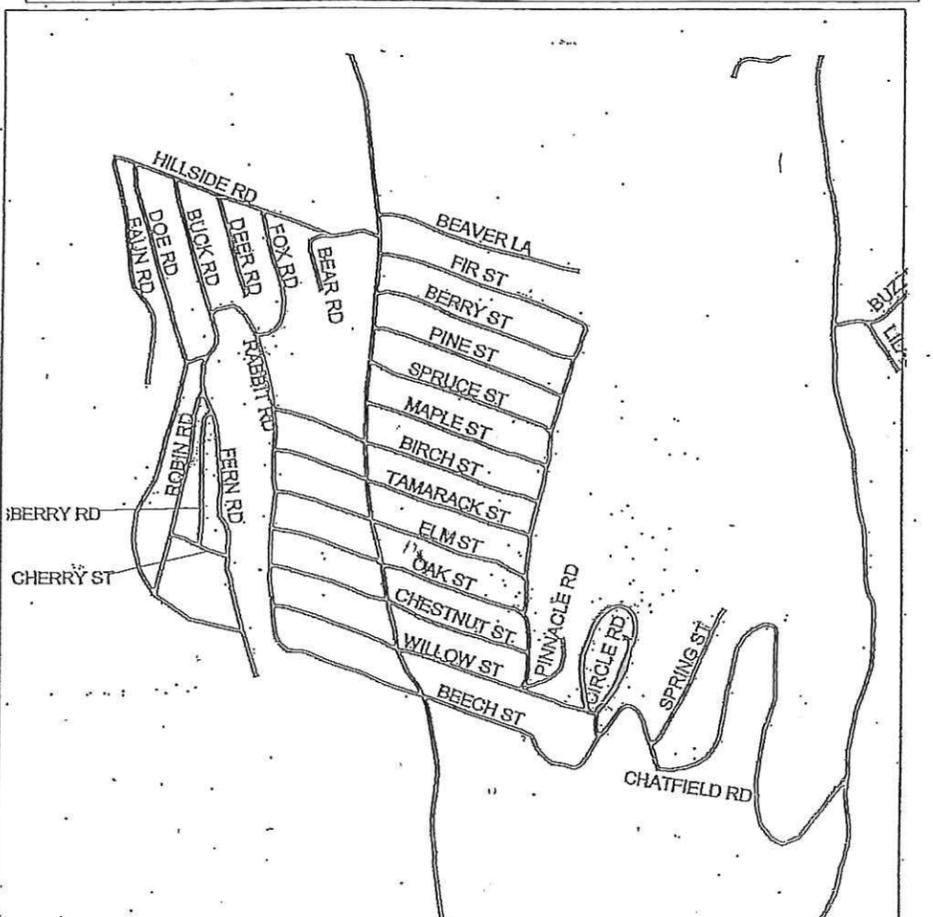
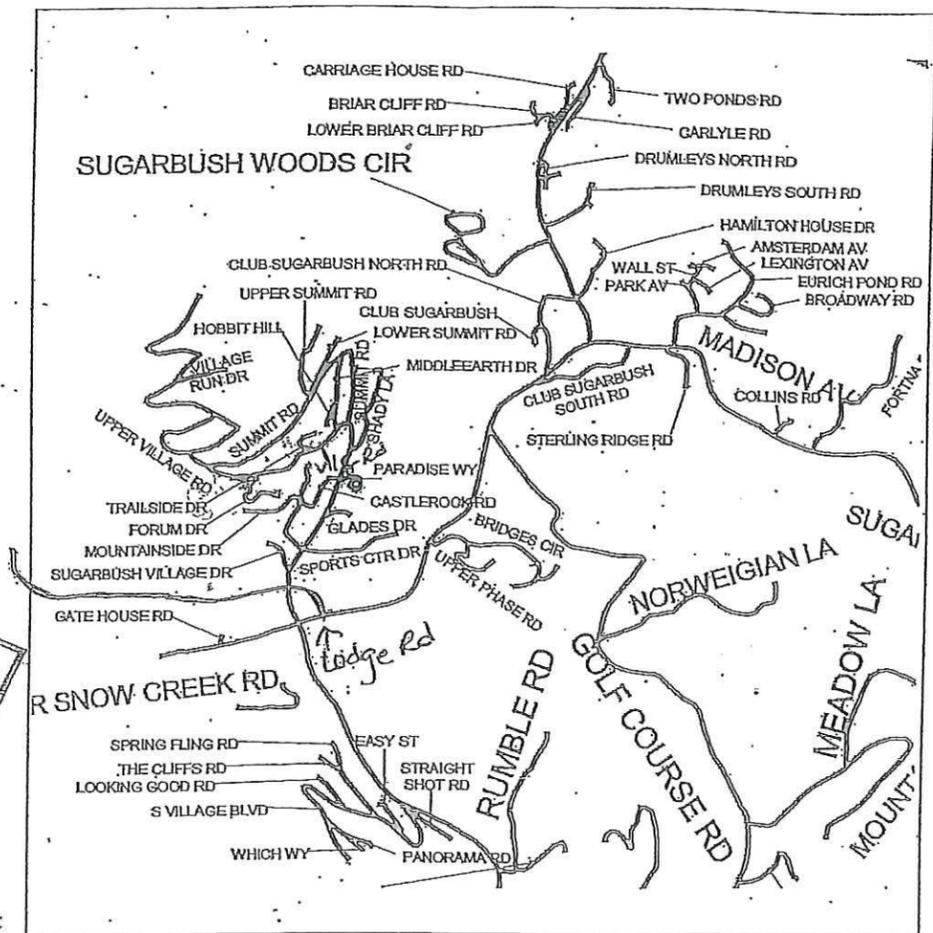
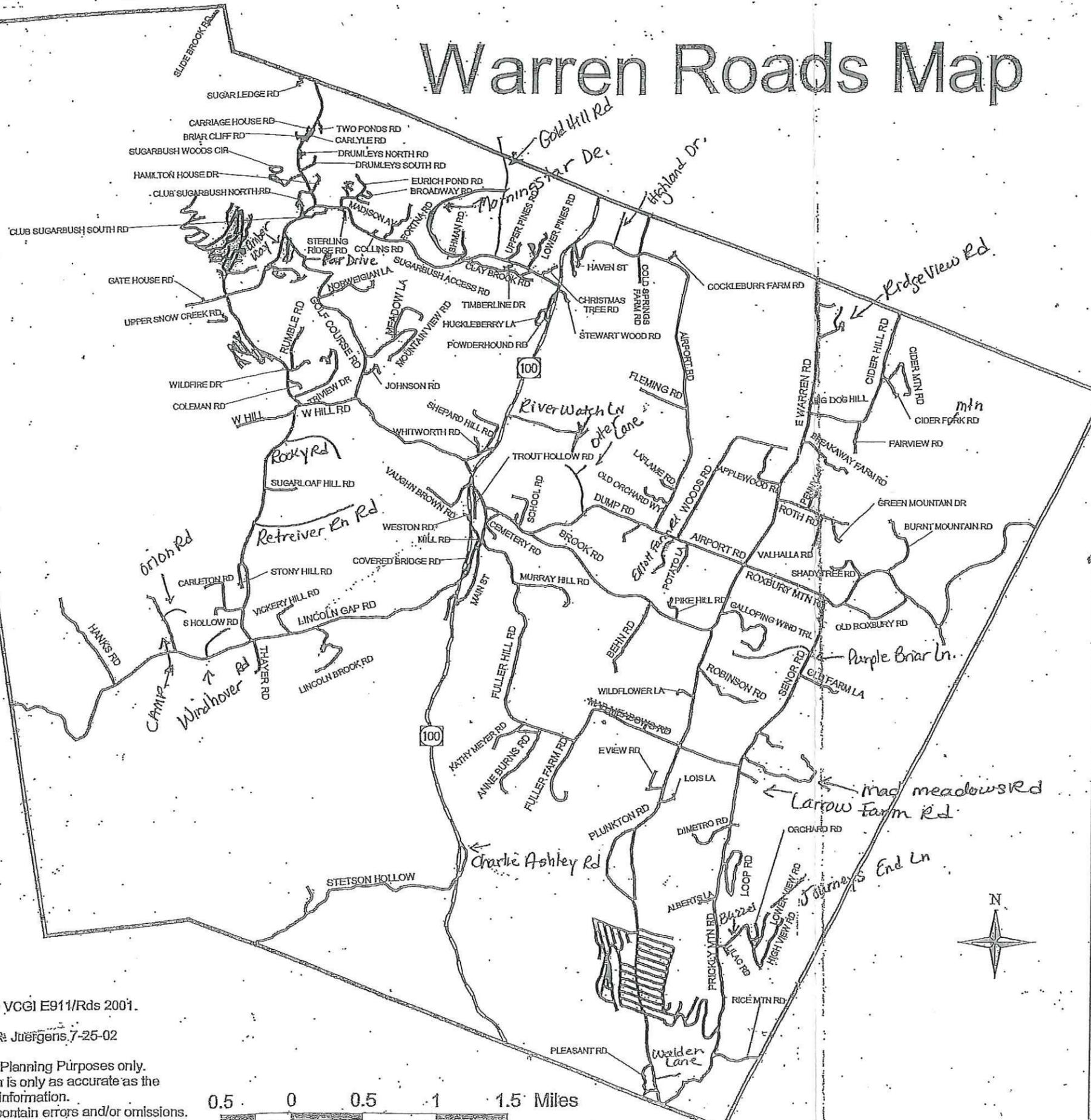
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Jaime Masterson
Fish Biologist
US Fish and Wildlife Service
Lake Champlain Fish and Wildlife Resource Office
11 Lincoln Street
Essex Junction, VT 05452
(802) 872-0629 x14

Jaime_Masterson@fws.gov

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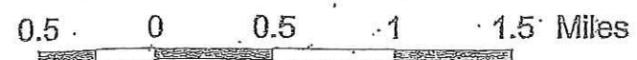
Warren Roads Map



Data Sets:
Roads: 1:5,000 VCGI E911/Rds 2001.

Map Created: R. Juergens, 7-25-02

This Map is for Planning Purposes only.
The data shown is only as accurate as the original source information.
This map may contain errors and/or omissions.



Cindi Jones

From: Borg, Jaron [Jaron.Borg@vermont.gov]
Sent: Monday, January 11, 2016 10:16 AM
To: Cindi Jones
Subject: RE: Brook Road Project

Cindy,

To answer your question. Yes as detailed this structure will meet the stream alteration standards.

Cheers,

Jaron

Jaron Borg, River Management Engineer
Watershed Management Division, Rivers Program
Vermont Department of Environmental Conservation
1 National Life Drive, Main 2
Montpelier, VT 05620-3522
802-371-8342 / Jaron.Borg@vermont.gov
On the Web @ <http://www.anr.state.vt.us/dec/waterq/rivers.htm>

*Hi Jaron
Done
1/11/16*

From: Cindi Jones [mailto:cjones@warrenvt.org]
Sent: Monday, January 11, 2016 8:09 AM
To: Borg, Jaron <Jaron.Borg@vermont.gov>
Subject: FW: Brook Road Project

Hi Jaron,

To answer your question on the cross sections, I have attached Doug's plans.

Thanks

Cindi

From: Doug Newton [mailto:newfonttechnicalservices@charter.net]
Sent: Monday, December 28, 2015 2:41 PM

To: Cindi Jones
Subject: Re: Brook Road Project

Hi Cindi,
Hope you had a nice Christmas and enjoyed some time away from the office!

The cross-sections and a schematic of a Plan View are attached; the Plan View shows the existing culvert, the proposed arch and the locations where the cross-sections were taken.

I was able to manipulate some things and ended up being able to get everything on one sheet so hopefully that will make things a little simpler.

Also attached is a revised spreadsheet file for the estimate; the revision includes adding the cost of the new single radius arch onto the Contractor's version of the estimate.

I got to thinking about it and assuming the town will purchase the arch, that makes the cost of that the same for every bidder so there's no reason it couldn't be included on their bid sheet.

Take a look at things and let me know if you have any questions or need anything else.

Thanks,
Doug

----- Original Message -----

From: Cindi Jones
To: Doug Newton
Sent: Wednesday, December 23, 2015 9:49 AM
Subject: RE: Brook Road Project

Hi Doug,

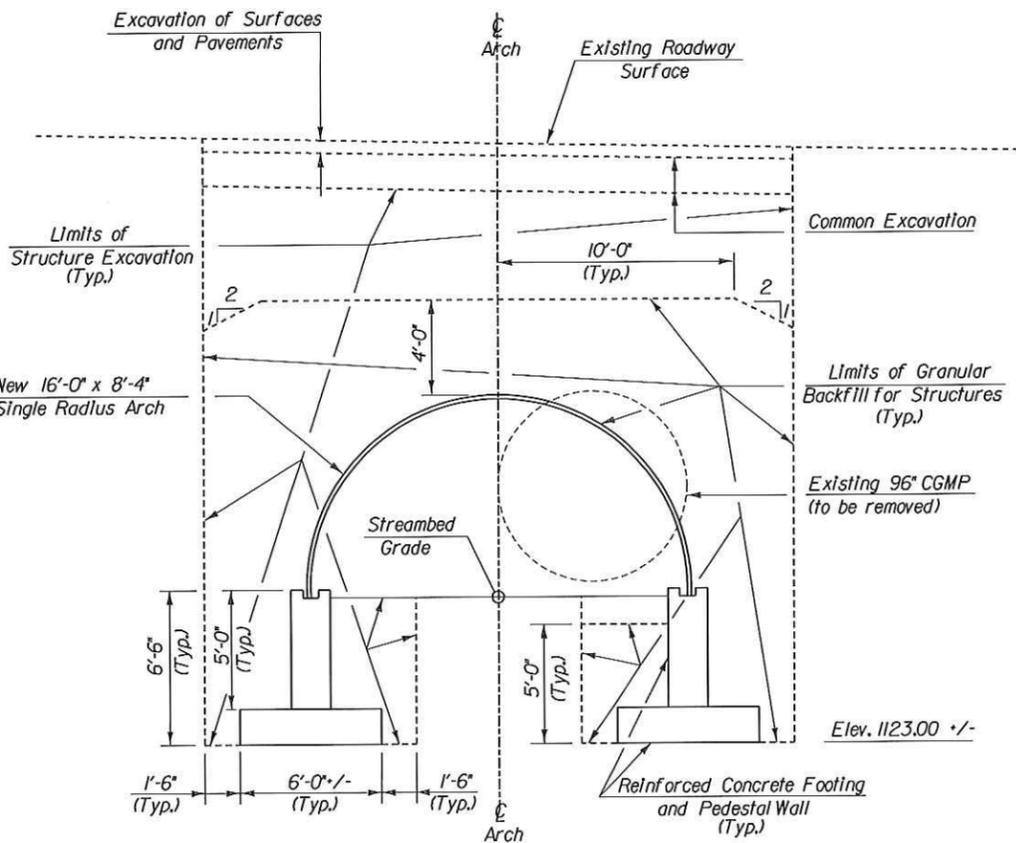
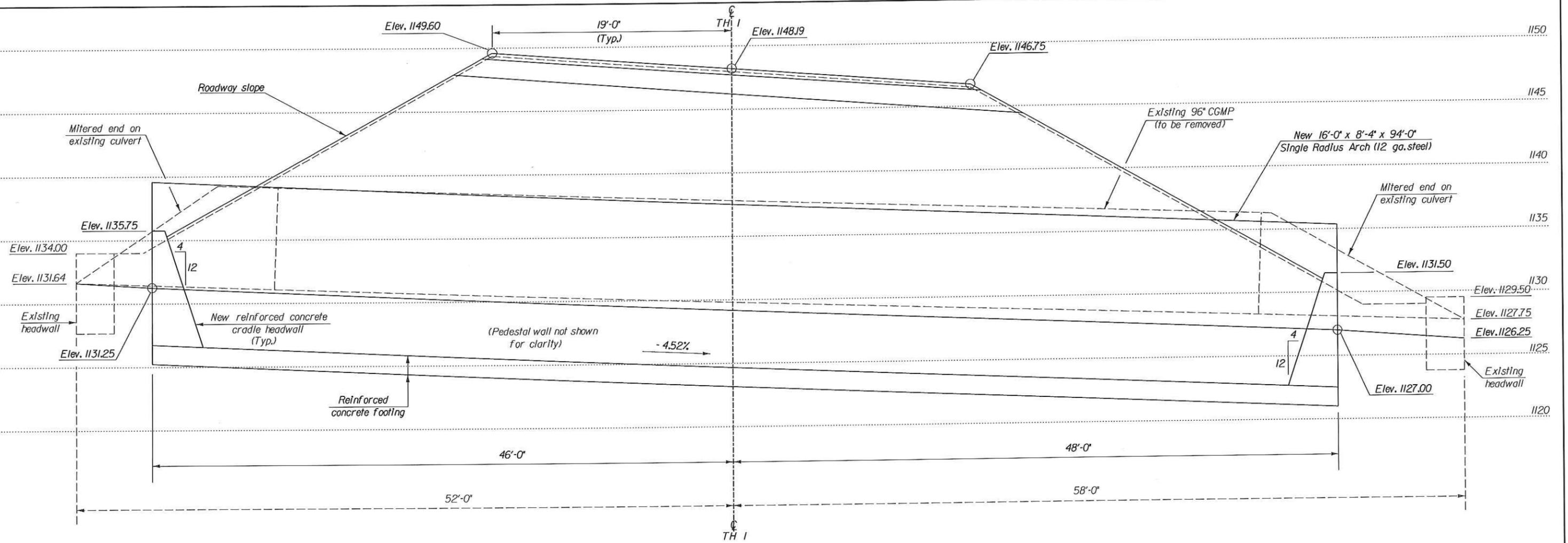
Cross sections would be nice if you can send in PDF. That way the file will be complete and if a contractor asks, I have them.

Thanks again!

Cindi

From: Doug Newton [mailto:newfonttechnicalservices@charter.net]
Sent: Wednesday, December 23, 2015 9:36 AM
To: Cindi Jones
Subject: Brook Road Project

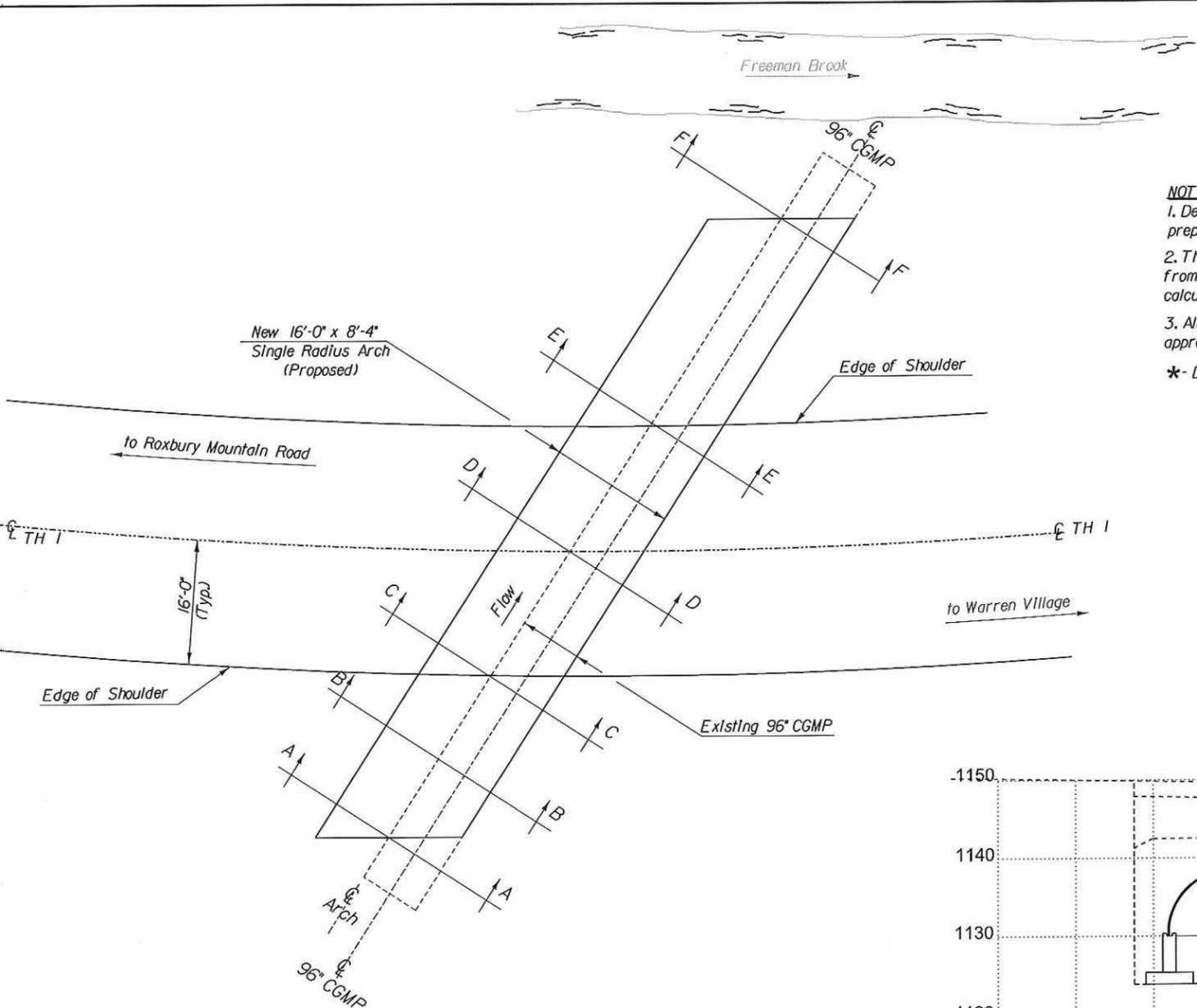
Cindi,



NOTES

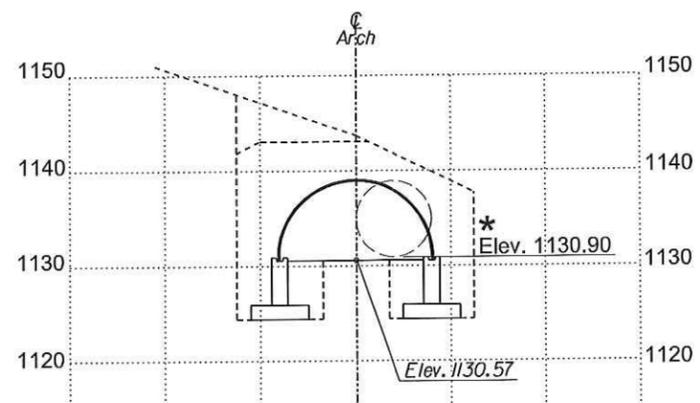
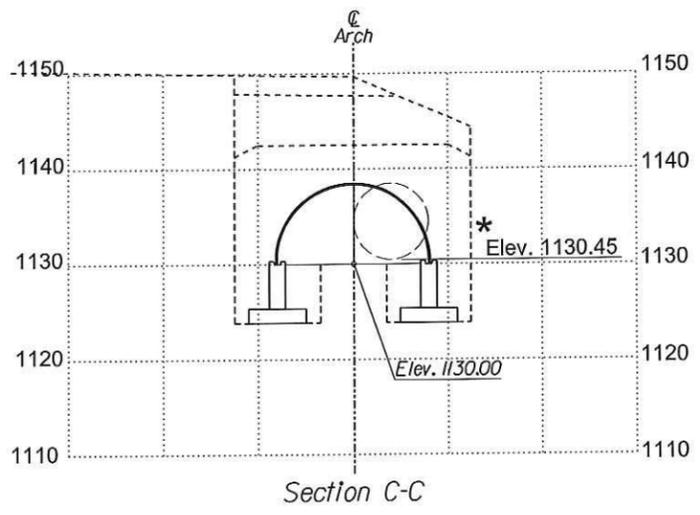
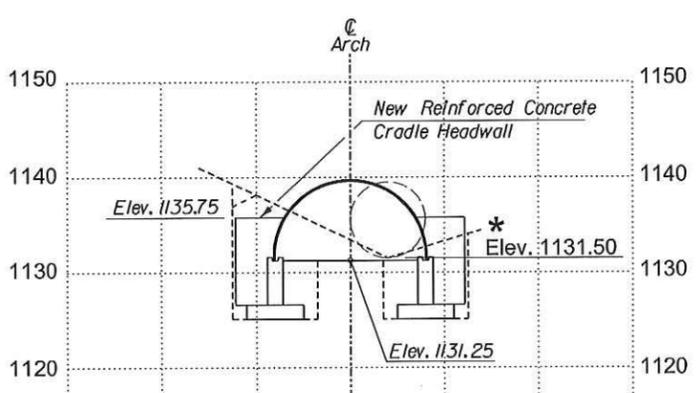
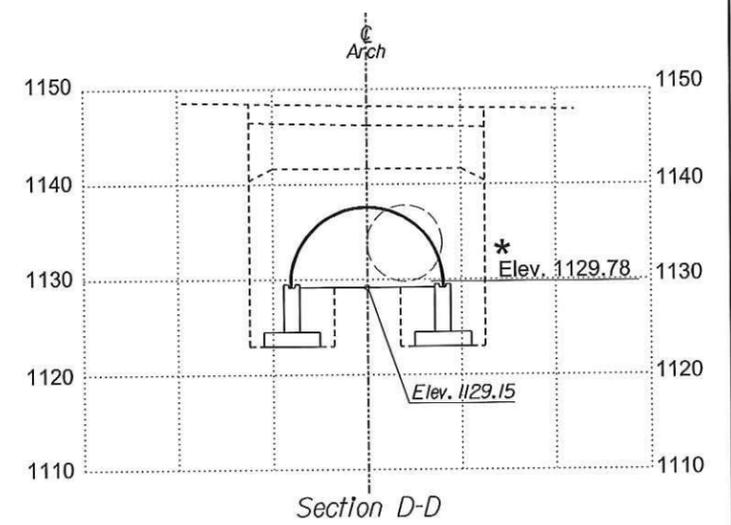
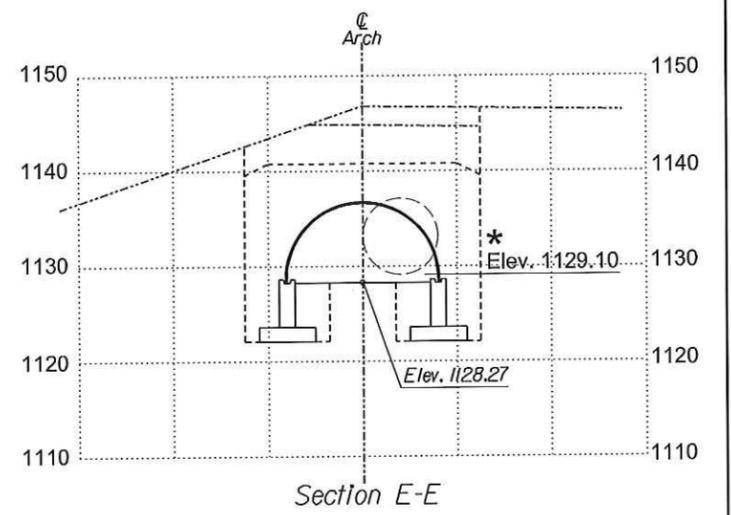
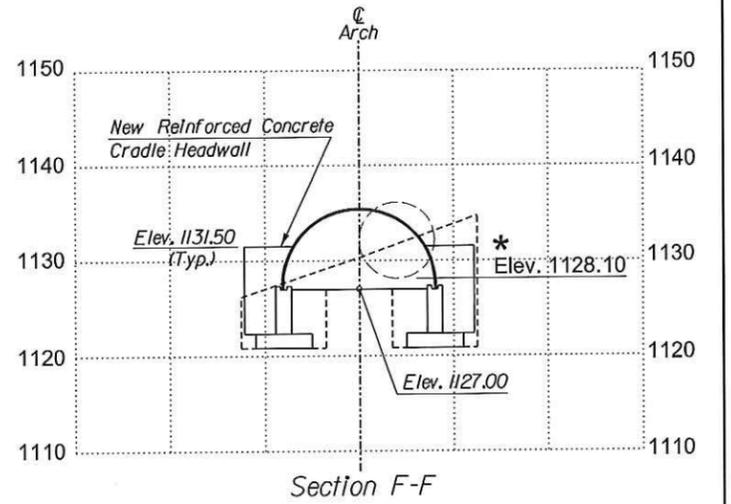
1. No survey work was done on this project; the elevations and details shown for the existing 96" CGMP are shown as dashed lines and were taken from the as-built plans from the project constructed in 1969-1970.
2. The new single radius arch will follow the same alignment as the existing culvert, and as shown, the centerline of the new arch will be located along the uphill (easterly) side of the existing culvert.
3. The ends of the new single radius arch will be cut on an angle so that they are parallel to the centerline of TH 1.
4. Approximately one half of the depth of the existing scour hole located in Freeman Brook at the outlet end of the existing culvert shall be filled in using excess stone fill and gravelly material already on the project. This work, including all necessary material and any work required to blend this work in with the existing streambed in Freeman Brook shall fall under the item All Purpose Excavator Rental, Type 1.
5. The reinforced concrete footings and pedestal walls are shown in concept only; the design for the actual footings, wall, and reinforcing steel will be done once the bearing capacity of the existing soil is determined.
6. There are existing buried utility lines located on the inlet side of the existing culvert; the exact location has not yet been determined in the field.

PROJECT NAME: TOWN OF WARREN
 PROJECT NUMBER: TH 1 (BROOK ROAD) BRIDGE No. 2



EXISTING PLAN SHOWING PROPOSED SINGLE RADIUS ARCH
Not to Scale

NOTES:
 1. Details noted and/or shown on this sheet were generated in conjunction with preparing an estimate for the proposed project and are not for use for construction.
 2. The cross-sections shown on this sheet were developed mathematically using information from the as-built plans and were created in an effort to provide an accurate calculation of some of the excavation and backfill quantities for the estimate.
 3. All elevations shown, whether existing or proposed, should be considered approximate until such time that final plans are developed.
 *- Denotes the approximate invert elevation of the existing 96' CGMP



Scale for Cross-Sections:

PROJECT NAME: TOWN OF WARREN
 PROJECT NUMBER: TH 1 (BROOK ROAD) BRIDGE No.2

One thing that I had talked about in a previous email was the fact that in order to better estimate the quantities involved, particularly the Structure Excavation and the Granular Backfill for Structures, I had created a series of cross-sections at right angles to the alignment of the existing pipe.

I then plotted both the existing culvert as well as the proposed arch, footings, etc. on those cross-sections and figured the quantities from there.

In our conversation yesterday, that subject never came up but if you would like me to send you a pdf of the sheets containing those cross-sections, I can.

There are a total of 6 cross-sections and together with a diagram to show where they were taken, I'd guess that it would amount to 2 additional sheets.

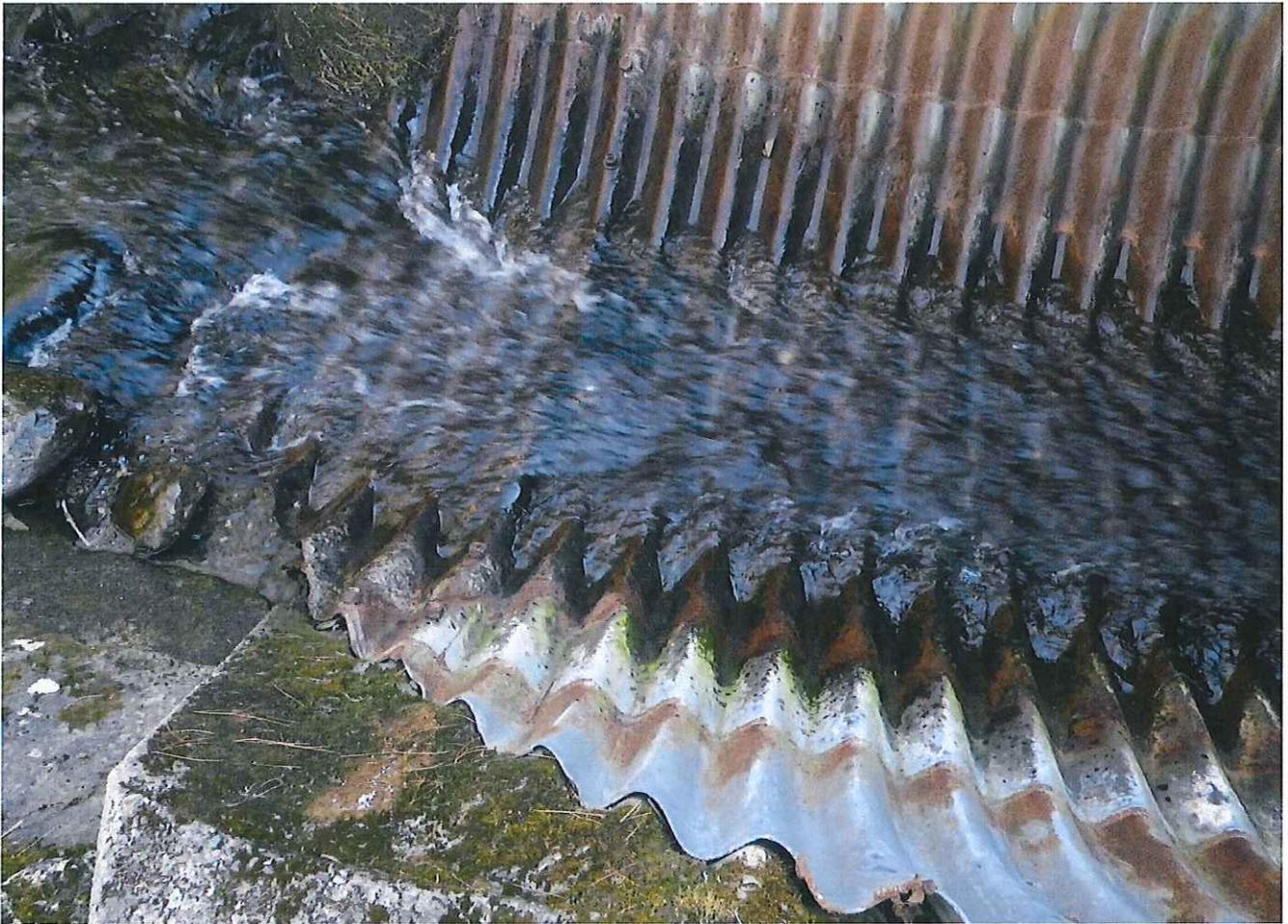
Maybe things are ok the way they are; it's entirely up to you, just let me know.

Doug

Newton Technical Services
728 South Barre Road
Barre, VT 05641
Office: (802) 476-6900
Cell: (802) 793-0499
Email: newtontechnicalservices@charter.net

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Thank you, Newton Technical Services

CULVERT UNDER BROOK RD. NEAR BEHN RD.



INVERT OF CULVERT ▲ AT INLET END



VIEW OF CULVERT FROM INLET END,

CULVERT UNDER BROOK ROAD NEAR BEHN RD.



INLET CONDITION ▲



OUTLET CONDITIONS ▲ OF MAIN CULVERT AND STORM DRAIN (FOREGROUND)

CULVERT UNDER BROOK RD. NEAR BEAN RD.



STORM DRAIN INLET MARKED AS BICYCLE HAZARD

CULVERT SHOWN FROM OUTLET END.

