STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Londonderry BF 016-1(33)

VT ROUTE 11, BRIDGE 24 over UNNAMED BROOK

April 2, 2015

I. Contents

I. Site Information

The culvert is located in a rural area along VT Route 11 in the Town of Londonderry approximately 1.6 miles west of the intersection with VT 100 (this refers to the western intersection of VT Route 11 and VT Route 100). The approximate mile point is 0.27. The culvert is located on a curved segment of VT Route 11. There are several driveways accessing VT Route 11 near the culvert. The depth of cover over the top of the culvert varies from approximately 5ft on the inside of the curve (northern lane) to approximately 10ft on the outside of the curve. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Rural Minor Arterial
Culvert Type	Asphalt Coated Corrugated Galvanized Metal Pipe (ACCGMP)
Culvert Span	6 feet
Culvert Length	66 ft.
Year Built	1948
Ownership	State of Vermont

Need

The following is a list of the deficiencies of Bridge 24 and VT Route 11 in this location.

1. This culvert has a rating of 3 “Serious” and has scattered random perforations throughout that are smaller than 2”.

2. There are signs of settlement in the roadway above the culvert. It is not apparent that the culvert is deforming or squashing, but there are localized areas where the walls are bulging inward slightly.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2017 and 2037.

TRAFFIC DATA	2017	2037
AADT	3,800	4,100
DHV	570	620
ADTT	410	640
%T	9.3	13.5
%D	54	54

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT > 2000 and a design speed of 50 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 4.3	11'/5' (32')	11'/5' (32')	
Bridge Lane and Shoulder Widths	VSS Table 4.3	11'/5' (32')[1]	11'/5' (32')	
Clear Zone Distance	VSS Table 4.4		20' fill / 12' cut (1:3), 14' cut (1:4)	
Banking	VSS Section 4.13	Varies from 3.9% to 8.2%	8% (max), 6% at side roads	Substandard
Speed	VSS Section 4.3	50 mph (Posted)	50 mph (Design)	
Horizontal Alignment	AASHTO Green Book Exhibit 3-26	R=1146' , Bridge located on a horizontal curve	R_{min}=758' @ e=8% R_{min}=1120' @ e=7.2%	
Vertical Grade	VSS Table 4.5	Bridge located in sag vertical curve between (-)2.1691% grade and (+)4.9633% grade	5% (max) for rolling terrain	
K Values for Vertical Curves	VSS Table 4.1	Bridge located on sag (K = 63)	110 crest / 90 sag	Substandard
Vertical Clearance Issues	VSS Section 4.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 4.1	304'	400'	Substandard
Bicycle/Pedestrian Criteria	VSS Table 5.8	5' Shoulder	5' Shoulder	
Bridge Railing	Structures Manual Section 13	Steel Beam Guardrail	Steel Beam Guardrail	
Hydraulics	VTrans Hydraulics Section	Passes Q_{50} storm event with headwater elev. 1328.1	Pass Q_{100} storm event without exceeding 1.5X diameter.	
Structural Capacity	SM, Ch. 3.4.1	Unknown	Design Live Load: HL-93	

[1]The Bridge Inspection Report indicates that a 32' approach roadway width. From the photos, it doesn't look like there are 4' shoulders.

Inspection Report Summary

Culvert Rating 3 Serious
Channel Rating 5 Fair

09/28/2012 - Culvert should be replaced in the near future. FRE/JAS

10/26/2010 – Poor condition due to scattered perforations throughout. Pipe needs full repairs or full replacement. MK/RF

Culvert is in poor condition due to perforations. Culvert should be evaluated for a possible sleeve. Brush on the inlet should be removed. Inspected 10-9-08. MK

Hydraulics

The existing 6' diameter culvert configuration meets the hydraulic standard. Headwater to depth ratios are within allowable limits and the Q_{100} passes through the culvert with no overtopping of the roadway. There is a small vertical drop at the outlet end of the culvert, but it has been determined that Aquatic Organism Passage (AOP) is not required at this location.

Recommendations

The Preliminary Hydraulics Report makes recommendations for culvert repair and replacement. A 5' diameter liner could be considered and would meet the hydraulic standard. If a liner is used, it is recommended that a mitered headwall be installed to maximize hydraulic efficiency.

If the culvert is replaced, a culvert or concrete box with a 6' diameter waterway or 6' wide by 5' high waterway opening was recommended. A concrete box would have baffles installed in the bottom for outlet velocity control. Headwalls and wingwalls are encouraged to protect the roadway embankment and provide maximum hydraulic efficiency. Scour and erosion control should be considered.

At one time, this culvert was used as a cattle pass. VTrans Right of Way personnel have reviewed existing deed information and there are no indications that this crossing is required to maintain a cattle pass.

Utilities

Underground:

There are no known buried utilities at the bridge site. Nearby buried utilities include a propane tank and a septic distribution field associated with the abutting motel. These utilities are not expected to be impacted.

Aerial:

There are several overhead utility lines passing over the culvert. Relocation is likely to be required, except for a repair alternative that does not require a crane.

Right Of Way

The existing Right-of-Way varies in width, between a minimum of approximately 75 ft. and a maximum of approximately 95 ft. It does not appear to be centered on the centerline of the roadway. It is shown on the Layout sheet. It is anticipated that temporary Right-of-Way will be required for access regardless of which alternative is chosen.

Resources

The resources present at this project are shown on the Existing Conditions Layout Sheet, and are as follows:

Biological:

The unnamed brook is the only regulated resource in the project area. There are no wetlands at the culvert site, nor are there species or habitats of special concern.

Wetlands

There are no wetlands within the project area.

Wildlife Habitat

There is wildlife and habitat in the project vicinity. Aquatic Organism Passage is not requested for this project, but wildlife connectivity is requested if a new bridge is contemplated.

Rare, Threatened and Endangered Species

There are no mapped rare, threatened or endangered species within the project area.

Agricultural

There are no prime agricultural soils within the project area, but there are Statewide Significant soils nearby.

Archaeological:
No Archaeological Resources have been identified at the site.

Historic:
No historically significant resources have been identified at the site.

Hazardous Materials:
According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are no known active hazardous sites in the project area.

Stormwater:
There are no stormwater concerns for this project.

II. Maintenance of Traffic

The Vermont Agency of Transportation has created an Accelerated Bridge Program in 2012, which focuses on expedited delivery of construction plans, permitting, and Right-of-Way, as well as accelerated construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with accelerated construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements and systems for new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Bridge Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic onto VT Route 100 South into the Town of Jamaica, then west on VT Route 30 into the Town of Winhall, and back to VT Route 11 as shown in the Appendix. This detour features the following:

Thru distance:	8.3 miles
Detour distance:	15.7 miles
Added distance for Thru Traffic:	7.4 miles
End to end distance:	24 miles

There are several local bypass routes that may see an increase in traffic from local passenger cars. These routes vary in end-to-end distance from 1.0 mile to under 5.0 miles. It is likely that any of these routes could see increased traffic if VT Route 11 was closed during construction, but they are not appropriate for truck traffic. The possible local bypass routes are as follows:

1. TH-1, Landgrove Road, Class 2 paved, to the Landgrove Town line, then Landgrove TH-9, Ridge Road, Class 3, unpaved, back to VT 11, a total end-to-end distance of under 5.0 miles.

2. TH-26, Brophy Lane, Class 3 unpaved, to TH-66, Sherwood lane, Class 3, unpaved, back to VT 11, with a total end-to-end distance of 1.0 mile.

Other bypass routes may be available. Access to driveways would be maintained. A map of the detour route and possible local bypass routes, which could see an increase in traffic, can be found in the appendix.

Advantages: Utilizing an off-site detour would eliminate the need to use a temporary bridge or phase construction to maintain traffic. This would decrease the cost and amount of time required to construct a project in this location. The impacts and amount of temporary rights required to construct a project in this location would also be reduced for this option. The safety of both construction workers and the travelling public will be improved by removing traffic from the construction site.

Disadvantages: Traffic flow would not be maintained through the project corridor during construction.

Option 2: Temporary Bridge

Initial investigations indicate that a temporary bridge could be located upstream or downstream of the existing structure. This site is on a "side hill", and is in a fill section. A temporary bridge downstream would require the removal of many trees and a large volume of temporary fill or sheet piling to construct the approaches. Impacts would occur on the neighboring downstream property. On the upstream side, a few trees would be lost, but the terrain is much easier to work with in terms of constructing approaches. There would be impacts to neighboring property driveway accesses, including a motel, but the accesses would be maintained. Temporary accommodation for the buried propane tank would be required. There are no biological or cultural resource impacts of concern, except for the waterway itself.

A one lane temporary bridge with traffic signals would be appropriate based on the daily traffic volumes. Overhead utilities will have to be relocated regardless of which side a temporary bridge was placed, with greater impacts on the downstream side. A temporary bridge would require temporary Right-of-Way acquisition. See the Temporary Bridge Layout Sheet in the appendix.

Advantages: Traffic flow would be maintained through the project corridor during construction.

Disadvantages: This option would require the acquisition of additional temporary rights, and would be relatively high in cost. There would be some delays and disruption to traffic, since the road would be reduced to one-way traffic, and the speed limit reduced. Overhead utilities would have to be moved regardless of which side a temporary bridge was placed.

Option 3: Phased Construction

Phased construction is the maintenance of one lane of alternating traffic on the existing bridge while building one lane at a time of the proposed structure. This keeps the road open during construction, while having minimal impacts to resources and adjacent property owners.

Based on traffic volumes and the existing roadway width, it would be reasonable to close one lane of traffic, and maintain one lane of alternating traffic, with traffic signals. However, the excavation to replace the culvert would be approximately 12'-15' deep. Phasing would require a fairly deep braced excavation immediately adjacent to a live traffic lane while the work was performed. There are no current subsurface borings available for the vicinity, but the Preliminary Geotechnical Report shows well drillers logs from nearby projects, some of which indicate the possibility of encountering bedrock as shallow as 26'. Without certainty that sheetpiles could be driven to an adequate depth, it would be difficult to ensure a safe and stable excavation. Although phasing will not be considered further on this project, it is noted that periodic lane closures will be necessary.

III. Alternatives Discussion

The existing roadway at the culvert location is substandard in terms of roadway banking, vertical curve K-values, and stopping sight distance. The correction of these features is not intended, since the scope of the project is limited to improving the culvert condition. Crash data from the 2008-2012 report has been reviewed, and it is not believed that the roadway geometry at this location is such that reconstruction of the roadway is warranted. Thus, the alternatives presented here are based on improvement of the condition of the culvert and channel.

No Action

This alternative would involve leaving the culvert in its current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing structure can stay in place without any work being performed on it during the next 10 years. Given the serious rating on this culvert, it will require work within the next 10 years. It is also the policy of VTrans to remove all elements rated 4 or lower from the State system. In the interest of safety to the traveling public, the No Action alternative is not recommended.

Alternative 1: Rehabilitation

Rehabilitation options include:

a: Invert Repair
b: Pipe Liner
c: Cured In Place Pipe
d: Grout Lining

All rehabilitation options would employ the use of hydroblasting or hydrodemolition to appropriately clean the existing pipe interior prior to rehabilitation. In addition to cleaning, some grouting would be needed to plug holes in the pipe and fill all voids on the outside of the pipe. Curing in dry conditions would be required in most cases, necessitating a re-routing of the flow during the work and for a prescribed curing period (usually 24 hours). A new concrete headwall with mitered inlets would be required for all rehabilitation alternatives. A service life of approximately 30 years can be expected if the pipes are rehabilitated.

a. Invert Repair

In many cases, invert repair is used to rehabilitate reinforced concrete pipe where the invert has eroded. Invert repair can be utilized on corrugated steel pipe, but typically consists of paving the invert, which is most effective where no structural capacity needs to be replaced. The culvert on this project is rated 3 (Serious), and there is some evidence in the photos that some settlement is occurring, possibly suggesting some sagging of the culvert roof. Therefore, a solution including some structural enhancement is desired, in addition to measures restoring the invert. Invert Repair alone will not be evaluated further in this report.

b. Pipe Liner

Adding a pipe liner, also called sliplining, consists of pulling a complete new pipe into the existing culvert, then grouting the space between the two. Sliplining can be done using several different types of pipe material including corrugated steel, reinforced concrete, and

polyethylene, and can restore the structural integrity of the culvert. There are two drawbacks to sliplining: One is that the waterway area is always reduced when sliplining is done; and two, it can be difficult to get the new liner installed, especially if there is distortion of the original host pipe as would be possible on this project. The Preliminary Hydraulics Report indicates that a 5' inside diameter liner would be adequate to meet the hydraulic standard on this project. Crucial to the success of this method would be surveying the interior of the existing CMP to insure that a rigid liner can be installed in the pipes. Temporary Right-of-Way would need to be acquired to provide a staging area at each end to accomplish this alternative.

c. CIPP (Cured In Place Pipe)

CIPP is another way of providing a new lining to the interior of an existing pipe. A resin-saturated felt or fiber tube is inserted into the pipe in a folded configuration, and is then expanded to be in contact with the entire interior surface of the existing culvert. Curing takes place by heating the resin using hot water, steam, or UV light. There have been concerns over the use of this method, because some of the materials and techniques have adverse impacts on water quality. The most common resins used in the past have been styrene-based or vinyl-based, both of which are toxic to aquatic species when cured using improperly handled hot water or steam. However, based on a study sponsored by the Virginia DOT, good water quality results have been achieved either using UV curing methods, or by capturing the process water used in curing and disposing of it at an appropriate publicly-owned wastewater treatment facility. VTrans currently has a committee in place with highway, structures and environmental expertise considering the advancement of this pipe repair method and more effective means of protecting water quality and habitat. By the time this project begins preliminary design, it is hoped that a comfort level will have been reached that allows all repair options to be considered with confidence.

It has been determined that the size limit for UV cured CIPP is 54". Although this method of curing may have promise for the future, environmental permitting concerns and the size limitation may inhibit further consideration of UV curing for this project. Temporary Right-of-Way would need to be acquired to provide a staging area at each end to accomplish this alternative.

d. Spray-On Liners

Spray-On liners provide a new rigid interior surface for the pipe and use either cementitious materials (polymer-enhanced cement mortar) or polyurea. These liners are spray applied either by hand or machine, although some users have had better quality control with hand-applied methods. Cementitious liners installed by these methods can provide full structural support, depending on thickness applied. Proper curing is essential to using spray-on liners to avoid bond failures. There are water quality impacts associated with the application of these liners, their degree of impact related to selection of materials. Literature indicates that the State of California has effectively banned the use of spray-on products using polyurea due to the toxic effects of isocyanate materials on the environment and on workers installing the material. Temporary Right-of-Way would need to be acquired to provide a staging area at each end to accomplish this alternative.

Advantages: A repair alternative would address the structural deficiencies of the existing culvert pipes without affecting traffic flow, with minimum upfront costs. It would have minimal impacts on resources. Very minimal impacts on traffic flow would be expected.

Disadvantages: A remaining service life of approximately 30 years would be gained, and slight temporary water quality impacts may be seen. Wildlife connectivity would not be improved.

Alternative 2: Structure Replacement Using Trenchless Methods

A replacement of the existing culvert adjacent to the current location could be accomplished. Conventional jack-and-bore methods would be likely to succeed on this project. A 5' diameter jack and bore would be proposed. Some regrading would be required at each end to direct water flow into and out of the pipes, which would have some minor temporary impacts to the stream habitat. New headwalls or wingwalls would be required for hydraulic efficiency. This solution would provide for a typical service life for culverts of at least 60 years, depending on material selection. It is assumed that temporary Right of Way will be necessary for the jack-and-bore equipment.

Traffic for this alternative would be maintained as normal flow through the work zone with minor impacts due to construction vehicles entering and leaving the site.

Advantages: This alternative would be a new structure with an estimated life span of 60 years. Traffic would be maintained through the work area with minor impacts.

Disadvantages: The location of the culvert and a small length of the stream on each end would be slightly modified, to avoid the existing pipe. This alternative has higher initial costs than pipe rehabilitation and slightly higher temporary impacts to resources.

Alternative 3: Structure Replacement Using Open Cut

Culvert replacement using an open cut was considered. The new culvert would either be a 6' diameter round section, a 6' wide by 5' high precast concrete box, or any other shape meeting the waterway requirements. It would be approximately 75' long at a skew of about 5 degrees. If a 3-sided box is used, it would be founded at least 6' below the channel bottom or on bedrock, and would have full headwalls. A 4-sided box could be used as well, and would be scour resistant. Baffles on the bottom would be recommended for velocity control. Traffic would need to be maintained either by off-site detour or temporary bridge. AOP is not requested, but measures enhancing wildlife connectivity are suggested by Vtrans environmental biologists.

IV. Alternatives Summary

Based on the existing site conditions, culvert condition, and recommendations from hydraulics and others, the following alternatives are offered:

Alternative 1a: Culvert Rehabilitation Using pipe Liner with Traffic Maintained with Minor, Occasional Interruption.
Alternative 1b: Culvert Rehabilitation Using Spray-On Liner with Traffic Maintained with Minor, Occasional Interruption.

Alternative 1c: Culvert Rehabilitation Using Cured-In-Place-Pipe with Traffic Maintained with Minor, Occasional Interruption.
Alternative 2: Culvert Replacement Using Trenchless Technology with Traffic Maintained with Minor, Occasional Interruption.
Alternative 3a: Culvert Replacement with Traffic Maintained on Offsite Detour.
Alternative 3b: Culvert Replacement with Traffic Maintained on Temporary Bridge.

V. Cost Matrix[1]

Londonderry BF 016-1(33)		Do Nothing	Alt 1a Culvert Rehab using New Liner No/Minor Traffic Impact	Alt 1b Culvert Rehab using Spray-On Liner No/Minor Traffic Impact	Alt 1c Culvert Rehab Using Cured-In-Place-Pipe No/Minor Traffic Impact	Alt 2 Culvert Replacement using Jack & Bore No/Minor Traffic Impact	Alt 3a Culvert Replacement Offsite Detour	Alt 3b Culvert Replacement Temporary Bridge
COST	Bridge Cost	$0	$113,000	$127,000	$213,000	$264,000	$145,000	$145,000
	Removal of Structure	$0	$0	$0	$0	$10,000	$10,000	$10,000
	Roadway	$0	$117,000	$117,000	$117,000	$131,000	$197,000	$197,000
	Maintenance of Traffic	$0	$10,000	$10,000	$10,000	$10,000	$40,000	$120,000
	Construction Costs	$0	$240,000	$254,000	$340,000	$415,000	$392,000	$472,000
	Construction Engineering + Contingencies	$0	$70,000	$74,000	$99,000	$120,000	$114,000	$137,000
	Total Construction Costs w CEC	**$0**	**$310,000**	**$328,000**	**$439,000**	**$535,000**	**$506,000**	**$609,000**
	Preliminary Engineering[2]	**$0**	**$82,000**	**$80,000**	**$119,000**	**$145,000**	**$137,000**	**$165,000**
	Right of Way	**$0**	**$14,000**	**$14,000**	**$14,000**	**$18,000**	**$18,000**	**$38,000**
	Total Project Costs	$0	$406,000	$422,000	$572,000	$698,000	$661,000	$812,000
SCHEDULING	Project Development Duration[3]	NA	4 years	4 years	4 years	2 years	4 years	4 years
	Construction Duration	NA	2 months	2 months	2 months	2 months	2 months	5 months
	Closure Duration (If Applicable)	NA	NA	NA	NA	NA	5 days	NA
ENGINEERING	Typical Section - Roadway (feet)	32'	32'	32'	32'	32'	32'	32'
	Typical Section - Bridge (feet)	5-11-11-5	5-11-11-5	5-11-11-5	5-11-11-5	5-11-11-5	5-11-11-5	5-11-11-5
	Geometric Design Criteria	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Traffic Safety	No Change	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	No	No
	Bicycle Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Hydraulic Performance	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Pedestrian Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Utility	No Change	Relocation	No Change	Relocation	Relocation	Relocation	Relocation
OTHER	ROW Acquisition	No	Yes	Yes	Yes	Yes	Yes	Yes
	Road Closure	No	No	No	No	No	Yes	No
	Design Life	<10 years	30 years	30 years	30 years	60 years	80 years	80 years

[1] Costs are estimates only, used for comparison purposes.
[2] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.
[3] Project Development Durations are staring from the end of the Project Definition Phase.

VI. Conclusion

Alternative 3a is recommended; replace the existing culvert while maintaining traffic on an offsite detour. A 6' high by 5' wide concrete box is proposed. Cover depth would be expected to be approximately 5ft. to 10 ft.. A box culvert that matches the natural stream course, eliminating the drop at the outfall, is recommended over a round shape to enhance wildlife connectivity.

Structure:

The initial cost for replacement of the culvert is higher than repairing it, but the total cost spread out over the expected service life is less. It seems reasonable to provide a 60 year fix for less money over the long run.

None of the alternatives considered would rectify the substandard banking, K values, or sight distance at this location. In order to rectify the substandard vertical alignment, the roadway would have to be raised over 2' and the project limits significantly extended.

Traffic Control:

The recommended method of traffic control is to close the bridge for 5 days, and maintain traffic on an offsite detour. The detour appropriate for trucks would add approximately 7.4 miles to the through route, and have an end-to-end distance of 24 miles. There are a couple of local bypass routes which, although not appropriate for trucks, would most likely be used by local traffic. These routes are quite short, consisting of 1.1 miles and 5 miles end-to-end.

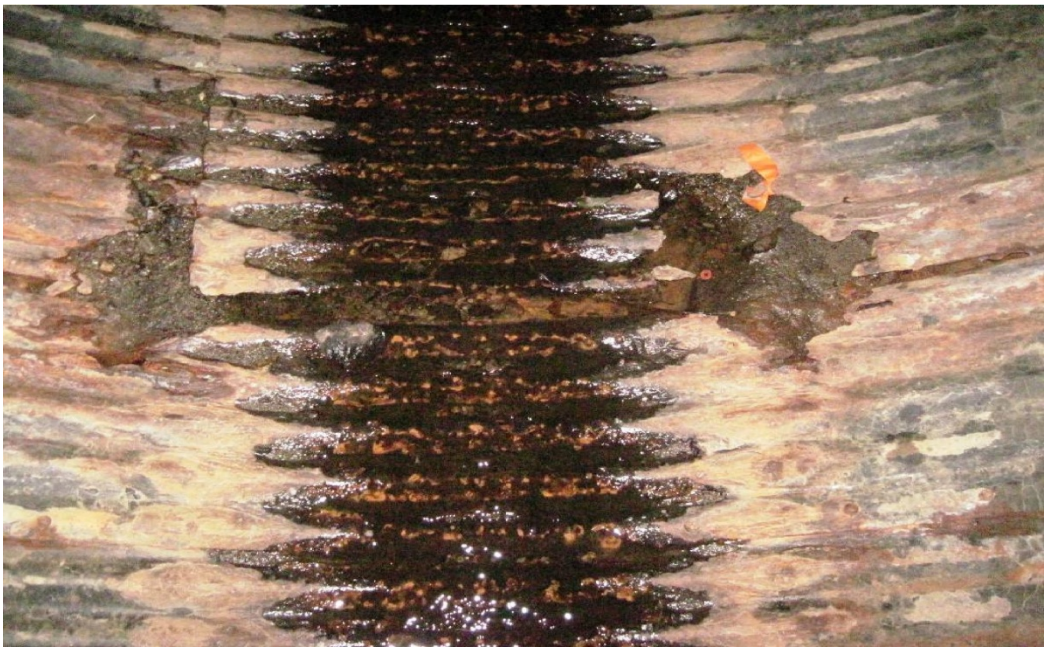
The option to close the road will have smaller impacts to adjacent properties compared to other traffic maintenance options. Additionally the option to close the road is the least expensive and the safest option. Access to driveways would be maintained.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Preliminary Hydraulics Memo
- Preliminary Geotechnical Report
- Natural Resources Memo
- Resource ID Completion Memo
- Archaeology Memo
- Historic Memo
- Local Input
- Detour Route
- Local Bypass Routes
- Plans
    - Existing Conditions
        - Profile
    - Proposed Conditions
        - Typical Sections
        - Layouts
        - Temporary Bridge Layouts

VT Route 11, Looking East

VT Route 11, Looking West



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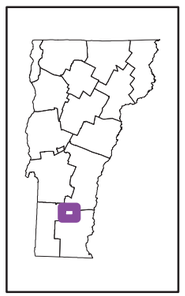
N

- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FAS/FAU
- FAS/FAU HWY
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- PRIVATE
- DISCONTINUED
- DISTRICT
- POLITICAL BOUNDARY
- NAMED RIVERS-STREAMS
- UNNAMED RIVERS-STREAMS

LONDONDERRY C 24
BF 016-1(33)

Produced by:
Mapping Unit
Vermont Agency of Transportation
August 2011



LONDONDERRY
WINDHAM COUNTY
DISTRICT # 2

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

Vermont Agency of Transportation ~ Structures Section ~ Bridge Management and Inspection Unit

Inspection Report for LONDONDERRY **bridge no.:** 0024 **District:** 2

Located on: VT11 **over** BROOK **approximately** 1.6 MI W JCT VT 100 **Maintained By:** STATE

CONDITION

Deck Rating: N NOT APPLICABLE

Superstructure Rating: N NOT APPLICABLE

Substructure Rating: N NOT APPLICABLE

Channel Rating: 5 FAIR

Culvert Rating: 3 SERIOUS

Federal Str. Number: 300016002413101

AGE and SERVICE

Year Built: 1948 **Year Reconstructed:** ____

Type of Service On: 1 HIGHWAY

Type of Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 7

ADT: 2800 **Year of ADT:** 1996

GEOMETRIC DATA

Length of Maximum Span (ft): 6

Structure Length (ft): 6

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

Bridge Rdwy Width Curb-to-Curb (ft): 0

Deck Width Out-to-Out (ft): 0

Appr. Roadway Width (ft): 32

Skew: 0

Bridge Median: 0 NO MEDIAN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 06 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: A.C.C.G.M.P.

Number of Main Spans: 1

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: N NOT APPLICABLE

Type of Wearing Surface: N NOT APPLICABLE

Type of Membrane: N NOT APPLICABLE

Deck Protection: N NOT APPLICABLE

CULVERT GEOMETRIC DATA and INDICATORS

Culvert Barrel Length (ft): 66

Average Cover Over Culvert (ft): 15

Waterway Area Through Culvert (sq.ft.): 19

Culvert Wing/Header Rating: N NOT APPLICABLE

Steel Culvert Corrosion Indicator: 4 RANDOM PERFORATIONS < 2" THROUGHOUT

Multi Plate Culvert Bolt Line Crack Indicator: N NOT A STEEL MULTI PLATE

APPRAISAL

Appr. Rdwy. Alignment: 8 EQUAL TO DESIRABLE CRITERIA

INSPECTION

Inspection Date: 092012 **Inspection Frequency (months):** 12

INSPECTION SUMMARY and NEEDS

9/28/2012 Culvert should be replaced in the near future. FRE/JAS

10/26/2010 Poor condition due to the scattered perforations throughout. Pipe needs repairs or full replacement. ~MK/RF

Culvert is in poor condition due to perforations. Culvert should be evaluated for a possible sleeve. Brush on the inlet should be removed. Inspected 10-9-08 ~MK

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Christopher Williams, Structures Project Manager

FROM: David Willey, Hydraulics Project Supervisor

DATE: April 8, 2014

SUBJECT: Londonderry BF 016-1(33), VT 11 Br. 24 over unnamed brook
Preliminary Hydraulics
GPS coordinates: N 43.2353° W 72.8447°

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

Existing Conditions

The existing structure is a 6.0' CMP with mitered ends. It provides 28.3 sq. ft. of waterway area. It was built in 1948. The pipe is in serious condition with holes through the invert and sides. There is about a 3' drop over rocks at the outlet.

Route logs and record plans indicate this was a cattle pass. It has not been used for that purpose for a long time and it would not be possible to use it for that without significant work at the site. This structure conveys a well defined stream.

Our calculations show the existing structure is more than adequate to convey the design flows. Headwater to depth ratios are within allowable values and all flows up to Q100 pass through the structure with no roadway overtopping. Thus the structure meets the hydraulic standards. This structure results in a Q50 headwater elevation of 1328.1'.

Repair Recommendations

A 5.0' corrugated interior liner could be considered and would be adequate hydraulically. That liner would provide 19.6 sq. ft. of waterway area. Headwater to depth ratios would be within allowable values and all flows up to Q100 pass through the structure with no roadway overtopping. Thus the structure meets the hydraulic standards. We recommend the existing mitered ends be removed and new cradle or full height headwalls be constructed on each end. Assuming the invert of the liner is 0.5' higher than the existing pipe invert, this pipe would result in a Q50 headwater elevation of 1328.8'.

A liner would constrict the channel even more than the existing pipe, and thus would be more prone to debris capture at the inlet. Headwater elevations would increase and AOP would not be provided. Due to the small size of the drainage area, that may be acceptable at this site. ANR would need to confirm this. A liner would increase the drop at the outlet and could increase outlet velocities. Additional scour protection would be required at the outlet

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

1. A 6.0’ diameter corrugated pipe, with 28-sq. ft. of waterway area. This structure is the same size as the existing pipe and will perform similarly. Using a different material, such as aluminum, or a different coating, could result in a longer life expectancy than the existing pipe.

2. A concrete box with a 6’ wide by 5’ high inside opening. The box should have 6” high baffles to help reduce outlet velocities. That will result in a 6’ wide by 4.5’ high waterway opening, providing 22.5-sq. ft. of waterway area. Baffles should be 6” high across the full width of the box. They should be spaced no more than 8’-0” apart throughout the structure with one baffle placed at the inlet and one at the outlet. Assuming the same inlet invert as the existing pipe, this structure will result in a Q50 headwater elevation of 1327.4’.

3. Any similar structure with a minimum clear span of 6’, a minimum clear height of 4.5’ and at least 22-sq. ft. of waterway area, that fits the site conditions, could be considered.

Due to the small drainage area of 0.06 sq. mi. (38 acres), the above recommendations were made on the assumption that aquatic organism passage will not be required. We have information from 2006, indicating ANR made a determination that AOP was not required. It will need to be confirmed whether that is still valid. If AOP is required, the invert will need to be buried and the size of the structure will need to be increased to provide the recommended waterway area.

Although there does not appear to be any need for a cattle pass at this time, you may want to determine if there is any legal obligation to maintain a cattle pass at this location.

General comments

If a pipe 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.

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.

Additional large stone fill may be required at the structures outlet, due to the anticipated high outlet velocities. We will make recommendations for stone fill when we do Final Hydraulics.

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, and achieve the best, least cost alternative for the design life of the structure. Other regulatory authorities, including the US Army Corps of Engineers may have additional concerns or requirements regarding replacement of this structure.

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

DCW
cc: Hydraulics Project File via NJW
Hydraulics Chrono File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, Project Manager, Structures

From: Thomas D. Eliassen, Transportation Geologist via Christopher C. Benda, Soils and Foundations Engineer

Date: March 14, 2014

Subject: Londonderry BF 016-1(33) Preliminary Geotechnical Information Report

In an effort to assist the Structures Section with their bridge type study, the Soils and Foundations Unit within the Materials and Research Section has completed a review of available geological data near Bridge No. 24 (Asphalt Coated Corrugated Metal Pipe [ACCGMP] culvert) on Vermont Route-11 between Brophy Lane and Sherwood Lane approximately 2 miles west of the village of Londenderry, Vermont. The location of this project is presented as Figure 1. Figure 2 show a view of the area of the culvert looking west and Figure 3 shows a photograph of the outfall of the subject culvert.

Figure 1 Location of Bridge 24.

Figure 2 View of project area looking west.

Figure 3 Photograph of culvert outfall.

This review included observations made from a review of existing photographs, a review of Google Earth images, the examination of historical in-house bridge boring files, as-built record plans, USDA Natural Resources Conservation soil survey records, published surficial and bedrock geologic maps and water well logs on-file at the Agency of Natural Resources.

Due to the winter conditions at the time of this investigation (recent heavy snowfall) and an existing heavy ground covering of snow, it was expected that a site visit would not prove beneficial. Existing photographs and images from Google Earth were used for the purposes of assessing topographic and geologic conditions that may impact the design and/or construction of the proposed bridge. Observations were also made of existing utility locations and logistical site access conditions. Figures 4 and 5 show the site conditions on either side of the roadway.

Figure 4 Image from Google Earth showing the drainage swale north of the roadway.

Figure 5 Google Earth image showing the drainage swale south of the roadway.

The project site has a drainage swale carrying drainage water from the northern side of the roadway to south of the roadway. Aboveground power, telephone and cable lines are present along both sides of the roadway. These lines appear to be set back from the roadway and should not interfere with boring activities.

No boring records were found in the Soils & Foundations in-house historical boring log records nor were there any within the historical record plans maintained by the Agency.

Drilling logs from private drinking water wells in the area of a project can be helpful in anticipating what may be encountered in the subsurface. The Agency of Natural Resources Private Well Locator interactive map was reviewed for these purposes. Four water wells are present in the area of the subject project. These well locations and drill log lithologic descriptions are depicted on Figure 6. It should be noted that these logs were developed and provided by the well drilling companies whose employees may have had little to no training in identifying soil and rock.

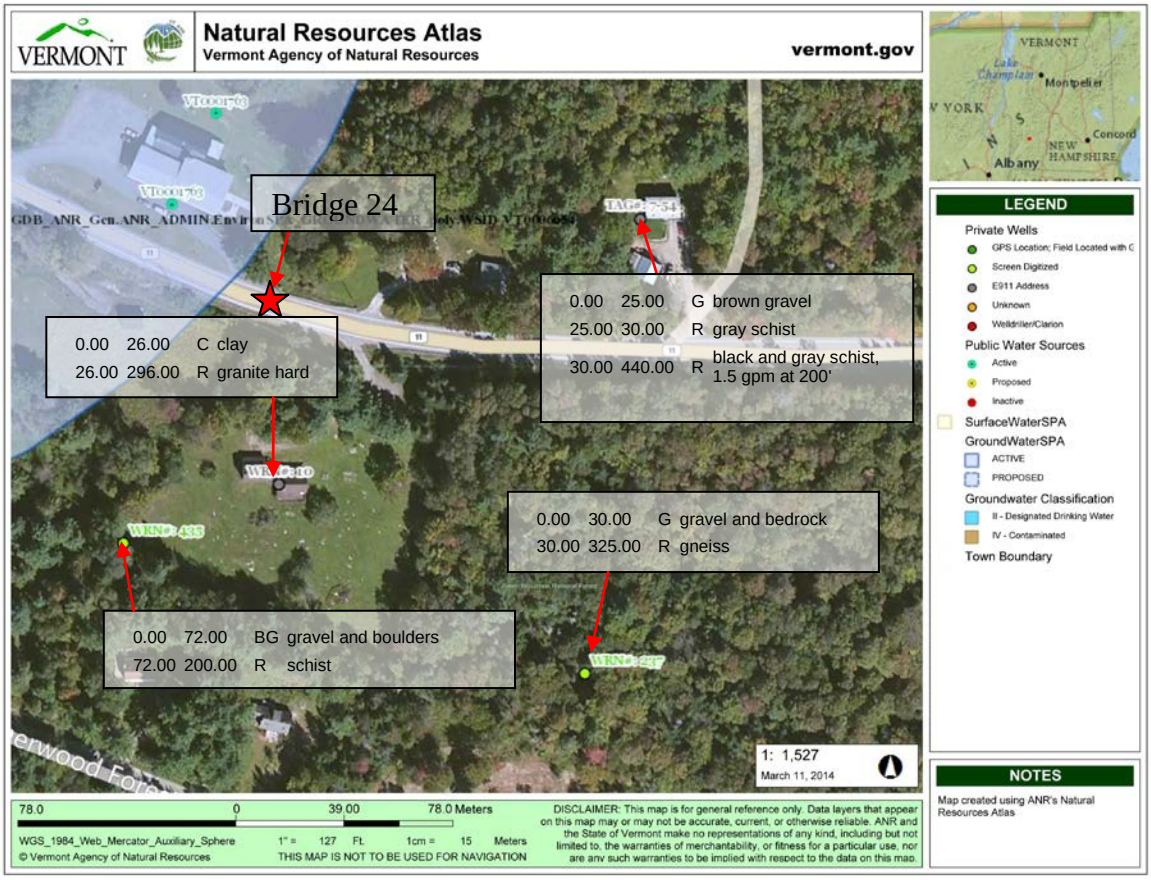


Figure 6 Map showing water well locations in the vicinity of Bridge 24. Also listed on this map are the driller well log notes referencing the stratigraphy encountered.

USDA Natural Resources Conservation soil survey records indicate that surficial soils in the area of the culvert consist of Worden loam, 8 to 15 percent slopes. Figure 7 shows a portion of the NRSC soil survey map in the project area. Worden loam deposits are labeled 17C on the map.

Figure 7 USDA Soil Map showing the distribution of soil types at the subject project site.

According to the 2011 bedrock map of Vermont, the project area is underlain by Precambrian aged bedrock of the Mount Holly Complex consisting of metavolcanic gneiss.

Surficial mapping conducted for the 1970 Surficial Geologic Map of Vermont indicates that the subject area is underlain by glacial till.

Generally, the subsurface can be characterized as Glacial Till consisting of gravel and boulders overlying bedrock. The thickness of Glacial Till deposits vary from 25 to 72 feet.

Because no previous subsurface borings, test pits are available, we recommend conducting two borings (one located adjacent to each end of the existing culvert). These borings should be performed in the shoulder area between the travel lanes and guardrail. Borings should be drilled to a depth of 25 feet and samples should be collected for characterizing the soil column. Sampling should be performed using Standard Penatration Test (SPT) techniques. If bedrock is encountered above 25 feet the boring should be extended 10 feet into sound bedrock.

It is expected that the existing culvert will be replaced by a newer one, most likely constructed as round corrugated steel pipe, structural plate pipe, horizontally ellipsed SPCSP or concrete box structure with appropriate headwalls.

If you have any questions, please feel free to contact us at 828-6916.

c: WEA/Read File
CCB/Project File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

TO: Lee Goldstein, Environmental Specialist

FROM: John Lepore, Transportation Biologist

DATE: April 17, 2014

SUBJECT: Londonderry B_F 016-1 (33)
VT 11, Bridge 24 over unnamed brook
Natural Resource Identification

The purpose of this memorandum is to confirm that I went out onto this project and found that the only regulated resource in the area is the small unnamed brook which is conveyed under VT 11 via Bridge 24. The limits of Ordinary High Water (OHW) should be depicted on the plans, and only fills below the OHW line will be regulated by the Corps of Engineers and ANR.

Wetlands

There are no wetlands in the project area.

Impact below OHW / Fisheries / AOP

This small, unnamed brook which is associated with this crossing feeds out of a small, spring fed pond which is immediately upstream of the crossing. ANR Fisheries Biologist, Ken Cox, reviewed this crossing in 2006 and determined that aquatic organism passage (AOP) is not required, due to the presence of the pond just upstream.

Species / Habitats of Special Concern

Species and/or habitats of special concern are not present in the area.

Agricultural Soils / Floodplains

There are no agricultural soils or floodplains in the project area.

cc: Chris Williams, Project Manager
BioFiles via Lepore

OFFICE MEMORANDUM

AOT - PROGRAM DEVELOPMENT DIVISION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Chris Williams, Project Manager
FROM: Jeff Ramsey, Environmental Specialist
DATE: June 30, 2014
PIN: 13B262

Project: Londonderry BF 016-1 (33)

ENVIRONMENTAL RESOURCES:

Wetlands:	___ Yes	_X_ No	
Historic/Historic District:	___ Yes	_X_ No	
Archaeological Site:	___ Yes	_X_ No	
4(f) Property:	___ Yes	_X_ No	
6(f) Property:	___ Yes	_X_ No	
Agricultural Land:	_X_ Yes	___ No	Statewide
Fish & Wildlife Habitat:	_X_ Yes	___ No	unnamed tributary, AOP not required
Endangered Species:	___ Yes	_X_ No	
Hazardous Waste:	_X_ Yes	___ No	Flood Brook School (site 931430), SMAC site closure date 01/01/96
Stormwater:	___ Yes	_X_ No	
USDA-Forest Service Lands:	___ Yes	_X_ No	
Wildlife Habitat Connectivity:	_X_ Yes	___ No	connectivity scores of 4 and 8 (10 being best), consider wildlife passage with this structure
Scenic Highway/ Byway:	___ Yes	_X_ No	
Act 250 Permits:	___ Yes	_X_ No	

If you have any questions or need additional information please let me know.
Thanks,
Jeff

cc:
Project File

VERMONT

Jeannine Russell
VTrans Archaeology Officer
State of Vermont
Environmental Section
One National Life Drive
Montpelier, VT 05633-5001
www.aot.state.vt.us

Agency of Transportation

[phone] 802-828-3981
[fax] 802-828-2334
[ttd] 800-253-0191

To: Lee Goldstein, VTrans Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer
via Brennan Gauthier, VTrans Archaeologist

Date: 6/30/2014

Subject: Londonderry BF 016-1(33) – Archaeological Resource ID

Lee,

A field visit was conducted by VTrans Archaeology Officer Jen Russell on May 8th, 2014 in order to assess archaeological resources in the project APE. For the purposes of this un-scoped bridge repair/replacement, a generalized APE of 200 feet in both upstream and downstream directions was incorporated. After thorough background research and a field visit, it has been determined that there are no archaeological resources in the project area. Please feel free to contact myself or Jen with any questions that may arise.

Sincerely,

Brennan

Brennan Gauthier
VTrans Archaeologist
Vermont Agency of Transportation
Project Delivery Bureau
Environmental Section
1 National Life Drive
Montpelier, VT 05633
tel. 802-828-3965
fax. 802-828-2334
Brennan.Gauthier@state.vt.us

VTrans Working to Get You There
Vermont Agency of Transportation

Ramsey, Jeff

From: Newman, Scott
Sent: Tuesday, February 04, 2014 11:00 AM
To: Ramsey, Jeff
Cc: O'Shea, Kaitlin; Williams, Chris
Subject: CW Bridges Resource ID's

Jeff –

I have completed the resource ID for the following bridge projects:

Londonderry BF 016-1(33)
Searsburg BF 010-1(50)
Weathersfield STP 0146(16)

None of the above bridges are historic, and none of the project areas contain any above-ground historic or Section 4(f) resources. When these projects come in for NEPA they will be processed as NHPA for 106 and n/a for 4(f)

Thanks,
Scott

Local & Regional Input Questionnaire

Project Name: Bridge 24 **Project Number: Londonderry BF 016-1(33) VT 11**

Community Considerations

1. Are there any scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the bridge is closed during construction? Examples include: a bike race, festivals, cultural events, farmers market, concerts, etc. that could be impacted? If yes, please provide date, location and event organizers' contact info. *In general, traffic would be heavily impacted when Flood Brook School is in session (Neil McIntyre, principal 802-824-6811). Other event impacts would be minor.*
2. Is there a "slow season" or period of time from May through October where traffic is less? *After Labor Day to the beginning of foliage(third week of Sept).*
3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes. *Phoenix Fire and Londonderry Volunteer Rescue Squad both located in Londonderry village 2 miles east of the project. Phoenix Fire serves Landgrove, west of the project and LVRS serves Landgrove and Peru, both west of the project, so emergency response would be impacted with detours or road closure.*
4. Where are the schools in your community and what are their schedules? *Flood Brook School is immediately adjacent to the project. See above for contact info.*
5. In the vicinity of the bridge, is there a land use pattern, existing generators of pedestrian and/or bicycle traffic, or zoning that will support development that is likely to lead to significant levels of walking and bicycling? Please explain. *No.*
6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity? *None local, but Rte. 11 is a major east-west trucking route.*
7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project? *Rec fields at Flood Brook School*
8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road? *There are no paved town roads that could serve as a detour. Some people might use Ridge Road to Reilly Road. These dirt roads are not adequate to handle increased traffic.*
9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain. *No.*
10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any

unconventional means such as local low-power FM. *The Message is Londonderry's newspaper of record. GNAT TV, Front Porch Forum, Town of Londonderry website, Londonderry email listserv*

11. Is there a local business association, chamber of commerce or other downtown group that we should be working with? *No.*

Design Considerations

1. Are there any concerns with the alignment of the existing bridge? For example, if the bridge is located on a curve, has this created any problems that we should be aware of? *None known.*

2. Are there any concerns with the width of the existing bridge? *None known.*

3. What is the current level of bicycle and pedestrian use on the bridge? *Low.*

4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one? Are there existing bicycle and/or pedestrian facilities on the approaches to the bridge? *No*

5. Does the Town have plans to construct either bicycle or pedestrian facilities leading up to the bridge? Please provide a copy of the planning document that demonstrates this (e.g. scoping study, master plan, corridor study) Please explain and provide documentation. *No*

6. Does the bridge provide an important link in the town or statewide bicycle or pedestrian network such that you feel that bicycle and pedestrian traffic should be accommodated during construction? *No*

7. Are there any special aesthetic considerations we should be aware of? *None known*

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain. *None known.*

9. Does the location have a history of flooding? If yes, please explain. *No*

10. Are you aware of any nearby Hazardous Material Sites? *No*

11. Are you aware of any historic, archeological and/or other environmental resource issues? *No*

12. Are there any other comments you feel are important for us to consider that we have not mentioned yet? *no*

Land Use & Public Transit Considerations – to be filled out by the municipality or RPC.

1. Does your municipal land use plan reference the bridge in question? If so please provide a copy of the applicable section or sections of the plan. *Not specifically mentioned.*

2. Please provide a copy of your existing and future land use map, if applicable.

3. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so please explain. *No*

4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider. *No*

BRIDGE 24

PERU

DETOUR ROUTE

LANDGROVE

LONDONDERRY

WINHALL

French Hollow

BONDVILLE

RAWSONVILLE

JAMAICA

Brook

Flood

Bk.

Lyons Pond

Burnt

Meadow

Winhall

Mud Pond

Cook

Eddy

Mill

Red

Gale Meadows Pond

WEST

RIVER

TOWN LINE

11

30

66

26

100

N

VT STATE PLANE GRID

THROUGH DISTANCE: 8.3 MILES
DETOUR DISTANCE: 15.7 MILES
ADDED THRU DISTANCE: 7.4 MILES
END TO END DISTANCE: 24.0 MILES

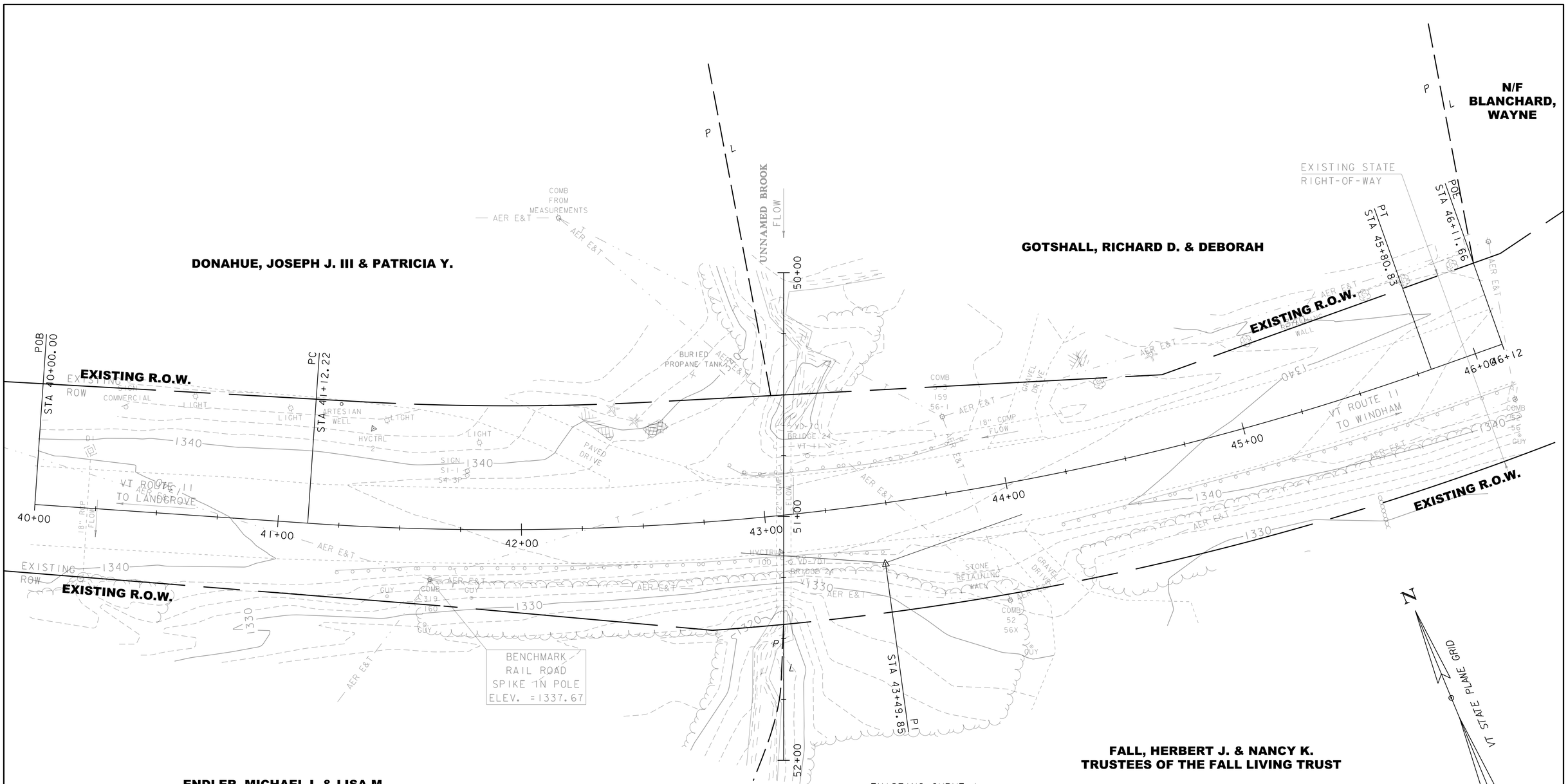
DETOUR ROUTE

SCALE 1" = 2000'
2000 0 2000

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BG 016-1(33)

FILE NAME: l3b262/sl3b262detour.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
REGIONAL DETOUR

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 1 OF 12



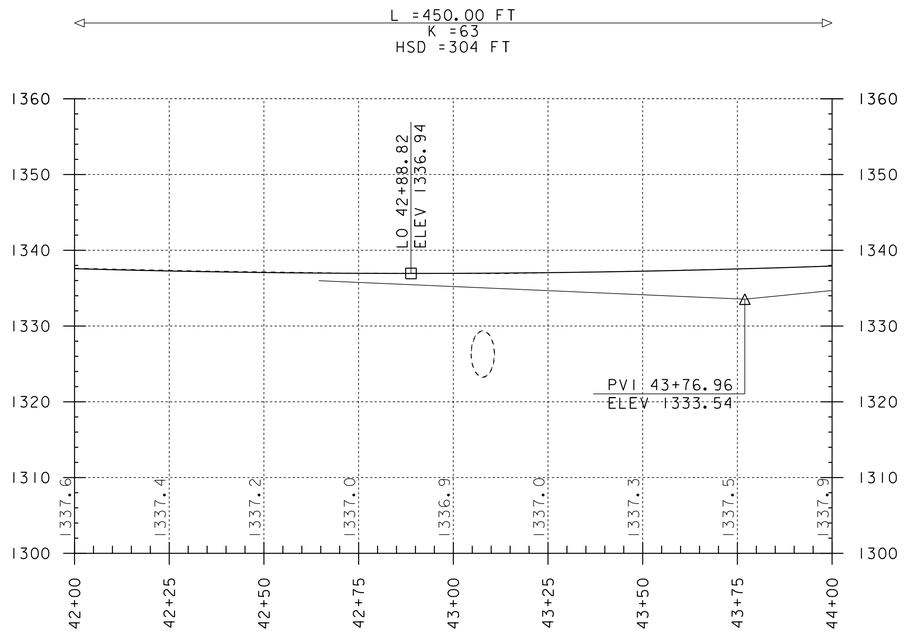
EXISTING CURVE 1
DELTA = 23°25'51"
D = 5°00'00"
R = 1145.92'
T = 237.63'
L = 468.62'
E = 24.38'

EXISTING CULVERT DATA
72" ACCGMP, 66' LONG
BUILT 1948, CATTLE PASS
15' AVERAGE COVER
19 SQ FEET WATERWAY OPENING

EXISTING CONDITIONS

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	LONDONDERRY
PROJECT NUMBER:	BF 016-1(33)
FILE NAME: l3b262/sl3b262border.dgn	PLOT DATE: 26-MAR-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS	SHEET 2 OF 12



VT ROUTE 11 EXISTING PROFILE

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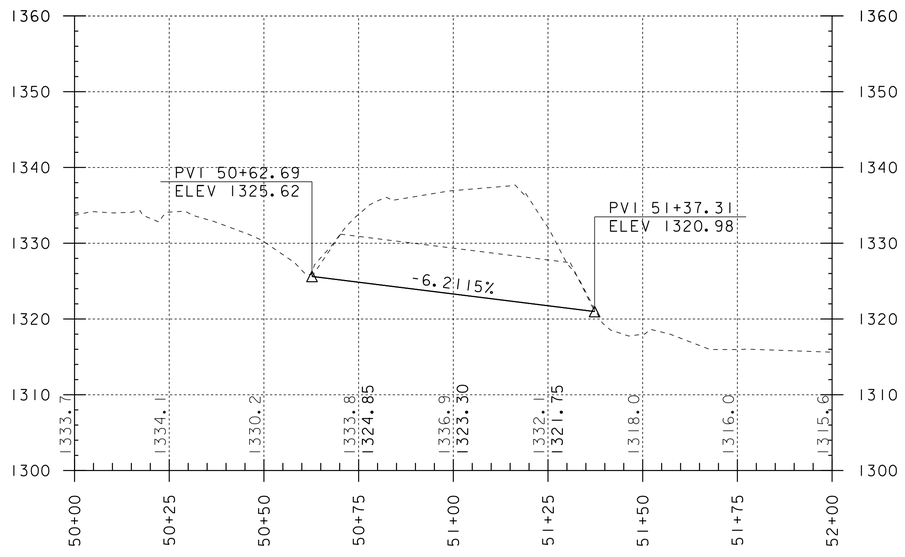
VERTICAL 1" = 10'-0"



CULVERT 24 EXISTING PROFILE

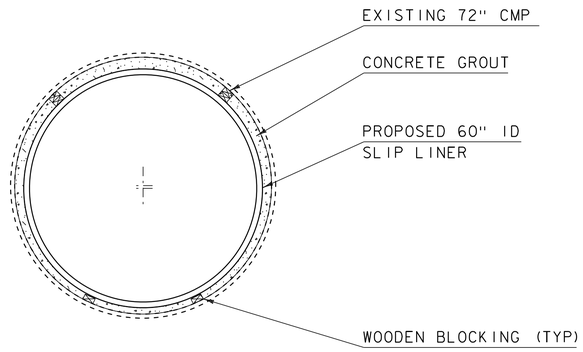
SCALE: HORIZONTAL 1" = 20'-0"
VERTICAL 1" = 10'-0"

NOTE:

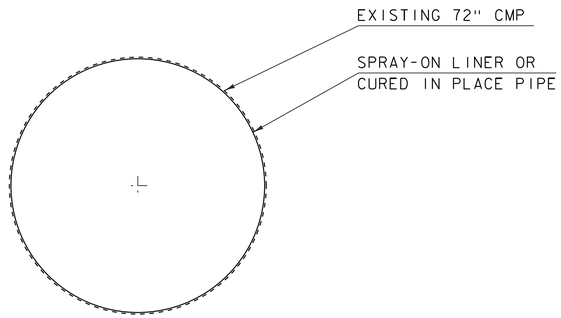
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

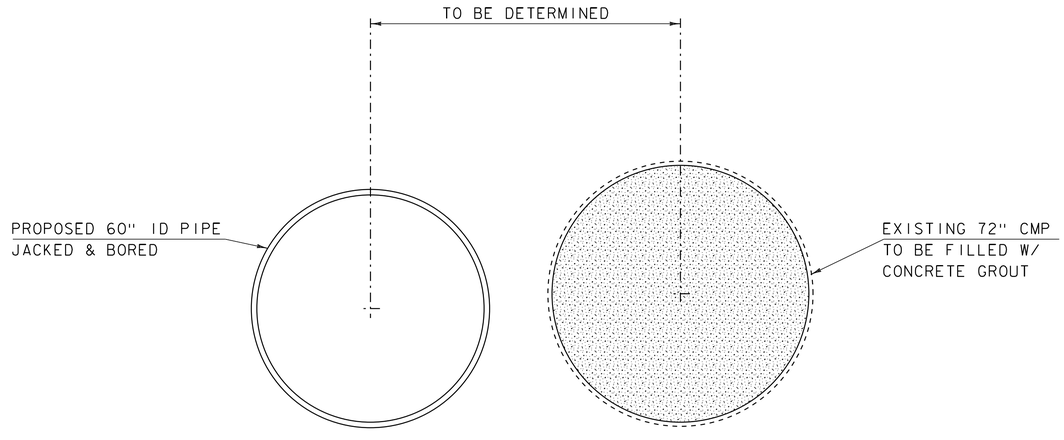
PROJECT NAME:	LONDONDERRY
PROJECT NUMBER:	BF 016-1(33)
FILE NAME: 13b262/13b262profile.dgn	PLOT DATE: 26-MAR-2015
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PROFILE SHEET	SHEET 3 OF 12



ALTERNATIVE IA TYPICAL SECTION

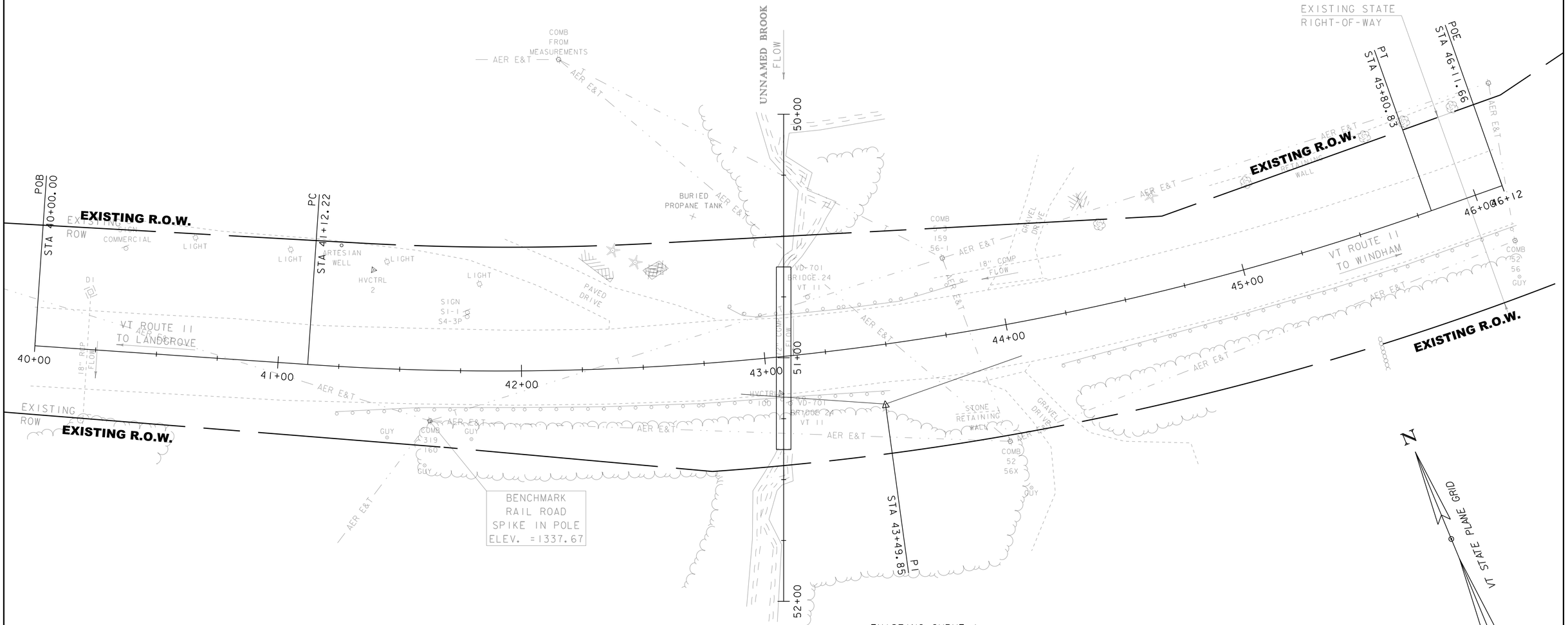


ALTERNATIVE IB & IC TYPICAL SECTION



ALTERNATIVE 2 TYPICAL SECTION

PROJECT NAME:	LONDONDERRY
PROJECT NUMBER:	BF 016-1(33)
FILE NAME: 13b262/sl3b262typical.dgn	PLOT DATE: 26-MAR-2015
PROJECT LEADER: K.HIGGINS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
TYPICAL SECTIONS SHEET 1	SHEET 4 OF 12



EXISTING CURVE 1
DELTA = 23°25'51"
D = 5°00'00"
R = 1145.92'
T = 237.63'
L = 468.62'
E = 24.38'

EXISTING CULVERT DATA
72" ACCGMP, 66' LONG
BUILT 1948, CATTLE PASS
15' AVERAGE COVER
19 SQ FEET WATERWAY OPENING

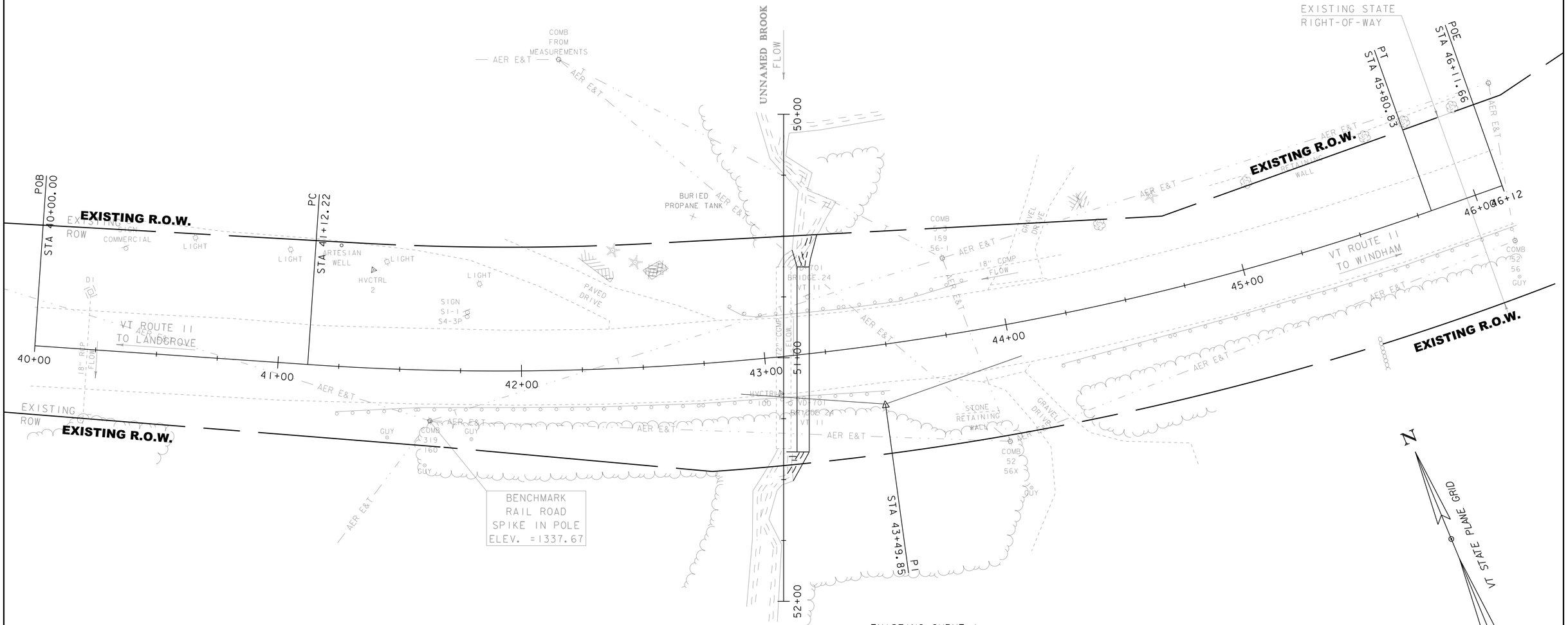
ALTERNATIVE 1 LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

FILE NAME: 13b262/sl3b262border.dgn
PROJECT LEADER: K.HIGGINS
DESIGNED BY: G.SWEENY
ALTERNATIVE 1 LAYOUT SHEET

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 5 OF 12

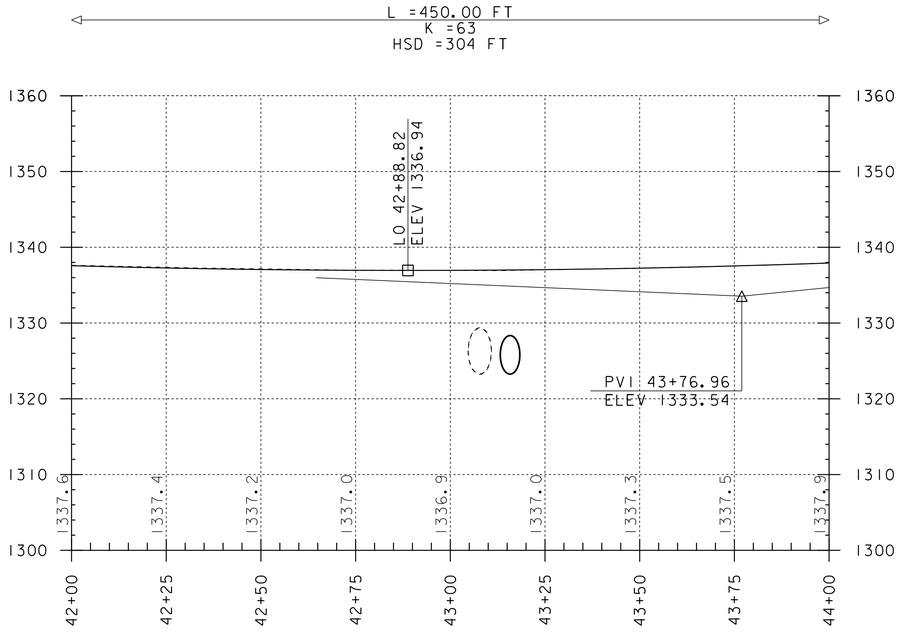


EXISTING CULVERT DATA
72" ACCGMP, 66' LONG
BUILT 1948, CATTLE PASS
15' AVERAGE COVER
19 SQ FEET WATERWAY OPENING

ALTERNATIVE 2 LAYOUT

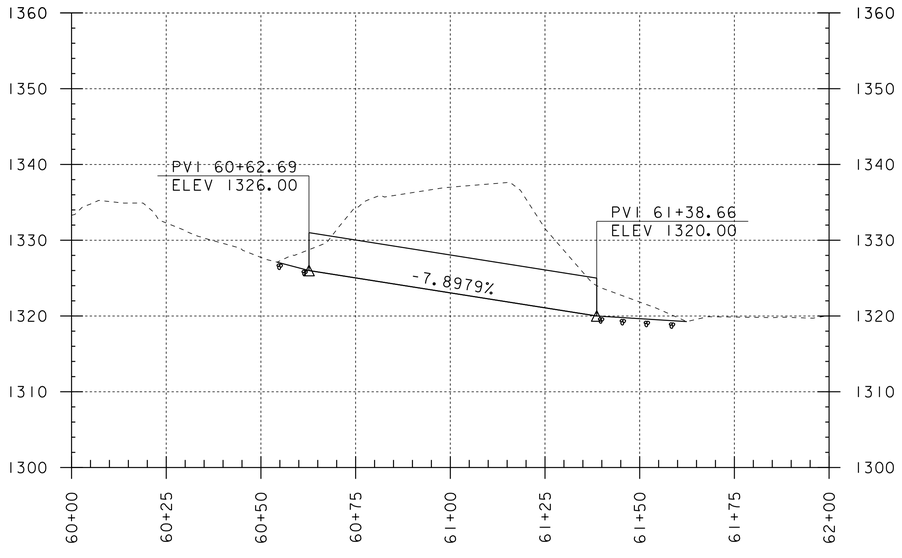
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	LONDONDERRY
PROJECT NUMBER:	BF 016-1(33)
FILE NAME: l3b262/sl3b262border.dgn	PLOT DATE: 26-MAR-2015
PROJECT LEADER: K.HIGGINS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 2 LAYOUT SHEET	SHEET 6 OF 12



ALTERNTAIVE 2 VT ROUTE 11 PROFILE

SCALE: HORIZONTAL 1" = 20'-0"
VERTICAL 1" = 10'-0"



ALTERNATIVE 2 PROFILE

SCALE: HORIZONTAL 1" = 20'-0"
VERTICAL 1" = 10'-0"

NOTE:

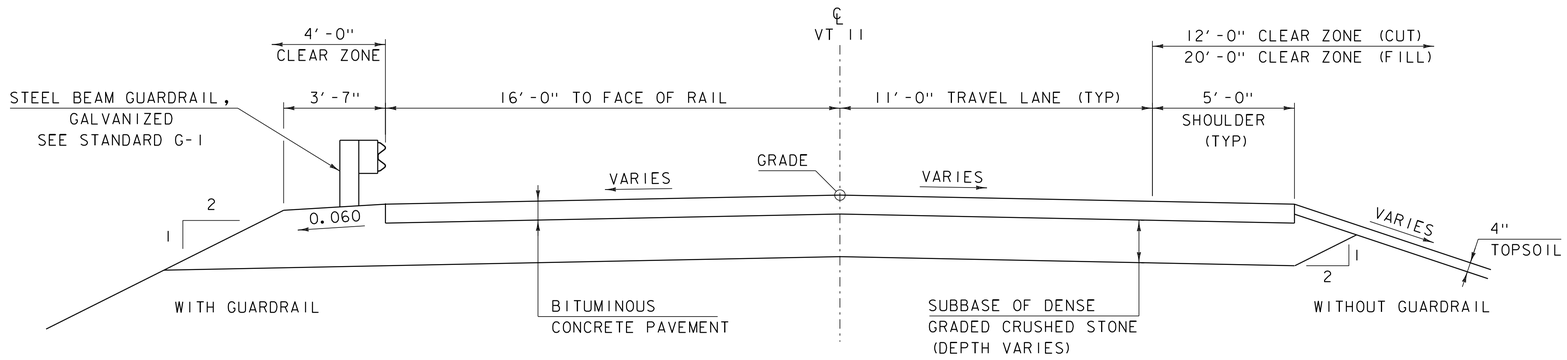
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

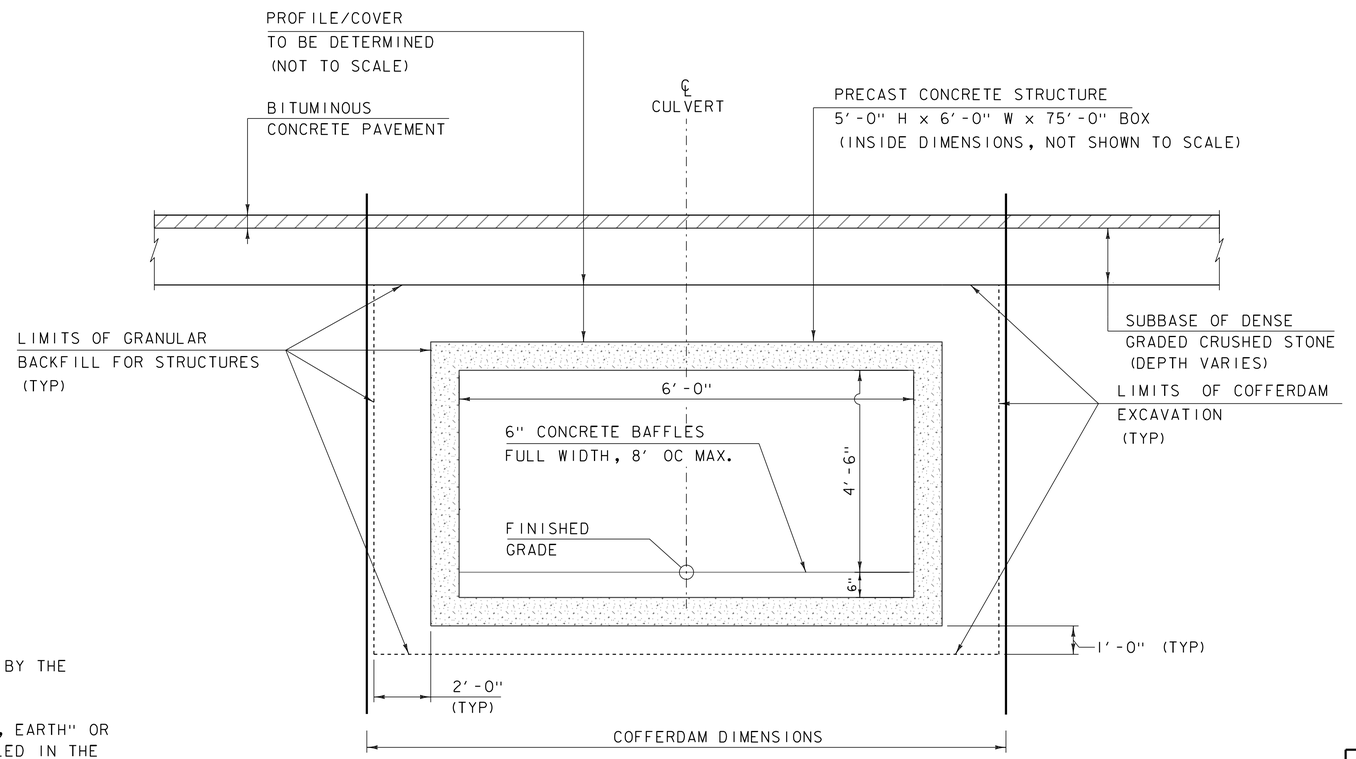
FILE NAME: 13b262/13b262profile.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
ALTERNATIVE 2 PROFILE SHEET

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 7 OF 12



PROPOSED VT 11 TYPICAL SECTION

SCALE 3/8" = 1'-0"



ALTERNATIVE 3

N.T.S.

COFFERDAM NOTES

1. COFFERDAM EXTERIOR DIMENSIONS TO BE DETERMINED BY THE CONTRACTOR.
2. THE PAY LIMITS OF EITHER "COFFERDAM EXCAVATION, EARTH" OR "COFFERDAM EXCAVATION, ROCK" SHALL BE AS DETAILED IN THE TYPICAL SECTION.
3. IF A COFFERDAM IS CONSTRUCTED WHICH IS LARGER THAN DETAILED ABOVE, NO MEASUREMENT AND PAYMENT WILL BE MADE FOR COFFERDAM EXCAVATION AND GRANULAR BACKFILL FOR STRUCTURES OUTSIDE THOSE PAY LIMITS.

MATERIAL TOLERANCES

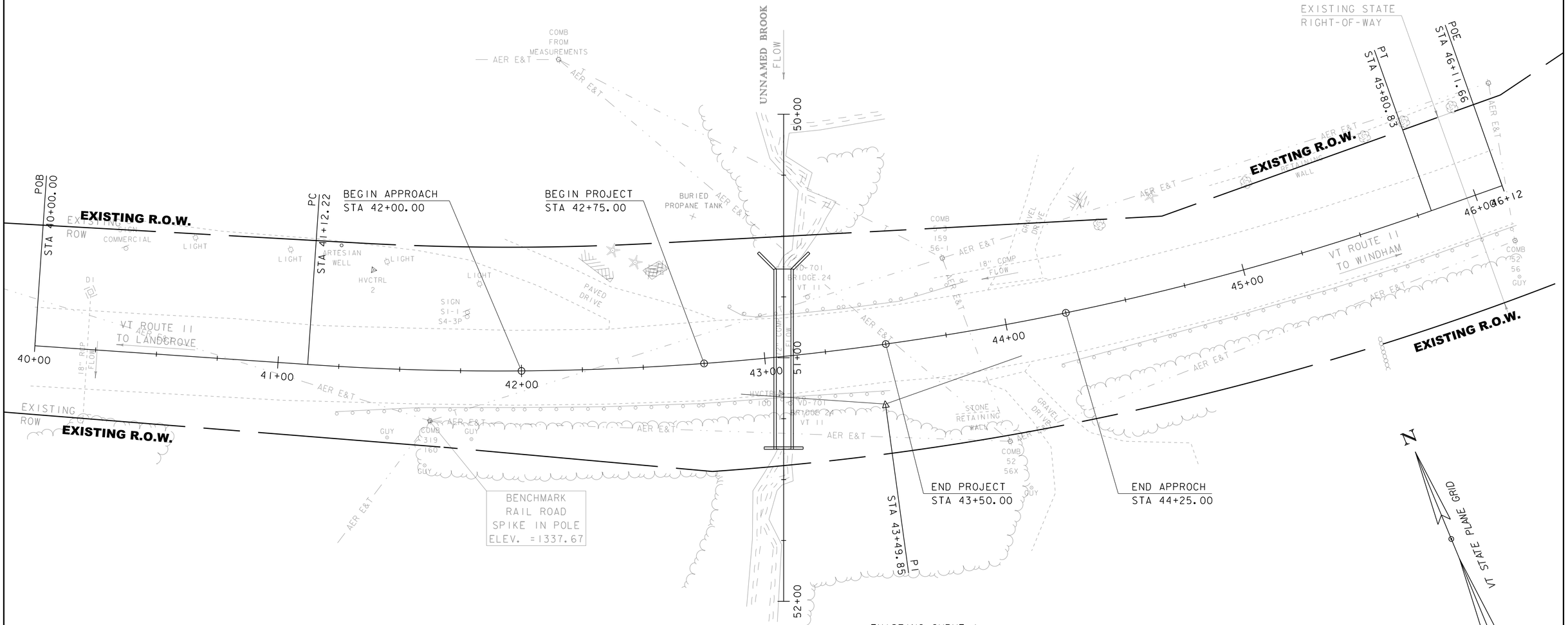
(IF USED ON PROJECT)

SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

FILE NAME: 13b262\sl3b262typical.dgn
PROJECT LEADER: K.HIGGINS
DESIGNED BY: G.SWEENY
TYPICAL SECTIONS SHEET 2

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 8 OF 12



EXISTING CURVE 1
DELTA = 23°25'51"
D = 5°00'00"
R = 1145.92'
T = 237.63'
L = 468.62'
E = 24.38'

EXISTING CULVERT DATA
72" ACCGMP, 66' LONG
BUILT 1948, CATTLE PASS
15' AVERAGE COVER
19 SQ FEET WATERWAY OPENING

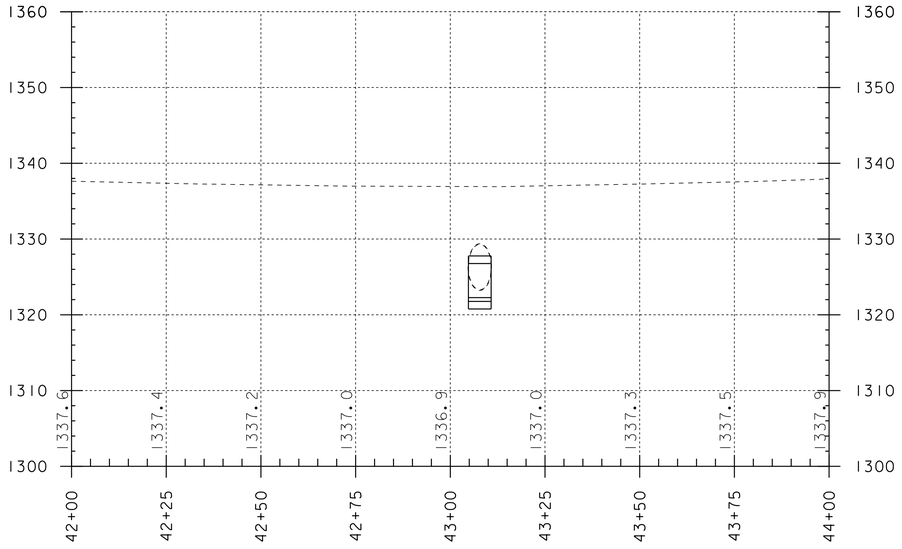
ALTERNATIVE 3 LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

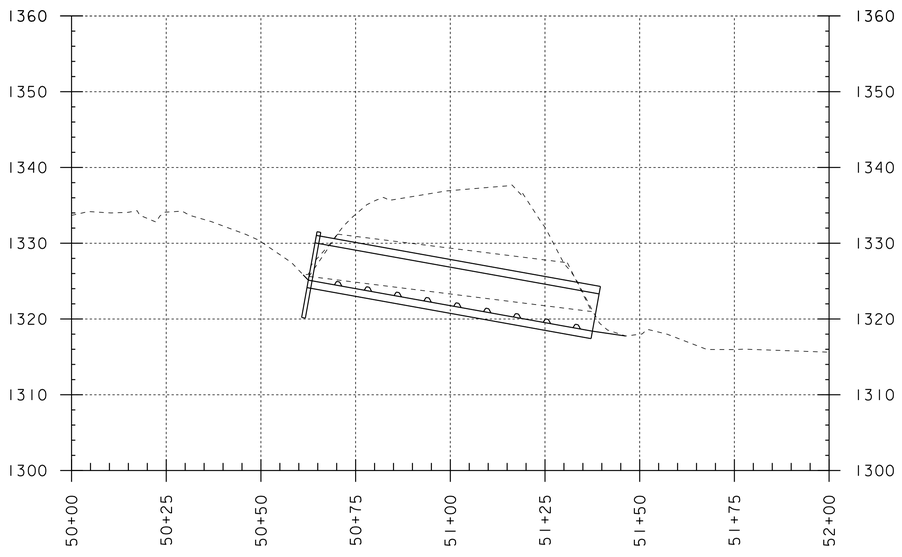
FILE NAME: l3b262/sl3b262border.dgn
PROJECT LEADER: K.HIGGINS
DESIGNED BY: G.SWEENY
ALTERNATIVE 3 LAYOUT SHEET

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 9 OF 12



ALTERNATIVE 3 VT ROUTE 11 PROFILE

SCALE: HORIZONTAL 1" = 20'-0"
VERTICAL 1" = 10'-0"



ALTERNATIVE 3 PROFILE

SCALE: HORIZONTAL 1" = 20'-0"
VERTICAL 1" = 10'-0"

NOTE:

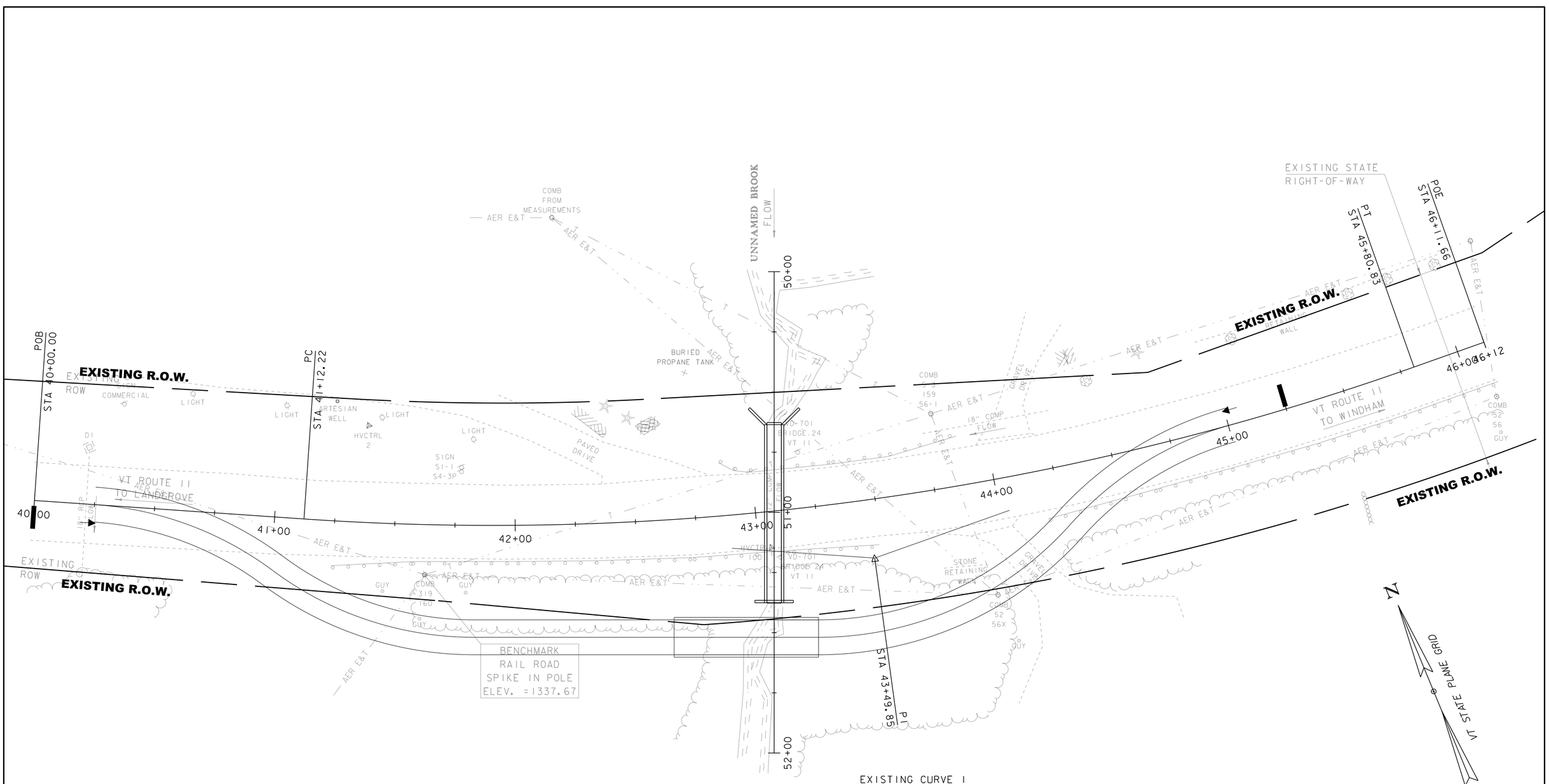
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

FILE NAME: 13b262/13b262profile.dgn
PROJECT LEADER: J.FITCH
DESIGNED BY: G.SWEENY
ALTERNATIVE 3 PROFILE SHEET

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 10 OF 12



EXISTING CURVE 1
DELTA = 23°25'51"
D = 5°00'00"
R = 1145.92'
T = 237.63'
L = 468.62'
E = 24.38'

EXISTING CULVERT DATA
72" ACCGMP, 66' LONG
BUILT 1948, CATTLE PASS
15' AVERAGE COVER
19 SQ FEET WATERWAY OPENING

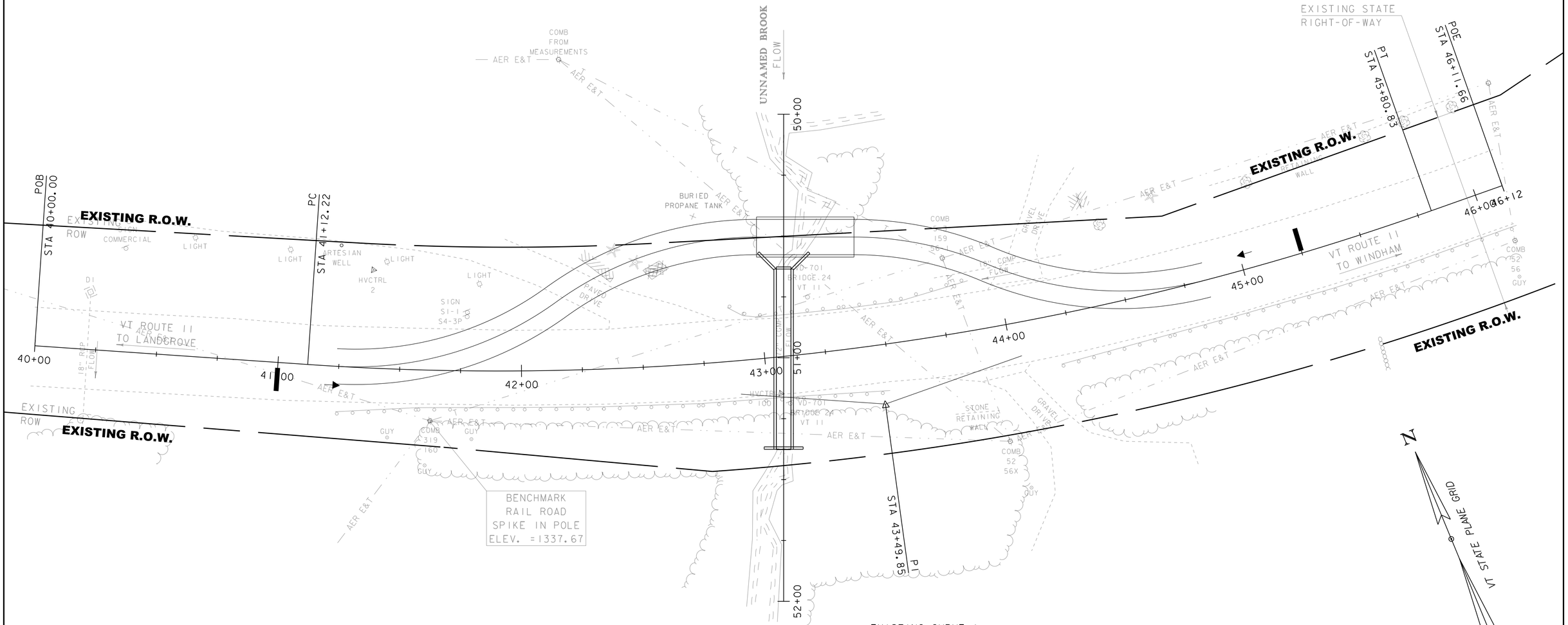
DOWNSTREAM TEMPORARY BRIDGE LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

FILE NAME: l3b262/sl3b262border.dgn
PROJECT LEADER: K.HIGGINS
DESIGNED BY: G.SWEENY
DOWNSTREAM TEMP BRIDGE LAYOUT SHEET

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 11 OF 12



EXISTING CURVE 1
DELTA = 23°25'51"
D = 5°00'00"
R = 1145.92'
T = 237.63'
L = 468.62'
E = 24.38'

EXISTING CULVERT DATA
72" ACCGMP, 66' LONG
BUILT 1948, CATTLE PASS
15' AVERAGE COVER
19 SQ FEET WATERWAY OPENING

UPSTREAM TEMPORARY BRIDGE LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: LONDONDERRY
PROJECT NUMBER: BF 016-1(33)

FILE NAME: l3b262/sl3b262border.dgn
PROJECT LEADER: K.HIGGINS
DESIGNED BY: G.SWEENY
UPSTREAM TEMP BRIDGE LAYOUT SHEET

PLOT DATE: 26-MAR-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 12 OF 12