STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Westminster 091-1(70)

I-91 Bridges 21 N&S over the Saxtons River and Saxtons River Rd (VT 121)

February 18, 2015

I. Contents

I. Site Information

Bridges 21 N&S are located approximately 2.4 miles north of exit 5 along Interstate 91 (I-91). The bridges cross Saxtons River and Saxtons River Rd (VT 121) in the town of Westminster. The area is rural surrounded by rolling hills and forested land. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and Survey data. See correspondence in the Appendix for more detailed information.

Roadway Classification	Rural Principal Arterial – Interstate
Bridge Type	7 & 8 Span Rolled Beam
Bridge Spans	534' (21N) and 542' (21S)
Year Built	1963
Ownership	State of Vermont

Need

The following are needs of I-91 between exits 5 and 6 over the Saxtons River and VT 121.

1. Bridge 21S is structurally deficient with pier cap deterioration.

2. The approach rail connections are substandard and the bridge rails do not meet the latest MASH 350 standards.

3. The bridges are too narrow for the roadway classification.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2016 and 2036.

Section	AADT		DHV		%T		%D		ADTT		ESALs	
	2016	2036	2016	2036	2016	2036	2016	2036	2016	2036	(2016~2036)	(2016~2056)
1	6400	7400	1000	1200	15.8	22.2	100	100	1400	2300	9,634,000	22,678,000
2	6400	7400	1300	1500	15.7	21.4	100	100	1400	2200	11,614,000	27,454,000
3	3000	3200	350	380	6.2	8.5	54	54	180	260	872,000	1,931,000

Section 1 – Bridge 21 Northbound
Section 2 – Bridge 21 Southbound
Section 3 – VT 121 beneath the bridges

Design Criteria

The design standards for this bridge project are the Vermont State Standards (VSS), dated October 22, 1997, A Policy on Geometric Design of Highways and Streets (Green Book), 6th Edition, and the VTrans Structures Design Manual, dated 2010. Minimum standards are based on the traffic volumes listed above and a design speed of 70 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	Green Book Chapter 8.2	4'-12'-12'-10'	4'-12'-12'-12'	Substandard
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	3'-12'-12'-3'	4'-12'-12'-12'	Substandard
Clear Zone Distance	VSS Table 3.4	Clear or Shielded	26’ fill / 20’ cut	
Banking	VSS Section 3.13	Normal Crown	8% (max)	
Speed		65 mph (Posted)	70 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = ∞'	R_{min}= 1810’ @ 8%	
Vertical Grade	AASHTO Green Book Table 8-1	3.20%	4% (max) for rolling terrain	
K Values for Vertical Curves	AASHTO Green Book Table 3-34	Tangent	247 crest 181 sag	
Vertical Clearance Issues	AASHTO Green Book 8.2.9	19'-3" below (min)	16’-3” (min)	
Stopping Sight Distance	AASHTO Green Book Table 3-34	~ 730 northbound north of the bridge	730'	
Bicycle/Pedestrian Criteria		None	N/A	Limited Access
Bridge Railing (and Approach Railing)	Structures Design Manual Section 13.2	2 Tube Bridge Rail w/ w-beam approach	TL-5	Substandard
Hydraulics	VTrans Hydraulic Section	Meets standard	Pass Q_{50} storm event with 1.0’ of freeboard	
Structural Capacity	Structures Design Manual Section 3.4.1	Sufficient (21N) Structurally Deficient (21S)	Design Live Load: HL-93	Substandard

Inspection Report Summary

Bridge	Deck Rating	Superstructure Rating	Substructure Rating	Channel Rating
21 N	5	7	5	7
21 S	5	7	4	7

6/4/2012 Structure is in fair condition however the piers continue to deteriorate from the bad troughs. All trough need to be repaired or deck should be made continues in the near future. Pier caps and the columns should be rehabbed soon. Curbs and fascias need to be cleaned and patched. Deck should be considered for a rehab in the near future. ~FRE/SJH (21N)

6/4/2012 All joint troughs should be repaired. Pier caps and bearing areas should be cleaned and patched along with the curbs Seat area with the exposed swedge bolt needs to be cleaned and patched. Structure should have a deck and pier rehab in the near future. ~FRE/SJH (21S)

Hydraulics

The existing bridges are more than adequate hydraulically, as they are way above the channel and span the channel, other than the piers.

If the existing bridges are rehabilitated, there should be no changes that would reduce the waterway area below elevation 381'. The need for scour countermeasures at the piers should be considered.

If the bridges are replaced, it would be preferable to keep all new piers out of the channel. Any new piers should be aligned with the channel. The bridges could be shortened. There should be no changes that would reduce the waterway area below elevation 381', that includes abutments and fill material. The bottom of beams should be above elevation 382'.

Utilities

The utility information is shown in the Appendix.

There are no known municipal water or sewer facilities along the Saxtons River Road (TH # 1) in the vicinity of these bridges.

There are no known buried facilities along the Saxtons River Road (TH # 1) and there are no known buried facilities within the I-91 ROW.

There are three black overhead utility lines which run along the edge of the Saxtons River Road (TH # 1) and pass directly under both the SB and NB bridges with minimal clearance between the bridge beams and the top cable. These facilities are owned by Comcast and FairPoint.

The above ground utilities will most likely require relocation for any construction alternative chosen for this project.

Right Of Way

The existing Right-of-Way is shown on the Layout sheet. There is a large but irregular shaped piece of Right of Way held by the State of Vermont surrounding the bridges.

It is anticipated that no Right of Way acquisitions will be required for any work associated with this project.

Resources

The resources present at this project are shown on the layout sheets.

Archaeological:
There are areas that could be considered sensitive for archaeology in all four quadrants of the project. However, depending on the scope of the work, it is unlikely that there will be archaeological impacts.

Historic:
Bridges 21 N&S which carry I-91 over the Saxtons River are not considered historic resources. There are no immediately adjacent historic properties.

Natural Resources:
The only regulated resource in the vicinity of Bridges 21 N&S is the Saxtons River which is classified as Essential Fish Habitat (EFH). A stream classification of EFH means that any in-stream impacts, regardless of the size or duration (temporary and permanent) will require a Category 2, Pre-construction Notification under Section 404.

There is a wetland on the western side of the southbound lanes between MM 31.3 -31.4, but that appears well outside of the scope of this project and thus, has not been delineated.

Crossovers between mile markers 30.9 and 31.3 will not impact any regulated natural resource or require further review.

Hazardous Materials:
There are no known hazardous waste sites near this project.

Stormwater:
No known issues.

II. Safety

The section of I-91 on which Bridges 21 N&S are located is a high crash location. The VTrans Traffic Safety section has rendered the opinion that the crashes are due to the narrow shoulder widths and lack of recovery area on the bridges. Approximately 75% of the crashes listed in the 2008-2012 report occurred on the bridges, mostly in dry conditions. The obvious solution would be to provide the standard lane and shoulder widths on the bridges. This would entail a complete replacement of both bridges, since the widths are on the order of 10 ft. too narrow. The addition of 10 ft. of width to 17 abutments and piers, some of which are in the river, and some of which would impact traffic flow on Saxtons River Road, would not be a cost-effective approach to providing the standard width. This is addressed further in the Alternatives Discussion below, Alternative 3b. Other scenarios discussed below include deck replacements or superstructure replacements, which do not provide shoulder widths that fully meet the width standards. In those cases, new, enhanced object markers or flashing beacons could be considered to highlight the narrow bridge ends.

Additional considerations were made to determine what potential measures could be taken to improve safety at this site:

- A product to improve the friction characteristics was considered. This product essentially addresses icy roads and bridges, and therefore could be effective in preventing some crashes, but only those during winter months. It was estimated that the cost of application would be in the range of $72,000 - $100,000, and considering a 5-8 year life of the product and a 50% reduction in winter crashes, a cost benefit ratio of 0.22-0.37 would be estimated after considering the annual benefits of reduced crashes. As a cost benefit ratio of 1.0 is the breakeven, it could be argued that it is not cost-effective to attempt an increase in roadway surface friction.
- The rate of approach railing taper was considered to determine whether changing the angle of the approach railing, or the rate at which it changes from the roadway shoulder to the bridge shoulder, is affecting the crash rate. Though guidance exists on the taper rate of the lane, guidance on the taper rate of the shoulder was not discovered. At least one other state uses a 1:25 taper rate, but no statistics on the effects on crash rates are available. Changing the approach railing taper alone was not considered further.
- If it was decided that the bridges would be completely replaced, they would be built to fully meet the width standards. As can be seen in the cost matrix below, the scoping project cost for a complete replacement is estimated to be approximately $20,870,800. Using the Interactive Highway Safety Design Model, it was estimated that a crash reduction rate of approximately 59% could be achieved with standard widths. Given the benefit estimates, over a 40 year period the benefit cost ratio is 0.06, well below the breakeven of 1.0. From a purely economic standpoint, it does not make sense to rebuild the bridges completely to the standard width for the sake of reducing crashes. No fatalities were recorded from 2007 to 2013, but this question could be reviewed further with consideration to risk of injuries or fatalities.

III. Maintenance of Traffic

The Vermont Agency of Transportation has developed an Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster 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 faster construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality.

Option 1: Temporary Bridges

The standard maintenance of traffic option based on the traffic volumes at this location would be a one lane temporary bridge. There is sufficient Right of Way located along this section of I-91 that a temporary bridge could be located east of the bridges while the northbound bridge is under

construction and west of the bridges before the bend in the river while the southbound bridge is under construction. Because a temporary bridge would need to span both the Saxtons River and the Saxtons River Rd, which are skewed to I-91, one would need to span a minimum of 300 feet to stay inside the ROW in this location. The maximum span for a Mabey bridge is 200 feet; thus any temporary bridges in this location would require a pier and multiple spans. Not only is a longer bridge more expensive than a shorter bridge, but the extra pier would increase costs and require more restrictions and permitting requirements because of likely in stream work.

This is the configuration shown in the Appendix and considered further in this report.

Advantages: A temporary bridge maintains traffic along the existing corridor during construction.

Disadvantages: There are extra costs associated with constructing or launching temporary bridges. Changes in traffic patterns can increase the probability of accidents and the increased time associated with constructing temporary approaches and launching the temporary bridges puts the construction workers at increased risk for accidents. In order to minimize the approach roadway work, the design speed would be reduced slightly and the decrease in speed would cause slight traffic delays.

Option 2: Phased Construction

Another method of maintaining traffic along this corridor would be to perform construction one lane at a time, or in phases, so that at least one lane of each bridge is open to traffic at any one time. Given the geometry and traffic volumes at this site, this is a possibility in this location.

Advantages: This would provide the advantage of a temporary bridge by maintaining traffic along the existing corridor during construction. In addition, the costs of maintaining traffic during phasing should be less expensive than maintaining traffic with a temporary bridge.

Disadvantages: While the time and cost required to construct a phased project may be less than that required to construct a project with a temporary bridge, the time required to construct a phased construction project is still longer than a project constructed without phasing, because some of the construction tasks have to be performed multiple times and cannot be performed concurrently. The costs of construction also increase over unphased work because of this increase in the length of time, the additional inconvenience of working around traffic, and the effort involved in coordinating the joints between the phases. Once again, while the corridor will be open to traffic during construction, traffic will still be delayed and disrupted by the reduction in the number of lanes and by construction vehicles and equipment entering and exiting the site. The construction workers and equipment will still be in close proximity to vehicular traffic increasing the probability of accidents.

Option 3: On-Site Detour with Crossovers

Another method for maintaining traffic on parallel structures with multiple lanes of unidirectional traffic is creating a crossover in the median before and after the structures to get all traffic off one structure and on to the parallel structure. This option is rarely available for most projects, because most non-interstate structures in Vermont do not have parallel bridges. The possibilities on

interstates may even be limited based on site distance, traffic patterns or obstructions in the median. Given the constraints at this site and perhaps utilizing a reduced design speed, it would be possible to maintain traffic at this location with crossovers. Two way traffic would be moved to the southbound bridge during construction of the northbound bridge and two way traffic routed to the northbound bridge while construction occurred on the southbound bridge.

Advantages: This would provide the advantage of a temporary bridge or phased construction by maintaining traffic along the existing corridor during construction.

Disadvantages: The costs associated with maintaining traffic with crossovers in this location rivals those for maintaining traffic with temporary bridges. Similar to the disadvantages for a temporary bridge, changes in traffic patterns can increase the probability of accidents and any maintenance of traffic plan that keeps traffic and construction workers in close proximity for extended durations puts the construction workers at increased risk for accidents. While the corridor will be open to traffic during construction, traffic will still be delayed and disrupted by the reduction in the number of lanes, potentially reduced speed through the construction zone, potential stop conditions at the exits and by construction vehicles and equipment entering and exiting the site.

Option 4: Off-Site Detour

This option would close the section of I-91 between exits 5 and 6 for a limited time during construction and would utilize US 5 between these exits to accommodate traffic traveling north and south along I-91. The through distance between exit 5 and 6 is 6.9 miles on I-91 and takes approximately 6 minutes in normal driving conditions. The detour on US 5 is 7.3 or 7.6 miles depending on whether you are traveling north or south and takes between 13 and 14 minutes in normal driving conditions.

This option would only be utilized for brief closure periods during off peak hours, such as weekends, in order to rapidly replace the superstructures. Some traditional methods of replacing a superstructure during a short closure period include: lateral slide, self-propelled modular transporters (SPMTs), and prefabricated bridge units. Each of these methods will be discussed briefly below.

Lateral Slide

A lateral slide consists of constructing an entire superstructure adjacent to the location where it is intended and physically pushing or pulling the structure into its design location along lubricated rails. This could take place to the east of the northbound bridges and to the west of the southbound bridges. This would require the construction of 17 temporary bents, some on land and some in the water and some approximately 40 feet tall, in order to support the new superstructures while they are being constructed. The logistics of trying to push or pull 7 or 8 spans of a bridge and keep them all aligned could become complicated as well. Once you add the users costs associated with detouring traffic off of the interstate, the costs associated with supporting and sliding the structure into place, and the traffic control and outreach costs, this method is as expensive or more expensive then some of the other maintenance of traffic methods available at this location.

Figure 1: Lateral Slide

[Images from "Accelerated Bridge Construction - Experience in Design, Fabrication and Erection of Prefabricated Bridge Elements and Systems" from FHWA (2011).]

Self-Propelled Modular Transporters (SPMT)

The SPMT method of construction involves constructing the entire superstructure in a location that is near but not in its final location. Then the superstructure is lifted off its temporary blocking, moved a short distance to its design location, and lowered into place. One of the advantages of constructing the bridge away from its final location is that it can be safer and less restricted than working over water and over traffic and can provide more clearance than working over Saxtons River Rd.

The disadvantage of this method in this location is that part of the bridge is over water and part of the bridge is on dry land. The portions of the bridge over land need to be over a piece of land that can be leveled in order to take advantage of the SPMTs. Those portions over water either need to be deep enough to utilize a barge or shallow enough to be filled in with a temporary roadway. The complications of coordinating multiple spans and coordinating multiple methods of moving the superstructure elements, along with the large earthworks and project impacts make this method of construction expensive and less desirable than one of the other methods of maintaining traffic with less impacts.

Figure 2: SPMT transporting a bridge superstructure

Prefabricated Bridge Units (PBU)

Another method of constructing the bridge in a safer and less restricted environment than over Saxtons River Rd is to build the bridge in pieces and deliver those pieces to the construction site to be joined together to form the bridge. These bridge superstructure pieces are referred to as Prefabricated Bridge Units, or PBUs. Many substructure pieces can be prefabricated as well and lifted into place before the PBUs are placed.

Ideally I-91 from exit 5 to 6 would only be closed during times of the week or times of day when the traffic counts are the lowest. The current method of constructing PBUs is to set adjacent units and pour concrete between the units to connect them together. Curing this concrete that is poured between units requires at least 24 hours at this point in time. Thus, the bridge could not be closed over night for night time work and reopened the next day; it would need to be closed for portions of a week, such as a weekend, when there is less traffic traveling along this stretch of I-91. Assuming that one could demolish one span a day and construct that corresponding span the next day and cure the connections the following day, it would take approximately 30 days to demolish and reconstruct the 15 spans for these two bridges. The user costs, alone, associated with detouring traffic for 30 days in this location are about $500,000. These costs along with the premium associated with accelerated bridge construction and 24 hour construction, the traffic control and outreach costs make this method as expensive or more expensive then some of the other maintenance of traffic methods available at this location.

Figure 3: PBU being lifted into place

A map of the detour route associated with this option can be found in the Appendix.

In general, there are many advantages to detouring traffic away from the work zone during construction. By detouring traffic away from construction activities, it creates a safer working environment for the construction workers. By not constructing the structure in phases, there will be no vibrations or deflections from adjacent traffic to affect the quality of the closure pours joining the phases. By not requiring the construction and removal of temporary approaches, temporary bridges and temporary crossovers, the length of construction can be reduced over those other options.

The disadvantages of detours traditionally consist of traffic not being maintained along the existing corridor for a limited portion of construction, such that through traffic sees an increase in travel times during the closure period. However, in this location, there are high user and construction costs associated with a detour, and with some methods fairly significant impacts. Given these disadvantages and because there are other methods of maintaining traffic in this location, the off-site detour option will not be considered further in this report.

IV. Alternatives Discussion

Bridge 21S is structurally deficient with pier cap deterioration. The approach rail connections are substandard and the bridge rails do not meet the latest MASH 350 standards. The bridges are too narrow for the roadway classification.

No Action

This alternative would involve leaving the bridges in their current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing bridge can stay in place without any work being performed on it during the next 10 years. This is only a possibility for Bridge 21N, which has fair and good ratings. Bridge 21S is structurally deficient and will need to have the joints and pier caps repaired in the near future.

Since some work on one of the bridges is required within the next 10 years, the complete No Action alternative will not be considered further in this report. An option considering the minimal amount of work necessary will be included.

Alternative 1: Concrete Repair

This rehabilitation option includes the minimal amount of work necessary to extend the useful lives of the bridges. Temporary wooden platforms have been constructed on the girders to catch pieces of the spalled deck from falling onto Saxtons River Rd below. After removing the deteriorated and loose concrete from the deck, forms will be constructed such that a thin layer of new concrete can be placed to replace this removed concrete. There are several disadvantages with this method of rehabilitation in this situation. The first is that most of the patching is overhead and takes place over Saxtons River Rd; this requires the work to be performed in difficult circumstances, and the new concrete must be placed from underneath the bridge. Second, having newer non-chloride laced concrete adjacent to the existing concrete usually exacerbates the rate of deterioration of the remaining concrete which surrounds the patch. This can be mitigated for approximately 20 years with the addition of sacrificial anodes into the patched structure.

The piers' deterioration is aggravated by the faulty joints, so the joints should either be replaced or removed when the deck is repaired. The piers would then also have the deteriorated and loose concrete removed. In addition to replacing the removed concrete and providing the same anodic protection mentioned above, some additional strengthening would be provided to better support the exterior girders on the pier caps.

Much of this work can be accomplished without impacting traffic on I-91. Individual lanes on Saxtons River Rd may need to be closed while substructure and overhead repair work is occurring. Daily lane closures on I-91 could be tolerated while the pavement is removed, the concrete is repaired and the expansion joints are replaced.

This alternative will remove the structurally deficient designation from Bridge 21S but would not address the substandard bridge rail or substandard bridge width.

Alternative 2: Deck Replacement

This work required under this alternative would be similar to that proposed under Alternative 1, except that instead of patching the concrete deck, the entire deck would be removed and replaced. This would provide an opportunity to rectify the substandard bridge and approach rail, as well as replacing or removing the joints along the bridge. The pier patching and strengthening would also be included in this alternative.

Instead of utilizing short-term or daily lane closures on I-91, this alternative would require more extensive traffic maintenance in the form of temporary bridges, phased construction, or cross-overs.

The only substandard feature not addressed with this alternative would be the narrow bridge width. If the substandard width is maintained, it is recommended that object markers at the beginning of the bridges have fluorescent yellow sheeting to enhance the visibility of the narrow

widths. If the existing object markers do not have this feature, they should be replaced. In addition, warning signs such as MUTCD (W5-2), or some type of beacon or LED warning sign in advance of the bridges should be considered.

Alternative 3: Superstructure Replacement

Alternative 3a: Superstructure Replacement (Existing Typical)

It is sometimes more difficult and costly to remove the deck from the existing beams without damaging the beams. The contractor is also not able to reduce the cost of the demolition by salvaging the existing beams; thus the demolition costs tend to be comparable between deck removal and superstructure removal as well. In addition, the length of time that the contractor needs to be at the site working on the bridge is longer for a deck replacement than for a complete superstructure replacement that utilizes accelerated construction techniques. Given all of these factors, when a bridge needs a deck replacement, it is reasonable to consider replacing the entire superstructure as well.

This alternative would also include the pier patching mentioned in the previous alternatives.

Traffic could be maintained at this site with any of the maintenance of traffic options mentioned above, including a temporary bridge, phased construction, cross-overs, or short-term road closures with offsite detours while utilizing accelerated bridge construction techniques.

Once again, the only substandard feature not addressed with this alternative would be the narrow bridge width.

Alternative 3b: Superstructure Replacement (40' Typical)

The alternative would be similar to 3a, except that the superstructures and approach roadway within the project limits would be widened to rectify all of the design deficiencies at the site. The superstructure units would be widened 1' on the passing lane side of the bridge and 9' on the right hand side of the bridge. The substructure could remain the same width on the passing lane side and all of the substructure widening would take place on the right hand side of each bridge.

There are 8 substructure units on the northbound bridge and 9 substructure units on the southbound bridge. Four of these units are immediately adjacent to Saxtons River Rd, which will require extra costs to mitigate working so close to the traffic, and 4 of the units are within the Saxtons River and will require extra costs and consideration to perform any extensions in the river. There is also the potential that 2 additional substructure units will require cofferdams to allow work on them to be completed in dry conditions. All of these costs in addition to the more expensive cubic foot work required to perform rehabilitation work would drive the costs of a substructure expansion close to that for a substructure replacement, especially if the number of substructure units could be reduced and/or the number of units adjacent to Saxtons River Rd or within Saxtons River could be reduced.

Once again, the costs of a substructure expansion would be close to that for a substructure replacement, and after one replaces the entire superstructure and constructs new portions of the substructure units, one would still be left with portions of 50 year old substructure units.

Traffic could be maintained at this site with any of the maintenance of traffic options mentioned above, including a temporary bridge, phased construction, cross-overs, or short-term road closures with offsite detours while utilizing accelerated bridge construction techniques.

This alternative will rectify all of the substandard features at this location.

Alternative 4: Complete Replacement

Similar to Alternative 3b, this alternative would address all of the substandard features in this location. However, rather than expanding the existing substructures and leaving portions of 50 year old concrete, all of the bridge components would be replaced with new components in a more optimal configuration. Approximately 100 feet of length could be removed from each structure in this configuration, to result in bridge lengths around 420 and 460 feet, and the number of spans could be reduced to 3 for each direction.

This alternative would also allow traffic to be maintained with any of the maintenance of traffic options mentioned above, including a temporary bridge, phased construction, cross-overs, or short-term road closures with offsite detours while utilizing accelerated bridge construction techniques.

V. Alternatives Summary

There are four options for maintaining traffic during this project; four rehabilitation alternatives; 1 complete replacement alternative; and at least 3 methods of getting superstructures into their final location. Trying to turn all of the options into an all-inclusive cost matrix would get overwhelming. Thus, some of the combinations will be eliminated before developing the matrix.

Maintenance of Traffic Costs

For phased construction, the more one needs to mobilize and the more construction tasks that need to be done multiple times, the higher the costs to do the same quantity of work. A premium above and beyond the traditional costs to do the work is added for conceptual estimating purposes to account for the extra mobilization and construction costs. As can be seen from Table 1, it is more cost-effective to phase the work than to remove the traffic from the work by using a temporary bridge or cross-overs for smaller scope work items. However, as the amount of work that needs to be done increases, the costs associated with phasing the work get closer to and exceed the costs for other methods of maintaining traffic. Thus for smaller scope alternatives, including the rehabilitation and deck replacement, the method of maintaining traffic will consist of phasing construction. For the larger scope alternatives, including the superstructure replacements and the complete replacement, the method of maintaining traffic will consist of utilizing cross-overs.

Based on the above information, including the existing site conditions, bridge conditions, and recommendations from the various resource groups, the alternatives below are being considered in the cost matrix:

Alternative 1: Concrete Repair with Traffic Maintained by Phasing
Alternative 2: Deck Replacement with Traffic Maintained by Phasing
Alternative 3a: Superstructure Replacement (Existing Typical) Utilizing a Cross-Over
Alternative 3b: Superstructure Replacement (40’ Typical) Utilizing a Cross-Over
Alternative 4: Complete Replacement Utilizing a Cross-Over

VI. Cost Matrix

Westminster IM 091-1(70)		Do Nothing	Alt 1	Alt 2	Alt 3a	Alt 3b	Alt 4
			Rehab	Deck Replace	Super (Exist Typical)	Super (40' Typical)	Complete Replace
			Phasing	Phasing	Cross-Over	Cross-Over	Cross-Over
COST[1]	Bridge Cost	$0	$2,079,000	$2,687,000	$5,653,000	$8,036,000	$9,944,000
	Removal of Structure	$0	$0	$754,000	$942,000	$942,000	$1,319,000
	Roadway	$0	$416,000	$552,000	$905,000	$1,143,000	$1,622,000
	Maintenance of Traffic	$0	$205,000	$205,000	$580,000	$580,000	$580,000
	Construction Costs	$0	$2,700,000	$4,198,000	$8,080,000	$10,701,000	$13,465,000
	Construction Engineering + Contingencies	$0	$810,000	$1,259,400	$2,424,000	$3,210,300	$4,039,500
	Total Construction Costs w CEC	$0	$3,510,000	$5,457,400	$10,504,000	$13,911,300	$17,504,500
	Preliminary Engineering[2]	$0	$675,000	$1,049,500	$2,020,000	$2,675,300	$3,366,300
	Right of Way	$0	$0	$0	$0	$0	$0
	Total Project Costs	$0	$4,185,000	$6,506,900	$12,524,000	$16,586,600	$20,870,800
SCHEDULING	Project Development Duration[3]	N/A	2 years	2 years	3 years	3 years	3 years
	Construction Duration	N/A	18 months	24 months	24 months	24 months	24 months
	Closure Duration (If Applicable)	N/A	N/A	N/A	N/A	N/A	N/A
ENGINEERING	Typical Section - Roadway (feet)	4-12-12-10	4-12-12-10	4-12-12-10	4-12-12-10	4-12-12-12	4-12-12-12
	Typical Section - Bridge (feet)	3-12-12-3	3-12-12-3	4-12-12-4	4-12-12-4	4-12-12-12	4-12-12-12
	Geometric Design Criteria	No Change	No Change	No Change	No Change	No Change	No Change
	Traffic Safety	No Change	No Change	Slightly Improved	Slightly Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	No
	Bicycle Access	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
	Pedestrian Access	No Change	No Change	No Change	No Change	No Change	No Change
	Utility	No	Yes	Yes	Yes	Yes	Yes
OTHER	ROW Acquisition	No	No	No	No	No	No
	Road Closure	No	No	No	No	No	No
	Design Life	<10 years	15 years	40 years	40 years	40 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 start from the end of the Project Definition Phase.

VII. Conclusion

The recommendation is to proceed with Alternative 2: Deck Replacement with Traffic Maintained by Phasing.

Discussion:
Alternative 1 is the least expensive construction alternative, however, the design life of that fix is only about 15 years. When one considers the annualized costs, the project cost divided by the assumed design life, of the proposed alternatives, then Alternative 2 is the least expensive cost per year option.

The superstructures are in good condition. The deck is the portion of the bridges that is in fair condition. While the substructures are rated in fair or poor condition, as well, this is only a result of the deteriorated deck sections allowing water to seep onto the bridge seats and cause damage to the pier caps. The work done to patch and strengthen the pier cap should be protected by the replaced deck, such that the entire substructure units do not need to be replaced until the deck deteriorates again. By removing some joints and replacing the others, the deck and underlying superstructures and substructures should be provided some more protection in the future than it receives now.

By allowing the bridge and approach rail to be upgraded with the new deck, this alternative would rectify all of the substandard features at this site, except the narrow bridge width. Because of the significant length of the structures in this location, the FHWA rating system has allowed that these structures, although narrow, are not functionally deficient for their route classification. Nonetheless, if the deck widths are not made standard, the addition of warning signs and/or object markers meeting the current MUTCD standards should be considered. Conversely, the section of I-91 within a half mile radius of the Bridge 21 N&S is listed as a High Crash Location (HCL)[1], with 22 incidents listed in the yearly crash summaries from 2007 to 2011 (see the Appendix). So while the bridges were placed on the list of bridges needing attention for structural reasons, an argument could be made to attempt to rectify the geometric deficiencies while one is working on the structures. If one wanted to either replace the bridges for structural reasons or try to address the HCL status at this site, then the recommendation would be to proceed with Alternative 4: Complete Replacement with a lane and shoulder width meeting the design standards.

The maintenance of traffic options were discussed previously and it is believed that the traffic impacts are low enough and the net decrease in safety due to construction activities taking place next to the traveling public is small enough, that it is appropriate to phase construction in order to accommodate the construction activities and the traveling public at the same time.

[1] http://highwaysafety.vermont.gov/sites/vhsa/files/documents/data/2008-2010%20Formal%20High%20Crash%20Location%20Report.pdf

VIII. Appendices

A. Site Pictures
B. Town Map
C. Bridge Inspection report
D. Hydraulics Memo
E. Preliminary Geotechnical Information
F. Natural Resources memo
G. Hazardous Waste Sites
H. Archaeology Memo
I. Historic Memo
J. Stormwater Memo
K. Utility Information
L. Local Input
M. Crash Data
N. Safety Discussions
O. Detour Route
P. Plans

Existing Conditions
Proposal
- Typical Sections
- LayoutPhasing
- Typical Sections
- Layout

o Crossover

Appendix A: Site Pictures

Deck Issues as Seen from the Top

Deck Issues as Seen from Below and Relatively Good States of Beams

Example of the Issues at Vermont Joints

Pier Cap Distress under Exterior Beams

Pier Cap Deterioration Caused By Leaking Joints

Condition of Piers Below the Caps

Appendix B: Town Map

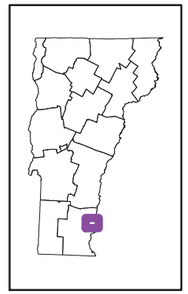
WESTMINSTER, I-91, BR 21 N&S

Scale 1:46,981

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

Produced by:
Mapping Unit
Vermont Agency of Transportation
August 2011



WESTMINSTER
WINDHAM COUNTY
DISTRICT # 2

Appendix C: Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for WESTMINSTER **bridge no.:** 0021N **District:** 2

Located on: I 00091 ML **over** I 91 OVER TH 1 SAXTO **approximately** 2.4 MI N EXIT 5 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 5 FAIR

Superstructure Rating: 7 GOOD

Substructure Rating: 5 FAIR

Channel Rating: 7 GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200091021N13202

Federal Sufficiency Rating: 068.1

Deficiency Status of Structure: ND

AGE and SERVICE

Year Built: 1963 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 6 HIGHWAY-WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 02

Bypass, Detour Length (miles): 01

ADT: 006450 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0085

Structure Length (ft): 000534

Lt Curb/Sidewalk Width (ft): 0.7

Rt Curb/Sidewalk Width (ft): 0.7

Bridge Rdwy Width Curb-to-Curb (ft): 30

Deck Width Out-to-Out (ft): 35

Appr. Roadway Width (ft): 038

Skew: 57

Bridge Median: 1 OPEN MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 22 FT 09 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 7 SPAN ROLLED BEAM

Number of Approach Spans: 0000 **Number of Main Spans:** 007

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 2 PREFORMED FABRIC

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 1 MEETS CURRENT STANDARD

Approach Guardrail: 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: 6 EQUAL TO MINIMUM CRITERIA

Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING ROADWAY

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: 8 STABLE FOR SCOUR

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 1 LOAD FACTOR (LF)

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 5 HS 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: FAS126

Insp. Date: 062012 **Insp. Freq. (months)** 24 **X-Ref. BrNum:** 0010B

INSPECTION SUMMARY and NEEDS

6/4/2012 Structure is in fair condition however the piers continue to deteriorate from the bad troughs. All trough need to be repaired or deck should be made continues in the near future. Pier caps and the columns should be rehabbed soon. Curbs and fascias need to be cleaned and patched. Deck should be considered for a rehab in the near future. ~FRE/SJH

07/19/2010 - Bridge needs major rehabilitation with extensive substructure reconstruction. New deck should be considered with continuous steel configuration to eliminated the leaking joints. Most fabric troughs are failed and leakage is unabated. Steel superstructure has only limited section loss at present. Bridge was rehabbed in 80's and infamous patch material is failing along the piers. No safety repairs are required at present but deterioration is certainly progressing. In short term, the dilapidated cable and corroded steel beam rail along VT 121 needs to be upgraded not only concerning errant vehicle occupant safety but also to protect the pier columns from possible impact damage. Delaminations above route 121 along the deck soffit also need attention. ~ MJ/DS

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for WESTMINSTER **bridge no.:** 0021S **District:** 2

Located on: I 00091 ML **over** I 91 OVER TH 1 SAXTO **approximately** 2.4 MI N EXIT 5 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 5 FAIR

Superstructure Rating: 7 GOOD

Substructure Rating: 4 POOR

Channel Rating: 7 GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200091021S13202

Federal Sufficiency Rating: 051.7

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1963 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 6 HIGHWAY-WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 02

Bypass, Detour Length (miles): 01

ADT: 006450 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0085

Structure Length (ft): 000542

Lt Curb/Sidewalk Width (ft): 0.7

Rt Curb/Sidewalk Width (ft): 0.7

Bridge Rdwy Width Curb-to-Curb (ft): 30

Deck Width Out-to-Out (ft): 35

Appr. Roadway Width (ft): 038

Skew: 57

Bridge Median: 1 OPEN MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 19 FT 03 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 8 SPAN ROLLED BEAM

Number of Approach Spans: 0000 **Number of Main Spans:** 008

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 2 PREFORMED FABRIC

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 1 MEETS CURRENT STANDARD

Approach Guardrail: 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation: 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: 6 EQUAL TO MINIMUM CRITERIA

Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING ROADWAY

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: 8 STABLE FOR SCOUR

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 1 LOAD FACTOR (LF)

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 5 HS 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: FAS126

Insp. Date: 062012 **Insp. Freq. (months)** 24 **X-Ref. BrNum:** 0010A

INSPECTION SUMMARY and NEEDS

6/4/2012 All joint troughs should be repaired. Pier caps and bearing areas should be cleaned and patched along with the curbs Seat area with the exposed swedge bolt needs to be cleaned and patched. Structure should have a deck and pier rehab in the near future. ~FRE/SJH

07/19/2010 - Bridge needs major rehabilitation with extensive substructure reconstruction. New deck should be considered with continuous steel configuration to eliminated the leaking joints. Most fabric troughs are failed and leakage is unabated. Steel superstructure has only limited section loss at present. Bridge was rehabbed in 80's and infamous patch material is failing along the piers. No safety repairs are required at present but deterioration is certainly progressing. In short term, the dilapidated cable rail along VT 121 needs to be upgraded not only concerning errant vehicle occupant safety but also to protect the pier columns from possible impact damage. Delaminations above route 121 along the deck soffit also need attention. ~ MJ/DS

Appendix D: Hydraulics memo

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Christopher Williams, Structures Project Manager

FROM: David Willey, Hydraulics Project Supervisor

DATE: January 21, 2013

SUBJECT: Westminster IM 091-1(70), I 91, Bridges 21 N & S over the Saxtons River & VT 121
GPS coordinates: N 43.1235° W 43.1235°

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

The existing northbound bridge has 7 spans and the southbound bridge has 8 spans. They were built in 1963. The abutments and piers are skewed about 33 degrees, to be aligned with the river and VT 121. Several piers are in the channel, near the banks on each side. At least one of the pier footings is exposed, due to scour around the pier. The beams are 30' to 40' above the river.

The existing bridges are more than adequate hydraulically, as they are way above the channel and span the channel, other than the piers.

The scope of the project has not been determined yet. Conventional survey is not available. Lidar is being used for scoping. We performed a less detailed preliminary hydraulic study than we normally do, to determine approximate water surface elevations to help in scoping. A more comprehensive hydraulic study may result in different recommendations, so should be requested if the scope of the project warrants it or if more detailed information is needed. The elevations listed below are for the upstream, southbound, bridge. The elevations would be somewhat lower for the downstream, northbound, bridge.

If the existing bridges are rehabilitated, there should be no changes that would reduce the waterway area below elevation 381'. The need for scour countermeasures at the piers should be considered.

If the bridges are replaced, it would be preferable to keep all new piers out of the channel. Any new piers should be aligned with the channel. The bridges could be shortened. There should be no changes that would reduce the waterway area below elevation 381', that includes abutments and fill material. The bottom of beams should be above elevation 382'.

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

Appendix E: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, P.E., Structures Project Manager

END CCB

From: Eric Denardo, Geotechnical Engineer, via Christopher C. Benda P. E., Soils and Foundations Engineer

Date: March 5th, 2014

Subject: Westminster IM 091-1(70) Preliminary Geotechnical Information

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 for Bridges 21 North and South on Interstate 91 in Westminster, which travel over VT-121 and the Saxtons River. This review included observations made during a site visit, 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.

Previous Projects

The record plans found for the project show that the bridge abutments and piers are supported mostly on driven piles. No specific subsurface information was available. The Soils and Foundations Unit maintains a GIS based historical record of subsurface investigations, which contains electronic records for the majority of borings completed in the past 10 years. An exploration of this map revealed no nearby borings in Westminster.

Water Well Logs

The Agency of Natural Resources (ANR) documents and publishes all water wells that are drilled for residential or commercial purposes. Published online, the logs can be used to determine general characteristics of soil strata in the area. The soil description given on the logs is done in the field, by unknown personnel, and as such, should only be used as an approximation. Four surrounding well logs were examined for depths to bedrock and soil strata.

Figure 1 contains the project and surrounding well locations. The specific wells used to gain information on the subsurface conditions are highlighted by red boxes.

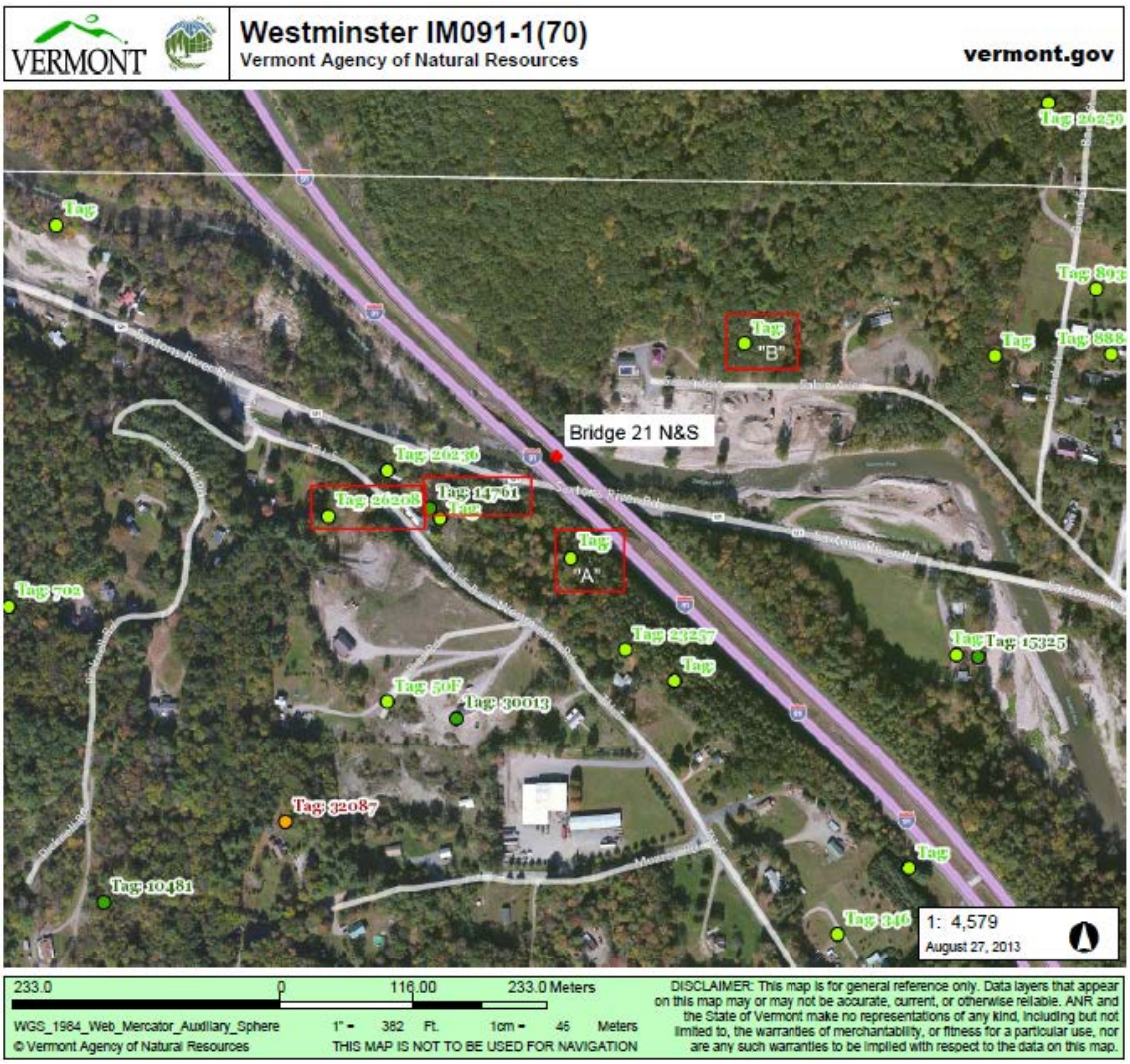


Figure 1. Highlighted well locations near subject project

Table 1 lists the well sites used in gathering the surrounding information. Wells are listed with the distance from the bridge project, depth to bedrock, and overlying soils encountered.

Table 1. Depths to bedrock of surrounding sites

Well Number	Distance From Project (feet)	Depth To Bedrock (feet)	Overlying Strata
26208	700	8	Gravel
14761	400	26	Sandy gravel
“A”	300	150	Gravel/Clay
“B”	650	2	Sand

USDA Soil Survey
The United States Department of Agriculture Natural Resources Conservation Service maintains a surficial geology map of the United States, which is available online. According to the Web Soil Survey, the strata directly underlying the project site consists of Quonset and Warwick soils very gravelly loam and Podunk fine sandy loam. These soils are well drained and deep to bedrock, and are both located within flood plains.

Geologic Maps of Vermont
Mapping conducted in 1970 for the Surficial Geologic map of Vermont shows that the project area is underlain by postglacial fluvial sand and glaciolacustrine gravel.

According to the 2011 Bedrock Map of Vermont, the project site is underlain with carbonaceous schist and metawacke.

A site visit was conducted on February 27th, 2014 to determine potential issues with boring operations, and to make any other pertinent observations about the project.

Figure 2. View of bridge, looking Southeast

Overhead utilities run beneath both bridges on the south side of VT Route 121/Saxtons River Road, shown above, which may conflict with boring operations. With the available sight distance, borings could also be conducted in the roadway.

According to record plans from previous construction, the existing piers are founded on steel piles. Pile length estimates from the record plans range from 20’ to 60’. No visible bedrock was seen during the site visit. Based on this and data from the surrounding well logs, bedrock is believed to be deep. If deep foundations are contemplated, borings should be advanced to bedrock.

Borings for the abutments should be conducted in the roadway, while any borings for additional substructures can be completed below the bridge. The minimal presence of cobbles and boulders in the river suggests borings and piles could be advanced with limited difficulty. Figure 3 shows piers located within the channel.

Figure 3. View of bridge looking Northwest

Based on this information, possible foundation options for a bridge replacement include the following:

Abutments

- Pile caps on a single row of H-Piles
- Reinforced concrete abutments on spread footings
- Reinforced concrete abutments founded on mechanically stabilized earth (MSE) walls

Piers

- Spread footings supported on driven piles
- Spread footings supported on micropiles
- Pier column supported on a single drilled shaft

Once substructure locations are determined, we recommend a minimum of two borings be taken at each abutment and a minimum of one at each substructure. If shallow bedrock or problematic soils are encountered, additional borings should be completed. Borings will help to more fully assess the subsurface conditions at the site including, but not limited to, the soil properties, ground water conditions and depth to bedrock. If drilled shafts are contemplated, final borings should be aligned with the shaft location(s).

When a preliminary alignment has been chosen, the Soils and Foundations Unit should be contacted to help determine a subsurface investigation that efficiently gathers the most information.

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-6910, or via email at Chris.Benda@state.vt.us.

cc: Project File/CCB
END

Appendix F: Natural Resources Memo

Fillbach, Tim

From: Lepore, John
Sent: Wednesday, January 15, 2014 4:00 PM
To: Goldstein, Lee
Cc: Williams, Chris; Lepore, John
Subject: WESTMINSTER IM 091-1(70) - Resource ID (Natural Resources)

The purpose of this email is to let you know that the only regulated resource in vicinity of Bridges 21N & 21S is the Saxton River, which itself is classified as Essential Fish Habitat (EFH). A stream classification of EFH means that any in-stream impacts, regardless of the size or duration (temporary and permanent) will require a Category 2, Pre-construction Notification under Section 404.

It should be noted that there is a wetland on the western side of the southbound lanes between MM 31.3 -31.4, but that appears well outside of the scope of this project and thus, has not been delineated.

My review included the medians for potential cross-overs, between mile markers 30.9 and 31.3 and have determined that cross-overs in this location will not impact any regulated natural resource or require further review.

Furthermore, if construction commences in phased construction, one bridge at time, it would minimize any impacts associated with staging.

If you have any questions about this, come see me…

~ John ~

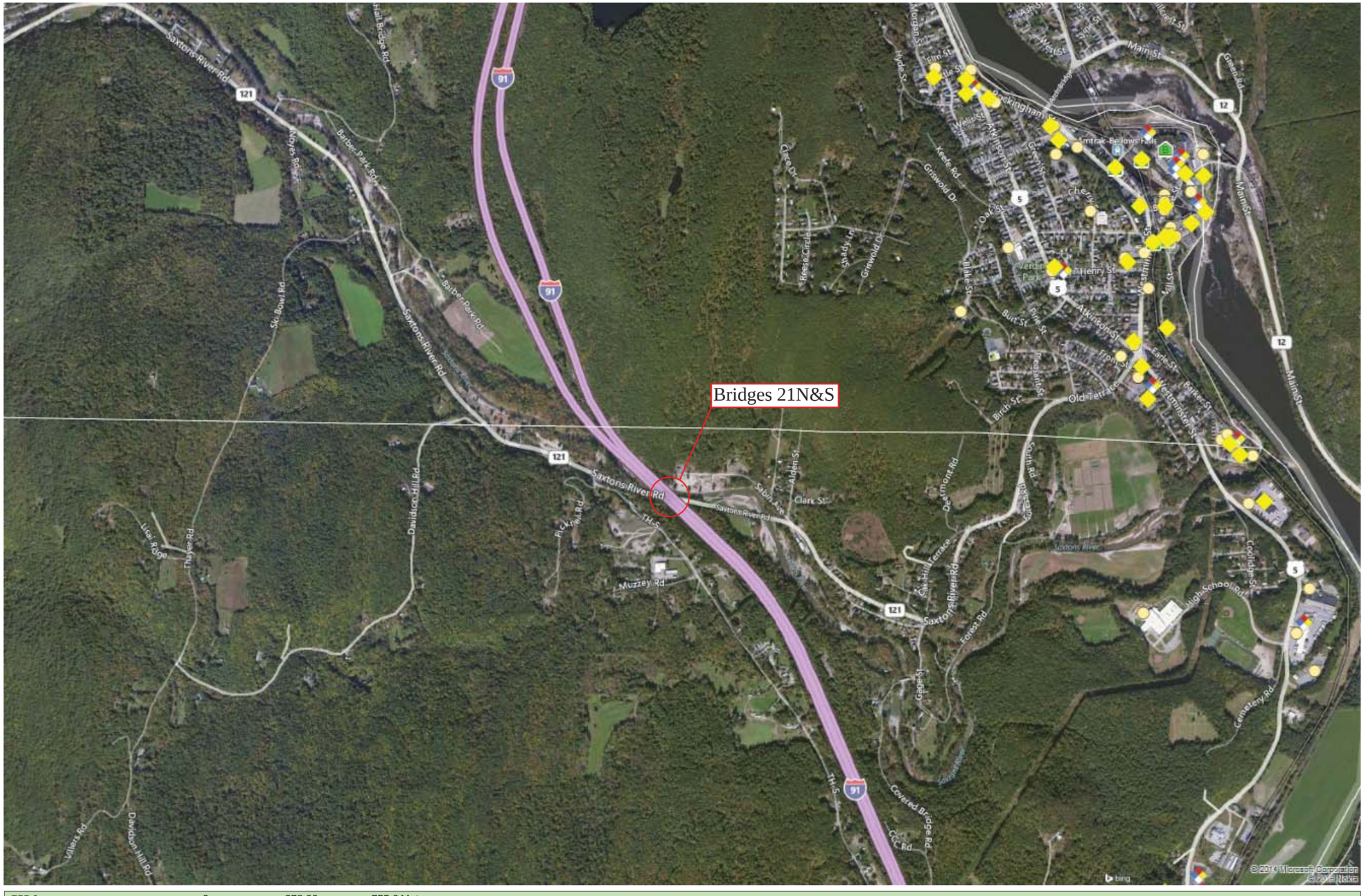
Appendix G: Hazardous Waste Sites

VERMONT

Hazardous Waste Sites

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Landfills
  - OPERATING
  - CLOSED
- Hazardous Waste Site
- Hazardous Waste Generators
- Brownfields
- Underground Storage Tank (working)
- Waste Water Facilities
- Town Boundary

1: 14,857

1in = 1238 ft.
1cm = 149 meters

755.0 0 378.00 755.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

NOTES

Map created using ANR's Natural Resources Atlas

Appendix H: Archaeological Memo

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, Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer

Date: December 30, 2013

Subject: Westminster IM 091-1(70) – Archaeological Resource ID

This project involves work on Bridge 21 N&S on I-91 which crosses over TH 1 (VT 121) and the Saxons River. The scope is not defined at this time so we are considering the project impact area to be at least a 200 foot radius around the bridge.

This resource ID consists of files review including photographs of the project area and ArcMap review. Some areas immediately adjacent to the project area appear to have been affected by TS Irene and are scoured. These are not considered sensitive. However, there are areas outside of the scour that are on higher elevations that could be considered sensitive for archaeology. Due to the time of year, this area cannot be field verified at this time so a conservative approach was taken to determine sensitive areas. Once plans are developed, a field visit can confirm impacts. Sensitive areas are marked on the attached map and are recorded in the geodatabase.

It is stated in the Environmental Request that crossovers are likely to be used during construction of this project. If that is the case, then there will be no archaeological concerns.

A review of conceptual plans will be necessary prior to issuing a formal clearance. Please contact me if you have any questions.

Thank you,
Jen Russell
VTrans Archaeology Officer

Cc: Chris Williams, Project Manager

VTrans Working to Get You There
Vermont Agency of Transportation


Westminster
IM 091-1(70)
0 0.01 0.02 0.04 0.06 0.08
Miles
1:4,363
N
Project Location
bing
Map created by J. Russell
PDD-Environmental Section
on 10-30-13

Appendix I: Historic Memo

Fillbach, Tim

From: O'Shea, Kaitlin
Sent: Monday, January 27, 2014 4:08 PM
To: Goldstein, Lee
Cc: Newman, Scott; Williams, Chris
Subject: WESTMINSTER IM 091-1(70) Historic Resource ID

Hi Lee,

The historic resource identification for WESTMINSTER IM 091-1(70) is complete. Bridges 21 N&S which carry I-91 over the Saxtons River are not considered historic resources. There are no immediately adjacent historic properties. If the SOW expands beyond the interstate and crossovers during construction (for example to Sabin Ave or Back Westminster Road), I will expand the resource ID.

Let me know if you need additional information.

Thank you,
Kaitlin

Kaitlin O'Shea
Historic Preservation Specialist
Vermont Agency of Transportation

802-828-3962
Kaitlin.O'Shea@state.vt.us

Appendix J: Stormwater Memo

Fillbach, Tim

From: Armstrong, Jon
Sent: Wednesday, March 12, 2014 5:05 PM
To: Goldstein, Lee
Cc: Williams, Chris
Subject: RE: Environmental Request NOTIFICATION: WESTMINSTER IM 091-1(70)-resource ID requested

Hi Lee,
I don't have any relevant information to share at this time other than please be aware that if the impervious surfaces associated with the crossovers are planned to be left in place longer than 3 yrs they are not considered temporary and must be considered towards the jurisdictional threshold for an operational permit. If it is looking like an operational stormwater permit will be required based on the scope please coordinate with me while working out proposed drainage and treatment strategies.
Let me know if you have any questions,
Jon

Jonathan B. Armstrong, PE
VTrans Stormwater Management Engineer
Program Development Div. - Environmental Section
One National Life Drive
Montpelier, VT 05633-5001
ph (802) 828-1332
fx (802) 828-2334
email: jon.armstrong@state.vt.us

"*We forget that the water cycle and the life cycle are one*."
- Jacques Cousteau

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·.¸.·´ ¸.·´¯`·.. ><((((º>`·.¸¸.·´´¯`·.¸¸.·´¯`·...><((((º>

From: Goldstein, Lee
Sent: Tuesday, December 10, 2013 5:22 PM
To: Russell, Jeannine; Newman, Scott; Goldstein, Lee; Lepore, John; Armstrong, Jon
Cc: Gauthier, Brennan; O'Shea, Kaitlin; Brown, Jane
Subject: FW: Environmental Request NOTIFICATION: WESTMINSTER IM 091-1(70)-resource ID requested

Hi Folks—resource ID request for bridge 121 on I-91 which spans TH1 (VT 121) and the Saxtons River. Most likely crossovers will be used for whichever SOW is finally determined at a later date.
Project Information:
PIN - 13A098

EA - 0911070-001
Chris Williams sent an RFI to everyone with some information and asked for confirmation of completion of Artemis dates for your specific activities back to him; just wondering if you are doing that? Anyway, there is info in his project file at this link:
Z:\Projects-Engineering\WestminsterIM091-1(70)13a098\Structures\Memos\2013\Westminster Town Map Br 21 NS.pdf
M:\Projects\13a098\Structures\Plots\Submittals\Existing Conditions-December 2013\13a098_Existing Conditions_20131206.pdf

Appendix K: Utility Information

Fillbach, Tim

From: Wheeler, Lawrence
Sent: Thursday, June 27, 2013 11:27 AM
To: Williams, Chris
Cc: McAvoy, Brian; Symonds, Wayne
Subject: Westminster IM 091-1(70) - BR 21 N & S over the Saxtons River Road - Request for Utility Information
Attachments: field sketch_0001.pdf; IMG_0596.JPG

Chris. To date I have not received a response from Comcast. I know they are on these poles because they are on this same line at the Saxtons River Village Bridge. I also do not believe they have anything buried. If anything should change I'll give you an update.

On 5/15/13 I conducted an on-site investigation of the existing utility locations within the referenced project area. Since that time I have been in contact with the Town of Westminster and numerous utility companies. The following summarizes my observations and discussions:

Municipal Utilities

- There are no municipal water or sewer facilities along the Saxtons River Road (TH # 1) in the vicinity of these bridges, per the Town's Road Foreman, Mark Lund. The water and sewer facilities in North Westminster (adjacent to the Saxtons River Road) do not run out as far as the interstate bridges. The municipal utilities within North Westminster are owned and maintained by the Village of Bellows Falls.

Public Utilities

Underground:

- There are no known buried facilities along the Saxtons River Road (TH # 1) and there are no known buried facilities within the I-91 ROW.

Aerial:

- There are no aerial electric facilities along the Saxton's River Road (TH #1); all electric lines should be outside of the project area along Sabin Avenue (across the river) and the Back Westminster Road (which runs parallel with I-91, a substantial distance to the west). Aerial electric facilities are owned by Green Mountain Power.

- There are three black lines which run along the edge of the Saxtons River Road (TH # 1) (see the attached sketch); these facilities are owned by Comcast and FairPoint. These black lines pass directly under both the SB and NB bridges; clearance between the bridge beams and the top cable is minimal (see attached picture).

Following is a list of the contacts for this project:

Town of Westminster
Matthew Daskal, Town Manager

Telephone: (802) 436-722-4255

mdaskal@westminstervt.org

Address: P.O. Box 147 Westminster, VT 05158

(The Town has no municipal water or sewer utilities in the vicinity of these bridges contact information is provided for your information)

Willis D. Stearns, II, Interim Village Manager

Telephone: (802) 436-463-3964

finance@rockbf.org

Address: P.O. Box 370 Bellows Falls, VT 05101

(The Village of Bellows Falls owns and maintains the municipal water and sewer utilities in North Westminster; although these facilities are not located within the project area, contact information is provided for your information)

Deborah Wood
Green Mountain Power

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Address: P.O. Box 398 Wilmington, VT 05363

Stephanie Hosking
FairPoint

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Ivan Peelle
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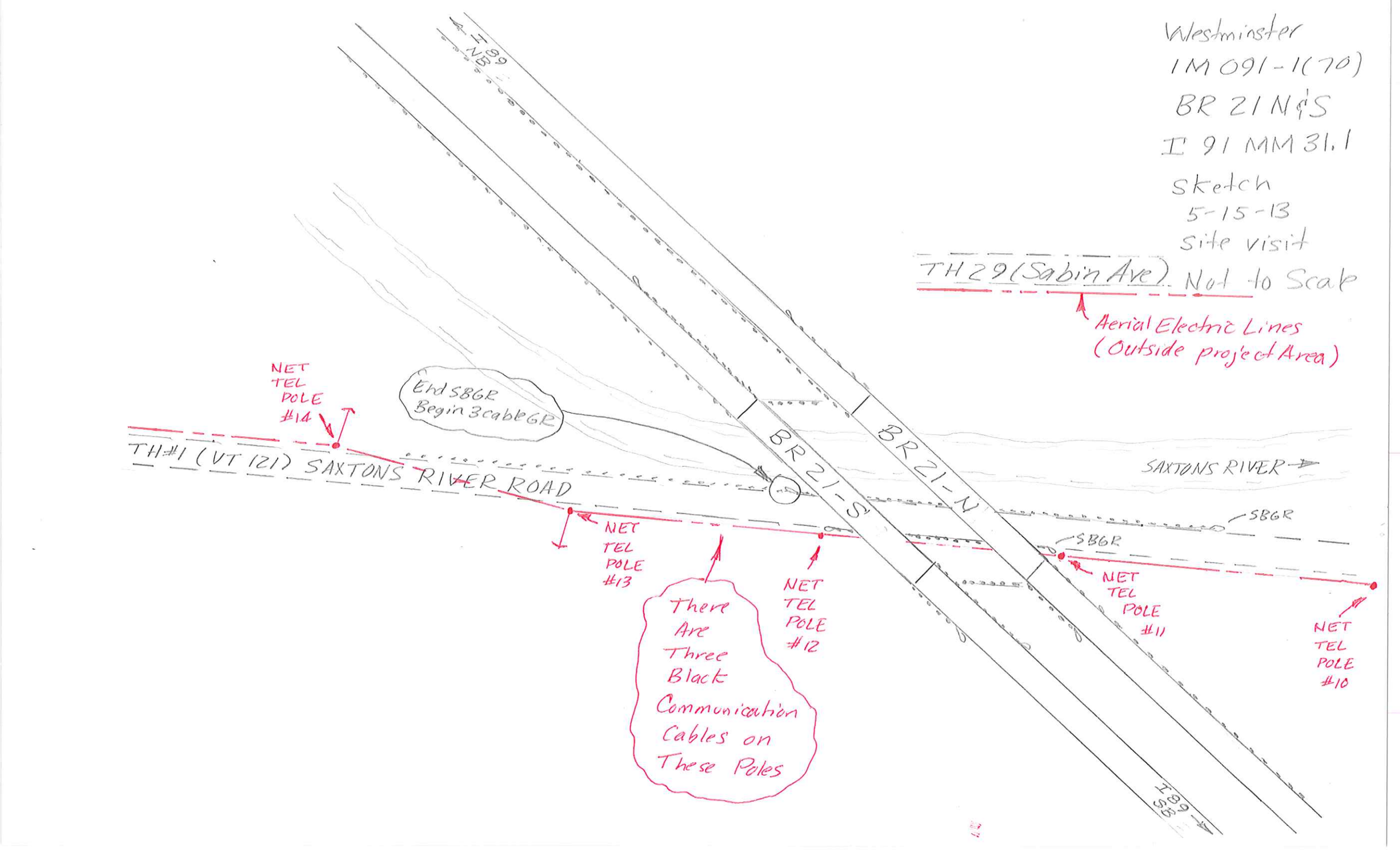
Telephone: (802) 447-1534 EXT 306

ivan_peelle@cable.comcast.com

Address: 107 McKinley Street Bennington, VT 05201


Westminster
IM 091-1(70)
BR 21 N&S
I 91 MM 31.1
Sketch
5-15-13
site visit
TH 29 (Sabin Ave) Not to Scale
Aerial Electric Lines
(Outside project Area)
I 91 NB
BR 21-S
BR 21-N
SAXTONS RIVER
End SBGR
Begin 3cable6R
NET TEL POLE #14
TH #1 (VT 121) SAXTONS RIVER ROAD
NET TEL POLE #13
There Are Three Black Communication Cables on These Poles
NET TEL POLE #12
SBGR
SBGR
NET TEL POLE #11
NET TEL POLE #10
I 89 SB

Appendix L: Local Input

VERMONT

State of Vermont
PDD/Structures Design Section
One National Life Drive
Montpelier, VT 05633-5001
www.aot.state.vt.us

Agency of Transportation

[phone] 802-828-2621
[fax] 802-828-3566
[ttd] 800-253-0191

December 9, 2013

Nathan Stoddard, Chair
c/o Doreen Woodward, Town Clerk
Town of Westminster
PO Box 147
Westminster, VT 05158

Re: Westminster IM 091-1(70) Interstate 91, Bridges 21 N/S on over TH 1 and Saxton's River

The subject bridge project is part of the Interstate Bridge Program and recently received funds for the Scoping phase. This bridge is owned and maintained by the State of Vermont and therefore local funds will not be required.

We are prepared to begin engineering work on this project and determine the appropriate scope of work to address the needs of the bridge. As part of that process, we strive to obtain as much information as possible about site conditions and community concerns to help ensure a productive working relationship. To that end we would appreciate your help in gathering that information. The information you provide will be considered as we evaluate design options. After the design evaluation is complete, we will conduct a public meeting to share the results and gather additional comments before proceeding to the next stage of project development. We expect the public meeting will be held within one year and will be able to provide you with a tentative construction date at that time.

I have attached a list of questions that will help you prepare your response to this letter. Please note that we are asking for your input relative to Saxtons River Road concerns rather than Interstate 89. For example, questions regarding pedestrian use on the bridge would actually be asking for this information on pedestrian use under this structure rather than on it.

I have copied a representative from your Regional Planning Commission and would encourage you to contact them and work together to provide us with this information. If possible, please respond within four weeks of the date of this letter.

If you have any questions, please feel free to contact me via email at Chris.Williams@State.VT.US or by phone at 828-0051.

Sincerely,

Christopher P. Williams, P.E.
Structures Project Manager

Attachments
cc: Matt Mann – Windham Regional Commission
Matthew Langham - VAOT Planning Coordinator

VTrans Working to Get You There
Vermont Agency of Transportation

TOWN OF WESTMINSTER
RUSSELL R. HODGKINS, TOWN MANAGER
P.O. BOX 147 WESTMINSTER, VT 05158
Tel. 802-722-4255 Fax 802-722-9816
Manager@westminstervt.org

State of Vermont
Attn: Christopher Williams

Local & Regional Input Questionnaire

1.) Are there any scheduled public events in the community that will generate increased traffic during construction? *There are no public events that have been brought to my attention for the north part of Westminster (Rt.121) where this construction project is scheduled.*

2.) Is there a slow season or period of time from May through October where traffic is less? *No. The normal traffic that goes through the construction zone is going from Bellows Falls to Saxtons River. North Westminster has limited affected households and at no time would the traffic pattern be more or less.*

3.) Describe the location of emergency responders and emergency response routes. *Emergency responders are located throughout Westminster and their routes to an emergency would depend upon where the situation was located and what was needed to address the emergency. Examples: If an emergency happens in the Village of Westminster and an emergency respondent was coming from North Westminster, he or she, would go either to Bellows Falls and up Route 5 to the Village or south to Back Westminster Road, which is through the construction site, to the 91 Access Road to the Village. If the emergency is in the West portion of Westminster and a respondent lives in the North Westminster portion of the Town (which we have at least two respondents that I know of) than he or she would definitely go through the construction site to Back Westminster Road to Westminster Heights Road. Before road closure or restrictions we would have to notify these people and all emergency respondents of this route change. The second part of the equation is the location of our emergency facilities. All of our services are located in the Village of Westminster (Fire, Rescue, and Shelters). We are a volunteer Fire Dept. and Rescue with contracted police from Newfane. Our Town highway department is located off the intersection of Back Westminster Road and the 91 Access Road. Our Road Foreman lives in North Westminster and his travel will be redirected if the road is closed. In conclusion, communication will be accentual to the success of your project and our Town's wellbeing.*

4.) Where are the schools in your community and what are their schedules? *We have two elementary schools and a regional high school in the Town of Westminster. The first school (K-4) is located in the Westminster West portion of the Town off Westminster West Road. Their school schedule ends in June for the most part and will start back up at the end of August. The majority of the students come from the West where they live. The second elementary school is in the Village of Westminster just off of Route 5 on "School St". Their schedule will mimic the first one, but the students will come from the North, West, and East sections of the Town. School bus routes will be affected during the regular school year, but with accentual communication, we will be able to figure out the best direct route for the safety of our children. This school also has*

summer classes with limited transportation needs. The third school is our Bellows Falls Union High School located on Route 5 at our north end. This school presents the biggest problem/ challenge. The high school has students that come from Grafton, Athens, Saxtons River, Bellows Falls, Rockingham, as well as Westminster. Bus routes are determined by early and late bus needs from all of the effected Towns and their kids. The school year is also end of June to end and starts up again in late August with athletes starting in late July. The schools activities are twice fold versus our elementary schools with a summer schedule of drama events, athletic events, and Town meetings. This building is our community center for all major Town meetings, emergency events, and social events. I know the schedule of the High School is typically done year by year, but you should check with the principal Chris Hodsden at (802)463-3944.

5.) In the vicinity of the bridge project, is walking or bicycling a major component of the land use pattern? *The location of the bridge project is on Rt. 121 which is a travel route by car, bus, and/or truck to get from Saxtons River to Bellows Falls or vice versa. Walking and/or bicycling are not common means of transportation or exercise in this area. The nearby Villages are not close together and this project is in the middle of the affected Villages.*

6.) Are there businesses that would be adversely impacted by a detour or due to the work zone proximity? *Yes. There are two businesses on Back Westminster Road that are less than a mile from the project site. Both companies have deliveries and are mobile in their business. One is Bazin Brothers Trucking & Excavation and the other is a logging company. These two businesses will have a large adjust to their daily schedules because of the project and it's duration. Again, as I've mentioned before, communication will be key to the success of this project and the impact that any closed or delayed access imposes.*

7.) Are there any Town/ Public buildings in the projects proximity? *No. The project, again, is between two Towns and Rt. 121 is the access to each other. The schools, while in session, will be the major concern along with emergency routes.*

8.) Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road? *Yes. The Back Westminster Road is a rural road with houses, a church, and a few businesses. This road has many pedestrians and bicyclists that frequent the area. The speed limit is 35 mph along the heaviest settled portion of the road and our police officers have a hard time keeping people safe as it is. The increased volume of traffic will have a large impact on this small community, not only during the daylight hours, but at night also.*

9.) Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? *Yes. If the 91 bridge is closed, then the traffic will be rerouted through Westminster's Village on Rt.5. South bound traffic will be trying to make up time through our Historic District. North bound traffic will again go through the Village and our school children walk the road as well as the general public for exercise. Throughout the summer we have Town activities at our community center (the Westminster Institute) which also has our public library in the building. We have a Halloween parade for our elementary school which goes up School Street to the Historic Town Hall on Route 5 and then back. It's not a long parade, but blocks traffic for approx.. 20 minutes.*

10.) Please identify any local communication channels that are available. *We have four major forms of community communication. Our local daily newspaper is the Brattleboro Reformer. Our Town newspaper is the Westminster Gazette and is distributed monthly to all the*

Westminster residents at the beginning of each month. We have a local TV station (Fact TV) and it's on cable TV to most of our residents, but not all. And lastly, we have our Town web page that most people frequent for news events and activities coming up.

11.) Is there a local business association, chamber of commerce, or other downtown group that we should be working with? *We have three districts in Westminster and all have governing bodies. The Town has a Town Manager who is filling out this questionnaire. We have a school district which is governed by a school board and will definitely have to be approached as this project gets closer. Their activities will be hindered if communication is not thorough and complete. The third district is the Fire Department. They are the backbone of the Town along with our highway department. All of our emergency management sources are funneled through these two entities for the Towns safety. They will have to be in the "Know" at all times as is with any project upon closing roads, re-routing traffic through Villages, and pedestrian traffic. Our Town Sherriff's Department (Windham Sherriff's Department in Newfane, Vt.) will also need to be notified and kept abreast of any and all construction details which will change our Town's safety.*

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Design Considerations

1.) Are there any concerns with the alignment of the existing bridge? *In talking with my Road Foreman, he said there has been no apparent problem with the existing alignment of the bridge.*

2.) Are there any concerns with the width of the existing bridge? *This bridge is not a Town owned bridge and we would have nothing to say about this. That being said we have not noticed any problems with the existing width of the 91 bridge in question.*

3.) What is the current level of bicycle and pedestrian use on the bridge? *Again, this is a State Highway which prohibits both of those uses. The Town has no jurisdiction on this bridge or its enforcement.*

4.) If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one? *A sidewalk is a non-factor for this State Highway. The Towns only concern about the structure being replaced would be the snow plowing factor in regards to the safety of our road underneath. The width and shoulder should be factored in so as to not to put our residents in harm's way when snow plows go by from the upper road.*

5.) Is there a need for a sidewalk or widened shoulder if one does not currently exist? *See answer number 4 of this section.*

6.) Does the bridge provide an important link in the Town or Statewide bicycle or pedestrian network such that bicycle and pedestrian traffic should be accommodated during construction? *This is a State Highway and as such prohibits such activities.*

7.) Are there any special aesthetic considerations we should be aware of? *Not that I'm aware of, but this is Vermont.*

8.) Are there any traffic , pedestrian, or bicycle safety concerns associated with the current bridge? *No. This is a State Highway.*

9.) Does the location have a history of flooding? *Yes. Recently we experienced major damage from tropical storm Irene. The river that this bridge expands over is the Saxtons River and it swelled its banks to do damage in three Townships. We still have not completed the entire cleanup due to money restraints. A portion of the damaged area is directly related to this bridge and its abutments.*

10.) Are you aware of any nearby Hazardous Material Sites? *No. The closest thing to a hazardous site in this area are the three partially destroyed homes just up river from this bridge. These were compromised in the Tropical Storm Irene. The hazards are typical septic system, heating fuel tanks, and construction debris.*

11.) Are you aware of any historic, archeological, and/or environmental resource issues? *No. The only environmental concern is the damaged house explained in question # 10 of this section.*

12.) Are there any other comments you feel are important for us to consider that we have not mentioned yet? *No. This has been pretty thorough and repetitive.*

****
****

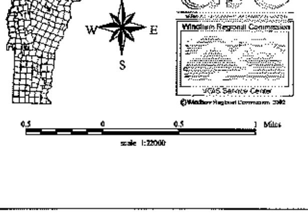
Land Use & Public Transit Considerations

1.) Does your municipal land use plan reference the bridge in question? *No.*

2.) Please provide a copy of your existing and future land use map. *See Attached.*

3.) Are there any existing, pending, or planned development proposals that would impact future transportation patterns near the bridge? *No.*

4.) Is there any planned expansion of public transit service in the project area? *Not that we are aware of, but the Town Plan leaves this up to Windham Regional Commission. See attached.*



Existing Land Use by Parcel

Town of Westminster, Vt.

- Commercial
- Industrial
- High-density residential
- Low-density residential
- Public land
- Open space - residential
- Open space - agricultural
- Open space - undeveloped

- Interstate highway (paved)
- Federal or state highway (paved)
- Class 2 town highway - paved
- Class 2 town highway - unpaved
- Class 3 town highway - paved
- Class 3 town highway - unpaved
- Class 4 town highway (unpaved)

- Parcel boundary
- Residential building
- Commercial building
- Barn/outbuilding
- Public building

- Legal town trail
- Private road/drive
- Railroad
- Stream
- River or pond

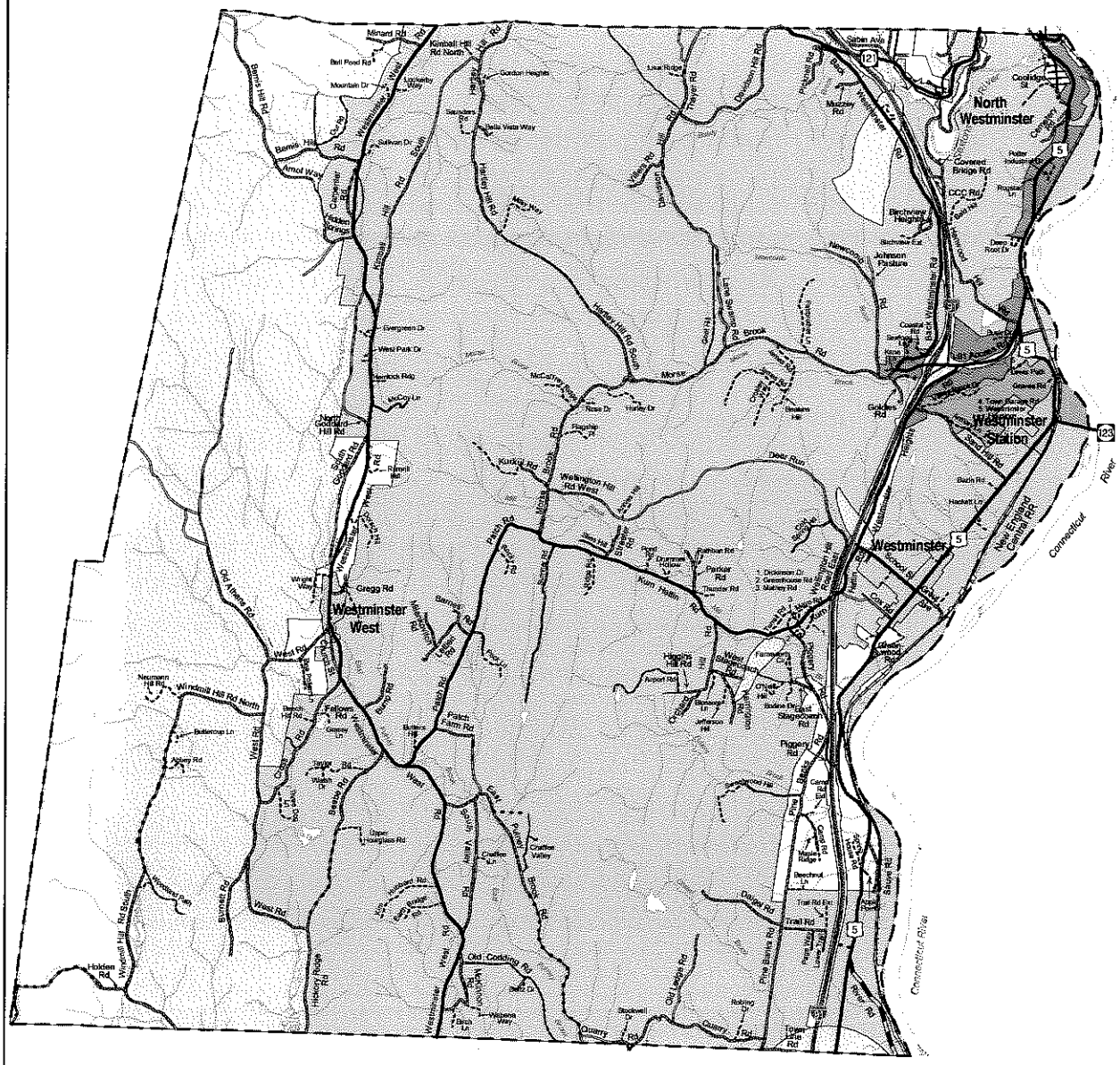
Sources:

Existing land use categories were determined on a parcel-by-parcel basis by the Town of Westminster. Land use categories are based upon 2002 land uses, and have been applied to parcel boundary data current to 1991. Where parcel changes have occurred since 1991, the dominant existing land use for that area is shown on this map.

- Town highways were digitized from 1984 1:5000 orthophotos by Greenhorne & O'Mara Inc. under contract with OGIS. Some road locations were updated by microDATA using GPS during data collection for Enhanced 9-1-1. Attributes are from AOT highway maps, and were verified and corrected by the Town of Westminster and WRC in 1999.

- Parcel boundaries were developed by Smartscan, Inc. from Westminster's 1:5000 parcel maps in 1991. These data have been updated by WRC in 1994 using information provided by DiBernardo Associates.

- Building locations were digitized from 1:5000 orthophotos. These data were corrected and building use information was provided by the Town of Westminster.



Proposed Land Use Districts

Town of Westminster, Vermont

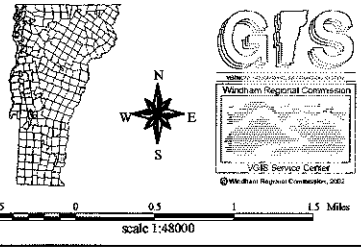
Sources:

- Proposed land use district boundaries were delineated by the Town of Westminster. Data were developed by WRC using parcel and source protection area GIS coverages.

- Town highway locations were digitized from 1989 1:5000 orthophotos by Greenhorne & O'Mara Inc. under contract with OGIS. Some road locations were updated by microDATA using GPS during data collection for Enhanced 9-1-1.

- Town highway attributes (i.e. class and pavement) are from AOT highway maps.

- Road names data were provided by the Town of Westminster.



- Commercial
- Industrial
- Village
- Village Residential
- Rural Residential
- Resource Conservation

- Interstate highway (paved)
- Federal highway (paved)
- Class 2 town highway - paved
- Class 2 town highway - unpaved
- Class 3 town highway - paved
- Class 3 town highway - unpaved
- Class 4 town highway (unpaved)
- Legal town trail
- Private road/drive
- Stream
- River or pond

August, 2002, C:\TOWNS\WESTM\STR\PLU.APR: 11x17 map

2. TRANSPORTATION

Because Westminster's development growth has resulted in a rise in our local population, there is an ever-increasing demand on the Town's transportation facilities. With this rise in use of our transportation system, it becomes essential that the system be well planned to promote public safety and to protect the rural character and scenic quality of our community.

Westminster's transportation network is essential to its economic vitality. Many residents commute to surrounding communities for employment, school, shopping, obtaining services, and for recreational and cultural activities. The private automobile is and will likely continue to be the principal means of transportation for Westminster resident for the foreseeable future.

Westminster Roads

Classification:

The road network in Westminster consists of town roads, a state highway, and a federal highway.

As identified on the Town's highway map, there are 86.925 miles of roads in Westminster. The network of roadways has been categorized according to the State's town highway classification system and its functional classification.

There are three function classification categories:

1. Arterial highways - Generally refers to highways used for through traffic. Interstate 91 and Route 5 are two arterial highways.

2. Collector roads - Roads used for getting from residential areas to arterial highways. These include the Westminster West Road, Route 121, the Back Westminster Road, Patch Road, Westminster Heights Road, and Kurn Hattin Road.

3. Local roads - They are the rural/residential streets and roads that make up most of the community's road system.

Functional classification categories are useful in identifying conflict, such as local roads that are serving as collectors and causing a function conflict for local residents.

The State of Vermont has developed a classification system for the purposes of Town Highway Mapping and Inventories, maintenance schedules, and State Aid. These design classifications are defined in 32 VSA as:

1. Class 1 - Those town highways which form the extension of a state highway route and which carry a state highway route number.

2. Class 2 - Those town highways selected as the most important highways in each town. As far as practicable, they shall be selected with the purposes of securing trunk lines of improved highways from town to town and to places which, by their nature, have more than a normal amount of traffic.

3. Class 3 - All traveled town highways other than Class 1 or 2 highways. The minimum standards for Class 3 highways are a highway negotiable under normal conditions all seasons of the year by a standard manufactured pleasure car. A highway not meeting this standard may be classified as a provisional Class 3 highway if, within five years of the determination, it will meet all Class 3 highway standards.

4. Class 4 - All other town highways.

Road Classifications for Westminster

Roads	Miles
Class 1	0.000
Class 2	20.650
Class 3	47.740
State Highways	9.443
Interstate-Federal	9.092
Total	86.925
Plus:	
Class 4 (Trails and Pent Roads)	7.520

Road Improvements

The Road Commissioner, the Road Foreman, and/or the Board of Selectmen do an ongoing evaluation of the local road conditions. The Road Commissioner, the Road Foreman, and many of the road crew have participated in the Vermont Local Road Program that provides transportation information exchanges at St. Michael's College in Winooski, Vermont.

Most road systems in Westminster were not designed for the heavy truck traffic that there is on them today. Westminster schedules approximately 1 1/4 miles of repaving a year, but this does not keep up with the actual wear on these roads due to heavy use.

Westminster's problematic areas are mostly due to spring thaws resulting in difficult ongoing maintenance on some of the gravel roads.

At the present time, Westminster is not dealing with any areas of congestion.

Bridges

There are six bridges in Westminster, excluding Interstate Route 91. Five of these are maintained by the Town; the sixth one is on US Route 5 crossing the Saxton's River and is maintained by the State of Vermont.

Growth Considerations

There is a strong link between transportation facilities and land use patterns. The capacity of Westminster's roads and bridges as well as the land terrain play important roles in defining potential opportunities and limitations for growth and directly influence where development can and cannot be located. Westminster has zoned for non-residential development on those roads with easiest access to US Interstate Route 91 and with three phase power available. Residential development has taken place for the most part along our Class 2 and Class 3 roads. Westminster has numerous private roads servicing residences.

Planning Initiative

Federal and State transportation legislation enacted over the past years has called for greater emphasis on state transportation planning. The Transportation Planning Initiative is the Vermont Agency of Transportation's (VAOT) program designed to meet the goals established by the legislature.

The Planning Initiative involves the decentralization of the VAOT's planning process to the local and regional levels. The planning with be facilitated through the Windham Regional Commission which will be responsible for coordinating with the towns to complete a Regional Transportation Plan.

Once the Regional Transportation Plan is developed, a Transportation Improvements Program will be prepared which will identify the prioritized list of eligible capital improvement projects within the region. Ultimately, the information prepared in the Transportation Improvements Program will be included in the VAOT Capital Program and Budget.

The following transportation-related resources are available in Westminster:

A. Land Travel

1. Bus: Vermont Transit, a common carrier, makes several regular stops daily at Fletcher's Store in Bellows Falls, connecting Westminster with all of New England and the USA. Connecticut River Transit offers commuter bus service to Bellows Falls, Brattleboro, Dummerston, and Putney.

3. Rail: Amtrak makes two stops daily at the railroad station in Bellows Falls, Central Vermont Railroad stops at Westminster Station Market for freight.

4. Taxi: Service is available from Bellows Falls and Brattleboro.

B. Air Travel

1. Hopkins Airport in Keene, New Hampshire.

2. Hartness State Airport in Springfield, Vermont has facilities for charter flights.

3. Other airports are located in Lebanon and Manchester, New Hampshire; Hartford, Connecticut; and Boston, Massachusetts.

C. Local Facilities

1. Westminster owns and operates its own school bus service for all students' grades Kindergarten through 12th grade.

Policy

To ensure that the transportation system in Westminster maximizes public safety and provides convenience commensurate with need, while respecting the integrity of the natural environment and maintaining the community's scenic, rural character and historic sites.

Recommendations

1. The Town shall schedule necessary road and bridge improvements to maintain adequate capacity and establish an equitable and affordable means of paying for these improvements.

2. The Town shall continue reasonable efforts to research old public rights of way to determine where public access still exists.

3. The Town shall maintain existing rural roads as gravel roads for scenic purposes.

4. The Town shall continue to install road name signs on all Town roads (and reinstall, if necessary) for the convenience of the public, but especially for use of emergency purposes, i.e. firemen, police, ambulance, and rescue workers.

5. The Town shall work with other regional communities and the regional planning commission to identify and implement alternative means of transportation that would reduce the level of traffic on local and regional roads.

Appendix M: Crash Data

Vermont Agency of Transportation

General Yearly Summaries - Crash Listing: State Highways and All Federal Aid Highway Systems

From 01/01/07 To 12/31/11 General Yearly Summaries Information

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Direction	Road Group
Route: I-91 Continued ...												
	VTVSP0400/11D10 0238	Westminster	27.19	01/22/2011	12:09	Clear		Other - Explain in Narrative	1	0		SH
	VTVSP0400/09D10 1075	Westminster	27.2	05/02/2009	00:15	Cloudy	Under the influence of medication/drugs/alcohol, Failure to keep in proper lane	Single Vehicle Crash	0	1		SH
	1314/17313-07	Westminster	27.45	11/20/2007	11:44	Snow	Driving too fast for conditions	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/09D10 1823	Westminster	27.65	07/14/2009	13:36	Clear	Fatigued, asleep	Single Vehicle Crash	1	0		SH
	VTVSP0400/09D10 2643	Westminster	27.96	09/30/2009	19:09	Cloudy	No improper driving	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/09D10 0643	Westminster	28.37	03/09/2009	08:02	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	S	SH
	1314/7895-07	Westminster	28.42	06/17/2007	16:10	Cloudy	No improper driving, Failed to yield right of way	Opp Direction Sideswipe	0	0	S	SH
	1314/1764-07	Westminster	28.53	01/15/2007	10:19	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	0	0	N	SH
	1314/10537-07	Westminster	28.54	06/16/2007	12:58	Clear	Failure to keep in proper lane	Single Vehicle Crash	1	0	S	SH
	1314/10543-07	Westminster	28.54	07/19/2007	05:40	Clear	Fatigued, asleep	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/09D10 1365	Westminster	28.61	05/30/2009	17:58	Clear	Distracted	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/08D10 0749	Westminster	28.7	02/22/2008	11:57	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	N	SH
	1314/10102-07	Westminster	28.8	06/19/2007	10:07	Clear	Failure to keep in proper lane, Fatigued, asleep	Single Vehicle Crash	1	0	S	SH
	VTVSP0400/08D10 1394	Westminster	28.85	04/18/2008	13:00	Clear	Unknown	Single Vehicle Crash	1	0	S	SH
	VTVSP0400/08D10 3724	Westminster	29.05	11/15/2008	17:58	Sleet, Hail (Freezing Rain or Drizzle)	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	0	0		SH
	VTVSP0400/08D10 3179	Westminster	29.1	09/19/2008	11:38	Clear	Made an improper turn, Failure to keep in proper lane, No improper driving	Same Direction Sideswipe	0	0	N	SH
	1314/5905-07	Westminster	29.36	04/04/2007	16:50	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	0	0	N	SH
	VTVSP0400/09D10 0475	Westminster	29.55	02/19/2009	22:41	Snow	Driving too fast for conditions	Same Direction Sideswipe	0	0	N	SH
	VTVSP0400/09D10 0476	Westminster	29.55	02/19/2009	22:45	Snow	Driving too fast for conditions, No improper driving	Other - Explain in Narrative	0	0	N	SH
	VTVSP0400/10D10 3173	Westminster	29.59	11/16/2010	15:10	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/10D10 1469	Westminster	29.8	05/30/2010	12:40	Clear	No improper driving	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/10D10 2399	Westminster	30.05	08/25/2010	09:00	Rain	Failure to keep in proper lane	Single Vehicle Crash	1	0	S	SH
	1314/8232-07	Westminster	30.15	06/06/2007	09:53	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0		SH
	VTVSP0400/11D10 3603	Westminster	30.65	11/27/2011	03:15	Fog, Smog, Smoke	Under the influence of medication/drugs/alcohol, Failure to keep in proper lane	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/10D10 0132	Westminster	30.77	01/13/2010	22:28	Clear	No improper driving	Other - Explain in Narrative	1	0	S	SH
	1418/7812-07	Westminster	30.83	05/21/2007	15:49	Cloudy	Fatigued, asleep	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/09D10 3560	Westminster	30.96	12/28/2009	11:54	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	1	0	S	SH
	1314/6873-07	Westminster	31	05/18/2007	11:35	Cloudy	Failure to keep in proper lane, Inattention	Single Vehicle Crash	1	0		SH
	VTVSP0400/08D10 0558	Westminster	31	02/09/2008	16:05	Snow	Driving too fast for conditions	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/08D10 3022	Westminster	31	09/04/2008	06:08	Cloudy	Failure to keep in proper lane, Inattention	Single Vehicle Crash	0	0	N	SH
	VTVSP0400/08D10 3413	Westminster	31	10/13/2008	21:25	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	0	0	N	SH

**Crash occurred prior to the last Highway Improvement Project. This data should not be used in a crash analysis. UNK indicates the Mile Marker is Unknown.*

Vermont Agency of Transportation

General Yearly Summaries - Crash Listing: State Highways and All Federal Aid Highway Systems

From 01/01/07 To 12/31/11 General Yearly Summaries Information

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Direction	Road Group
Route: I-91 Continued ...												
	VTVSP0400/09D10 2134	Westminster	31	08/12/2009	18:49	Cloudy	Failure to keep in proper lane, Exceeded authorized speed limit	Single Vehicle Crash	0	0	N	SH
	VTVSP0400/10D10 0092	Westminster	31	01/09/2010	14:43	Clear	Driving too fast for conditions	Single Vehicle Crash	2	0		SH
	VTVSP0400/11D10 0767	Westminster	31	03/14/2011	07:05	Cloudy	Driving too fast for conditions	Single Vehicle Crash	0	0	N	SH
	1314/11018-07	Westminster	31.02	07/12/2007	12:12	Clear	Driving too fast for conditions, Distracted, No improper driving	Rear End	1	0		SH
	VTVSP0400/11D10 0788	Westminster	31.05	03/16/2011	11:05	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/11D10 2572	Westminster	31.05	08/23/2011	15:42	Clear	Failure to keep in proper lane	Single Vehicle Crash	3	0		SH
	1314/16006-07	Westminster	31.07	10/17/2007	18:01	Clear	Unknown	Other - Explain in Narrative	1	0		SH
	VTVSP0400/09D10 0039	Westminster	31.15	01/05/2009	01:25	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/11D10 0372	Westminster	31.2	02/05/2011	11:53	Cloudy	Inattention, Failure to keep in proper lane	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/08D10 1188	Rockingham	0.02	03/28/2008	11:43	Clear	Driving too fast for conditions, Operating defective equipment	Single Vehicle Crash	0	0	N	Ramp/Spur
	1314/1765-07	Rockingham	0.05	01/19/2007	19:24	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	N	Ramp/Spur
	VTVSP0400/10D10 1326	Rockingham	0.51	05/15/2010	09:08	Cloudy	Distracted, Followed too closely, No improper driving	Rear End	0	0	N	Ramp/Spur
	VTVSP0400/08D10 1780	Rockingham	31.3	05/24/2008	19:32	Clear	No improper driving	Single Vehicle Crash	0	0		SH
	VTVSP0400/09D10 2222	Rockingham	31.3	08/21/2009	10:19	Clear	Failure to keep in proper lane	Single Vehicle Crash	2	0		SH
	VTVSP0400/10D10 0645	Rockingham	31.31	02/27/2010	09:20	Cloudy	Exceeded authorized speed limit, Failure to keep in proper lane	Single Vehicle Crash	1	0	S	SH
	VTVSP0400/09D10 1589	Rockingham	31.35	06/22/2009	09:25	Cloudy	Unknown	Single Vehicle Crash	1	0		SH
	VTVSP0400/10D10 3428	Rockingham	31.55	12/12/2010	10:26	Cloudy	Driving too fast for conditions	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/08D10 0756	Rockingham	31.75	02/22/2008	15:17	Snow	Driving too fast for conditions	Single Vehicle Crash	1	0		SH
	VTVSP0400/10D10 0722	Rockingham	31.78	03/07/2010	13:10	Clear	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, Failure to keep in proper lane	Single Vehicle Crash	2	0		SH
	VTVSP0400/08D10 0200	Rockingham	31.8	01/14/2008	18:11	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	N	SH
	VTVSP0400/09D10 1299	Rockingham	31.8	05/24/2009	06:28	Clear	No improper driving	Single Vehicle Crash	1	0	N	SH
	VTVSP0400/08D10 0243	Rockingham	31.82	01/18/2008	01:53	Snow	No improper driving, Driving too fast for conditions, Failure to keep in proper lane		0	0	N	SH
	1314/12562-07	Rockingham	31.9	09/30/2007	13:21	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	N	SH
	VTVSP0400/11D10 0577	Rockingham	32	02/25/2011	08:21	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	1	0	S	SH
	VTVSP0400/09D10 0830	Rockingham	32.07	04/04/2009	06:00	Clear	Fatigued, asleep, Failure to keep in proper lane	Single Vehicle Crash	0	0	N	SH
	VTVSP0400/11D10 0578	Rockingham	32.13	02/25/2011	08:53	Snow	No improper driving, Driving too fast for conditions	Same Direction Sideswipe	1	0	N	SH
	VTVSP0400/11D10 0586	Rockingham	32.25	02/25/2011	12:10	Snow	Driving too fast for conditions	Single Vehicle Crash	1	0	S	SH
	1314/3429-07	Rockingham	32.3	01/15/2007	12:28	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	0	0	S	SH
	VTVSP0400/08D10 0453	Rockingham	32.4	02/02/2008	08:16	Cloudy	Driving too fast for conditions	Single Vehicle Crash	0	0	N	SH

**Crash occurred prior to the last Highway Improvement Project. This data should not be used in a crash analysis. UNK indicates the Mile Marker is Unknown.*

Appendix N: Safety Discussions

Jennifer,

Per your request, I reviewed the crash data for the section of I-91 between mile points 31.07 and 31.57.

This section of I-91 contains a high crash location for the 2008-2012 reporting period (the last time the high crash location report was generated by Highway Research). The boundaries of the high crash location are tighter. They go from mile point 30.9 to mile point 31.2 and include the bridges.

Looking back in time, this section of I-91 was also classified as a high crash section in the 1998-2002 HCL report as well as in the 2006-2010 HCL report. It was not identified as a high crash location in the 2002-2004 HCL report.

The majority of the crashes within the high crash location are taking place at the bridges (approximately 75% for the 2008-2012 HCL).

At the bridges, the crashes are pretty much distributed evenly between the southbound and the northbound directions. They also happened mostly on a dry road surface.

From my review of the crash reports and the crashes at the bridges as well as along I-91, it is my opinion that the narrowness of the bridges and the lack of recovery area are the reasons why crashes have been happening at the bridges.

Providing wider shoulders on the bridges is obviously the needed remedial action to reduce the occurrence of crashes on the bridges.

An enhancement that could be done easily would be to replace the object markers at the beginning of the bridges with new ones that would have fluorescent yellow sheeting (assuming that the existing ones are not currently of this type). This would make the approaches to the bridges more visible.

The MUTCD suggests that a narrow bridge sign (W5-2) may be used in advance of a bridge on which the approach shoulders are narrowed as is the case with the bridges under considerations. While the agency has been using this sign on state roads, the agency has not been using this sign on the interstate. The latest guidance that I am aware of on this dates back to June 1995 when Dave Ross was Traffic and Safety Engineer.

You may want to discuss the possible use of this sign on your project with Amy Gamble. If this sign could be used, then I could see a “TAPCO” type application with some form of beacon or LEDs around the sign that would flash when a vehicle would be approaching the bridge to try to get their attention before they enter the bridge. The flashing action would be activated once a vehicle has been detected in the detection zone.

From: Dupigny-Giroux Mario
Sent: Tuesday, February 10, 2015 8:08 AM
To: Sweeny, Gary
Cc: Fitch, Jennifer; Nyquist, Bruce
Subject: RE: I-91 Westminster

Gary,

Here are my answers to the questions that you brought up concerning the bridges on I-91 in Westminster.

Question about the wide of the bridges.

I used the Interactive Highway Safety Design Model (IHSDM) to develop a crash reduction factor to go from the Do Nothing Alternative to Alternative 3b that changes the bridge typical from 3-12-12-3 to 4-12-12-12. Based on this analysis, I determined that the potential reduction in crashes is 59.5%.

From my review of the crash reports, I identified seven crashes that had taken place on the bridge in a five-year period. Specifically, these included five property-damage-only crashes and two crashes with a non-incapacitating injury.

Given the 59.5% crash reduction and this injury distribution of crashes, I determined that over a 40 year service life, the annual benefits would be $35,381 and that the annual costs would be $644,165. This produces a benefits to costs ratio of 0.05.

Because the benefits to costs ratio is well below 1 , it would not be justified, from a safety perspective, to widened the bridges as proposed in Alternative 3b.
Similarly for Alternative 4, with an 80 year service life, the benefits to costs ratio would also be below 1 at 0.06.

Question about the high friction surface

High friction surface treatment is being promoted by FHWA as a mean of reducing run-off-the road crashes http://www.fhwa.dot.gov/everydaycounts/edctwo/2012/pdfs/fhwa-cai-14-019_faqs_hfst_mar2014_508.pdf.

Here are two products:

Safelane is specifically targeted at icy bridge crashes.
http://www.cargill.com/products/salt/winter/safelane/

Tyregrip, http://www.ennisflint.co.uk/products/products/highfriction/prismo-tyregrip

The cost of materials for a high friction surface treatment is dependent of the quantity used. This cost varies between $25/SY to $35/SY.

For the two bridges in Westminster, there would be around 2869 SY and the total cost would be between $71,725 and $100,415.

The service life is around 5 to 8 years.

There are no official crash reduction factors for this type of application although FHWA reports that research is being done to this effect.

There is one study for a Safelane application on bridges in Minnesota that reported before and after data for winter months crashes. I averaged the sites and I came up with a 50% reduction in crashes.

The crash data for the five-year period that I reviewed specifically on the bridges had two crashes that took place under icy conditions (21%) and five under dry conditions (71%).

With the $100,415 high end cost, if I assume a 50% crash reduction and consider only the crashes that took place on an icy surface, I get $2,522 in annual benefits and a 0.16 benefits to costs ratio.

If I consider the crashes that happened during the winter months (October to March), there are three property damage crashes. The benefits to costs ratio is 0.24 with $ 3,783 of annual benefits.

With the low end cost of $71,725 and with the two crashes that took place under icy conditions, the benefits to costs ratio is 0.22, with $2,522 in annual benefits. With all winter crashes, the benefits to costs ratio 0.37 and $3783 in annual benefits.

Question about tapering the shoulder more quickly

The MUTCD has specific formulae for when the thru lanes are being shifted. But there is nothing for when the shoulder is being narrowed as what we are talking about here. These formulae were also presented in the Washing DOT Manual that you pointed to me.

The basis of IHSDM is the Highway Safety Manual. IHSDM would not replicate the effect that the transition may have on drivers, if there is an effect. What it would do is to suggest that crashes would be reduced because the width of the shoulder is wider for a longer distance. However, it would not capture the possible effect that the taper may have on the crashes that are taking place on the bridge.

Mario Dupigny-Giroux, P.E.
Traffic Safety Engineer
Vermont Agency of Transportation
1 National Life Building
Montpelier, VT 05633
Phone: 802 828-0169
Fax: 802 828-2437
Email: mario.dupigny-giroux@state.vt.us

A shoulder narrows sign (VW-619) could also be used with the same idea, but I am not sure that this sign has been used on the interstate either.

Let me know if you have any other questions.

Mario Dupigny-Giroux, P.E.
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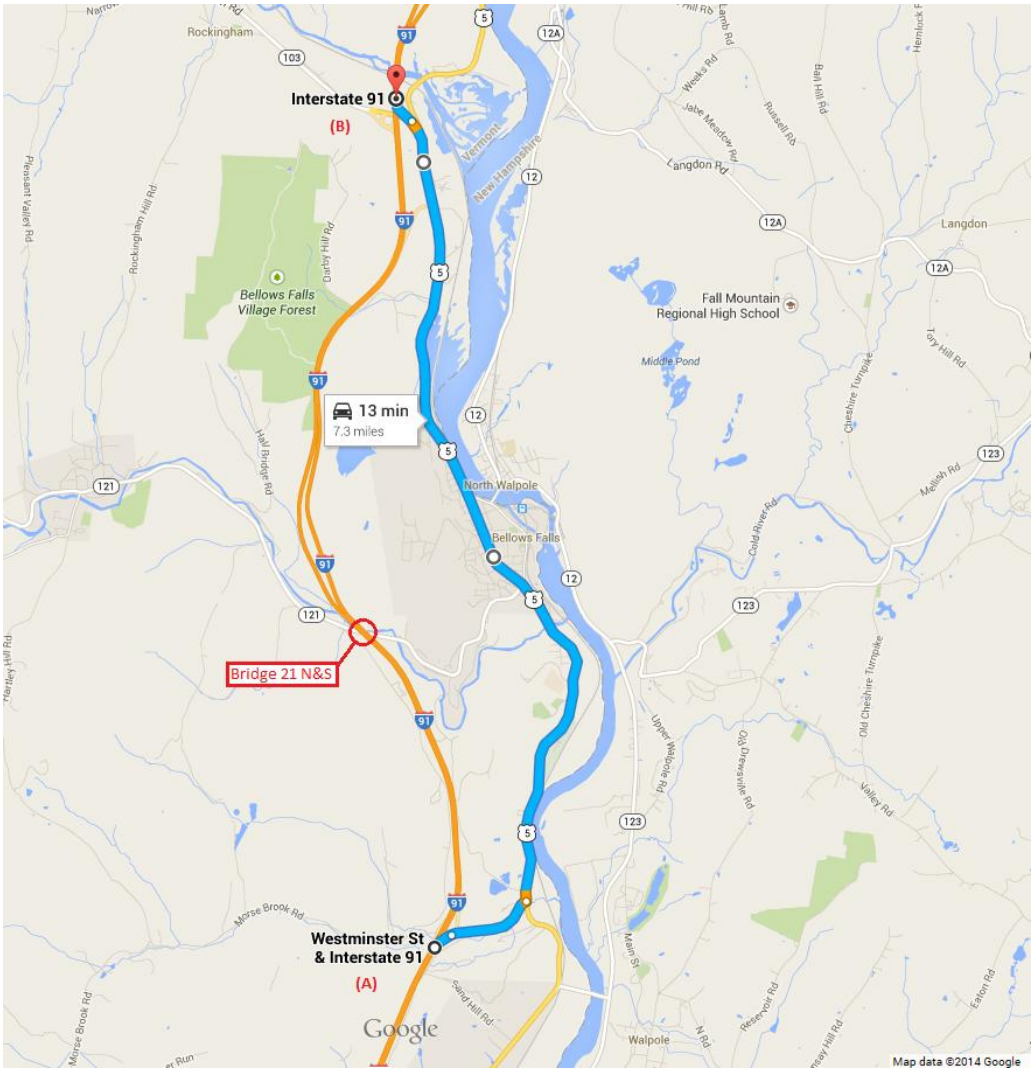
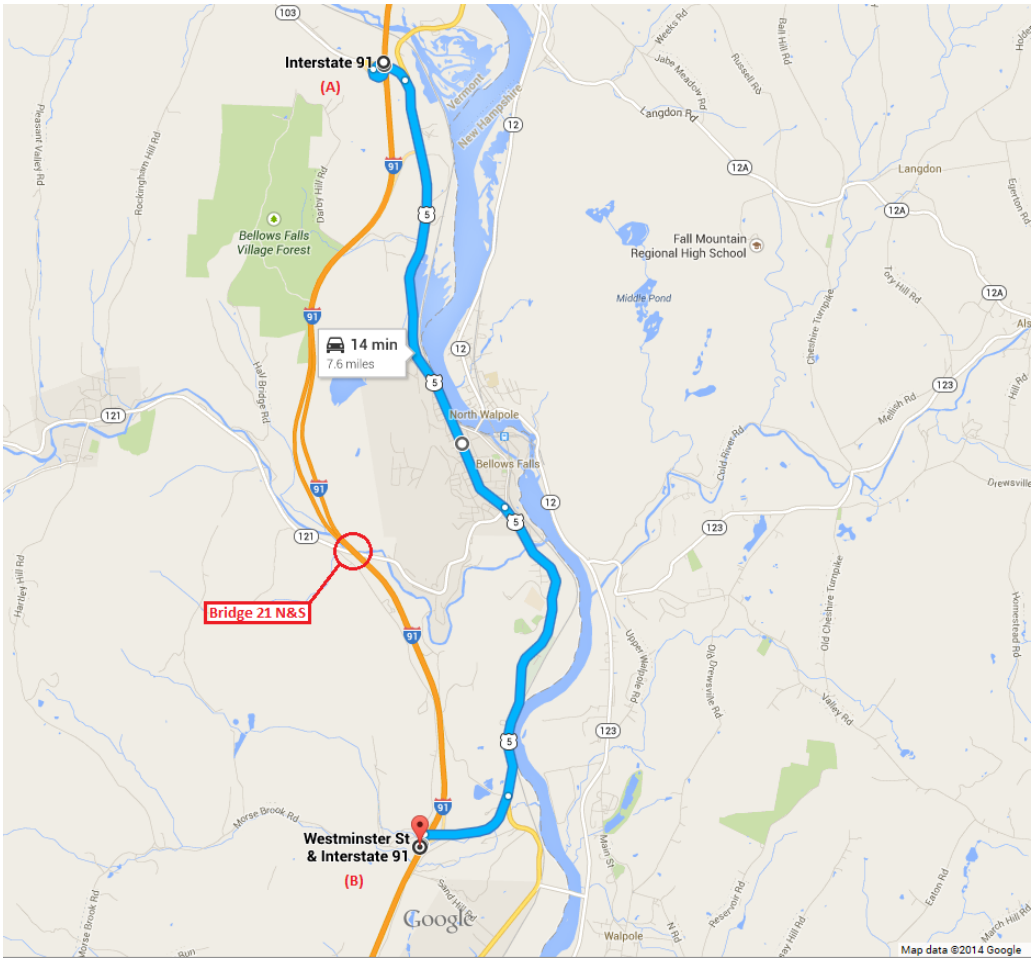
Email: mario.dupigny-giroux@state.vt.us

Appendix O: Detour Route



<u>Detour Route (Traveling North)</u> – Exit 5 I-91 to Westminster St to US 5 to Exit 6 I-91

A to B on Through Route: 6.9 Miles (about 6 minutes)
A to B on Detour Route: 7.3 Miles (about 13 minutes)
Added Miles: 0.4 Miles (about 7 minutes)



<u>Detour Route (Traveling South)</u> – Exit 6 I-91 to US 5 to Westminster St to Exit 5 I-91

A to B on Through Route: 6.9 Miles (about 6 minutes)
A to B on Detour Route: 7.6 Miles (about 14 minutes)
Added Miles: 0.7 Miles (about 8 minutes)

Appendix P: Plans

I-91 SOUTHBOUND
EXISTING CURVE 1
DELTA = 23°08'41"
D = 1°15'53"
R = 4530.00'
T = 927.60'
L = 1829.90'
E = 94.00'

PT
STA 2636+02.26

PT
STA 1636+16.76

PI

2633+00
2634+00
2635+00
2636+00
2637+00
2638+00

1633+00
1634+00
1635+00
1636+00
1637+00
1638+00

SIGN
WX-X

I-91 NORTHBOUND
EXISTING CURVE 1
DELTA = 23°11'50"
D = 1°13'32"
R = 4675.00'
T = 959.53'
L = 1892.77'
E = 97.45'

VT STATE PLANE GRID
N

MATCH LINE
STA 1638+25.00 NB
STA 2638+25.00 SB

LAYOUT 1

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

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

FILE NAME: 13a098/sl3a098border.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
LAYOUT SHEET 1

PLOT DATE: 07-JUL-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 1 OF 37

VT STATE PLANE GRID

I-91 SOUTHBOUND
TO PUTNEY

2639+00 2640+00 2641+00 2642+00 2643+00 2644+00

1639+00 1640+00 1641+00 1642+00 1643+00 1644+00

MATCH LINE
STA 1644+25.00 NB
STA 2644+25.00 SB

MATCH LINE
STA 1638+25.00 NB
STA 2638+25.00 SB

DI

SIGN
OM3R

SIGN
OM3L

SIGN
MILE MARKER
31.0
BRIDGE
2IN

BEGIN BRIDGE 2IN
STA 1643+94.00

TELEPHONE
POLE

LAYOUT 2

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET 2	SHEET 2 OF 37

MATCH LINE
STA 1644+25.00 NB
STA 2644+25.00 SB

BEGIN BRIDGE 21S
STA 2645+25.25

SIGN
MILE MARKER
31.0

TELEPHONE POLE

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO ROCKINGHAM

N 46° 38' 50.97" W

2645+00 2646+00 2647+00 2648+00 2649+00 2650+00

1645+00 1646+00 1647+00 1648+00 1649+00 1650+00

50+00 51+00 52+00 53+00 54+00 55+00

S 79° 45' 31" E

TELEPHONE POLE

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

SAXTONS RIVER
FLOW

END BRIDGE 21N
STA 1649+18.05

VT STATE PLANE GRID

MATCH LINE
STA 1650+25.00 NB
STA 2650+25.00 SB

LAYOUT 3

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET 3	SHEET 3 OF 37

END BRIDGE 21S
STA 2650+65.75

SIGN
OM3L

SIGN
BRIDGE
21S

SIGN
OM3R

DI

2651+00 2652+00 2653+00 2654+00 2655+00 2656+00

1651+00 1652+00 1653+00 1654+00 1655+00 1656+00

I-91 NORTHBOUND
TO ROCKINGHAM

SIGN
GX-X
(ROCKINGHAM)

PC STA 1652+49.87

MATCH LINE
STA 1650+25.00 NB
STA 2650+25.00 SB

MATCH LINE
STA 1656+25.00 NB
STA 2656+25.00 SB

VT STATE PLANE GRID

N

LAYOUT 4

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
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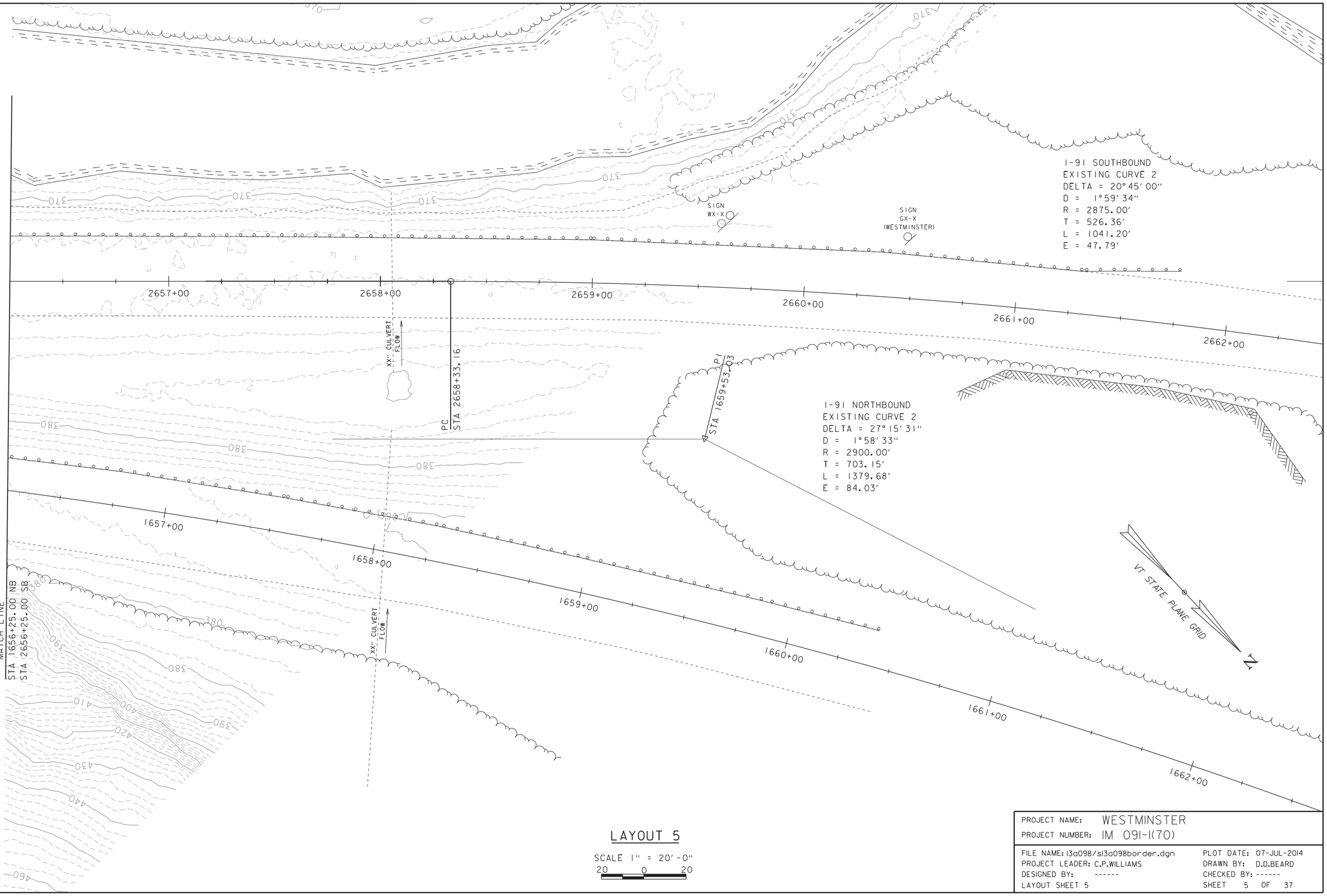

LAYOUT 5

SCALE 1" = 20'-0"

20 0 20

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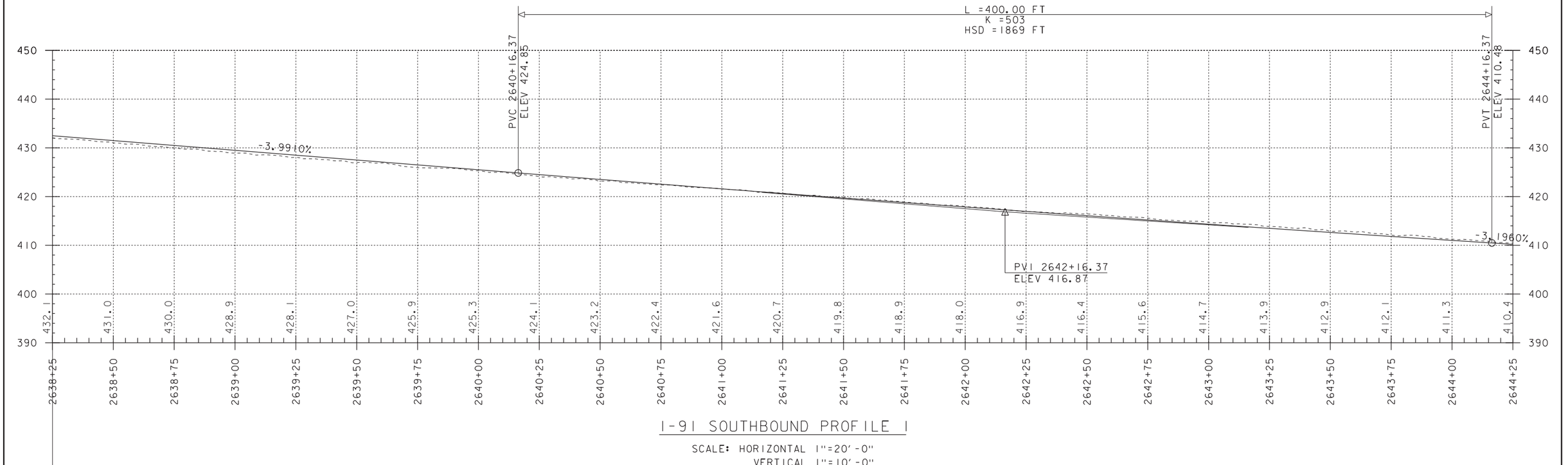
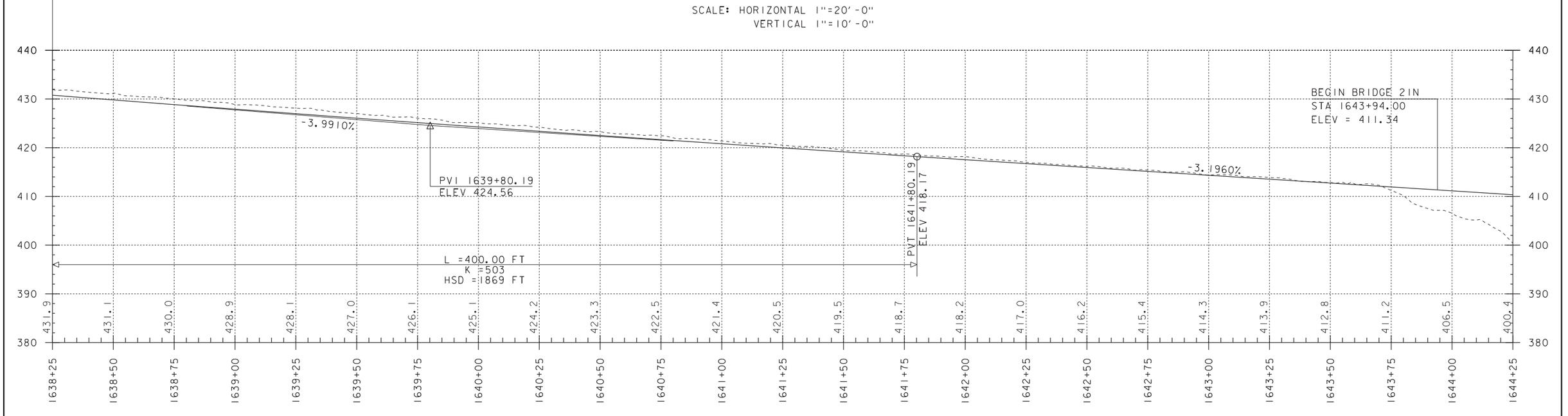
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET 5	SHEET 5 OF 37



I-91 SOUTHBOUND PROFILE 1

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



I-91 NORTHBOUND PROFILE 1

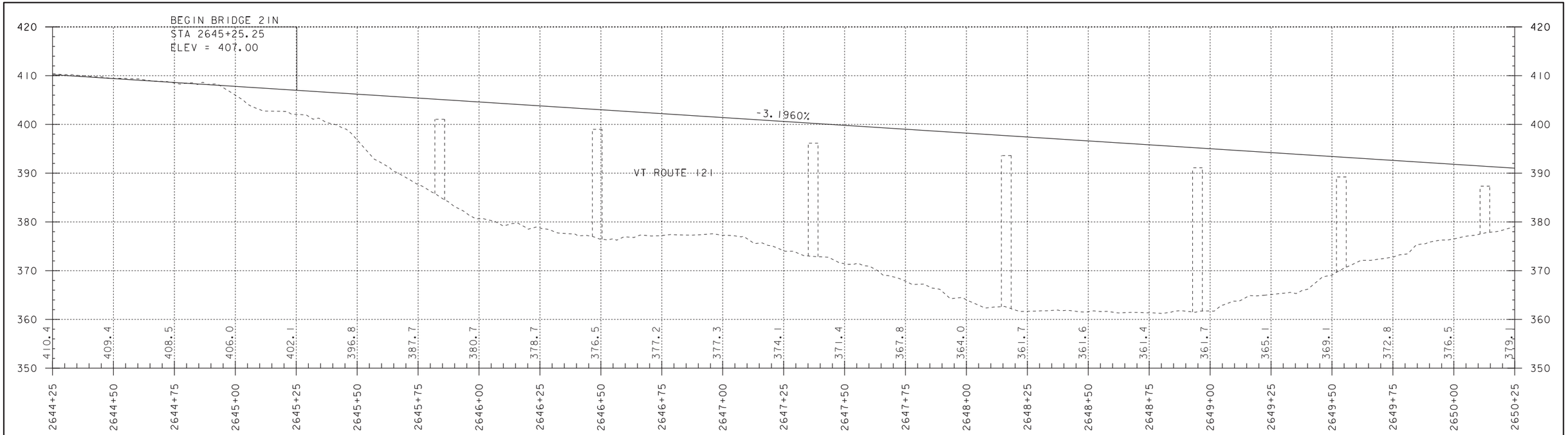
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
ELEVATIONS TAKEN FROM LIDAR DATA
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

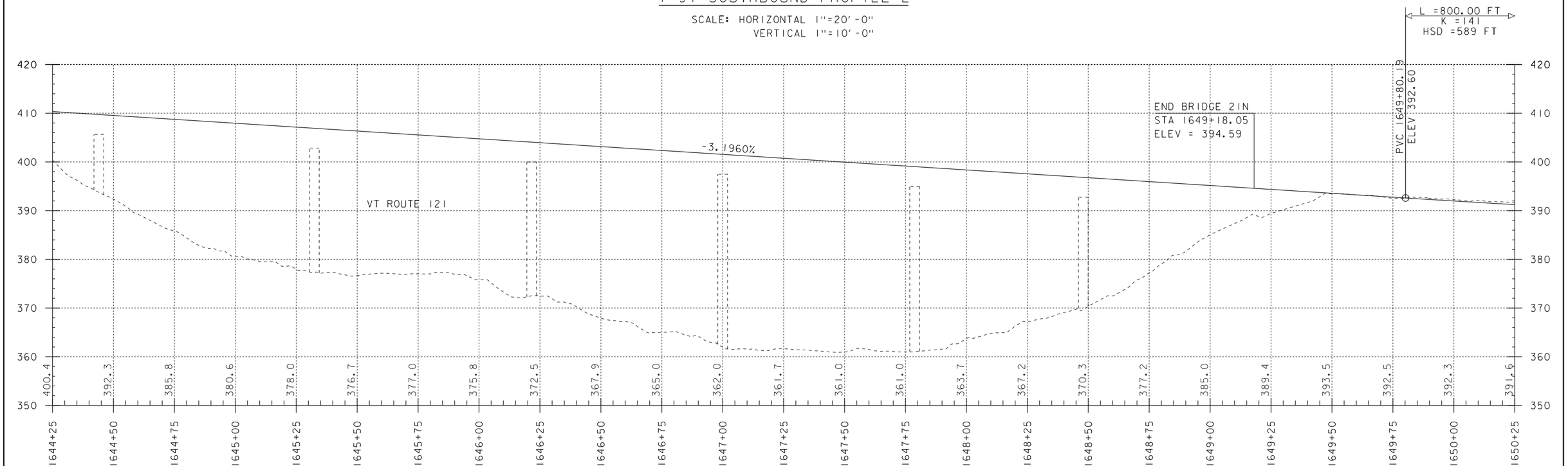
FILE NAME: 13a098/sl3a098profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET 1

PLOT DATE: 07-JUL-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------



I-91 SOUTHBOUND PROFILE 2

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



I-91 NORTHBOUND PROFILE 2

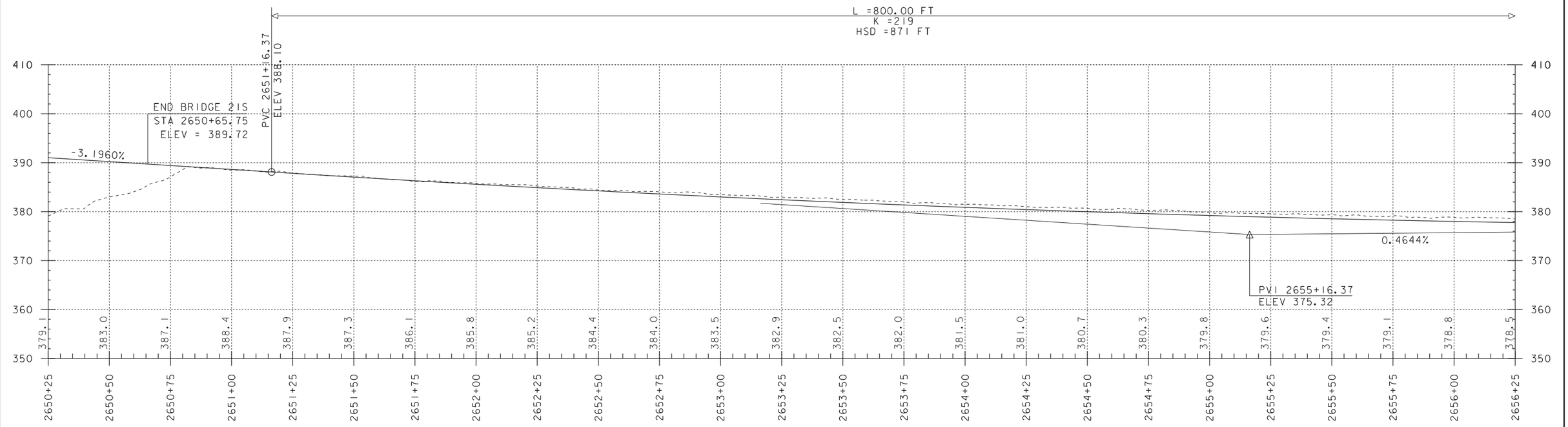
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
ELEVATIONS TAKEN FROM LIDAR DATA
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

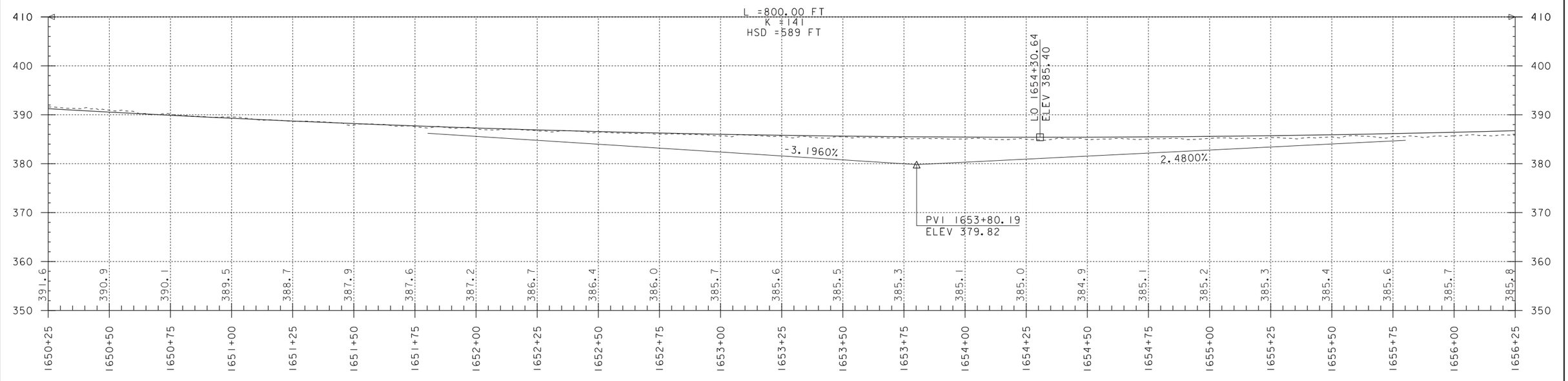
FILE NAME: 13a098/sl3a098profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET 2

PLOT DATE: 07-JUL-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 7 OF 37



I-91 SOUTHBOUND PROFILE 3

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



I-91 NORTHBOUND PROFILE 3

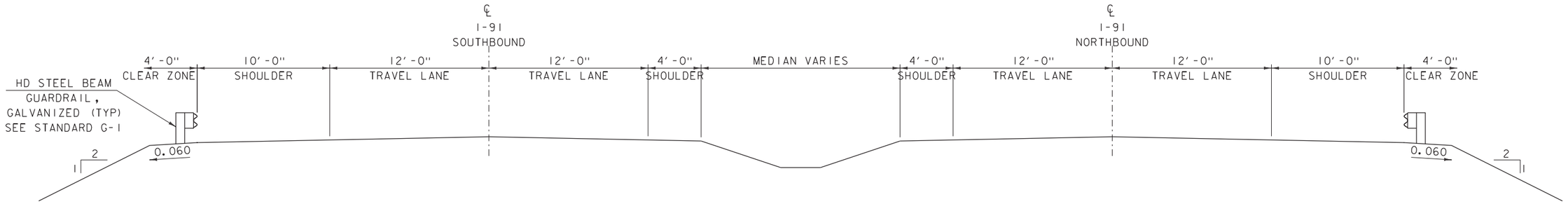
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
ELEVATIONS TAKEN FROM LIDAR DATA
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

FILE NAME: 13a098/sl3a098profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET 3

PLOT DATE: 07-JUL-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------



EXISTING ROADWAY TYPICAL SECTION

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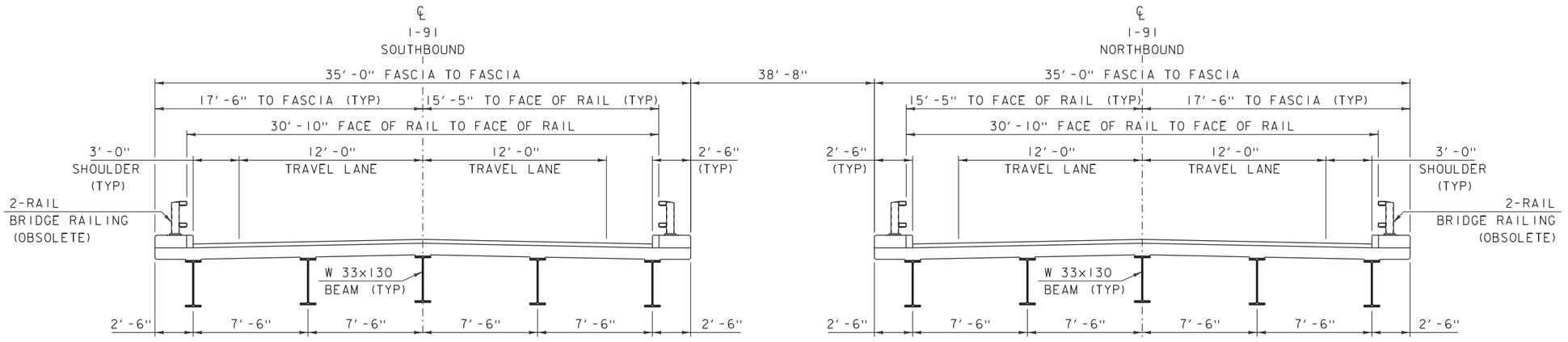
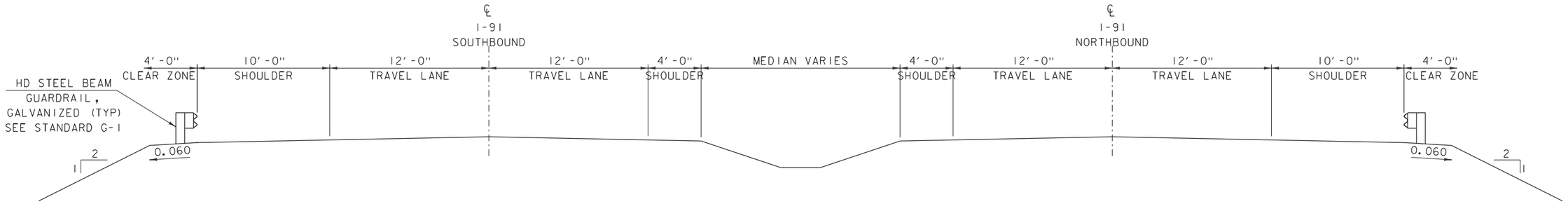


BRIDGE EXISTING TYPICAL SECTION

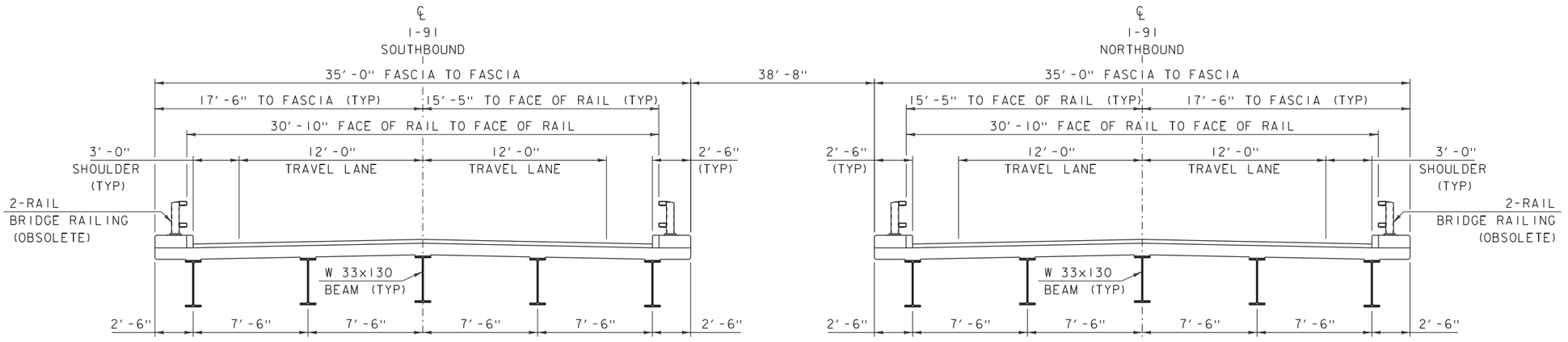
SCALE 1/4" = 1'-0"

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098typical.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: T.FILLBACH	CHECKED BY: T.FILLBACH
EXISTING TYPICAL SECTIONS	SHEET 9 OF 37



EXISTING ROADWAY TYPICAL SECTION

SCALE 1/4" = 1'-0"



ALTERNATIVE #1 TYPICAL SECTION

SCALE 1/4" = 1'-0"

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: I3a098/sI3a098typical.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: T.FILLBACH	CHECKED BY: T.FILLBACH
ALTERNATIVE ITYPICAL SECTIONS	SHEET 10 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

TELEPHONE POLE

DI

DI

SIGN MILE MARKER 31.0

N 46°

00 2642+00 2643+00 2644+00 2645+00 2646+00 2647+00

DI

DI

SIGN OM3R

N 46°38'50.97" W

00 1642+00 1643+00 1644+00 1645+00 1646+00 1647+00

SIGN MILE MARKER 31.0 BRIDGE 2IN

SIGN OM3L

TELEPHONE POLE

BEGIN BRIDGE 2IN
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

SAXTONS RIVER
FLOW

55+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

TELEPHONE POLE

ALTERNATIVE 1 - LAYOUT 1

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

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

FILE NAME: 13a098/sl3a098border_alt4.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
ALTERNATIVE 1 LAYOUT SHEET 1

PLOT DATE: 07-JUL-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 11 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

52+00

53+00

S 79° 45' 31" E

68' 50.97" W

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

SIGN OM3R

D1

2648+00 2649+00 2650+00 2651+00 2652+00 2653+00

1648+00 1649+00 1650+00 1651+00 1652+00 1653+00

END BRIDGE 21N
STA 1649+18.05

PC STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

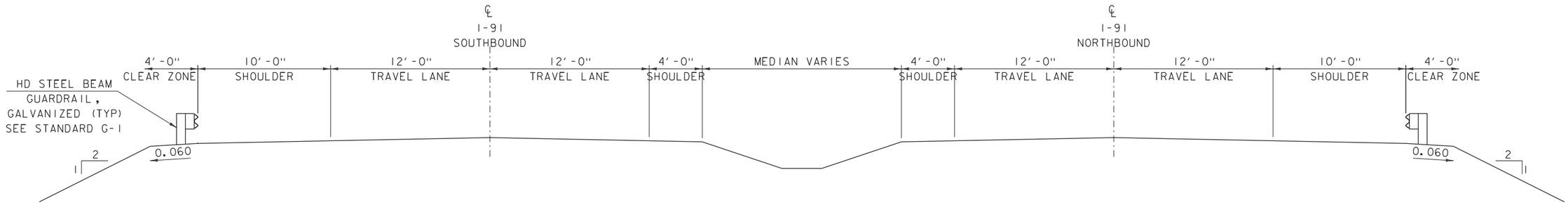
VT STATE PLANE GRID

N

ALTERNATIVE 1 - LAYOUT 2

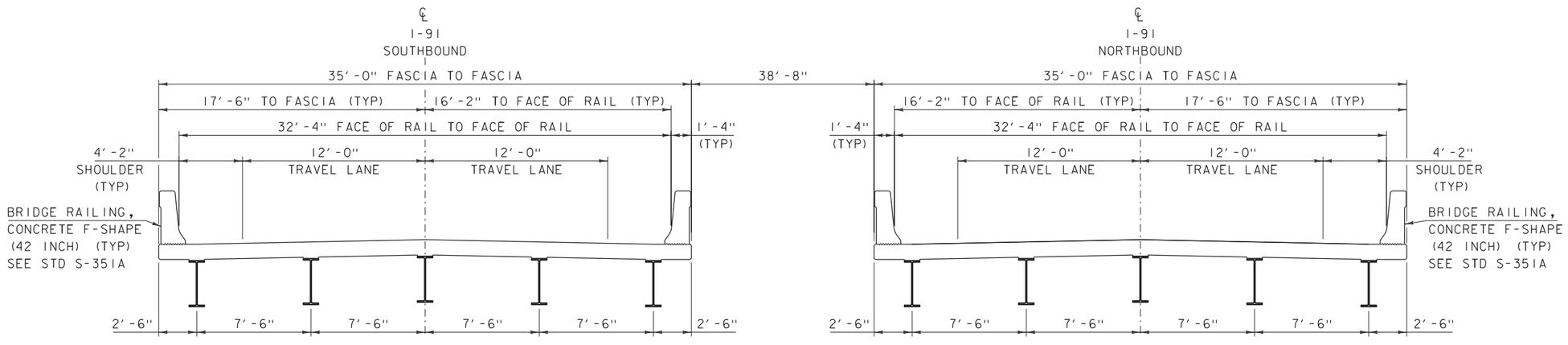
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 1 LAYOUT SHEET 2	SHEET 12 OF 37



EXISTING ROADWAY TYPICAL SECTION

SCALE 1/4" = 1'-0"



ALTERNATIVES #2 & #3A TYPICAL SECTION

SCALE 1/4" = 1'-0"

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: I3a098/sI3a098typical.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: T.FILLBACH	CHECKED BY: T.FILLBACH
ALTERNATIVES 2 & 3A TYPICAL SECTIONS	SHEET 13 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

TELEPHONE POLE

DI

DI

SIGN
MILE MARKER
31.0

N 46°

00

2642+00

2643+00

2644+00

2645+00

2646+00

2647+00

DI

DI

SIGN
OM3R

N 46°38'50.97" W

00

1642+00

1643+00

1644+00

1645+00

1646+00

1647+00

SIGN
MILE MARKER
31.0
BRIDGE
2IN

SIGN
OM3L

TELEPHONE POLE

BEGIN BRIDGE 2IN
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

SAXTONS RIVER
FLOW

55+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

TELEPHONE POLE

ALTERNATIVE 2 - LAYOUT 1

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 2 LAYOUT SHEET 1	SHEET 14 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

D1

68° 50' 97" W

2648+00

2649+00

2650+00

2651+00

2652+00

2653+00

SIGN OM3R

D1

52+00

S 79° 45' 31" E

53+00

1648+00

1649+00

1650+00

1651+00

1652+00

1653+00

D1

END BRIDGE 21N
STA 1649+18.05

PC
STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

ALTERNATIVE 2 - LAYOUT 2

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 2 LAYOUT SHEET 2	SHEET 15 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

TELEPHONE POLE

DI

DI

SIGN
MILE MARKER
31.0

N 46°

00 2642+00 2643+00 2644+00 2645+00 2646+00 2647+00

DI

DI

SIGN
OM3R

N 46° 38' 50.97" W

00 1642+00 1643+00 1644+00 1645+00 1646+00 1647+00

SIGN
MILE MARKER
31.0
BRIDGE
2IN

SIGN
OM3L

TELEPHONE POLE

BEGIN BRIDGE 2IN
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

SAXTONS RIVER
FLOW

55+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

TELEPHONE POLE

ALTERNATIVE 3A - LAYOUT 1

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 3A LAYOUT SHEET 1	SHEET 16 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

D1

68° 50' 97" W

2648+00

2649+00

2650+00

2651+00

2652+00

2653+00

SIGN OM3R

D1

52+00

S 79° 45' 31" E

53+00

1648+00

1649+00

1650+00

1651+00

1652+00

1653+00

D1

END BRIDGE 21N
STA 1649+18.05

PC
STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

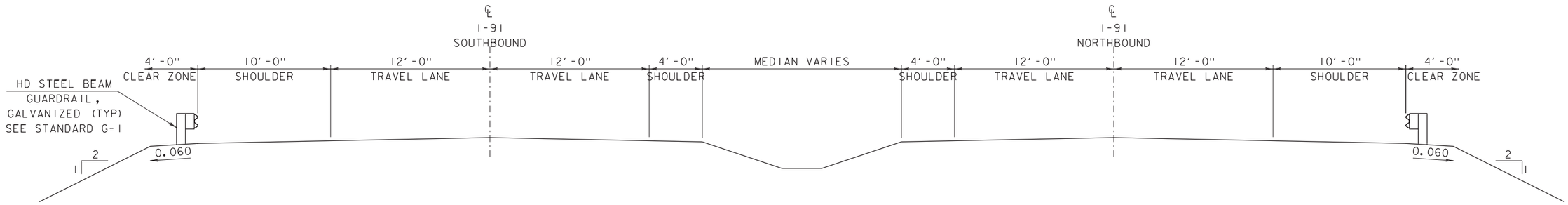
VT STATE PLANE GRID

N

ALTERNATIVE 3A - LAYOUT 2

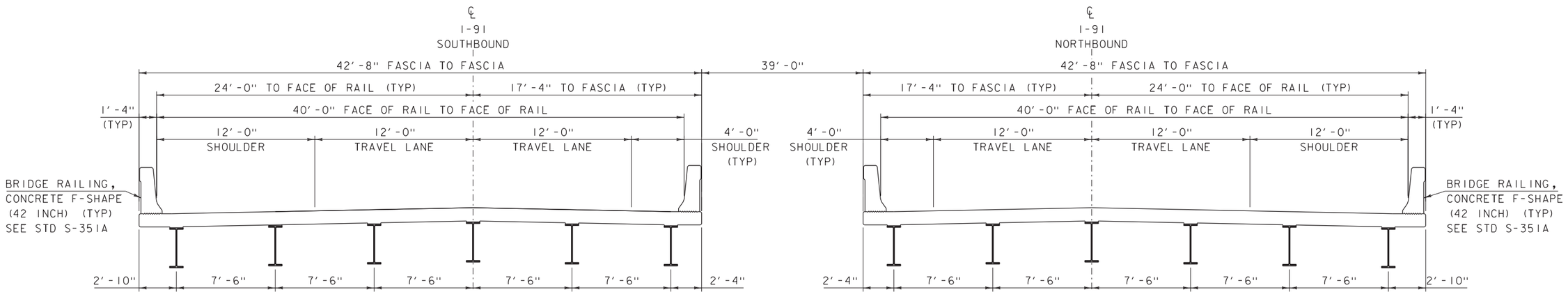
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 3A LAYOUT SHEET 2	SHEET 17 OF 37



EXISTING ROADWAY TYPICAL SECTION

SCALE 1/4" = 1'-0"



ALTERNATIVES #3B & #4 TYPICAL SECTION

SCALE 1/4" = 1'-0"

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: I3a098/sI3a098typical.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: T.FILLBACH	CHECKED BY: T.FILLBACH
ALTERNATIVES 3B & 4 TYPICAL SECTIONS	SHEET 18 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

DI
DI
SIGN
MILE MARKER
31.0

TELEPHONE
POLE

N 46°

00
2642+00
2643+00
2644+00
2645+00
2646+00
2647+00

DI
DI
DI

SIGN
OM3R

N 46°38'50.97" W

00
1642+00
1643+00
1644+00
1645+00
1646+00
1647+00

SIGN
MILE MARKER
31.0
BRIDGE
2IN

SIGN
OM3L

TELEPHONE
POLE

BEGIN BRIDGE 2IN
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

SAXTONS RIVER
FLOW

55+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

TELEPHONE
POLE

ALTERNATIVE 3B - LAYOUT 1

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 3B LAYOUT SHEET 1	SHEET 19 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

52+00

53+00

S 79° 45' 31" E

68° 50' 97" W

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

SIGN OM3R

D1

2648+00 2649+00 2650+00 2651+00 2652+00 2653+00

1648+00 1649+00 1650+00 1651+00 1652+00 1653+00

END BRIDGE 21N
STA 1649+18.05

PC STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

ALTERNATIVE 3B - LAYOUT 2

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 3B LAYOUT SHEET 2	SHEET 20 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

DI
DI
SIGN
MILE MARKER
31.0

TELEPHONE
POLE

N 46°

00
2642+00
2643+00
2644+00
2645+00
2646+00
2647+00

DI
DI
DI

SIGN
OM3R

N 46°38'50.97" W

00
1642+00
1643+00
1644+00
1645+00
1646+00
1647+00

SIGN
OM3L

SIGN
MILE MARKER
31.0
BRIDGE
2IN

TELEPHONE
POLE

BEGIN BRIDGE 2IN
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

SAXTONS RIVER
FLOW

55+00

VT STATE PLANE GRID

N

TELEPHONE
POLE

ALTERNATIVE 4 - LAYOUT 1

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

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

FILE NAME: 13a098/sl3a098border_alt4.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
ALTERNATIVE 4 LAYOUT SHEET 1

PLOT DATE: 07-JUL-2014
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 21 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

52+00

53+00

S 79° 45' 31" E

68° 50' 97" W

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

SIGN OM3R

D1

2648+00 2649+00 2650+00 2651+00 2652+00 2653+00

1648+00 1649+00 1650+00 1651+00 1652+00 1653+00

END BRIDGE 21N
STA 1649+18.05

PC STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

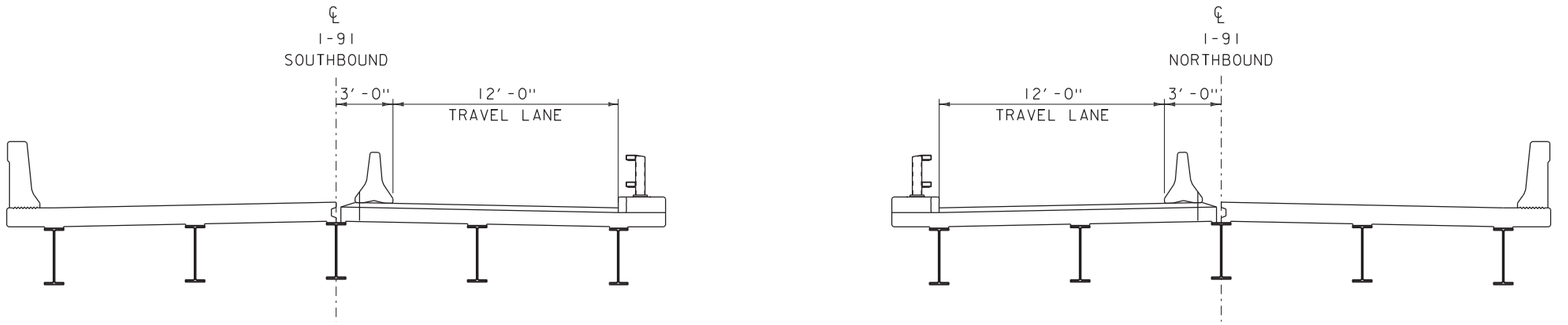
VT STATE PLANE GRID

N

ALTERNATIVE 4 - LAYOUT 2

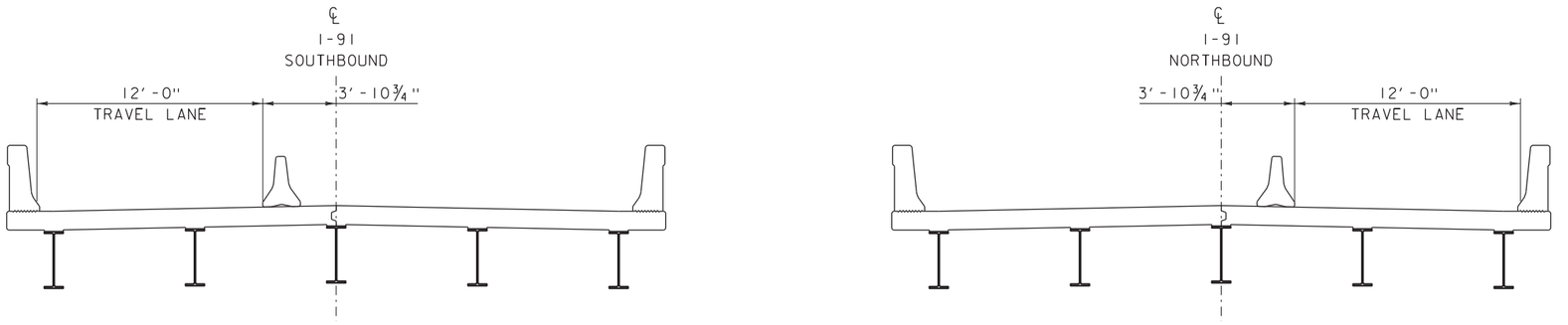
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 4 LAYOUT SHEET 2	SHEET 22 OF 37



PHASE #1 TYPICAL SECTION

SCALE 1/4" = 1'-0"



FLOW

PHASE #2 TYPICAL SECTION

SCALE 1/4" = 1'-0"

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: I3a098/sI3a098phasing.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: T.FILLBACH	CHECKED BY: T.FILLBACH
PHASING TYPICAL SECTIONS	SHEET 23 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

TELEPHONE POLE

DI

DI

SIGN MILE MARKER 31.0

N 46°

2642+00

2643+00

2644+00

2645+00

2646+00

2647+00

DI

DI

DI

SIGN OM3R

N 46°38'50" W

1642+00

1643+00

1644+00

1645+00

1646+00

1647+00

SIGN MILE MARKER 31.0 BRIDGE 21N

SIGN OM3L

TELEPHONE POLE

BEGIN BRIDGE 21N
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

SAXTONS RIVER
FLOW

55+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

TELEPHONE POLE

PHASE #1 LAYOUT

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE #1 LAYOUT SHEET 1	SHEET 24 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

52+00

53+00

S 79° 45' 31" E

68° 50' 97" W

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

SIGN OM3R

D1

2648+00 2649+00 2650+00 2651+00 2652+00 2653+00

1648+00 1649+00 1650+00 1651+00 1652+00 1653+00

END BRIDGE 21N
STA 1649+18.05

PC STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

PHASE #1 LAYOUT

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE #1 LAYOUT SHEET 2	SHEET 25 OF 37

BEGIN BRIDGE 21S
STA 2645+25.25

TELEPHONE POLE

DI

DI

SIGN
MILE MARKER
31.0

2642+00

2643+00

2644+00

2645+00

2646+00

2647+00

N 46°38'50.97" W

DI

DI

SIGN
OM3R

1642+00

1643+00

1644+00

1645+00

1646+00

1647+00

SIGN
MILE MARKER
31.0
BRIDGE
2IN

SIGN
OM3L

TELEPHONE POLE

BEGIN BRIDGE 2IN
STA 1643+94.00

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

54+00

SAXTONS RIVER
FLOW

55+00

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

TELEPHONE POLE

PHASE #2 LAYOUT

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE #2 LAYOUT SHEET 1	SHEET 26 OF 37

TELEPHONE POLE

TH 1 / VT ROUTE 121 (SAXTONS RIVER ROAD) TO ROCKINGHAM

50+00

51+00

52+00

53+00

S 79° 45' 31" E

S 10° 01' 37" W

END BRIDGE 21S
STA 2650+65.75

SIGN OM3L

SIGN BRIDGE 21S

SIGN OM3R

D1

2648+00 2649+00 2650+00 2651+00 2652+00 2653+00

1648+00 1649+00 1650+00 1651+00 1652+00 1653+00

END BRIDGE 21N
STA 1649+18.05

PC STA 1652+49.87

MATCH LINE
STA 1647+25.00 NB
STA 2647+25.00 SB

VT STATE PLANE GRID

N

PHASE #2 LAYOUT

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_alt4.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE #2 LAYOUT SHEET 2	SHEET 27 OF 37

PT
STA 2636+02.26

00
2633+00
2634+00
2635+00
2636+00
2637+00
2638+00

PT
STA 1636+16.76

D=

00
1633+00
1634+00
1635+00
1636+00
1637+00
1638+00

SIGN
WX-X

MATCH LINE
STA 1638+25.00 NB
STA 2638+25.00 SB

VT STATE PLANE GRID

N

NORTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 1	SHEET 28 OF 37

VT STATE PLANE GRID

N

MATCH LINE
STA 1644+25.00 NB
STA 2644+25.00 SB

I-91 SOUTHBOUND
TO PUTNEY

2639+00 2640+00 2641+00 2642+00 2643+00 2644+00

DI DI DI DI

SIGN
OM3R

1639+00 1640+00 1641+00 1642+00 1643+00 1644+00

SIGN
MILE MARKER
31.0
BRIDGE
2IN

SIGN
OM3L

MATCH LINE
STA 1638+25.00 NB
STA 2638+25.00 SB

TELEPHONE
POLE

NORTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 2	SHEET 29 OF 37

MATCH LINE
STA 1644+25.00 NB
STA 2644+25.00 SB

TELEPHONE POLE

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO ROCKINGHAM

SIGN
MILE MARKER
31.0

TELEPHONE POLE

2645+00 2646+00 2647+00 2648+00 2649+00 2650+00

50+00 51+00 52+00 53+00 54+00 55+00

1645+00 1646+00 1647+00 1648+00 1649+00 1650+00

TELEPHONE POLE

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

SAXTONS RIVER
FLOW

MATCH LINE
STA 1650+25.00 NB
STA 2650+25.00 SB

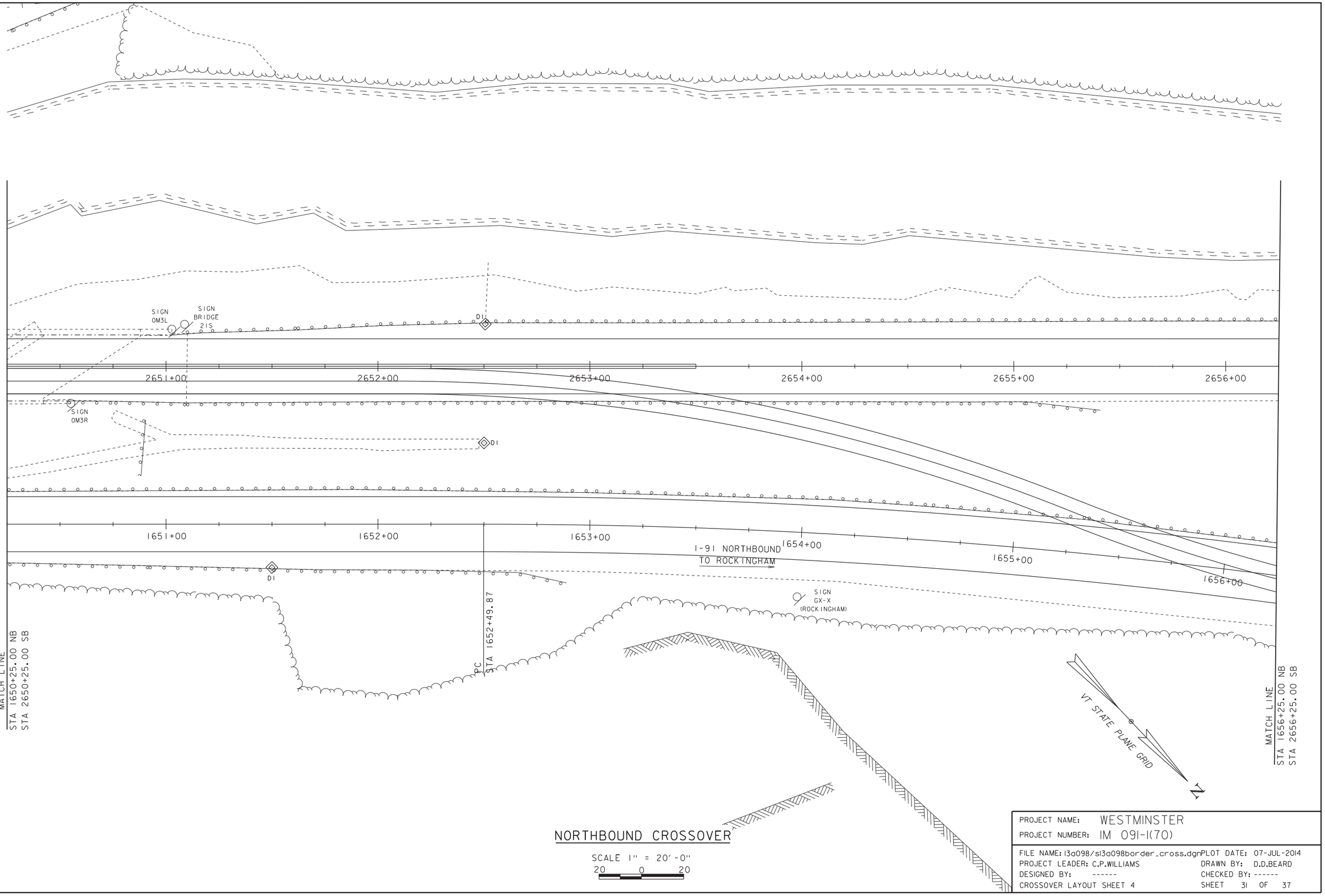
VT STATE PLANE GRID

N

NORTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 3	SHEET 30 OF 37



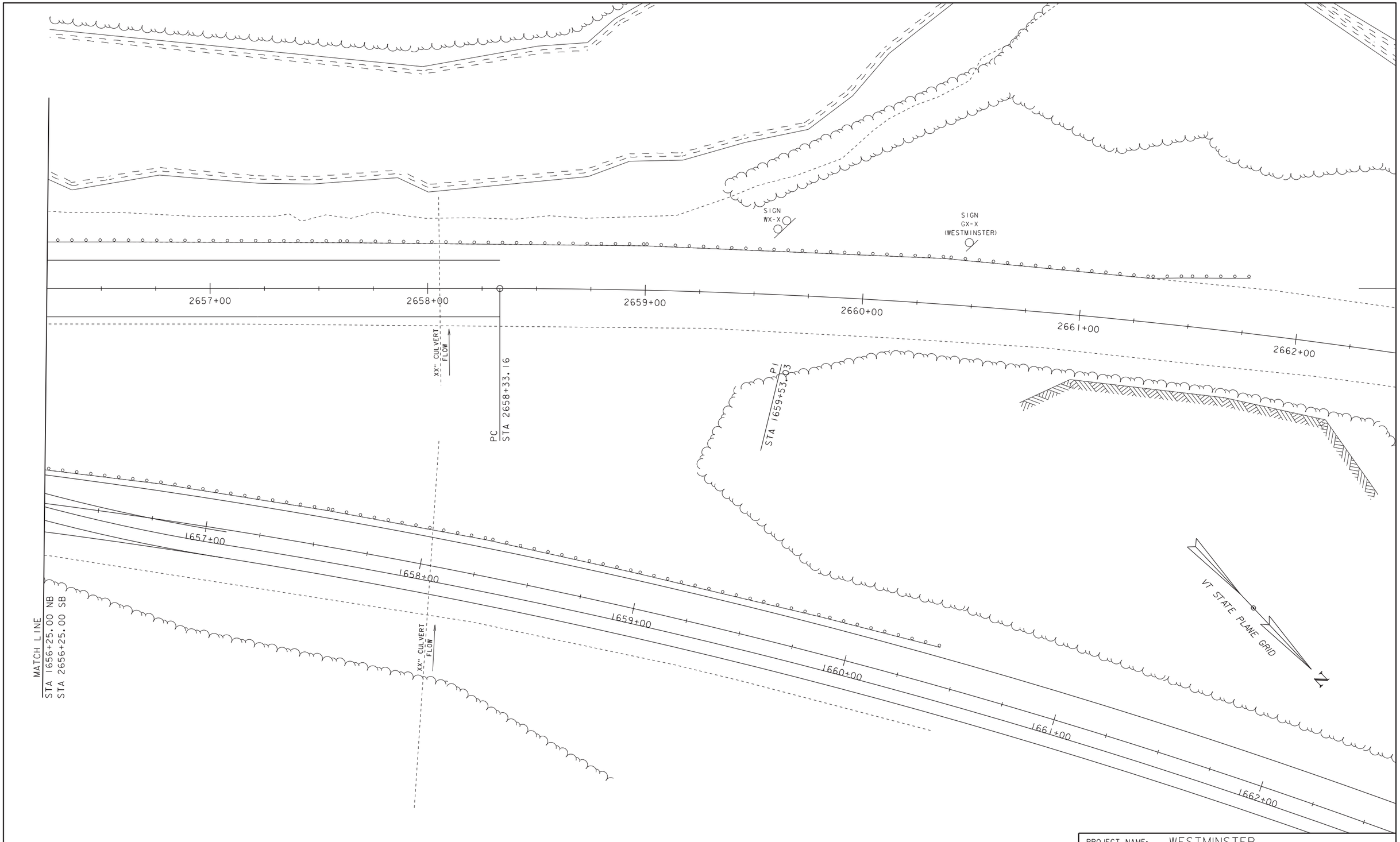
NORTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: WESTMINSTER
PROJECT NUMBER: IM 091-1(70)

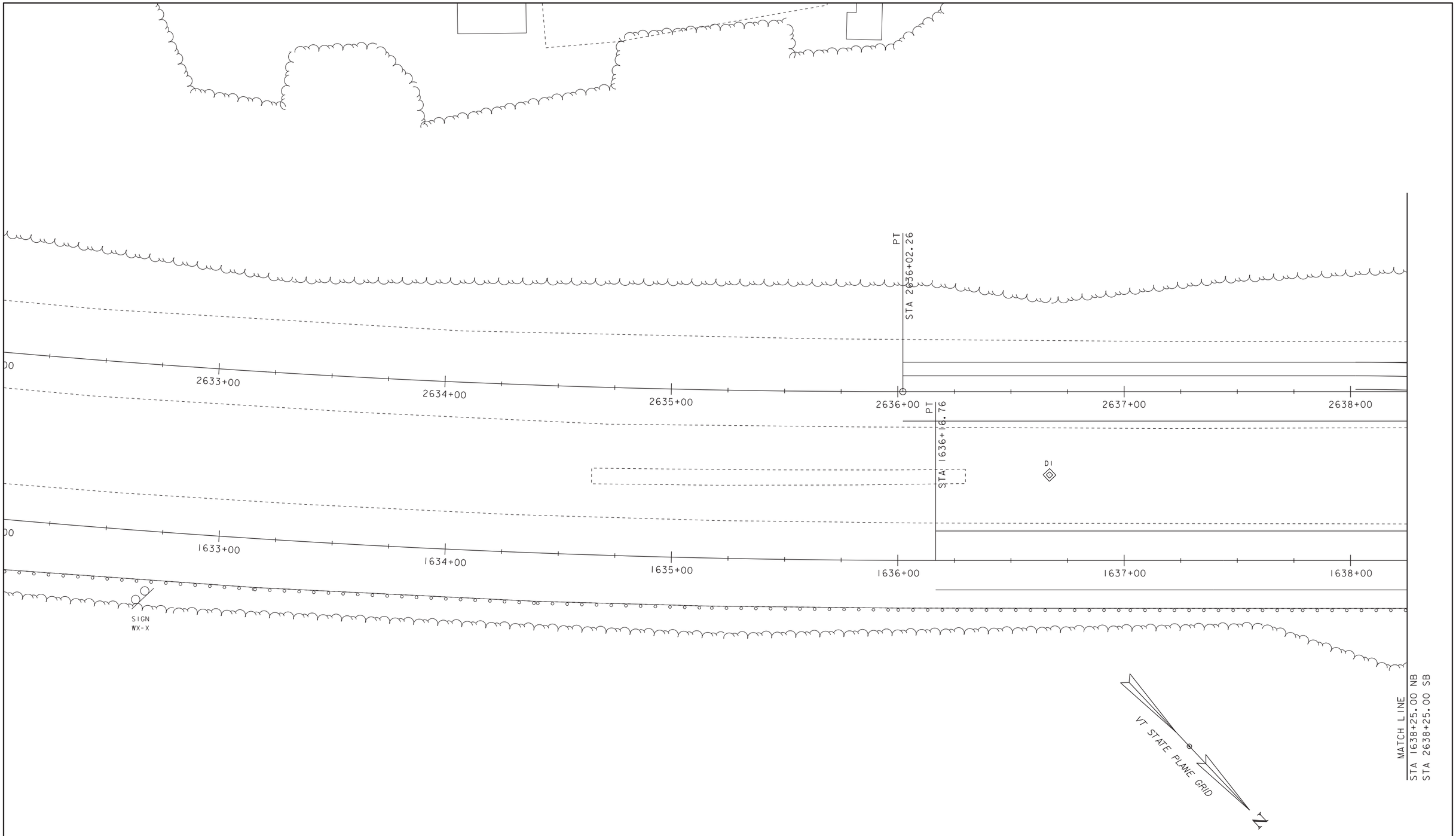
FILE NAME: 13a098/sl3a098border_cross.dgn PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS DRAWN BY: D.D.BEARD
DESIGNED BY: ------ CHECKED BY: ------
CROSSOVER LAYOUT SHEET 4 SHEET 31 OF 37



NORTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 5	SHEET 32 OF 37



SOUTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME:	13a098/sl3a098border_cross.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
CROSSOVER LAYOUT SHEET 1	
PLOT DATE:	07-JUL-2014
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	33 OF 37

VT STATE PLANE GRID

N

MATCH LINE
STA 1644+25.00 NB
STA 2644+25.00 SB

I-91 SOUTHBOUND
TO PUTNEY

2639+00 2640+00 2641+00 2642+00 2643+00 2644+00

1639+00 1640+00 1641+00 1642+00 1643+00 1644+00

D1

SIGN
OM3R

SIGN
OM3L

SIGN
MILE MARKER
31.0
BRIDGE
2IN

MATCH LINE
STA 1638+25.00 NB
STA 2638+25.00 SB

TELEPHONE
POLE

SOUTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 2	SHEET 34 OF 37

MATCH LINE
STA 1644+25.00 NB
STA 2644+25.00 SB

TELEPHONE POLE

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO ROCKINGHAM

SIGN
MILE MARKER
31.0

TELEPHONE POLE

2645+00 2646+00 2647+00 2648+00 2649+00 2650+00

50+00 51+00 52+00 53+00 54+00 55+00

1645+00 1646+00 1647+00 1648+00 1649+00 1650+00

TELEPHONE POLE

TH 1 / VT ROUTE 121
(SAXTONS RIVER ROAD)
TO US ROUTE 5

SAXTONS RIVER
FLOW

MATCH LINE
STA 1650+25.00 NB
STA 2650+25.00 SB

VT STATE PLANE GRID

N

SOUTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 3	SHEET 35 OF 37

SIGN
OM3L

SIGN
BRIDGE
2 IS

D1

2651+00

2652+00

2653+00

2654+00

2655+00

2656+00

SIGN
OM3R

D1

1651+00

1652+00

1653+00

1654+00

1655+00

1656+00

I-91 NORTHBOUND
TO ROCKINGHAM

D1

SIGN
GX-X
(ROCKINGHAM)

MATCH LINE
STA 1650+25.00 NB
STA 2650+25.00 SB

PC
STA 1652+49.87

MATCH LINE
STA 1656+25.00 NB
STA 2656+25.00 SB

VT STATE PLANE GRID

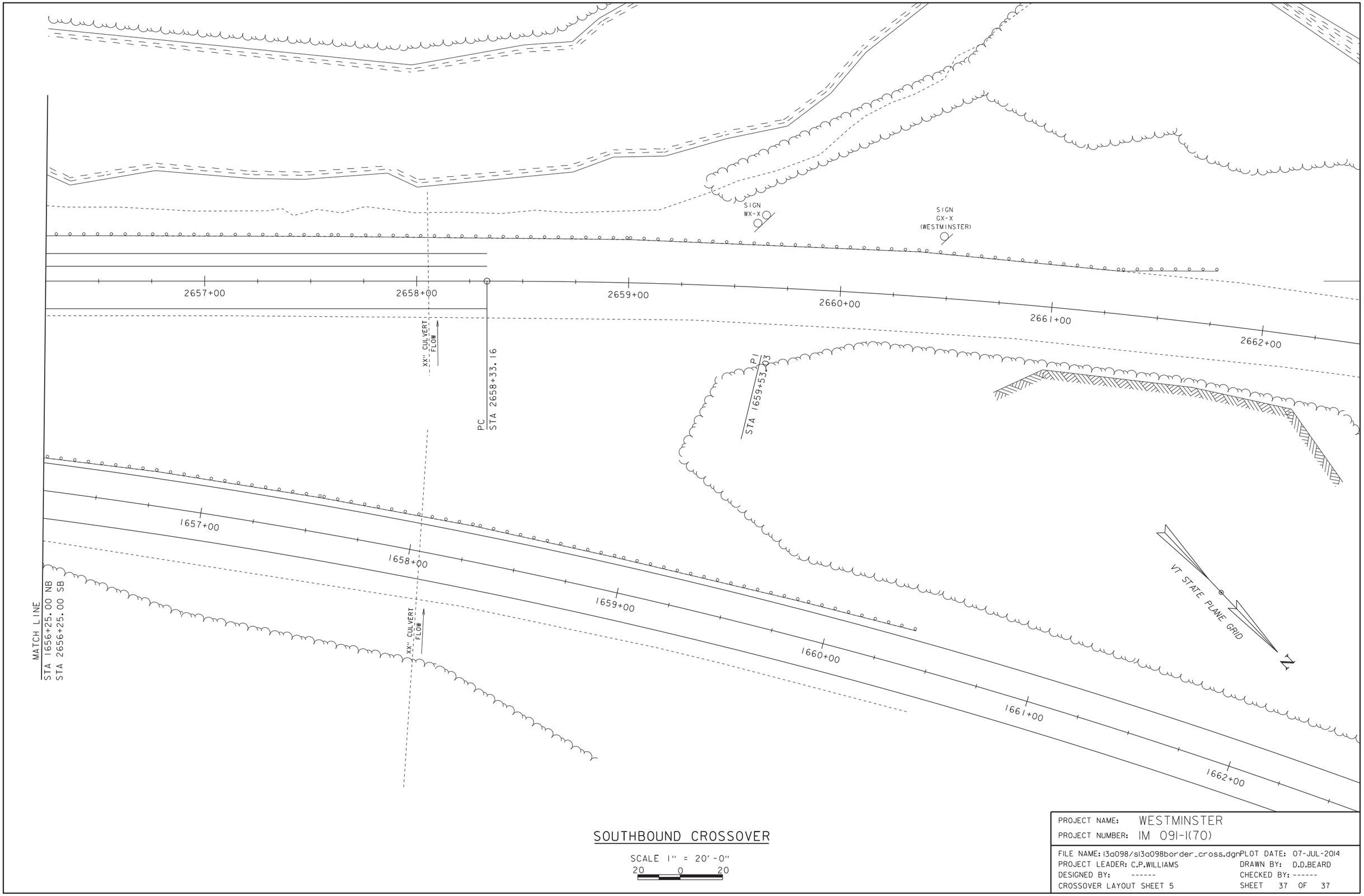
N

SOUTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: 13a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 4	SHEET 36 OF 37



SOUTHBOUND CROSSOVER

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

PROJECT NAME:	WESTMINSTER
PROJECT NUMBER:	IM 091-1(70)
FILE NAME: l3a098/sl3a098border_cross.dgn	PLOT DATE: 07-JUL-2014
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER LAYOUT SHEET 5	SHEET 37 OF 37