

**STATE OF VERMONT  
AGENCY OF TRANSPORTATION**

**Scoping Report**

**FOR**

**Bolton IM 089-2(45)**

**INTERSTATE 89, BRIDGE 51-3 OVER TOWN HIGHWAY 4**

January 13, 2017

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## I. Site Information

Bridge 51-3 is a state owned interstate bridge located on I-89. The bridge crosses over Bolton Notch Road (TH 4) at the intersection of Bolton Notch Road with US Route 2 (South end of culvert) and the intersection of Bolton Notch Road with Mountain View Drive (North end of culvert). There is a 12'-6" vertical clearance warning through the culvert. The Long Trail has been relocated to pass under Bridge 51- during the summer of 2015. Varins Gravel Pit is located 0.5 miles north of the bridge on TH 4. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and Orthophotos. See correspondence in the Appendix for more detailed information.

### Roadway Classifications:

I-89	Rural Principal Arterial
TH 4	Local Road

Bridge Type	Reinforced Concrete Box Culvert
Culvert Length	148 feet
Culvert Span	20 feet
Year Built	1964
Ownership	State of Vermont

### Need

The following is a list of deficiencies of Bridge 51-3, I-89 and TH-4 in this location:

1. The culvert is rated as fair. There has been settlement of the structure, evident from large vertical cracks in the culvert. Full depth cracks as wide as 2 ½ inches have been observed but appear to have stabilized.
2. TH-4: The width of TH-4 through the culvert is substandard. Additionally, the vertical curve is substandard, and there is not adequate stopping sight distance.
3. The vertical clearance above TH-4 through the culvert is 12'-6", which is substandard. The culvert is used by dump trucks from the gravel pit to the north, and evidence of truck accessories, such as antennas, scraping across the top of the culvert has been observed.

### Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2015 and 2035.

APPROACH	I-89 NB		I-89 SB		TH 4	
	2015	2035	2015	2035	2015	2035
TRAFFIC DATA						
AADT	13,300	15,900	13,300	15,900	600	640
DHV	1,500	1,800	1,600	1,900	70	70
ADTT	1,600	2,900	1,600	3,000	170	260

%T	7.3	11.4	7.7	12.7	2.6	3.7
%D	100	100	100	100	80	80

A more detailed traffic analysis for each hour during the months May through November can be found in the Appendix. This data is useful in determining the impacts of traffic maintenance during construction.

### I-89 Design Criteria

The design standards for this roadway are:

1. AASHTO. *A Policy on Geometric Design of Highways and Streets*. Association of State Highway and Transportation Officials, Washington, DC, 2011. (The Green Book)
2. AASHTO. *Roadside Design Guide*. Association of State Highway and Transportation Officials, Washington, DC, 2011.

Minimum standards are based on a  $2,000 > \text{DHV} > 1,500$ , and a design speed of 70 mph for a Freeway.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	Green Book Chapter 8.2.4	4'-12'-12'-10' (38')	4'-12'-12'-10' (38')	
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	4'-12'-12'-10' (38')	4'-12'-12'-10' (38') <sup>1</sup>	Culvert has sufficient length to meet the minimum standard
Clear Zone Distance	Roadside Design Guide Table 3-1		30' fill (1:6 or flatter), 38' fill (1:5 – 1:4), 28' cut (1:6 or flatter), 26' cut (1:5 – 1:4), 22' cut (1:3)	
Banking	Green Book Chapter 8.2.6	Southbound: Normal Crown Northbound: 2.8%	8% (max) for ice and snow conditions	
Speed		65 mph (Posted)	70 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = ∞ (Southbound) R = 7,640' (Northbound)	R <sub>min</sub> = 14,500 @ NC R <sub>min</sub> = 7,470 @ 2.8%	
Vertical Grade	GB Table 8-1	-2.4076% max Southbound -1.9112% max Northbound	4% (max) for rolling terrain	
K Values for Vertical Curves	Green Book Table 3-34 Green Book Table 3-36	K <sub>crest</sub> = 280 (Southbound), K <sub>sag</sub> = 276, 208 (Southbound), K <sub>crest</sub> = 338 (Northbound)	247 crest / 181 sag	
Vertical Clearance		No Issues Noted	16'-0" (min)	
Stopping Sight Distance	GB Table 7-1	854' (Northbound)	730'	
Bicycle/Pedestrian Criteria		N/A – Bicycles and Pedestrians are Restricted from the Interstate	N/A	
Bridge Railing	Structures Design Manual Section 13	W Beam Rail	TL-4	
Structural Capacity	SM, Ch. 3.4.1	Unknown	Design Live Load: HL-93	

<sup>1</sup> For all total bridge replacement projects consisting of a buried structure, the buried structure shall be of sufficient length to allow the addition of a future 12' maintenance lane for projects on I-89 from exit 10 through exit 18 and on I-91 from the Mass border through exit 3. This future maintenance lane shall be assumed to be adjacent to the left shoulder.

## TH-4 Design Criteria

The design standards for this roadway are:

1. Vermont State Standards, dated October 22, 1997.
2. AASHTO. *A Policy on Geometric Design of Highways and Streets*. Association of State Highway and Transportation Officials, Washington, DC, 2011. (The Green Book)

Minimum standards are based on an ADT of 640, and a design speed of 35 mph for a Local Road.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 6.3	9'/2' (22')	9'/2' (22')	
Bridge Lane and Shoulder Widths	VSS Table 6.3	9'/1' (20')	9'/2' (22')	Substandard
Clear Zone Distance	VSS Table 6.5	Culvert wingwalls within clear zone	7' fill / 7' cut	Substandard
Banking	VSS Section 6.12	Normal Crown	6% (max) for proximity to intersections	
Speed		35 mph	35 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-9	R = ∞ (Through Culvert) R = 480' (North Approach)	R <sub>min</sub> = 4,100 @ NC R <sub>min</sub> = 487 @ 5.6%	
Vertical Grade	VSS Table 6.6	-6.557% max (within project limits) -17.06% max (north of project limits)	13% (max) for mountainous terrain	
K Values for Vertical Curves	VSS Table 6.1	K <sub>sag</sub> = 7 (South approach), K <sub>sag</sub> = 15 (North Approach)	40 crest / 50 sag	Substandard
Vertical Clearance	VSS Section 6.7	12'-2"	14'-3" (min)	Substandard
Stopping Sight Distance	VSS Table 6.1	67'	225'	Substandard
Bicycle/Pedestrian Criteria	VSS Table 6.7	1' shoulder	1' shoulder <sup>2</sup>	
Bridge Railing	Structures Design Manual Section 13	None	TL-2	
Structural Capacity	SM, Ch. 3.4.1	Unknown	Design Live Load: HL-93	

## Inspection Report Summary

Culvert Rating                      5 Fair

05/17/2012 – No change in settlement cracking since the last inspection. Will continue to monitor biennially. Apron at the east end could use pothole repair. Signed for a vertical clearance of 12'-6" at each end. \*See latest CM for clearance alteration recommendation by DCP. ~MJ/DK

<sup>2</sup> A 4 foot shoulder should be provided on either side of TH-4 to accommodate The Long Trail hiking trail which will pass through the bridge starting in the summer of 2014.

04/19/10 Culvert has cracking throughout. The settlement at the Route 2 end appears to have stabilized. The posting should be changed to 12'-2". ~DCP

### **Vertical Clearance**

When the culvert was originally constructed there was 12'-9" of vertical clearance along TH 4. However, due to paving, the culvert currently provides a 12'-6" vertical clearance for vehicles traveling on Notch Road through the culvert. Due to the actual 12'-6" vertical clearance measured in inspection the inspection report suggests changing the posted height in order to ensure adequate clearance. The current clearance does not meet the minimum standard of 14'-3". There is evidence of over height vehicles/vehicle accessories impacting the culvert. It is proposed that any new structure should meet the minimum vertical clearance requirement of 14'-3".

### **Utilities**

The existing utilities are shown on the Existing Conditions Layout Sheet, and are as follows:

#### Municipal Utilities

- There are no municipal water or sewer facilities within this project area; all homes, including those within the Mountain View Drive Development, have private wells and septic systems.

#### Public Utilities

##### Underground:

- There is a major underground telephone line which runs along the northern edge of U.S. Route 2 which is owned by FairPoint Communications. This buried cable is only a few feet from the U.S. Route 2 pavement; the cables are encased in concrete.
- There are no buried facilities along the Bolton Notch Road (TH # 4).

##### Aerial:

- There are aerial electric (three phase) and telephone facilities which run along the northerly edge of U.S. Route 2 thru the entire project area. These facilities cross thru the U.S. 2/TH 4 intersection within 50 feet of the southern end of Bridge # 51-3.
- There is a single phase electric line and one telephone line which cross over I-89 diagonally over Bridge #51-3, to an existing pole in the northwest quadrant of the existing bridge. These facilities then cross diagonally back over TH #4 and proceed along the town highway.
- These existing aerial facilities are owned by Green Mountain Power and Waitsfield Champlain Valley Telecom.

Overhead utilities should not need to be relocated for the recommended alternative.

### **Right Of Way**

The existing Right-of-Way is plotted on the Existing Conditions Layout Sheet. It is anticipated that additional Right-of-Way acquisition will be necessary if the full bridge replacement option is chosen.

## **Resources**

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

### Biological

This is a dry crossing and carries TH 4 (Notch Road) underneath Interstate 89.

### Wetlands/Watercourses

There are no wetlands within the project area.

There are no watercourses within the project area.

### Wildlife Habitat

Moderate terrestrial wildlife habitat occurs on both sides of Interstate 89 at this location. According to latest ANR-Fish and Wildlife “BioFinder” mapping there is moderate concentration of components contributing to biological diversity to the north and low concentration of components contributing to biological diversity to the south (see attached ANR mapping). If the structure will be replaced, opportunities for wildlife movement should be explored as the design moves forward.

### Rare, Threatened and Endangered Species

According to VT Fish and Wildlife Natural Heritage mapping and US Fish and Wildlife mapping there are no rare, threatened or endangered species within the project area.

### Agricultural

There are mapped prime agricultural soils within the project area (Winooski very fine sandy loam). These soils were formed in alluvial deposits on floodplains and are frequently flooded.

### Hazardous Materials

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are no hazardous waste sites located in the vicinity of the project. The closest Hazardous Waste Site along I-89 is located 5,500 feet east of the bridge, and no impacts to this site are expected.

### Historic

The bridge is not a historic structure. The only historic resource in the area is the railroad corridor, which is a linear historic district. It is identified on the Layout Sheets. It is anticipated that the railroad historic district will not be impacted.

### Archeological

The project area was heavily disturbed during interstate construction and is not considered sensitive for historic or pre-contact archaeology. Staging sites will be reviewed independently when they are submitted by the contractor.

### Stormwater

There are no stormwater concerns for this project.

## **II. Alternatives Discussion**

### **No Action**

This alternative would involve leaving the culvert in its current condition. The existing culvert is in fair condition; although the culvert is not in imminent danger of failure, the cracks due to settlement need to be repaired in order to increase the overall life expectancy of the structure. If a bridge is expected to last at least another 10 years, then the No Action alternative may be considered a viable option. However, the culvert has full depth cracks as wide as 2 ½” on both sides. In the interest of salvaging this structure, the No Action alternative is not recommended.

### **Alt 1: Rehabilitation of Existing Culvert**

This option would include repairs to the culvert to extend its useful life. The culvert is rated as fair, and is structurally tolerable according to the federal criteria. However, this culvert has substandard horizontal and vertical clearances and rehabilitating the culvert will not improve these features.

There are a number of different repair types and procedures that could be done to rehabilitate this culvert. However, the simplest would be to use Class I, Class II, and Class III repair’s as necessary from the 2011 Standard Specifications for Construction. These repair procedures include removing the bad concrete around the reinforcing, cleaning the reinforcing and casting new concrete around cleaned reinforcing. If needed additional reinforcing could be lapped or mechanically spliced onto the existing exposed reinforcing.

The geotechnical report indicated soft soil conditions were encountered when drilling near the largest crack in the box and that no other borings encountered similar soft spots. The report also states that no voids were encountered during drilling. The lack of voids encountered helps to rule out undermining from unknown water sources and leads to the conclusion of poorly compacted soils when compared with the inspection records. The inspection records indicate that no additional settlement has been observed since 1996. The first recorded evidence of the vertical crack was in 1978 however it is likely the crack began much earlier. Between 1978 and 1996 the crack opened up from a very thin crack to 2 ½” in width. In order to ensure the success of the structural repairs and remaining life of the box culvert soil, stabilization such as injection grouting could also be considered as part of this project. Once all other repairs have been accomplished the structure should be cleaned and silaned in order to provide additional protection from water and winter maintenance practices along TH 4.

### **Alt 2: Rehabilitation of Existing Culvert with Designated Pedestrian Crossing**

Members of the community expressed concerns at a public meeting on October 25<sup>th</sup>, 2016 about pedestrian safety inside the culvert. Recently the Green Mountain Club built a crossing over the Winooski river near Bolton Notch Rd and relocated the long trail to pass through this structure which significantly increases the pedestrian use. Given the narrowness of the culvert, the lack of visibility due to grade, as well as the lack of visibility due to darkness inside the culvert community members have reported a series of near accidents.

This option would include all of the same repairs to the culvert as in Alternative 1 as well as the installation of a 5’ wide sidewalk inside the culvert. By installing a sidewalk and positively separating pedestrians from vehicular traffic the structure would be reduced to a single lane. The new configuration would be a 5’ sidewalk, 11’ lane, and 2’ shoulders with a stop condition on each end of the culvert.

A traffic analysis was done to verify that the reduction in lanes would satisfy the traffic demands during peak hours as well as not cause vehicles to que up into Route 2. The Vtrans Traffic Safety Engineer also did a site visit and made a series of recommendations for the proposed condition. The most significant recommendation was to include a High Friction Surface Treatment on Notch road to improve vehicles ability to stop during the winter months. Both the traffic analysis and safety recommendations are in the appendices.

### **Alt 3: Full Bridge Replacement – With New Buried Structures**

This alternative would replace the existing bridge with a new buried structure, with larger horizontal and vertical clearances at the existing location. Right-of-Way will be required for this alternative for the reconstruction of TH-4. The various considerations under this option include: the alignment, the bridge width and length, skew, and structure type.

#### *a. Alignment*

The current horizontal alignment meets the current standards, so any new structure could be constructed on the existing alignment. By placing a new bridge on the existing horizontal alignment, project limits and impacts to resources can be minimized.

It is possible to maintain traffic on TH-4 for the entirety of construction by constructing an off-alignment new buried structure next to the old structure. This would involve reconstructing approximately 750 feet of Notch road in order to match back into the existing alignment. This would be costly, and have large impacts to adjacent land. As such, this option is not being evaluated.

#### *b. Bridge/Roadway Width*

I-89: The current paved width of I-89 through the project area is 38 feet, which is the minimum standard. Since a new 80+ year bridge is being proposed, the bridge geometry should meet the minimum standards. The culvert will be increased in length to account for an additional 12 feet in width on each barrel of the interstate to accommodate future widening. By providing this extra width, work can be done to the interstate bridge in the future, while maintaining two lanes of traffic. A 50 foot width bridge will be proposed both northbound and southbound. This 50 foot bridge width will transition down to a roadway width of 38 feet.

TH-4: The current width provided through the structure when traveling on TH-4 is 20 feet. This does not meet the minimum standard of 22 feet. Since a new 80+ year bridge is being proposed, the bridge geometry should meet the minimum standards. Additionally, the Long Trail passes through the structure, in order to accommodate the increased pedestrian traffic TH-4, a typical section of 2-9-9-2 (22') with a 4.5 sidewalk on the east side of the box will be proposed

#### *c. Bridge Length and Skew*

The existing culvert has a barrel length of approximately 150 feet with no skew. If a new buried structure were proposed, a structure with a barrel length of 150 feet would match the existing site conditions and would meet the minimum standard required, as this length would allow for the addition of two 12-foot future bridge maintenance lanes. The new buried structure would have no skew.

#### *d. Structure Type*

A prefabricated structure will be the preferred choice, due to decreased construction time. The most economical 27' span length buried structure type that is most commonly used in Vermont is a 3 sided precast arch or frame. The structure may be placed on pedestal walls in order to meet the minimum vertical clearance of 14'-3".

Since the structure will be directly exposed to deicing salts on the inside, it is recommended that a corrosive resistant coating is applied to the inside of the concrete to protect against deterioration.

There is visible bedrock located in the project area however borings indicate it is very unlikely that shallow bedrock will be encountered. Therefore, the arch or frame can be supported on piles or a spread footing.

*e. Additional Considerations*

Since the Long Trail is being relocated under the bridge, it is expected that TH-4 will have heavy pedestrian usage through the culvert. Various considerations to accommodate the trail, such as lighting, or painting the inside of the culvert a light color should be considered in the final design of the structure.

**Alternative 4: Full Bridge Replacement – With Two (non-buried) Bridges**

This alternative would remove the existing culvert, and replace it with two new bridges over TH-4; a bridge for northbound traffic and a bridge for southbound traffic. Right-of-Way will be required for this alternative for the reconstruction of TH-4. The various considerations under this option include: the bridge width and length, skew, superstructure type, and substructure type.

*a. Alignment*

The current horizontal alignment meets the current standards, so any new structure will be constructed on the existing alignment. By placing a new bridge on the existing horizontal alignment, project limits and impacts to resources can be minimized.

*b. Bridge/Roadway Width*

I-89: The current paved width of I-89 through the project area is 38 feet, which is the minimum standard. Since a new 80+ year project is being proposed, the bridge geometry should meet the minimum standards. An additional 12 feet should be added to the standard shoulder width to provide a future bridge maintenance lane. By providing this extra width, work can be done to the bridge in the future, while maintaining two lanes of traffic. A 50 foot width bridge will be proposed both northbound and southbound. This 50 foot bridge width will transition down to a roadway width of 38 feet in as short of a distance as possible. Two bridges, each providing a 50 foot width rail-to-rail will be proposed.

TH-4: The current width provided through the structure when traveling on TH-4 is 20 feet. This does not meet the minimum standard of 22 feet. Since a new 80+ year bridge is being proposed, the bridge geometry should meet the minimum standards. Additionally, the Long Trail has been relocated and passes through the existing bridge. In order to accommodate the increased pedestrian traffic on TH-4, a typical section of 4-9-9-4 (26' total) will be proposed. This provides 4 foot shoulders on each side of TH-4, as per our discussion with the VTrans Bicycle and Pedestrian Program Manager. A 26 foot pavement width under the bridge along with appropriate ditching for drainage along TH-4 will be proposed.

*c. Bridge Length and Skew*

The existing span is 20 feet long and with no skew. If two new steel beam bridges were constructed, 100 foot span bridges would be proposed in order to accommodate The Long Trail and wildlife passage, and match site conditions. TH-4 runs under I-89 perpendicularly, therefore it is proposed that any new bridge have no skew to match this existing site condition.

*d. Superstructure Type*

A prefabricated structure will be the preferred choice, due to decreased construction time. Since traffic will be maintained along the corridor utilizing a crossover or temporary bridges with reduced construction zone speed limits, accelerated bridge construction techniques are appropriate in order to reduce the disruption to traffic. Based on an approximate 100' span requirement the most economical bridge type that is most commonly used in Vermont, is a steel and composite concrete deck (Prefabricated Bridge Units). This type of structure would maximize the vertical clearance over TH-4 through the structure compared to the buried structure option. TH-4 is used by dump trucks traveling to and from Varins Gravel Pit, and the minimum vertical clearance would be achieved for this bridge type, accommodating those trucks. Additionally, this type of bridge would provide natural lighting for pedestrians, bicycles, and hikers on The Long Trail.

*e. Substructure Type*

There is visible bedrock located in the project area, however borings indicate that shallow bedrock likely will not be encountered. Given the borings information integral abutments can be used.

### **III. Maintenance of Traffic**

The Vermont Agency of Transportation reviews each new project to determine suitability for the 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 sooner. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements as well as innovative materials in new bridges and rehabilitation 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. The following options have been considered:

#### **Option 1: Off-Site Detour**

*I-89:*

This option would close the section of I-89 near the bridges to through traffic for a limited time during construction. The detour would utilize US 2 from exit 10 to 11 for traffic traveling north and south along I-89. The through distance on this detour is almost identical at 15 miles, however the estimate time for getting from exit 10 to 11 on US 2 increases to 25 minutes from the 15 minutes it takes on I-89. Given traffic volumes this option will not be considered further.

*TH-4:*

TH-4 will need to be briefly closed regardless of the alternative that is selected. Since the existing structure is a 4-sided box, with TH-4 running through the box, TH-4 would have to be closed during the removal of the existing box or installation of a new box. Additional activities may warrant the closure of TH-4 for safety reasons, such as the lifting of heavy materials overhead. If rehabilitation is chosen as the preferred alternative a 2-day closure will be required in order to complete repairs in the center of the box where there isn't enough space to pass one lane of traffic around the construction crew.

The shortest route that could be used for vehicles when TH-4 under the bridge is closed has an end-to-end distance of 10.8 miles and would take 30 minutes to drive around. There are steep slopes along the detour route; however the steepest slope is on Notch Road between US Route 2 and the gravel pit, so the truck traffic on TH-4 is already accustomed to these slopes. The detour route is as follows:

1. Notch Road, to Stage Road, US Route 2 back to Notch Road

Since this detour is located on local roads, the towns of Bolton and Richmond would have to agree to let VTrans detour and sign around this route.

*Advantages:* The costs associated with signing the detour are much lower than the construction costs associated with the other maintenance of traffic options. By detouring traffic away from construction activities, it creates a safer working environment for the construction workers. By not requiring the construction and removal of temporary approaches, temporary bridges and other temporary traffic control measures, the length of construction can be reduced. This is the safest traffic control option since the traveling public is removed from the construction site.

*Disadvantages:* Traffic will not be maintained along the existing corridor for a limited portion of construction. Through traffic will see an increase in travel times during the closure period.

## **Option 2: Temporary Bridge**

### *I-89:*

The standard maintenance of traffic option based on the length of the bridges and the traffic volumes at this location would be a two lane temporary bridge for each barrel. For this option, a two-lane temporary bridge would be placed both north of the bridges for northbound traffic, and another placed south of the bridges for southbound traffic. Both the northbound and southbound side of the bridge could be constructed at the same time, in order to minimize the construction duration. The vertical alignment of TH-4 slopes upward to the north, and the northern temporary bridge would need to maintain at least, the existing vertical clearance, which is already substandard.

### *TH-4:*

If a temporary bridge is used to maintain traffic on I-89, TH-4 still would not be able to stay open for the duration of all construction activities, if a full bridge replacement is chosen as the best alternative. Since the existing structure is a 4-sided box, with TH-4 running through the box, TH-4 would have to be closed for short durations, during removal of the box.

*Advantages:* A temporary bridge maintains two-lane traffic along the existing corridor during construction.

*Disadvantages:* There are extra costs associated with constructing temporary bridges as well as changes in traffic patterns that can increase the probability of accidents. This option would require additional Right-of-Way acquisition for placement of the northern temporary bridge.

### **Option 3: Phasing**

Another method of maintaining traffic along the corridor during construction is to build/repair the structure one lane at a time, or in phases. This allows keeping the road open during construction, while having minimal impacts to adjacent property and environmental resources.

*I-89:*

Due to vertical constraints, this option will not be considered. There is approximately 6 feet of vertical fill over the existing 16 foot culvert; it would be extremely tricky and costly to hold back 22 feet of fill during each phase for phased construction of a new bridge.

*TH-4:*

Construction activities for TH-4 that do not require a closure will be done in phases. This will ensure the shortest possible closure of TH-4 during the construction or rehabilitation of Bridge 51-3. This means that for activities such as concrete patching along the edges of the box, TH-4 would be reduced to one lane while the opposite lane is being repaired, then traffic would be switched over to the newly repaired lane while the other lane is under repair.

*Advantages:* Traffic would be maintained along the existing corridor during construction.

*Disadvantages:* The costs of construction increases over un-phased 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 4: I-89 Cross-Over**

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. With a reduced design speed, it would be possible to maintain I-89 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.

Hourly traffic data has been compiled for both the northbound and southbound lanes for the months of May through November. This traffic data can be found in the appendix. The traffic volumes highlighted in red are the volumes at which there are unfavorable conditions when traffic is reduced to one lane.

During construction of the first bridge, three lanes can be accommodated over the other side of the existing structure. Based on traffic data, it is most favorable to keep two lanes of northbound traffic open and reduce the southbound traffic to one lane and cross it over to the northbound side.

June is the most optimum month to construct the southbound bridge, since southbound traffic has the lowest volume in June. Traffic data shows that during June, the southbound direction can be reduced to one lane without causing significant delays.

The traffic data indicates that for all months other than June, two lanes of traffic need to be accommodated in each direction in order to avoid delays in the afternoon commute. Since the proposed structure will be wider than the existing typical, 4 lanes can be accommodated over the new structure. Therefore, for the second crossover, northbound traffic can be crossed over to the new bridge on the southbound side, while maintaining two lanes going northbound and two lanes going southbound. Typical sections and layouts for these cross over scenarios can be found in the appendix.

*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. 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. Additionally, traffic on TH-4 would not be able to stay open for the duration of all construction activities, if a full bridge replacement is chosen as the best alternative. There would likely be a series of short closures to traffic on TH-4 during some construction activities.

#### **IV. Alternatives Summary**

Based on the existing site conditions and bridge condition, there are several viable alternatives:

Alternative 1: Rehabilitation of the Existing Structure with Traffic Maintained on Alignment Utilizing Phased Construction with a Weekend Closure Period

Alternative 2: Rehabilitation of the Existing Structure and Designated Pedestrian Access Utilizing Phased Construction with a Weekend Closure Period

Alternative 3a: Full Bridge Replacement with a Buried Structure and Traffic Maintained on a Crossover

Alternative 3b: Full Bridge Replacement with a Buried Structure and Traffic Maintained on Temporary Bridges

Alternative 4a: Full Bridge Replacement with Two Separate Steel Beam Bridges and Traffic Maintained on a crossover

Alternative 4b: Full Bridge Replacement with Two Separate Steel Beam Bridges and Traffic Maintained on Temporary Bridges

V. Cost Matrix<sup>3</sup>

Bolton IM 089-2(45)		Alt 1 Rehabilitation	Alt 2 Rehabilitation With designated PED Access	Alt 3 Full Bridge Replacement with Buried Structure		Alt 4 Full Bridge Replacement with Two Separate Steel Beam Bridges	
				a. Crossover	b. Temporary Bridge	a. Crossover	b. Temporary Bridge
COST	Bridge Cost	\$72,377	\$109,571	\$1,669,000	\$1,669,000	\$3,110,300	\$3,110,300
	Removal of Structure	\$0	\$0	\$80,000	\$80,000	\$80,000	\$80,000
	Roadway	\$132,692	\$134,837	\$1,277,000	\$1,277,000	\$1,201,000	\$1,201,000
	Maintenance of Traffic	\$75,490	\$90,588	\$890,390	\$1,000,000	\$890,390	\$1,000,000
	Construction Costs	\$280,559	\$334,996	\$3,916,390	\$4,026,000	\$5,281,700	\$5,391,300
	Construction Engineering	\$84,200	101,000	\$783,300	\$805,200	\$1,056,400	\$1,078,300
	Contingencies	\$56,241	\$67,004	\$4,504,000	\$4,630,000	\$6,074,000	\$6,201,000
	Preliminary Engineering <sup>4</sup>	\$110,000	\$110,000	\$470,000	\$484,000	\$529,000	\$540,000
	Right of Way	\$0	\$0	\$100,000	\$120,000	\$100,000	\$120,000
	Total Project Costs	<b>\$531,000</b>	<b>\$613,000</b>	<b>\$5,074,000</b>	<b>\$5,234,000</b>	<b>\$6,703,000</b>	<b>\$6,861,000</b>
	Annualized Costs	\$26,550	\$30,650	\$63,425	\$65,425	\$67,030	\$68,610
SCHEDULING	Project Development Duration <sup>5</sup>	1 year	1 year	4 years	4 years	4 years	4 years
	Construction Duration	1 year	1 year	2 years	2 years	2 years	2 years
	Closure Duration (If Applicable)	2 days	2 days	N/A	N/A	N/A	N/A
ENGINEERING	Typical Section – I-89 Roadway (feet)	38'	38'	38'	38'	38'	38'
	Typical Section – TH 4 Roadway (feet)	22' (20' in culvert)	2'-11'-2' (SW) - 5' (20')	4-9-9-4 (26')	4-9-9-4 (26')	4-9-9-4 (26')	4-9-9-4 (26')
	Typical Section – Bridge (feet)	4'-12'-12'-10' (38')	4'-12'-12'-10' (38')	4'-12'-12'-10' (38')	4'-12'-12'-10' (38')	4'-12'-12'-22' (50')	4'-12'-12'-22' (50')
	Geometric Design Criteria	Substandard vertical curve on TH 4	Substandard vertical curve on TH 4	Substandard vertical curve on TH 4	Substandard vertical curve on TH 4	Substandard vertical curve on TH 4	Substandard vertical curve on TH 4
	Traffic Safety	No Change	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	No
	Bicycle Access	No Change	No Change	Improved on TH-4	Improved on TH-4	Improved on TH-4	Improved on TH-4
	Vertical Clearance	Substandard	Substandard	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria
	Pedestrian Access	No Change	Improved	Improved on TH-4	Improved on TH-4	Improved on TH-4	Improved on TH-4
	Utility	No Change	No Change	Relocation	Relocation	Relocation	Relocation
OTHER	ROW Acquisition	No	No	No	No	No	No
	Road Closure	No	No	No	No	No	No
	Design Life	20+ years	20+ years	80 years	80 years	100 years	100 years

<sup>3</sup> Costs are estimates only, used for comparison purposes.

<sup>4</sup> Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.

<sup>5</sup> Project Development Durations are starting from the end of the Project Definition Phase.

## **VI. Conclusion**

We recommend **Alternative 2**; to repair the existing concrete box culvert and provide a designated pedestrian access utilizing phased construction with a 2-day closure.

This alternative includes improving the existing soil conditions through soil stabilization as well as repairing the cracked/deteriorated portions of the culvert with standard cast-in-place concrete repair methods. The alternative will have no impacts on I-89 other than a possible lane closure during soil stabilization. The work will be accomplished utilizing alternating one-way traffic along TH-4 maintained by flagging or temporary signals. For work done near the center third of the box a short closure will be required as there will not be enough space to allow traffic to pass around the construction activities. At this phase in the project a weekend closure is expected to be sufficient to accomplish the necessary work. The final condition will leave the culvert as a one lane structure with alternating one way traffic and a permanent designated pedestrian crossing.

### *The Long Trail:*

As of the summer of 2015, The Long Trail has been relocated to pass under bridge 51-3. During construction of the bridge, there will be closures to the trail under the bridge. Long Trail hikers can use the pre-2015 Long Trail path located on the Bolton Valley Access Road or find an alternate route around.

## **VII. Appendices**

# Site Pictures



Looking West Towards US Route 2



Looking East



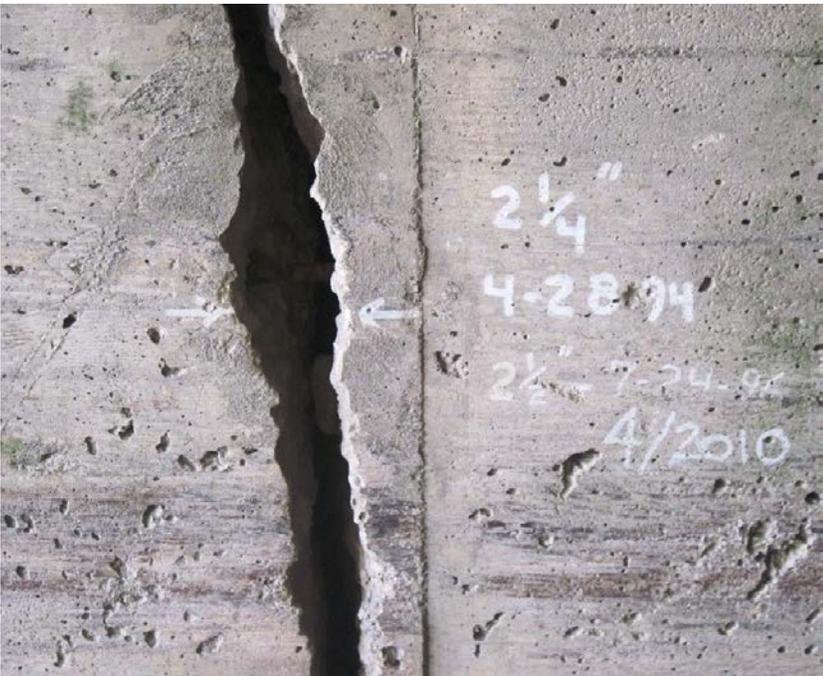
Large Vertical Crack (South Side)



Large Vertical Crack (South Side Close up)



Large Vertical Crack (North Side)



Large Vertical Crack (North Side Close up)



Evidence of Impact/Scraping



Evidence of Over Height Vehicle Accessories (Such as Antenna's)



# Bridge Inspection Report

## STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for **BOLTON**

bridge no.: 051-3

District: 6

Located on: I 00089 ML

over I 89 OVER TH NO 4

approximately 5.8 MI S EXIT 11

Owner: 01 STATE-OWNED

### CONDITION

Deck Rating: **N NOT APPLICABLE**  
 Superstructure Rating: **N NOT APPLICABLE**  
 Substructure Rating: **N NOT APPLICABLE**  
 Channel Rating: **N NOT APPLICABLE**  
 Culvert Rating: **5 FAIR**  
 Federal Str. Number: 20008951-304012  
 Federal Sufficiency Rating: 064.6  
 Deficiency Status of Structure: **FD**

### STRUCTURE TYPE and MATERIALS

Bridge Type: **R.C. BOX CULVERT**  
 Number of Approach Spans: 0000      Number of Main Spans: 001  
 Kind of Material and/or Design: **1 CONCRETE**  
 Deck Structure Type: **N NOT APPLICABLE**  
 Type of Wearing Surface: **N NOT APPLICABLE**  
 Type of Membrane: **N NOT APPLICABLE**  
 Deck Protection: **N NOT APPLICABLE**

### AGE and SERVICE

Year Built: 1964    Year Reconstructed: 0000  
 Service On: **1 HIGHWAY**  
 Service Under: **1 HIGHWAY**  
 Lanes On the Structure: 04  
 Lanes Under the Structure: 01  
 Bypass, Detour Length (miles): 01  
 ADT: 023700      % Truck ADT: 13  
 Year of ADT: 1998

### APPRAISAL \*AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: **N SAFETY FEATURE NOT REQUIRED**  
 Transitions: **N SAFETY FEATURE NOT REQUIRED**  
 Approach Guardrail: **N SAFETY FEATURE NOT REQUIRED**  
 Approach Guardrail Ends: **N SAFETY FEATURE NOT REQUIRED**  
 Structural Evaluation: **5 BETTER THAN MINIMUM TOLERABLE CRITERIA**  
 Deck Geometry: **N NOT APPLICABLE**  
 Underclearances Vertical and Horizontal: **3 INTOLERABLE, CORRECTIVE ACTION NEEDED**  
 Waterway Adequacy: **N NOT OVER WATER**  
 Approach Roadway Alignment: **8 EQUAL TO DESIRABLE CRITERIA**  
 Scour Critical Bridges: **N NOT OVER WATERWAY**

### GEOMETRIC DATA

Length of Maximum Span (ft): 0020  
 Structure Length (ft): 000020  
 Lt Curb/Sidewalk Width (ft): 0  
 Rt Curb/Sidewalk Width (ft): 0  
 Bridge Rdwy Width Curb-to-Curb (ft): 0  
 Deck Width Out-to-Out (ft): 0  
 Appr. Roadway Width (ft): 076  
 Skew: 00  
 Bridge Median: **1 OPEN MEDIAN**  
 Min Vertical Clr Over (ft): 99 FT 99 IN  
 Feature Under: **HIGHWAY BENEATH STRUCTURE**  
 Min Vertical Underclr (ft): 12 FT 05 IN

### DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): **5 NO RATING ANALYSIS PERFORMED**  
 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:  
 Insp. Date: 052012      Insp. Freq. (months) 24      X-Ref. BrNum:

### INSPECTION SUMMARY and NEEDS

5/17/2012 - No change in settlement cracking since the last inspection. Will continue to monitor biennially. Apron at the east end could use pothole repair. Signed for a vertical clearance of 12' - 6" at each end. \* See latest CM for clearance alteration recommendation by DCP. - MJ/DK  
 Culvert has cracking through out. The settlement at the rt. 2 end appears to have stabilized. The posting should be changed to 12'-2". 4/19/10 DCP

# Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

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

**From:** Laura Ripley, Geotechnical Engineer, via Christopher C. Benda P. E., Soils and Foundations Engineer

**Date:** August 26<sup>st</sup>, 2013

**Subject:** Bolton IM 089-2(45) Preliminary Geotechnical Information

---

## 1.0 INTRODUCTION

The Soils and Foundations Unit within the Materials and Research Section has performed a preliminary geotechnical investigation for Bridge No. 51, located at the intersection of US Route 2 and Town Highway 4 (Bolton Notch Rd.) directly under Interstate I-89 in the town of Bolton, VT. This report includes a review of available historical subsurface data and field observations made during a recent site visit. The materials referenced in this investigation include: VTrans boring files and record plans, Agency of Natural Resources (ANR) water well logs, ANR Environmental Interest Locator, USDA Natural Resources Conservation soil survey records and USGS bedrock and Vermont Geological Survey surficial geologic maps.

## 2.0 HISTORICAL SUBSURFACE INFORMATION

### 2.1 Previous Projects

No boring information was noted on the record plans recovered for Bridge No. 51. No boring log data were found in the Soils & Foundations project database or the in-house historical boring log records in the vicinity of this bridge.

### 2.2 ANR Water Well Logs

Drilling logs from private drinking water wells in the area of a project can be helpful in anticipating what may be encountered in the subsurface strata. The Agency of Natural Resources (ANR) Private Well Locator interactive map was reviewed for these purposes. The data provided estimates the depth to bedrock and expected soils types encountered on the site. It should be noted that these logs were developed and provided by well drilling companies whose employees may have had little to no formal training in identifying soil and rock. Water wells in close proximity of the subject bridge are highlighted in Figure 1.

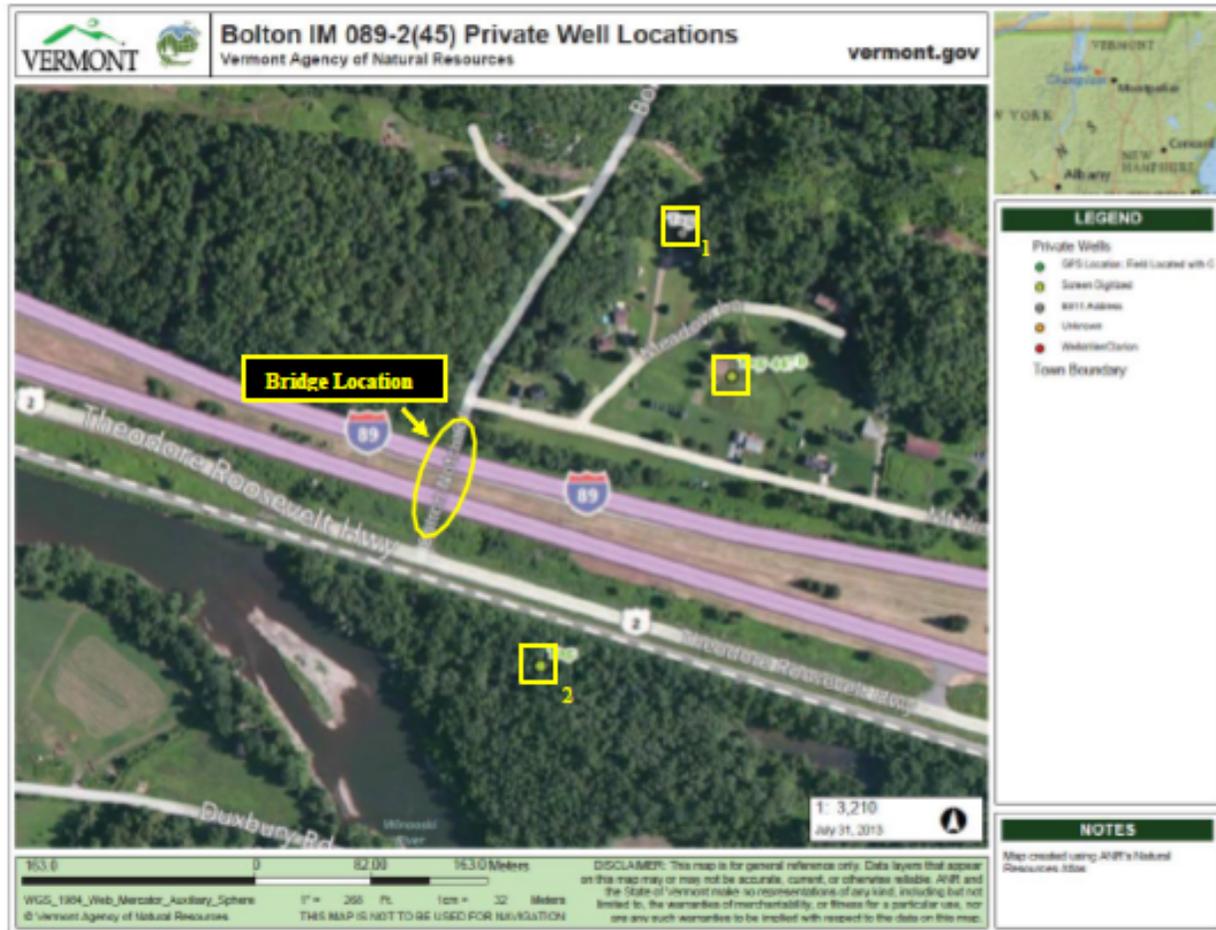


Figure 1 Site map with well locations.

Four wells were identified within an approximate radius of 1,000 feet, and the information for each is listed in Table 1.

Table 1. Well log descriptions of surrounding sites.

Well Tag Number	Distance From Project (feet)	Depth to Bedrock (feet)	Material Description
-- (1)	750	44	Hardpan
447B	675	1	--
-- (2)	400	--	Sand, gravel with boulders

**2.3 USDA Environmental Interest Locator**

The U.S. Department of Agriculture (USDA) provides online maps with data locating potential environmental hazards. It was determined that there were currently no hazardous waste sites or designated wetlands within the project vicinity. There are currently no land use restrictions on this area.

**2.4 USDA Soil Survey**

The U.S. Department of Agriculture (USDA) Natural Resources Conservation (NRC) soil survey records provide online published soil data. These indicated that the existing soils

at the project site consist of both Winooski very fine sandy loam. The Winooski soils are typically very deep to bedrock and moderately well drained with a seasonal high water table ranging from 1.5-3.0 feet and an erosion factor of 0.49.

### 2.5 USGS Bedrock Maps

Based on recent bedrock mapping for the 2011 State bedrock geologic map (Ratcliffe, N.M., Stanley, R.S, Gale, M.H., Thompson, P.J., and Walsh, G.J., 2011, Bedrock Geologic Map of Vermont: U.S. Geological Survey Scientific Investigations Map 3184, 3 sheets, scale 1:100,000), the rock type underlying this area consists of schist and phyllite, described as "Silvery-green quartz-muscovite-chlorite schist and phyllite, commonly with albite and magnetite, locally contains dolomite". No bedrock outcrops were observed during the site visit.

### 3.0 FIELD OBSERVATIONS

Pertinent information was gathered during an initial site visit in order to determine any potential issues with boring observations or design considerations.



Figure 3. View of existing site. Photograph was taken facing north.

An overhead utility runs across the bridge from the northwest to southeast corner, as seen in Figure 3. The existing structure is a four sided box structure that passes under the interstate and does not cross a waterway. Placement of the borings will be affected by large ditches and heavy vegetation on all corners of bridge and should be located in an accessible area. Other considerations should include obtaining information that can be applicable to the wingwalls as well as the culvert structure.

#### 4.0 RECOMMENDATIONS

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

- Reinforced concrete abutment on spread footings
- Precast arch on spread footings
- Stub abutments with spread footings on MSE Walls

It is recommended that a minimum of two borings be drilled to a depth of 50 feet at opposite ends of the box in order to assess the subsurface conditions. Additional borings at opposite ends of the wingwalls may be necessary in this case as well, due to the extent of the existing structure. If variable conditions are noted or shallow bedrock is encountered, additional borings should be advanced to establish a more detailed bedrock profile.

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-2561.

cc: Read File/WEA  
Project File/CCB  
LAR

# Natural Resources Memo

**State of Vermont**  
**Program Development Division**  
One National Life Drive  
Montpelier, VT 05633-5001  
[www.aot.state.vt.us](http://www.aot.state.vt.us)

[phone] 802-828-3979  
[fax] 802-828-2334  
[ttd] 800-253-0191

*Agency of Transportation*

To: Jeff Ramsey, VTrans Environmental Specialist  
From: Glenn Gingras, VTrans Environmental Biologist  
Date: 9/24/2013  
Subject: Bolton IM 089-2(45) - Natural Resource ID

I have completed my natural resource scoping review for the above referenced project. My evaluation has included the following resources: wetlands, wildlife habitat, agricultural soils, and rare, threatened and endangered species. I have reviewed all existing mapped information and project information including photos in the project file. A site visit was made on 9/23/13.

The project involves the bridge 51-3 N&S on Interstate 89. This is a dry crossing and carries TH 4 (Notch Road) underneath Interstate 89. At this time we are identifying resources within the project area as a scope has not been defined. The current structure is a R.C. box culvert.

#### **Wetlands/Watercourses**

There are no wetlands within the project area.

There are no watercourses within the project area.

#### **Wildlife Habitat**

Moderate terrestrial wildlife habitat occurs on both sides of Interstate 89 at this location. According to latest ANR-Fish and Wildlife "BioFinder" mapping there is moderate concentration of components contributing to biological diversity to the north and low concentration of components contributing to biological diversity to the south (see attached ANR mapping). If the structure will be replaced opportunities for wildlife movement will be explored as the design moves forward.

#### **Rare, Threatened and Endangered Species**

According to VT Fish and Wildlife Natural Heritage mapping and US Fish and Wildlife mapping there are no rare, threatened or endangered species within the project area.

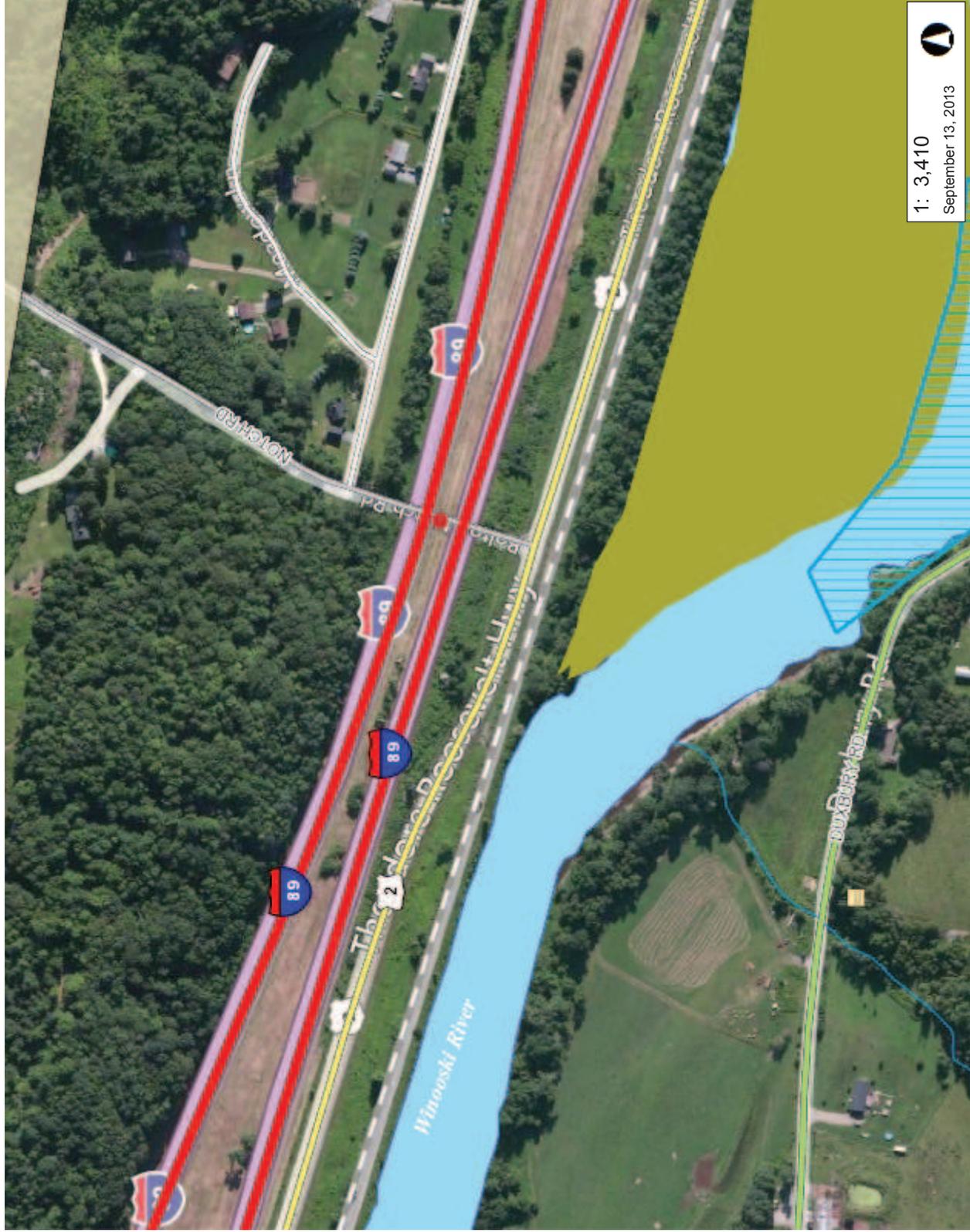
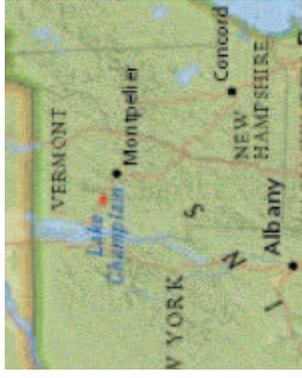
#### **Agricultural Soils**

There are mapped prime agricultural soils within the project area (Winooski very fine sandy loam). These soils were formed in alluvial deposits on floodplains and are frequently flooded.



**Bolton IM 089-2(45)**  
Vermont Agency of Natural Resources

**vermont.gov**



1: 3,410  
September 13, 2013

**LEGEND**

- Rare Threatened Endangered
- Threatened or Endangered
- Rare
- Significant Natural Community
- Uncommon Species and Other
- Animal
- Plant
- Natural Community
- Deer Wintering Areas
- Indiana Bat Hibernacula
- Wetlands - VSWI
- Class 1 Wetland
- Class 2 Wetland
- Wetlands - VSWI Advisory Lay
- Special Flood Hazard Areas (FDFIRM)
- AE (1-percent annual chance flood)
- A (1-percent annual chance flood)
- AO (1-percent annual chance zone feet)
- 0.2-percent annual chance flood ha
- Act250 Permits **\*\*INCOMPLETE**
- Roads
- Principal Arterial
- Minor Arterial
- Rural Major Collector
- Rural Minor Collector
- Urban Collector

**NOTES**

Map created using ANR's Natural Resources Atlas

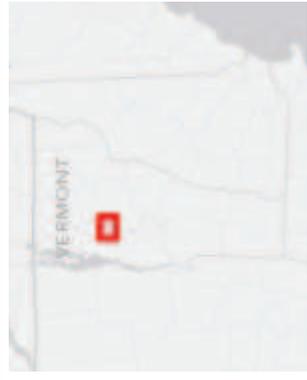
173.0 0 86.00 173.0 Meters

1" = 284 Ft. 1cm = 34 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

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1: 102,718  
September 13, 2013

**LEGEND**

Town Boundary \*NOT A COMI

Component Concentration

- Tier 1 = Greatest
- Tier 2 = Very High
- Tier 3 = High
- Tier 4 = Moderate
- Tier 5 = Low
- Tier 6 = Insufficient Data

**NOTES**

0.3 0 0.16 0.3 Miles

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

WGS\_1984\_Web\_Mercator\_Auxiliary\_Sphere  
© Vermont Agency of Natural Resources



<u>TIER</u>	<u>ACRES</u>	<u>Description</u>
1	48.77	Greatest concentration of components contributing to biological diversity or presence of rare species or natural communities.
2	229.31	Very high concentration of components contributing to biological diversity.
3	125.3	High concentration of components contributing to biological diversity.
4	986.95	Moderate concentration of components contributing to biological diversity.
5	909.62	Low concentration of components contributing to biological diversity.

**Component Concentration**

- Tier 1 - Greatest
- Tier 2 - Very High
- Tier 3 - High
- Tier 4 - Moderate
- Tier 5 - Low
- Tier 6 - Insufficient data



<u>TIER</u>	<u>ACRES</u>	<u>Description</u>
6	68.4	Insufficient data. There are currently no data identifying components assessed during the development of BioFinder. Site evaluation may identify one or more components.

# Archaeology Memo



**Jeannine Russell**  
VTrans Archaeology Officer  
State of Vermont  
Environmental Section  
One National Life Drive  
Montpelier, VT 05633-5001  
[www.aot.state.vt.us](http://www.aot.state.vt.us)

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

*Agency of Transportation*

To: Jeff Ramsey, VTrans Environmental Specialist  
From: Jeannine Russell, VTrans Archaeology Officer  
via Brennan Gauthier, VTrans Assistant Archaeologist  
Date: 9/23/2013  
Subject: Bolton IM 089-2(45) – Archaeological Resource ID

Jeff,

I completed a field review of the proposed Bridge 51-3 replacement/rehab project located over TH-4 in Bolton. The project area was heavily disturbed during interstate construction and is not considered sensitive for historic or precontact archaeology. Staging sites will be reviewed independently when they are submitted by the contractor.

Brennan

**Brennan Gauthier**  
VTrans Archaeologist  
Vermont Agency of Transportation  
Program Development Division  
Environmental Section  
1 National Life Drive  
Montpelier, VT 05633  
tel. 802-828-3965  
fax. 802-828-2334  
[Brennan.Gauthier@state.vt.us](mailto:Brennan.Gauthier@state.vt.us)



# Historic Memo

**Ramsey, Jeff**

---

**From:** O'Shea, Kaitlin  
**Sent:** Thursday, September 12, 2013 10:01 AM  
**To:** Ramsey, Jeff  
**Cc:** Newman, Scott; Williams, Chris; Spooner, Karen  
**Subject:** RE: Bolton IM 089-2 (45) Resource ID request

Good morning Jeff,

I have completed the resource ID for this project: Bolton IM 089-2(45). The bridge is not a historic structure. The only historic resource in the area is the railroad corridor, which is a linear historic district. It is identified in arcmap, under the project number. Note that I've drawn historic district lines on either side of the rail corridor near the project, but the district would continue through the entire corridor.

Let me know if you have any questions.  
Thanks,

Kaitlin

---

**From:** Ramsey, Jeff  
**Sent:** Wednesday, September 11, 2013 4:23 PM  
**To:** Armstrong, Jon; Gingras, Glenn; Russell, Jeannine; Gauthier, Brennan; O'Shea, Kaitlin; Newman, Scott  
**Cc:** Williams, Chris  
**Subject:** Bolton IM 089-2 (45) Resource ID request

Hi all,  
Chris Williams would like resources identified for this project.

**From:** Jeff Ramsey, Environmental Specialist  
**Date:** September 11, 2013  
**Project:** Bolton IM 089-2 (45)  
**PIN:** 13A090 EA: 0892045 001  
**Project Manager:** Chris Williams

**Link to Photos:** [Z:\Projects-Engineering\BoltonIM089-2\(45\)13a090\Structures\Pictures](Z:\Projects-Engineering\BoltonIM089-2(45)13a090\Structures\Pictures)

The project manager would like resources identified for this project.

If there aren't any resources present, please feel free to issue a Resource Clearance for the CE as well.

Link:  
[Z:\Projects-Engineering\BoltonIM089-2\(45\)13a090\Environmental](Z:\Projects-Engineering\BoltonIM089-2(45)13a090\Environmental)

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



# Local Input

## Community Considerations from the Town of Bolton, Amy Grover, Town Clerk 10/15/2103 Possible Impact on the Notch Road Tunnel Under I89 Bridge 51-3

1. Are there any scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the bridge is closed during construction? Examples include: a bike race, festivals, cultural events, farmers market, concerts, etc. that could be impacted? If yes, please provide date, location and event organizers' contact info.
  - **Community events would include July celebrations at Wheeler Field in West Bolton for all of the Bolton community.**
2. Is there a "slow season" or period of time from May through October where traffic is less?
  - **LESS TRAFFIC: There would be no school/school bus traffic during school summer vacation time (the end of June through the end of August).**
  - **MORE TRAFFIC: May – October is probably a very busy season for the Beckman's Gravel Pit business located near 499 Notch Road, with customers' trucks almost exclusively using the Notch Road tunnel for access to their business.**
3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.
  - **The Bolton Notch Road tunnel provides the most expedient emergency access to all of Notch Road, Mill Brook Road, Cemetery Road, Black Fly Hill Road, Mountain View Drive, Fern Hollow Road, Bear Mountain Road and parts of Stage Road. Tunnel delays/closures would require access to these areas via RT 2 west to Jonesville, 3 miles, then onto Stage Road to access all the afore mentioned roads. Please contact the Bolton Highway Foreman if you would like precise mileages.**
  - **Emergency Responders:**  
**Fire Department: Bolton VFD responds from the RT 2 station in Bolton.**  
**Ambulance: Richmond Rescue responds from Richmond or Waterbury Ambulance responds from Waterbury**  
**Police: VT State Police responds from the Williston barracks or on the road.**
4. Where are the schools in your community and what are their schedules?  
**Schools: prek – 4<sup>th</sup> grade attend Smilie School at 2712 Theodore Rossevelt Highway (RT 2) in Bolton.**  
**Middle School – CHMS in Richmond**  
**High School – MMU in Jericho.**  
**They follow the CESU school calendar available on the CESU VT website.**
5. In the vicinity of the bridge, is there a land use pattern, existing generators of pedestrian and/or bicycle traffic, or zoning that will support development that is likely to lead to significant levels of walking and bicycling?  
**The Green Mountain Club's (GMC) confirmed re route of the Long Trail in Bolton will utilize the tunnel for all hiker traffic in this area.**
6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity?  
**Beckman's gravel pit, previously mentioned, and there may be other home based businesses as well.**
7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project?  
**Town land is located near the tunnel and as noted above, will include GMC's rerouted Long Trail.**
8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road?  
**Stage Road in Jonesville could see a huge increase in traffic, it lies within both Richmond and Bolton.**
9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain.
  - **All town highway maintenance and plowing of all the roads mentioned in question #2.**

10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM.
- **Town of Bolton Facebook page**
  - **Town of Bolton Front Porch Forum**
  - **Monthly Newsletter; The Bolton Gazette**

11. Is there a local business association, chamber of commerce or other downtown group that we should be working with?

**We have none of those entities in Bolton.**

### **Design Considerations**

1. Are there any concerns with the alignment of the existing bridge? For example, if the bridge is located on a curve, has this created any problems that we should be aware of?  
**Bridge: n/a**
2. Are there any concerns with the width of the existing bridge?  
**Bridge: n/a**  
**Tunnel: too narrow for 2 vehicles, especially for 1 vehicle and a truck coming from the gravel pit fully loaded, and too narrow for pedestrians, hiker, and bikers.**
3. What is the current level of bicycle and pedestrian use on the bridge?  
**Bridge: n/a**  
**Tunnel: school buses from MMU and CHMS drop students off to walk through the tunnel to get home, bike commuters utilize the tunnel.**
4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one?  
**Bridge: n/a**  
**Tunnel: yes the tunnel should have wide shoulders and a pedestrian/bike lane clearly marked, and perhaps even elevated**
5. Is there a need for a sidewalk or widened shoulder if one does not currently exist? Please explain.  
**Bridge: n/a**  
**Tunnel: YES, to accommodate hikers, walkers and bikers with increased safety in the tunnel.**
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?  
**Bridge: n/a**  
**Tunnel: YES!**
7. Are there any special aesthetic considerations we should be aware of?  
**No.**
8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain.  
**Bridge – no**  
**Tunnel – yes – too narrow for all the reasons stated above in #5, #4, #3, #2.**
9. Does the location have a history of flooding? If yes, please explain.  
**The area in front of as well as the tunnel were flooded during tropical storm Irene. There was no access through the tunnel during flooding.**
10. Are you aware of any nearby Hazardous Material Sites?  
**No.**
11. Are you aware of any historic, archeological and/or other environmental resource issues?  
**No.**

12. Are there any other comments you feel are important for us to consider that we have not mentioned yet?  
**The Notch Road Tunnel is a vital connector to every single road, home, and business on the north side of RT 2 in Bolton and West Bolton. Closure of any type would have an enormous negative impact on our community, not only adding increased time and distance for commuters, school buses, mail and other deliveries, for access to the recreational opportunities on Stage Road (Preston Pond Hiking trails, CRAG VT climbing areas) but particularly on businesses, for recreation and especially on all emergency access.**

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

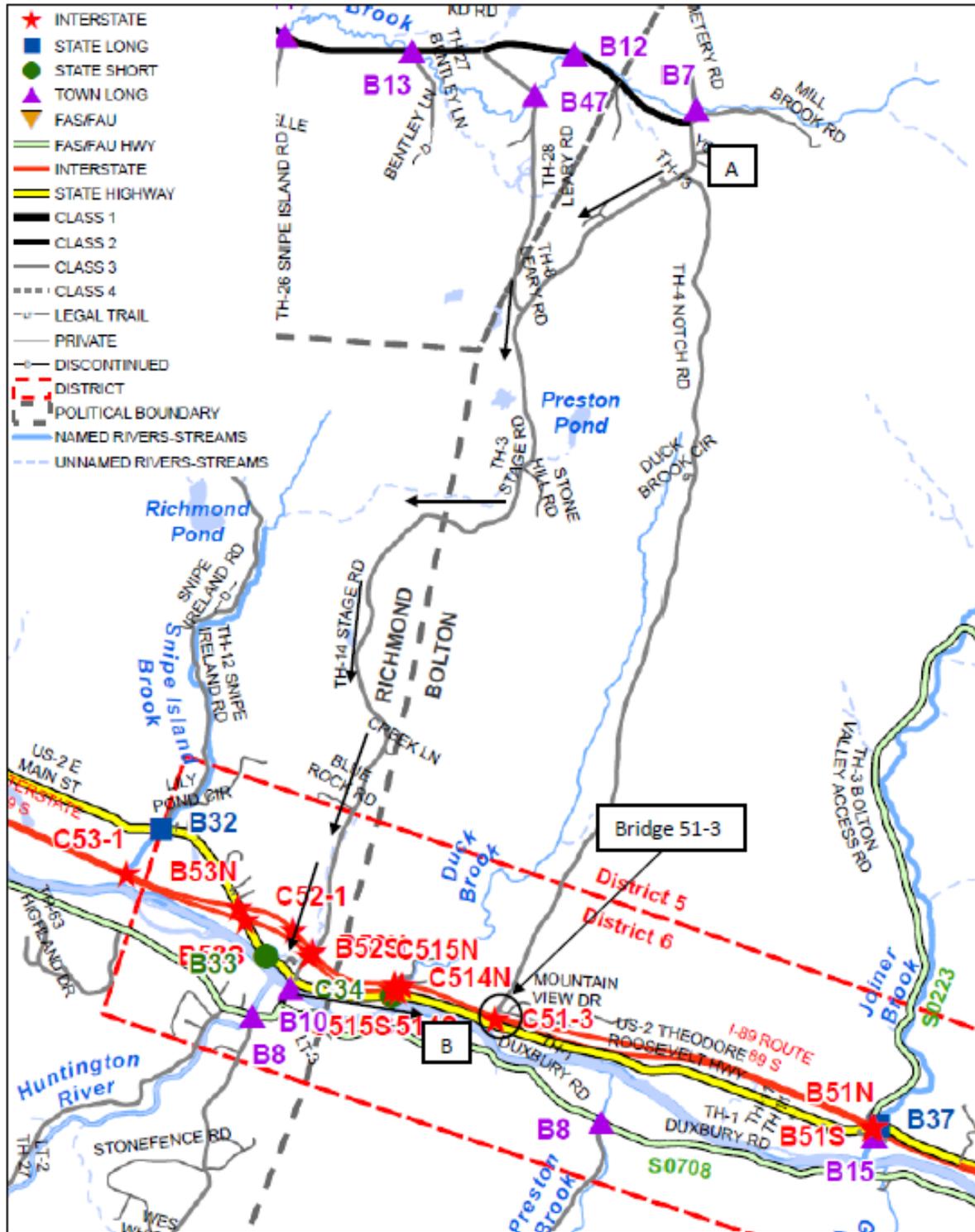
1. Does your municipal land use plan reference the bridge in question? If so please provide a copy of the applicable section or sections of the plan. **No.**
2. Please provide a copy of your existing and future land use map, if applicable.
3. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so please explain.

**Not at this time.**

4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider.

**Not at this time.**

# TH-4 Detour



## Detour Route

Notch Road, to Stage Road, US Route 2 back to Notch Road

A – B Through Route: 6.2 Miles

A – B Detour Route: 4.6 Miles

Added Miles: 1.6 Miles

End-End Distance: 10.8 Miles

# Traffic Data & Analysis

I-89 between Exits 10 and 11

Estimated Hourly Volumes for Year 2015 (Based on P6W089(13))

Threshold values: According to the 2010HCM, the maximum capacity for a two-lane highway which has been reduced to a single lane, is 1400 vehicles/hour. VTrans field data indicates that the capacity is slightly less, around 1350 vehicles/hour, if there is a crossover in place

DIRECTION NB Month May				DIRECTION NB Month Jun				DIRECTION NB Month Jul				DIRECTION NB Month Aug				DIRECTION NB Month Sep				DIRECTION NB Month Oct				DIRECTION NB Month Nov																	
Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun						
12:00 AM		12:00 AM	44	62	69	12:00 AM		12:00 AM	54	60	83	12:00 AM		12:00 AM	65	76	93	12:00 AM		12:00 AM	65	80	111	12:00 AM		12:00 AM	52	53	85	12:00 AM		12:00 AM	47	53	101	12:00 AM		12:00 AM	44	52	63
1:00 AM		1:00 AM	35	43	73	1:00 AM		1:00 AM	36	36	48	1:00 AM		1:00 AM	44	45	53	1:00 AM		1:00 AM	43	52	59	1:00 AM		1:00 AM	37	52	49	1:00 AM		1:00 AM	36	37	60	1:00 AM		1:00 AM	30	34	50
2:00 AM		2:00 AM	35	52	52	2:00 AM		2:00 AM	35	42	35	2:00 AM		2:00 AM	44	44	40	2:00 AM		2:00 AM	39	41	50	2:00 AM		2:00 AM	32	41	38	2:00 AM		2:00 AM	30	39	37	2:00 AM		2:00 AM	30	35	30
3:00 AM		3:00 AM	54	56	47	3:00 AM		3:00 AM	55	56	40	3:00 AM		3:00 AM	57	56	41	3:00 AM		3:00 AM	49	55	40	3:00 AM		3:00 AM	46	44	35	3:00 AM		3:00 AM	49	46	42	3:00 AM		3:00 AM	50	52	34
4:00 AM		4:00 AM	143	148	67	4:00 AM		4:00 AM	155	140	66	4:00 AM		4:00 AM	138	134	66	4:00 AM		4:00 AM	137	134	65	4:00 AM		4:00 AM	140	131	71	4:00 AM		4:00 AM	146	129	72	4:00 AM		4:00 AM	128	140	59
5:00 AM		5:00 AM	341	348	117	5:00 AM		5:00 AM	387	363	132	5:00 AM		5:00 AM	383	335	127	5:00 AM		5:00 AM	341	316	118	5:00 AM		5:00 AM	316	306	107	5:00 AM		5:00 AM	318	292	102	5:00 AM		5:00 AM	280	260	100
6:00 AM		6:00 AM	840	853	303	6:00 AM		6:00 AM	912	844	245	6:00 AM		6:00 AM	846	713	200	6:00 AM		6:00 AM	798	719	224	6:00 AM		6:00 AM	793	792	206	6:00 AM		6:00 AM	797	736	180	6:00 AM		6:00 AM	736	672	177
7:00 AM		7:00 AM	1180	1192	375	7:00 AM		7:00 AM	1267	1090	370	7:00 AM		7:00 AM	1137	952	290	7:00 AM		7:00 AM	1205	1074	319	7:00 AM		7:00 AM	1256	1188	296	7:00 AM		7:00 AM	1264	1148	272	7:00 AM		7:00 AM	1159	1009	266
8:00 AM		8:00 AM	856	935	492	8:00 AM		8:00 AM	976	911	511	8:00 AM		8:00 AM	923	837	466	8:00 AM		8:00 AM	1014	949	459	8:00 AM		8:00 AM	1002	957	446	8:00 AM		8:00 AM	1043	990	451	8:00 AM		8:00 AM	917	867	388
9:00 AM		9:00 AM	774	816	730	9:00 AM		9:00 AM	831	899	731	9:00 AM		9:00 AM	853	863	715	9:00 AM		9:00 AM	907	977	759	9:00 AM		9:00 AM	829	835	732	9:00 AM		9:00 AM	838	866	732	9:00 AM		9:00 AM	739	784	656
10:00 AM		10:00 AM	751	800	909	10:00 AM		10:00 AM	787	845	904	10:00 AM		10:00 AM	870	923	933	10:00 AM		10:00 AM	924	1054	1018	10:00 AM		10:00 AM	799	833	932	10:00 AM		10:00 AM	787	871	919	10:00 AM		10:00 AM	726	816	833
11:00 AM		11:00 AM	744	892	1044	11:00 AM		11:00 AM	802	960	992	11:00 AM		11:00 AM	890	1029	1093	11:00 AM		11:00 AM	949	1162	1228	11:00 AM		11:00 AM	821	908	1107	11:00 AM		11:00 AM	780	927	1089	11:00 AM		11:00 AM	729	842	985
12:00 PM		12:00 PM	781	908	1042	12:00 PM		12:00 PM	829	1038	1041	12:00 PM		12:00 PM	906	1120	1120	12:00 PM		12:00 PM	970	1191	1272	12:00 PM		12:00 PM	850	937	1102	12:00 PM		12:00 PM	814	1015	1120	12:00 PM		12:00 PM	756	916	1003
1:00 PM		1:00 PM	787	952	988	1:00 PM		1:00 PM	843	1085	1009	1:00 PM		1:00 PM	931	1176	1087	1:00 PM		1:00 PM	985	1227	1237	1:00 PM		1:00 PM	858	1035	1039	1:00 PM		1:00 PM	828	1060	1068	1:00 PM		1:00 PM	733	955	967
2:00 PM		2:00 PM	863	1071	996	2:00 PM		2:00 PM	910	1129	994	2:00 PM		2:00 PM	1020	1243	1176	2:00 PM		2:00 PM	1067	1344	1264	2:00 PM		2:00 PM	938	1149	1052	2:00 PM		2:00 PM	930	1176	1099	2:00 PM		2:00 PM	798	1020	972
3:00 PM		3:00 PM	1003	1271	965	3:00 PM		3:00 PM	1055	1292	985	3:00 PM		3:00 PM	1106	1425	1157	3:00 PM		3:00 PM	1187	1461	1269	3:00 PM		3:00 PM	1106	1352	1094	3:00 PM		3:00 PM	1111	1386	1119	3:00 PM		3:00 PM	968	1234	983
4:00 PM		4:00 PM	1189	1438	940	4:00 PM		4:00 PM	1277	1497	965	4:00 PM		4:00 PM	1316	1535	1125	4:00 PM		4:00 PM	1399	1648	1247	4:00 PM		4:00 PM	1256	1562	1064	4:00 PM		4:00 PM	1277	1591	1194	4:00 PM		4:00 PM	1164	1387	952
5:00 PM		5:00 PM	1074	1290	818	5:00 PM		5:00 PM	1151	1386	857	5:00 PM		5:00 PM	1221	1364	998	5:00 PM		5:00 PM	1374	1496	1133	5:00 PM		5:00 PM	1236	1517	999	5:00 PM		5:00 PM	1238	1539	1148	5:00 PM		5:00 PM	1067	1271	821
6:00 PM		6:00 PM	632	884	644	6:00 PM		6:00 PM	667	922	688	6:00 PM		6:00 PM	719	951	792	6:00 PM		6:00 PM	825	1093	926	6:00 PM		6:00 PM	749	1052	814	6:00 PM		6:00 PM	724	1125	876	6:00 PM		6:00 PM	582	800	597
7:00 PM		7:00 PM	432	645	518	7:00 PM		7:00 PM	441	654	544	7:00 PM		7:00 PM	481	686	651	7:00 PM		7:00 PM	538	794	730	7:00 PM		7:00 PM	464	703	648	7:00 PM		7:00 PM	430	725	627	7:00 PM		7:00 PM	352	522	428
8:00 PM		8:00 PM	329	519	402	8:00 PM		8:00 PM	355	579	455	8:00 PM		8:00 PM	383	616	566	8:00 PM		8:00 PM	436	709	592	8:00 PM		8:00 PM	325	550	508	8:00 PM		8:00 PM	306	574	482	8:00 PM		8:00 PM	277	394	348
9:00 PM		9:00 PM	256	451	290	9:00 PM		9:00 PM	269	493	381	9:00 PM		9:00 PM	326	496	441	9:00 PM		9:00 PM	361	563	463	9:00 PM		9:00 PM	229	455	387	9:00 PM		9:00 PM	227	471	332	9:00 PM		9:00 PM	214	328	252
10:00 PM		10:00 PM	149	270	192	10:00 PM		10:00 PM	172	298	266	10:00 PM		10:00 PM	221	352	302	10:00 PM		10:00 PM	223	375	342	10:00 PM		10:00 PM	150	325	279	10:00 PM		10:00 PM	150	404	244	10:00 PM		10:00 PM	140	224	178
11:00 PM		11:00 PM	83	125	127	11:00 PM		11:00 PM	95	168	145	11:00 PM		11:00 PM	126	190	168	11:00 PM		11:00 PM	124	216	190	11:00 PM		11:00 PM	84	169	147	11:00 PM		11:00 PM	81	220	140	11:00 PM		11:00 PM	73	125	110

DIRECTION SB Month May				DIRECTION SB Month Jun				DIRECTION SB Month Jul				DIRECTION SB Month Aug				DIRECTION SB Month Sep				DIRECTION SB Month Oct				DIRECTION SB Month Nov																	
Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun	Avg Vol 2015	Day	Begin Hour	Mon-Thu	Fri	Sat-Sun
12:00 AM		12:00 AM	79	99	125	12:00 AM		12:00 AM	84	99	129	12:00 AM		12:00 AM	86	102	118	12:00 AM		12:00 AM	94	99	145	12:00 AM		12:00 AM	81	109	130	12:00 AM		12:00 AM	78	108	119	12:00 AM		12:00 AM	72	91	106
1:00 AM		1:00 AM	48	53	50	1:00 AM		1:00 AM	50	52	66	1:00 AM		1:00 AM	59	61	74	1:00 AM		1:00 AM	57	67	73	1:00 AM		1:00 AM	45	57	65	1:00 AM		1:00 AM	47	67	70	1:00 AM		1:00 AM	51	62	61
2:00 AM		2:00 AM	42	47	42	2:00 AM		2:00 AM	42	62	46	2:00 AM		2:00 AM	47	45	53	2:00 AM		2:00 AM	42	53	41	2:00 AM		2:00 AM	42	49	41	2:00 AM		2:00 AM	39	52	43	2:00 AM		2:00 AM	38	54	39
3:00 AM		3:00 AM	38	47	34	3:00 AM		3:00 AM	36	43	33	3:00 AM		3:00 AM	46	49	37	3:00 AM		3:00 AM	42	46	42	3:00 AM		3:00 AM	37	46	33	3:00 AM		3:00 AM	37	44	33	3:00 AM		3:00 AM	35	49	30
4:00 AM		4:00 AM	72	72	35	4:00 AM		4:00 AM	80	82	43	4:00 AM		4:00 AM	81	99	57	4:00 AM		4:00 AM	72	75	51	4:00 AM		4:00 AM	63	72	40	4:00 AM		4:00 AM	64	70	40	4:00 AM		4:00 AM	58	78	47
5:00 AM		5:00 AM	187	182	79	5:00 AM		5:00 AM	207	185	102	5:00 AM		5:00 AM	206	192	132	5:00 AM		5:00 AM	201	192	103	5:00 AM		5:00 AM	195	195	90	5:00 AM		5:00 AM	199	200	95	5:00 AM		5:00 AM	189	191	104
6:00 AM		6:00 AM	497	517	191	6:00 AM		6:00 AM	541	519	219	6:00 AM		6:00 AM	514	499	274	6:00 AM		6:00 AM	521	471	238	6:00 AM		6:00 AM	527	523	191	6:00 AM		6:00 AM	550	550	203	6:00 AM		6:00 AM	523	476	188
7:00 AM		7:00 AM	1027	1026	355	7:00 AM		7:00 AM	1079	989	403	7:00 AM		7:00 AM	1006	918	514	7:00 AM		7:00 AM	1050	982	449	7:00 AM		7:00 AM	1039	1037	372	7:00 AM		7:00 AM	1079	1071	382	7:00 AM		7:00 AM	998	949	357
8:00 AM		8:00 AM	953	897	521	8:00 AM		8:00 AM	985	990	565	8:00 AM		8:00 AM	987	950	679	8:00 AM		8:00 AM	1067	1014</																			

HIGHWAY DIVISION

**TO:** Jonathan Griffin, Structures Project Manager

**FROM:** Maureen Carr, Traffic Analysis Engineer *MC*  
 Alex Flinn, Rotation Engineer

**DATE:** November 30, 2016

**RE:** Bolton IM 089-2(45) Revision 1  
 US 2, TH4, BR #51-3

Per your request on October 31, 2016, we have analyzed the existing box culvert on TH4 as a two-directional, one-way bridge using Synchro 9 software. The traffic control for the one-way bridge was modeled using signals; however the phasing and timings were used to simulate traffic conditions as if the bridge was all-way stop controlled. Traffic volumes used in the analysis were provided from a 2013 turning movement count and DHV calculations.

	50th Percentile Queue Length (ft.)	95th Percentile Queue Length (ft.)	Approach Delay (s)
<i>Southbound approach (Notch Rd towards US2)</i>	3	14	15.1
<i>Northbound approach (US 2 towards Notch Rd)</i>	11	30	12.6

If you have any questions, or if further information is needed, please call at 793-4443.

CC: Data Analysis Files

Lanes, Volumes, Timings

1: US 2 and TH 4 (Notch Rd)

11/30/2016



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↔		↘	↘
Traffic Volume (vph)	37	135	153	19	2	6
Future Volume (vph)	37	135	153	19	2	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.985		0.895	
Flt Protected		0.989			0.989	
Satd. Flow (prot)	0	1842	1835	0	1649	0
Flt Permitted		0.989			0.989	
Satd. Flow (perm)	0	1842	1835	0	1649	0
Link Speed (mph)		50	50		25	
Link Distance (ft)		350	343		89	
Travel Time (s)		4.8	4.7		2.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	147	166	21	2	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	187	187	0	9	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	31.7%
Analysis Period (min)	15
	ICU Level of Service A

Lanes, Volumes, Timings

5: TH4 (Notch Rd) and Dummy Link (North of culvert)

11/30/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations				↑	↑		
Traffic Volume (vph)	0	0	0	56	14	0	
Future Volume (vph)	0	0	0	56	14	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frts							
Flt Protected							
Satd. Flow (prot)	0	0	0	1863	1863	0	
Flt Permitted							
Satd. Flow (perm)	0	0	0	1863	1863	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	25			25	25		
Link Distance (ft)	281			251	157		
Travel Time (s)	7.7			6.8	4.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	0	0	61	15	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	0	61	15	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	.16			.16	.16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type				NA	NA		
Protected Phases				Free	1	2	
Permitted Phases							
Minimum Split (s)					17.0	17.0	
Total Split (s)					18.0	22.0	
Total Split (%)					45.0%	55%	
Maximum Green (s)					6.0	10.0	
Yellow Time (s)					4.0	4.0	
All-Red Time (s)					8.0	8.0	
Lost Time Adjust (s)					0.0		
Total Lost Time (s)					12.0		
Lead/Lag					Lead	Lag	
Lead-Lag Optimize?					Yes	Yes	
Act Effct Green (s)				40.0	6.0		
Actuated g/C Ratio				1.00	0.15		
v/c Ratio				0.03	0.05		
Control Delay				0.0	15.1		
Queue Delay				0.0	0.0		
Total Delay				0.0	15.1		
LOS				A	B		
Approach Delay					15.1		
Approach LOS					B		

Lanes, Volumes, Timings

5:

11/30/2016



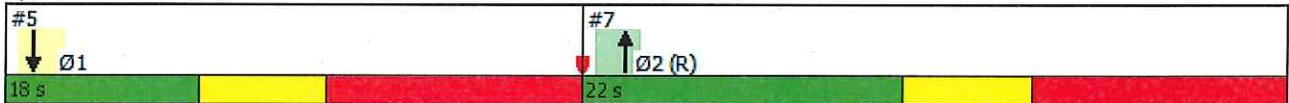
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Queue Length 50th (ft)				0	3		
Queue Length 95th (ft)				0	14		
Internal Link Dist (ft)	201			171	77		
Turn Bay Length (ft)							
Base Capacity (vph)				1863	279		
Starvation Cap Reductn				0	0		
Spillback Cap Reductn				0	0		
Storage Cap Reductn				0	0		
Reduced v/c Ratio				0.03	0.05		

Intersection Summary

Area Type: Other  
 Cycle Length: 40  
 Actuated Cycle Length: 40  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Green  
 Natural Cycle: 40  
 Control Type: Pretimed  
 Maximum v/c Ratio: 0.13  
 Intersection Signal Delay: 3.0  
 Intersection Capacity Utilization 14.2%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 5:



Lanes, Volumes, Timings

7: TH 4 (Notch Rd) and Dummy Lnk (south of culvert)

11/30/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1
Lane Configurations				↑	↑		
Traffic Volume (vph)	0	0	0	56	14	0	
Future Volume (vph)	0	0	0	56	14	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	0	0	0	1863	1863	0	
Flt Permitted							
Satd. Flow (perm)	0	0	0	1863	1863	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	30			25	25		
Link Distance (ft)	185			89	251		
Travel Time (s)	4.2			2.4	6.8		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	0	0	61	15	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	0	61	15	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type				NA	NA		
Protected Phases				2	Free	1	
Permitted Phases							
Minimum Split (s)				17.0		17.0	
Total Split (s)				22.0		18.0	
Total Split (%)				55.0%		45%	
Maximum Green (s)				10.0		6.0	
Yellow Time (s)				4.0		4.0	
All-Red Time (s)				8.0		8.0	
Lost Time Adjust (s)				0.0			
Total Lost Time (s)				12.0			
Lead/Lag				Lag		Lead	
Lead-Lag Optimize?				Yes		Yes	
Act Effct Green (s)				10.0	40.0		
Actuated g/C Ratio				0.25	1.00		
v/c Ratio				0.13	0.01		
Control Delay				12.6	0.0		
Queue Delay				0.0	0.0		
Total Delay				12.6	0.0		
LOS				B	A		
Approach Delay				12.6			
Approach LOS				B			

Lanes, Volumes, Timings

7:

11/30/2016



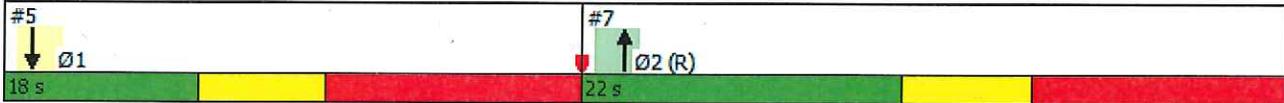
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1
Queue Length 50th (ft)				11	1		
Queue Length 95th (ft)				30	0		
Internal Link Dist (ft)	105			9	171		
Turn Bay Length (ft)							
Base Capacity (vph)				465	1863		
Starvation Cap Reductn				0	0		
Spillback Cap Reductn				0	0		
Storage Cap Reductn				0	0		
Reduced v/c Ratio				0.13	0.01		

Intersection Summary

Area Type: Other  
 Cycle Length: 40  
 Actuated Cycle Length: 40  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Green  
 Natural Cycle: 40  
 Control Type: Pretimed  
 Maximum v/c Ratio: 0.13  
 Intersection Signal Delay: 10.1  
 Intersection Capacity Utilization 14.2%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 7:



VTrans  
Highway Division

Counter: T12-333  
Counted by: C Philbrook  
Weather: Sunny  
Town: 2-13.25 Bolton

File Name : 2-13\_25merged13  
Site Code : 30401703  
Start Date : 9/19/2013  
Page No : 1

Groups Printed- Auto - Medium - Heavy

Start Time	Bolton Notch Rd from Stage Rd From North				US 2 from Waterbury From East				From South				US 2 from Richmond From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00 AM	3	0	1	0	0	11	0	0	0	0	0	0	0	6	0	0	21
06:15 AM	2	0	1	0	1	31	0	0	0	0	0	0	0	15	0	0	50
06:30 AM	4	0	1	0	3	18	0	0	0	0	0	0	0	19	0	0	45
06:45 AM	5	0	3	0	2	17	0	0	0	0	0	0	0	19	0	0	46
Total	14	0	6	0	6	77	0	0	0	0	0	0	0	59	0	0	162
07:00 AM	6	0	3	0	2	31	0	0	0	0	0	0	0	24	0	0	66
07:15 AM	8	0	14	0	2	33	0	0	0	0	0	0	0	29	3	0	89
07:30 AM	8	0	5	0	3	39	0	0	0	0	0	0	0	27	2	0	84
07:45 AM	7	0	1	0	1	32	0	0	0	0	0	0	0	27	2	0	70
Total	29	0	23	0	8	135	0	0	0	0	0	0	0	107	7	0	309
08:00 AM	5	0	3	0	0	20	0	0	0	0	0	0	0	25	5	0	58
08:15 AM	6	0	2	0	4	18	0	0	0	0	0	0	0	14	3	0	47
08:30 AM	8	0	3	0	2	21	0	0	0	0	0	0	0	19	4	0	57
08:45 AM	1	0	2	0	1	16	0	0	0	0	0	0	0	16	3	0	39
Total	20	0	10	0	7	75	0	0	0	0	0	0	0	74	15	0	201
09:00 AM	0	0	0	0	0	10	0	0	0	0	0	0	0	13	2	0	25
09:15 AM	3	0	1	0	0	17	0	0	0	0	0	0	0	12	1	0	34
09:30 AM	1	0	2	0	3	13	0	0	0	0	0	0	0	19	1	0	39
09:45 AM	2	0	1	0	2	18	0	0	0	0	0	0	0	18	2	0	43
Total	6	0	4	0	5	58	0	0	0	0	0	0	0	62	6	0	141
10:00 AM	2	0	4	0	3	16	0	0	0	0	0	0	0	16	2	0	43
10:15 AM	1	0	8	1	2	18	0	0	0	0	0	0	0	20	2	0	52
10:30 AM	4	0	0	0	2	18	0	0	0	0	0	0	0	12	1	0	37
10:45 AM	2	0	0	0	5	27	0	0	0	0	0	0	0	22	1	0	57
Total	9	0	12	1	12	79	0	0	0	0	0	0	0	70	6	0	189
11:00 AM	2	0	0	0	5	8	0	0	0	0	0	0	0	20	2	0	37
11:15 AM	2	0	4	0	1	15	0	0	0	0	0	0	0	20	3	0	45
11:30 AM	1	0	3	0	1	11	0	0	0	0	0	0	0	17	4	0	37
11:45 AM	2	0	2	0	2	25	0	0	0	0	0	0	0	34	3	0	68
Total	7	0	9	0	9	59	0	0	0	0	0	0	0	91	12	0	187
12:00 PM	0	0	1	0	1	14	0	0	0	0	0	0	0	16	4	0	36
12:15 PM	3	0	0	0	5	22	0	0	0	0	0	0	0	12	3	0	45
12:30 PM	1	0	1	0	1	14	0	0	0	0	0	0	0	14	0	0	31
12:45 PM	4	0	3	0	0	24	0	0	0	0	0	0	0	17	3	0	51
Total	8	0	5	0	7	74	0	0	0	0	0	0	0	59	10	0	163
01:00 PM	4	0	1	0	0	11	0	0	0	0	0	0	0	13	4	0	33
01:15 PM	3	0	0	0	2	17	0	0	0	0	0	0	0	26	4	0	52
01:30 PM	5	0	0	0	0	16	0	0	0	0	0	0	0	30	0	0	51
01:45 PM	1	0	1	0	2	17	0	0	0	0	0	0	0	23	2	0	46
Total	13	0	2	0	4	61	0	0	0	0	0	0	0	92	10	0	182
02:00 PM	3	0	4	0	5	26	0	0	0	0	0	0	0	14	4	0	56
02:15 PM	0	0	3	0	1	24	0	0	0	0	0	0	0	18	0	0	46
02:30 PM	0	0	4	0	2	24	0	0	0	0	0	0	0	16	0	0	46
02:45 PM	0	0	0	0	1	33	0	0	0	0	0	0	0	21	5	0	60
Total	3	0	11	0	9	107	0	0	0	0	0	0	0	69	9	0	208
03:00 PM	0	0	2	0	1	32	0	0	0	0	0	0	0	21	3	0	59

VTrans  
Highway Division

Counter: T12-333  
Counted by: C Philbrook  
Weather: Sunny  
Town: 2-13.25 Bolton

File Name : 2-13\_25merged13  
Site Code : 30401703  
Start Date : 9/19/2013  
Page No : 2

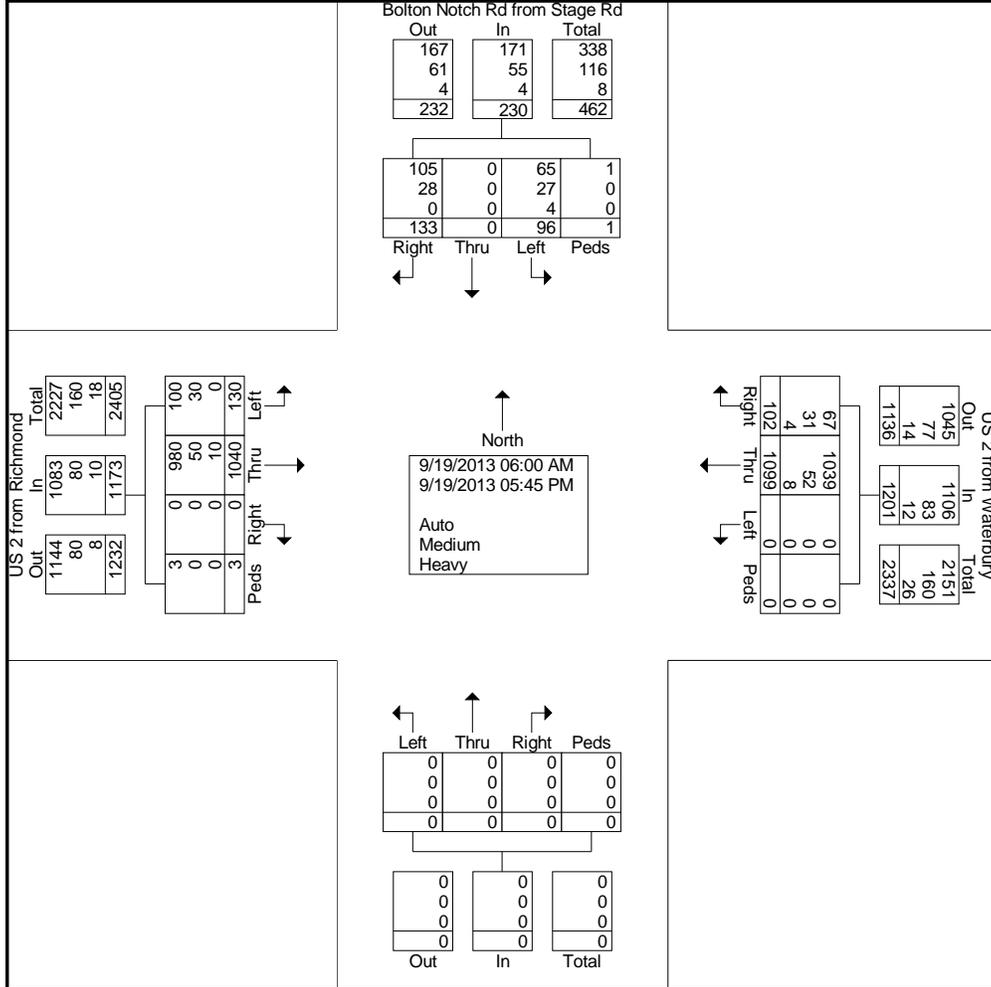
Groups Printed- Auto - Medium - Heavy

Start Time	Bolton Notch Rd from Stage Rd From North				US 2 from Waterbury From East				From South				US 2 from Richmond From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:15 PM	1	0	1	0	4	30	0	0	0	0	0	0	0	22	2	0	60
03:30 PM	5	0	3	0	2	22	0	0	0	0	0	0	0	19	5	0	56
03:45 PM	1	0	2	0	4	26	0	0	0	0	0	0	0	39	1	0	73
Total	7	0	8	0	11	110	0	0	0	0	0	0	0	101	11	0	248
04:00 PM	1	0	0	0	0	20	0	0	0	0	0	0	0	30	3	3	57
04:15 PM	2	0	3	0	3	34	0	0	0	0	0	0	0	29	2	0	73
04:30 PM	1	0	1	0	2	46	0	0	0	0	0	0	0	28	3	0	81
04:45 PM	1	0	1	0	2	40	0	0	0	0	0	0	0	29	7	0	80
Total	5	0	5	0	7	140	0	0	0	0	0	0	0	116	15	3	291
05:00 PM	2	0	0	0	2	37	0	0	0	0	0	0	0	41	3	0	85
05:15 PM	2	0	0	0	5	30	0	0	0	0	0	0	0	37	9	0	83
05:30 PM	2	0	0	0	5	30	0	0	0	0	0	0	0	23	10	0	70
05:45 PM	6	0	1	0	5	27	0	0	0	0	0	0	0	39	7	0	85
Total	12	0	1	0	17	124	0	0	0	0	0	0	0	140	29	0	323
Grand Total	133	0	96	1	102	1099	0	0	0	0	0	0	0	1040	130	3	2604
Apprch %	57.8	0	41.7	0.4	8.5	91.5	0	0	0	0	0	0	0	88.7	11.1	0.3	
Total %	5.1	0	3.7	0	3.9	42.2	0	0	0	0	0	0	0	39.9	5	0.1	
Auto	105	0	65	1	67	1039	0	0	0	0	0	0	0	980	100	3	2360
% Auto	78.9	0	67.7	100	65.7	94.5	0	0	0	0	0	0	0	94.2	76.9	100	90.6
Medium	28	0	27	0	31	52	0	0	0	0	0	0	0	50	30	0	218
% Medium	21.1	0	28.1	0	30.4	4.7	0	0	0	0	0	0	0	4.8	23.1	0	8.4
Heavy	0	0	4	0	4	8	0	0	0	0	0	0	0	10	0	0	26
% Heavy	0	0	4.2	0	3.9	0.7	0	0	0	0	0	0	0	1	0	0	1

# VTrans Highway Division

Counter: T12-333  
 Counted by: C Philbrook  
 Weather: Sunny  
 Town: 2-13.25 Bolton

File Name : 2-13\_25merged13  
 Site Code : 30401703  
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 Page No : 3

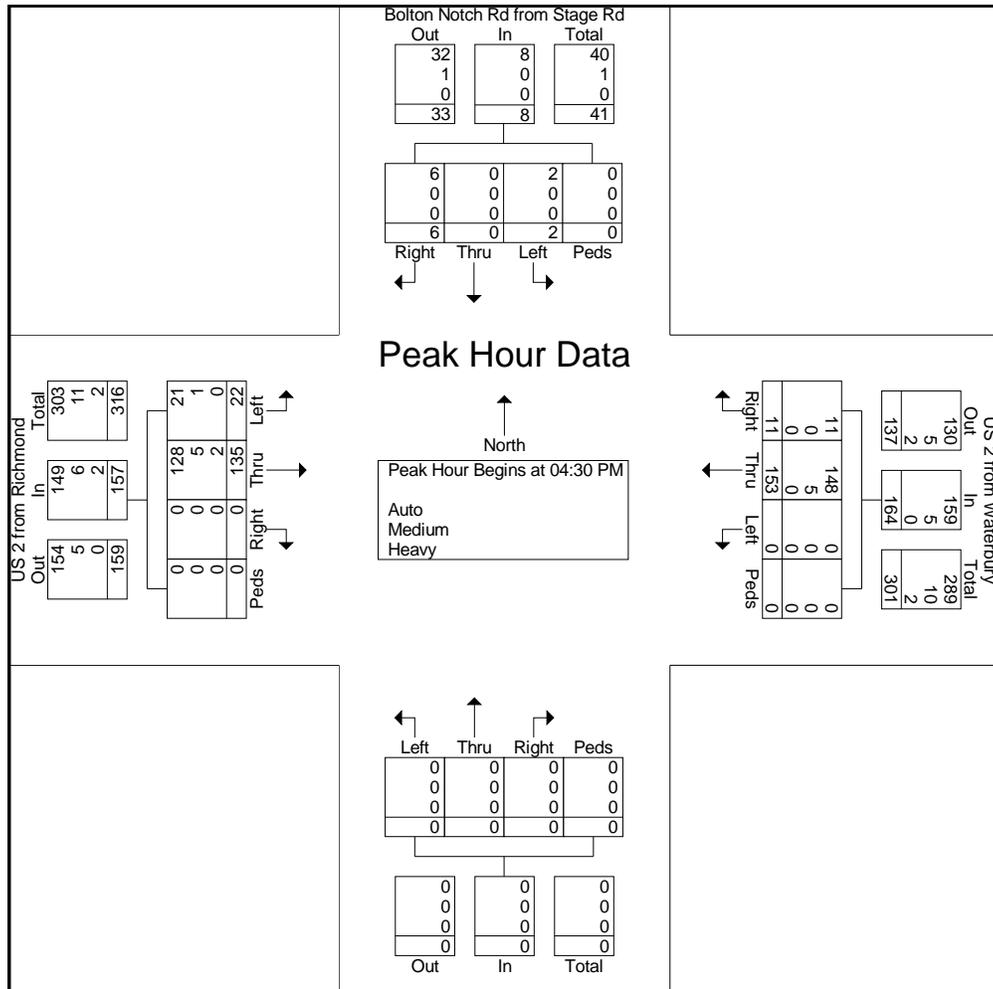


# VTrans Highway Division

Counter: T12-333  
 Counted by: C Philbrook  
 Weather: Sunny  
 Town: 2-13.25 Bolton

File Name : 2-13\_25merged13  
 Site Code : 30401703  
 Start Date : 9/19/2013  
 Page No : 4

Start Time	Bolton Notch Rd from Stage Rd From North					US 2 from Waterbury From East					From South					US 2 from Richmond From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 06:00 AM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	1	0	1	0	2	2	46	0	0	48	0	0	0	0	0	0	28	3	0	31	81
04:45 PM	1	0	1	0	2	2	40	0	0	42	0	0	0	0	0	0	29	7	0	36	80
05:00 PM	2	0	0	0	2	2	37	0	0	39	0	0	0	0	0	0	41	3	0	44	85
05:15 PM	2	0	0	0	2	5	30	0	0	35	0	0	0	0	0	0	37	9	0	46	83
Total Volume	6	0	2	0	8	11	153	0	0	164	0	0	0	0	0	0	135	22	0	157	329
% App. Total	75	0	25	0		6.7	93.3	0	0		0	0	0	0		0	86	14	0		
PHF	.750	.000	.500	.000	1.00	.550	.832	.000	.000	.854	.000	.000	.000	.000	.000	.000	.823	.611	.000	.853	.968
Auto	6	0	2	0	8	11	148	0	0	159	0	0	0	0	0	0	128	21	0	149	316
% Auto	100	0	100	0	100	100	96.7	0	0	97.0	0	0	0	0	0	0	94.8	95.5	0	94.9	96.0
Medium	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	5	1	0	6	11
% Medium																					
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
% Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	1.3	0.6



# **Traffic Safety Engineer's Findings**

**From:** [Dupigny-Giroux Mario](#)  
**To:** [Griffin, Jonathan](#)  
**Subject:** RE: Bolton IM 089-2(45)  
**Date:** Monday, November 07, 2016 2:15:20 PM  
**Attachments:** [image001.png](#)  
[Notch Road signs.pdf](#)

---

Good Afternoon Jon,

I visited the underpass at Notch Road in Bolton and offer the following based on the one-way road conversion that you discussed with me.

Below are some general safety measures to consider:

- Currently, the duration that the flashing beacons flash to indicate the presence of pedestrians in the underpass is too long. The beacons continue to flash for several minutes after pedestrians are no longer in the tunnel. The unnecessary flashing could reduce the effectiveness of these traffic control devices if familiar motorists, who have seen the beacons flash but no pedestrians in the tunnel, start ignoring them. The length of time the beacons flash once a pedestrian pushes the button should be adjusted.
- Lighting should be provided in the underpass.
- To reduce the stacking of vehicles on the northbound approach between the underpass and US 2 if a signal was used to control traffic, the green interval should dwell on the northbound approach. It would switch when a vehicle is detected on the south approach.
- If a sidewalk is constructed, a railing should be provided on the sidewalk to serve as a buffer between the vehicles and the pedestrians.
- With either a traffic signal or a stop sign, if motorists having difficulty to stop during winter conditions due to the steep hill on the southbound approach is a concern, a High Friction Surface Treatment (HFST) could be installed in the southbound lane for a length of 500 to 1000 ft.

With a one lane road conversion, the placement and order of the traffic control devices on the southbound approach could go like this:

With a traffic signal, assuming that the signal heads would be mounted on a pedestal on each side of the abutments, the stop bar and Stop Here on Red sign could be 40 ft north of the abutments (as per the MUTCD, the signal heads have to be at least 40 ft from the stop bar). A low clearance sign would have to be installed between the stop sign and Mountain View Road. Because the distance between the two signs would be less than 200 ft, it would be better for the Low Clearance sign to be installed on the bridge (using the W12-2a rectangular version). Then there would be a Signal Ahead sign that could be located 500 ft from the stop bar and be supplemented with a 500 ft distance plaque underneath. A One Lane Road sign could be installed a thousand feet from the stop bar.

If Stop control is preferred, the sequence of signs would be the same. The Stop sign would replace the Stop Here on Red sign and the Stop Ahead sign would replace the Signal Ahead sign. A One Lane Road sign would be installed a thousand feet away from the underpass. As before, the Low Clearance sign would be better installed on the bridge.

The northbound approach is more challenging due to the limited space between the underpass and US 2. The placement of the control devices could be like this:

If feasible, placing the two signal heads on the bridge would maximize the space available compared to placing the signal heads next to the abutments. While the 40 ft distance available from the signal head to the stop bar would be closer to the underpass with both signal heads located on the bridge, the remaining distance between the abutment and the stop bar would not be sufficient to serve as a transition to shift into the one lane road. The stop bar will have to be set back more.

If the Low Clearance sign is left at its current location, the Stop Here on Red sign would be too close to it and would most likely hide it. Maybe one possible arrangement would be to have only one signal head on the bridge and one next to the left hand side abutment. This could give some space to install a Low Clearance sign on the bridge. Using a horizontal signal face section on the bridge in this case may make this more feasible.

Under a stop control situation, the location of the stop bar on the northbound approach would most likely be at the same location as if a traffic signal was installed. The stop sign would be at the stop bar and the Low Clearance sign would be installed on the bridge.

Additionally, some advanced warning signs could be installed on US 2 in both directions since the distance to the stopping point would be very short. Depending on the traffic control device use, a Stop Ahead sign or a Signal Ahead sign could be used in combination with a One Lane Road sign. Each of these assemblies would be supplemented with an arrow sign (W16-6p) below the to warn that the condition is on the side road.

Attached are some sketches to illustrate the placement of the signs.

I reviewed the crash data for the 2010 crash reporting period to now and did not find any crashes at this location.

Let me know if you have any questions or if I can be of further assistance.

---

**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@vermont.gov](mailto:mario.dupigny-giroux@vermont.gov)



---

**From:** Griffin, Jonathan

**Sent:** Monday, October 31, 2016 3:36 PM

**To:** Dupigny-Giroux Mario

**Subject:** Bolton IM 089-2(45)

Hi Mario,

The EA is below:

0892045 001 - BOLTON IM 089-2(45)

If you need anything please let me know.

Thanks,

Jon

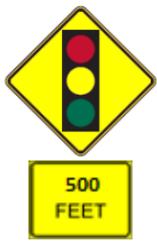


Northbound Approach with Signal

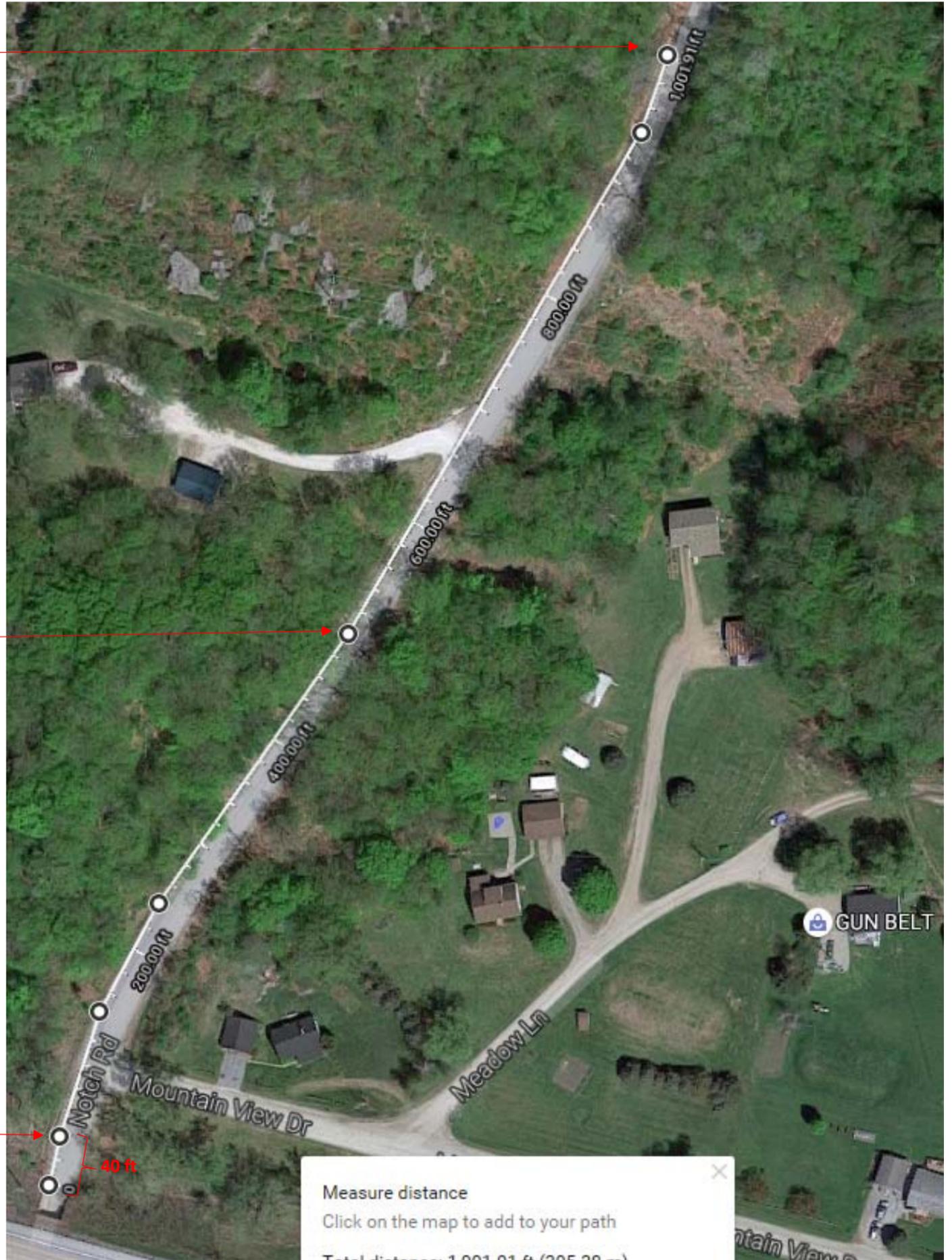


Southbound Approach with Signal





Install a stop bar  
40 ft from the  
abutment



# Plans

REVIEWERS NOTES:

1:

# STATE OF VERMONT AGENCY OF TRANSPORTATION



## PROPOSED IMPROVEMENT BRIDGE PROJECT

TOWN OF BOLTON  
COUNTY OF CHITTENDEN

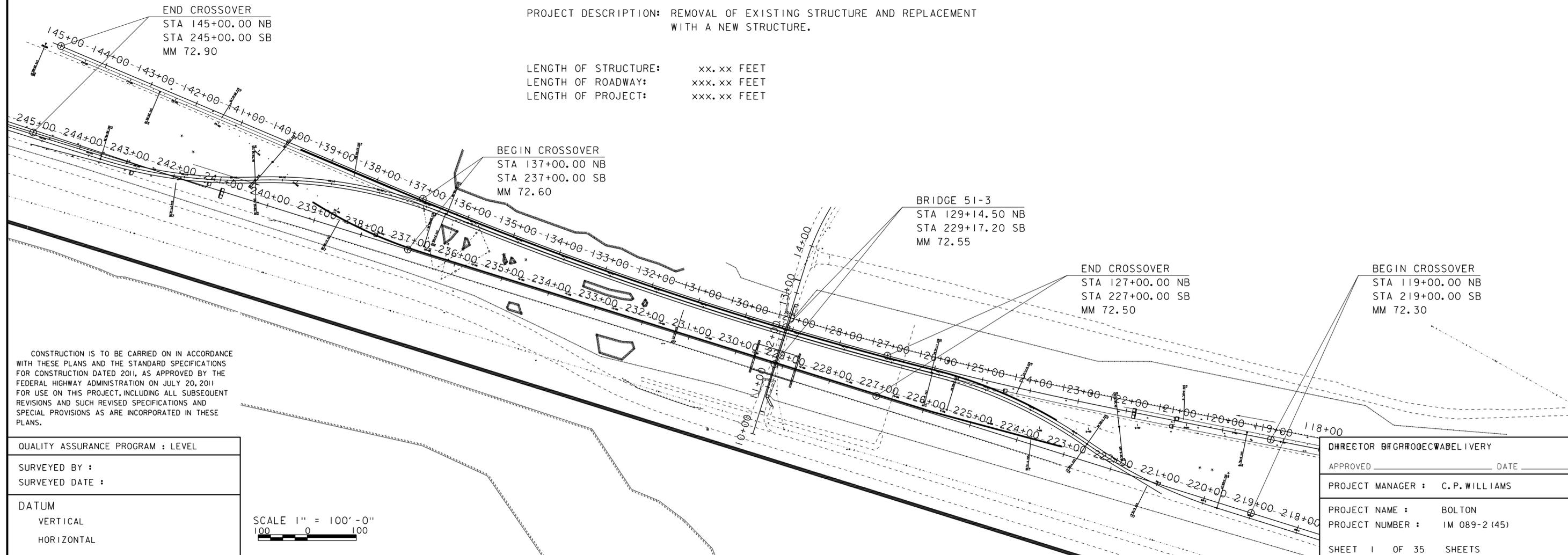
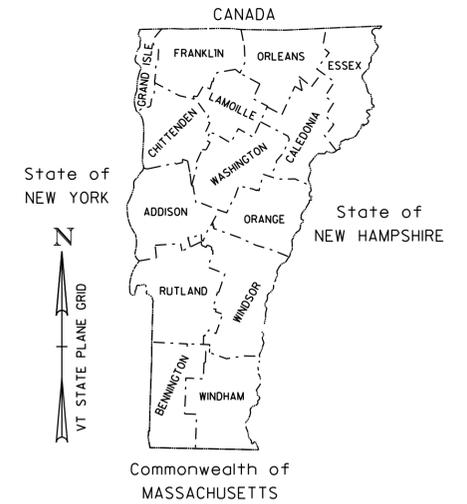
ROUTE NO : 1-89, RURAL PRINCIPAL ARTERIAL

BRIDGE NO : 51-3

PROJECT LOCATION: OVER TH-4, APPROXIMATELY 25 FEET NORTH OF THE INTERSECTION OF TH-4 AND US-2

PROJECT DESCRIPTION: REMOVAL OF EXISTING STRUCTURE AND REPLACEMENT WITH A NEW STRUCTURE.

LENGTH OF STRUCTURE: xx.xx FEET  
LENGTH OF ROADWAY: xxx.xx FEET  
LENGTH OF PROJECT: xxx.xx FEET

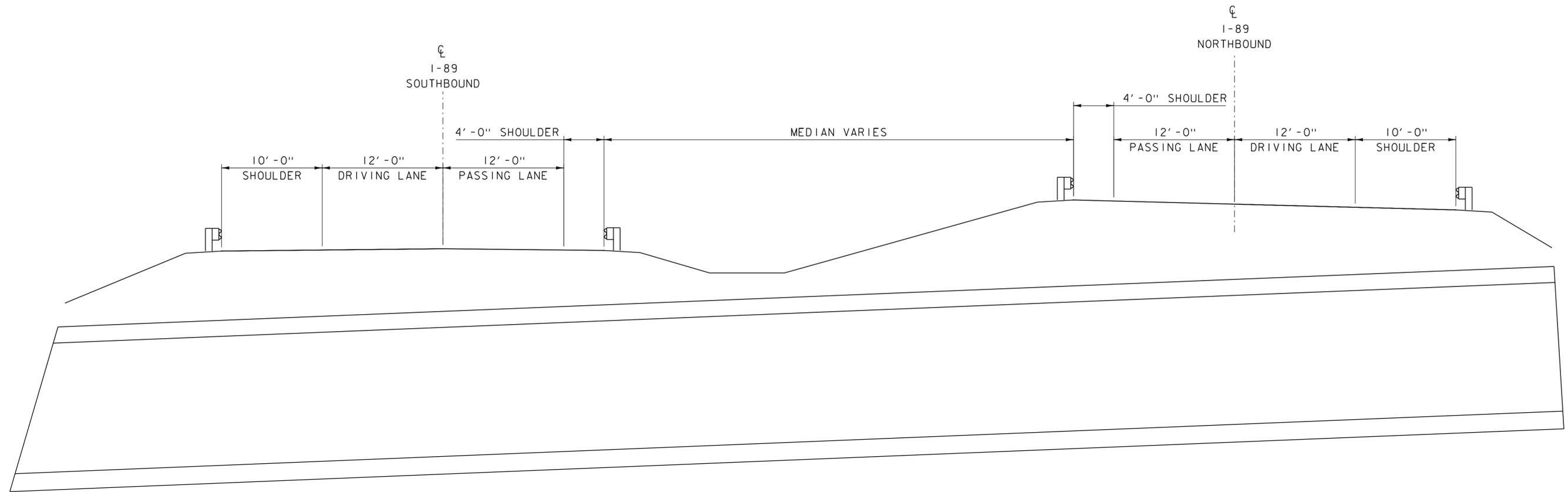


CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON JULY 20, 2011 FOR USE ON THIS PROJECT, INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

QUALITY ASSURANCE PROGRAM : LEVEL
SURVEYED BY :
SURVEYED DATE :
DATUM
VERTICAL
HORIZONTAL

SCALE 1" = 100'-0"  
100 0 100

DIRECTOR #RGR00ECWABELIVERY	
APPROVED _____	DATE _____
PROJECT MANAGER : C.P.WILLIAMS	
PROJECT NAME :	BOLTON
PROJECT NUMBER :	1M 089-2 (45)
SHEET 1 OF 35 SHEETS	

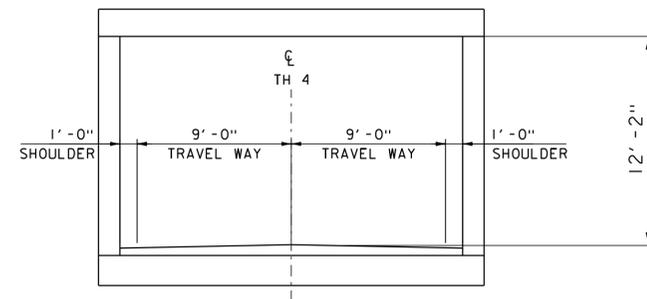


I-89 SOUTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"

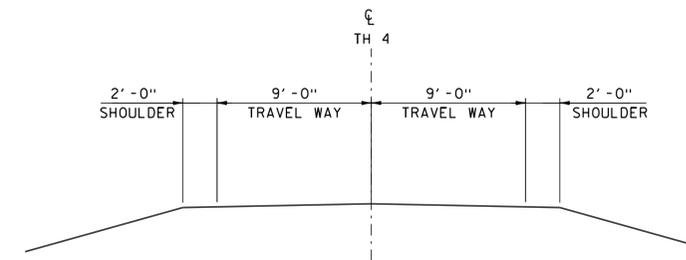
I-89 NORTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"



TH-4 EXISTING TYPICAL SECTION THROUGH CULVERT

SCALE: 1/4" = 1'-0"



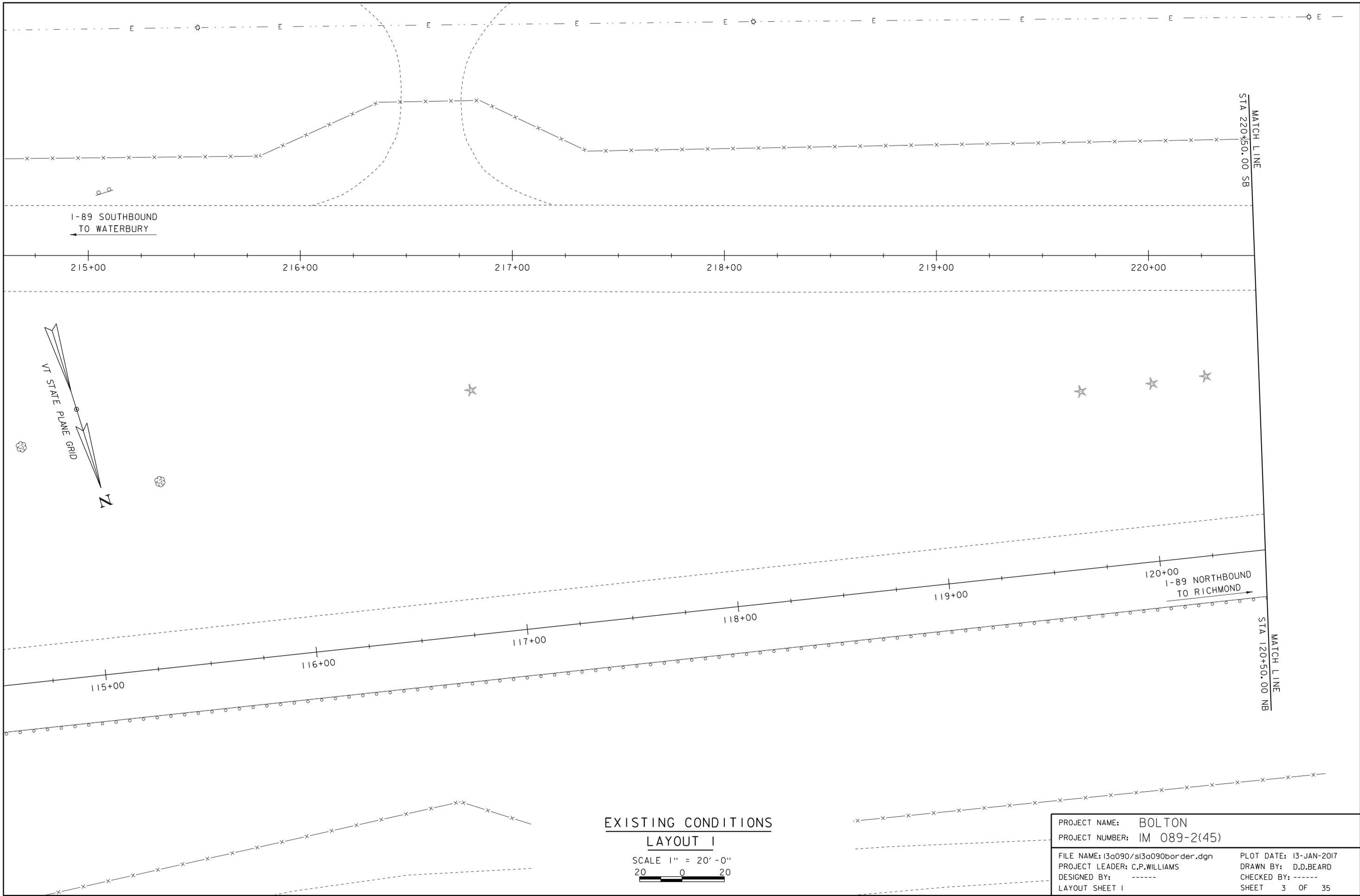
TH-4 TYPICAL ROADWAY SECTION

SCALE: 1/4" = 1'-0"

PROJECT NAME: BOLTON  
PROJECT NUMBER: IM 089-2(45)

FILE NAME: I3a090/sl3a090+yp.dgn  
PROJECT LEADER: C.P.WILLIAMS  
DESIGNED BY: L.J.STONE  
EXISTING TYPICAL SECTIONS

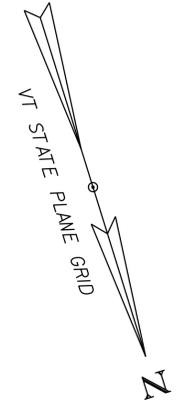
PLOT DATE: 13-JAN-2017  
DRAWN BY: L.J.STONE  
CHECKED BY: -----  
SHEET 2 OF 35



I-89 SOUTHBOUND  
TO WATERBURY

215+00 216+00 217+00 218+00 219+00 220+00

MATCH LINE  
STA 220+50.00 SB



120+00  
I-89 NORTHBOUND  
TO RICHMOND

115+00 116+00 117+00 118+00 119+00

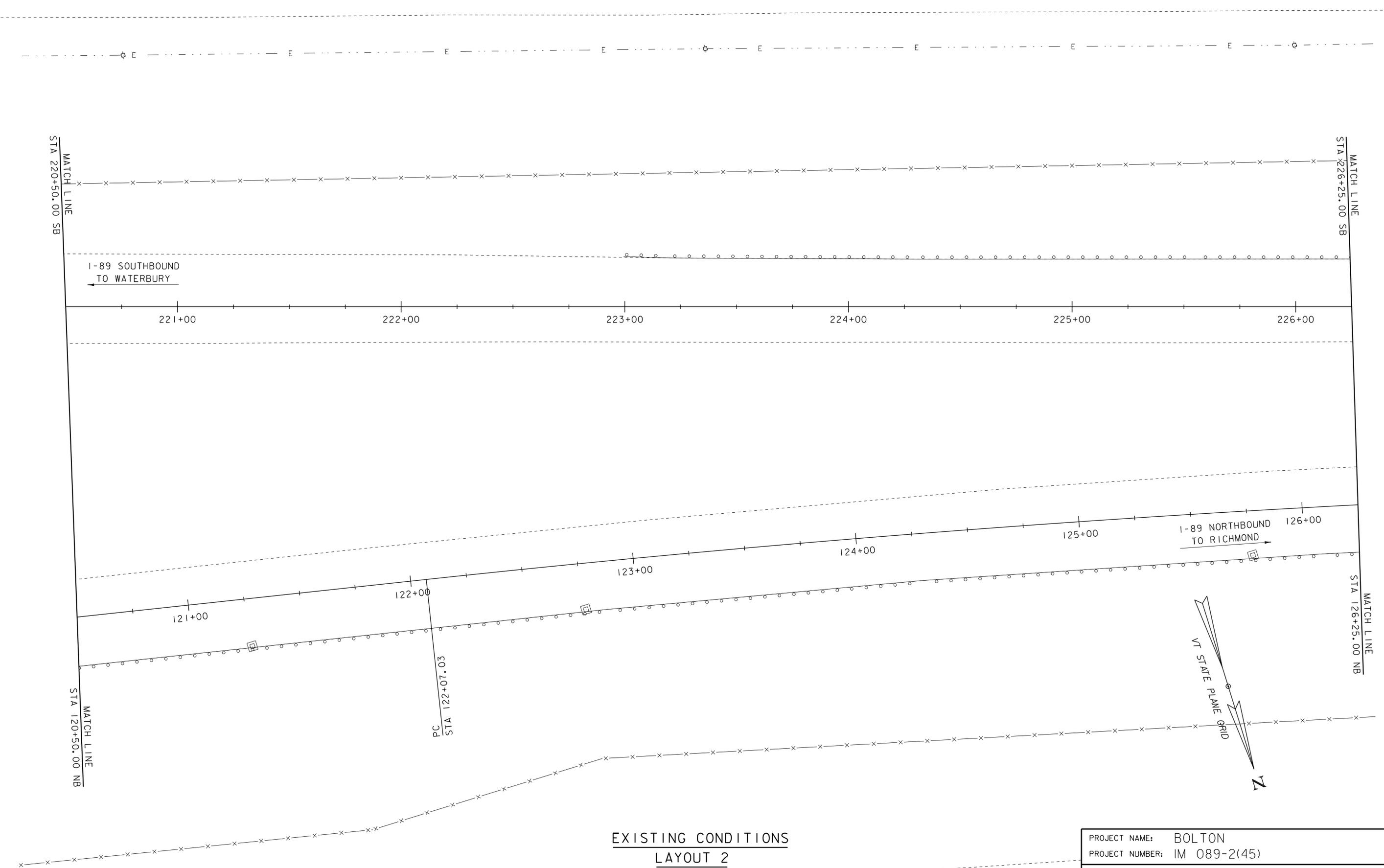
MATCH LINE  
STA 120+50.00 NB

**EXISTING CONDITIONS**

**LAYOUT 1**

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	LAYOUT SHEET 1
DESIGNED BY: -----	SHEET 3 OF 35



**EXISTING CONDITIONS**

**LAYOUT 2**

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 4 OF 35
DESIGNED BY: -----	LAYOUT SHEET 2

NECR

HISTORIC DIST

EXISTING R.O.W. (APPROX.)

US ROUTE 2  
TO WATERBURY

POB  
STA 10+00.00

US ROUTE 2  
TO RICHMOND

STA 226+25.00 SB  
MATCH LINE

STA 232+00.00 SB  
MATCH LINE

I-89 SOUTHBOUND  
TO WATERBURY

36" X 228' ACCCGMP  
FLOW

PI  
STA 129+88.33

I-89 NORTHBOUND  
TO RICHMOND

STA 126+25.00 NB  
MATCH LINE

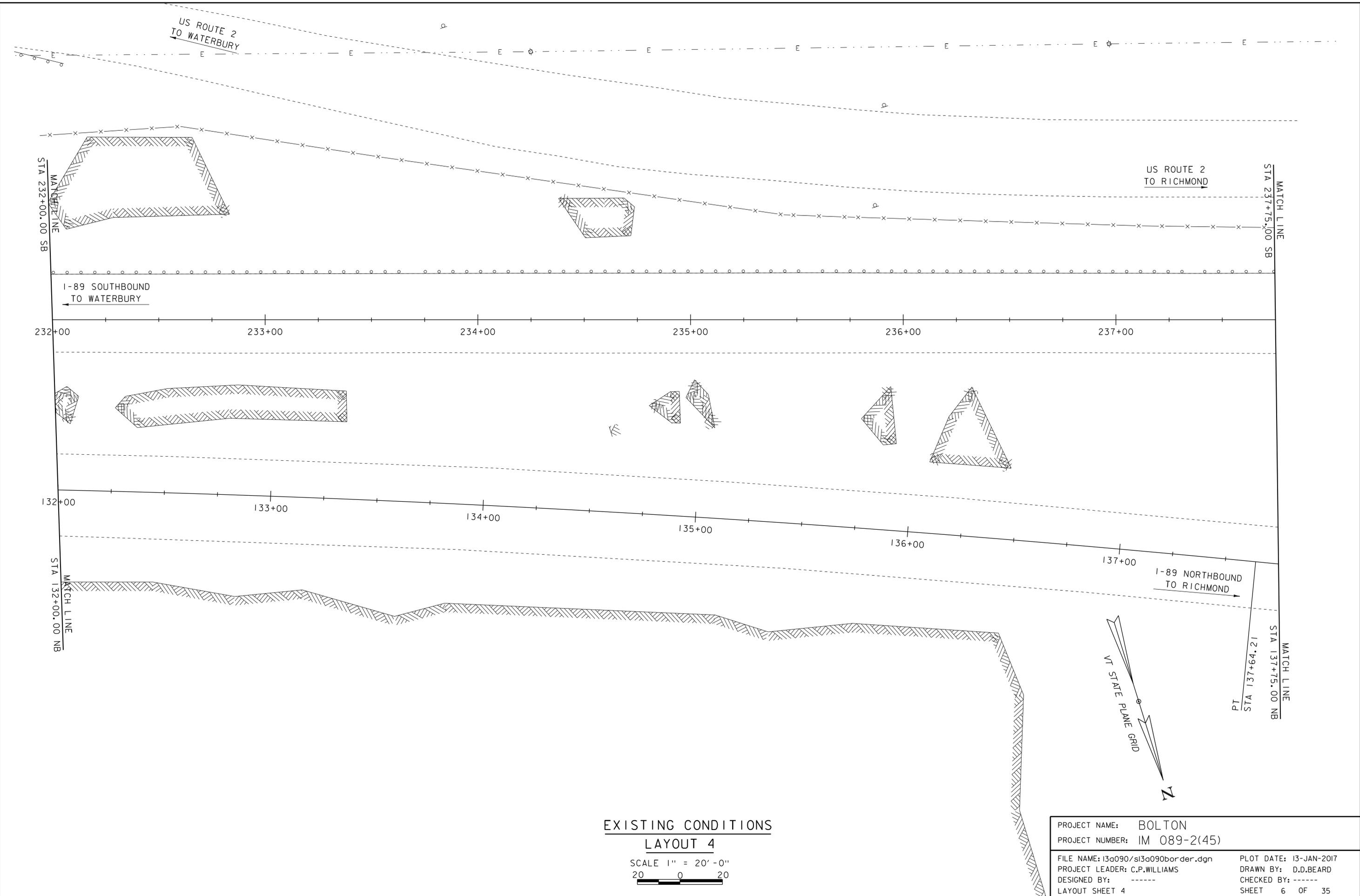
STA 132+00.00 NB  
MATCH LINE

EXISTING CONDITIONS LAYOUT 3

MATCH LINE  
STA 13+25.00  
LAYOUT 6

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	LAYOUT SHEET 3
DESIGNED BY: -----	SHEET 5 OF 35

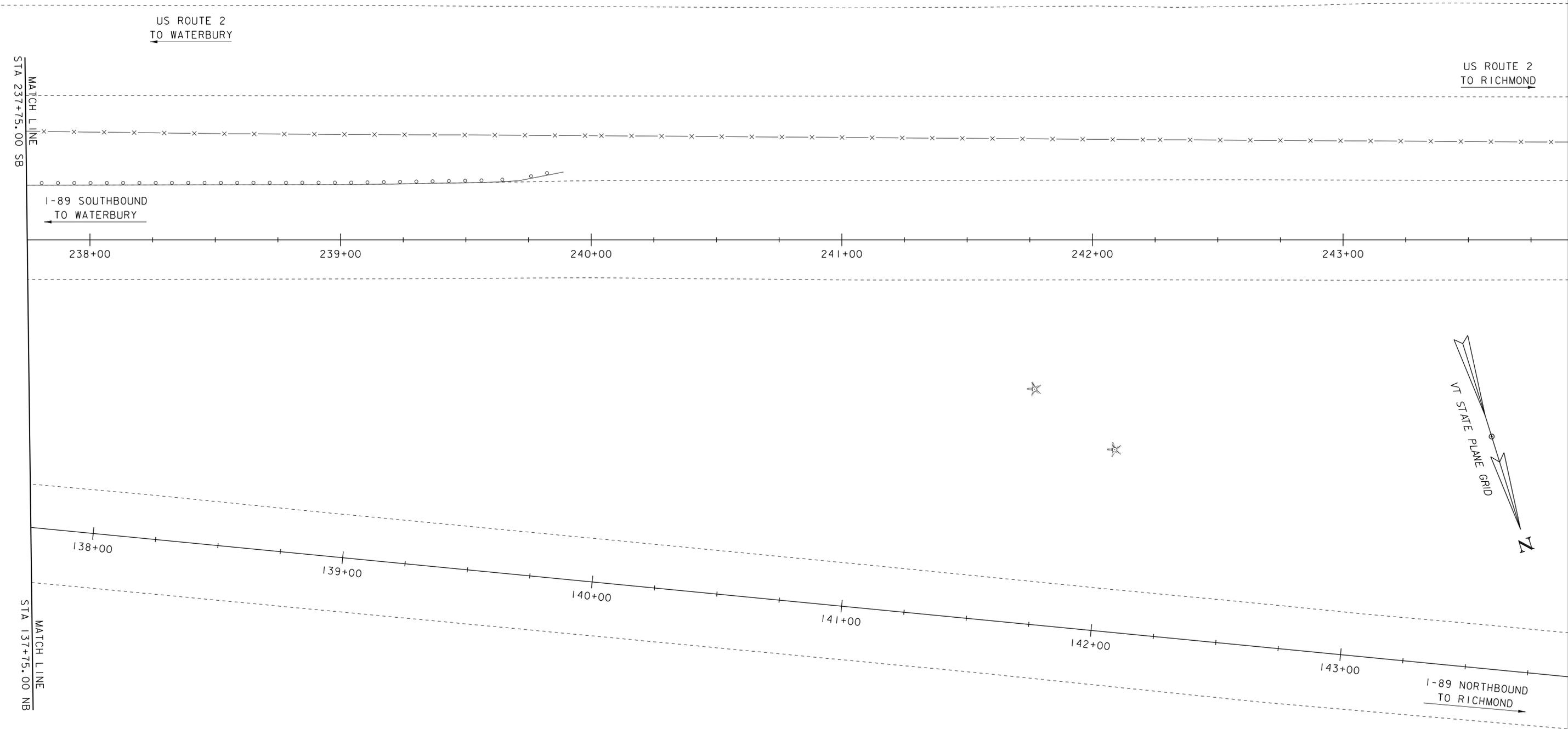


EXISTING CONDITIONS

LAYOUT 4

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 6 OF 35
DESIGNED BY: -----	
LAYOUT SHEET 4	

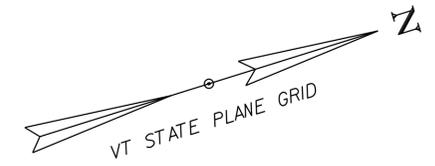
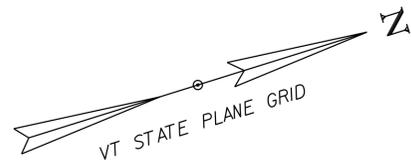


EXISTING CONDITIONS

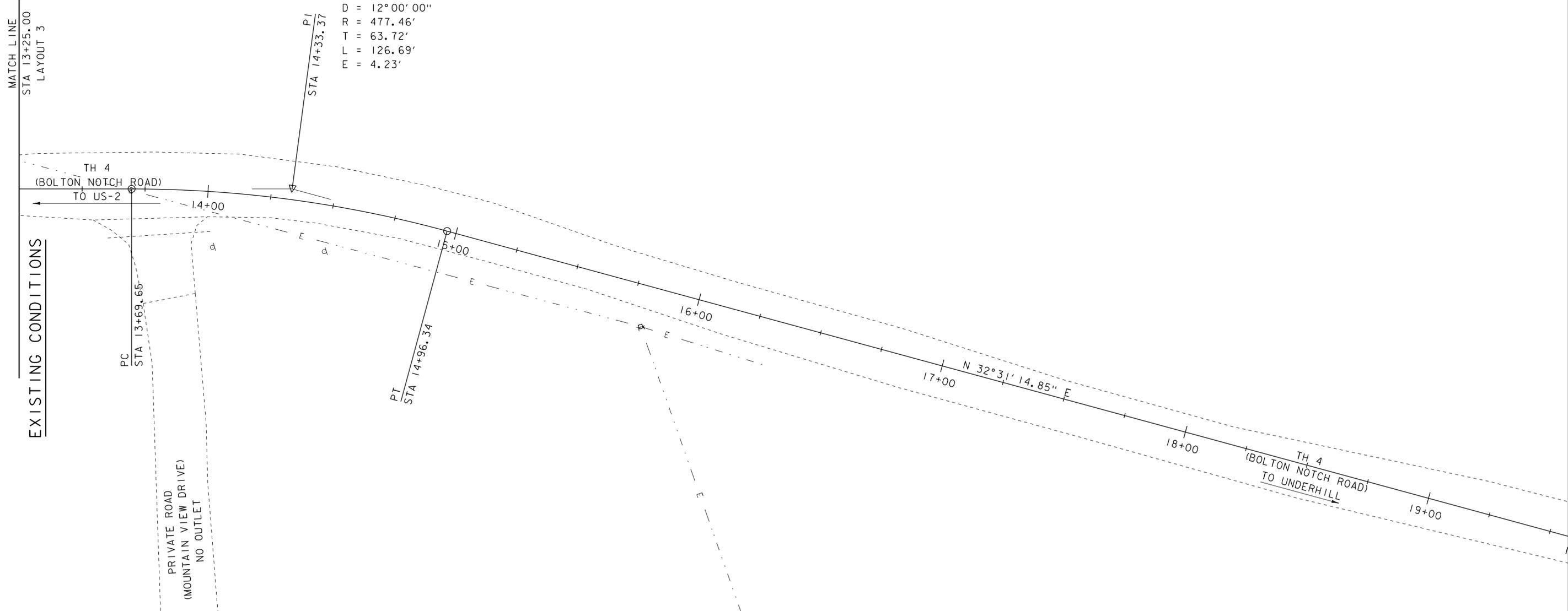
LAYOUT 5

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: i3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 7 OF 35
DESIGNED BY: -----	LAYOUT SHEET 5



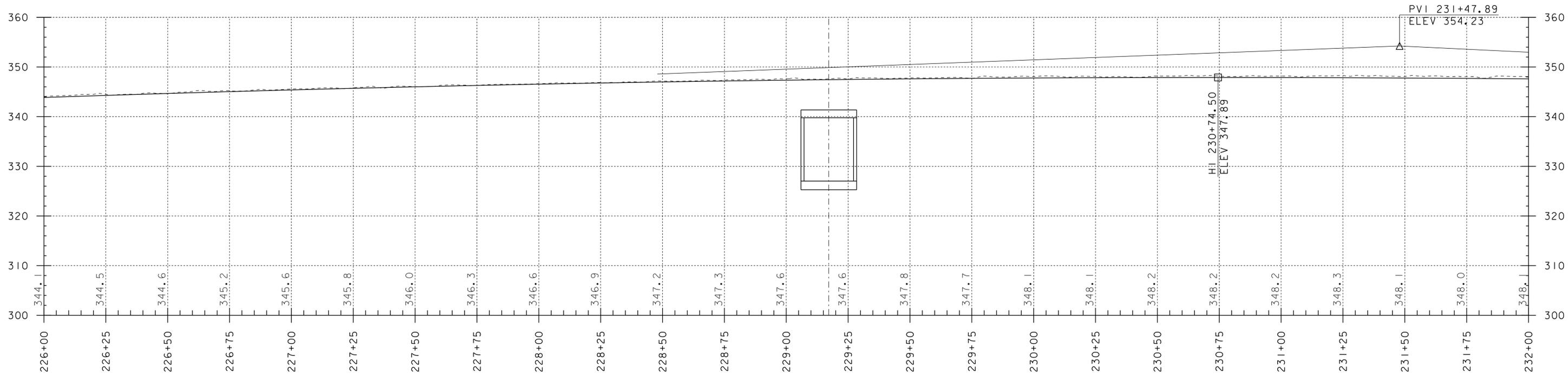
TH4 EXISTING CURVE  
 DELTA = 15° 12' 11"  
 D = 12° 00' 00"  
 R = 477.46'  
 T = 63.72'  
 L = 126.69'  
 E = 4.23'



EXISTING CONDITIONS LAYOUT 6

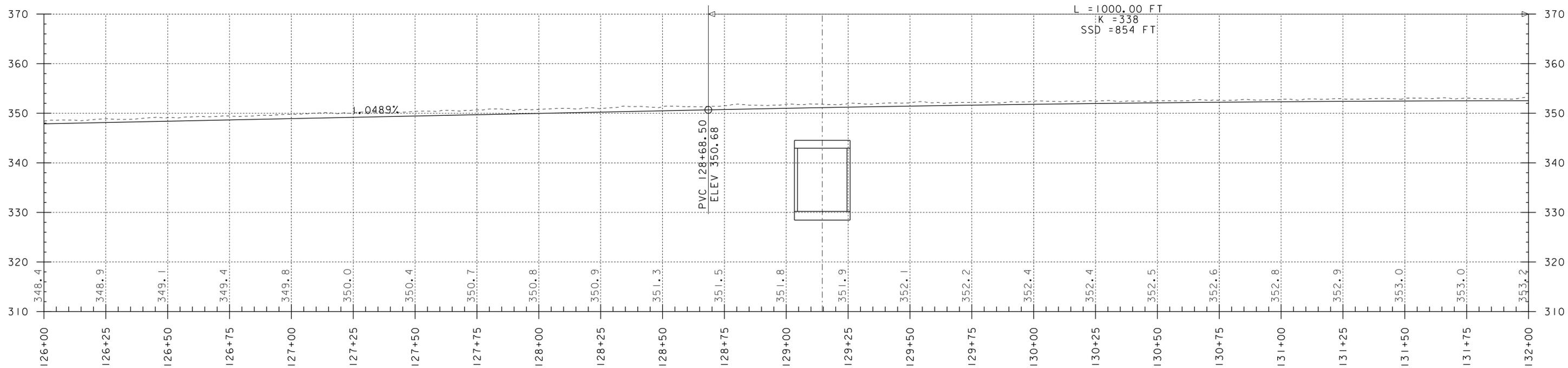
SCALE 1" = 20'-0"  
 20 0 20

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	LAYOUT SHEET 6
DESIGNED BY: -----	SHEET 8 OF 35



**I-89 SOUTHBOUND EXISTING PROFILE**

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



**I-89 NORTHBOUND EXISTING PROFILE**

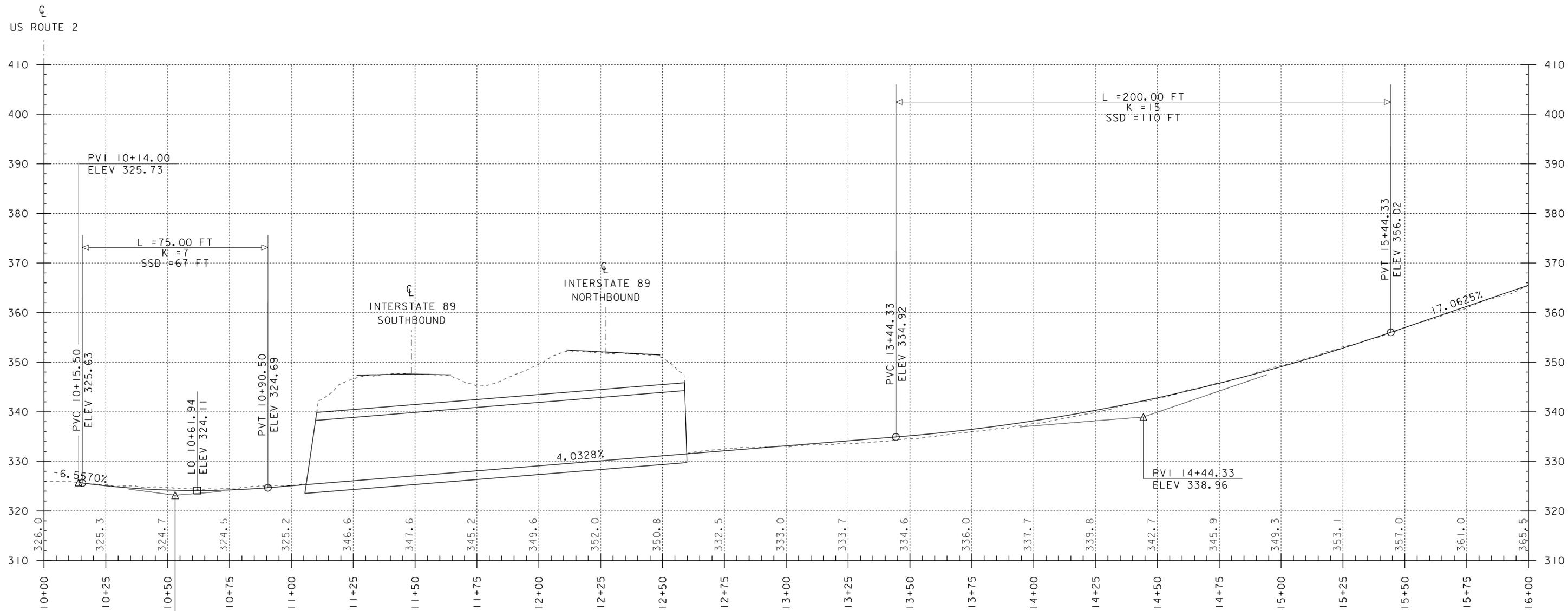
SCALE: HORIZONTAL 1"=20'-0"  
 VERTICAL 1"=10'-0"

**NOTE:**

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG CL

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG CL

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090profile.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 9 OF 35
DESIGNED BY: -----	
INTERSTATE PROFILE SHEET	



**TOWN HIGHWAY 4 EXISTING PROFILE**

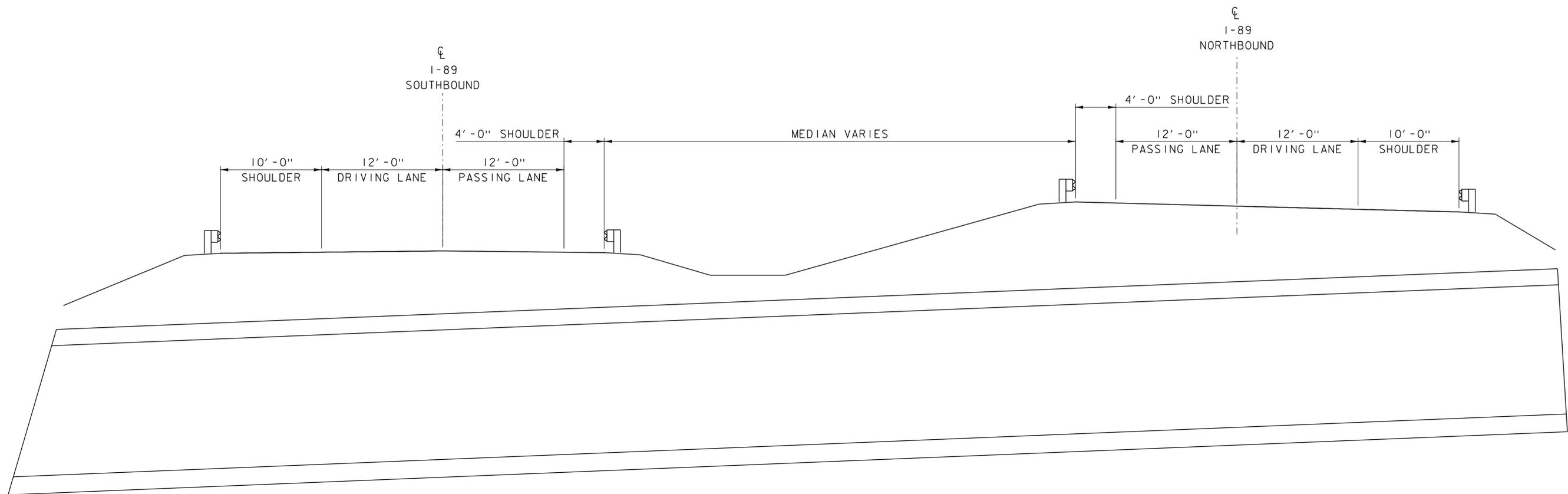
SCALE: HORIZONTAL 1"=20'-0"  
 VERTICAL 1"=10'-0"

**NOTE:**

GRADES SHOWN TO THE NEAREST  
 TENTH ARE EXISTING GROUND ALONG CL

GRADES SHOWN TO THE NEAREST  
 HUNDREDTH ARE FINISH GRADE ALONG CL

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090profile.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 10 OF 35
DESIGNED BY: -----	
TOWN HIGHWAY 4 PROFILE SHEET	

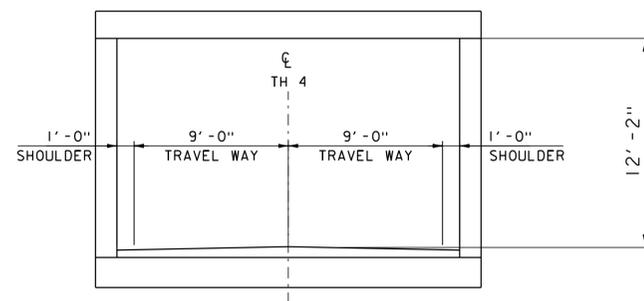


I-89 SOUTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"

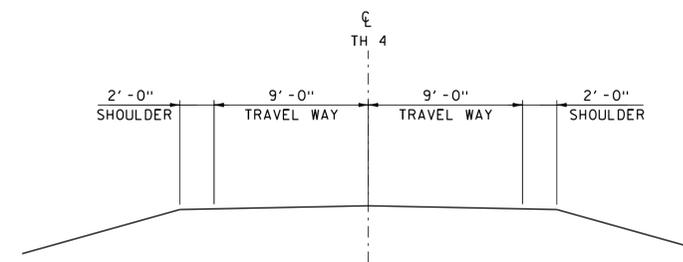
I-89 NORTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"



ALTERNATIVE 1 TH-4 TYPICAL SECTION THROUGH CULVERT

SCALE: 1/4" = 1'-0"



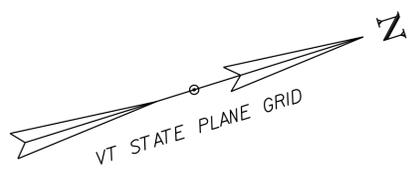
TH-4 TYPICAL ROADWAY SECTION

SCALE: 1/4" = 1'-0"

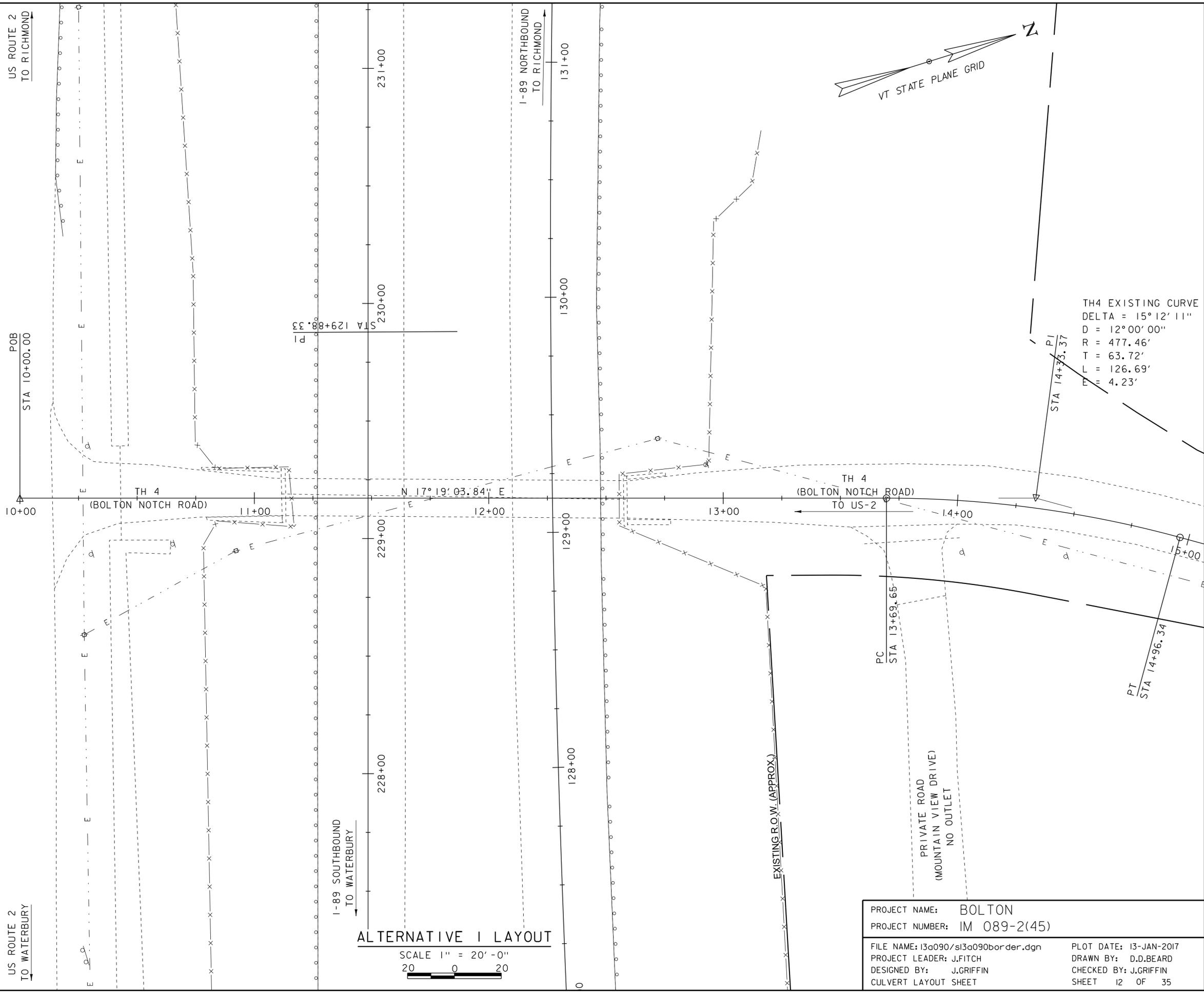
PROJECT NAME: BOLTON  
PROJECT NUMBER: IM 089-2(45)

FILE NAME: I3a090/sl3a090+yp.dgn  
PROJECT LEADER: C.P.WILLIAMS  
DESIGNED BY: L.J.STONE  
ALTERNATIVE 1 TYPICAL SECTIONS

PLOT DATE: 13-JAN-2017  
DRAWN BY: L.J.STONE  
CHECKED BY: -----  
SHEET 11 OF 35



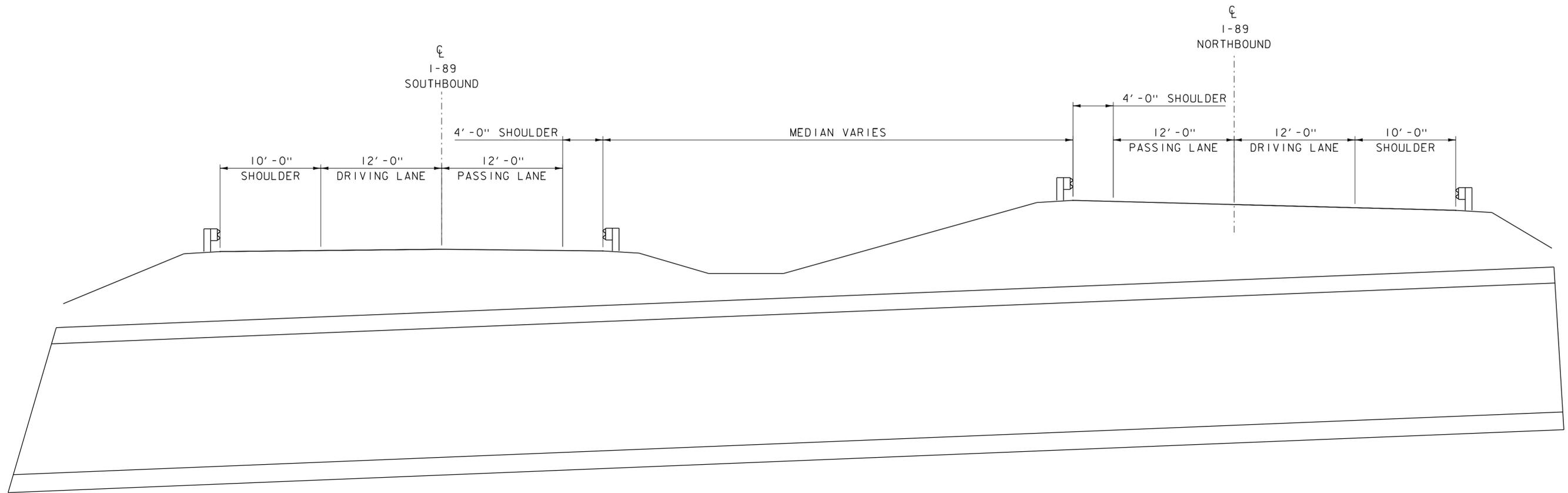
TH4 EXISTING CURVE  
 DELTA = 15° 12' 11"  
 D = 12° 00' 00"  
 R = 477.46'  
 T = 63.72'  
 L = 126.69'  
 E = 4.23'



ALTERNATIVE I LAYOUT

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

PROJECT NAME:	BOLTON	PLOT DATE:	13-JAN-2017
PROJECT NUMBER:	IM 089-2(45)	DRAWN BY:	D.D.BEARD
FILE NAME:	I3a090/sl3a090border.dgn	CHECKED BY:	J.GRIFFIN
PROJECT LEADER:	J.FITCH	SHEET	12 OF 35
DESIGNED BY:	J.GRIFFIN		
CULVERT LAYOUT SHEET			

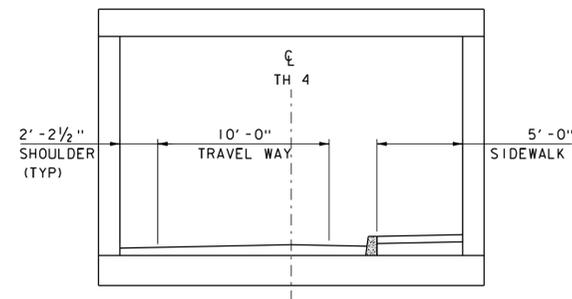


I-89 SOUTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"

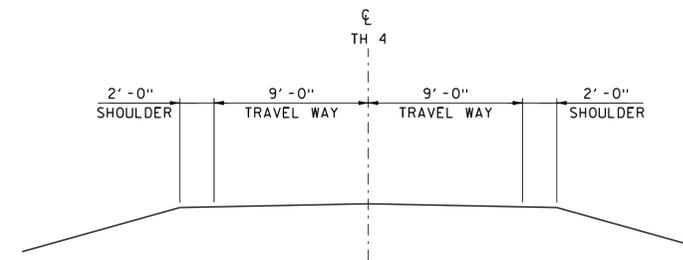
I-89 NORTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"



ALTERNATIVE 2 TH-4 TYPICAL SECTION THROUGH CULVERT

SCALE: 1/4" = 1'-0"



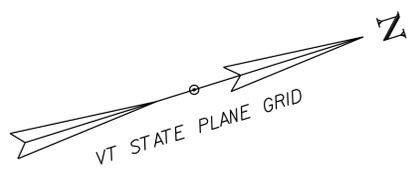
TH-4 TYPICAL ROADWAY SECTION

SCALE: 1/4" = 1'-0"

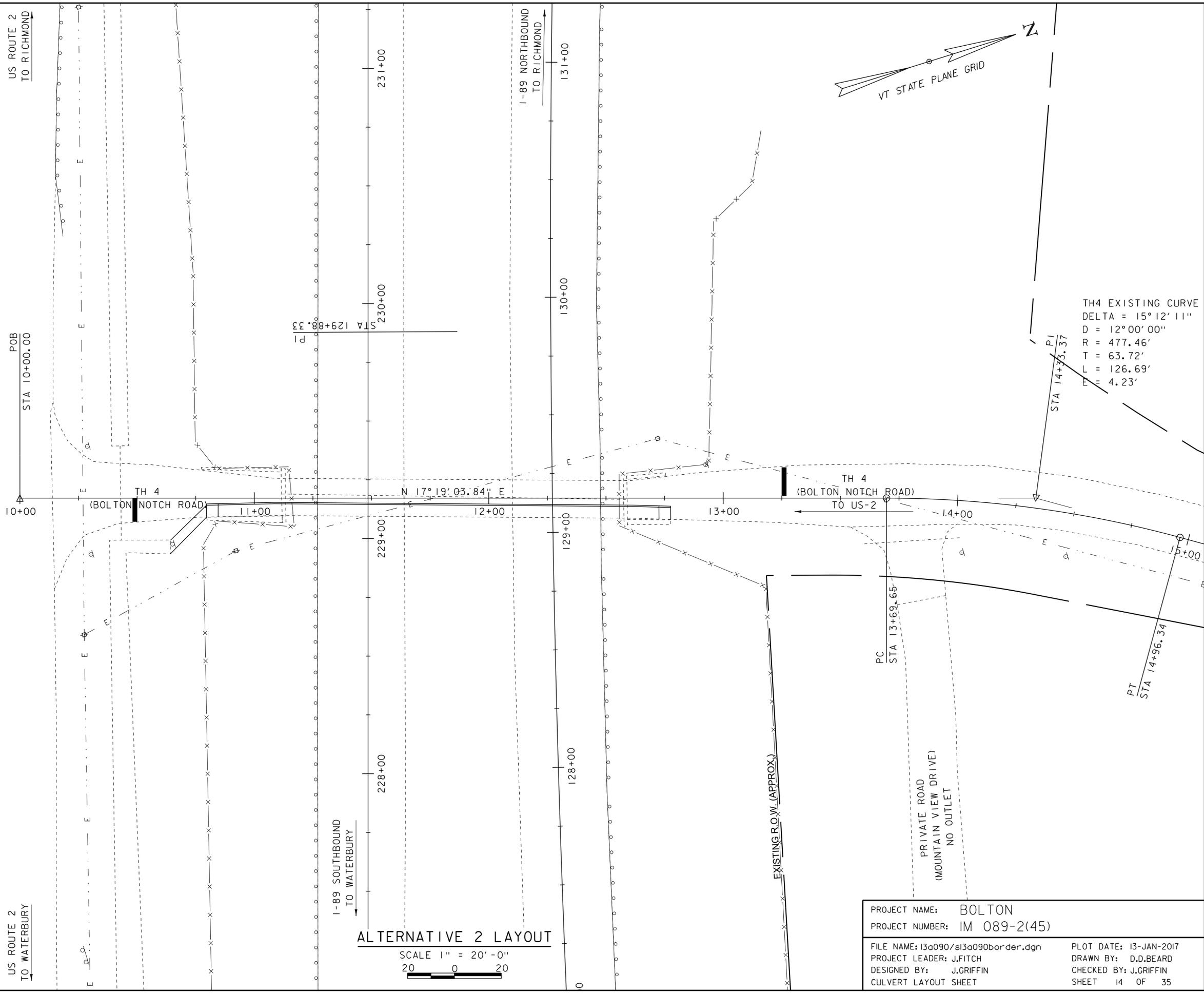
PROJECT NAME: BOLTON  
PROJECT NUMBER: IM 089-2(45)

FILE NAME: I3a090/sl3a090+yp.dgn  
PROJECT LEADER: J.FITCH  
DESIGNED BY: J.GRIFFIN  
ALTERNATIVE 2 TYPICAL SECTIONS

PLOT DATE: 13-JAN-2017  
DRAWN BY: D.D.BEARD  
CHECKED BY: J.GRIFFIN  
SHEET 13 OF 35



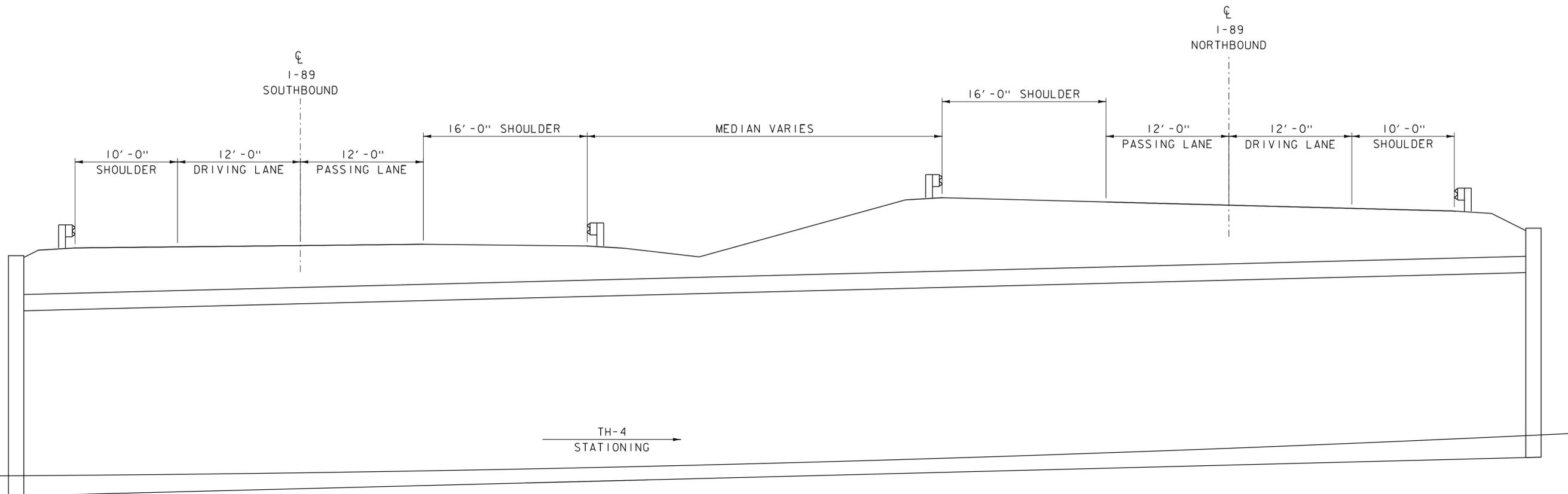
TH4 EXISTING CURVE  
 DELTA = 15° 12' 11"  
 D = 12° 00' 00"  
 R = 477.46'  
 T = 63.72'  
 L = 126.69'  
 E = 4.23'



ALTERNATIVE 2 LAYOUT

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: J.GRIFFIN
PROJECT LEADER: J.FITCH	SHEET 14 OF 35
DESIGNED BY: J.GRIFFIN	
CULVERT LAYOUT SHEET	

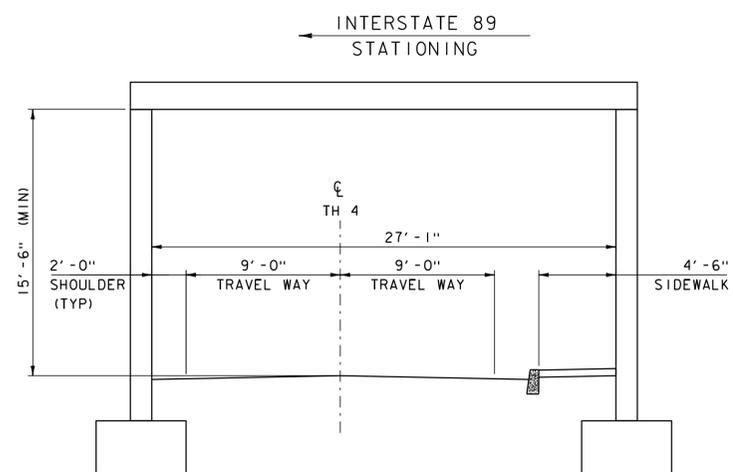


I-89 SOUTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"

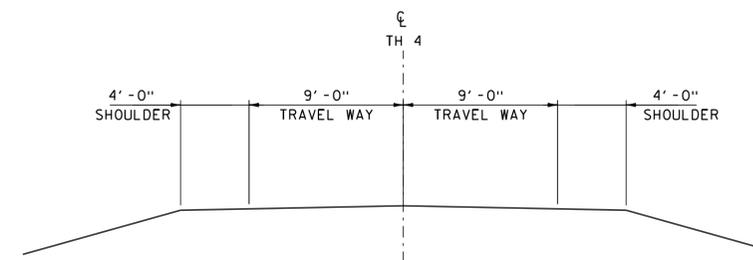
I-89 NORTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"



ALTERNATIVE 3 TH-4 TYPICAL SECTION THROUGH CULVERT

SCALE: 1/4" = 1'-0"



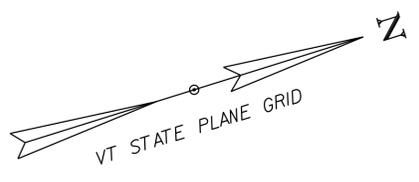
TH-4 TYPICAL ROADWAY SECTION

SCALE: 1/4" = 1'-0"

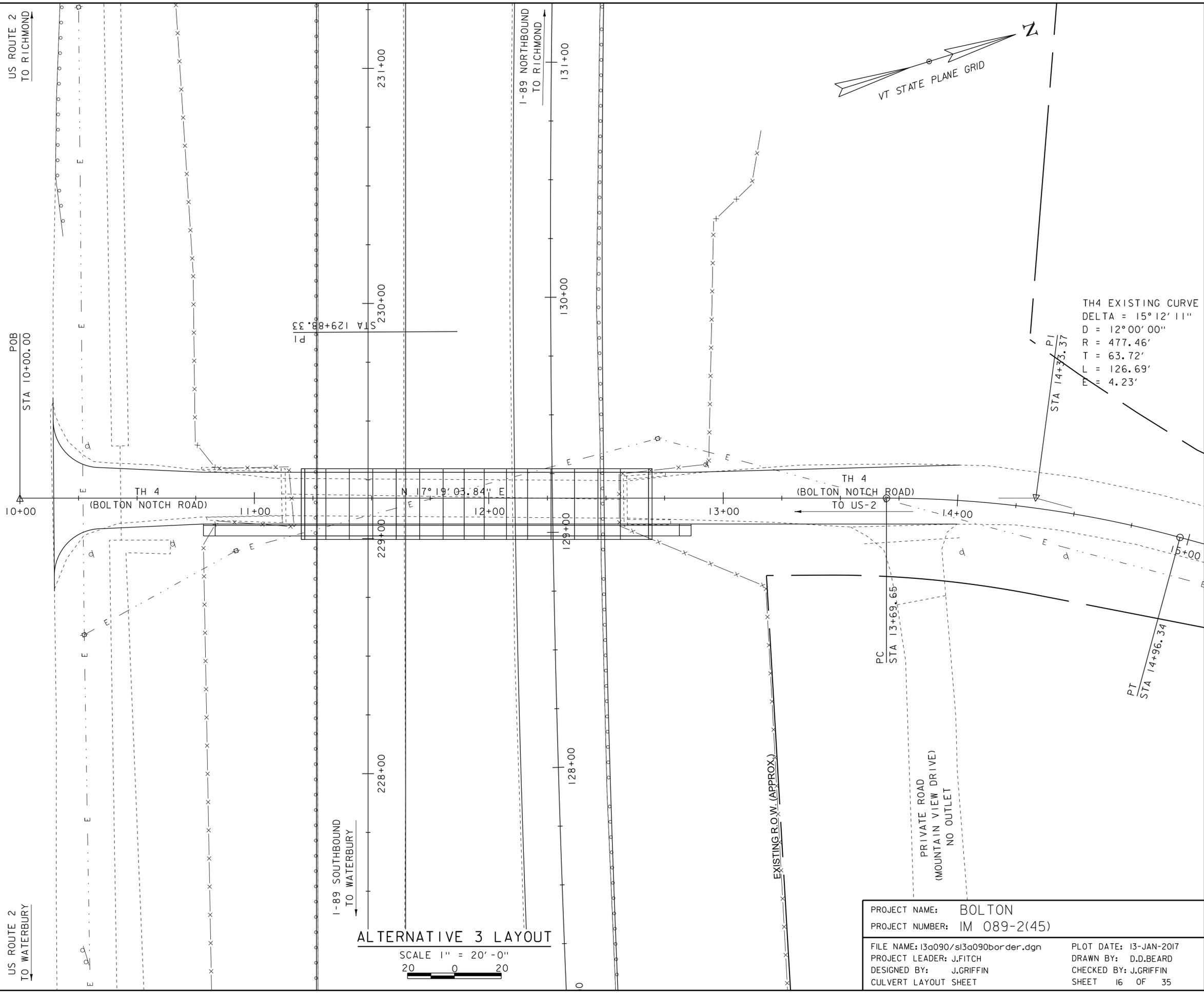
PROJECT NAME: BOLTON  
PROJECT NUMBER: IM 089-2(45)

FILE NAME: I3a090/sl3a090+yp.dgn  
PROJECT LEADER: C.P.WILLIAMS  
DESIGNED BY: L.J.STONE  
ALTERNATIVE 3 TYPICAL SECTIONS

PLOT DATE: 13-JAN-2017  
DRAWN BY: L.J.STONE  
CHECKED BY: -----  
SHEET 15 OF 35



TH4 EXISTING CURVE  
 DELTA = 15° 12' 11"  
 D = 12° 00' 00"  
 R = 477.46'  
 T = 63.72'  
 L = 126.69'  
 E = 4.23'



ALTERNATIVE 3 LAYOUT

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

PROJECT NAME:	BOLTON	PLOT DATE:	13-JAN-2017
PROJECT NUMBER:	IM 089-2(45)	DRAWN BY:	D.D.BEARD
FILE NAME:	I3a090/sl3a090border.dgn	CHECKED BY:	J.GRIFFIN
PROJECT LEADER:	J.FITCH	SHEET	16 OF 35
DESIGNED BY:	J.GRIFFIN		
CULVERT LAYOUT SHEET			

HISTORIC DIST

HISTORIC DIST

POB  
 STA 10+00.00

US ROUTE 2  
 TO WATERBURY

I-89 SOUTHBOUND  
 TO WATERBURY

I-89 NORTHBOUND  
 TO RICHMOND

EXISTING R.O.W. (APPROX.)

PRIVATE ROAD  
 (MOUNTAIN VIEW DRIVE)  
 NO OUTLET

PI  
 STA 14+35.37

PT  
 STA 14+96.34

PC  
 STA 13+69.65

PI  
 STA 129+88.33

10+00

11+00

12+00

13+00

14+00

15+00

228+00

229+00

230+00

231+00

128+00

129+00

130+00

131+00

132+00

133+00

134+00

135+00

136+00

137+00

138+00

139+00

140+00

141+00

142+00

143+00

144+00

145+00

146+00

147+00

148+00

149+00

150+00

151+00

152+00

153+00

154+00

155+00

156+00

157+00

158+00

159+00

160+00

TH 4  
 (BOLTON NOTCH ROAD)

TH 4  
 (BOLTON NOTCH ROAD)  
 TO US-2

HISTORIC DIST

HISTORIC DIST

US ROUTE 2  
 TO RICHMOND

I-89 SOUTHBOUND  
 TO WATERBURY

I-89 NORTHBOUND  
 TO RICHMOND

EXISTING R.O.W. (APPROX.)

PRIVATE ROAD  
 (MOUNTAIN VIEW DRIVE)  
 NO OUTLET

PI  
 STA 14+35.37

PT  
 STA 14+96.34

PC  
 STA 13+69.65

PI  
 STA 129+88.33

10+00

11+00

12+00

13+00

14+00

15+00

228+00

229+00

230+00

231+00

128+00

129+00

130+00

131+00

132+00

133+00

134+00

135+00

136+00

137+00

138+00

139+00

140+00

141+00

142+00

143+00

144+00

145+00

146+00

147+00

148+00

149+00

150+00

151+00

152+00

153+00

154+00

155+00

156+00

157+00

158+00

159+00

160+00

TH 4  
 (BOLTON NOTCH ROAD)

TH 4  
 (BOLTON NOTCH ROAD)  
 TO US-2

HISTORIC DIST

HISTORIC DIST

US ROUTE 2  
 TO RICHMOND

I-89 SOUTHBOUND  
 TO WATERBURY

I-89 NORTHBOUND  
 TO RICHMOND

EXISTING R.O.W. (APPROX.)

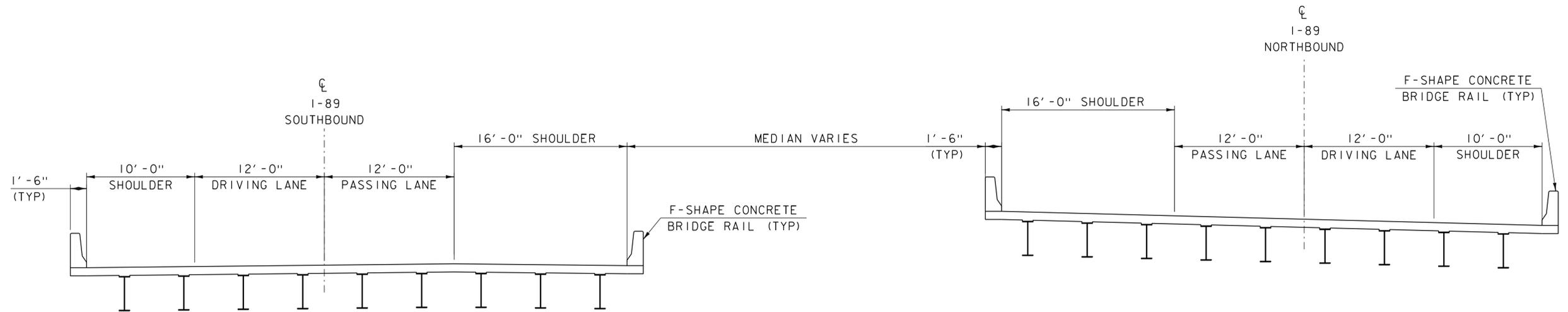
PRIVATE ROAD  
 (MOUNTAIN VIEW DRIVE)  
 NO OUTLET

PI  
 STA 14+35.37

PT  
 STA 14+96.34

PC  
 STA 13+69.65

PI  
 STA 129+88.33



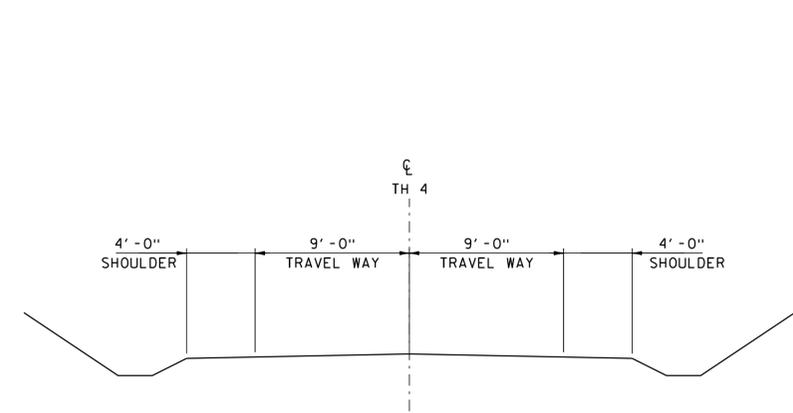
TH-4  
STATIONING →

I-89 SOUTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"

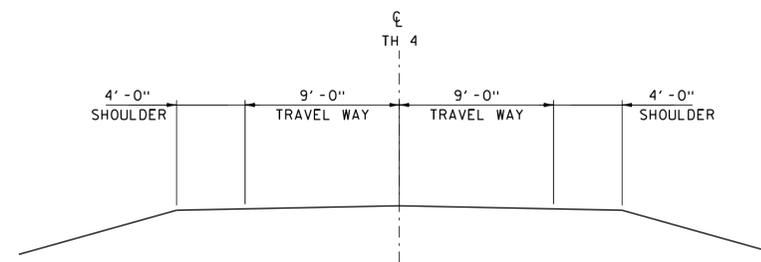
I-89 NORTHBOUND TYPICAL SECTION

SCALE: 1/4" = 1'-0"



ALTERNATIVE 4 TH-4 TYPICAL SECTION UNDER NEW BRIDGE

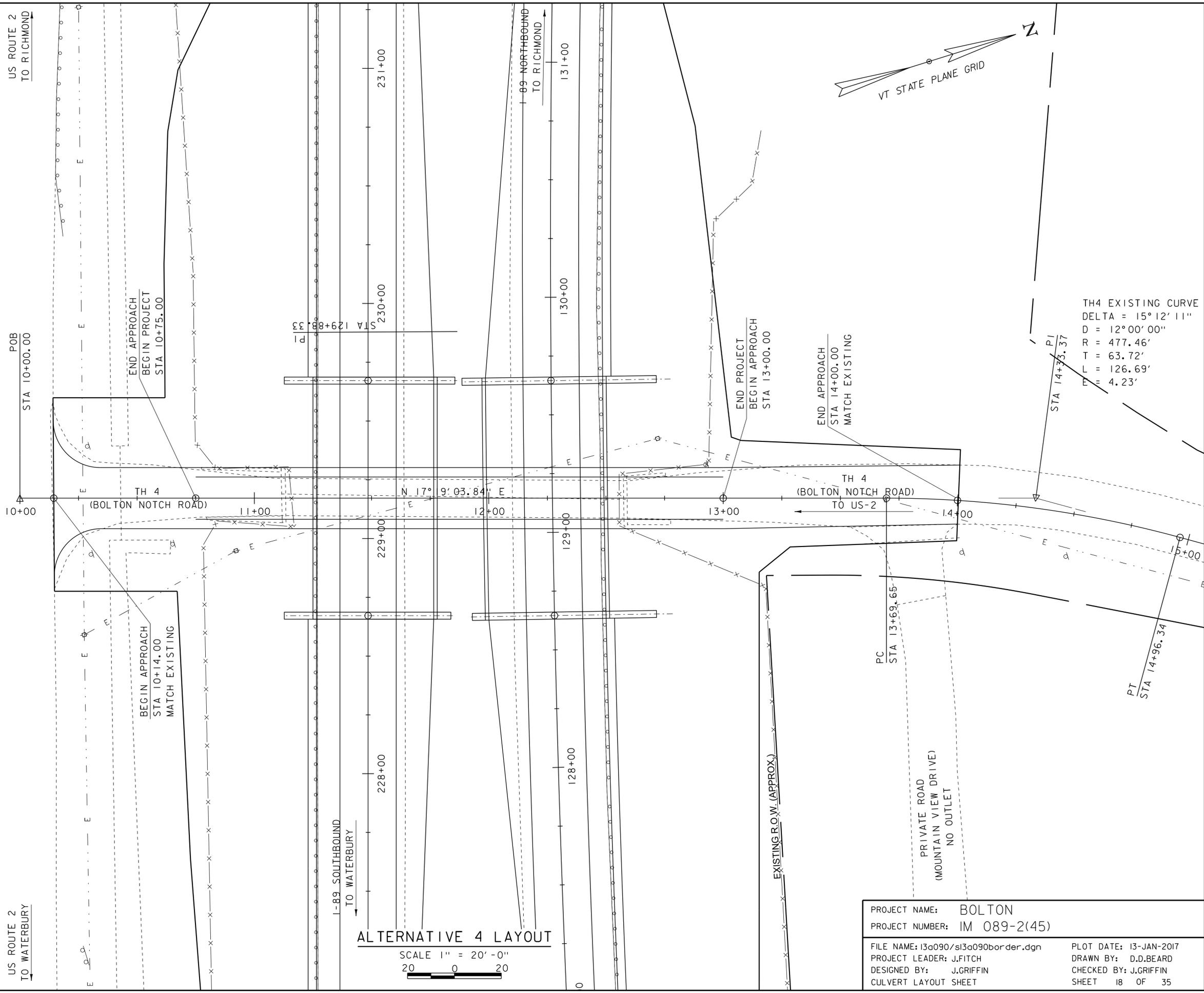
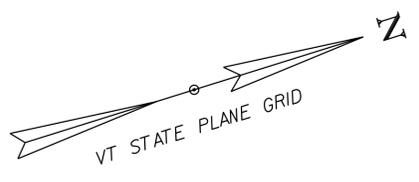
SCALE: 1/4" = 1'-0"



TH-4 TYPICAL ROADWAY SECTION

SCALE: 1/4" = 1'-0"

PROJECT NAME: BOLTON	
PROJECT NUMBER: IM 089-2(45)	
FILE NAME: I3a090/sl3a090+yp.dgn	PLOT DATE: 13-JAN-2017
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: L.J.STONE	CHECKED BY: -----
ALTERNATIVE 4 TYPICAL SECTIONS	SHEET 17 OF 35

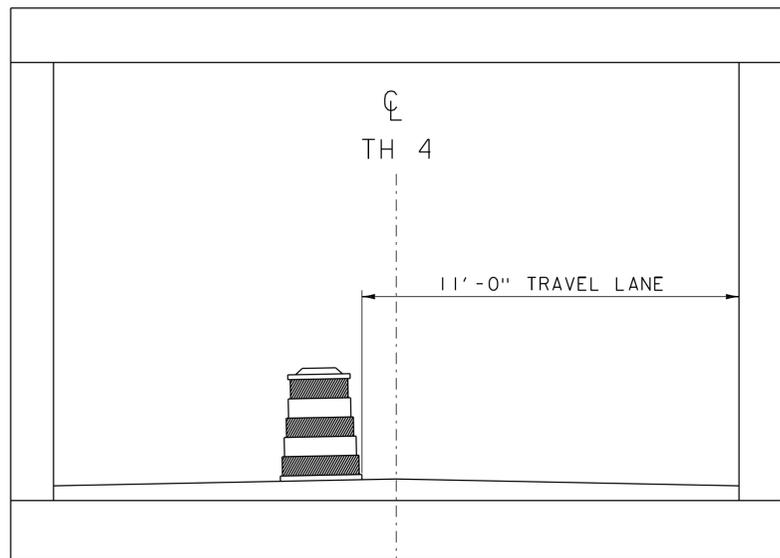


TH4 EXISTING CURVE  
 DELTA = 15° 12' 11"  
 D = 12° 00' 00"  
 R = 477.46'  
 T = 63.72'  
 L = 126.69'  
 E = 4.23'

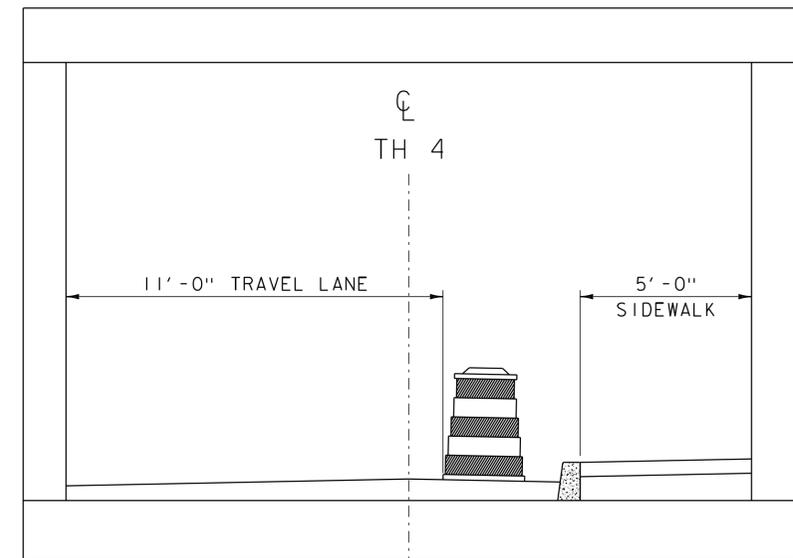
**ALTERNATIVE 4 LAYOUT**

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

PROJECT NAME:	BOLTON	PLOT DATE:	13-JAN-2017
PROJECT NUMBER:	IM 089-2(45)	DRAWN BY:	D.D.BEARD
FILE NAME:	I3a090/sl3a090border.dgn	CHECKED BY:	J.GRIFFIN
PROJECT LEADER:	J.FITCH	CULVERT LAYOUT SHEET	SHEET 18 OF 35
DESIGNED BY:	J.GRIFFIN		



PHASE 1



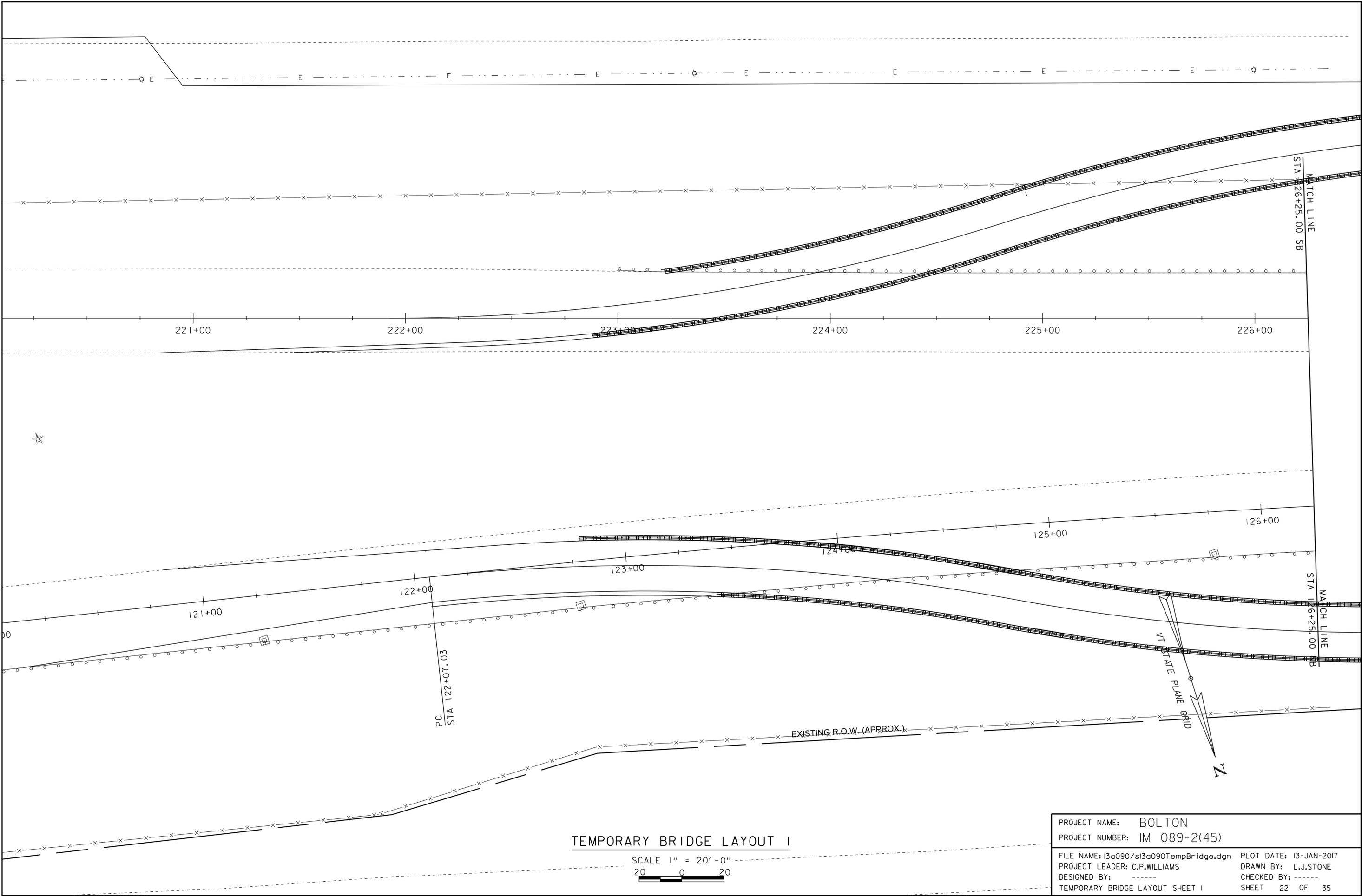
PHASE 2

PROJECT NAME: BOLTON  
 PROJECT NUMBER: IM 089-2(45)

FILE NAME: I3a090/sl3a090phasing.dgn PLOT DATE: 13-JAN-2017  
 PROJECT LEADER: J.FITCH DRAWN BY: D.D.BEARD  
 DESIGNED BY: J.GRIFFIN CHECKED BY: J.GRIFFIN  
 PHASING TYPICAL SECTIONS SHEET 19 OF 35



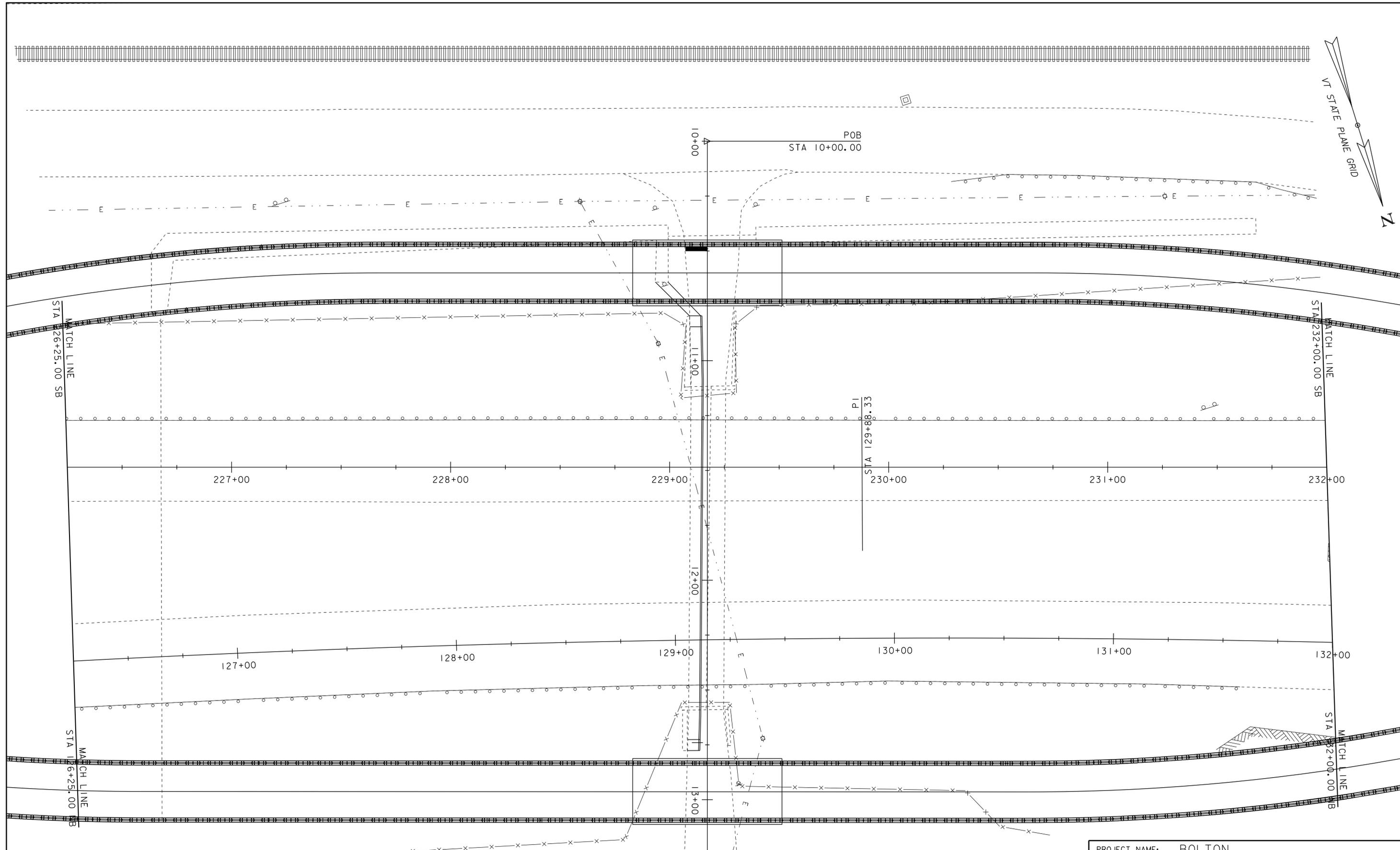
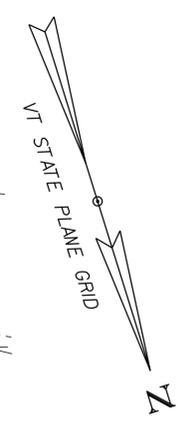




**TEMPORARY BRIDGE LAYOUT I**

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

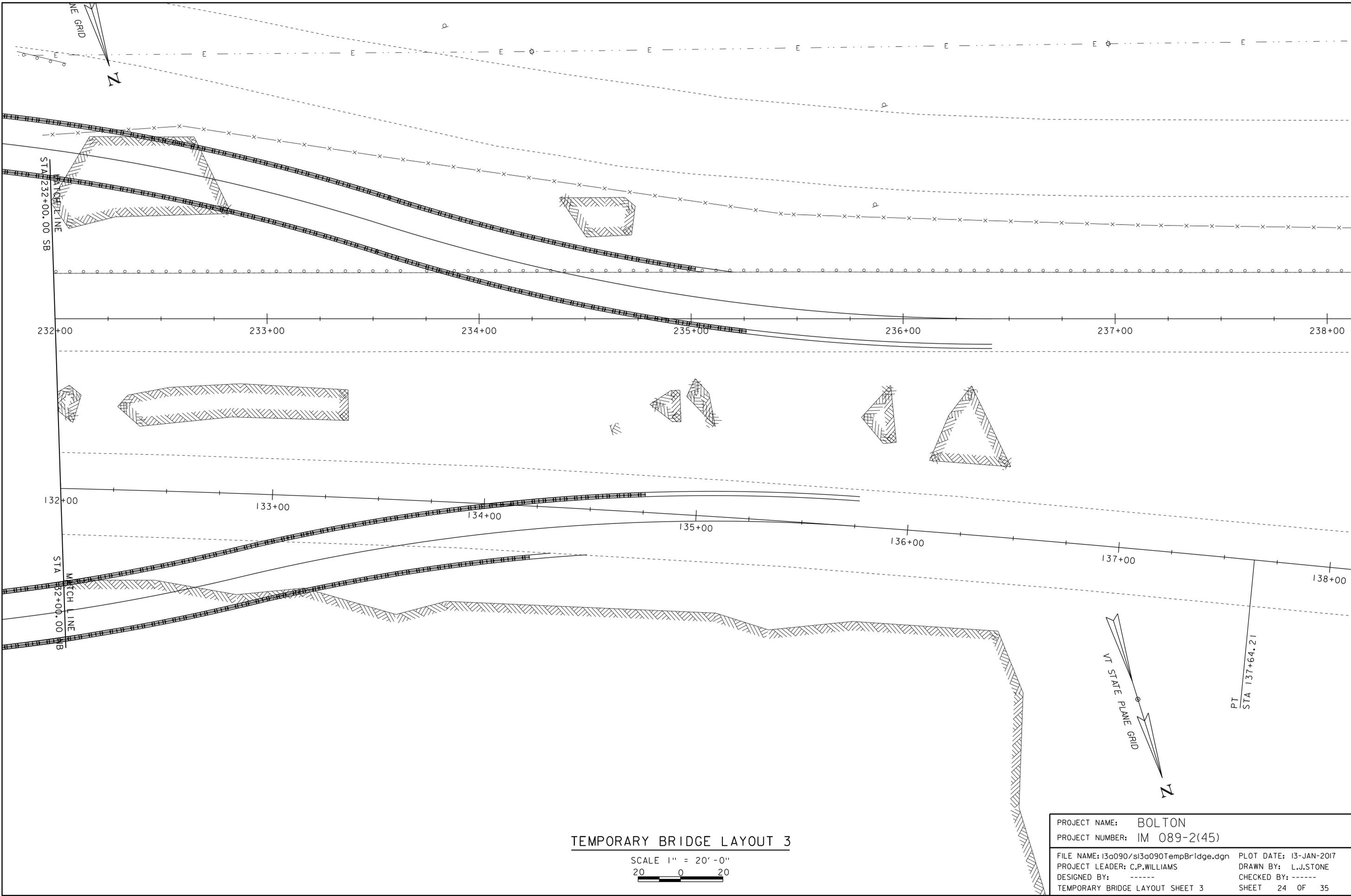
PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: L.J.STONE
FILE NAME: I3a090/sl3a090TempBridge.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	DESIGNED BY: -----
TEMPORARY BRIDGE LAYOUT SHEET I	SHEET 22 OF 35



TEMPORARY BRIDGE LAYOUT 2

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

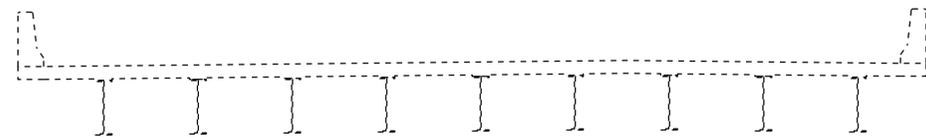
PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: L.J.STONE
FILE NAME: I3a090/sl3a090TempBridge.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	DESIGNED BY: -----
TEMPORARY BRIDGE LAYOUT SHEET 2	SHEET 23 OF 35



TEMPORARY BRIDGE LAYOUT 3

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

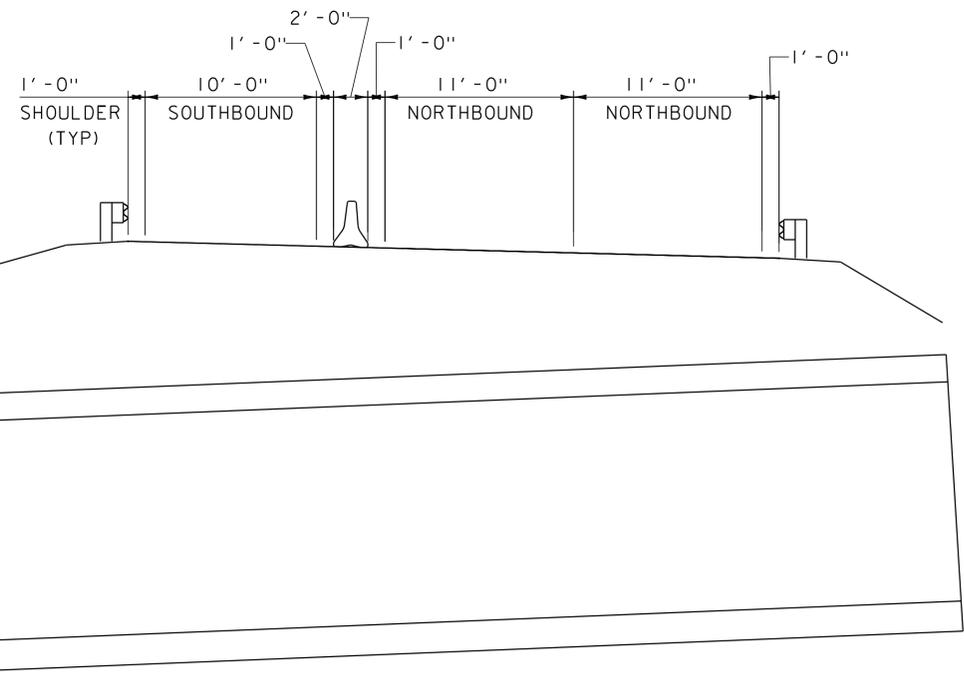
PROJECT NAME:	BOLTON	FILE NAME:	I3a090/sl3a090TempBridge.dgn	PLOT DATE:	13-JAN-2017
PROJECT NUMBER:	IM 089-2(45)	PROJECT LEADER:	C.P.WILLIAMS	DRAWN BY:	L.J.STONE
		DESIGNED BY:	-----	CHECKED BY:	-----
		TEMPORARY BRIDGE LAYOUT SHEET 3		SHEET	24 OF 35



I-89 NEW CONSTRUCTION SOUTHBOUND BRIDGE

TYPICAL SECTION

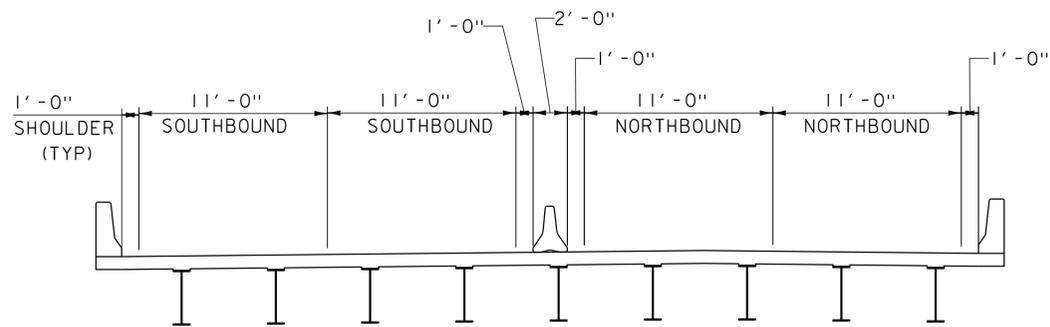
SCALE: 1/4" = 1'-0"



I-89 TRAFFIC MAINTAINED ON EXISTING NORTHBOUND BRIDGE

TYPICAL SECTION

SCALE: 1/4" = 1'-0"



I-89 NEW CONSTRUCTION NORTHBOUND BRIDGE

TYPICAL SECTION

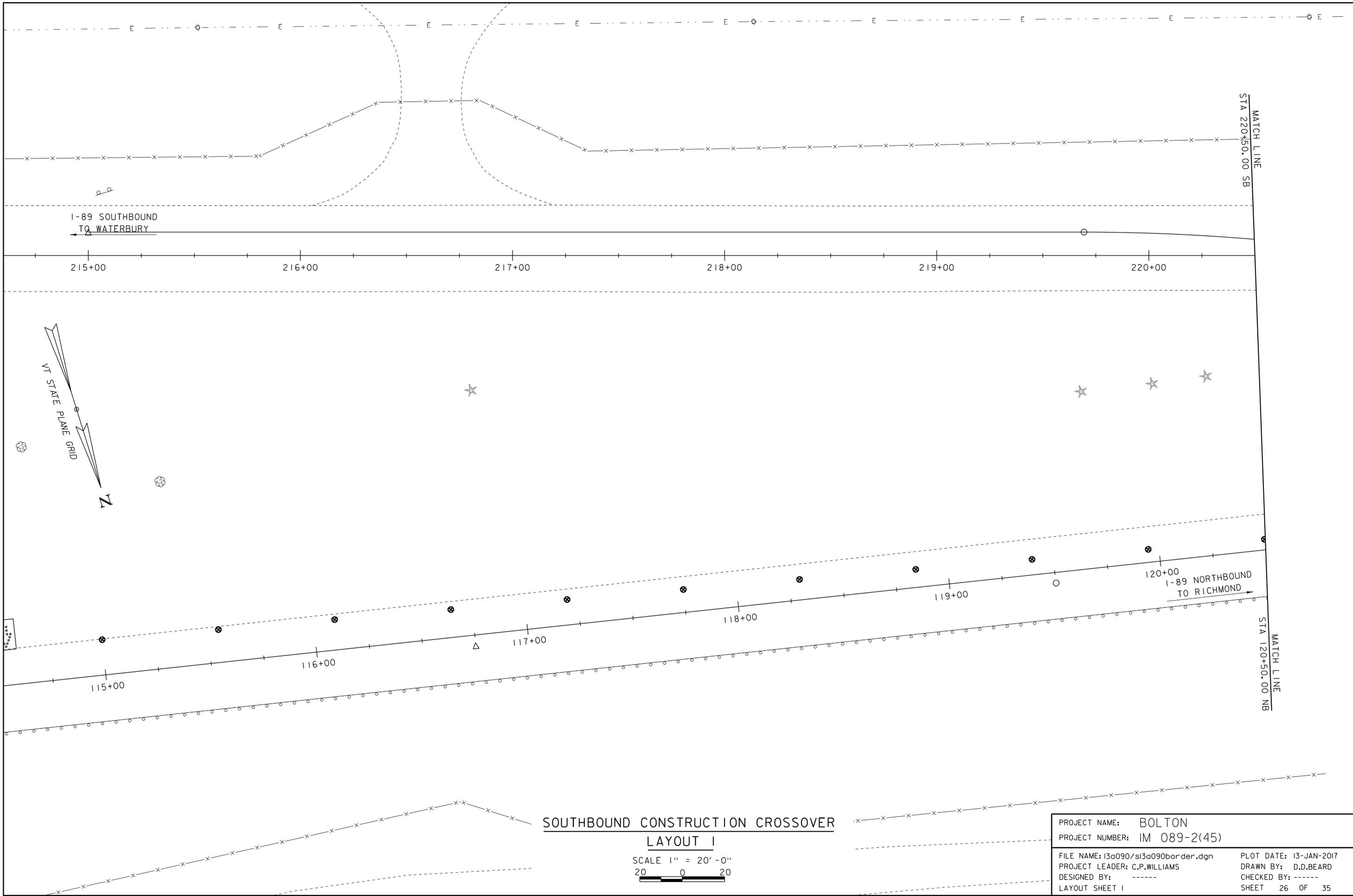
SCALE: 1/4" = 1'-0"

I-89 TRAFFIC MAINTAINED ON NEW SOUTHBOUND BRIDGE

TYPICAL SECTION

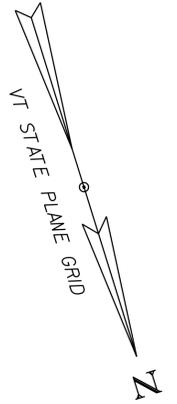
SCALE: 1/4" = 1'-0"

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: L.J.STONE
FILE NAME: I3a090/sl3a090+yp.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 25 OF 35
DESIGNED BY: L.J.STONE	
CROSSOVER TYPICAL SECTIONS	



I-89 SOUTHBOUND  
TO WATERBURY

215+00 216+00 217+00 218+00 219+00 220+00



120+00  
I-89 NORTHBOUND  
TO RICHMOND

115+00 116+00 117+00 118+00 119+00

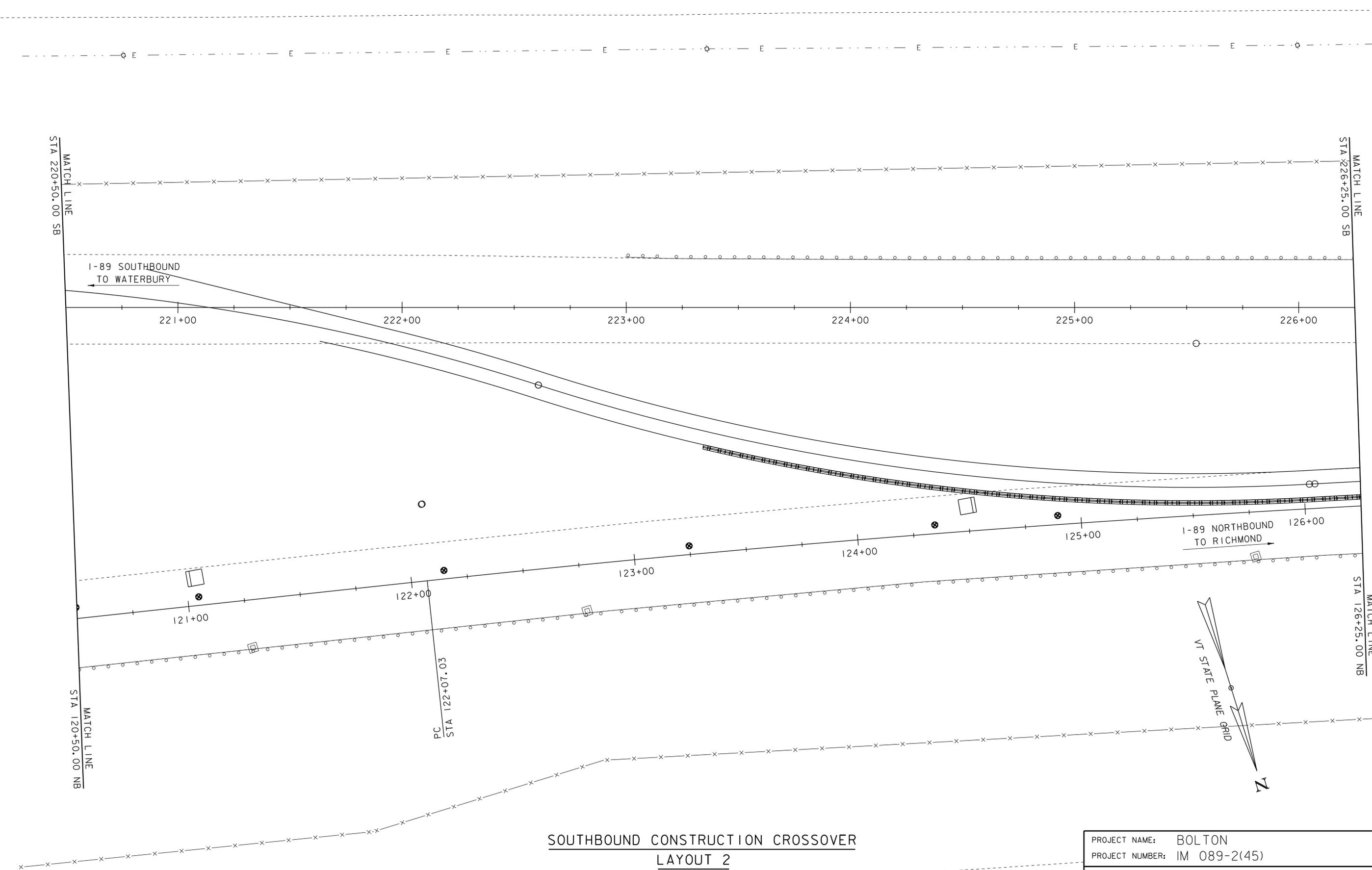
**SOUTHBOUND CONSTRUCTION CROSSOVER  
LAYOUT I**

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 26 OF 35
DESIGNED BY: -----	LAYOUT SHEET I

MATCH LINE  
STA 220+50.00 SB

MATCH LINE  
STA 120+50.00 NB

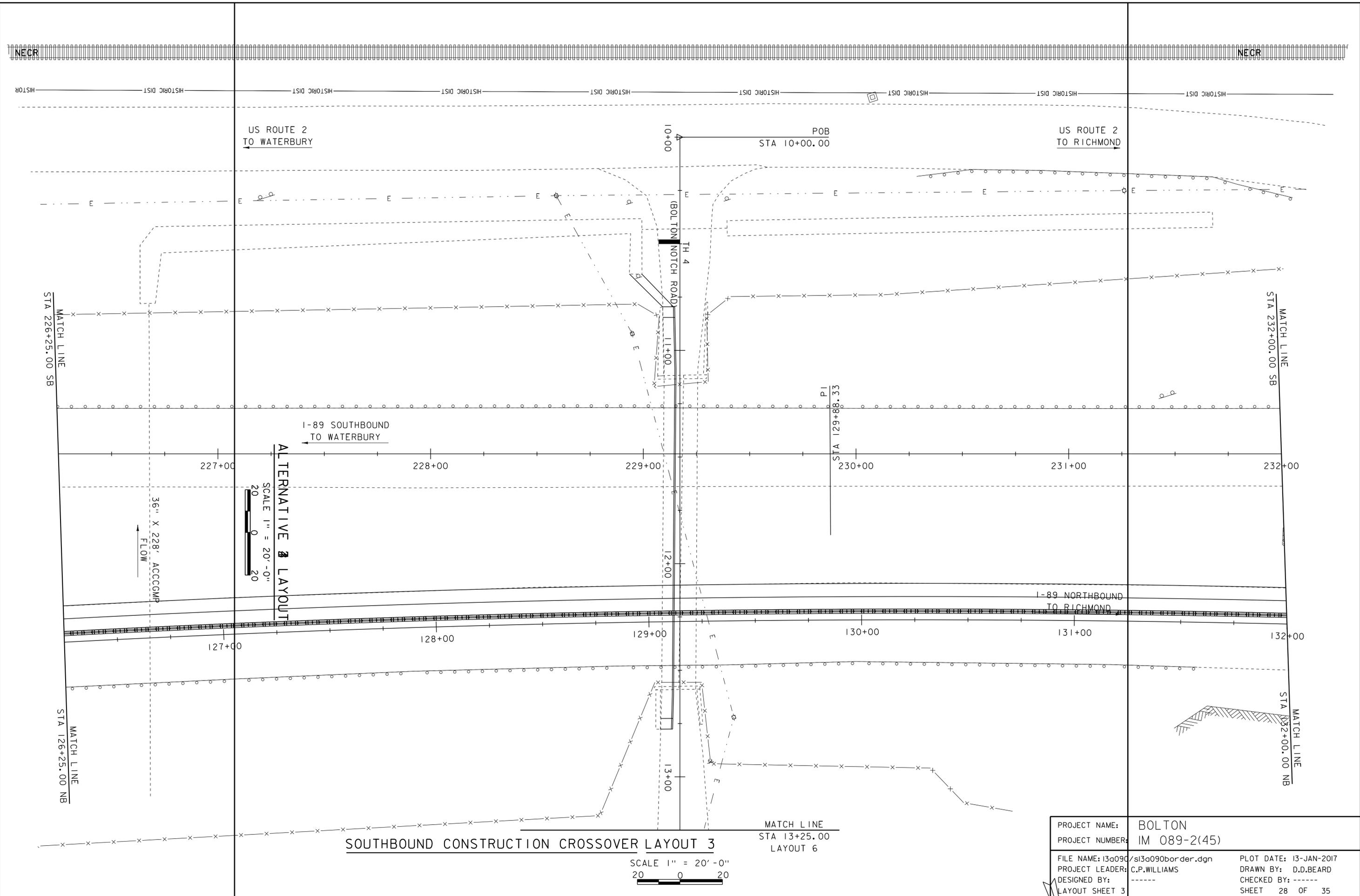


**SOUTHBOUND CONSTRUCTION CROSSOVER**

**LAYOUT 2**

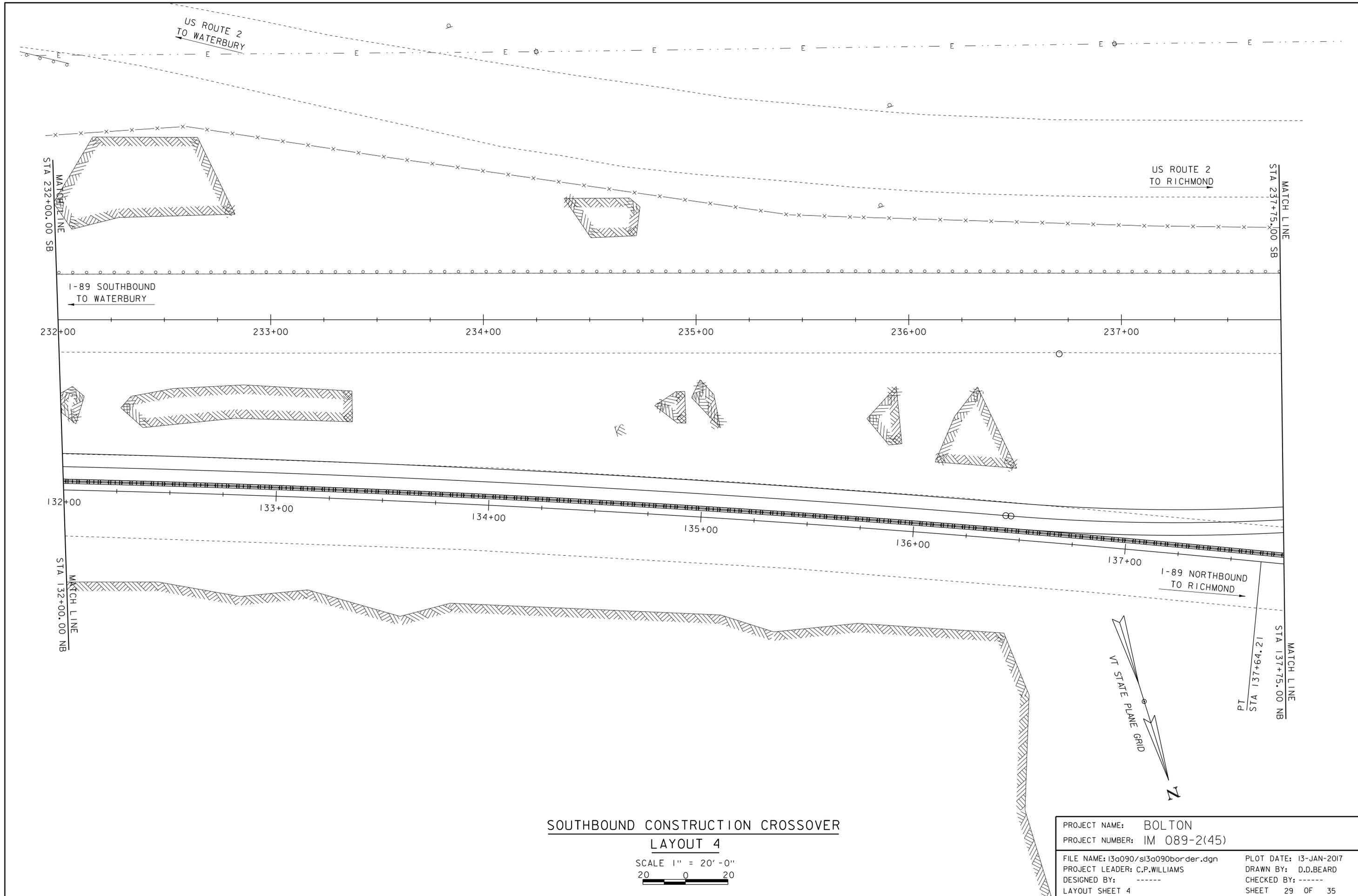
SCALE 1" = 20'-0"  
 20 0 20

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 27 OF 35
DESIGNED BY: -----	LAYOUT SHEET 2



**SOUTHBOUND CONSTRUCTION CROSSOVER LAYOUT 3**

PROJECT NAME:	BOLTON	PLOT DATE:	13-JAN-2017
PROJECT NUMBER:	IM 089-2(45)	DRAWN BY:	D.D.BEARD
FILE NAME:	13a090c/s13a090border.dgn	CHECKED BY:	-----
PROJECT LEADER:	C.P.WILLIAMS	SHEET	28 OF 35
DESIGNED BY:	-----	LAYOUT SHEET	3

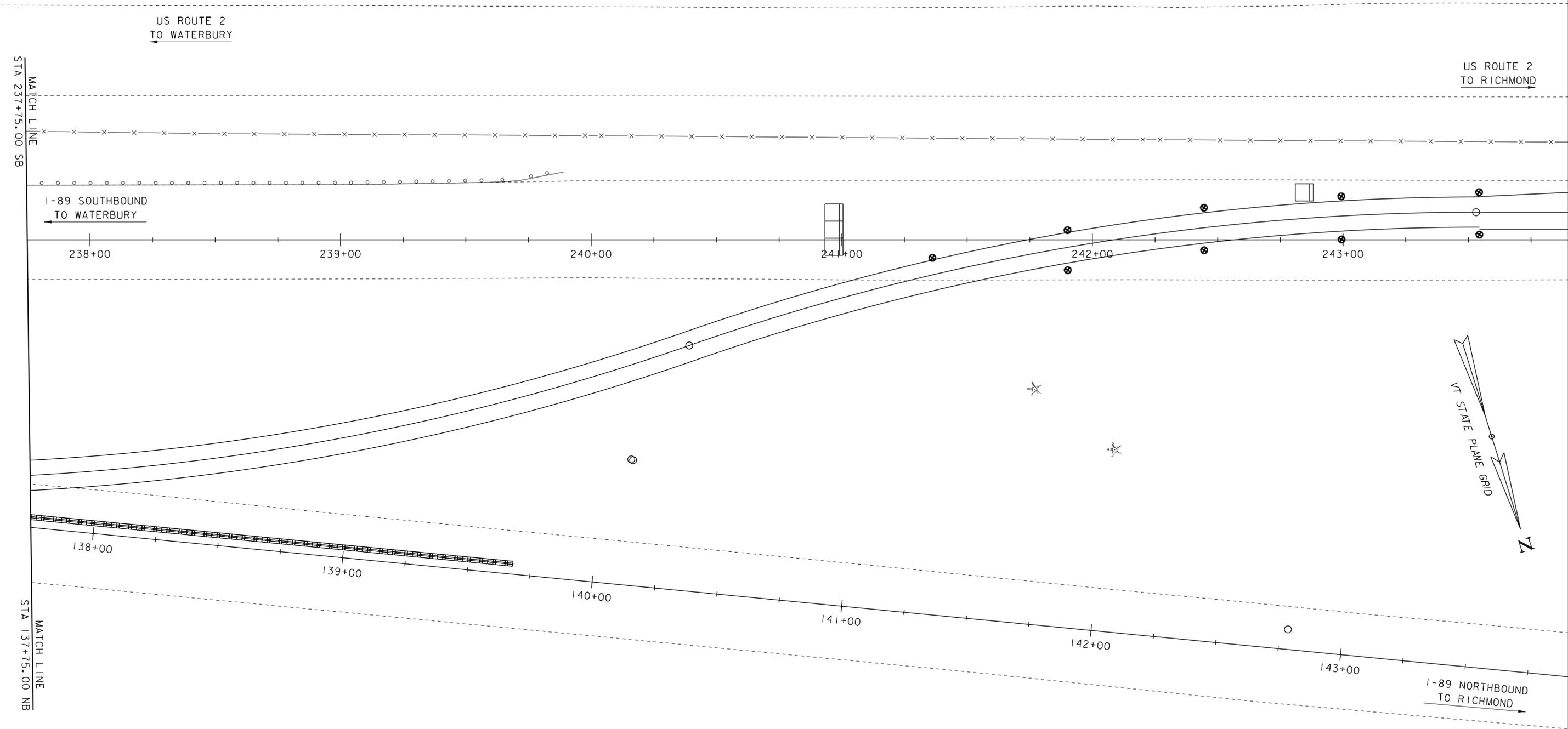


**SOUTHBOUND CONSTRUCTION CROSSOVER**

**LAYOUT 4**

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 29 OF 35
DESIGNED BY: -----	
LAYOUT SHEET 4	

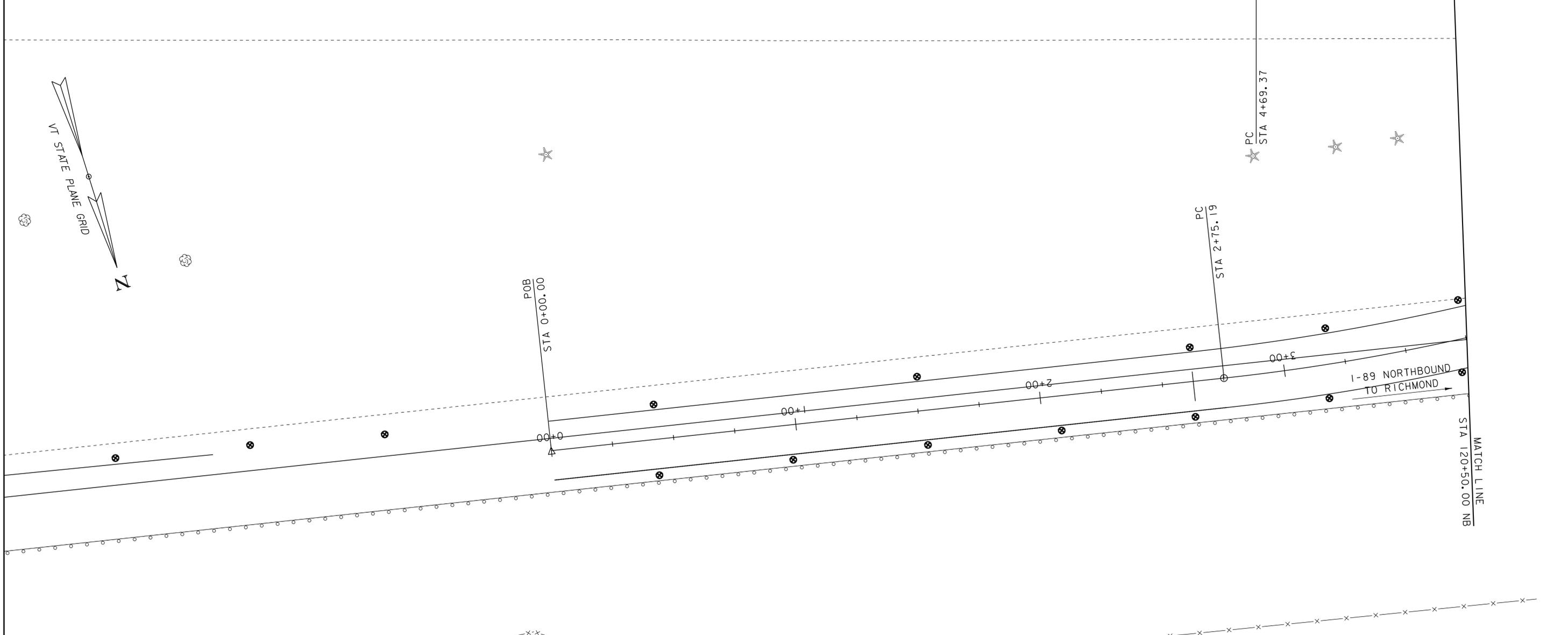
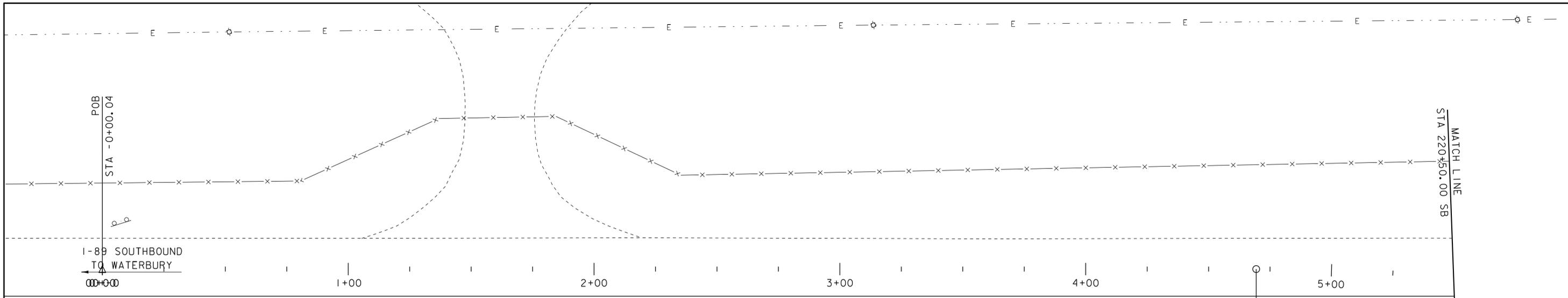


**SOUTHBOUND CONSTRUCTION CROSSOVER**

**LAYOUT 5**

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 30 OF 35
DESIGNED BY: -----	LAYOUT SHEET 5



**NORTHBOUND CONSTRUCTION CROSSOVER**  
**LAYOUT I**

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

PROJECT NAME: BOLTON		PLOT DATE: 13-JAN-2017	
PROJECT NUMBER: IM 089-2(45)		DRAWN BY: D.D.BEARD	
FILE NAME: I3a090/sl3a090border.dgn		DESIGNED BY: -----	
PROJECT LEADER: C.P.WILLIAMS		CHECKED BY: -----	
LAYOUT SHEET I		SHEET 31 OF 35	

STA 220+50.00 SB  
MATCH LINE

STA 226+25.00 SB  
MATCH LINE

I-89 SOUTHBOUND  
TO WATERBURY

221+00

222+00

223+00

224+00

225+00

226+00

STA 120+50.00 NB  
MATCH LINE

STA 126+25.00 NB  
MATCH LINE

I-89 NORTHBOUND  
TO RICHMOND

124+00

125+00

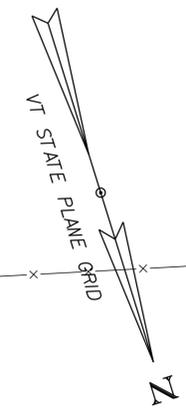
126+00

122+00

123+00

121+00

PC  
STA 122+07.03

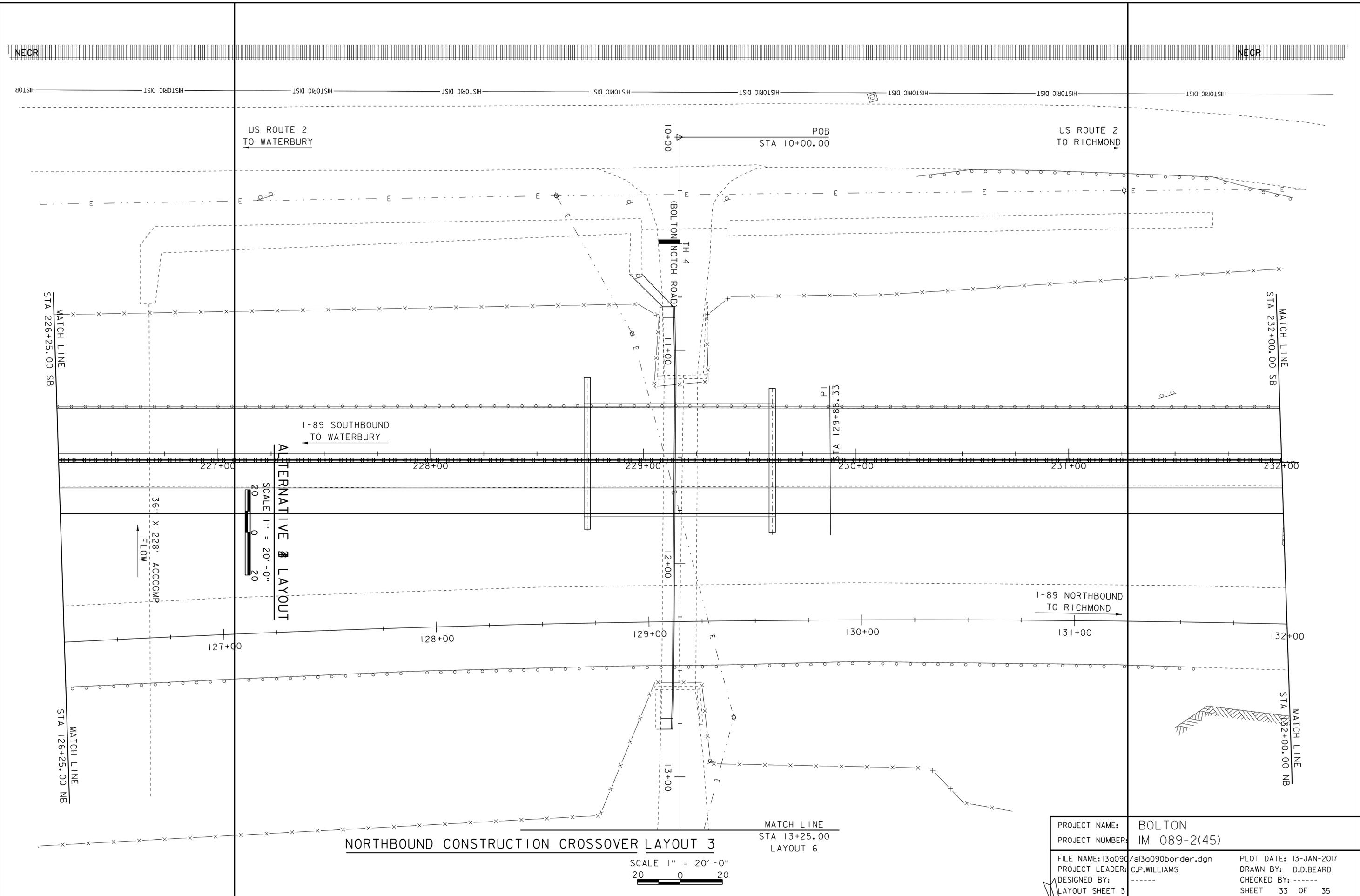


### NORTHBOUND CONSTRUCTION CROSSOVER

#### LAYOUT 2

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 32 OF 35
DESIGNED BY: -----	LAYOUT SHEET 2



US ROUTE 2  
TO WATERBURY

US ROUTE 2  
TO RICHMOND

I-89 SOUTHBOUND  
TO WATERBURY

I-89 NORTHBOUND  
TO RICHMOND

ALTERNATIVE 2 LAYOUT

SCALE 1" = 20'-0"

36' X 228' ACCCGMP

FLOW

POB  
STA 10+00.00

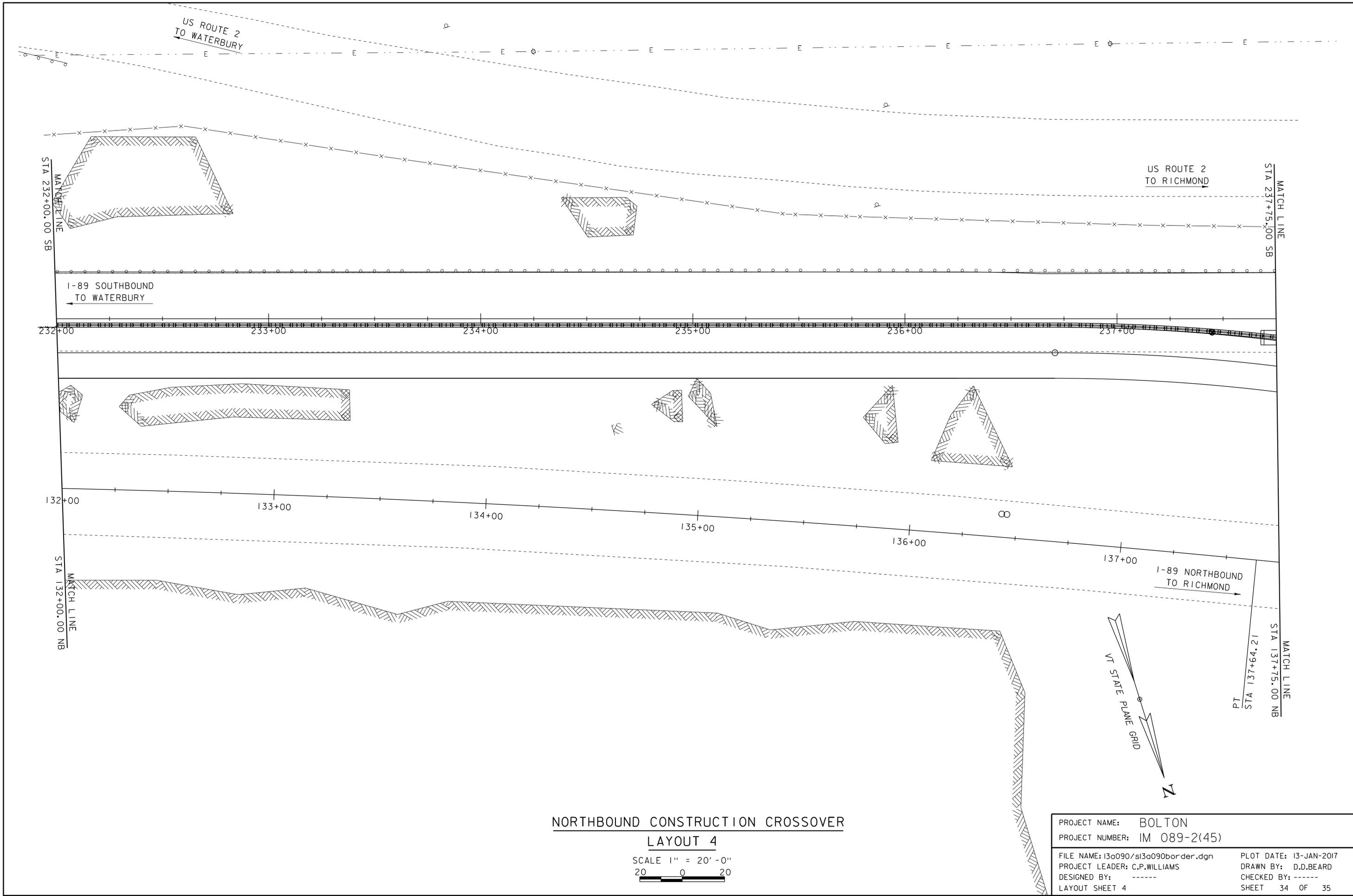
PI  
STA 129+88.33

NORTHBOUND CONSTRUCTION CROSSOVER LAYOUT 3

MATCH LINE  
STA 13+25.00  
LAYOUT 6

SCALE 1" = 20'-0"

PROJECT NAME:	BOLTON	PLOT DATE:	13-JAN-2017
PROJECT NUMBER:	IM 089-2(45)	DRAWN BY:	D.D.BEARD
FILE NAME:	I3a090/sl3a090border.dgn	CHECKED BY:	-----
PROJECT LEADER:	C.P.WILLIAMS	SHEET	33 OF 35
DESIGNED BY:	-----	LAYOUT SHEET	3



US ROUTE 2  
TO WATERBURY

US ROUTE 2  
TO RICHMOND

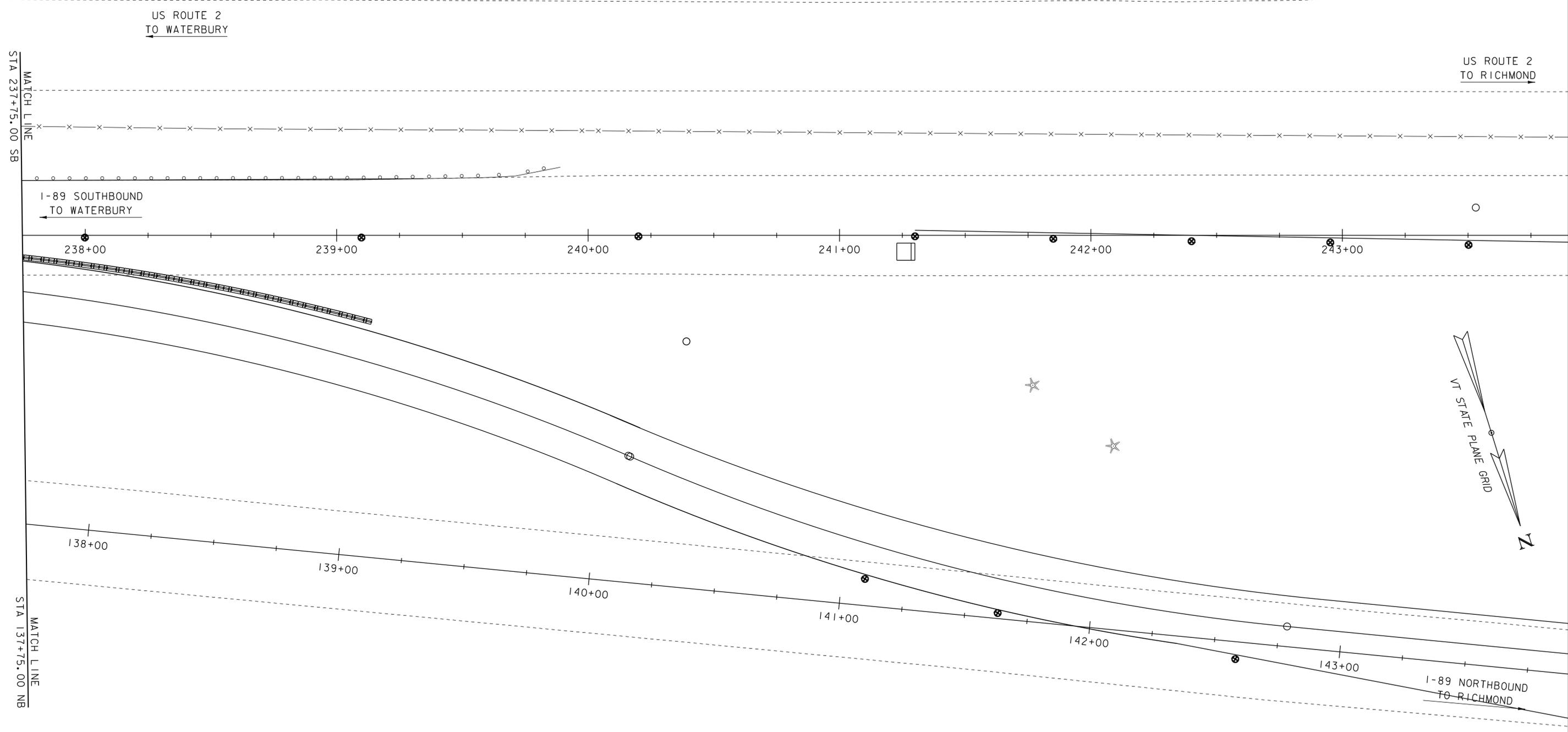
I-89 SOUTHBOUND  
TO WATERBURY

I-89 NORTHBOUND  
TO RICHMOND

**NORTHBOUND CONSTRUCTION CROSSOVER**  
**LAYOUT 4**

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: I3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 34 OF 35
DESIGNED BY: -----	
LAYOUT SHEET 4	



NORTHBOUND CONSTRUCTION CROSSOVER  
LAYOUT 5

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

PROJECT NAME: BOLTON	PLOT DATE: 13-JAN-2017
PROJECT NUMBER: IM 089-2(45)	DRAWN BY: D.D.BEARD
FILE NAME: i3a090/sl3a090border.dgn	CHECKED BY: -----
PROJECT LEADER: C.P.WILLIAMS	SHEET 35 OF 35
DESIGNED BY: -----	LAYOUT SHEET 5