STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Norwich IM 091-2(89)

I-91 Bridges 48 N&S over VT Route 10A

January 30, 2020

I. Contents

I. Site Information

Bridges 48 N&S are located along Interstate 91 (I-91) at the interchange of exit 13 at mile marker 74.8 and cross over VT Route 10A in the Town of Norwich. 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 Classification	I-91: Principal Arterial – Interstate, National Highway System VT Route 10A: Major Collector
Bridge Type	3 Span Continuous Plate Girder
Bridge Lengths	225' (48 N&S)
Year Built	1968
Ownership	State of Vermont

Need

The following are needs of Bridges 48 N&S along I-91 at exit 13 over VT Route 10A.

1. Bridges 48 N&S are structurally deficient with substructure ratings of 4, poor.
   - *Reinforced Concrete Backwalls:* The backwalls have map cracking throughout and scattered areas of light efflorescence and rust staining.
     - Bridge 48N: The abutment 1 (northern) side of the northbound bridge has large areas of spalling in the ends with voids and exposed reinforcing. The east end has a full depth hole that penetrates up through the curb. The abutment 2 (southern) ends of the northbound bridge have small areas of spalling with deep voids and some exposed reinforcing.
     - Bridge 48S: The ends have large areas of spalling w/ deep voids, scaling, and exposed reinforcing. The west end of abutment 1 has a full depth hole that penetrates up through the curb.
   - *Abutment Stems:* The abutment stems have heavy deterioration with map cracking throughout with scattered areas of rust staining and light efflorescence throughout. The ends of the abutments have large areas of spalling that have undermined the bearings, exposing swedge bolts, and caused some minor settlement. The spalling extends down into the stems in areas. Spalling in the west end of abutment 1 on bridge 48S will soon penetrate to the backfill.
   - *Wingwalls:* The wingwalls are in fair condition, with map cracking throughout and light staining. There are areas of spalling with surrounding delaminations along the joints.
   - *Piers:* The piers are in fairly good condition with only minor distresses. There is some fine map cracking in the pier cap ends with light staining.

2. While the decks on bridge 48N and 48S are rated as good and satisfactory respectively, they have minor maintenance needs.
   - *Curbs:* The existing concrete curbs with granite facing on both bridges have map cracking throughout w/ scattered small spalls and patched areas. The ends have large spalled areas w/ scaling and exposed reinforcing.
   - *Joints:* The finger plate joints have minor rust staining and pitting. The steel plate ends are heaving and have become undermined, and patched areas have spalled back out. The steel troughs have scattered perforations with spalling in the surrounding joint headers.

- *Fascia's:* The fascias have map cracking throughout with scattered small delaminations and areas of rust staining. There is spalling in the surrounding areas of the joints w/ heavy scaling and exposed reinforcing.
- *Decks:* The reinforced concrete decks have fine map cracks throughout. Additionally, the deck on Bridge 48 S has scattered areas of rust staining in Bay 4 in span 2.

3. While the superstructure on bridge 48N and 48S are rated as good and satisfactory respectively, they have minor maintenance needs.
   - *Girders:* The girders have some minor pitting in the fascia beam ends. Additionally, the east fascia beam on bridge 48S has some minor deflection in the bottom flange over the west bound lane of VT Route 10A due to past collision damage.
   - *Bearings:* The fascia beam bearings have settlement towards the backwalls due to spalling and undermining in the bridge seats.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2024 and 2044.

Section	AADT		DHV		%T		%D		ADTT		ESALs	
	2024	2044	2024	2044	2024	2044	2024	2044	2024	2044	(2024~2044)	(2024~2044)
1	6,000	6,600	750	810	9.8	17.1	100	100	800	1,500	4,023,000	9,691,000
2	10,000	10,900	1,200	1,300	9.1	15.8	100	100	1,300	2,400	6,637,000	15,989,000

Section 1 – Bridge 48 Northbound
Section 2 – Bridge 48 Southbound

The 2016 AADT on VT Route 10A under Bridges 48 N&S is 12,600 vehicles per day.

Design Criteria

The design standards for this project are the Vermont State Standards (VSS), dated October 22, 1997, A Policy on Geometric Design of Highways and Streets (Green Book), 7th Edition, the VTrans Structures Design Manual, dated 2018, and Interstate Scoping Guidance, dated 2014. Minimum standards are based on the traffic volumes listed above and a design speed of 70 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	Green Book Chapter 8.2	4'-12'-12'-12 (40')	4'-12'-12'-10' (38')	
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	NB: 4'-12'-12'-10' (38') SB: 4'-12'-12'-12'-2' (42')	NB: 4'-12'-12'-10' (38') SB: 4'-12'-12'-12'-10' (50')	Substandard shoulder on southbound bridge
Clear Zone Distance	VSS Table 3.4	Clear or Shielded	26' fill / 20' cut	
Banking	VSS Section 3.13	Normal Crown	8% (max)	
Speed		65 mph (Posted)	70 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = ∞	R_{min}= 1,810' @ 8%	
Vertical Grade	AASHTO Green Book Table 8-1	-2.56% (max)	4% (max) for rolling terrain	
K Values for Vertical Curves	AASHTO Green Book Table 3-35	Tangent	247 crest / 181 sag	
Vertical Clearance Issues	VSS Section 5.8	15'-6" (below 48N) 14'-6" (below 48S)	14'-3" (min)	
Stopping Sight Distance	AASHTO Green Book Table 3-35	2000+'	730'	
Bicycle/Pedestrian Criteria		None	N/A	Limited Access
Bridge Railing (and Approach Railing)	Structures Design Manual Section 13.2	3 Tube Bridge Rail w/ w-beam approach	TL-5	Substandard
Structural Capacity	Structures Design Manual Section 3.4.1	Structurally Deficient (48N&S)	Design Live Load: HL-93	Substandard

Inspection Report Summary

Bridge	Deck Rating	Superstructure Rating	Substructure Rating	Channel Rating
48 N	7	7	4	N/A
48 S	6	6	4	N/A

Bridge 48 N:

4/18/2019 – The failed drainage systems of the joints and spalled out curb ends allows for the saturation and deterioration of the abutments. Spalling continues in the backwalls and bridge seat of abutment 2 w/ heavy scaling and exposed reinforcing. The fascia beam bearings of abutment 2 have minimal supporting concrete and settlement will occur. Corrective repairs are needed. ~JW/MC

5/25/2018 – The abutment ends have significant spalling in the bridge seats undermining the facia beam bearings. The undermining of the abutment 2 bearings has caused some minor settlement. Saturation continues due to the open curb joints above. This structure should be considered for a

joint replacement project extending out to the fascia's, eliminating the open curb joints. Concrete repairs are needed in the abutments, backwalls, and the curb ends above. ~JW/MC

5/25/2016 – This structure needs to have concrete repairs made to the surrounding areas of the joints, curb ends, backwalls, and abutments. Due to the failed curb ends at the joints and failed drainage of the finger plate joint, saturation continues and deep spalling has occurred. The finger plate joint should be considered for replacement with a Vermont joint and it should extend to the fascia's with scuppers installed. ~JW/AC

Bridge 48 S:

4/18/2019 – The failed drainage systems of the joints and spalled out curb ends allows for the saturation and deterioration of the abutments. Spalling continues in the backwalls and bridge seat of abutment 2 w/ heavy scaling and exposed reinforcing. The fascia beam bearings of abutment 2 have minimal supporting concrete and settlement will occur. Corrective repairs are needed. ~JW/MC

5/25/2018 – The abutment ends have significant spalling in the bridge seats, undermining the facia beam bearings. The undermining of the abutment 2 bearings has caused some minor settlement. Spalling in the east end of abutment 1 has spread down into the stemwall and will soon penetrate to the backfill. Saturation continues due to the open curb joints above. This structure should be considered for a joint replacement project extending out to the fascias, eliminating the open curb joints. Concrete repairs are needed in the abutments, backwalls, and the curb ends above. ~JW/MC

5/25/2016 – This structure needs to have concrete repairs made to the surrounding areas of the joints, curb ends, backwalls, and abutments. Due to the failed curb ends at the joints and failed drainage of the finger plate joint, saturation continues, and deep spalling has occurred. The finger plate joint should be considered for replacement with a Vermont joint and it should extend to the fascias with scuppers installed. ~JW/AC

Hydraulics

Bridge 48 N&S is a dry crossing, so hydraulics is not applicable.

Utilities

Aerial Utilities: (Aerial utilities through the project area are owned by: Green Mountain Power Company, Consolidated Communications, Firstlight, and Comcast)

- The Aerial crossings are roughly 600ft south of bridges on I-91

Underground Utilities:

- CCI has underground along VT Route 10A, buried on the north side of VT Route 10A.
- There is underground electrical for street lighting along VT Route 10A that is owned by VTrans.

Municipal Utilities:

- The Town of Norwich Fire District has an 8-inch water main underneath the bridges buried along VT Route 10A. The Water main is located to the north side of VT Route 10A. The Town of Norwich water main is believed to be 10 feet below the surface of the existing ground.

- No sewer lines exist within the project limits.

- The Town of Norwich has street lighting along the VT Route 10A corridor under the bridges.

Right of Way

The existing Right-of-Way is shown on the Existing Conditions Layout sheet.

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

Resources

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

Archaeological:
There are no archaeologically sensitive areas within the project area.

Historic:
The project is considered EXEMPT for above-ground historic resources per the Section 106 Exemption Regarding Effects to the Interstate Highway System adopted by the Advisory Council on Historic Preservation on March 10, 2005.

Natural Resources:

Wetlands/Watercourses

There are no wetlands or watercourses within the review area.

Wildlife Habitat

There is very limited wildlife habitat at this location.

Rare, Threatened and Endangered Species (R/T/E)

The only listed species in the project area is the federally threatened northern long-eared bat. The bridge does not provide useful roosting habitat, so restrictions caused by this animal are unlikely.

Agricultural Soils

There are no mapped agricultural soils in the review area.

Hazardous Materials:
The hazardous waste sites located in the project area are shown on the map to the right. There are two hazardous waste sites in close proximity to the bridge.

Stormwater:
No known issues.

II. Safety

Interstate 91: There have been 14 crashes located in the project area along Interstate 91 in Norwich within the last 5-year period.

VT Route 10A: There have been 19 crashes located along VT Route 10A at the I-91 interchange at exit 13 in Norwich within the last 5-year period.

The following High Crash Locations are located within the project area:

High Crash Location Segment:

Route	Town	Mileage	# of Crashes	# of Fatalities	# of Injuries
I-91	Norwich	74.8 – 75.1	13	0	2

High Crash Location Intersection:

Route	Town	Mileage	# of Crashes	# of Fatalities	# of Injuries
VT Route 10A & I-91	Norwich	0.17 – 0.25 (VT Route 10A)	20	0	3

The VTrans Traffic Safety Engineer evaluated the project site with the following findings:

High Crash Intersection, VT Route 10A @ I-91, MM 0.17-0.25

This is a four-way intersection composed of VT Route 10A, the bottom of the I-91 NB exit ramp at exit 13 and the NB I-91 NB on ramp. The exit ramp has a slight down grade and it has an exclusive right turn lane and a share left and thru lane. VT Route 10A, is a four-lane road separated by a median and it has an exclusive left turn lane in the eastbound direction.

Crashes from 2010 and up were reviewed. The primary crash pattern at this intersection is of the right-angle type involving an eastbound vehicle on VT Route 10A and a vehicle coming off the exit ramp. The primary reason for this type of crashes are vehicles sliding off at the bottom of the exit ramp due to ice and snow and continuing into the intersection not being able to stop. These crashes occurred mostly in 2014 and 2015 (six crashes). Two more crashes happened in 2016 and 2017 (one each year).

The District is reporting that they have stepped up their winter maintenance on both VT Route 10A and the exit 13 ramps over the past couple of winters, in an attempt to provide a safer product for the traveling public.

A second reason for the occurrence of this primary crash pattern at this intersection is a VT Route 10A vehicle going through the red light. There were two instances during the review period. The motorists in these crashes said that they did not see the red light. In one of the crashes, the reporting officer indicated that the traffic signal appeared to be functioning properly and that no lights were out on the eastbound side. These crashes happened in 2014 and 2015.

Suggestions for reducing the occurrences of crashes:

- Backplates could be added to the signal heads (if it is determined that the spanwire can handle the additional weight) to make the signal heads more visible.

- Winter maintenance has been improved and winter related crashes have been reduced. Another step could be to install a high friction surface treatment on the off ramp.

High Crash Segment, I-91, MM 74.8 – 75.10

This section of I-91 includes Bridges 48 N & S as well as the I-91 NB on ramp and the I-91 SB on ramp.

Crashes from 2010 and up were reviewed. This section was within a work zone in 2012. While there are thirteen crashes listed on this section of I-91, information is available for only six of them. Of the six crashes for which information is available, three happened in the work zone in 2012.
The three work zone crashes happened at the exit 13 NB on ramp. In two cases, a vehicle was attempting to merge onto I-91. In the other case, a vehicle was slowing down to let somebody from the ramp get on I-91 and this vehicle got rear-ended. The other three crashes involved hitting a deer, driving aggressively, and overturning due to slippery road conditions (ice).

It is suspected that the crashes for which no data is available were classified as non-reportable. These may have involved single vehicles that ran-off-the road due to rain or snow.
An email was sent to the Royalton Barrack to obtain additional information for these other crashes.

If additional information is provided, further analysis will be provided.

The District is reporting that there are sometimes close calls in the southbound on ramp acceleration lane during the morning commute as drivers do not always yield when entering I-91.

Suggestions for reducing the occurrences of crashes:

- Given the available information, there are no recommendations for reducing the occurrence of the types of crashes that were identified on this section of I-91. However, to address the concern brought by the District and the merging issue when entering I-91 southbound, the solid white line defining the gore could be extended to force people to merge further south. In addition, rumble stripes (similar to centerline rumble stripes) could be installed along the solid white line to further accomplish this (this was done at I-89 Exist 15 SB in Winooski).

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 in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

This option would close the section of I-91 between the on and off ramps at exit 13. The detour would utilize the on and off ramps at exit 13 for northbound traffic, and US Route 5 from exit 13 to 12 for traffic traveling south along I-91. The through distance on the US Route 5 detour is almost identical at 3.8 miles versus the 3.4 miles on I-91, with travel times estimated at 7 minutes for the detour route and 3 minutes for traveling on I-91. The detour for northbound traffic would not add any distance to the through route.

Due to the high traffic volumes on VT Route 10A, it would be advantageous to detour traffic around the bridge. Traffic traveling on VT Route 10A would detour onto River Road to US Route 5 to circumvent bridges 48 N&S. Traffic on VT Route 10A heading south on Interstate-91 would take US Route 5 down to exit 12.

It is recommended that a detour only be utilized for brief closure periods during off peak hours, such as nights or weekends, in order to rapidly replace the deck or superstructures. The methods available to replace a deck or superstructure during a short closure period include: lateral slide, self-propelled modular transporters (SPMTs), and prefabricated bridge elements. Each of these methods is discussed briefly below.

Lateral Slide

A lateral slide consists of constructing an entire superstructure adjacent to the location where it is intended and physically pushing or pulling the structure into its design location along lubricated rails. This allows traffic to be maintained on the existing bridges while construction of the bridges takes place. Traffic would then be detoured for approximately 3 days while the existing bridge is removed and the new bridge is moved into place.

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

One of the disadvantages of utilizing a lateral slide for Bridges 48 N&S is that the construction still needs to take place over VT Route 10A. There are some height restrictions and worker safety issues when construction occurs over busy roadways.

Self-Propelled Modular Transporters (SPMT)

There are several methods of constructing the bridge in a safer, less restricted environment before moving it into place. One of those methods utilizes SPMTs. Similar to a lateral slide, SPMT placement requires that the entire superstructure is constructed near but not in its intended location, allowing traffic to be maintained on the existing bridges while the new bridges are constructed. Instead of sliding the superstructure into place, it is lifted off its temporary blocking, moved a short distance to its design location, and lowered into place. This method can also be used in reverse to remove the existing superstructure.

Superstructures have been removed and replaced utilizing SPMTs during 12 hour stretches overnight. This type of technology has been used in several states, including Florida, Louisiana, Minnesota, Rhode Island, New York, Illinois, Washington, and Utah. It is reasonable to assume that the I-91 closure period would be similar to that for a lateral slide to incorporate the site preparation work, the clean up and backfilling that may be required after the superstructure has been replaced. One of the disadvantages of using SPMTs is that VT Route 10A, in addition to I-91, needs to be closed to traffic while the move is taking place. While this is an additional inconvenience, it does not rule out the use of SPMTs because there are alternate methods for traffic to get to the other side of I-91 on VT Route 10A.

Prefabricated Bridge Units (PBU)

Another method of constructing the bridge in a safer and less restricted environment over VT Route 10A is to prefabricate portions of the bridge structure and deliver those pieces to the construction site to be joined together to form the bridge. These bridge superstructure pieces are referred to as Prefabricated Bridge Units, or PBUs. Many substructure pieces can be prefabricated as well and lifted into place before the PBUs are placed. Using rapid setting concrete for the joint closure pours, the closure period can be reduced to 3 days per bridge for this method of superstructure replacement as well.

Installation Costs
The baseline method of installing the superstructure is using a crane to lift the PBUs into place. These costs are included in the baseline bridge costs. The extra engineering and temporary supports required for a lateral slide are approximately $150,000 per bridge, and the costs paid to an SPMT subcontractor would be around $200,000 per bridge for a dry crossing.

A map of the detour route can be found in the Appendix.

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 constructing the structure in phases, there will be no vibrations or deflections from adjacent traffic to affect the quality of the closure pours joining the phases. By not requiring the construction and removal of temporary approaches, temporary bridges and temporary crossovers, the length of construction can be reduced over those other options.

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 Bridges

The standard maintenance of traffic option based on the length of the bridges and the traffic volumes at these locations would be a one lane temporary bridge for each barrel of I-91. There is sufficient Right-of-Way located along this section of I-91 that a temporary bridge could be located east of the existing bridges while the northbound bridges are under construction and west of the existing bridges while the southbound bridges are under construction.

A one lane Mabey bridge is approximately 24’ wide. The distance between the northbound and southbound bridges is approximately 35’. Thus, it would seem that a temporary bridge could be launched between the north and south bound bridges to be utilized in turn for both the north and southbound traffic without being moved while work is being performed on each bridge.

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

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

Disadvantages: There are extra costs associated with constructing or launching temporary bridges, especially in a narrow median. Changes in traffic patterns can increase the probability of accidents and the increased time associated with constructing temporary approaches and launching the temporary bridges puts the construction workers at increased risk for accidents. In order to minimize the length of median affected by the temporary roadwork, the design speed should probably be reduced to more safely allow vehicles to navigate the temporary roadway. This decrease in speed would cause slight traffic delays.

Option 3: Phased Construction

Phased construction is the maintenance of one lane of traffic on the existing bridge while working on the other lane. The project begins with traffic being constricted to one lane, while work is done on the other. After completion of improvements to the first lane, traffic is switched to the completed lane and work proceeds on the second lane. Traffic flow is constant, although delayed due to slower speeds in the work zone. In the case of Interstate bridges, phasing is usually appropriate only for

repairs or replacement of deck and/or railing. For bridges 48 N&S, DHV volumes are below the 1250 vehicles per hour cutoff that guidance allows for one lane during peak hours, therefore phasing could be considered for a reasonable period of time without needing to reopen both lanes. Periodic short term lane closures on VT Route 10A would be necessary to provide access to crews working on the superstructures from below. These closures would not be advised during peak hours because of the high peak hourly volumes on VT Route 10A.

Advantages: Traffic flow is maintained through the corridor during the project. Phasing the work allows the work to proceed one lane at a time without the expense of a temporary bridge or crossovers and without the inconvenience of a closure and detour.

Disadvantages: Compared to a closure and detour or a temporary bridge scenario, it takes longer and costs more to construct, rehabilitate, or repair a bridge project in phases because some of the construction tasks have to be performed multiple times and cannot be performed concurrently. Additional permit requirements may come into play. The safety risks for both workers and travelers are also increased due to the close proximity to each other. Some structural qualities, such as joints, demand more coordination time and may suffer in quality as well. Periodic lane closures outside of peak hours on VT 10A would be required.

Option 4: On-Site Detour with Crossovers

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

There is adequate site distance and there are no obstructions. Additionally, the elevation of the northbound and southbound lanes are nearly equal, making this a good candidate for crossovers.

There is not enough distance between the on ramp to I-91 south and Bridge 48S. As such, the on ramp for I-91 south would either need to be closed during construction or be reconstructed in another location. Traffic utilizing exit 13 to enter I-91 SB would need to detour onto US Route 5 to the exit 12 on ramp if the ramp was closed.

IV. Alternatives Discussion

Bridges 48 N&S are structurally deficient with heavy deterioration of the backwalls radiating down into the abutment stems. The abutment ends in particular have heavy spalling under the fascia beams. However, the decks and superstructures on both bridges are rated as being in Satisfactory to Good condition.

Maintenance Schedule:
It is desired to keep the northbound and southbound direction for each bridge on the same maintenance cycle. Therefore, the recommended scope for Bridge 48N should be the same for Bridge 48S.

No Action

This alternative would involve leaving the bridges in their current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing bridge can stay in place without any work being performed on it during the next 10 years. Bridges 48 N&S had a Bridge Inspection Finding that specified a "Maintenance Finding" which require at least a minimal amount of work in the near future. The substructures are rated a 4 (Poor), and as such the bridges are considered structurally deficient. Since some work is required within the next 10 years, the No Action alternative will not be considered further in this report.

Alternative 1: Rehabilitation

This rehabilitation option includes the minimal amount of work necessary to extend the useful lives of the bridges. This alternative would involve substantial repairs including possible full replacement of the existing substructures. Additionally, while the superstructure and deck are rated as being in satisfactory to good condition, there are maintenance issues that would need to be addressed with any rehabilitation. A rehabilitation for the bridges would include the following:

- The superstructures would be shored at each of the abutments. The bridge seats and stems at the abutments would be cut down, and new stems and bridge seats would be poured on the existing footings supported on piles. The wingwalls have a significant amount of map cracking. The wingwalls should be repaired along with the stem and bridge seats. The superstructure would then be placed back on new bearings.
- The backwalls are failing. New backwalls should be poured.
- The northern bridge joints (finger joints) are in poor condition and have significantly contributed to the poor rating of the substructure due to water and salt leaking on to the abutments. In order to protect any new substructure elements, the finger joints would require replacement. The existing finger joints would be removed, and new joints would be constructed. The deck has spalling in the surrounding areas of the joints with heavy scaling and exposed reinforcing steel. The joint replacement would include removal of the concrete surrounding the joints and pouring new concrete around the joints.
- The concrete curbs behind the granite facing have a significant amount of map cracking with some spalled areas with exposed reinforcing. The bridge fascias would be removed, and new fascias, curbing, and railing would be constructed.
- All exposed concrete on the bridge should be sprayed with silane water repellant. This should protect the degrading concrete for several years against moisture damage, at which point, a new application should occur.
- The existing deck would be membraned and paved.

While the existing abutments are in poor condition, the piers and remaining components are in satisfactory to good condition. It is reasonable to assume that with the repairs listed above, the existing substructure and beams can safely carry anticipated traffic loads for an additional 30 years.

The current curb to curb width of bridge 48N is approximately 38 feet, which meets the minimum standard of 38 feet. As such, the current typical section of 4'-12'-12'-10' will be maintained for the northbound bridge. The current curb to curb width of bridge 48S is approximately 42 feet, which does not meet the minimum standard of 50 feet. The overhang may be increased slightly to provide a wider shoulder on the southbound bridge. Any possible widening will be determined in design.

Advantages: This option provides the lowest upfront cost to extend the life of the structure.

Disadvantages: Having newer non-chloride laced concrete adjacent to the existing concrete usually exacerbates the rate of deterioration of the remaining concrete which surrounds the repairs. This can be mitigated for approximately 30 years with the addition of sacrificial anodes into the patched structure.

Maintenance of traffic: Most of this work can be accomplished with single lane closure utilizing phased construction on I-91. Individual lanes on VT Route 10A may need to be closed as well while substructure and overhead repair work is occurring.

This alternative will address the deterioration issues of the existing bridges.

Alternative 2: Deck Replacement

A deck replacement for this bridge would include a new deck, curbs and railings, along with substructure repairs. There would be substantial repairs to the substructures including possible replacement of the existing abutment stems. A rehabilitation for the bridges would include the following:

- The existing deck would be removed, and a new cast-in-place deck would be poured.
- The superstructures would be shored at each of the abutments or removed and reset for substructure work to take place. The bridge seats and stems at the abutments would be cut down, and new stems and bridge seats would be poured on the existing footings supported on piles. The superstructure would then be placed back on new bearings.
- The backwalls are failing. New backwalls would be poured.
- The northern bridge joints (finger joints) are in poor condition and have significantly contributed to the poor rating of the substructure due to water and salt leaking on to the abutments. As part of the deck replacement, all new joints would be constructed, which would protect any new and existing substructure elements from future leakage.
- All new and existing exposed concrete on the bridge should be sprayed with silane water repellant. This should protect the degrading concrete for several years against moisture damage, at which point, a new application should occur.
- Any areas of spalling and deterioration in the wingwalls, abutments, and pier caps not being replaced should be prepared for concrete repair and repaired with the appropriate concrete class.

While the existing abutments are in poor condition, the piers and remaining components are in satisfactory to good condition. It is reasonable to assume that with partial replacement of the abutments along with the repairs listed above, the existing substructure and beams can safely carry anticipated traffic loads for an additional 40 years.

The current curb to curb width of bridge 48N is approximately 38 feet, which meets the minimum standard of 38 feet. As such, the current typical section of 4'-12'-12'-10' will be maintained for the northbound bridge. The current curb to curb width of bridge 48S is approximately 42 feet, which does not meet the minimum standard of 50 feet. The overhang may be increased slightly to provide a wider shoulder on the southbound bridge. Any possible widening will be determined in design.

Advantages: This alternative would address the immediate concerns of the poor abutment condition and maintenance issues of the decks, with minimal upfront cost. This alternative would remove the structurally deficient designation of the bridges. The effects on the adjacent properties, resources, and wildlife would be minimal. The width of the existing bridge meets the minimum standards for width.

Disadvantages: Having newer non-chloride laced concrete adjacent to the existing concrete usually exacerbates the rate of deterioration of the remaining concrete which surrounds the repairs.

Maintenance of Traffic: Traffic could be maintained on an offsite detour, a temporary bridge, crossovers or with phased construction. If crossovers are constructed, the on-ramp for southbound traffic at exit 13 would need to be closed during construction or reconstructed in a new location.

Alternative 3: Superstructure Replacement

A superstructure replacement option for this bridge would include a new deck, railings, and superstructure, with substructure repairs as follows:

- The bridge seats would be cut down, and new bridge seats along with a new backwall would be poured. The superstructure would be placed back on new bearings.
- Any areas of spalling and deterioration in the wingwalls, abutments, and pier caps not being replaced should be prepared for concrete repair and repaired with the appropriate concrete class.
- All exposed concrete on the bridge should be sprayed with silane water repellant. This should protect the degrading concrete for several years against moisture damage, at which point, a new application should occur.

While the existing abutments are in poor condition, the piers and remaining components are in satisfactory to good condition. It is reasonable to assume that with partial replacement of the abutments along with the repairs listed above, the existing substructure and beams can safely carry anticipated traffic loads for an additional 40 years.

The current curb to curb width of bridge 48N is approximately 38 feet, which meets the minimum standard of 38 feet. As such, the current typical section of 4'-12'-12'-10' will be maintained for the northbound bridge. The current curb to curb width of bridge 48S is approximately 42 feet, which does not meet the minimum standard of 50 feet. The overhang may be increased slightly to provide a wider shoulder on the southbound bridge. Any possible widening will be determined in design.

Advantages: This alternative would address the immediate concerns of the poor abutment condition and maintenance issues of the decks, with minimal upfront cost. This alternative would remove the structurally deficient designation of the bridges. The effects on the adjacent properties, resources, and wildlife would be minimal. The width of the existing bridge meets the minimum standards for width.

Disadvantages: The existing superstructure for bridge 48N and bridge 48S are in good condition and satisfactory condition respectively and are only 52 years old. This option would remove bridge components that have not reached the end of their useful life.

Maintenance of Traffic: Traffic could be maintained on an offsite detour while utilizing accelerated bridge construction techniques, a temporary bridge, crossovers or with phased construction. If crossovers are constructed, the on-ramp for southbound traffic at exit 13 would need to be closed during construction or reconstructed in a new location.

Alternative 4: Complete Replacement

This alternative would replace the existing bridges with a new superstructure as well as new substructures at the existing location. The current horizontal alignment meets current standards for minimum radius and banking, and an on-alignment option should be considered to reduce permanent impacts to adjacent properties and resources.

The various considerations under this option include: the bridge width and length, skew, superstructure type and substructure type.

a. Bridge Width

The current curb to curb width of bridge 48N is approximately 38 feet, which meets the minimum standard of 38 feet. The current curb to curb width of bridge 48S is 42 feet, which does not meet the minimum standard of 50 feet. Since a new 100-year bridge is being proposed, the bridge geometry should meet the minimum standards. As such, the current typical section of 4'-12'-12'-10' for the northbound bridge, and the standard typical section of 4'-12'-12'-12'-10' for the southbound bridge will be proposed.

b. Bridge Length and Skew

The existing bridges are each comprised of 3-spans totaling 225 feet-long with a skew of 30 degrees and a maximum span of 110-feet. If a new steel beam bridge is proposed, the number of spans and span length would remain the same to allow for deep foundations similar to the existing configuration.

c. Superstructure Type

The most economical superstructure type for this span is a steel girder superstructure with a cast-in-place composite concrete deck. If an offsite detour is chosen to be the preferred method of traffic control, then accelerated bridge construction methods would be recommended. These are explained in section III: Maintenance of Traffic of this report and could include a lateral slide, self-propelled Modular Transporters, or prefabricated elements. The most common type of prefabricated superstructure elements that can satisfy a 110-foot maximum span length are Prefabricated Precast Bridge Units (PBUs) or prefabricated precast deck slabs on steel beams.

The current vertical clearance over Bridge 48 S is 14'-6". This meets the minimum standard of 14'-3". However, it is recommended that the existing superstructure depth does not increase.

d. Substructure Type

The existing abutments and piers are founded on piles. The preliminary geotechnical report indicates that new abutments and piers could be founded on either spread footings bearing on suitable foundation soils, or deep foundations such as driven piles or drilled shafts

extending to bedrock. Sufficient subsurface information should be obtained in design to verify the in-situ conditions and determine the best foundation type. The preliminary geotechnical report can be found in Appendix D.

Maintenance of Traffic: Traffic could be maintained on an offsite detour, a temporary bridge, crossovers or with phased construction. If crossovers are constructed, the on-ramp for southbound traffic at exit 13 would need to be closed during construction or reconstructed in a new location.

V. Alternatives Summary

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

Bridges 48 North & South
Alternative 1a: Rehabilitation with Traffic Maintained on an Offsite Detour
Alternative 1b: Rehabilitation with Traffic Maintained via Phased Construction
Alternative 1c: Rehabilitation with Traffic Maintained on a Temporary Bridge
Alternative 1d: Rehabilitation with Traffic Maintained on Crossovers
Alternative 2a: Deck Replacement with an Offsite Detour
Alternative 2b: Deck Replacement with Traffic Maintained via Phased Construction
Alternative 2c: Deck Replacement utilizing a Temporary Bridge
Alternative 2d: Deck Replacement with Traffic Maintained on Crossovers
Alternative 3a: Superstructure Replacement with an Offsite Detour
Alternative 3b: Superstructure Replacement with Traffic Maintained via Phased Construction
Alternative 3c: Superstructure Replacement utilizing a Temporary Bridge
Alternative 3d: Superstructure Replacement with Traffic Maintained on Crossovers
Alternative 4a: Full Bridge Replacement with Traffic Maintained on an Offsite Detour
Alternative 4b: Full Bridge Replacement with Traffic Maintained via Phasing
Alternative 4c: Full Bridge Replacement with Traffic Maintained on a Temporary Bridge
Alternative 4d: Full Bridge Replacement with Traffic Maintained on Crossovers

VI. Bridge 48 N&S Cost Matrix[1]

Norwich IM 091-2(89)		Do Nothing	Rehabilitation				Deck Replacement				Superstructure Replacement				Full Bridge Replacement			
			a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers	a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers	a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers	a. Offsite Detour	b. Phased Construction	c. Temporary Bridge	d. Crossovers
COST	Bridge Cost	$0	1,444,200	1,660,800	1,444,200	1,444,200	3,133,200	1,968,000	1,711,400	1,711,400	6,406,000	4,345,800	3,779,000	3,779,000	9,777,200	7,078,800	6,155,400	6,155,400
	Removal of Structure	$0	160,000	184,000	160,000	160,000	883,200	1,015,680	883,200	883,200	883,200	1,015,680	883,200	883,200	1,656,000	1,904,400	1,656,000	1,656,000
	Roadway	$0	236,000	340,000	236,000	236,000	474,000	572,000	398,000	398,000	454,000	772,000	536,000	536,000	808,000	848,000	590,000	590,000
	Maintenance of Traffic	$0	238,600	593,200	854,040	464,480	238,600	593,200	854,040	464,480	238,600	593,200	854,040	464,480	238,600	593,200	854,040	464,480
	Construction Costs	$0	2,078,800	2,778,000	2,694,240	2,304,680	4,729,000	4,148,880	3,846,640	3,457,080	7,981,800	6,726,680	6,052,240	5,662,680	12,479,800	10,424,400	9,255,440	8,865,880
	Construction Engineering & Contingencies	$0	519,700	694,500	673,560	576,170	945,800	1,037,220	961,660	864,270	1,197,270	1,009,002	907,836	849,402	1,871,970	2,084,880	1,851,088	2,216,470
	Accelerated Premium	$0	0	0	0	0	331,030	0	0	0	558,726	0	0	0	873,586	0	0	0
	Total Construction Costs w CEC	$0	2,598,500	3,472,500	3,367,800	2,880,850	6,005,830	5,186,100	4,808,300	4,321,350	9,737,796	7,735,682	6,960,076	6,512,082	15,225,356	12,509,280	11,106,528	11,082,350
	Preliminary Engineering	$0	519,700	694,500	538,848	576,170	378,320	331,910	307,731	276,566	1,197,270	1,009,002	907,836	849,402	1,247,980	2,084,880	2,776,632	2,216,470
	Right of Way	$0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Project Costs	$0	3,118,200	4,167,000	3,906,648	3,457,020	6,384,150	5,518,010	5,116,031	4,597,916	10,935,066	8,744,684	7,867,912	7,361,484	16,473,336	14,594,160	13,883,160	13,298,820
	Annualized Costs	$0	103,940	138,900	130,222	115,234	159,604	137,950	127,901	114,948	273,377	218,617	196,698	184,037	164,733	145,942	138,832	132,988
SCHEDULEING	Project Development Duration		3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years
	Construction Duration		6 months	9 months	2 years	2 years	9 months	2 years	2 years	2 years	9 months	2 years	2 years	2 years	2 years	2 years	3 years	3 years
	Closure Duration (If Applicable)		3 weeks each bridge	NA	NA	NA	8 weeks each bridge	NA	NA	NA	8 weeks each bridge	NA	NA	NA	1 year each bridge	NA	NA	NA
ENGINEERING	Typical Section - Roadway (feet)	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'	40'
	Typical Section - Bridge (feet)	NB: (38’) SB: (42’)	NB: 4'-12'-12'-10' (38’) SB: 4'-12'-12'-12'-2' (42’)				NB: 4'-12'-12'-10' (38’) SB: 4'-12'-12'-12'-2' (42’)				NB: 4'-12'-12'-10' (38’) SB: 4'-12'-12'-12'-2' (42’)				NB: 4'-12'-12'-10' (38’) SB: 4'-12'-12'-12'-10' (50’)			
	Geometric Design Criteria	Meets Minimum Standards	Substandard shoulder width on southbound bridge				Substandard shoulder width on southbound bridge				Substandard shoulder width on southbound bridge				Meets Minimum Standards			
	Traffic Safety	Structurally Deficient	Improved				Improved				Improved				Improved			
	Alignment Change	No Change	No Change				No Change				No Change				No Change			
	Bicycle Access	LAH	Limited Access Highway				Limited Access Highway				Limited Access Highway				Limited Access Highway			
	Pedestrian Access	LAH	Limited Access Highway				Limited Access Highway				Limited Access Highway				Limited Access Highway			
	VT 10A Vertical Clearance	14'-6" (Minimum)	Meets Minimum Standards				Meets Minimum Standards				Meets Minimum Standards				Meets Minimum Standards			
	Utilities	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OTHER	ROW Acquisition	No Change	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	Road Closure	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No
	Design Life (years)	<10	30	30	30	30	40	40	40	40	40	40	40	40	100	100	100	100

[1] Costs are estimates only, used for comparison purposes.

VII. Conclusion

Alternative 1d is recommended: to rehabilitate the existing bridge while maintaining traffic on crossovers.

Discussion:
The rehabilitation alternative has both the lowest upfront and annualized cost. The deck and superstructure on Bridge 48 N are rated as being in good condition and the deck and superstructures on Bridge 48 S are rated as being in satisfactory condition. Additionally, the bridge is only 51 years old and has not reached the end of its useful life. While the substructures are rated as being in poor condition, the pier caps and columns are rated as being in fairly good condition with only minor distresses. The bridge is considered structurally deficient due to the condition of the abutments.

As part of the project, the abutments need extensive repairs and/or full replacement along with the following:

- The superstructures will be shored at each of the abutments. The bridge seats and stems at the abutments will be cut down, and new stems, wingwalls, and bridge seats will be poured on the existing footings supported on piles. New backwalls will also be poured.
- In order to protect the rehabilitated abutments, new joints will be installed on the bridge. The joint replacement will include removal of the concrete surrounding the existing finger joints and new concrete will be poured around the joints.
- The bridge fascias will be removed, and new fascias, curbing, and railing will be constructed.
- The deck will be membraned and paved.
- All exposed concrete on the bridge will be sprayed with silane water repellant.

The current curb to curb width of bridge 48N is approximately 38 feet, which meets the minimum standard of 38 feet. As such, the current typical section of 4'-12'-12'-10' will be maintained for the northbound bridge. The current curb to curb width of bridge 48S is approximately 42 feet, which does not meet the minimum standard of 50 feet. The overhang may be increased slightly to provide a wider shoulder on the southbound bridge. Any possible widening will be determined in design.

Traffic Control:
It is recommended that traffic be maintained on crossovers during construction. Due to the extensive substructure work and the need to jack the structure up on temporary supports, there are higher risks and costs associated with phased construction.

Crossovers will be constructed in the median before and after the structures to get all traffic off one structure and on to the parallel structure. There is adequate site distance and there are no obstructions at this bridge site. Additionally, the elevation of the northbound and southbound lanes are nearly equal, making this a good candidate for crossovers.

There is not enough distance between the on-ramp to I-91 south and Bridge 48S to merge the on-ramp traffic onto a crossover. As such, the on-ramp for I-91 south would either need to be closed during construction or be reconstructed in another location. Traffic utilizing exit 13 to enter I-91 SB would need to detour onto US Route 5 to the exit 12 on ramp if the ramp is closed.

VIII. Appendices

Appendix A: Site Pictures
Appendix B: Town Map
Appendix C: Bridge Inspection Reports
Appendix D: Preliminary Geotechnical Information
Appendix E: Resource ID Completion Memo
Appendix F: Natural Resources Memo
Appendix G: Hazardous Waste Sites
Appendix H: Archaeology Memo
Appendix I: Historic Memo
Appendix J: Utility Investigation
Appendix K: Local Input
Appendix L: Office of Highway Safety Road Safety Audit of VT Route 10A, I-91 NB exit, and McKenna Rd
Appendix M: Operations Input
Appendix N: Crash Data
Appendix O: Detour Routes
Appendix P: Plans

Appendix A: Site Pictures

Picture 1: Typical pier condition

Picture 2: Cracking at pier cap nose

Picture 3: Abutment Condition

Picture 4: Deck and Superstructure

Picture 5: Abutment Deterioration

Picture 6: Abutment Deterioration

Picture 7: Wingwall cracking and curb deterioration

Picture 8: Abutment deterioration at bearing location

Picture 9: Poor backwall condition

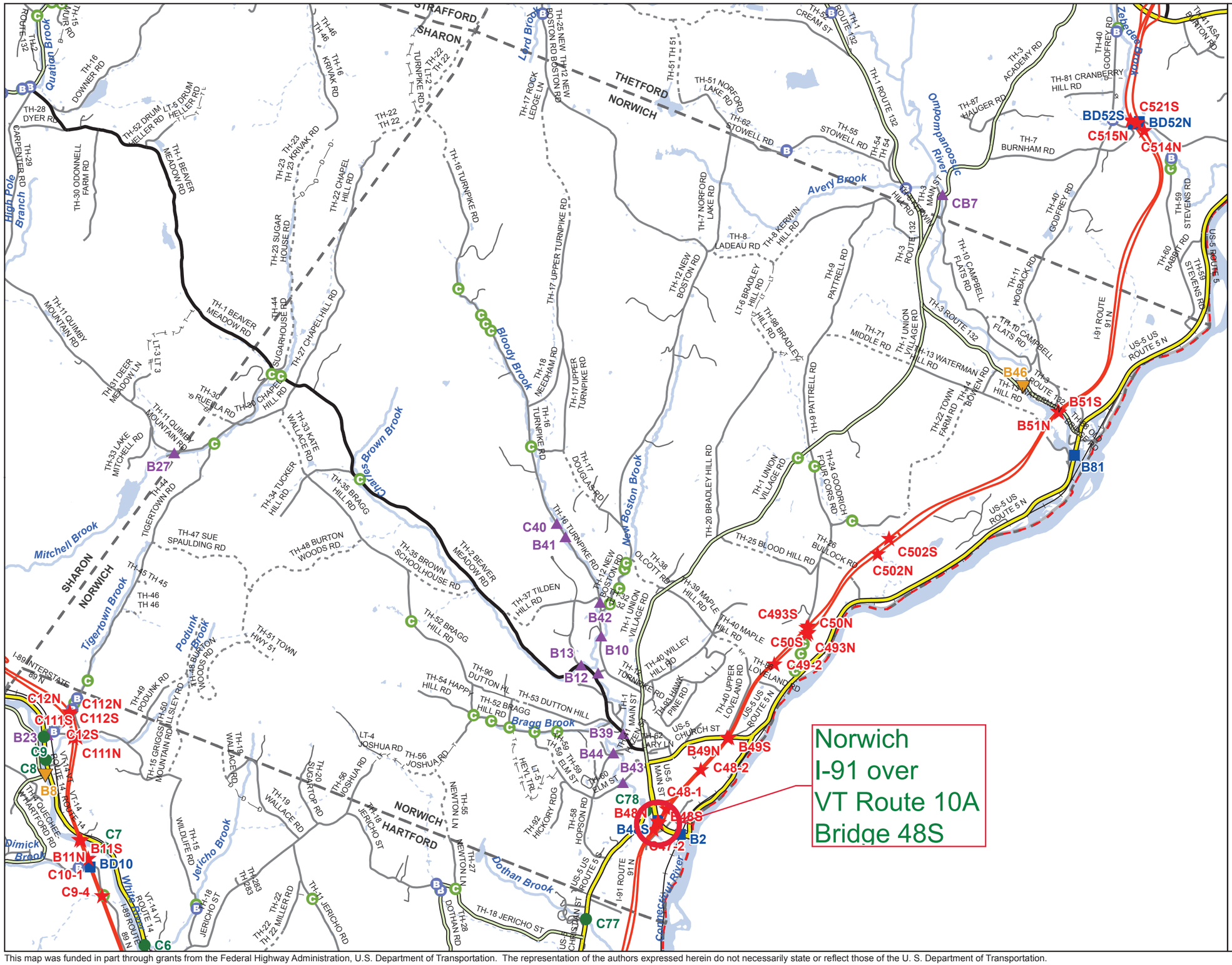

Picture 10: Abutment deterioration at bearing location


Picture 11: Water infiltration on abutment

Picture 12: Curb cracking and deterioration

Picture 13: Curb Deterioration (note cracking and efflorescence on wingwall)

Appendix B: Town Map



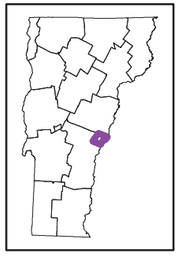
N

Scale: 1:54,870

- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FAS/FAU
- BIKE PATH
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LT — LT LEGAL TRAIL
- PRIVATE
- D — D DISCONTINUED
- FAS/FAU HWY
- MAINTENANCE DISTRICT
- POLITICAL BOUNDARY
- VTRANS REGION BOUNDARY
- NAMED RIVER-STREAM
- UNNAMED RIVER-STREAM
- B Point from Local Bridge Data *
- C Point from Local Culvert Data *

* Points are from local town bridge and culvert inventories. Some points may overlap where VTrans has also conducted an inventory on the Town highway.
Data source: VOBCIT aka VTCulverts

Produced by:
Mapping Section
Division of Policy, Planning and Intermodal Development
Vermont Agency of Transportation
May 2017



NORWICH

COUNTY-TOWN CODE: **1411-0**
WINDSOR COUNTY
DISTRICT # 4
District Long Name: White River Junction District
VTrans Four Region: Southeast

This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

Appendix C: Bridge Inspection Reports

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for NORWICH **bridge no.:** 0048N **District:** 4

Located on: I 00091 ML **over** I 91 OVER VT 10A **approximately** I 91 EXIT 13 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 7 GOOD

Superstructure Rating: 7 GOOD

Substructure Rating: 4 POOR

Channel Rating: N NOT APPLICABLE

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200091048N14112

Federal Sufficiency Rating: 064.2

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1968 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 1 HIGHWAY

Lanes On the Structure: 02

Lanes Under the Structure: 02

Bypass, Detour Length (miles): 00

ADT: 008700 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0110

Structure Length (ft): 000225

Lt Curb/Sidewalk Width (ft): 1.5

Rt Curb/Sidewalk Width (ft): 0.8

Bridge Rdwy Width Curb-to-Curb (ft): 37.3

Deck Width Out-to-Out (ft): 42

Appr. Roadway Width (ft): 040

Skew: 25

Bridge Median: 1 OPEN MEDIAN

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

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 15 FT 06 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 3 SP CONT PLATE GIR

Number of Approach Spans: 0000 **Number of Main Spans:** 003

Kind of Material and/or Design: 4 STEEL CONTINUOUS

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane: 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail: 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation: 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: 7 BETTER THAN MINIMUM CRITERIA

Waterway Adequacy: N NOT OVER WATER

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: N NOT OVER WATERWAY

DESIGN VEHICLE, RATING, and POSTING

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

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 5 HS 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: VT10A

Insp. Date: 042019 **Insp. Freq. (months)** 12 **X-Ref. BrNum:** 0001A

INSPECTION SUMMARY and NEEDS

4/18/2019 The failed drainage systems of the joints and spalled out curb ends allows for the saturation and deterioration of the abutments. Spalling continues in the backwalls and bridge seat of abutment 2 w/ heavy scaling and exposed reinforcing. The fascia beam bearings of abutment 2 have minimal supporting concrete and settlement will occur. Corrective repairs are needed. JW/MC

5/25/2018 The abutment ends have significant spalling in the bridge seats undermining the facia beam bearings. The undermining of the abutment 2 bearings has caused some minor settlement. Saturation continues due to the open curb joints above. This structure should be considered for a joint replacement project extending out to the fascias, eliminating the open curb joints. Concrete repairs are needed in the abutments, backwalls, and the curb ends above. JW/MC

5/25/2016 This structure needs to have concrete repairs made to the surrounding areas of the joints, curb ends, backwalls, and abutments. Due to the failed curb ends at the joints and failed drainage of the finger plate joint, saturation continues and deep spalling has occurred. The finger plate joint should be considered for replacement with a Vermont joint and it should extend to the fascias with scuppers installed. JW/AC

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for NORWICH **bridge no.:** 0048S **District:** 4

Located on: I 00091 ML **over** I 91 OVER VT 10A **approximately** I 91 EXIT 13 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 6 SATISFACTORY

Superstructure Rating: 6 SATISFACTORY

Substructure Rating: 4 POOR

Channel Rating: N NOT APPLICABLE

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200091048S14112

Federal Sufficiency Rating: 054

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1968 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 1 HIGHWAY

Lanes On the Structure: 03

Lanes Under the Structure: 05

Bypass, Detour Length (miles): 00

ADT: 008700 **% Truck ADT:** 13

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0110

Structure Length (ft): 000225

Lt Curb/Sidewalk Width (ft): 1.5

Rt Curb/Sidewalk Width (ft): 1.5

Bridge Rdwy Width Curb-to-Curb (ft): 42

Deck Width Out-to-Out (ft): 48

Appr. Roadway Width (ft): 040

Skew: 29

Bridge Median: 1 OPEN MEDIAN

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

Feature Under: HIGHWAY BENEATH STRUCTURE

Min Vertical Underclr (ft): 14 FT 06 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: 3 SP CONT PLATE GIR

Number of Approach Spans: 0000 **Number of Main Spans:** 003

Kind of Material and/or Design: 4 STEEL CONTINUOUS

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane: 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail: 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: 6 EQUAL TO MINIMUM CRITERIA

Waterway Adequacy: N NOT OVER WATER

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: N NOT OVER WATERWAY

DESIGN VEHICLE, RATING, and POSTING

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

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 5 HS 20

INSPECTION and CROSS REFERENCE

X-Ref. Route: VT10A

Insp. Date: 042019 **Insp. Freq. (months)** 12 **X-Ref. BrNum:** 00001

INSPECTION SUMMARY and NEEDS

4/18/2019 The failed drainage systems of the joints and spalled out curb ends allows for the saturation and deterioration of the abutments. Spalling continues in the backwalls and bridge seat of abutment 2 w/ heavy scaling and exposed reinforcing. The fascia beam bearings of abutment 2 have minimal supporting concrete and settlement will occur. Corrective repairs are needed. JW/MC

5/25/2018 The abutment ends have significant spalling in the bridge seats, undermining the facia beam bearings. The undermining of the abutment 2 bearings has caused some minor settlement. Spalling in the east end of abutment 1 has spread down into the stemwall and will soon penetrate to the backfill. Saturation continues due to the open curb joints above. This structure should be considered for a joint replacement project extending out to the fascias, eliminating the open curb joints. Concrete repairs are needed in the abutments, backwalls, and the curb ends above. JW/MC

5/25/2016 This structure needs to have concrete repairs made to the surrounding areas of the joints, curb ends, backwalls, and abutments. Due to the failed curb ends at the joints and failed drainage of the finger plate joint, saturation continues and deep spalling has occurred. The finger plate joint should be considered for replacement with a Vermont joint and it should extend to the fascias with scuppers installed. JW/AC

Appendix D: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Nick Wark, P.E., P.I.I.T. Program Manager

From: August Arles, Geotechnical Engineer, via Callie Ewald, P.E., Geotechnical Engineering Manager

Date: November 20th, 2019

Subject: Norwich IM 091-2(89) Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed the preliminary geotechnical investigation of Bridges 48N/S on Interstate 91 over Route 10A in the Town of Norwich. Bridges 48 N/S are three-span continuous steel bridges that are part of the exit 13 interchange. The subject project consists of replacing or rehabilitating the existing structures. This review included the examination of as-built record plans, in-house historical boring log files, well log data, and hazardous site information on file at the Vermont Agency of Natural Resources (ANR), as well as published geologic maps relating to surficial and bedrock data. A site visit was not conducted by Geotechnical Section staff however photos from bridge inspection reports and available satellite imagery were reviewed as part of this preliminary investigation.

2.0 SUBSURFACE INFORMATION

2.1 Published Geologic Data

Mapping conducted in 1970 for the Surficial Geologic Map of Vermont shows the project site consists of glaciolacustrine deposits of silt, silty clay, and clay (Doll, 1970).

According to the Bedrock Map of Vermont from 2011, published by the USGS and State of Vermont, the project site is underlain with bedrock consisting of Meta-Andesite, and Meta-Basalt of the Ammonoosuc Volcanics formation. The project site borders the Partridge Formation that consists of Schist (Ratliffe, et. al, 2011).

The Geotechnical Engineering Section maintains a GIS based historical record of subsurface investigations, which contains electronic records for the majority of borings completed in the past 10 years. Research for this project showed that there were no nearby projects within 0.5-miles of the project site.

2.2 Water Well Logs

The Vermont ANR maintains a record of private and public wells drilled in their Atlas database. Published online, these logs may provide general characteristics of the soil strata and depth to bedrock in the area. The three closest logs of wells WRN 246, WRN 230, and TAG 41730 were located approximately 561 ft, 936 ft, and 1072 ft from the project site and reported bedrock at a depth of 39 ft, 73 ft, and 50 ft, respectively.

2.3 Hazardous Materials and Underground Storage Tanks

The ANR Atlas also maintains a database of all known hazardous waste sites and underground storage tanks. According to their published data there are five sites within a 0.5-mile radius, consisting of two hazardous waste generators and three hazardous sites. The project itself does not lie on a hazardous site, and there is no anticipated impact from the surrounding sites on the project.

2.4 Record Plans

Record plans from the bridge construction dated from 1967 were reviewed as part of this investigation. The record plans included layout, profile, pier, and abutment details. The abutment detail sheet indicates that the concrete abutments and wingwalls are founded on two rows of 12BP53 steel piles with a maximum design pile load of 45 tons and states the bottom of pile cap elevation at each location. All piles were driven until bedrock and estimated lengths range from 50 ft to 75 ft. The pier detail sheet indicates that the concrete piers are founded on 12BP53 steel piles with a maximum pile design load of 45 tons and states the bottom of pile cap elevation at each location. All piles were driven until bedrock was reached and estimated lengths range from of 25 ft to 60 ft. Both the abutment and pile detail sheets provide additional information on pile numbering, spacing, and batter direction and degree.

The record plans also detail twenty-four borings that were previously drilled for the current bridges. The record plans indicate the overburden soil consists primarily of sands and silts with a trace amounts of gravel, as well as the presence of bedrock at elevations between 408.6 ft and 455.1 ft. Figure 2.1 below shows the layout of the 24 borings, and Table 2.1 summarizes the findings of those borings.

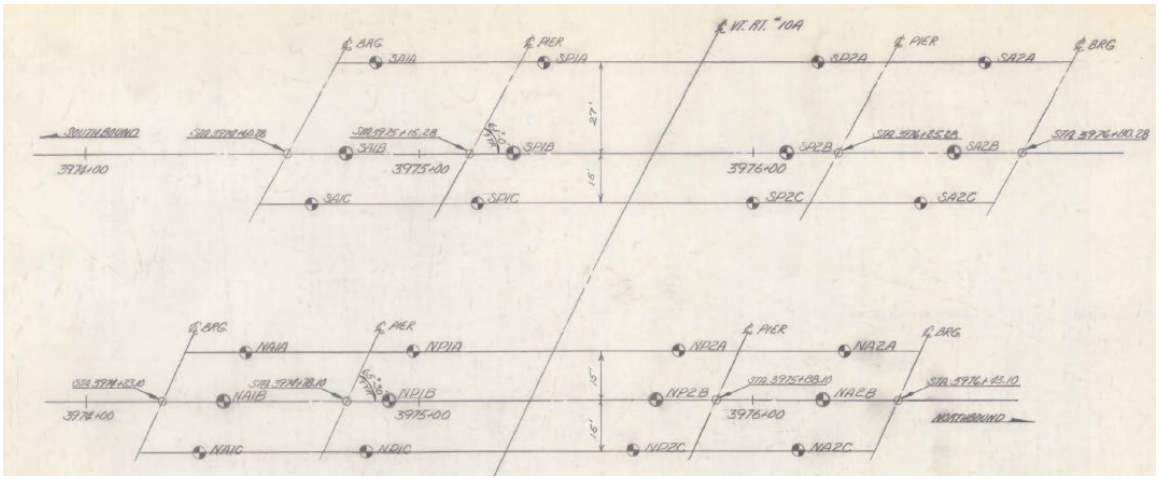


Figure 2.1: *Boring layout*

Table 2.1 *Boring advancements and respective elevation of bedrock.*

BORING NO.	STATION	OFFSET	GROUND ELEVATION	LEDGE ELEVATION
NA1A	3974+47.7	15' LT. N.B	464.6	455.1
NA1B	3974+91	℄ N.B.	464.6	444.6
NA1C	3974+33.7	15' RT. N.B	464.4	446.1
NP1A	3974+97.7	15' LT. N.B	463.6	437.1
NP1B	3974+91	℄ N.B	465.6	437.6
NP1C	3974+83.7	15' RT. N.B.	466.5	431.5
NP2A	3975+77.7	15' LT. N.B	463.5	437.0
NP2B	3975+71	℄ N.B.	466.6	408.6
NP2C	3975+63.7	15' RT. N.B	471.8	425.6
NA2A	3976+27.7	15' LT. N.B	465.8	422.1
NA2B	3976+21	℄ N.B	469.7	420.7
NA2C	3976+13.7	15' RT. N.B	472.5	412.9
SA1A	3974+87	27' LT. S.B.	456.1	441.6
SA1B	3974+78	℄ S.B	456.6	446.6
SA1C	3974+67.5	15' RT. S.B	459.1	448.1
SP1A	3975+37	27' LT. S.B.	456.6	446.8
SP1B	3975+28	℄ S.B.	457.7	449.7
SP1C	3975+17.5	15' RT. S.B.	459.1	450.1
SP2A	3976+19.6	27' LT. S.B	459.9	443.2
SP2B	3976+10	℄ S.B.	460.0	440.0
SP2C	3976+0	15' RT. S.B.	460.0	439.7
SA2A	3976+69.6	27' LT. S.B.	463.7	440.7
SA2B	3976+60	℄ S.B.	463.8	446.8
SA2C	3976+50	15' RT. S.B.	463.6	442.4

3.0 FIELD OBSERVATIONS

A site investigation was not conducted by Geotechnical Section staff however photos from bridge inspection reports and satellite imagery were reviewed to evaluate feasibility of boring operations and assess general site conditions as they relate to the proposed project.

No overhead obstructions were observed along I-91 that would interfere with any potential boring operations. Borings advanced for the bridge abutments can likely be located, in the median of I-91 and from either the side slopes of I-91 or from the roadway of VT Route 10A and the adjacent slopes. For borings advanced for potential piers, if drilling is to be conducted from the roadway of VT Route 10A, then borings will likely need to be located outside of the footprint of the existing bridge structures due to limited overhead clearance under the bridges. If borings are deemed to be required close to the center of the existing pier locations, then borings could be advanced through the bridge deck from the travel lanes of I-91 which would likely require significant traffic control coordination, closure of one lane of the interstate, and possibly closure of one lane of VT Route 10A.

Bedrock was not visible in any of the available imagery. Bridge abutments were armored with stone fill as shown in Figure 3.1. Figure 3.2 through Figure 3.4 illustrate the overhead clearance limitations along VT Route 10A under the existing structures that may affect boring locations.

Figure 3.1: *Stone fill armoring at bridge abutment. [Inspection photo dated 2016]*

Figure 3.2: *Facing I-91 Southbound south abutment; note limited overhead clearance for drilling operations under existing bridge. [Inspection photo dated 2016]*

Figure 3.3: *Facing I-91 Southbound north abutment; note limited overhead clearance for drilling operations under existing bridge deck. [Inspection photo dated 2016]*

Figure 3.4: *Facing west, southbound Bridge 48. [Inspection photo dated 2014]*

4.0 RECOMMENDATIONS

4.1 Preliminary Foundation Alternatives

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

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

Piers
- Reinforced concrete piers on spread footings
- Pile caps supported by H-Piles
- Pier columns supported on drilled shafts

4.2 Proposed Subsurface Investigation

Once proposed alignments for the replacement bridges are chosen as well as preferred foundation alternatives, we recommend assessing the existing subsurface information and developing a subsurface investigation program that augments the existing information to verify the subsurface conditions at the site including, but not limited to, the soil properties, groundwater conditions, and depth to bedrock. If drilled shafts are contemplated, final borings should be aligned with the shaft location(s) to the degree possible given access restrictions.

5.0 CLOSING

When a design alternative, as well as a preliminary alignment has been chosen, the Geotechnical Engineering Section can assist in designing a subsurface investigation that efficiently gathers adequate information for the alternative chosen.

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

6.0 REFERENCES

Doll, C. G., 1970, Surficial Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Ratcliffe, N. M., Stanley, R. S., Gale, M. H., Thompson, P. J., Walsh, G. J., 2011, Bedrock Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Vermont Agency of Natural Resources Department of Environmental Conservation, Natural Resources Atlas, www.anr.vermont.gov/maps/nr-atlas%20, accessed 11/13/2019.

cc: Laura Stone, P.E., P.I.I.T. Project Manager
Electronic Read File/MG
Project File/CEE
AJA

Appendix E: Resource ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Laura Stone, Project Manager
FROM: Lee Goldstein, Environmental Specialist, SE Region
DATE: October 28, 2019
Project: **Norwich IM 091-2(89)-12a568**

ENVIRONMENTAL RESOURCES:

Archaeological Site:	___ Yes	X No	See Archaeological Resource ID Memo
Historic/Historic District:	___ Yes	X No	See Historic Resource ID Memo
Wetlands:	___ Yes	X No	See Natural Resource ID Memo
Agricultural Land:	___ Yes	X No	See Natural Resource ID Memo
Fish & Wildlife Habitat:	___ Yes	X No	See Natural Resource ID Memo
Wildlife Habitat Connectivity:	___ Yes	X No	See Natural Resource ID Memo
Endangered Species:	X Yes	___ No	See Natural Resource ID Memo
Stormwater:	___ Yes	X No	See Stormwater Resource ID Memo
6(f) Property:	___ Yes	X No	
Hazardous Waste/ ANR Urban Background Soils:	___ Yes	X No	See ANR map
USDA-Forest Service Lands:	___ Yes	X No	
Scenic Highway/ Byway:	___ Yes	X No	
Act 250 Permits:	___ Yes	X No	See ANR map
FEMA Floodplains:	___ Yes	X No	See ANR map
Flood Hazard Area/ River Corridor:	___ Yes	X No	See ANR map
US Coast Guard:	___ Yes	X No	
Lakes and Ponds:	___ Yes	X No	See ANR map
303D List/ Class A Water/ Outstanding Resource Water:	___ Yes	X No	See ANR map
Surface and Ground Water (SPA) Source Protection Area:	___ Yes	X No	See ANR map
Groundwater Classification:	___ Yes	X No	See ANR map
Public Water Sources/ Private Wells:	___ Yes	X No	See ANR map
Other:	___ Yes	X No	no .dgn created

cc:
Project File

Appendix F: Natural Resources Memo

VERMONT

State of Vermont
Program Development Division
One National Life Drive
Montpelier, VT 05633-5001
vtrans.vermont.gov

Agency of Transportation

[phone] 802-279-2562
[fax] 802-828-2334
[ttd] 800-253-0191

To: Project File

From: James Brady, VTrans Environmental Biologist

Date: October 23, 2019

Subject: Norwich IM 091-2(89) - Natural Resource ID

I have completed my natural resource report for the above referenced project. My evaluation has included wetlands, wildlife habitat, agricultural soils and rare, threatened and endangered species.

Bridges 0048N and 0048S, Interstate 91

Wetlands/Watercourses
There are no wetlands or watercourses within the review area.

Wildlife Habitat
There is very limited wildlife habitat at this location.

Rare, Threatened and Endangered Species
The only listed species in the project area is the federally threatened northern long-eared bat. The bridge does not provide useful roosting habitat, so restrictions caused by this animal are unlikely.

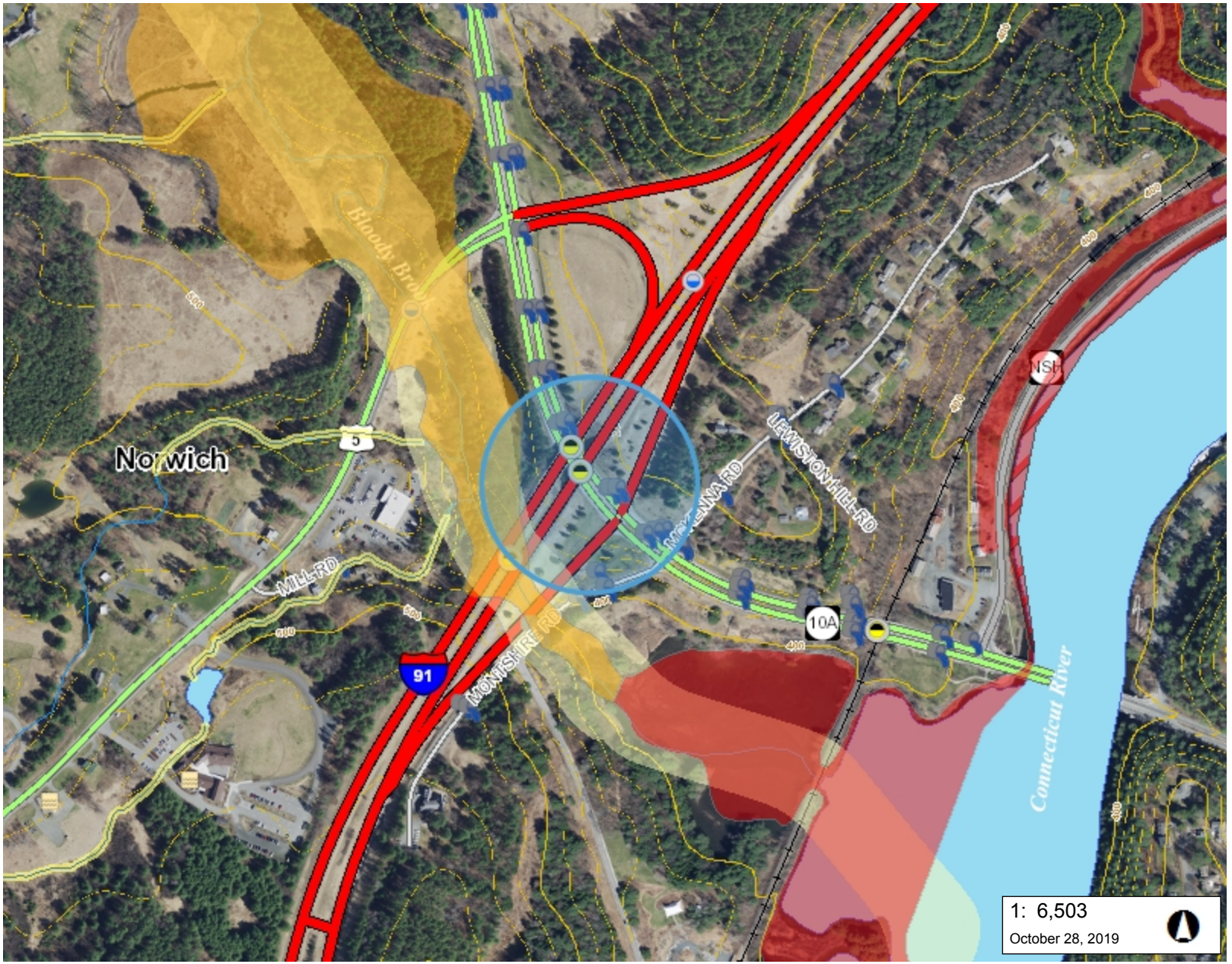
Agricultural Soils
There are no mapped agricultural soils in the review area.

VERMONT

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- DFIRM Floodways
- Flood Hazard Areas (Only FEM
  - AE (1-percent annual chance floodp
  - A (1-percent annual chance floodpl
  - AO (1-percent annual chance zone feet)
  - 0.2-percent annual chance flood ha
- River Corridors (Aug 27, 2019)
- .5 - 2 sqmi.
- .25-.5 sqmi.
- Act250 Permits **INCOMPLET
- VTRANS State and Town Long
- VTRANS State Short Structure
- Town Bridge
- Town Culvert
- Railroads
- Roads
  - Interstate
  - Principal Arterial
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
  - Not part of function Classification S
- Waterbody
- Stream
- Downtown District Boundaries
- Neighborhood Development Ar

NOTES

Norwich IM 091-2(89)-No Act 250; Bloody Brook and Connecticut River adjacent. Map created 10/28/2019 using ANR's Natural Resources Atlas.

330.0 0 165.00 330.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 542 Ft. 1cm = 65 Meters

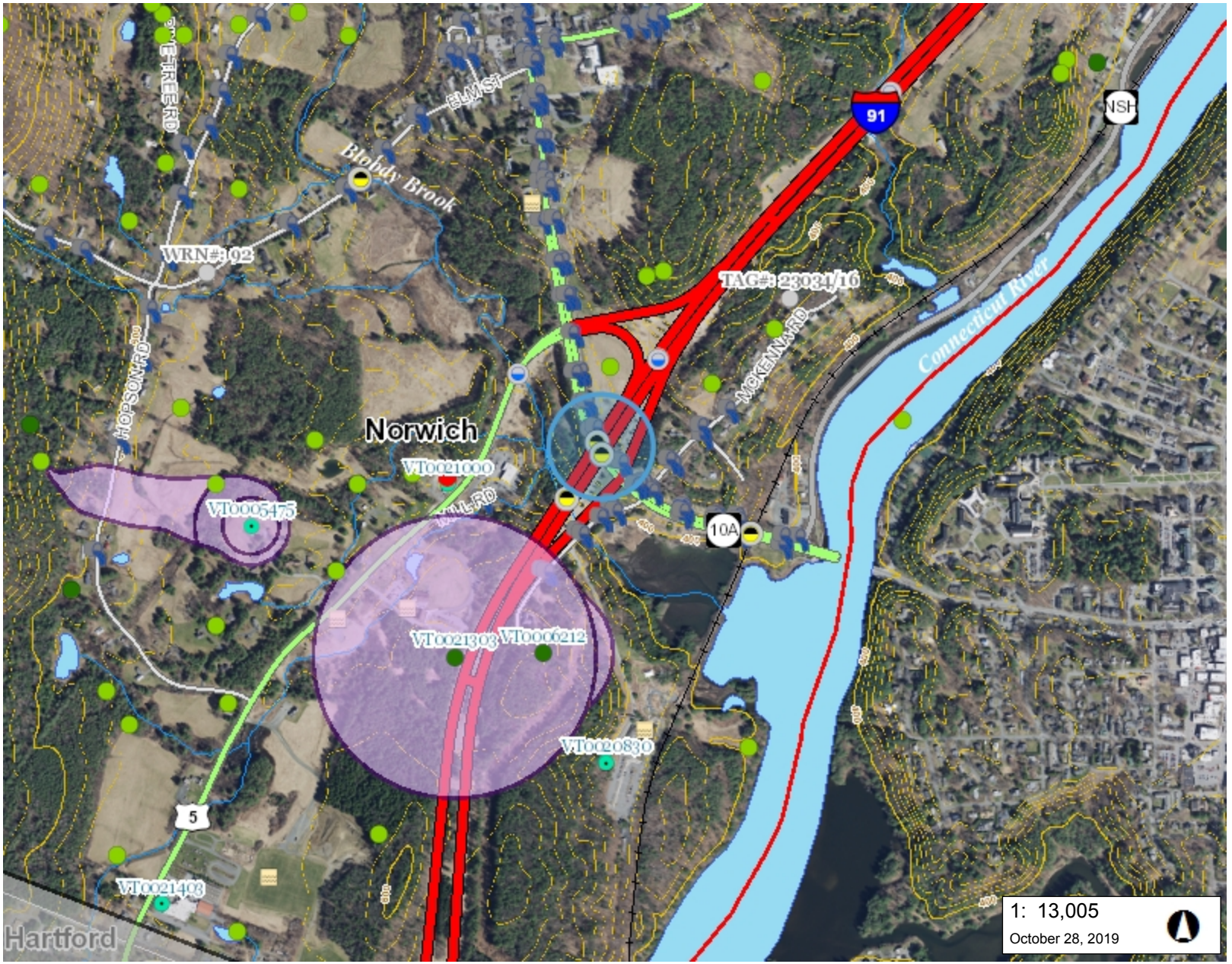
THIS MAP IS NOT TO BE USED FOR NAVIGATION

VERMONT

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- 303(d) List of Impaired Stream
- Watersheds for 303(d) List
- Priority Waters List (Streams a
  - Part B (impaired TMDL not requirec
  - Part D (impaired with approved TM
  - Part E (altered exotic species)
  - Part F (altered flow regulation)
- Stressed Waters List (Streams
- Designated ORW (Streams an
- Prospective ORW (Streams an
- Prospective ORW (Lakes and
- Class A(1) Ecological Waters
- Class A(2) Public Water Suppl
- Mixed Classifications for Uses
- Waste Water Facilities
- Sewer Service Area
- Private Wells
  - Incorrectly Located
  - GPS Located
  - Screen Digitized
  - E911 Address Matched
  - Welldriller/Clarion
  - Unknown Location Method
- Public Water Sources
  - Active
  - Proposed
  - Inactive

NOTES

Norwich IM 091-2(89)-No direct water quality concerns. Map created 10/28/2019 using ANR's Natural Resources Atlas.

661.0 0 330.00 661.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1084 Ft. 1cm = 130 Meters

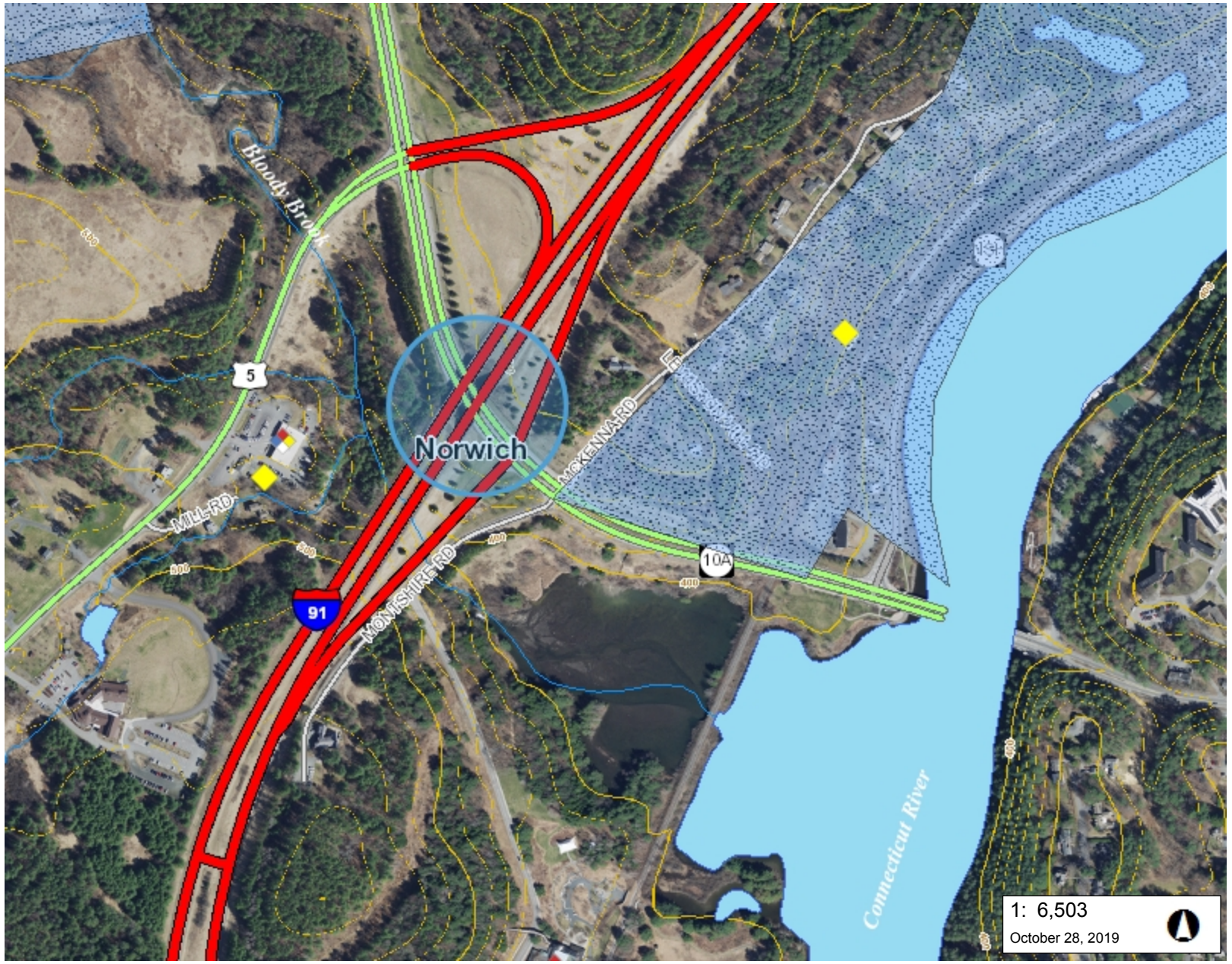
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix G: Hazardous Waste Sites

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Landfills
  - OPERATING
  - CLOSED
- Land Use Restrictions
  - Class IV GW Reclass
  - Class VI GW Reclass
  - Deed Restriction
  - Easement
  - Land Record Notice
  - Other
- Hazardous Site
- Hazardous Waste Generators
- Brownfields
- Salvage Yard
- Aboveground Storage Tank
- Underground Storage Tank (w
- Dry Cleaner
- Urban Soil Background Areas
- Roads
  - Interstate
  - Principal Arterial
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
  - Not part of function Classification S
- Waterbody

NOTES

Norwich IM 091-2(89)-no mapped HazMat sites or Urban Background Soils present within anticipated project limits, but are adjacent. Map created 10/28/2019 using ANR's Natural Resources Atlas

330.0 0 165.00 330.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 542 Ft. 1cm = 65 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix H: Archaeology Memo

VERMONT

Brennan Gauthier
VTrans Senior Archaeologist
Vermont Agency of Transportation
Project Delivery Bureau
Environmental Section
1 National Life Drive
Montpelier, VT 05633
tel. 802-279-1460
Brennan.Gauthier@Vermont.gov

To: Lee Goldstein, VTrans Environmental Specialist
From: Brennan Gauthier, VTrans Senior Archaeologist
Date: 7/31/2019
Subject: Norwich IM 091-2(89) Archaeological Resource Identification

Lee,

I have completed my field inspection and background research for the pair of I-91 bridges that span Vermont Route 10A in the town of Norwich, Windsor County, Vermont. Although unscoped, I assumed a wide Area of Potential Effect (APE) in order to identify resources that may be worth identifying if the project scope change to include a larger area.

I have concluded that there are no mappable archaeological resources within the area around bridges 48N and 48S. A field visit was conducted on 7/16/2019 in order to assess disturbance within the APE. This area was heavily altered during the construction of I-91 in 1965/6 and does not retain intact soils. Additionally, this project will be cleared as exempt once the Section 106 request is submitted since it involves work on a facility of the Interstate Highway System as per the ACHP notice of 2005.

Please feel free to reach out with any questions or concerns that may arise as part of this process.

Sincerely,

Brennan

Brennan

VTrans Working to Get You There
Vermont Agency of Transportation

Images and Illustrations

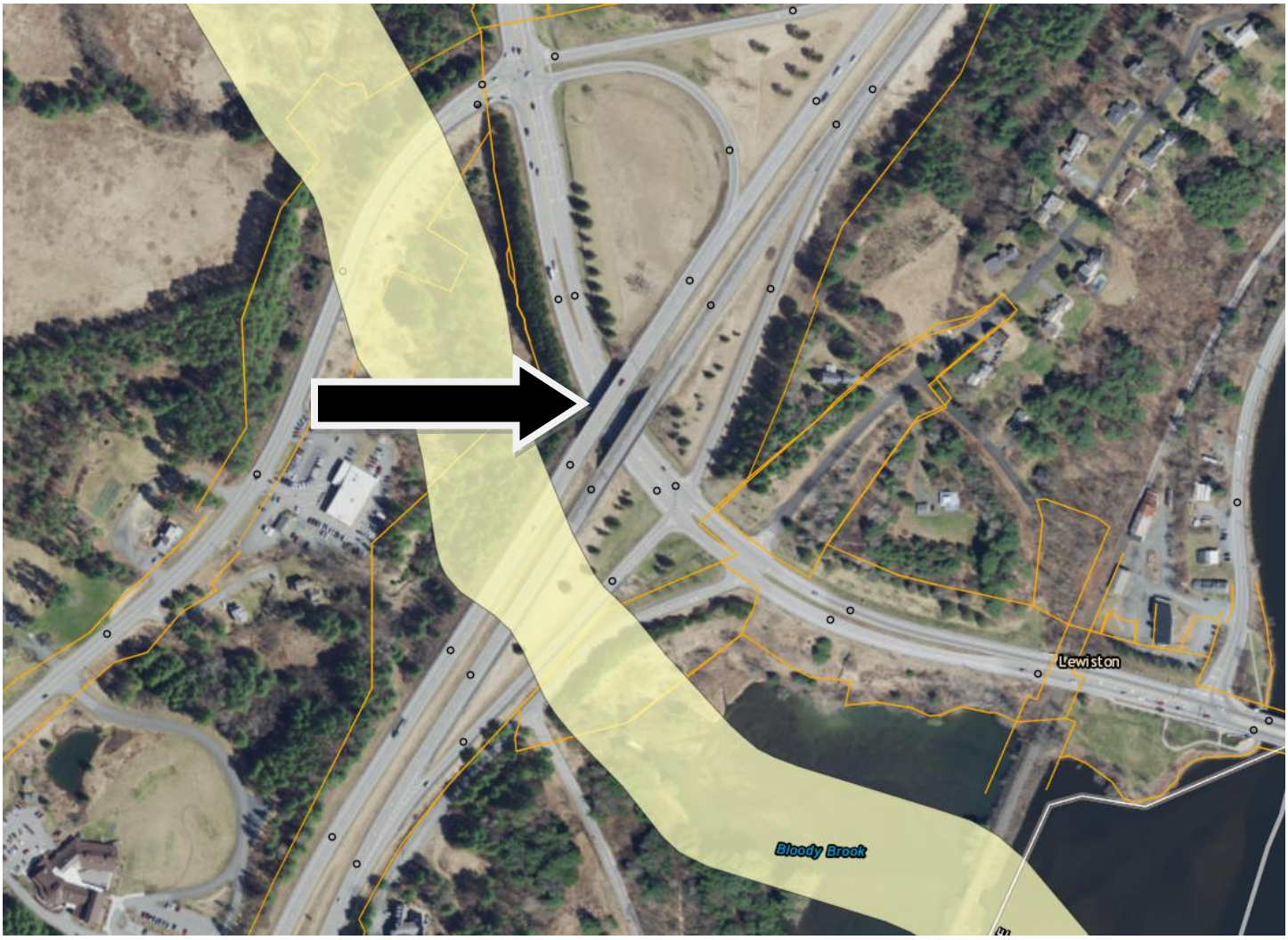


Figure 1: Bridges 48N and 48S.

Figure 2: Google Street View of Bridge 48N.

VERMONT

Figure 3: Google Street View of Bridge 48S.

Appendix I: Historic Memo

Goldstein, Lee

From: Fernandez, Gabrielle
Sent: Thursday, August 15, 2019 10:53 AM
To: Goldstein, Lee; Obenauer, Kyle
Subject: Norwich IM 091-2(89) exempt resource ID

Hi Lee:

This project (Norwich IM 091-2(89)) is considered EXEMPT for above-ground historic resources per the Section 106 Exemption Regarding Effects to the Interstate Highway System adopted by the Advisory Council on Historic Preservation on March 10, 2005. (See Federal Register Vol.70/No.46)

The determination of effect for the overall project will be based on findings for archaeology.

Kyle will update VPINS to note that the project is exempt for above ground resources and Historic review is complete for this project.

Kyle will save this email in the project's NEPA/Specialist Reviews/Historic folder.

Thanks,
Gabrielle

Gabrielle Fernandez | AOT Technical Apprentice IV
Vermont Agency of Transportation
1 National Life Drive
Montpelier, VT 05603
(802) 793-3738

VERMONT

Appendix J: Utility Investigation

Norwich IM 091-2(89)

Existing Utilities within Project Limits Report 09-30-2019

Bridge 48N&S on Interstate 91 in Norwich, Vt.

AERIAL

-Green Mountain Power Company
-Consolidated Communications
-Firstlight
-Comcast

UNDERGROUND

-CCI dose have underground along VT 10A.
-There is underground electrical for street lighting along VT 10A that is owned by VTrans.

NOTE: CCI is buried to the north side of VT 10A.

MUNICIPAL

-The Town of Norwich Fire District has a 8" water main underneath the bridges Buried along Vt Route 10A. The Water main is located to the north side of VT Route 10A.
-There is no Town of Norwich Sewer lines.
-The Town of Norwich has street lighting along the Vt Route 10A corridor under the bridges.

NOTE: The Town of Norwich water main is believed to be 10 feet below the surface of the existing ground.

NOTE: The Aerial crossings are roughly 600ft south of bridges on I-91

Appendix K: Local Input

Local & Regional Input Questionnaire

Project Summary

This project, IM 091-2(89), focuses on bridge 48N&S on Interstate 91 over VT Route 10A in Norwich, Vermont. The bridges are deteriorating and are in need of either a major maintenance action or replacement. Potential options being considered for this project include major deck and substructure repairs or removal of the existing bridges and replacement with new bridges placed in the same locations. It is possible that VTrans will recommend a road closure and detour traffic off of the interstate for the duration of the work. Efforts will be made to limit the detour to State roads.

Community Considerations

1. Are there regularly 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 bridges are closed during construction? Examples include annual bike races, festivals, parades, cultural events, weekly farmers market, concerts, etc. that could be impacted? If yes, please provide approximate date, location and event organizers' contact info.

   The 91 bridges are not as big of a concern for the construction. It's VT10A that runs under the bridges is a key commuter route into Hanover NH for Dartmouth College and Dartmouth Hitchcock Medical Center. It's a heavily traveled route and is key in maintaining open traffic during construction somehow (perhaps a similar traffic plan to the Hartford 91 bridge slide project where US5 remained opened but limited to traffic). The Montshire Museum https://www.montshire.org/ and a child care center off Montshire Rd traffic may be impacted.

   The Prouty race in July may have impacts more with traffic trying to access Hanover during construction. https://secure3.convio.net/dhmc/site/TR/FNCCC/General-FNCCC?sid=1270&type=fr_informational&pg=informational&fr_id=1590

   Dartmouth College / Hanover events for traffic consideration: graduation, alumni weekend, Prouty

   The communities use Interstate Exit to access the Norwich Farmers Market on Saturdays and also King Arthur Flour Bakery, https://www.kingarthurflour.com/visit

2. Is there a "slow season" or period of time from May through October where traffic is less or no events are scheduled?

   No

3. Please describe the location of the Town garage, emergency responders (fire, police, ambulance) and emergency response routes that might be affected by the closure of the bridge, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers.

   See town facilities map attached.

4. Are there businesses (including agricultural operations and industrial parks) or delivery services (fuel or goods) that would be adversely impacted either by a detour or due to work zone proximity?

   None

5. Are there important public buildings (town hall, community center, senior center, library) or community facilities (recreational fields, town green, etc.) close to the project?

   Not immediately adjacent to the project. See town facilities map.

6. What other municipal operations could be adversely affected by a road/bridge closure or detour?

   None

7. Are there any town highways that might be adversely impacted by traffic bypassing the construction on other local roads? Please indicate which roads may be affected and their condition (paved/unpaved, narrow, weight-limited bridges, etc), including those that may be or go into other towns.

   If the Interstate exit is closed for on/off ramp access, traffic will use US5/VT10A and/or use NH10 to access the area.

8. Is there a local business association, chamber of commerce, regional development corporation, or other downtown group that we should be working with? If known, please provide name, organization, email, and phone number.

   Upper Valley Business Alliance (Hanover Chamber of Commerce) -
   https://www.hanoverchamber.org/

   Upper Valley Chamber of Commerce
   http://www.uppervalleychamber.com/

9. Are there any public transit services or stops that use the bridge or transit routes in the vicinity that may be affected if they become the detour route?

   Yes – Advance Transit's Brown route goes through the I91 interchange twice every 45 minutes, and the two Green route buses are traveling through that section 4 times an hour. In all, that is about 7 buses an hour on VT10A to and from Hanover, NH.
   Contact: Van Chesnut vchesnut@advancetransit.com and Chris Andreasson candreasson@advancetransit.com

   There is a bus stop on VT10A at Montshire Rd and McKenna Rd.

Schools

1. Where are the schools in your community and what are their yearly schedules (example: first week in September to third week in June)?

   Norwich Elementary School – Marion Cross - https://www.marioncross.org/

   Dartmouth College, Hanover, NH

2. Is this project on specific routes that school buses or students use to walk to and from school?

   The project is over VT10A which is a school bus route and students of Dartmouth College walk/run on VT10A.

3. Are there recreational facilities associated with the schools nearby (other than at the school)?

   Not recreational facilities associated with the school BUT there is the Appalachian Trail that goes along VT10A at that section under the I-91 bridge.

Pedestrians and Bicyclists

1. Is pedestrian and bicycle traffic heavy enough on VT Route 10A that it should be accommodated during construction?

   Yes.

2. Does the Town have plans to construct either pedestrian or bicycle facilities leading up to the bridge? Please provide any planning documents demonstrating this (scoping study, master plan, corridor study, town or regional plan).

   Not at this time. There was a recent Road Safety Audit completed in the vicinity. See attached Summary as well as the full RSAR report.

3. 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 level of walking and bicycling are fairly significant between commuters to and from Hanover, NH/Lebanon NH for Dartmouth College, Hanover High School, Dartmouth Hitchcock Medical Center, Montshire Museum.

Design Considerations

1. Are there any concerns with the alignment of the existing bridges? For example, if the bridge is located on a curve, has this created any problems that we should be aware of?

   No.

2. Are there any concerns with the width of the existing bridges?

   No.

3. Are there any special aesthetic considerations we should be aware of?

   No.

4. Are there any known Hazardous Material Sites near the project site?

   No.

5. Are there any known historic, archeological and/or other environmental resource issues near the project site?

   No.

6. Are there any utilities (water, sewer, communications, power) attached to the existing bridges? Please provide any available documentation.

   Unknown.

7. Are there any existing, pending, or planned municipal utility projects (communications, lighting, drainage, water, wastewater, etc.) near the project that should be considered?

   The Town has an 8-inch water main near the north abutments. These were installed when interstate was built back in the 60s. District #4 still has plans.

8. Are there any other issues that are important for us to understand and consider?

Land Use & Zoning

1. Please provide a copy of your existing and future land use map or zoning map, if applicable. See attached.

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

3. Is there any planned expansion of public transit or intercity transit service in the project area? Please provide the name and contact information for the relevant public transit provider.

   No planned expansion of existing transit routes. Advance Transit's Brown route goes through the I91 interchange twice every 45 minutes, and the two Green route buses are traveling through that section 4 times an hour. In all, that is about 7 buses an hour on VT10A. Contact: Van Chesnut vchesnut@advancetransit.com and Chris Andreasson candreasson@advancetransit.com

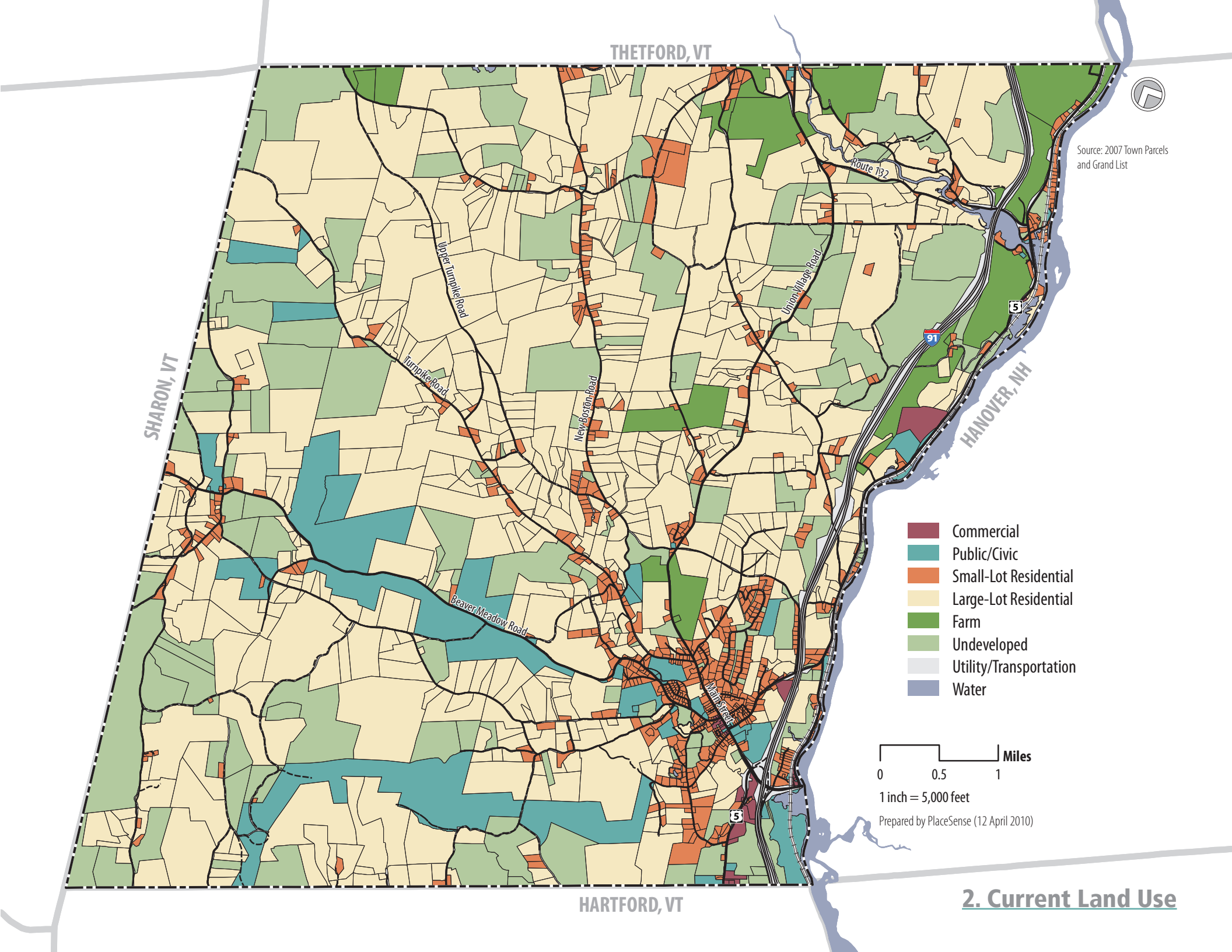
Communications

1. Please identify any local communication outlets that are available for us to use in communicating with the local population. Include weekly or daily newspapers, blogs, radio, public access TV, Facebook, Front Page Forum, etc. Also include any unconventional means such as local low-power FM.

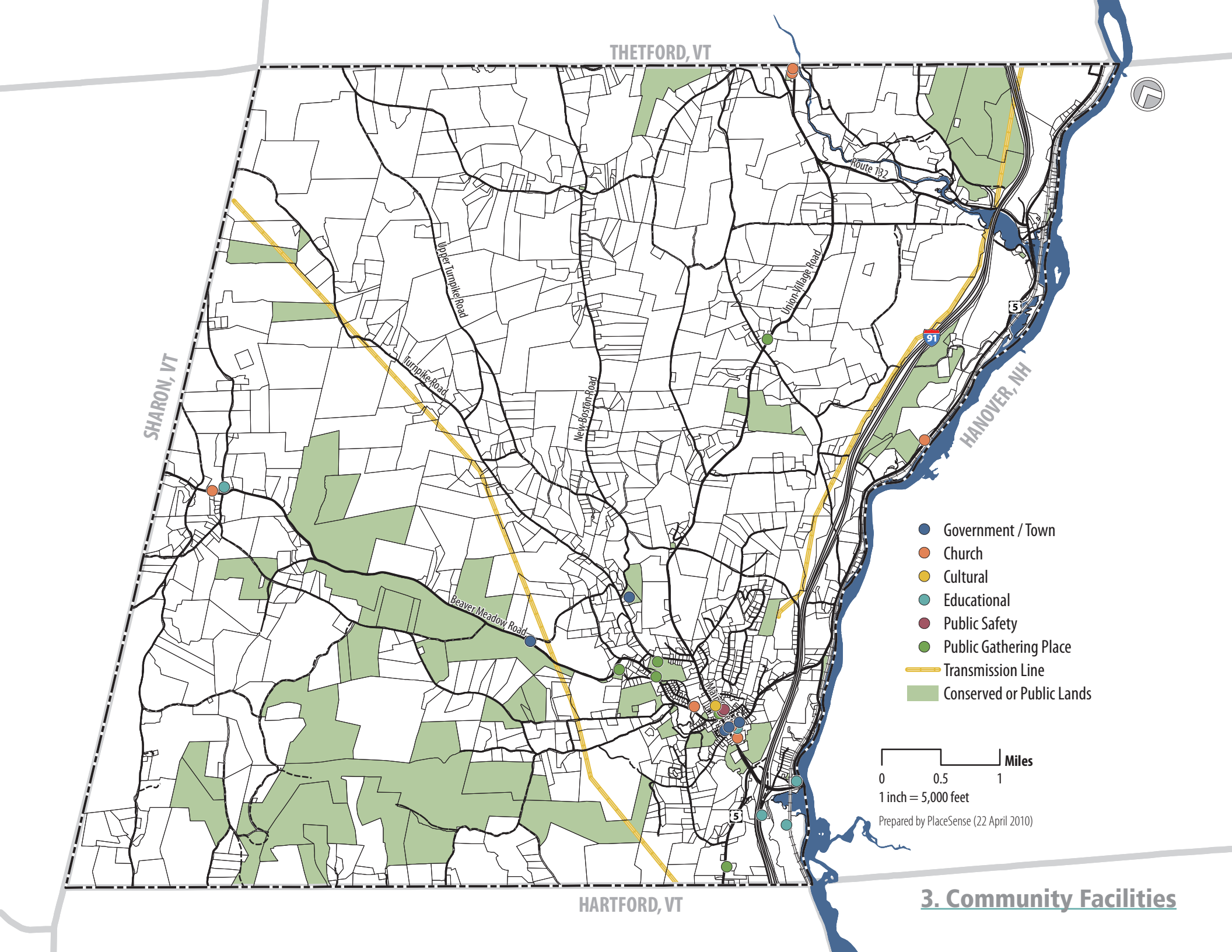
   Valley News
   Norwich Listserv/Front Porch Forum
   Hanover Listserv

2. Other than people/organizations already referenced in this questionnaire, are there any others who should be kept in the loop as the project moves forward?

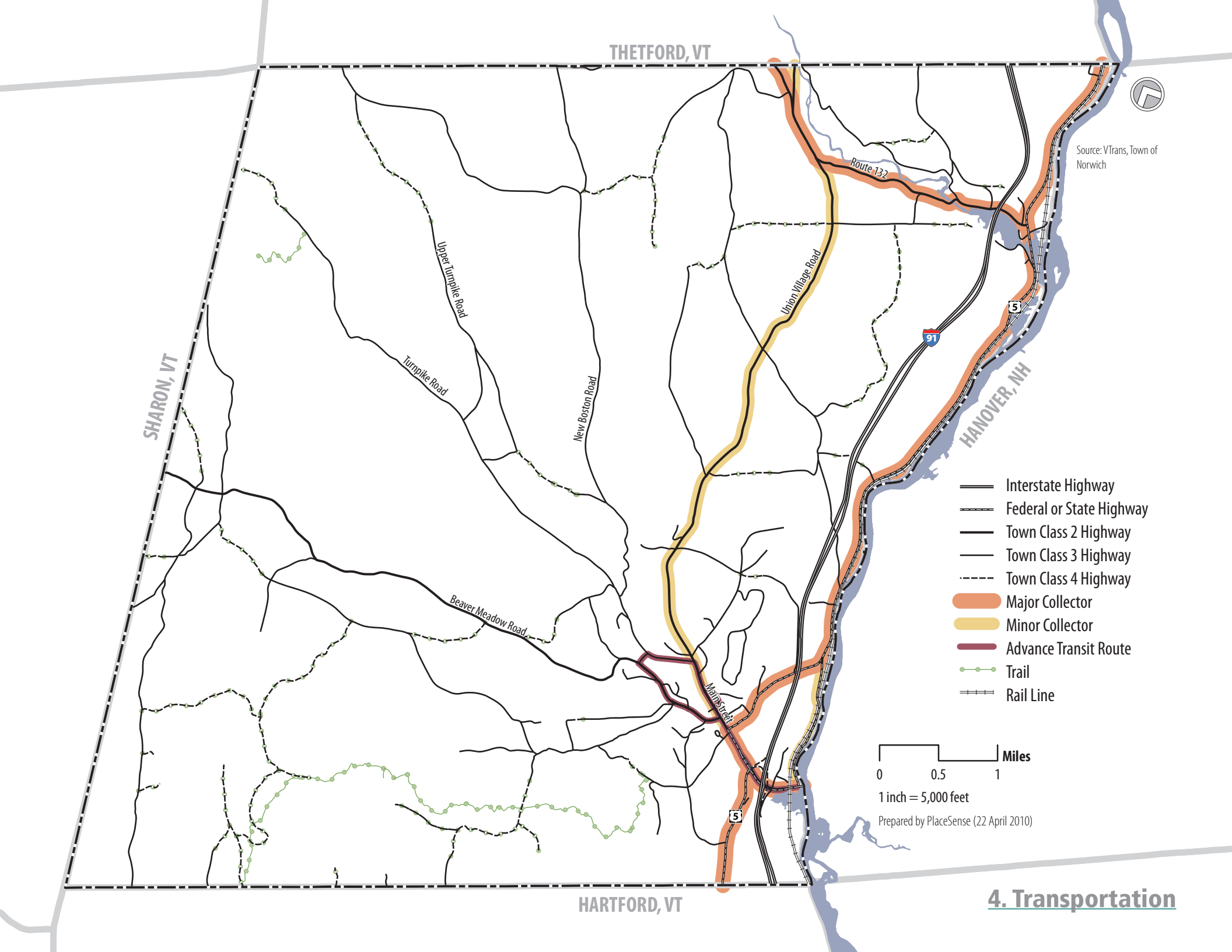
   Montshire Museum
   Child Care Center of Norwich
   Dartmouth College
   Advance Transit
   Residents living on McKenna Dr (the Town will have a list of residents)



2. Current Land Use



3. Community Facilities


THETFORD, VT
SHARON, VT
HARTFORD, VT
HANOVER, NH
Route 132
Union Village Road
Upper Turnpike Road
Turnpike Road
New Boston Road
Beaver Meadow Road
Main Street
5
91
Source: VTrans, Town of Norwich
Interstate Highway
Federal or State Highway
Town Class 2 Highway
Town Class 3 Highway
Town Class 4 Highway
Major Collector
Minor Collector
Advance Transit Route
Trail
Rail Line
Miles
0
0.5
1
1 inch = 5,000 feet
Prepared by PlaceSense (22 April 2010)

Potential Safety Enhancements Summary Table

Safety Concern	Safety Enhancement	Potential Responsibility	Safety Payoff	Time Frame	Cost
Lack of Pedestrian Connections to Go from One side of VT 10a to the Other	Install a south to north pedestrian signals at the I-91 northbound exit ramp and a sidewalk on the south side of VT 10a from the ramp to Montshire Road	VTrans (signal), Town (Sidewalk)		Mid - Long	Mid - High
Entering VT 10a from McKenna Road or Montshire Road is difficult	Install "Do Not Block Intersection" signs and pavement markings	VTrans		Immediate - Short	Low initial (must be maintained)
	Conduct a corridor study from the village center to Hanover	TRORC		Mid	Mid
The Right Turn onto I-91 Northbound Creates Conflicts	Install rumble stripes inside the shoulder to deter motorists from continuing through the shoulder to make a right turn	VTrans		Mid	Low Mid
	Consider installing flexible delineators from May 1 to October 1 of each year	VTrans		Mid	Low
Motorists confuse McKenna Road for the I-91 Northbound on Ramp	Increase the size of the McKenna street name sign to a 12-inch tall sign	Town		Short	Low
	Install an additional No Outlet sign on the south side of McKenna Road	Town		Short	Low
The Walk Signal Indications at the Signals along VT 10a are Too Short and Provide a False Sense of Security	The walk time has been increased at all signals except the one at the bridge	VTrans		Immediate (Done)	Low

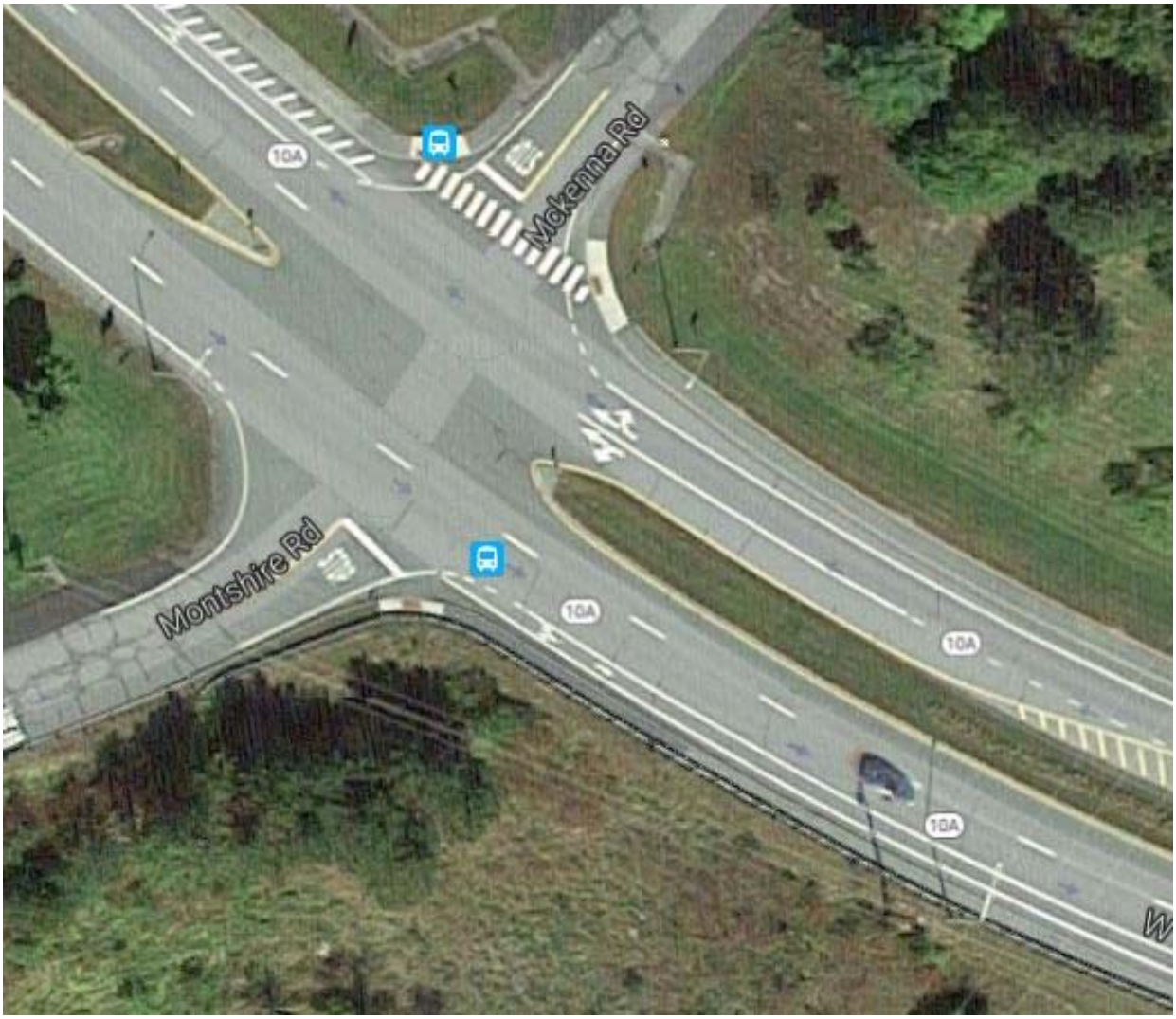
Appendix L: Office of Highway Safety Road Safety Audit of VT Route 10A, I-91 NB exit, and McKenna Rd

Office of Highway Safety

Road Safety Audit Review

Town:	Norwich	**Date Reviewed:**	May 24, 2017
Route:	VT 10a, I-91 NB exit, McKenna Rd	**Mile points:**	VT 10a MM 0.21 – 0.26

Location Map



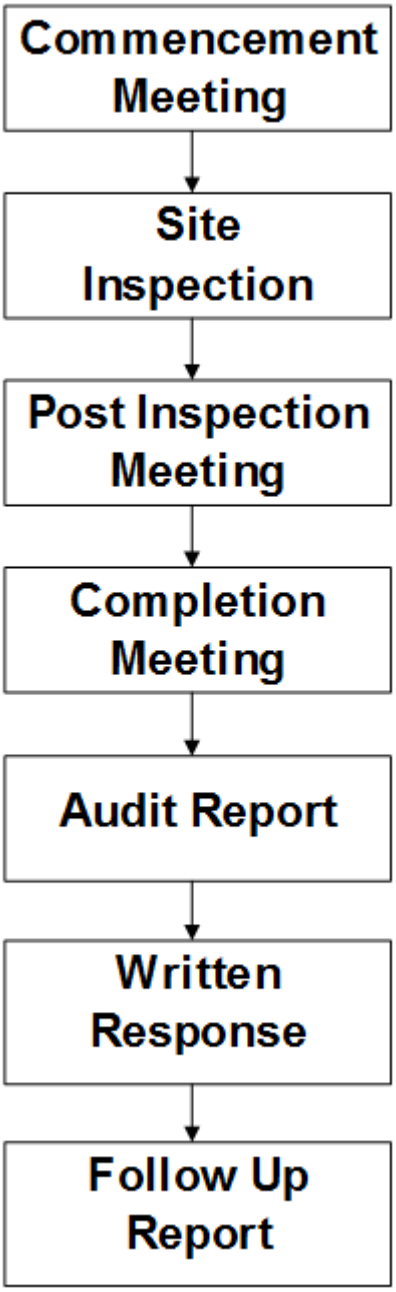
Office of Highway Safety

Road Safety Audit Review

RSAR Process

A Road Safety Audit Review (RSAR) is a formal examination of an existing road in which an independent, multi-discipline team (the Audit Team) reports on potential safety issues. According to the Federal Highway Administration (FHWA), the purpose of a RSAR is to determine which elements of the road may present a safety concern, to what extent and under what circumstances as well as to identify opportunities to mitigate the identified safety concerns.

Figure 1 - Road Safety Audit Process



The RSAR process is composed of several steps as shown in Figure 1. The process starts with a Commencement Meeting during which the Audit Team reviews data and gathers community concerns. A Site Inspection is then performed by the Audit Team. The site visit involves the identification of safety deficiencies as seen in the field. The Audit Team will usually drive through the location of interest to “get a feel” for the area, traveling through each approach in the case of intersections. The team is to then drive at a slower speed to make observations. If needed, the team will also walk the location. Following the site inspection, the Audit Team holds a Post Inspection Meeting**.** It is during this meeting that the team members discuss their observations and identify safety issues. The team is to reach a consensus on the importance of each safety issue mentioned. Only those issues for which a consensus is reached are included in the RSAR findings. A RSAR report (Written Report) is prepared.

The Written Report identifies safety concerns and proposes guidance. These issues and solutions are presented in a tabular format associated to each Responsible Entity for

ease of reporting. The Responsible Entities are any groups who own a roadway feature or who are responsible for making an improvement or for initiating further studies. These could include for example, the VTrans design section, the local town, the local police or the local RPC.

Location

The primary location of this RSAR is the intersection of VT 10a, Montshire Road and McKenna Road. This intersection is between mile points 0.21 and 0.26.

Purpose of the RSAR

This RSAR was conducted at the request of the Town of Norwich to document safety concerns at the intersection of VT 10a, Montshire Road and McKenna Road and to propose countermeasures.

The RSAR herein has sought to identify potential safety hazards and physical features which may affect road user safety. However, it is possible that not every deficiency has been identified. It should further be recognized that the implementation of the guidance in this report might contribute to improve the level of safety of the facility reviewed but not necessarily remove all the risks.

RSAR Participants

Mario Dupigny-Giroux from the Office of Highway Safety, VTrans, was the RSAR coordinator.

The other participants were:

Michael Blakslee	District 4, VTrans
John Holding,	District 4, VTrans
Jon Kaplan,	Bike/Ped, VTrans
Justin LaPerle,	OHS, VTrans
Derek Lyman,	TSMO, VTrans
Pat McManamon,	DMV, VTrans
Chris Mercon,	TSMO, VTrans
Paul White,	GHSP, VTrans
Kara Yelinek,	Bike/Ped, VTrans

Phil Dechert,	Town of Norwich
Herb Durfee	Town of Norwich
Doug Robinson,	Town of Norwich PD
Sharon Racusin,	McKenna Road Resident
Rita Seto,	TRORC

Information Reviewed

Geometry

This study area along VT 10a is comprised of the I-91 exit 13 ramps and of the Montshire/McKenna intersection.

Route 10A is a divided level road that runs west to east.

Traveling west on 10A, the lanes open into two lanes, one for travel on US 5 south and one for traveling to I-91 South and into Norwich Center.

Traveling east, VT 10a has two lanes prior to the ramps. At the ramps intersection, there is a left turn lane to go onto the northbound ram. After this intersection, the lanes merge into one east of the Montshire/McKenna intersection and continue to the Ledyard Bridge.

The exit 13 northbound off ramp intersection is controlled by a traffic signal. The ramp has a slight downgrade and traffic turning right have a dedicated right turn lane.

The Montshire/McKenna road intersection is a four-way intersection controlled by stop signs at the Montshire and at the McKenna approaches.

The next figure shows an aerial view from 2005 and one from 2016. It can be seen that the I-91 exit ramp used to have a slip lane and that there also used to be an exclusive right turn lane for traffic to get on the I-91 northbound on ramp. The space for this exclusive right turn lane is now being used for a bike lane.


2005 View (source Google Maps)
0.2
0.2


2016 View (source Google Maps)
Main St
S Main St
Mckenna Rd
Mckenna Rd
Montshire Rd
Montshire Rd
Montshire Rd

Speed Limit

The posted speed limit on VT 10a in the area of the McKenna Road intersection is 30 mph.

Traffic Volumes

The 2014 Average Annual Daily Traffic on VT 10a was 13,900 vehicles per day between the I-91 off ramp and River Road.

The Two Rivers-Ottaquechee Regional Commission conducted a peak turning movement count on May 9, 2017, between the hours of 6:00 am to 9:00 am and 3:00 pm to 6 pm. The raw count is shown in the following table.

Start Time	McKenna Road From North				VT10A Hanover From East				Montshire Road From South				VT10A Norwich From West			
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
06:00 AM	1	0	0	0	0	11	0	0	0	0	0	0	0	75	2	0
06:15 AM	2	0	0	0	0	11	0	0	0	0	0	0	0	155	0	0
06:30 AM	0	0	1	0	0	52	0	0	0	0	0	0	0	167	0	0
06:45 AM	1	0	1	0	0	43	0	0	0	0	0	0	5	184	1	0
07:00 AM	1	0	0	0	0	61	0	0	0	0	2	0	3	192	0	0
07:15 AM	1	0	0	0	0	51	2	0	0	0	0	0	9	295	1	0
07:30 AM	0	0	0	0	0	68	2	0	3	0	4	0	6	259	0	0
07:45 AM	0	0	1	0	0	70	4	0	1	0	3	0	5	212	2	0
08:00 AM	2	0	0	0	1	79	6	0	2	0	2	0	8	202	1	0
08:15 AM	0	0	1	0	0	78	2	0	8	0	7	0	13	211	1	0
08:30 AM	1	0	1	0	0	78	0	0	1	0	2	0	7	190	0	0
08:45 AM	0	0	5	0	0	75	1	0	3	0	3	0	4	171	1	0
Total 6:00 to 9:00 am	**9**	**0**	**10**	**0**	**1**	**677**	**17**	**0**	**18**	**0**	**23**	**0**	**60**	**2313**	**9**	**0**
03:00 PM	2	0	0	0	0	169	2	0	1	0	5	0	3	109	4	0
03:15 PM	4	0	0	0	3	186	3	0	2	0	2	0	6	127	0	0
03:30 PM	5	0	1	0	1	196	1	0	4	0	7	0	3	121	0	0
03:45 PM	0	0	0	0	1	185	2	0	2	0	1	0	4	117	0	0
04:00 PM	1	0	0	0	0	252	0	0	2	0	4	0	2	121	2	0
04:15 PM	1	0	0	0	0	229	4	0	1	0	5	0	7	108	1	0
04:30 PM	2	0	0	0	3	253	2	0	6	0	10	0	1	124	3	0
04:45 PM	1	0	3	0	6	226	1	0	4	0	1	0	4	130	2	0
05:00 PM	0	0	1	0	1	221	7	0	6	0	13	0	11	145	1	0
05:15 PM	0	0	0	0	1	277	4	0	5	0	16	0	2	112	1	0
05:30 PM	0	0	0	0	0	256	1	0	7	0	5	0	1	123	1	0
05:45 PM	4	0	1	0	0	229	1	0	1	0	4	0	0	142	4	0
Total 3:00 to 6:00 pm	**20**	**0**	**6**	**0**	**16**	**2679**	**28**	**0**	**41**	**0**	**73**	**0**	**44**	**1479**	**19**	**0**

Pavement Condition

The pavement surface on VT 10a is rated as poor in the area of the I-91 ramps and of the Montshire/McKenna intersection with the year of last work being 2009 (VTransparency, August 7, 2017).

Traffic Studies

VTrans Traffic Research Unit completed a left turn lane warrant analysis for the intersection of VT 10a and Montshire Road. The analysis was based on year 2017 Design Hour Volumes and shows that a westbound left turn lane is warranted.

VTrans Traffic Research also completed a capacity analyses for the subject intersection with and without an exclusive westbound left turn lane in place. This evaluation indicates that the level of service remains unchanged except for the movements from Montshire Road. The complete results are show in the next table.

	Existing Configuration				With Exclusive Westbound Left-Turn Lane			
	EB LT/TH	WB LT/TH	NB LT/TH/RT	SB LT/TH/RT	EB LT/TH	WB LT/TH	NB LT/TH/RT	SB LT/TH/RT
V/C ratio	0.01	0.02	0.35	0.06	0.01	0.02	0.83	0.06
95% Queue Length	0.0	0.0	1.6	1.6	0.0	0.0	7.1	0.2
Control Delay (s/veh)	11.1	8.8	33.4	33.4	11.1	8.8	195.4	40.3
Level-of-Service (LOS)	B	A	D	E	B	A	F	E

Past Projects

HES 0170(4) was for the elimination of the yield condition (slip lane) at 1-91 exit #13 Ramp “A” and for the construction of a dedicated right turn lane. This project was completed with STP 2602(1) in 2009.

Project STP 2602(1) was for the resurfacing of VT 10a. This included the striping of the bike lane as it currently exists. The original design was for two through lanes and one dedicated right turn lane west of McKenna Road. East of McKenna Road (but traveling west), the project plans showed a dedicated left turn lane where there is currently a share left and through lane along with a shared through and right turn lane.

A road safety audit was conducted at this same location in June 2008. A summary is provided at the end of this report.

Future Projects

There are no known future projects for this area.

Crash History

The crash history along this segment was reviewed for the five-year period covering the years 2012 to 2016. For the purpose of analyzing crashes, the segment was further divided into two sub areas, namely the intersection with the I-91 exit 13 northbound off ramp and the McKenna intersection.

Overall, along this segment of VT 10a, there were twenty crashes reported during this period. Of the twenty crashes, fourteen crashes took place at the exit 13 intersection and six in the area of the McKenna Road intersection.

The major crash pattern at the I-91 northbound exit ramp is a right angle crash involving a vehicle that is coming off I-91 northbound. Nine of the fourteen crashes at this intersection were of this type (71%). Of the nine crashes, seven happened when the ramp was icy or snow covered (78%). Of the seven crashes that occurred when the road was icy or snow covered, four were in 2014, two in 2015 and one in 2016. During the reporting period, total snowfall amounts were significantly larger in 2013, 2014 and 2015.

In contrast, a previous analysis of crash data indicated that there had been twenty-four crashes at this intersection between 2002 and 2004. The majority of the crashes were rear-end crashes

at the slip lane (that was present at the time). There had been only three right angle crashes of the type described earlier and only one due to icy or snow on the ramp.

At the McKenna Road intersection, there were only four crashes reported during the 2012-2016 period. Two of these were right angle crashes (one involving a vehicle on the Montshire Road approach because of visibility issue with a snowbank and one with a vehicle on the McKenna Road approach also with a visibility issue caused by a bus that was stopped in the right hand lane. The other two crashes involved shifting lane maneuvers in the eastbound direction.

At total of three crashes were identified during the 2002-2004 three-year period at the McKenna Road intersection. One of the crashes was a right angle crash at McKenna Road. In this case, the driver who entered VT 10a thought that the oncoming westbound vehicle was about to turn left the other two crashes involved single motorists who lost control (one on VT 10a and one on Montshire Road).

Crash narratives are provided at the end of this report along with the 2002-2004 and the 2012-2016 collision diagrams.

Current Local Concerns

The Town of Norwich reported the following issues:

> The left turn to Montshire Road / straight (to Rt. 5) arrow is an issue.
>
> Cars are speeding by McKenna Road in the left lane when cars in the right lane have stopped to let traffic out of McKenna Road.
>
> The right turn onto I-91nb is hazardous. When there is a line of traffic stopped at the light, people repeatedly drive in the striped shoulder to turn right. When the light changes, the driver in the lane does not expect to see anyone on their right side also turning. There have been near misses at that spot.

There is an incredible amount of traffic coming from every direction and especially from the exit 13 ramp. Motorists on McKenna road and Montshire Road have difficulties egressing onto 10A.

When traveling westbound and approaching McKenna Road, some motorists think they are getting onto the interstate and accelerate up McKenna Road instead.

There needs to be a way for people to move safely to and from the sidewalk and the bus stop at the Montshire Road approach. It is probably the most serious safety issue.

The walk signal indications (from River Rd all the way to US 5) give people a false sense of security.

The RPC reported the following issues:

Turning left off McKenna onto VT10A is an issue during the non-peak hours due to the flow of vehicles from both directions. Gaps between vehicles to enter VT 10A safely are perceived to be too short.

From McKenna, the corner sight distance is poor when looking towards Hanover.

McKenna Road Resident Sharon Racusin reported the following issues:

If there is a vehicle in the right most westbound through lane, people on McKenna Road cannot see if the is a vehicle coming in the left most westbound lane.

The bike lane under the underpass is too narrow.

The pedestrian button at the signal the I-91 northbound on ramp was broken all winter.

During the morning peak, traffic is backing up on I-91

Identified Safety Concerns

This section lists the areas of safety concern identified by the audit team during the site inspection and from the analysis of available data. This section also reports the potential safety enhancements suggested by the audit team. The concerns are not listed in order of importance.

Concern: Lack of Pedestrian Connections to Go from One side of VT 10a to the Other

Westbound transit bus passengers at being dropped off at McKenna Road. They need to cross four lanes of traffic to get to Montshire Road.

Safety Enhancements:

Mid-to-Long Term

Install a south-to-north pedestrian signal at the I-91 northbound exit ramp and a sidewalk on the south side of VT 10a from the ramp to Montshire Road. Move the bus stop to the I-91 intersection.

Concern: Entering VT 10a from McKenna Road or Montshire Road is difficult

Vehicles on VT 10a are blocking the intersection at times. At other times, traffic on VT 10a is flowing from both directions and motorists on McKenna Road have a hard time finding gaps in traffic. Another issue is that a vehicle on McKenna Road waiting to enter onto VT 10a when a vehicle is stopped in the right most lane cannot see westbound oncoming vehicles in the left hand lane.

Safety Enhancements:

Immediate-to-Short Term

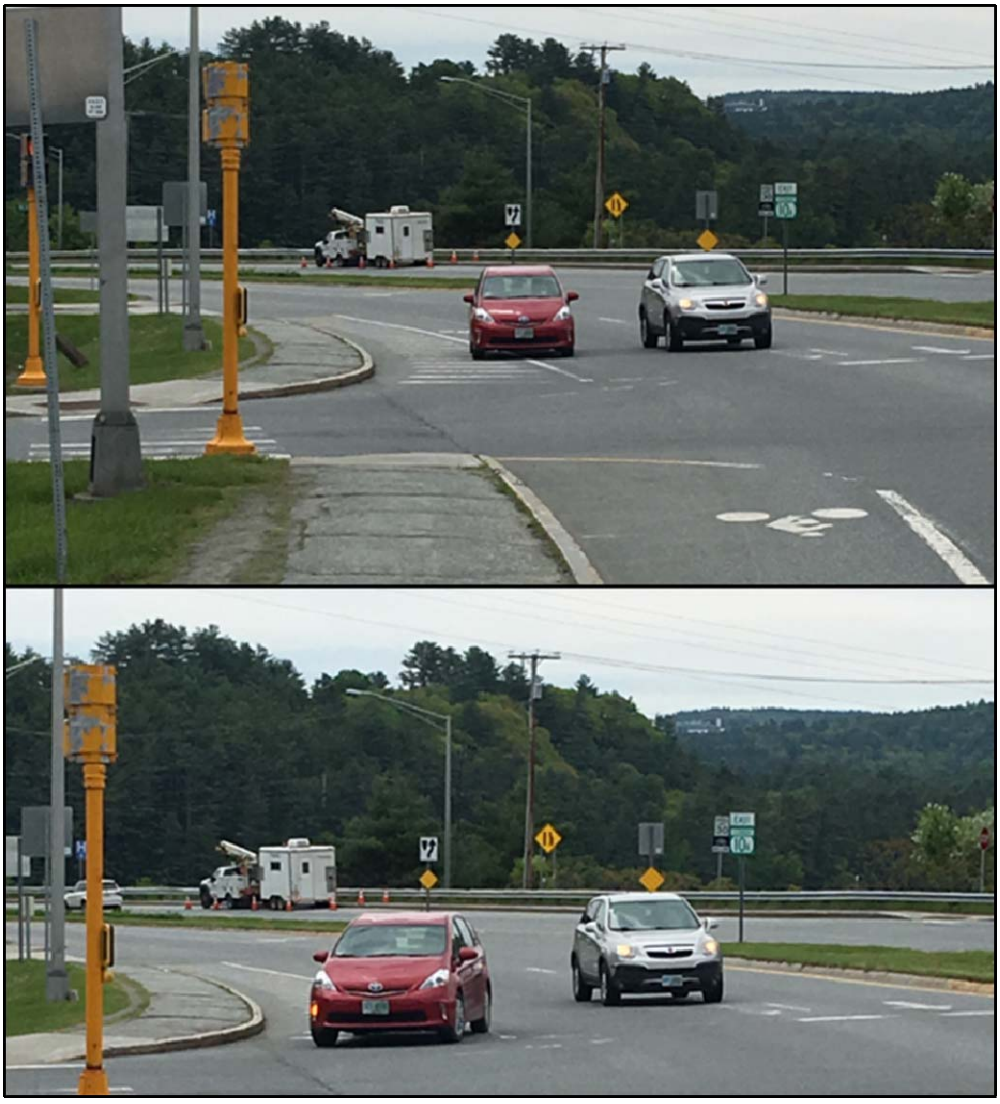
Install “Do Not Block Intersection” signs and corresponding pavement markings.

Mid Term

Conduct a corridor study from the village center to Hanover.

Concern: The Right Turn onto I-91 Northbound Creates Conflicts

People have been observed to drive in the crosshatched shoulder to make a right turn onto the I-91 on-ramp. Conflicts and near misses occur when a vehicle that is in the correct lane initiates a right turn and a vehicle is also making a right turn but from the shoulder.



Safety Enhancements:

Short Term

Install rumble stripes inside the shoulder to deter motorists from continuing through the shoulder to make a right turn.

Consider installing flexible delineators from May 1 to October 1 of each year.

Concern: Motorists confuse McKenna Road for the I-91 Northbound on Ramp

As stated, some motorists that are traveling westbound turn right onto McKenna Road, thinking that this is the I-91 on ramp.

Safety Enhancements:

Short Term

Increase the size of the McKenna street name sign to a 12-inch tall sign.

Install an additional No Outlet sign on the south side of McKenna Road

Concern: The Walk Signal Indications at the Signals along VT 10a are Too Short and Provide a False Sense of Security

It has been reported that the walk phase at many of the signals was not long enough.

Immediate

The walk time was increased at all signals except at the one at the bridge (this is because the intersection at the bridge has a concurrent pedestrian phase to cross River Street and the current equipment is not compatible with a leading pedestrian interval or delay vehicle green).

Summary of Safety Enhancements

The safety concerns and potential actions that were identified in the previous sections are further summarized in the next table. These potential enhancements will be presented to respective parties for further consideration. The entities listed under the column called “Potential Responsibility” are suggested groups that could possibly implement some of the countermeasures.

Potential Safety Enhancements Summary Table

Safety Concern	Safety Enhancement	Potential Responsibility	Safety Payoff	Time Frame	Cost
Lack of Pedestrian Connections to Go from One side of VT 10a to the Other	Install a south to north pedestrian signals at the I-91 northbound exit ramp and a sidewalk on the south side of VT 10a from the ramp to Montshire Road	VTrans (signal), Town (Sidewalk)		Mid - Long	Mid - High
Entering VT 10a from McKenna Road or Montshire Road is difficult	Install "Do Not Block Intersection" signs and pavement markings	VTrans		Immediate - Short	Low initial (must be maintained)
	Conduct a corridor study from the village center to Hanover	TRORC		Mid	Mid
The Right Turn onto I-91 Northbound Creates Conflicts	Install rumble stripes inside the shoulder to deter motorists from continuing through the shoulder to make a right turn	VTrans		Mid	Low Mid
	Consider installing flexible delineators from May 1 to October 1 of each year	VTrans		Mid	Low
Motorists confuse McKenna Road for the I-91 Northbound on Ramp	Increase the size of the McKenna street name sign to a 12-inch tall sign	Town		Short	Low
	Install an additional No Outlet sign on the south side of McKenna Road	Town		Short	Low
The Walk Signal Indications at the Signals along VT 10a are Too Short and Provide a False Sense of Security	The walk time has been increased at all signals except the one at the bridge	VTrans		Immediate (Done)	Low

COLLISION DIAGRAM

Key Number = 1

MUNICIPALITY: 1411 COUNTY:

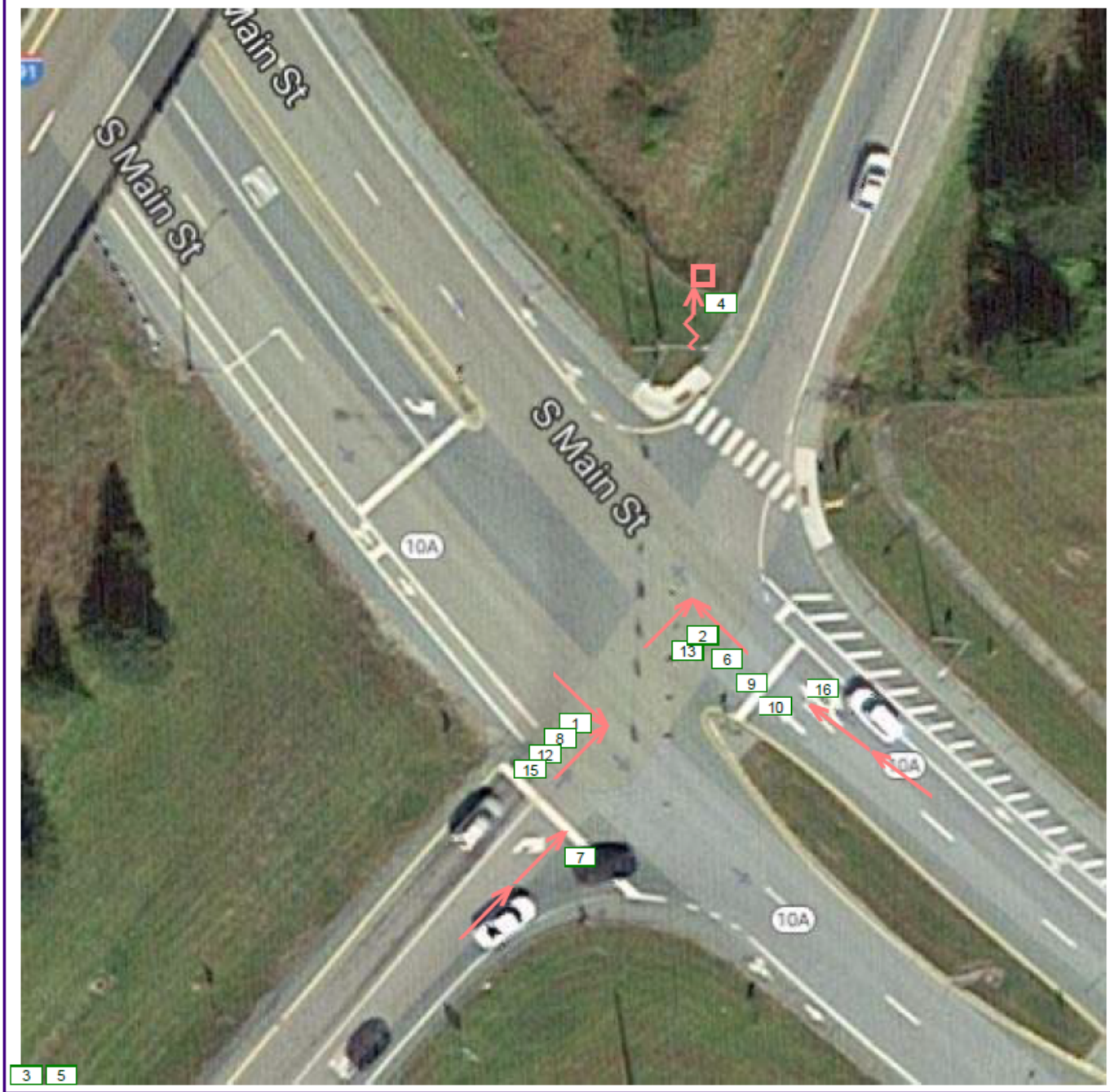
INTERSECTION: 10A

PERIOD: 5 YEARS 0 MONTHS FROM 1/1/2012 TO 12/31/2016

FILE: 10aMcKeena

CASE # :

BY: DATE: 5/1/2017



SYMBOLS			MANNER OF COLLISION	
MOVING VEHICLE	P	PEDESTRIAN	REAR END	HEAD ON
TURNING VEHICLE	B	BICYCLIST	LEFT TURN	RIGHT TURN
BACKING VEHICLE	A	ANIMAL	LEFT TURN	RIGHT TURN
PARKED VEHICLE		FIXED OBJECT	OVERTAKE	RIGHT ANGLE
999 RECORD NUMBER		Fatal	OUT OF CONTROL	SIDE SWIPE

COLLISION DIAGRAM

Key Number = 2

MUNICIPALITY: 1411 COUNTY:

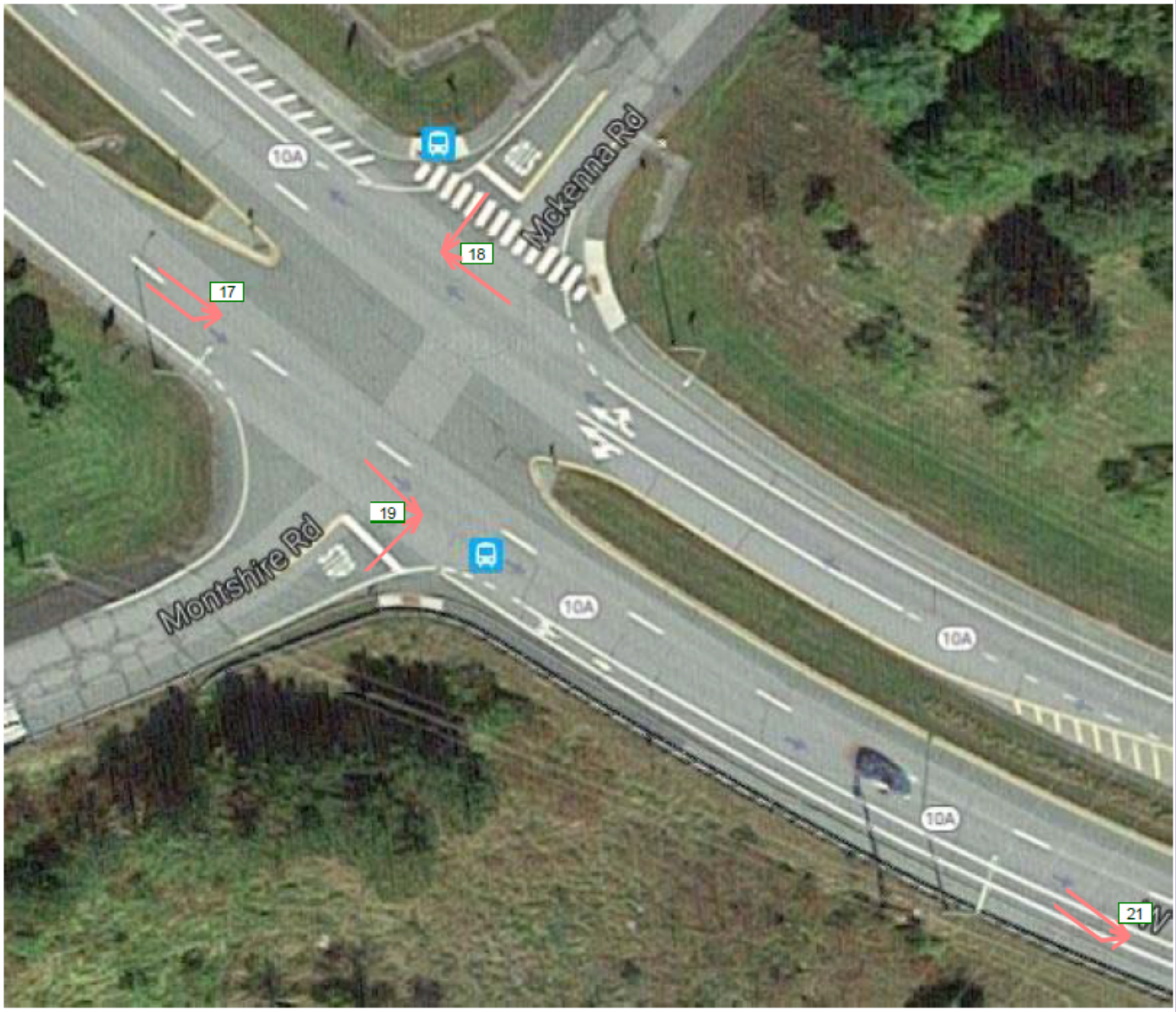
INTERSECTION: 10A

PERIOD: 5 YEARS 0 MONTHS FROM 1/1/2012 TO 12/31/2016

FILE: 10aMcKeena

CASE # :

BY: DATE: 5/1/2017



SYMBOLS			MANNER OF COLLISION	
MOVING VEHICLE	P	PEDESTRIAN	REAR END	HEAD ON
TURNING VEHICLE	B	BICYCLIST	LEFT TURN	RIGHT TURN
BACKING VEHICLE	A	ANIMAL	LEFT TURN	RIGHT TURN
PARKED VEHICLE		FIXED OBJECT	OVERTAKE	RIGHT ANGLE
999 RECORD NUMBER		Fatal	OUT OF CONTROL	SIDE SWIPE

Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
1	15NW0010	1/3/15 6:30 PM	VT-10A	Property Damage Only	Other - Explain in Narrative	Freezing Precipitation	Snow	This crash occurred at the intersection of VT Rt 10A and the I91 Northbound off ramp. At the time of the crash, the weather was cold and it was snowing. The roadway is paved and the ramp is downhill connecting to a level RT 10A main road. The roadway was snow covered and slippery. No injuries were reported. Operator #1 advised he was exiting the interstate and coming down the ramp. He applied the brakes and the vehicle began to slide. He stepped on the brakes harder and tried to steer but the car slid into the intersection hitting the other vehicle. Operator #2 advised that she was traveling on RT 10A and approached the intersection on a green light. As she entered the intersection, the other vehicle slid into her vehicle causing it to veer to the left into a traffic sign. Investigation revealed the Vehicle #1 was traveling North on I91 and had exited onto the off ramp. Vehicle #2 was traveling East on RT 10A. At some point, Vehicle #1 attempted to slow down and began to slide on the snow-covered roadway. Operator #1 applied the brakes harder and attempted to steer causing the vehicle to continue to slide on the road. Vehicle #2 had continued on RT 10A and had entered the intersection on a green light. Vehicle #1 slid into the intersection against a red light and struck the right front passenger door and fender area of Vehicle #2 pushing it to the left and onto a divider median. Vehicle #1 hit a traffic sign post, snapping it off near the base. Vehicle #1 was then caught up on the broken sign post. The cause of this crash is the fact the Vehicle #1 was traveling at a speed not prudent for the weather conditions. Contributing factors to this crash include the fact that the weather was poor, the roadway was slippery and snow-covered and Operator #1 is a relatively new driver with approximately 6 months of driving experience.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
2	15NW00109	2/3/15 9:08 AM	VT-10A	Property Damage Only		No Turns, Thru moves only, Broadside ^<	Clear	Snow	This crash occurred in the town of Norwich at the intersection of Route 10A and the bottom of the I-91 Exit ramp at exit 13. At the time of the crash, the weather was clear although extremely cold. At the time of this crash, the road was packed snow covered and extremely slippery. Operator #1 stated that she was exiting I-91 via the exit ramp and was traveling at approximately 35 - 40 MPH. Stated that as she was approaching the Rte. 10A intersection, she tried to slow but her vehicle started to slide and she lost control, her vehicle slid on the ice, across Rte. 10A, across the median striking Vehicle #2 which was stopped in traffic. Operator 2 stated that he was stopped in a line of traffic waiting to proceed west on Rte. 10A. Stated that he observed Vehicle #1 coming down the exit ramp and saw that the vehicle was starting to slide. Advised that he was unable to move as there were vehicles stopped both in front and back of his vehicle.
3	15NW00831	8/18/15 1:47 PM	VT-10A	Property Damage Only			Unknown		Crash at the intersection of Rte. 10A and the I-91 North exit ramp onto Rte. 10A. It was reported that there were no injuries and no road blockage. Nothing more is available. No boxes were checked for direction of crash. Cannot map it.
4	12NW00771	6/11/12 7:24 PM	VT-10A	Property Damage Only		Single Vehicle Crash	Clear	Dry	On 6/11/12, single vehicle motor vehicle crash at the intersection of Rt 10A and Interstate 91 Exit 13 northbound on ramp. Op 1 had driven his vehicle off the road into a fence. There were rubber marks that went from the center of his lane right off the road into the fence. Said he was traveling at about 35 MPH and when he began to turn, the wheels did not move the car. He stated that as soon as this happened, the vehicle went into the fence. The rubber marks were consistent with his statement. The vehicle most likely suffered a steering failure. Cardinal direction on the report is north.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
5	13NW00733	6/9/13 2:00 PM	VT-10A	Property Damage Only			Clear	Dry	13NW00733 5 This accident occurred on Route 10A at the intersection with the I-91 On and Off Ramps. Traveling West on 10A, the lanes open into two lanes, and one for travel on Route 5S and one for traveling to I-91 S and into Norwich center. Traveling east, it is a two-lane road prior to the ramps. At the intersection, there is a left turn lane to go onto the NB ramp. After the intersection, the lanes merge to one and continue to the Ledyard Bridge. Operator #1 advised that he wanted to go to I-91 South and realized he made the wrong turn. He intended to do a U-Turn at the intersection. He saw Vehicle #2 approaching and saw his directional on. Believing Vehicle #2 was going to turn onto the On ramp, he began to make the U-turn and turned into the side of Vehicle #2 as it crossed the intersection. Operator #2 advised he was intending to take I-91 South and was in the right lane. He signaled his intention to stay in the lane. As he continued into the intersection, Vehicle #1 pulled out of lane and struck the driver side of his vehicle. Investigation revealed that Vehicle #1 was in the left turn lane facing East. Operator #1 intended to make a u turn from that lane to head back to the I-91 South on ramp. Vehicle #2 was traveling West and was intending to take the I-91 south on ramp. Operator #1 saw the directional of Vehicle #2 and believed it was going to turn onto the NB ramp. Operator #1 made the U-turn and did not see that vehicle #2 was continuing straight. Operator #1 should have ensured that Vehicle #2 was in fact turning before beginning the maneuver. Both vehicles were removed by Bob's Service Center due to damage. Operator #1 was issued VCVC 2699997 for Vehicle Failing to Yield-Left Turn.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
6	14NW00001		1/2/14 7:35 AM	VT-10A	Property Damage Only	Opp Direction Sideswipe	Freezing Precipitation	Snow	Two-car motor vehicle crash. There were no reported injuries and there was road blockage. One operator was issued a VCVC for defective equipment. Near the I91 northbound entrance and exit ramps. There were no reported injuries. Operator #1 said that she was the fifth vehicle in a line of traffic traveling down the exit ramp. She advised she approached the intersection to make a left hand turn. While turning she applied her brakes and the vehicle's wheels locked up. Advised the vehicle skidded across the eastbound lanes, across the median, and hit a westbound vehicle in the left lane. Advised that she was traveling slowly because of the road conditions in the line of traffic and none of the other vehicles showed and signs of slipping. Operator #2 said that she was stopped in the westbound lane of VT Route 10a at a red light. She advised she did not see Vehicle #1 approaching her. She advised the impact was a surprise to her. My investigation reveals Vehicle #2 was traveling west on VT Route 10a and was stopped at the intersection with I91 northbound entrance and exit ramps. Vehicle #2 was in the left lane, closest to the median, was stopped because the traffic control signal was displaying a red light. Vehicle #1 exited I91 at Exit 13 (Norwich) and was negotiating a turn onto VT Route 10a. Vehicle #1 failed to negotiate the corner, crossed over the median, and collided with Vehicle #2. The impact did not activate air bags. The driver's side front corner of Vehicle #1 collided with the driver's side rear passenger door of Vehicle #2. Based on my investigation and Operator Statements this crash may have been avoided had Operator #1 been using winter rated tires or traveling at a very slow speed. Being that four vehicles in front of the Operator negotiated the same intersection and she did not, it appears the tires were not appropriate for the road condition.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
7	14NW00005	1/2/14 2:30 PM	VT-10A	Property Damage Only		Rear End	Freezing Precipitation	Snow	Vehicle #1 was coming off the exit 13 north bound off ramp and was trying to make a left hand turn when she hit vehicle #2in the rear bumper. Vehicle #2 driven was also coming off the ramp and was trying to make a left hand turn as well. The 91 northbound off ramp was covered in snow/ice and was the cause of six slide offs or crashes.
8	14NW00016	1/4/14 1:00 PM	VT-10A	Property Damage Only		Same Direction Sideswipe	Clear	Ice	This accident occurred at the intersection of Vermont Route 10A and I-91 Northbound Off Ramp. At the time of the accident, the weather was clear and cold. No injuries were reported. Operator #1 advised that she had exited the interstate and was approaching the traffic light. As she was slowing, her vehicle was on an icy section of road and began to slide. The ABS of the vehicle was working but she did not gain any steering control until near the traffic light, but by that time, she was sliding into the intersection. Her vehicle caught at the last moment, but sideswiped a vehicle on the main road. Operator #2 advised she was traveling east on Route 10A. As she passed through the intersection, the other vehicle slid into her car. Investigation revealed that Vehicle #1 was exiting the interstate at the Norwich exit. As the vehicle came down the ramp, it apparently was on an icy/slippery section. Was unable to control the vehicle until the last second. Vehicle #2 was traveling east on 10A and had entered the intersection appropriately. Her vehicle was then sideswiped by Vehicle #1. Contributing factors to this accident are the fact that the exit ramp did have a section that was icy. There had been several other incidents of vehicles sliding into the intersection due to the improperly maintained ramp. While I was investigating this crash, several vehicles almost slid into the intersection or into my police car. An additional factor is the fact that vehicles that exit the ramp do travel at a speed greater than the suggested ramp speed. The average being at least 45 to 50 miles per hour. Which is a speed too fast for the conditions present at the time. State highway was contacted to lay salt or sand on the affected area.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
9	14NW00557	2/13/14 11:00 AM	VT-10A	Property Damage Only		No Turns, Thru moves only, Broadside ^<	Freezing Precipitation	Snow	Op 2 called and reported that in February 2014 he was travelling on Route 10A during a storm and was struck by OP 1 who was coming down the Exit 13 ramp and could not stop. As months have passed, no investigation was completed.
10	14NW00217	2/19/14 12:30 PM	VT-10A	Property Damage Only		No Turns, Thru moves only, Broadside ^<	Freezing Precipitation		Vehicle #1 was traveling north coming off the exit 13 northbound off ramp and hit ice near the bottom of the ramp. It was unable to stop at the red light and hit vehicle #2 in the passenger side, which was travelling eastbound on Route 10A. Vehicle #2 made no attempt to swerve as it didn't see vehicle #1 coming into the intersection as there was a large snow bank present. A significant amount of snow fell quickly in a short period of time and created the slippery conditions which mostly contributed to the crash.
11	14NW00238	2/24/14 6:35 AM	VT-10A	Property Damage Only		Rear End	Clear	Dry	Minor non-reportable crash on R10A. Op 1 hit Op 2's rear bumper with her front bumper. According to the crash report, this took place 200 feet west of River Road which is at mile point 0.48 and outside of the area of concern.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
12	14NW00356		3/30/14 9:30 AM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	Wet	This accident occurred at the intersection of I-91 Northbound ramps and Vermont 10A. At the time of the accident, the weather was overcast and cool. The roadway was free from defects and there were no obstructions to visibility in either direction. No injuries were reported. Operator #1 advised that she was traveling on 10A heading towards Hanover. She did not see the red light and the other car was just in front of her as she drove. She hit the car. Also advised that she thought Vehicle #2 was coming off the ramp fast. Operator #2 advised that he had just gotten of I-91 and was planning to turn left onto 10A. As he approached the intersection, he had a green light and proceeded into the intersection turning left. As he did, Vehicle #1 hit the side of his vehicle and spun it around and off the road. Witness #1 advised that he was stopped at the light, first car in line. He was watching traffic and saw the silver car (Vehicle #2) come off ramp on green light. He saw the blue car (Vehicle #1) hit Vehicle #2. Witness #2 advised that she was stopped at the traffic light. She advised they had been stopped for several seconds. She advised she could see both vehicles approaching the intersection as she was watching traffic. The light was not changing and was red for traffic on 10A and green for the off ramp. The blue car (Vehicle #1) did not appear to be slowing for the red light and subsequently hit the silver car in the intersection. Investigation revealed that the witness vehicles were stopped at a red light on 10A. These vehicles were in the westbound lane of 10A and were first in line at the lights. While conducting the investigation I did observe the traffic light several times and found that it was in proper working order and appeared to be functioning properly. No lights were out on the eastbound side.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
13	15NW00349		4/21/15 6:00 PM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	Dry	This crash occurred on Route 10A at the intersection with the Northbound off ramp of I-91. The weather was clear and warm. No injuries were reported to this officer at the time of report. Operator #1 advised she was traveling east on 10A and did not notice the light was red and proceeded into the intersection and her vehicle hit the other vehicle. Operator #2 advised that he was coming off the ramp and intending to turn left onto 10A. As his vehicle entered the intersection, Vehicle #2 stuck the driver's side rear wheel, spinning the vehicle and trailer. Investigation revealed that Vehicle #1 was traveling east on Route 10A. Vehicle #2 had exited the northbound lane of I-91 and was on the exit ramp. Vehicle #2 had a green light and was preparing to turn left onto 10A. Vehicle #1 was facing a red light. Operator #1 did not see the red light and continued into the intersection as Vehicle #2 was entering the intersection to turn. Vehicle #1 struck the left rear wheel of Vehicle #2, which was towing a trailer, and caused the vehicle to "jack-knife".
14	15NW01269		12/10/15 4:28 PM	VT-10A	Property Damage Only	Left Turn and Thru, Angle Broadside -- >v--	Clear	Dry	No in the area of concern. This crash occurred at the intersection of Main Street/US Route5 S/VT 10A/I-91 SB ramps. At the time of the crash the weather was cold and the roadway was free from defects and visibility obstructions. No injuries were reported to this officer. Operator #1 advised she exited the interstate and was at the traffic light. The light turned green and cars began to move. She began to make a left turn onto Route 10A. Her vehicle was then struck by another car. Operator #2 advised she was intending to travel straight onto the Southbound Interstate ramp. As she proceeded through the intersection with traffic, the other car turned into her path and the vehicles hit. Investigation revealed that both vehicles were at the intersection with Operator #1 intending to make a left turn onto Route 10A and Operator #2 intending to enter the Southbound Interstate ramp. The roadway is level paved blacktop and the traffic light was functioning properly at the time.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
15	16NW00040		1/12/16 2:00 PM	VT-10A	Property Damage Only	Same Direction Sideswipe	Freezing Precipitation	Slush	On January 12, 2016, at approximately 1506 hours, OP 1had been traveling north on Interstate 91 and had gotten off the interstate at exit 13. Said she had attempted to stop her vehicle at the end of the ramp but when she started to brake her vehicle began to slide, striking a vehicle passing through the intersection. Op 2 told me that he had been traveling east on 10A. He told me that he had a green light at the intersection and started to pass through when another vehicle hit the passenger side of his vehicle. At the time of the crash, the section of road where the crash occurred was paved. On the date and time of the crash, it was heavily snowing and the roadway was a mix of snow and frozen rain and the roadways had not been treated with sand/salt. Op 1s' speed and the road conditions were contributing factors in the crash.
16	16NW00277		3/26/16 6:15 PM	VT-10A	Injury	Rear End	Clear	Dry	On March 26, 2016, at approximately 1821 hours, the crash occurred at the intersection of Vermont 10A and the Interstate 91 northbound on ramp. Report of possible injury. Op1 told me that he had been traveling west on 10A when the crash occurred. He told me that the traffic light had been green as he approached the intersection. He told me that he had looked down to fiddle with the radio and did not notice the light change to red, rear ending the vehicle stopped at the light. Op 2 had been stopped at the red light at the intersection of 10A and the Interstate 91 northbound on ramp when the crash occurred. Said had been traveling west. Estimated that he had been stopped at the red light for approximately 10-15 seconds when his vehicle was struck. The traffic light was in normal operation at the time of the crash. The road was level and curved slightly to the right with a posted speed limit of 30 miles per hour. On the date and time of the crash, the weather was clear and the roadway was dry and free of debris.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
17	13NW00468	4/22/13 1:40 PM	VT-10A	Property Damage Only		Left Turn and Thru, Angle Broadside -- >v--	Clear	Dry	This accident occurred on Route 10A at the intersections with Montshire and McKenna Roads. At the time of the accident, the weather was warm and clear. The roadway is paved blacktop and free from defects. The roadway is straight and has several intersections near it from I-91 ramps and turn lanes. Operator #1 advised that he had missed a turn to go to a business in town and saw the intersection ahead and wanted to turn around. He checked for traffic and was merging into the left lane. Said did not see that Vehicle #2 was next to him and his vehicle struck/sideswiped the other vehicle. Operator #2 advised he was traveling East on 10A intending to travel into New Hampshire. As he passed the I-91 ramps and approached the other intersection, Vehicle #1 struck the side of his vehicle.
18	14NW01132	10/20/14 4:00 PM	VT-10A	Injury		No Turns, Thru moves only, Broadside ^<	Clear	Dry	This crash occurred on Route 10A at the intersection of McKenna and Montshire Road. At the time of the accident, the weather was clear and warm. Passengers from Vehicle #2 were transported to DHMC as a precaution. Operator #2 advised that he was intending to turn left onto 10A from McKenna Road. Traffic had stopped and a school bus left room for him to enter the intersection. Advised the bus driver waved him into intersection. As he proceeded, Vehicle #2 had driven into intersection and he hit the side of the car. Operator #1 advised that she was in traffic on 10A. She intended to get into the left lane to eventually turn onto Route 5. Traffic had slowed and as she approached the lane opening, she continued to travel straight. A school bus was in the right lane. As she passed the front of the bus, the other vehicle hit the side of her car. Witness #1 advised that she was in traffic, driving the school bus. As traffic stopped, she saw Vehicle #1 at McKenna road. She stopped to allow him room to enter intersection. As she waited, Vehicle #1 drove out of McKenna Road and in front of her vehicle. It came out quickly. The vehicle then hit the side of a vehicle that was coming up through the intersection. Traffic was heavy with afternoon commuters.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
19	15NW00179	2/25/15 11:30 AM	VT-10A	Property Damage Only		No Turns, Thru moves only, Broadside ^<	Clear	Dry	This crash occurred on Route 10A at the intersection with Montshire Drive. At the time of the crash, the weather was cool and clear. The roadway was dry and free from defects. Operator #1 advised that the accident was her fault as she ran into the side of Vehicle #2. Advised she was making a left turn from Montshire onto 10A. She did not see any approaching traffic and entered the intersection. As she did, Vehicle #2 was proceeding past her and her vehicle struck the side of the other car. Advised that her view was a bit obstructed by snow banks along Route 10A. Operator 32 advised that he made a right turn off the exit ramp and intended to head straight into Hanover, NH. As he drove past the Montshire Road, Vehicle #1 pulled out and hit the side of his vehicle. Investigation revealed that Vehicle #1 was preparing to make a left turn onto 10A from Montshire Road. Vehicle #2 had made a right turn off the exit ramp onto Route 10A. Due to winter snowfall, snow is piled up on the roadside and does obstruct view of approaching eastbound traffic. The exit ramp cannot be clearly seen from Montshire Road. A contributing factor to this crash is the fact that visibility is partially obstructed due to piled up snow along the south side of Route 10A.
20	16NW00897	8/25/16 5:20 PM	VT-10A	Property Damage Only		Rear End	Cloudy	Dry	Not sure of the location. This could be at the light by the Ledyard Bridge or it could be at the ramp and traffc would have been backed up past McKenna. On August 25, 2016, at 1725 hours, Hartford Dispatch advised of a motor vehicle crash on Vermont Route 10A, near the Ledyard Bridge. Two vehicles parked on McKenna Road, OP 1 said she was driving west on 10A when the vehicle in front of her stopped suddenly. Said she was unable to stop in time and hit the back of the vehicle. Said that she was distracted because her son was screaming in the backseat. OP 2 said he had been stopped at the traffic light on 10A west for about a minute when someone crashed into the back of the trailer. The crash occurred on a paved public highway with a posted speed limit of 30 miles per hour. The section of road where the crash occurred was straight and had a clear line of sight in both directions. On the date and time of the crash, the weather was clear and the roadway was dry.

Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
21	15NW01283		12/15/15 2:30 PM	VT-10A	Property Damage Only	Same Direction Sideswipe	Cloudy	Dry	On December 15, 2015 at approximately 1530 hours, a two-car motor vehicle crash which occurred on Vermont Route 10a near Montshire Road. There were no reported injuries. There were no road obstructions, which could contribute to the crash. In the area of the crash, the eastbound lanes are preparing to merge into a single lane. The merge is warned by signs that the right hand eastbound lane will end and traffic should merge into the left lane. Operator #1 who advised she was traveling east on Vermont Route 10a in the right lane and began to merge into the left lane as the lane would be ending. She advised her speed was approximately 20 miles per hour. She advised that she did not see or hear Vehicle #2 in the left lane alongside of her. Advised she did not realize the vehicle was there until the point of impact. Op 2 advised he was traveling east on Vermont Route 10a in the left lane. He advised he was alongside of Vehicle #1 and traveling a nearly the same speed, which he believed to be approximately 20 miles per hour. Advised that Vehicle #1 began to merge into his lane striking his vehicle.

Road Safety Audit Review Summary - DRAFT
Norwich – Vermont Route 10a
June 11, 2008

Introduction: A Road Safety Audit Review is a formal examination of an existing road or intersection to recommend low-cost safety improvements. This work is done by an independent team of transportation professionals – these professionals bring many different transportation specialties to the review process. The role of being Independent is taken seriously, this means that most participants are not directly involved with the location being audited and all have no preconceived notions of what ought to happen. A safety audit can also involve town officials, interested citizens, and other responsible entities insofar as those individuals conform to the same unbiased perspective. The audit team is responsible for performing a site visit, identifying safety issues, and coming to a consensus about possible solutions.

Safety Audit Process: The safety audit process, nationally recognized and often used by VTrans officials, is composed of several steps. A project coordinator organizes and implements the audit. The process starts with a meeting of citizens and local officials – that was conducted on site with McKenna Road residents, town officials, and Montshire Museum representative on April 29th. The meeting purpose is to compile all the community concerns for the audit team to study.

The audit team then meets to review those comments and hold their own site inspection tour – held on May 8th. The site visit involves identification of safety deficiencies as seen in the field (not in a cubicle at VTrans Montpelier!). In preparation many of the audit team visit the site a few days prior to familiarize themselves with the location and collect traffic data (May 1st and 2nd).

Following the site inspection, the audit team reconvenes to discuss their observations and recommendations. Normally, the team is to reach a consensus on each safety issue and only those issues for which a consensus is reached are included in the findings. However, for this review we included any issues that had been raised by any members of the audit team.

The safety audit summary is developed and presented to the Norwich Selectboard for comments. The report findings showcase the list of issues found and identify the parties expected to address those issues. The last requirement of actually doing the work takes the greatest amount of time. The Selectboard reviews the audit findings and helps guide the local coordinator with the implementation piece.

Locations: We needed to prioritize the audit to include three separate areas along VT Route 10a. This was done to ensure we focused on the most important areas first. In priority, the locations were:

1. McKenna/Montshire/VT10a intersection
2. VT10a corridor and lane closure concept
3. River Road intersection.

Audit team: We had an unusually good audit team for this project. The field of transportation is comprised of numerous different specialties and fortunately this audit had a broad range of traffic operations, signage, maintenance, and road safety professionals. The VTrans staff were primarily out of the Montpelier offices, although one was from the White River Junction District office. The

participants: Trevor Starr, Mario Dupigny-Giroux, Maureen Carr, Susan Clark, Colin Philbrook, and Marcos Miller. We also had Sarah Nunan, Norwich Selectboard, Lucy Gibson, Jamie Hess, and John Lawe from the Norwich Transportation Committee, Doug Robinson and Steve Soares, Norwich staff. These folks not only brought a great deal of local knowledge to the table, most of them have good transportation backgrounds! Chuck Wise was the coordinator from the Two Rivers-Ottauquechee Regional Commission.

Traffic data summary: This road has some of the most significant traffic volumes in the region – 14,000 vehicles per day. In 2008, the 85th percentile speed (the maximum speed that most vehicles are recorded traveling) was 37mph. The average speed on this road was 32mph. These speeds were collected by automatic traffic counters and independently confirmed with a traffic radar study. The crash history is fairly significant within the greater interstate/McKenna/Montshire Road intersection. The majority of crashes occur along the slip lane and McKenna Road averages 1 crash per year. Local officials indicated that crashes occurring along any spot on this intersection are interconnected. Additional traffic information included Alice Worth and Sharon Racusin's summary of traffic data and crash history.

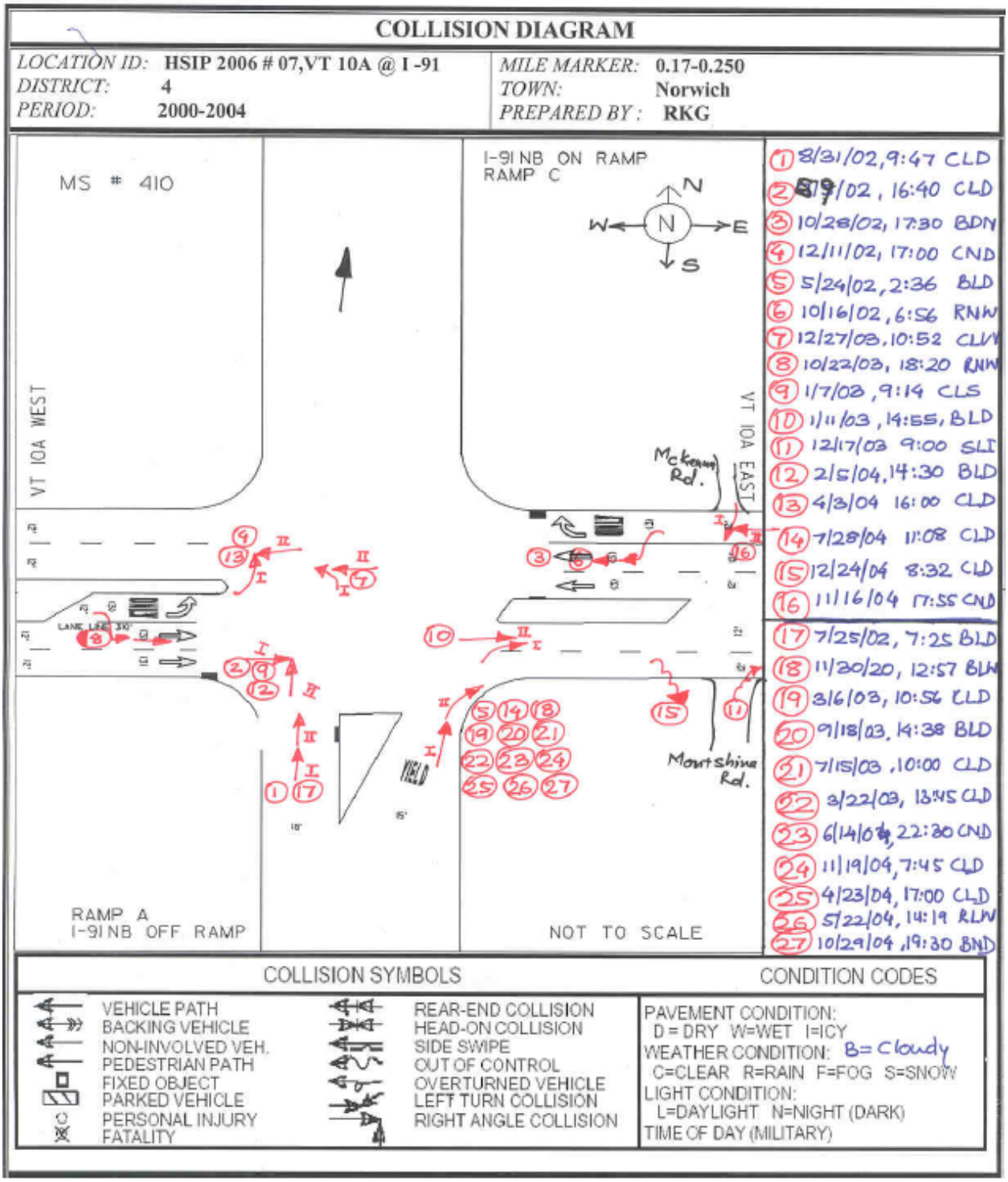
Safety deficiencies: The audit team and local officials discussed safety concerns and were able to distill the major safety deficiencies down to the following list.

1. Slip lane is dangerous and needs to be removed
2. Bicycle and pedestrian safety should be considered along that entire stretch of roadway
3. The entrance and egress for all the local roads are challenging/dangerous
4. Speed is an ever-present condition that deteriorates traffic and bike/ped safety
5. Traffic signals do not appear to be optimized for efficient traffic flows.

Recommendations: These are the safety improvement recommendations to be implemented.

1. Remove slip lane – As this is the source of most of the crashes, the slip lane needs to be removed. This work will be done as part of the VT10a/US5 paving project.
2. Temporary lane closure – Many people have many opinions on what will happen if VT Route 10a westbound was restricted to one travel lane. Absent studying the concept to death, the consensus of the audit group was to do an experimental trial period and let everyone evaluate the impacts. A single traffic lane would allow for the installation of a full-sized bicycle lane; however the lane reduction may result in an unacceptable level of traffic congestion. The lane closure would be accomplished using traffic barrels, barricades, and cones. This work would be done by the Town of Norwich with technical support provided by VTrans and TRORC.
3. Signage – The current assortment of signs is acceptable, but could be enhanced. VTrans will look to change the signs to better enforce speed limits (*strictly enforced*) and improve intersection safety. This work would be done by VTrans.
4. Permanent speed boards – The current speed enforcement and the use of the traffic speed board has resulted in a 5mph decrease in speeds. This is a substantial improvement that can be more permanently achieved. The audit team felt that many people are not aware that traffic speeds are an issue and these signs will provide important feedback for regional traffic. The Town of Norwich would install these signs with feedback from VTrans.

5. Signal coordination – There is a concern that the current traffic signals are not optimized for traffic flow. There is a regular schedule of signal maintenance and signal synchronization, but VTrans should examine the traffic signals again to ensure they are optimized for traffic flows.



Appendix L: Operations Input

Bridge Scoping Project IM 091-2(89)
Operations Input Questionnaire

The Structures Section has begun the scoping process for IM 091-2(89), Interstate 91, Bridges 48N&S, over VT Route 10A. These are Plate Girder/Concrete deck bridges constructed in 1968. The Structure Inspection, Inventory, and Appraisal Sheet (attached) for bridge 48N rates the deck as 7 (good), the superstructure as 7 (good), and the substructures as 4 (poor). And the Structure Inspection, Inventory, and Appraisal Sheet (attached) for bridge 48S rates the deck as 6 (satisfactory), the superstructure as 6 (satisfactory), and the substructures as 4 (poor). We are interested in hearing your thoughts regarding the items listed below. Leave it blank if you don't wish to comment on a particular item.

1. What are your thoughts on the general condition of these bridges and the general maintenance effort required to keep them in service? The southbound is far worse Then the North bound. They are washed every other year, but other Then that I haven't seen anything done
2. What are your comments on the current geometry and alignment of the bridges (curve, sag, banking, sight distance)? They are good

3. Do you feel that the posted speed limit is appropriate? yes

4. Are the current bridges and approach roadway width adequate for winter maintenance including snow plowing? No The joint on the south end of SB bridge is a nightmare.

5. Are the joints salvageable or would you recommend replacement? Replacement, as long as it doesn't turn out like WRJ's Monster bridge. If so don't touch it.
6. Are the railings constantly in need of repair or replacement? What type of railing works best for your district? (We are recommending more and more box beam guardrail on our bridges because of crash-worthiness and compatibility with accelerated projects). We have no issues with the rail, however if box beam is safer it seams logical to replace.

7. Are you aware of abutting property owners that are likely to need special attention during the planning and construction phases? These could be people with disabilities, elderly, or simply folks who feel they have been unfairly treated in the past. NO

8. Do you find that extra effort is required to keep the slopes around the bridges in a stable condition? No

9. Are you familiar with traffic volumes in the area of this project? Yes they are heavy.

10. Do you think a closure with off-site detour and accelerated construction would be appropriate? Do you have any opinion about a possible detour route, assuming that we use State route for State projects and any route for Town projects? Are there locations on a potential detour that are already congested that we should consider avoiding? yes, we can detour down Route 5, but it will be very congested.

11. Please describe any larger projects that you have completed that may not be reflected on the attached Appraisal sheet, such as deck patches, paving patches, railing replacement with new type, steel coating, etc. None

12. Are there any drainage issues that we should address on this project? Not to my knowledge

13. Are you aware of any complaints that the public has about issues that we can address on this project? The SB joint as discussed earlier in questions, higher snow fence as well. The traffic is so heavy that cars sit below stalled and occationaly get hit with snow.

14. Is there anything else we should be aware of?

Not to my knowledge.

Appendix M: Crash Data

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

WHERE Year of Crash >= 2012 AND Year of Crash <= 2016

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VTVSP1100/13D304930	Norwich	74.00	11/15/2013	22:04	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VT0141000/13NW01527	Norwich	74.00	11/15/2013	22:20	Clear		[No Direction of Collision]	0	0	0	N	SH
	VTVSP1100/14D300991	Norwich	74.00	03/12/2014	16:09	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/14D301171	Norwich	74.00	03/25/2014	07:50	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/14D302809	Norwich	74.00	07/17/2014	16:02	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/15D300133	Norwich	74.00	01/12/2015	16:44	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/15D300708	Norwich	74.00	02/15/2015	18:18	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/13D301114	Norwich	74.20	03/19/2013	05:00	Snow		Single Vehicle Crash	1	0	0	S	SH
	VT0141000/15NW01210	Norwich	74.20	11/24/2015	17:15	Clear	No improper driving	Single Vehicle Crash	0	0	0	N	SH
	VTVSP1100/16D300325	Norwich	74.45	01/31/2016	21:04	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	N	SH State Owned
	VTVSP1100/16D305040	Norwich	74.57	12/18/2016	05:52	Snow	Driving too fast for conditions	Single Vehicle Crash	1	0	0	N	SH State Owned
	VTVSP1100/12D302284	Norwich	74.80	06/07/2012	15:04	Clear	Failed to yield right of way, Inattention, No improper driving	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	0	0	0	S	SH
	VTVSP1100/13D304982	Norwich	74.80	11/20/2013	05:12	Fog, Smog, Smoke	No improper driving	Single Vehicle Crash	0	0	0	S	SH
	VTVSP1100/13D300198	Norwich	74.90	01/16/2013	17:32	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VT0140000/12WNC0070	Norwich	74.91	06/20/2012	07:52	[No Weather]		[No Direction of Collision]	1	0	0	S	SH
	VTVSP1100/12D302251	Norwich	74.93	06/05/2012	15:49	Clear	Failed to yield right of way, No improper driving	Same Direction Sideswipe	0	0	0	S	SH
	VTVSP1100/13D301204	Norwich	75.00	03/27/2013	07:51	Clear	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	1	0	0	S	SH
	VTVSP1100/13D304798-1	Norwich	75.00	11/06/2013	06:28	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/13D304798	Norwich	75.00	11/06/2013	06:28	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/13D305025	Norwich	75.00	11/23/2013	05:45	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	N	SH
	VTVSP1100/13D305508	Norwich	75.00	12/23/2013	02:15	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/15D300238	Norwich	75.00	01/18/2015	16:18	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VTVSP1100/15D304581	Norwich	75.00	11/24/2015	17:21	[No Weather]		[No Direction of Collision]	0	0	0		SH
	VT0141000/14NW00098	Norwich	75.06	01/21/2014	12:45	Clear		Single Vehicle Crash	0	0	0	S	SH
	VTVSP1100/13D300981	Norwich	75.11	03/10/2013	17:23	Clear	Fatigued, asleep	Single Vehicle Crash	2	0	0	S	SH
	VT0141000/12NW00832	Norwich	75.32	06/23/2012	16:19	Rain	Driving too fast for conditions	Single Vehicle Crash	0	0	0	S	SH

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

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

WHERE Year of Crash >= 2012 AND Year of Crash <= 2016

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0140200/12SF05263	Springfield	0.66	12/21/2012	02:27	Snow	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	W	SH
	VT0140200/13SF03575	Springfield	0.66	09/06/2013	19:31	Clear	No improper driving	Single Vehicle Crash	0	0	0	E	SH
	VT0140200/15SF01919	Springfield	0.66	04/26/2015	14:15	Cloudy	Failure to keep in proper lane	Same Direction Sideswipe	0	0	0	W	SH
	VT0140200/14SF01653	Springfield	0.83	05/01/2014	15:31	Clear	Inattention, Failed to yield right of way, No improper driving	Left Turn and Thru, Broadside v<--	1	1	0	N, W	SH
Route: VT-10A													
	VT0141000/12NW00418	Norwich	0.00	04/05/2012	17:15	Clear	No improper driving, Inattention	[No Direction of Collision]	0	0	0	W	SH
	VT0141000/12NW00798	Norwich	0.00	06/16/2012	17:00	Clear		No Turns, Thru moves only, Broadside ^<	2	0	0	N, E	SH
	VT0141000/14NW00244	Norwich	0.00	02/24/2014	21:40	Cloudy	Disregarded traffic signs, signals, markings, Exceeded authorized speed limit	No Turns, Thru moves only, Broadside ^<	0	0	0	W, N	SH
	VT0141000/14NW00710	Norwich	0.00	06/30/2014	16:45	Clear	No improper driving	Single Vehicle Crash	0	0	0	E	SH
	VT0141000/14NW00827	Norwich	0.00	07/25/2014	16:50	Clear	Followed too closely	Rear End	0	0	0	W	SH
	VT0141000/14NW01000	Norwich	0.00	09/18/2014	11:00	[No Weather]	Other improper action	Rear End	0	0	0	W	SH
	VT0141000/15NW00250	Norwich	0.00	03/24/2015	18:05	Clear		Rear End	1	0	0	W	SH
	VT0141000/15NW0010	Norwich	0.20	01/03/2015	19:30	Snow		Other - Explain in Narrative	0	0	0	E, N	SH
	VT0141000/15NW00109	Norwich	0.20	02/03/2015	10:08	Clear	Driving too fast for conditions, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	N, W	SH
	VT0141000/15NW00831	Norwich	0.20	08/18/2015	13:47	[No Weather]		[No Direction of Collision]	0	0	0	N	SH
	VT0141000/12NW00771	Norwich	0.21	06/11/2012	19:24	Clear		Single Vehicle Crash	0	0	0	N	SH
	VT0141000/13NW00733	Norwich	0.21	06/09/2013	14:00	Clear	Failed to yield right of way, No improper driving	[No Direction of Collision]	0	0	0	W	SH
	VT0141000/14NW00001	Norwich	0.21	01/02/2014	08:35	Snow	Operating defective equipment, No improper driving	Opp Direction Sideswipe	0	0	0	N, W	SH
	VT0141000/14NW00005	Norwich	0.21	01/02/2014	15:30	Snow		Rear End	0	0	0	N	SH
	VT0141000/14NW00016	Norwich	0.21	01/04/2014	14:00	Clear		Same Direction Sideswipe	0	0	0	N, E	SH
	VT0141000/14NW00557	Norwich	0.21	02/13/2014	12:00	Snow		No Turns, Thru moves only, Broadside ^<	0	0	0	N, W	SH
	VT0141000/14NW00217	Norwich	0.21	02/19/2014	13:30	Snow		No Turns, Thru moves only, Broadside ^<	0	0	0	N, E	SH
	VT0141000/14NW00238	Norwich	0.21	02/24/2014	07:35	Clear		Rear End	0	0	0	E	SH
	VT0141000/14NW00356	Norwich	0.21	03/30/2014	09:30	Cloudy	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	E, N	SH
	VT0141000/15NW00349	Norwich	0.21	04/21/2015	18:00	Clear	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	E, N	SH
	VT0141000/15NW01269	Norwich	0.21	12/10/2015	17:28	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	E, N	SH

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

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

WHERE Year of Crash >= 2012 AND Year of Crash <= 2016

*	Reporting Agency/ Incident No.	City/Town	Mile Marker	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0141000/16NW00040	Norwich	0.21	01/12/2016	15:00	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions, No improper driving	Same Direction Sideswipe	0	0	0	E	SH State Owned
	VT0141000/16NW00277	Norwich	0.21	03/26/2016	18:15	Clear	Inattention, No improper driving	Rear End	1	0	0	W	SH State Owned
	VT0141000/13NW00468	Norwich	0.25	04/22/2013	13:40	Clear	Made an improper turn, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	E	SH
	VT0141000/14NW01132	Norwich	0.25	10/20/2014	16:00	Clear		No Turns, Thru moves only, Broadside ^<	2	0	0	S, W	SH
	VT0141000/15NW00179	Norwich	0.25	02/25/2015	12:30	Clear	Failed to yield right of way	No Turns, Thru moves only, Broadside ^<	0	0	0	N, E	SH
	VT0141000/16NW00897	Norwich	0.25	08/25/2016	17:20	Cloudy	Inattention, No improper driving	Rear End	0	0	0	W	SH State Owned
	VT0141000/15NW01283	Norwich	0.26	12/15/2015	15:30	Cloudy	Inattention, No improper driving	Same Direction Sideswipe	0	0	0	E	SH
	VT0141000/12NW01251	Norwich	0.43	09/19/2012	13:49	Rain	Followed too closely, No improper driving	Rear End	1	0	0	E	SH
	VT0141000/14NW00130	Norwich	0.44	01/27/2014	08:20	Clear		Rear End	0	0	0	E	SH
	VT0141000/12NW01709	Norwich	0.45	12/23/2012	13:10	Clear	Followed too closely	Rear End	0	0	0	E	SH
	VT0141000/16NW01138	Norwich	0.46	10/19/2016	16:30	Clear	Driving too fast for conditions, No improper driving	Rear End	1	0	0	W	SH State Owned
	VT0141000/15NW01238	Norwich	0.47	12/01/2015	12:47	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions, Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0141000/15NW01310	Norwich	0.47	12/24/2015	08:25	Clear	Followed too closely, No improper driving	Same Direction Sideswipe	0	0	0	E	SH
	VT0141000/12NW00917	Norwich	0.48	07/11/2012	15:30	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0141000/12NW00972	Norwich	0.48	07/21/2012	22:03	Clear		No Turns, Thru moves only, Broadside ^<	0	0	0	W, N	SH
	VT0141000/13NW00409	Norwich	0.48	04/11/2013	13:12	Clear	Followed too closely	Rear End	0	0	0	E	SH
	VT0141000/13NW01709	Norwich	0.48	12/29/2013	21:10	Snow		Rear End	0	0	0	W	SH
	VT0141000/14NW00598	Norwich	0.48	06/04/2014	15:55	Clear	Followed too closely, No improper driving	Rear End	1	0	0	W	SH
	VT0141000/14NW00599	Norwich	0.48	06/04/2014	16:40	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	SH
	VT0141000/14NW00636	Norwich	0.48	06/15/2014	16:47	[No Weather]	Disregarded traffic signs, signals, markings, No improper driving	No Turns, Thru moves only, Broadside ^<	1	0	0	E, S, W	SH
	VT0141000/15NW00079	Norwich	0.48	01/26/2015	10:45	Clear		Rear End	0	0	0	E	SH
	VT0141000/15NW00827	Norwich	0.48	08/17/2015	17:50	Clear		No Turns, Thru moves only, Broadside ^<	0	0	0	E, N	SH
	VT0141000/16NW00804	Norwich	0.48	07/29/2016	[No Time]	[No Weather]		[No Direction of Collision]	0	0	0	E, P	SH State Owned
	VT0141000/16NW00901	Norwich	0.48	08/26/2016	14:15	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	W	SH State

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

Vermont Agency of Transportation

Statewide Sections - Route Log Order /2 - Statewide

Years: 2010 - 2014

H.C.L No.	/3. Route	System	Town	Mileage	ADT	Years	Crashes	Fatalities	Injuries	PDO Crashes	Critical Rate	Actual Rate	Ratio Actual/Critical	Severity Index ($/Accident/1.)
	526 I-91	Interstate, Rural (r)	Springfield	45.900 - 46.200	10200	5	8	1	1	7	1.314	1.432	1.09	$193,900
	190 I-91	Interstate, Rural (r)	Springfield, Weathersfield	46.800 - 47.100	10200	5	12	0	2	10	1.314	2.148	1.635	$20,567
	418 I-91	Interstate, Rural (r)	Weathersfield	47.800 - 48.100	10200	5	9	0	0	9	1.314	1.611	1.226	$8,900
	490 I-91	Interstate, Rural (r)	Weathersfield	52.000 - 52.300	13000	5	10	0	2	8	1.238	1.404	1.134	$22,900
	617 I-91	Interstate, Rural (r)	Weathersfield	53.000 - 53.300	13000	5	9	0	0	9	1.238	1.264	1.021	$8,900
	489 I-91	Interstate, Rural (r)	Windsor	53.800 - 54.100	13000	5	10	0	2	9	1.238	1.404	1.134	$23,790
	615 I-91	Interstate, Rural (r)	Windsor	54.900 - 55.200	13000	5	9	0	4	6	1.238	1.264	1.021	$41,000
	162 I-91	Interstate, Rural (r)	Windsor	58.200 - 58.500	13000	5	15	0	4	12	1.238	2.107	1.701	$28,160
	393 I-91	Interstate, Rural (r)	Windsor	58.800 - 59.100	13000	5	11	0	2	9	1.238	1.545	1.247	$21,627
	536 I-91	Interstate, Rural (r)	Hartford	69.800 - 70.100	27306	5	17	0	4	14	1.048	1.137	1.085	$25,894
	219 I-91	Interstate, Rural (r)	Norwich	74.800 - 75.100	12294	5	13	0	2	11	1.255	1.931	1.538	$19,669
	102 I-91	Interstate, Rural (r)	Bradford	97.700 - 98.000	5500	5	9	1	2	7	1.537	2.988	1.944	$181,122
	353 I-91	Interstate, Rural (r)	Newbury	103.000 - 103.300	5500	5	6	0	2	4	1.537	1.992	1.296	$32,233
	354 I-91	Interstate, Rural (r)	Newbury	105.800 - 106.100	5500	5	6	0	2	4	1.537	1.992	1.296	$32,233
	236 I-91	Interstate, Rural (r)	Newbury	106.300 - 106.600	5500	5	7	0	0	7	1.537	2.324	1.512	$8,900
	237 I-91	Interstate, Rural (r)	Newbury	107.000 - 107.300	5500	5	7	0	0	7	1.537	2.324	1.512	$8,900
	540 I-91	Interstate, Rural (r)	Newbury	108.800 - 109.100	5500	5	5	0	2	4	1.537	1.66	1.08	$38,680
	358 I-91	Interstate, Rural (r)	Newbury	109.600 - 109.900	5500	5	6	0	0	6	1.537	1.992	1.296	$8,900
	303 I-91	Interstate, Rural (r)	Ryegate	112.800 - 113.100	5100	5	6	0	1	5	1.567	2.148	1.371	$20,567
	304 I-91	Interstate, Rural (r)	Ryegate	113.800 - 114.100	5100	5	6	0	0	6	1.567	2.148	1.371	$8,900
	480 I-91	Interstate, Rural (r)	Ryegate	114.600 - 114.900	5100	5	5	0	2	3	1.567	1.79	1.142	$36,900
	482 I-91	Interstate, Rural (r)	Ryegate	115.800 - 116.100	5100	5	5	0	1	4	1.567	1.79	1.142	$22,900

Formal Statewide Intersections - Route Log Order /2 - Statewide

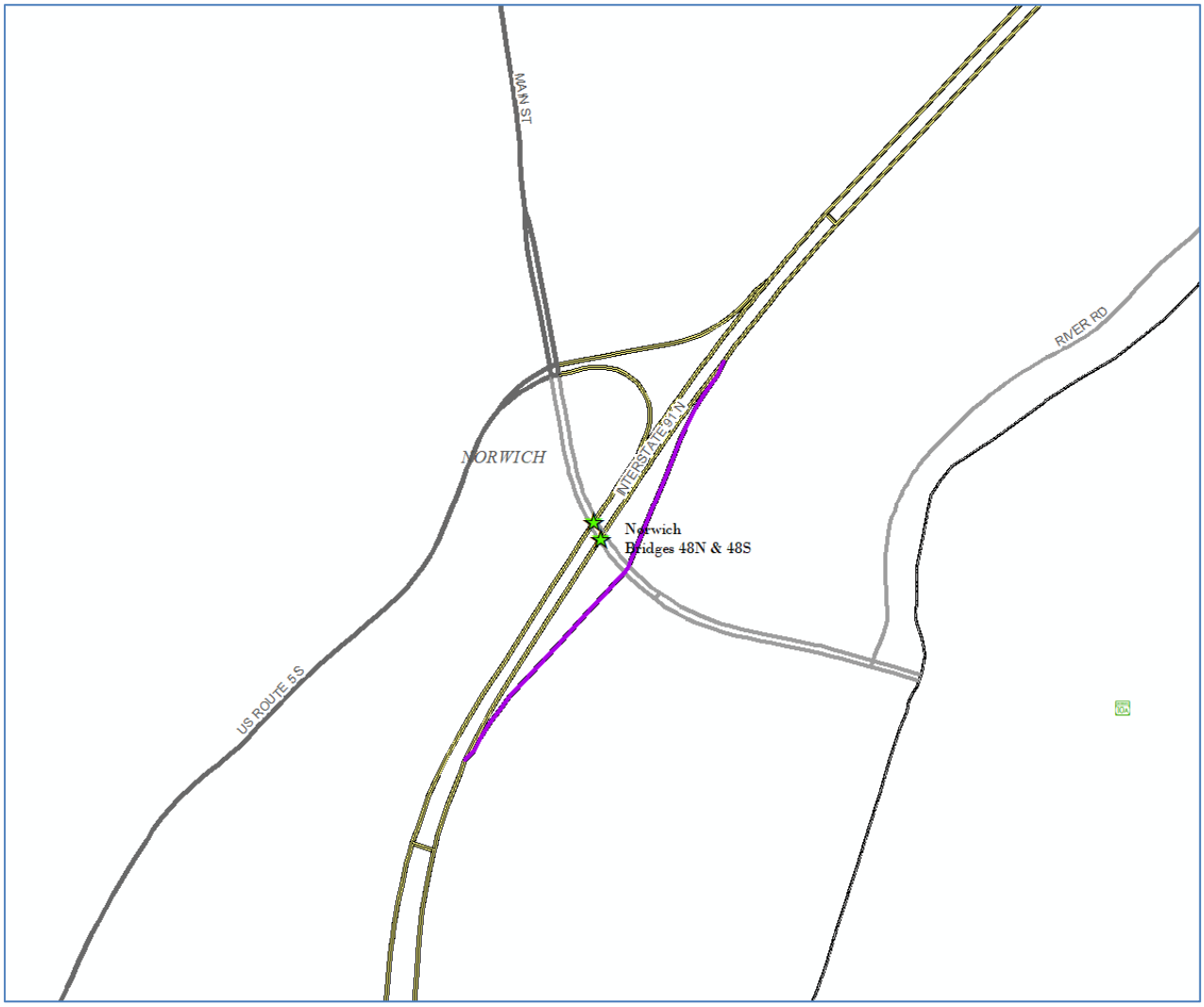
Years: 2012 - 2016

H.C.L No.	/3.	Route	System	Town	Mileage	AADT	Years	Crashes	Fatalities	Injuries	PDO Crashes	Critical Rate	Actual Rate	Ratio Actual/Critical	SMS Severity Index
	34	US-5, VT-10A, I-91	Major Collector (r)	Norwich	0.990 - 1.060	10,950	5	24	0	8	19	0.790	1.201	1.521	$38,446
	101	US-7, VT-7A, TOWN HWY. NO. 28 (KOCHER DR.), BENNINGTON	Principal Arterial (u)/Minor Arterial (u)	Bennington	4.100 - 4.200	22,540	5	56	0	14	45	1.293	1.361	1.053	$31,205
	108	US-7, VT-103, TOWN ROAD 0019	Principal Arterial (r)	Clarendon	3.250 - 3.380	11,535	5	15	0	6	12	0.705	0.713	1.011	$44,440
#	84	US-7, WEST RUTLAND-RUTLAND (BR US-4), <T0000>	Principal Arterial (u)	Rutland City	1.270 - 1.290	27,850	5	48	0	18	33	0.836	0.944	1.130	$40,956
#	76	US-7, <0189>, SWIFT ST., SOUTH BURLINGTON	Principal Arterial (u)/Urban Collector (u)	South Burlington/Burlington	1.720 - 0.010	38,650	5	60	0	1	59	0.731	0.851	1.163	$12,587
#	14	US-7, MAIN ST., BURLINGTON, US-2	Principal Arterial (u)	Burlington	2.110 - 2.130	21,400	5	65	0	9	58	0.871	1.664	1.910	$22,337
#	47	US-7, PEARL ST., BURLINGTON	Principal Arterial (u)/Minor Arterial (u)	Burlington	2.420 - 2.440	16,780	5	57	0	13	47	1.350	1.861	1.379	$29,502
#	64	US-7, BURLINGTON (ALTERNATE US-7)	Principal Arterial (u)	Burlington	3.050 - 3.070	12,235	5	27	0	5	23	0.962	1.209	1.256	$26,015
#	7	US-7, W. ALLEN ST., WINOOSKI CITY, VT-15, E. CANAL ST., WINOOS, W. CENTER ST., WINOO, <T0000>	Principal Arterial (u)/Minor Arterial (u)	Winooski City	0.040 - 0.230	29,630	5	163	0	14	150	1.246	3.014	2.419	$18,000
#	39	US-7, E SPRING ST., WINOOSKI CITY, W SPRING ST., WINOOSKI CITY	Principal Arterial (u)/Urban Collector (u)	Winooski City	0.430 - 0.450	17,340	5	38	0	13	29	0.832	1.201	1.444	$38,900
	111	US-7, VT-2A	Principal Arterial (u)/Minor Arterial (u)	Colchester	3.580 - 3.650	14,700	5	37	0	8	32	1.378	1.379	1.001	$28,908
	30	US-7, VT-207	Major Collector (r)	St. Albans Town	2.290 - 2.310	8,950	5	21	0	12	13	0.824	1.286	1.559	$57,567
	102	VT-7A	Minor Arterial (u)	Bennington	0.100 - 0.120	13,350	5	20	0	2	18	0.781	0.821	1.051	$19,020
	94	VT-7A, RICE LN., BENNINGTON, <T0000>	Minor Arterial (u)/Urban Collector (u)	Bennington	1.700 - 1.720	5,900	5	12	0	13	4	1.028	1.114	1.084	$99,642
#	105	VT-9, DEPOT ST., BENNINGTON, WASHINGTON ST., BENNINGTON	Principal Arterial (u)/Urban Collector (u)	Bennington	4.260 - 4.280	9,650	5	17	0	2	15	0.931	0.965	1.036	$20,382
#	70	VT-9, UNION ST., BENNINGTON, PLEASANT ST., BENNINGTON	Principal Arterial (u)/Urban Collector (u)	Bennington	4.810 - 4.830	9,540	5	20	0	8	14	0.934	1.149	1.230	$43,310
	21	VT-9, VT-8	Principal Arterial (r)/Major Collector (r)	Searsburg	1.720 - 1.920	3,439	5	11	0	0	11	1.029	1.753	1.703	$11,300
	79	VT-9, VT-100, TOWN ROAD 0033	Principal Arterial (r)/Minor Arterial (r)	Wilmington	2.990 - 3.050	7,926	5	16	0	1	15	0.962	1.106	1.150	$16,125
	89	VT-10A, I-91	Major Collector (r)	Norwich	0.170 - 0.250	12,950	5	20	0	3	18	0.763	0.846	1.109	$23,445
	69	VT-11, VT-30	Minor Arterial (r)	Winhall	3.030 - 3.230	6,926	5	12	0	0	12	0.766	0.949	1.240	$11,300
	74	VT-11, VT-100, TOWN ROAD 0059	Minor Arterial (r)	Londonderry	1.880 - 1.960	5,810	5	10	0	2	8	0.798	0.943	1.181	$26,740
#	45	VT-11, VT-106	Minor Arterial (r)/Major Collector (r)	Springfield	3.950 - 4.030	12,350	5	32	0	2	30	1.021	1.420	1.391	$16,125

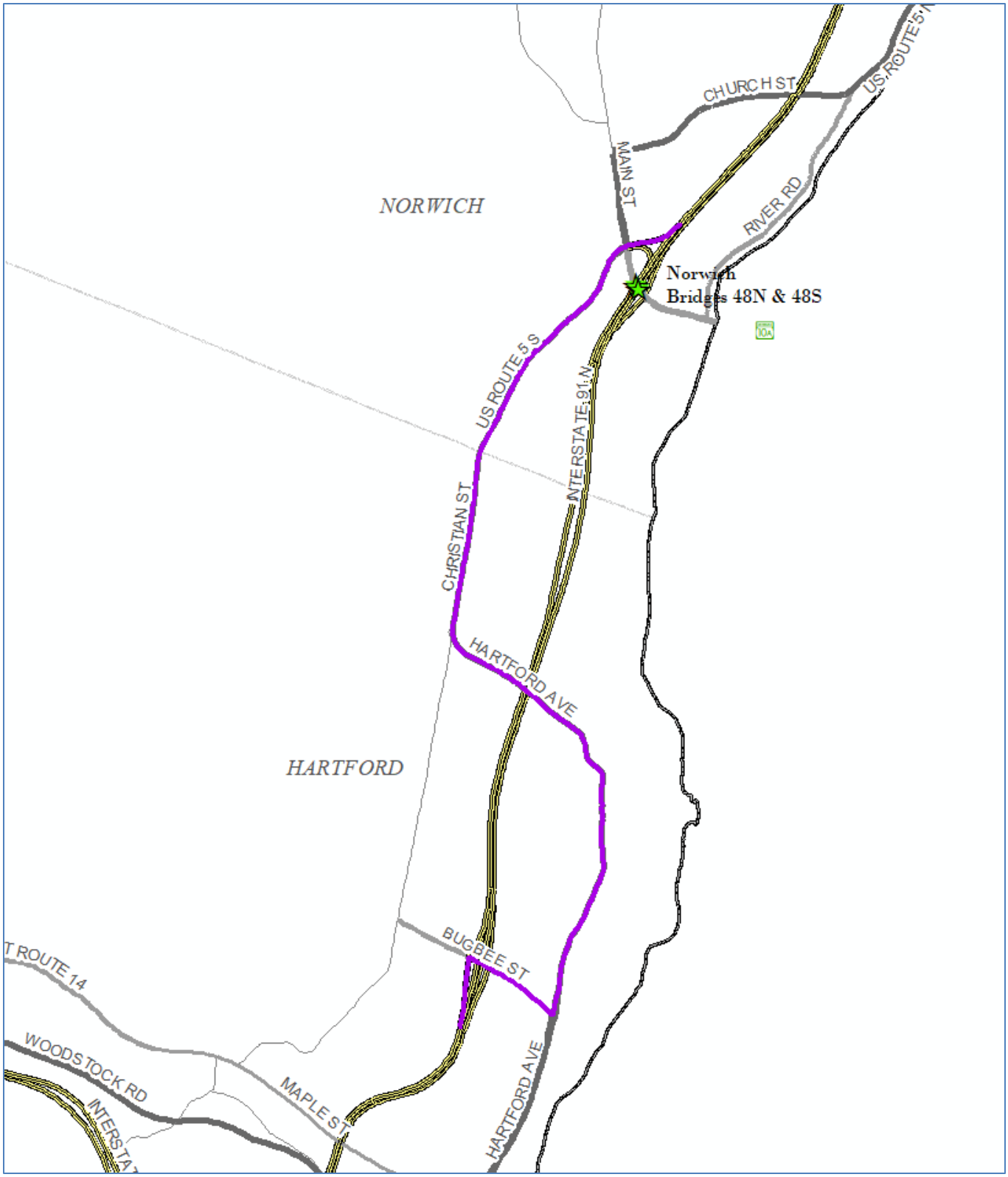
Appendix N: Detour Routes

The offsite detour option would close the section of I-91 between the on and off ramps at exit 13. The detour would utilize the on and off ramps at exit 13 for northbound traffic, and US Route 7 from exit 13 to 12 for traffic traveling south along I-91. The through distance on the US Route 5 detour is almost identical at 3.8 miles versus the 3.4 miles on I-91, with travel times estimated at 7 minutes for the detour route and 3 minutes for traveling on I-91. The detour for northbound traffic would not add any distance to the through route.

Due to the high traffic volumes on VT Route 10A, it would be advantageous to detour traffic around the bridge. Traffic traveling on VT Route 10A would detour onto River Street to US Route 5 to circumvent bridges 48 N&S. Traffic on VT Route 10A heading south on Interstate-91 would take US Route 5 down to exit 12.



I-91 Northbound Detour



I-91 Southbound Detour

VT Route 10A Detour

Appendix O: Plans

DRESDEN SCHOOL DISTRICT

APPROX. EXISTING R.O.W.

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

3918+00
3919+00
3920+00
3921+00
3922+00
3923+00

VT STATE PLANE GRID

EXISTING CONDITIONS

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 1	SHEET 1 OF 86

DRESDEN SCHOOL DISTRICT

INTERSTATE 91
SOUTHBOUND

3924+00
3925+00
3926+00
3927+00
3928+00
3929+00

PC
STA 3926+49.14

INTERSTATE 91
NORTHBOUND

APPROX. EXISTING R.O.W.

VT STATE PLANE GRID

N

EXISTING CONDITIONS

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

DARTMOUTH COLLEGE:
C/O REAL ESTATE OFFICE

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: l2a568/sl2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 2	SHEET 2 OF 86

DRESDEN SCHOOL DISTRICT

KING ARTHUR FLOUR CO., INC.

APPROX. EXISTING R.O.W.

INTERSTATE 91
SOUTHBOUND

3930+00

3931+00

3932+00

3933+00

3934+00

3935+00

INTERSTATE 91
NORTHBOUND

APPROX. EXISTING R.O.W.

VT STATE PLANE GRID N

DARTMOUTH COLLEGE;
C/O REAL ESTATE OFFICE

EXISTING CONDITIONS

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

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: I2a568/sI2a568border.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
EXISTING CONDITIONS LAYOUT 3

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 3 OF 86

KING ARTHUR FLOUR CO., INC.

N

VT STATE PLANE GRID

INTERSTATE 91
SOUTHBOUND

3936+00

3937+00

3938+00

3939+00

3940+00

3941+00

PT
STA 3940+89.76

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP D

APPROX. EXISTING R.O.W.

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

ECT

APPROX. EXISTING R.O.W.

CHILD CARE CENTER, INC.

EXISTING CONDITIONS

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: 12a568/sl2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 4	SHEET 4 OF 86

KING ARTHUR FLOUR CO., INC.

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP D

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

24" x 65' CONCRETE ARCH
FLOW

VT STATE PLANE GRID

ECT

DI

3942+00 3943+00 3944+00 3945+00 3946+00 3947+00

EXISTING CONDITIONS

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME:	I2a568/sI2a568border.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
EXISTING CONDITIONS LAYOUT 5	
PLOT DATE:	03-DEC-2019
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	5 OF 86

INTERSTATE 91
SOUTHBOUND

VT ROUTE 10A
TO US ROUTE 5

INTERSTATE 91
NORTHBOUND

PC
STA 3953+38.97

VT ROUTE 10A
TO NEW HAMPSHIRE

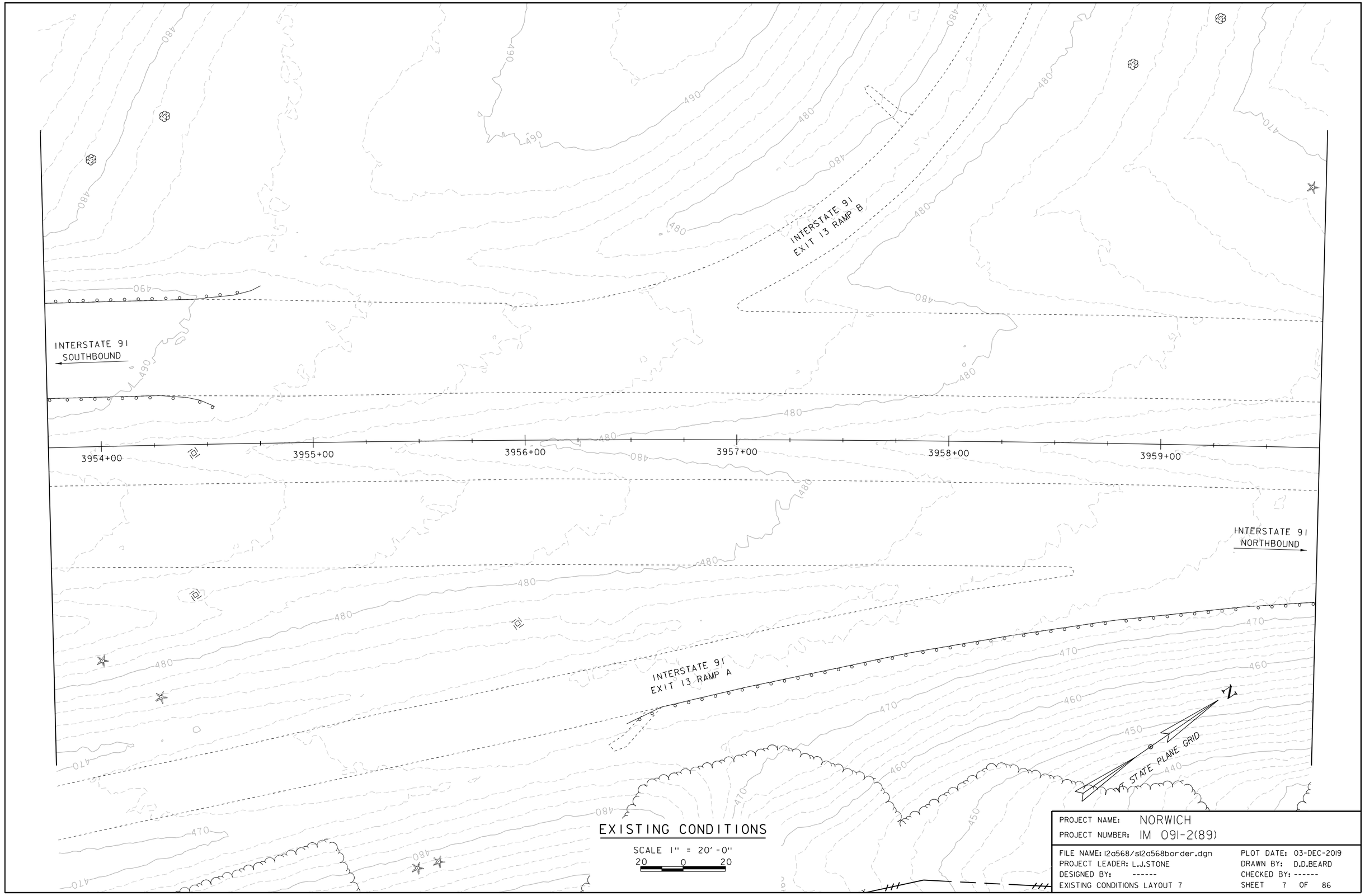
3948+00 3949+00 3950+00 3951+00 3952+00 3953+00

VT STATE PLANE GRID

EXISTING CONDITIONS

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 6	SHEET 6 OF 86



EXISTING CONDITIONS

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: 12a568/sl2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 7	SHEET 7 OF 86

INTERSTATE 91
EXIT 13 RAMP D

72" X 296' ACCGMPP
FLOW

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

3960+00 3961+00 3962+00 3963+00 3964+00 3965+00

D1

VT STATE PLANE GRID

HANEY, ELIZABETH A.

EXISTING CONDITIONS

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 8	SHEET 8 OF 86

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

3966+00
3967+00
3968+00
3969+00
3970+00
3971+00

D1

APPROX. EXISTING R.O.W.

VT STATE PLANE GRID

EXISTING CONDITIONS

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

L & M HOLDINGS LLC

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: l2a568/sl2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 9	SHEET 9 OF 86

TOWN OF NORWICH:
WITH THE UPPER VALLEY LAND TRUST

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

3972+00 3973+00 3974+00 3975+00 3976+00 3977+00

PT STA 3974+08.31

VT STATE PLANE GRID

EXISTING CONDITIONS

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

L & M HOLDINGS LLC

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: I2a568/sI2a568border.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
EXISTING CONDITIONS LAYOUT 10

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 10 OF 86

APPROX. EXISTING R.O.W.

SHERWIN, BEVERLY JANE

INTERSTATE 91
SOUTHBOUND

3978+00 | 3979+00 | 3980+00 | 3981+00 | 3982+00 | 3983+00

D1

INTERSTATE 91
NORTHBOUND

L & M HOLDINGS LLC

VT STATE PLANE GRID

N

EXISTING CONDITIONS

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT II	SHEET II OF 86

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

3984+00 3985+00 3986+00 3987+00 3988+00 3989+00

APPROX. EXISTING R.O.W.

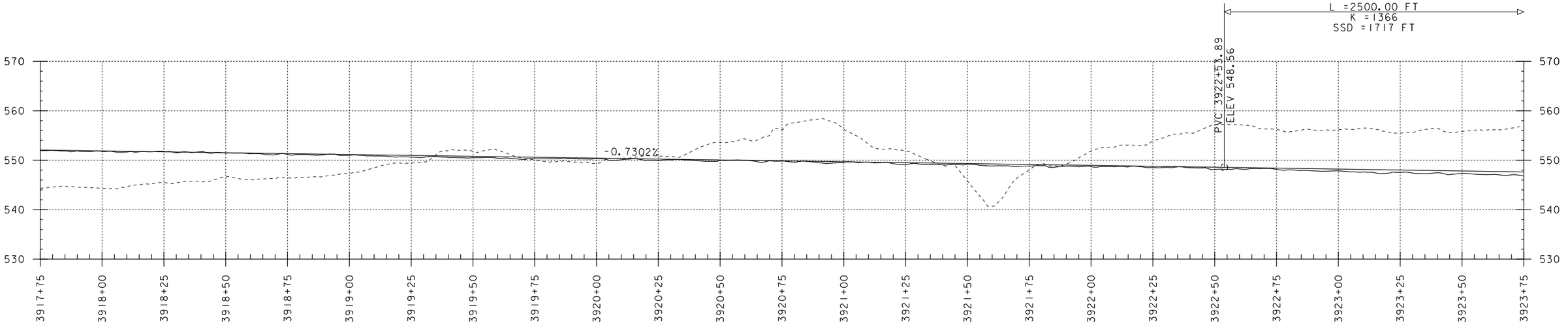
L & M HOLDINGS LLC

VT STATE PLANE GRID

EXISTING CONDITIONS

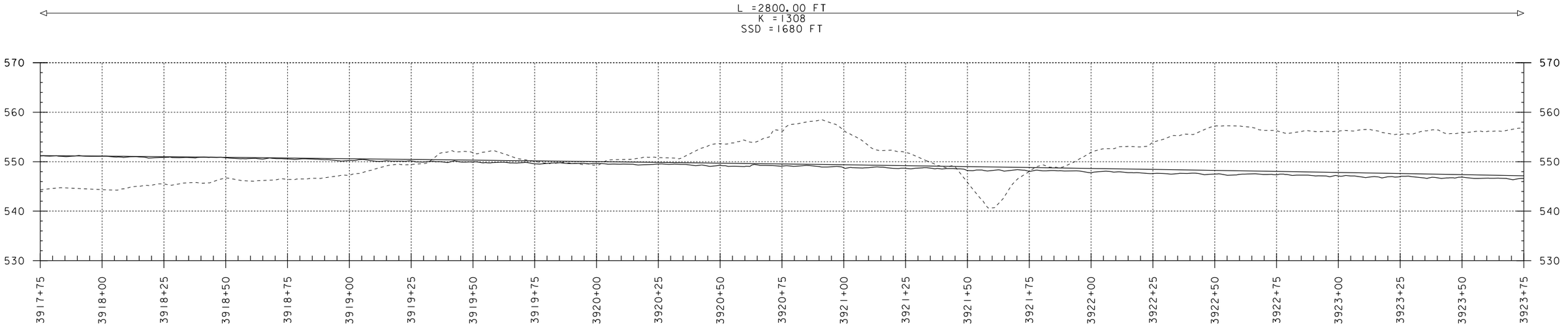
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: 12a568/sl2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT 12	SHEET 12 OF 86



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

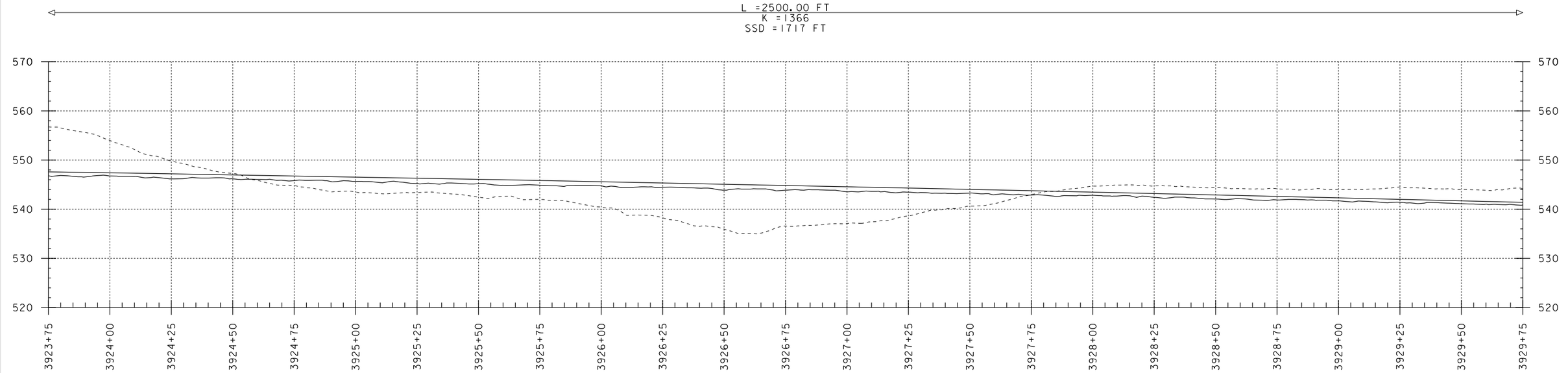
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

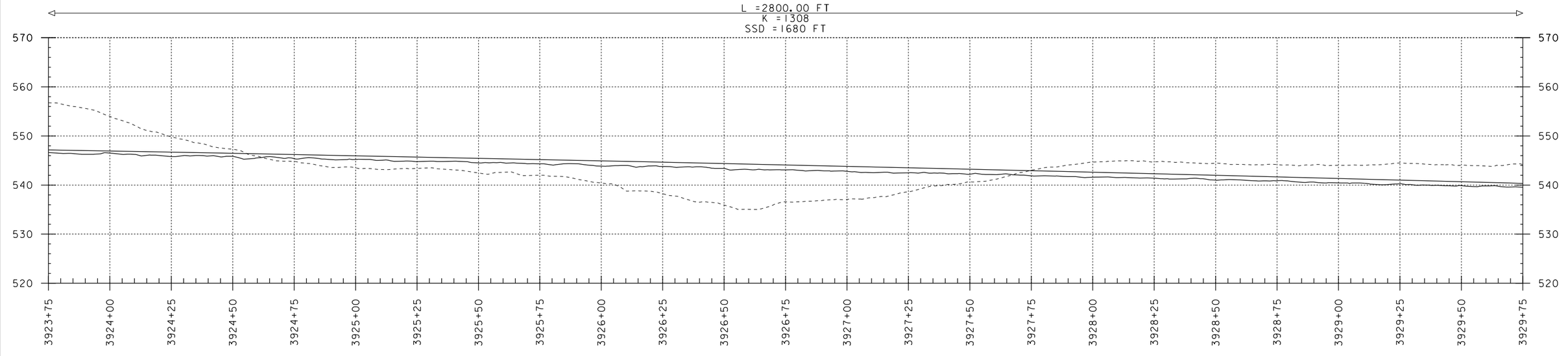
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 1

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 13 OF 86



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

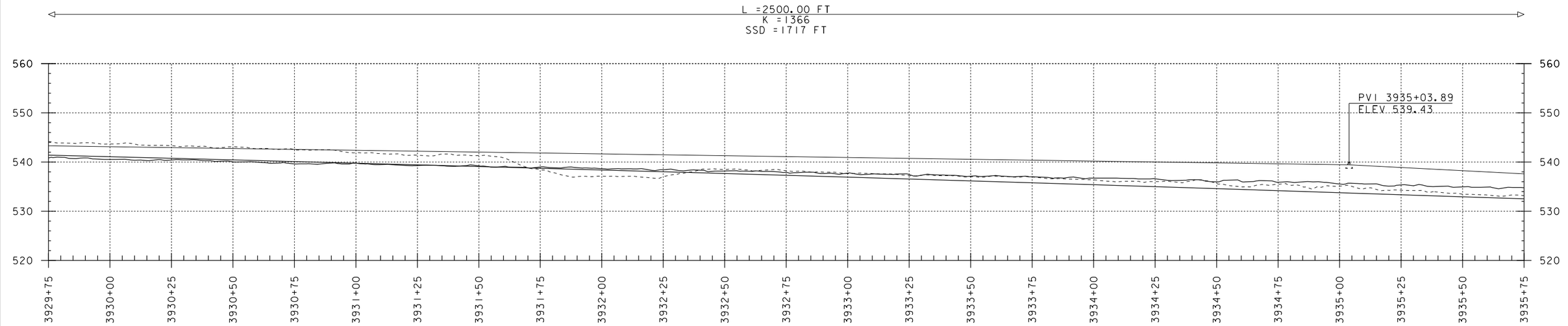
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

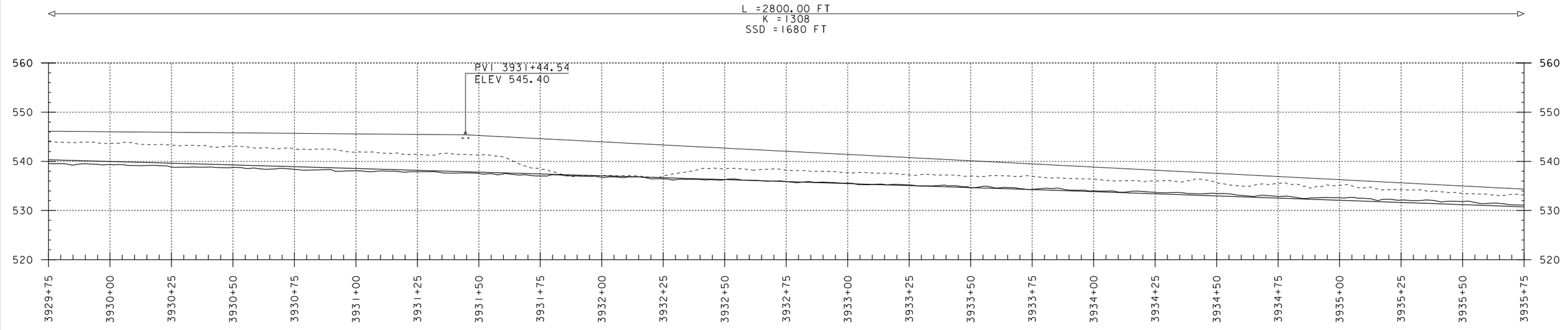
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 2

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

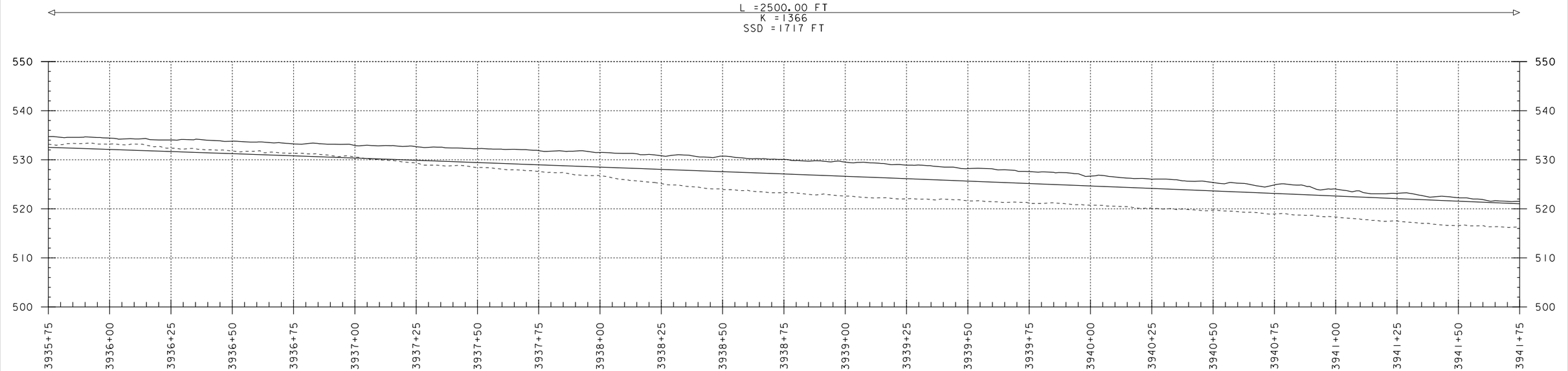
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

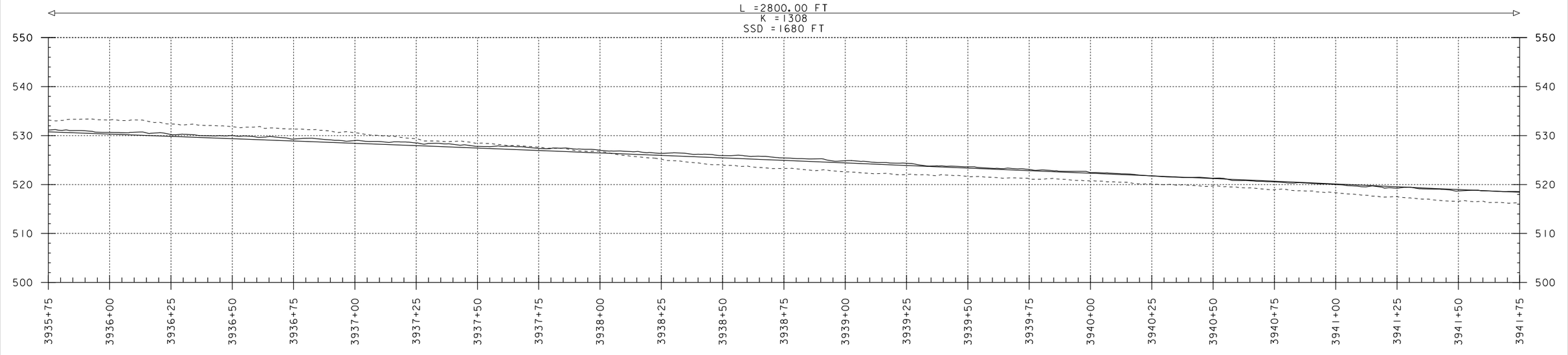
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 3

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

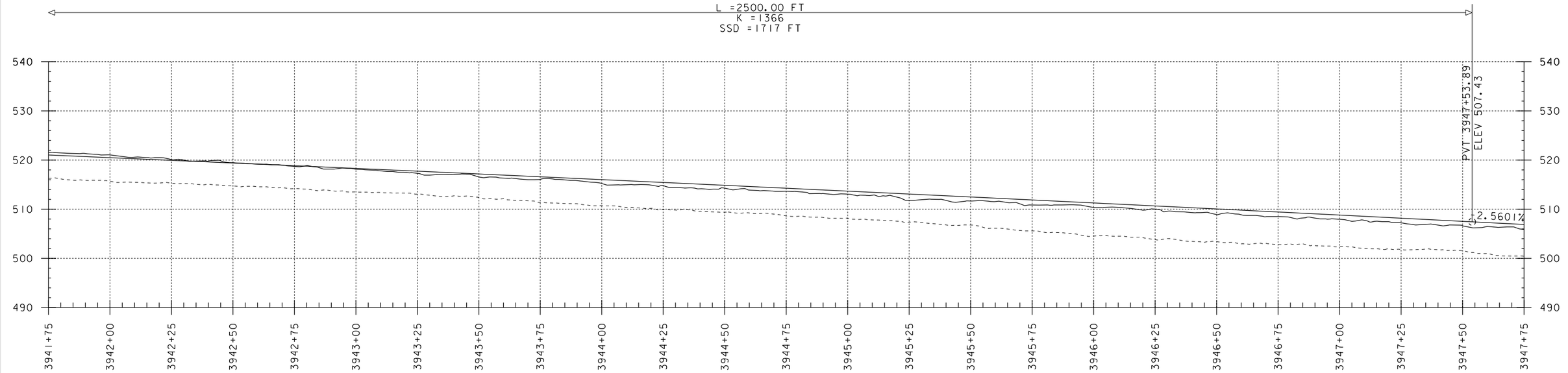
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

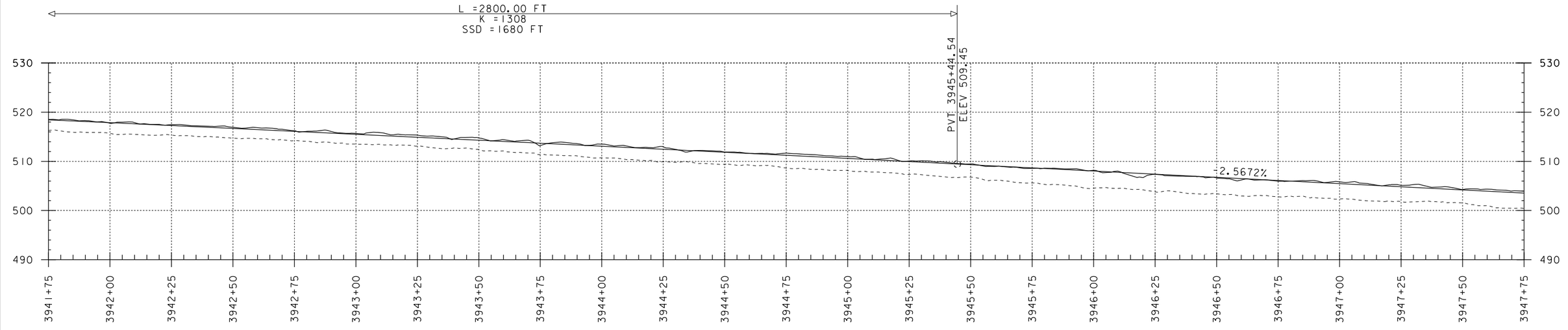
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 4

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

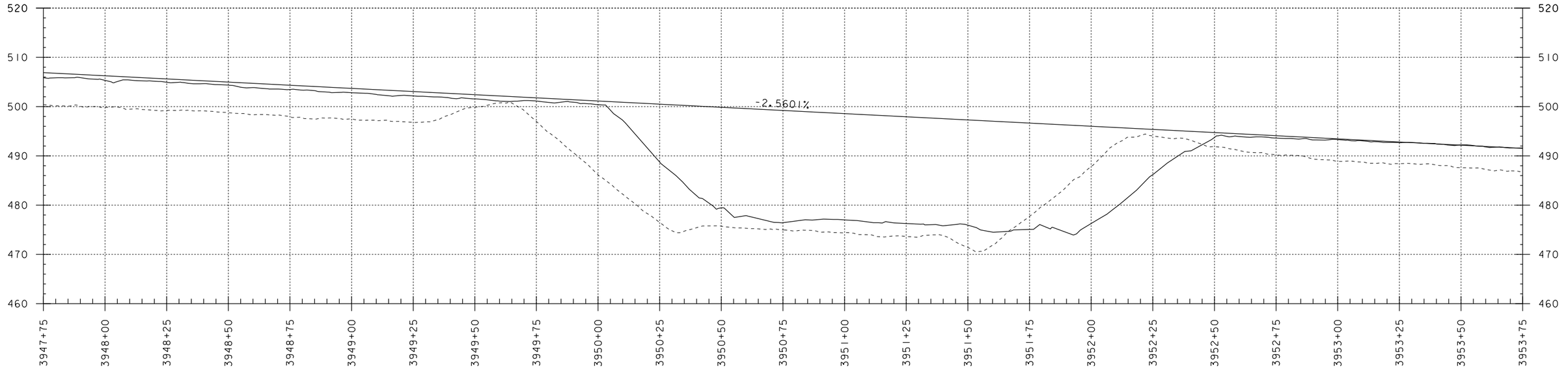
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

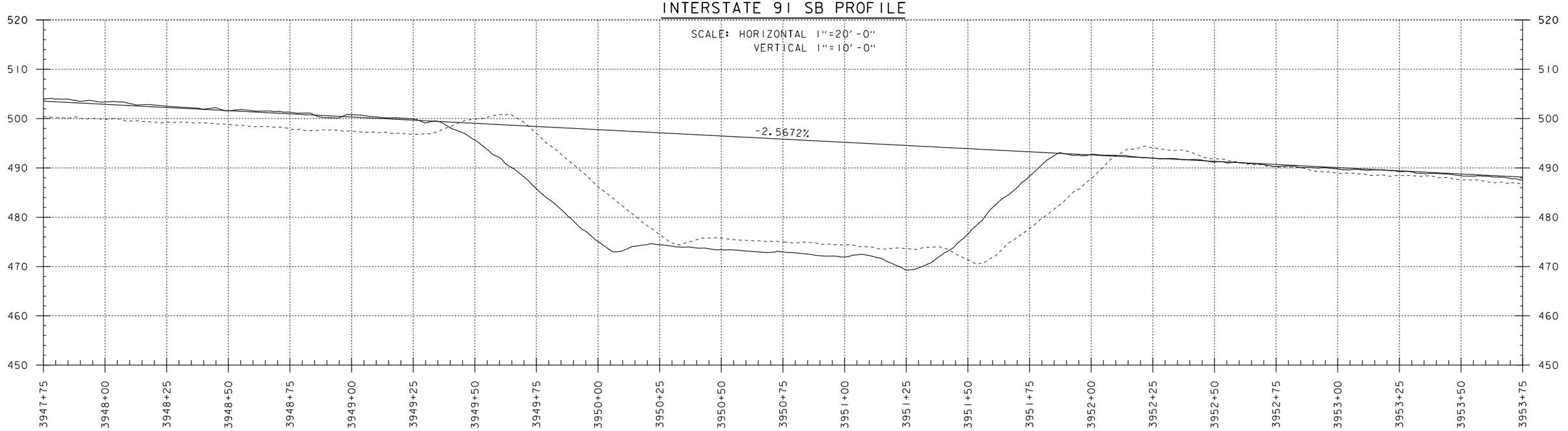
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 5

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 17 OF 86



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

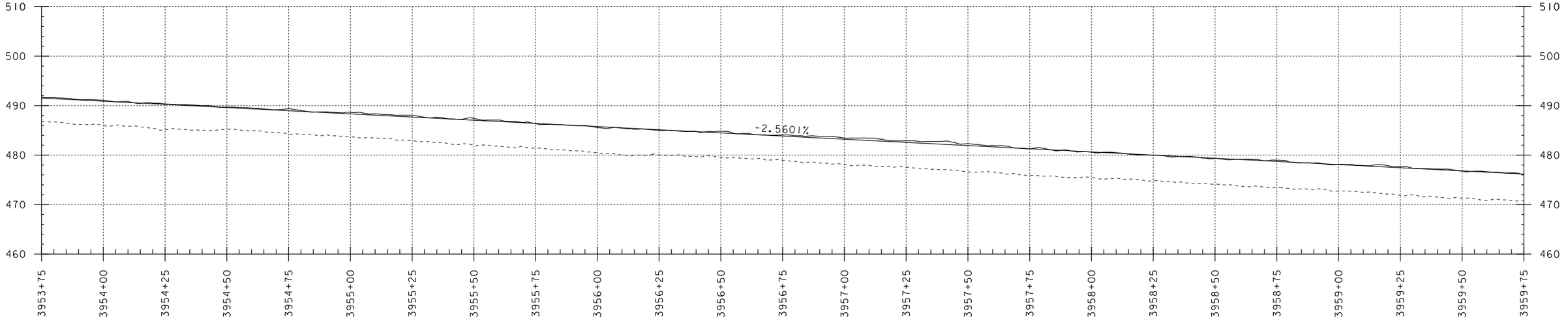
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

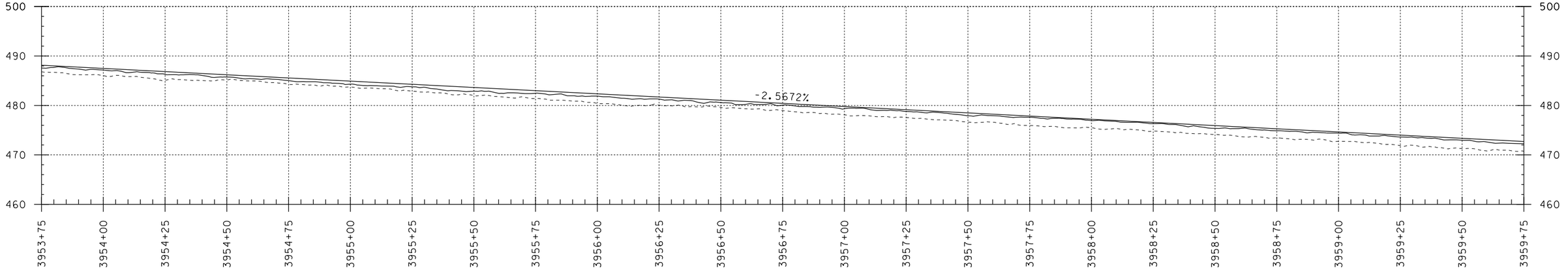
FILE NAME: I2a568/sI2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 6

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

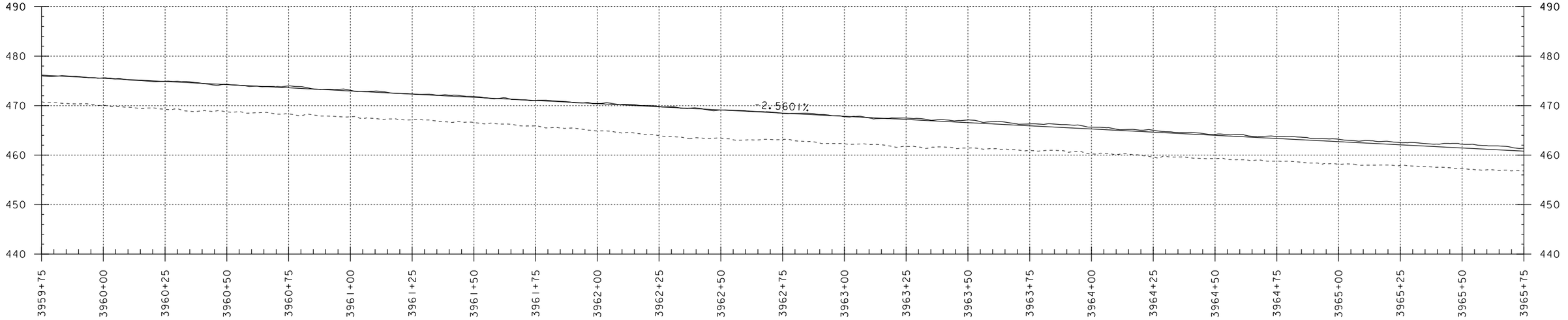
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

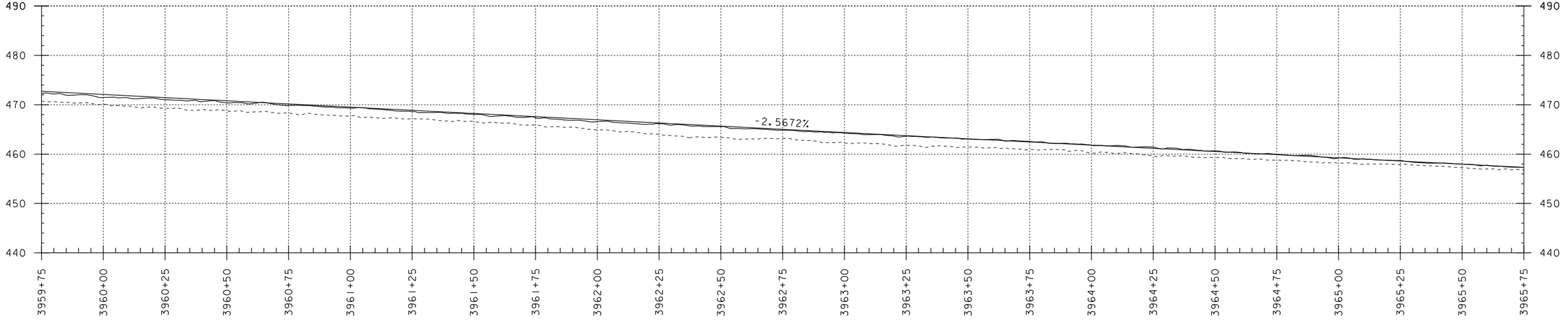
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 7

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 19 OF 86



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

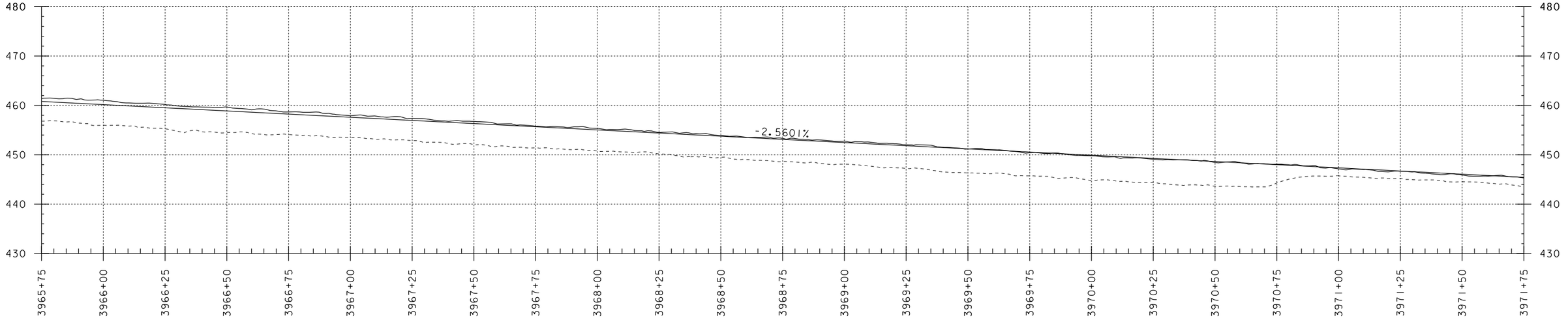
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

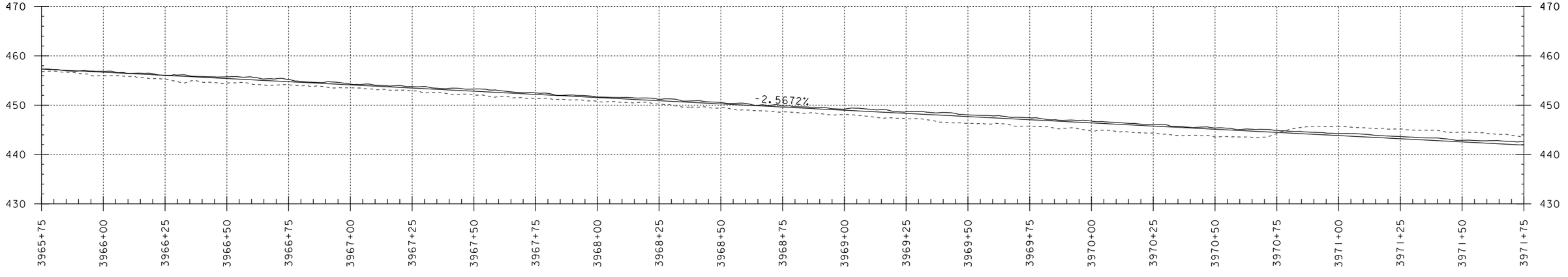
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 8

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 20 OF 86



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

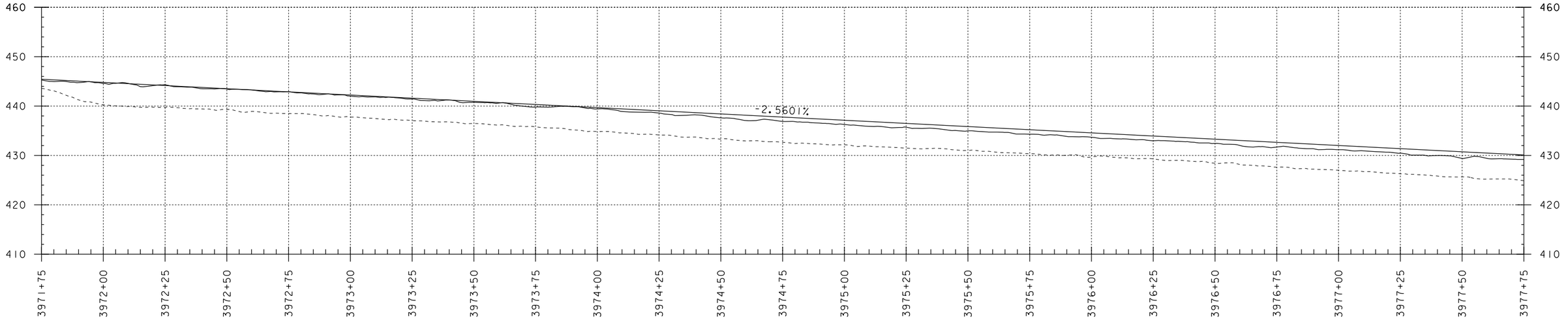
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

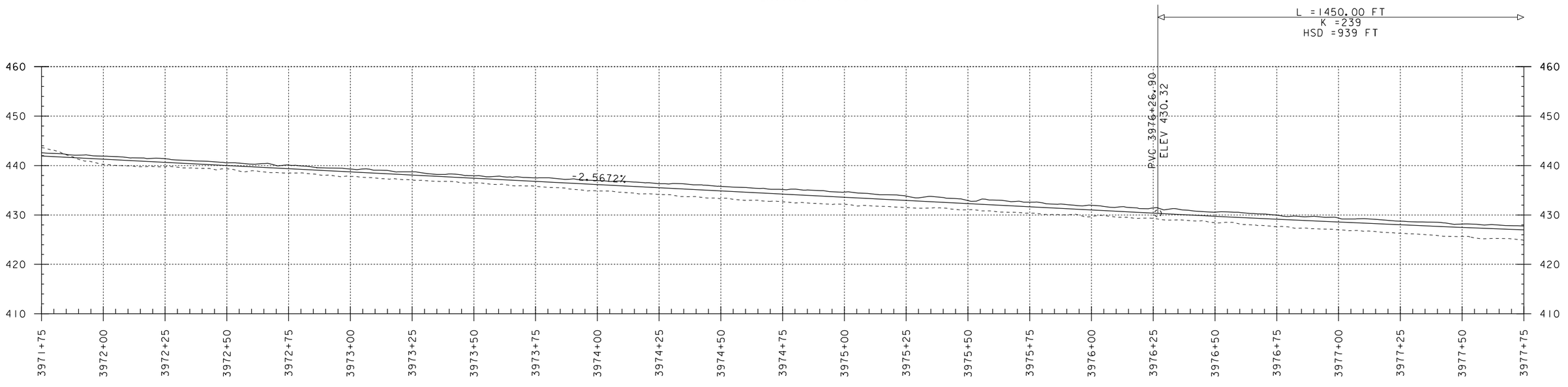
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 9

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 21 OF 86



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

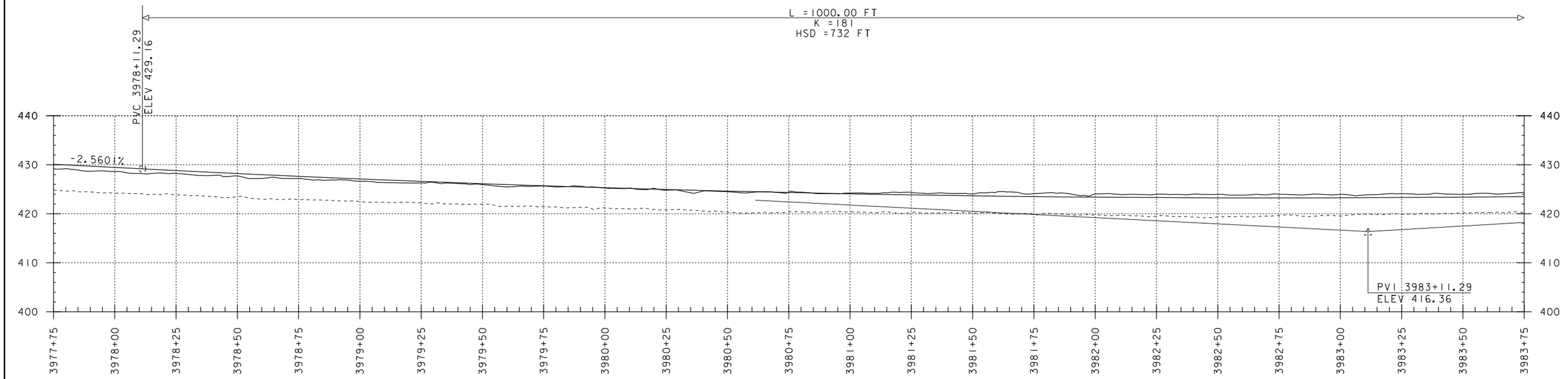
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

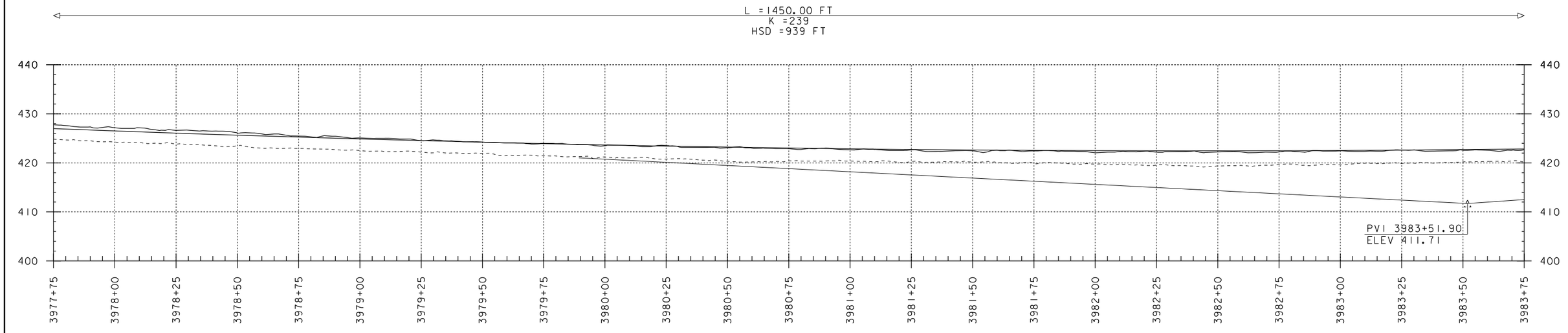
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 10

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

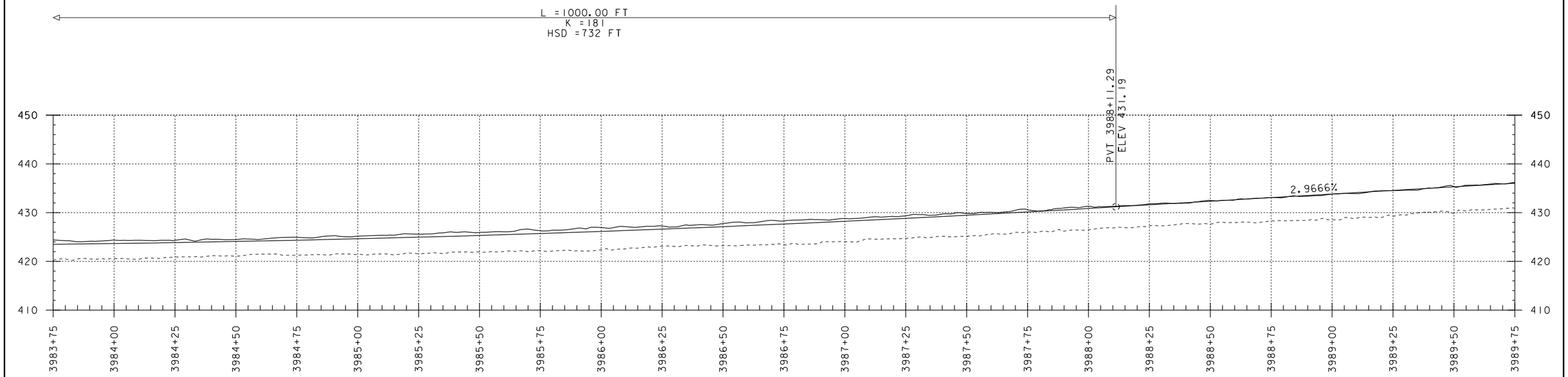
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

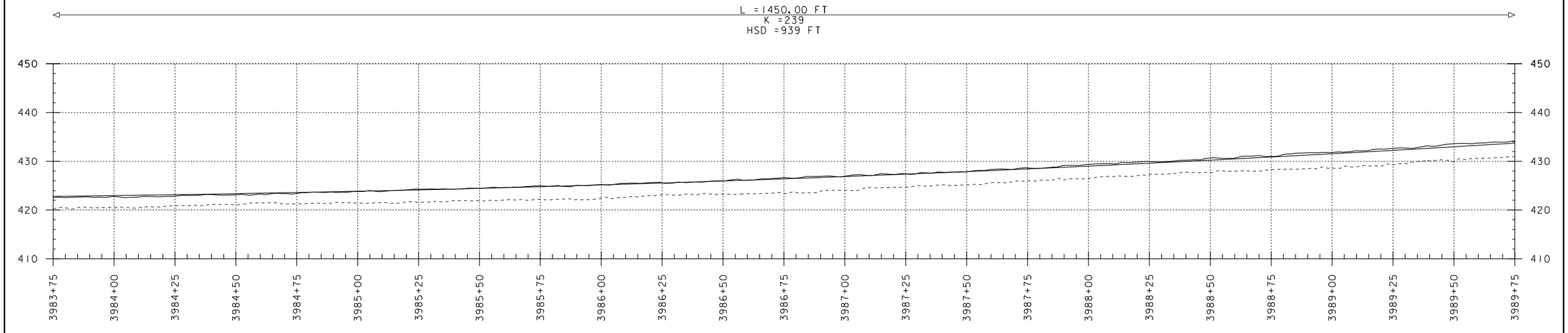
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET II

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------



INTERSTATE 91 SB PROFILE

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



INTERSTATE 91 NB PROFILE

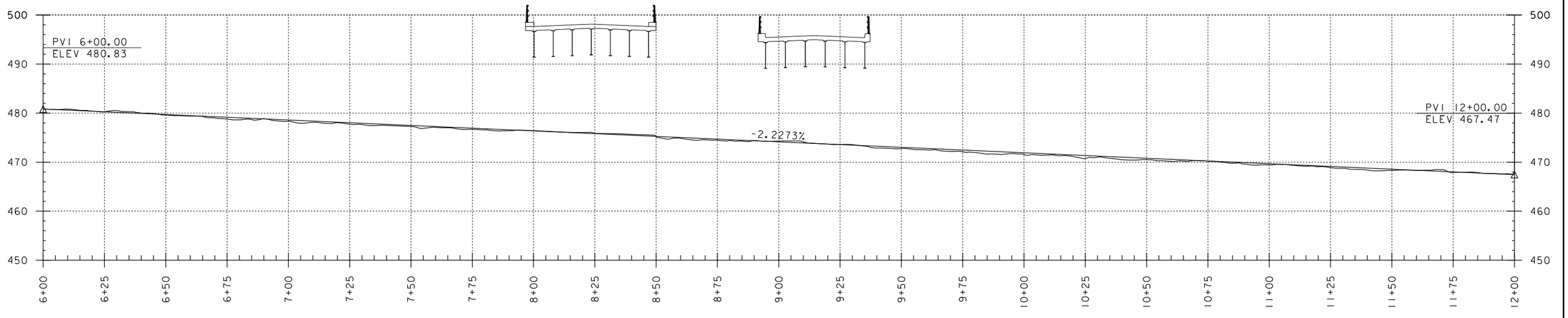
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET 12

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 24 OF 86



VT ROUTE 10A PROFILE

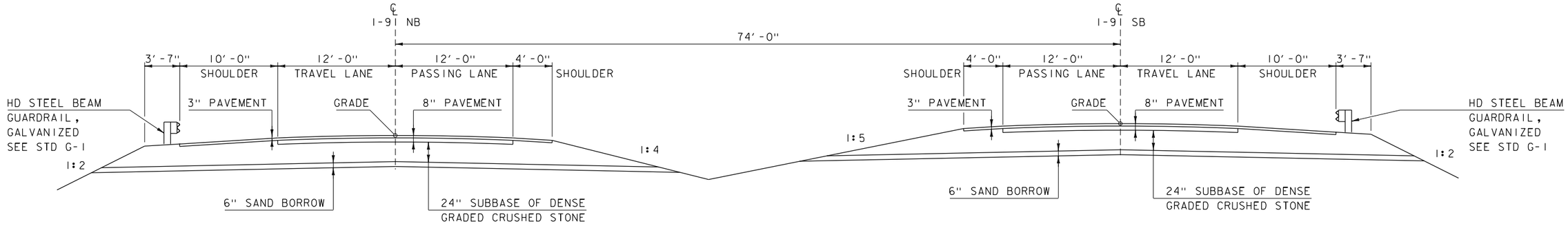
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

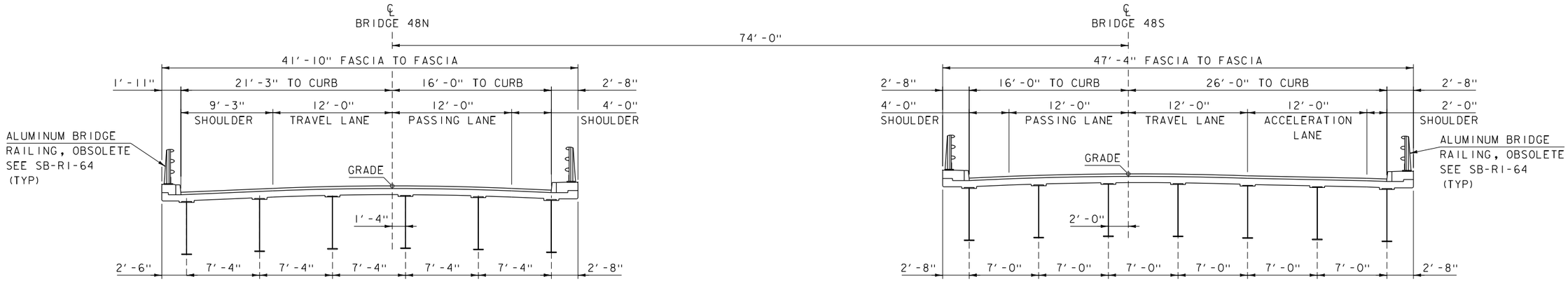
FILE NAME: 12a568/sl2a568profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
VT ROUTE 10A PROFILE SHEET

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 25 OF 86



EXISTING I-91 TYPICAL SECTION

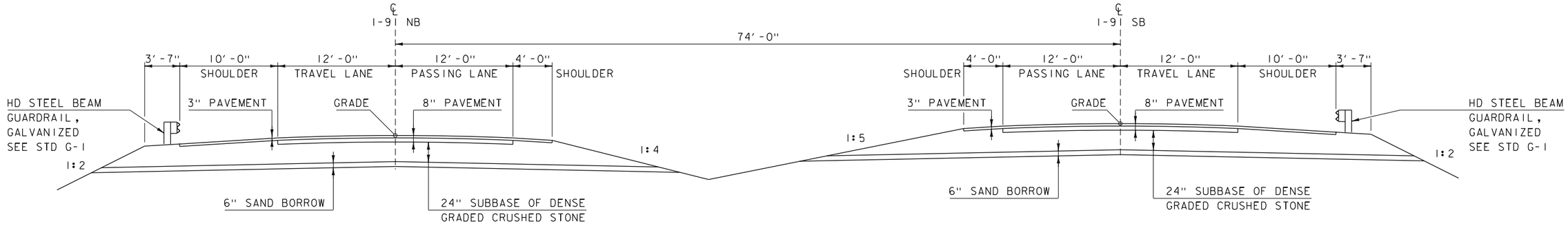
SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



EXISTING BRIDGE 48 N/S TYPICAL SECTION

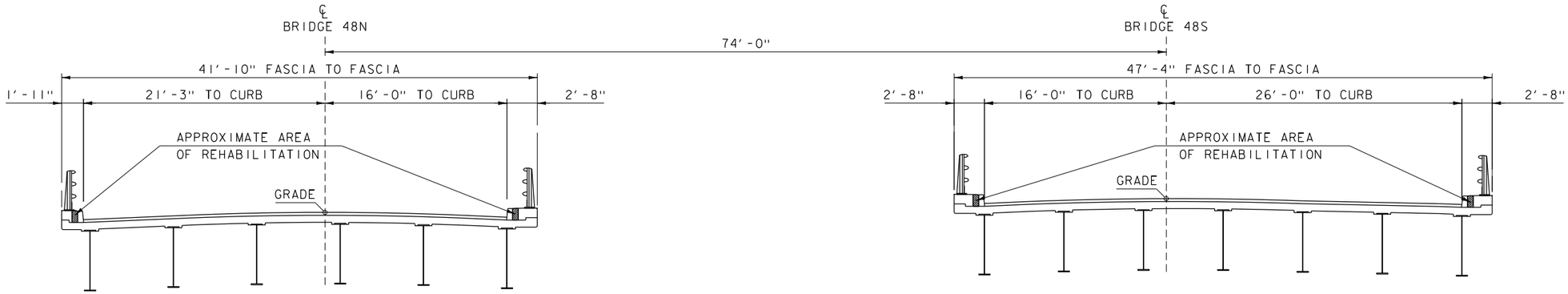
SCALE 3/16" = 1'-0"

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-3(53)
FILE NAME: l2a568/sl2a568typ.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING TYPICAL SECTIONS	SHEET 26 OF 86



EXISTING I-91 TYPICAL SECTION

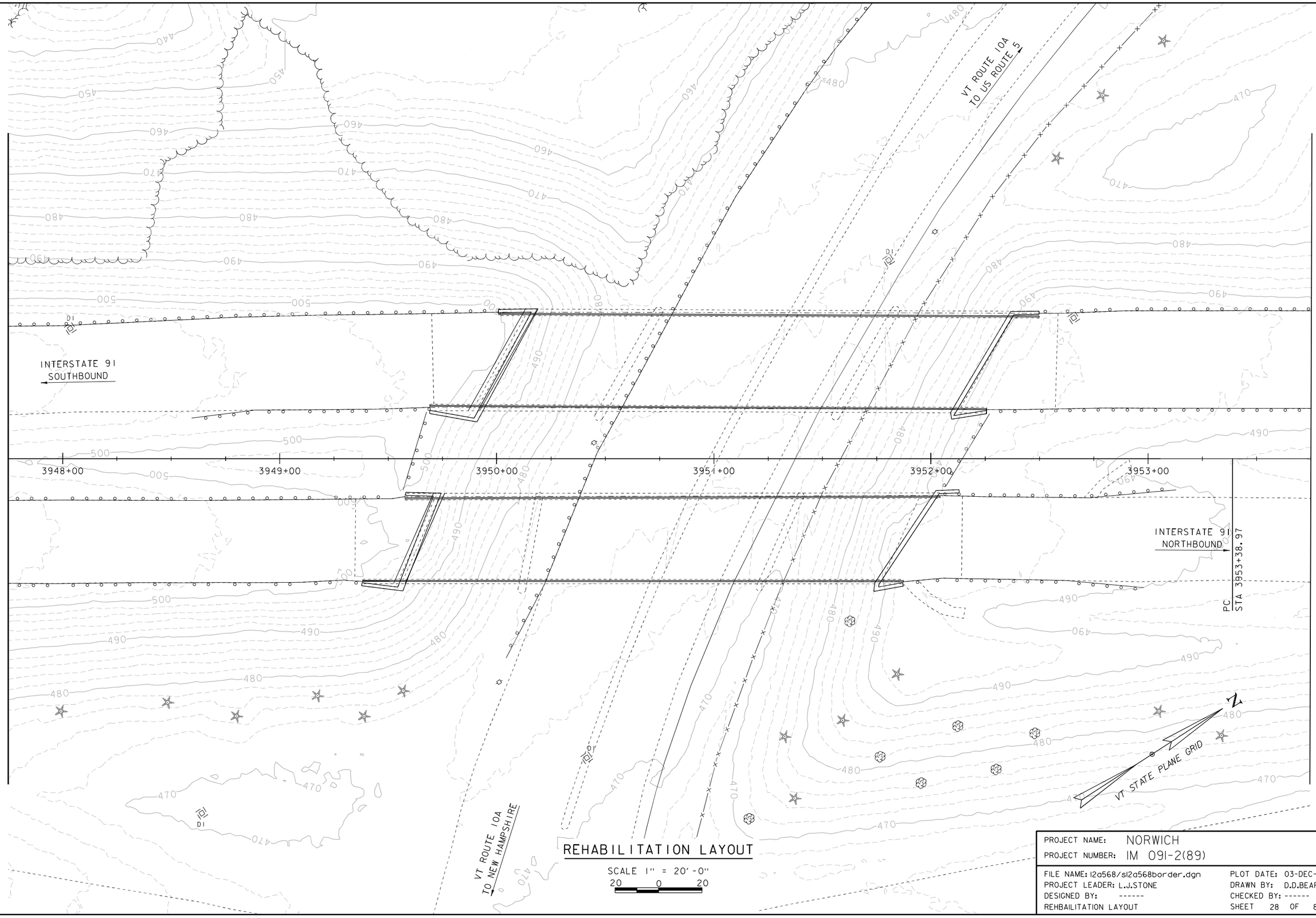
SCALE 3/16″ = 1′-0″
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S REHABILITATION TYPICAL SECTION

SCALE 3/16″ = 1′-0″

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-3(53)	
FILE NAME: 12a568/sl2a568typ.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
REHABILITATION TYPICAL SECTIONS	SHEET 27 OF 86

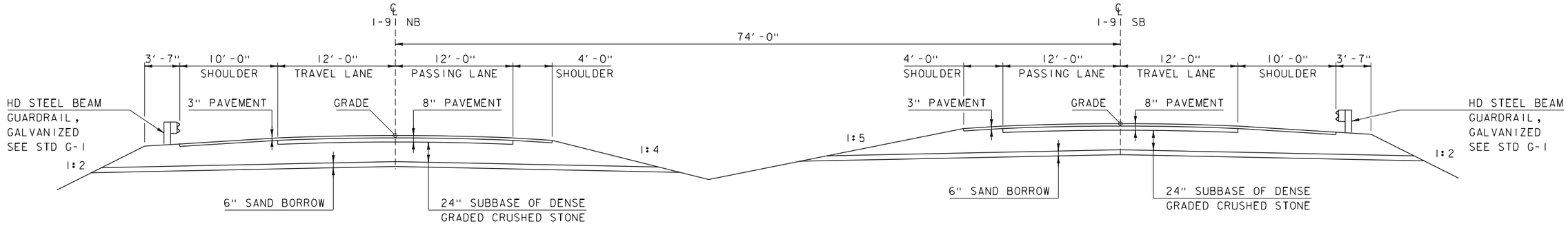


REHABILITATION LAYOUT

SCALE 1" = 20'-0"

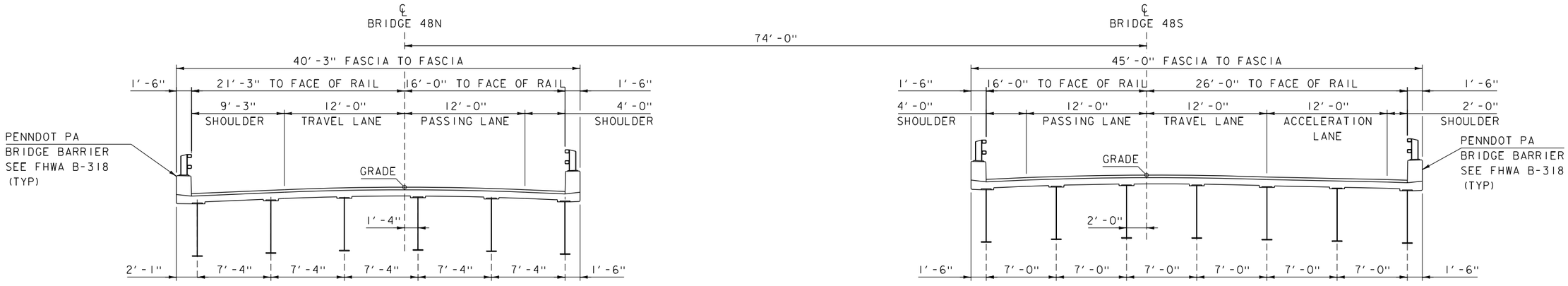
20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
REHBAILITATION LAYOUT	SHEET 28 OF 86



EXISTING I-91 TYPICAL SECTION

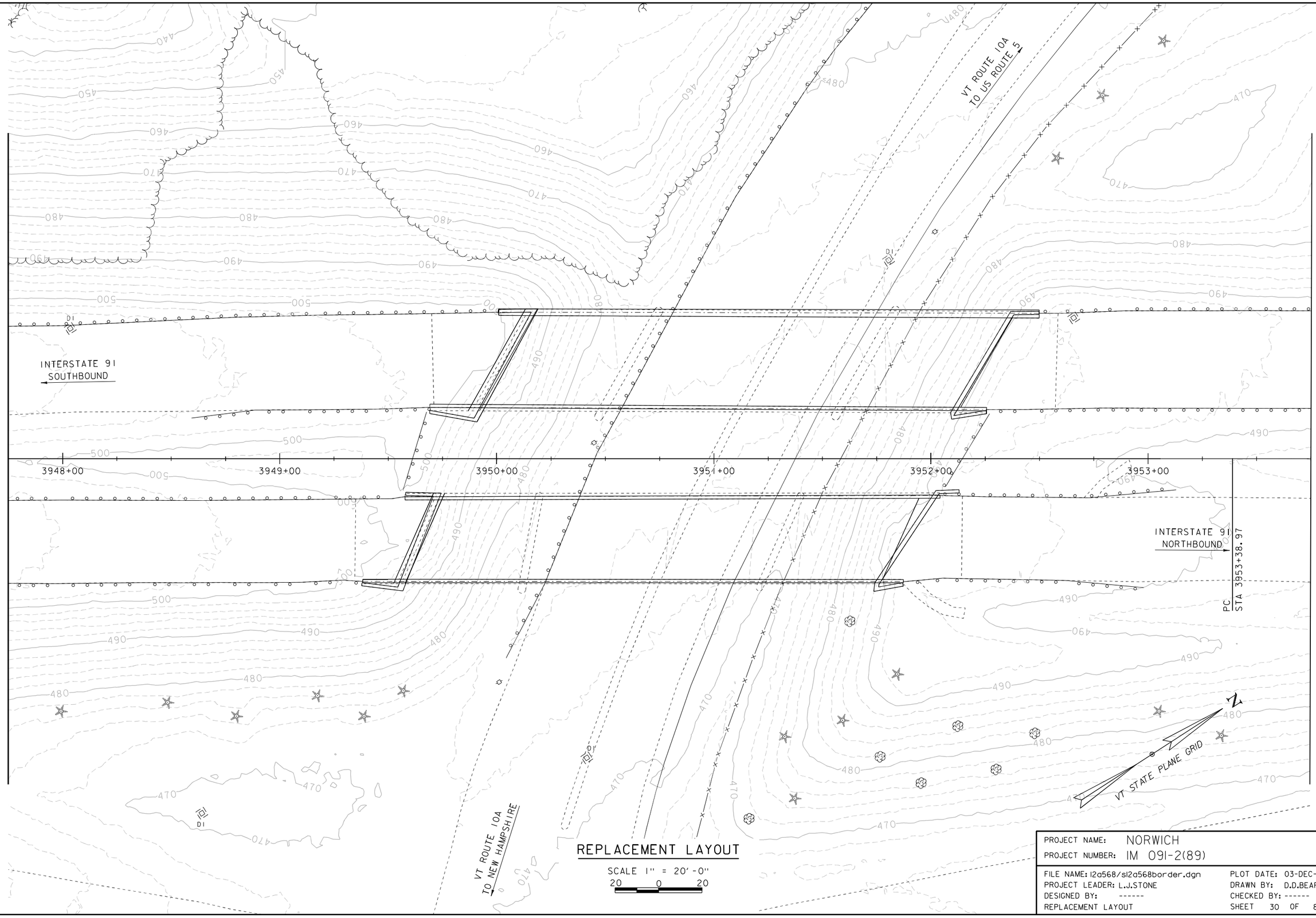
SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S REPLACEMENT TYPICAL SECTION

SCALE 3/16" = 1'-0"

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-3(53)	
FILE NAME: 12a568/sl2a568typ.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
REPLACEMENT TYPICAL SECTIONS	SHEET 29 OF 86

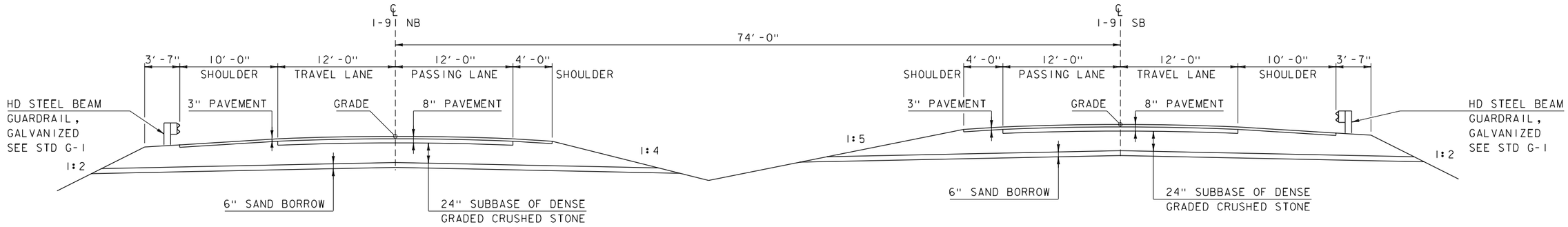


REPLACEMENT LAYOUT

SCALE 1" = 20'-0"

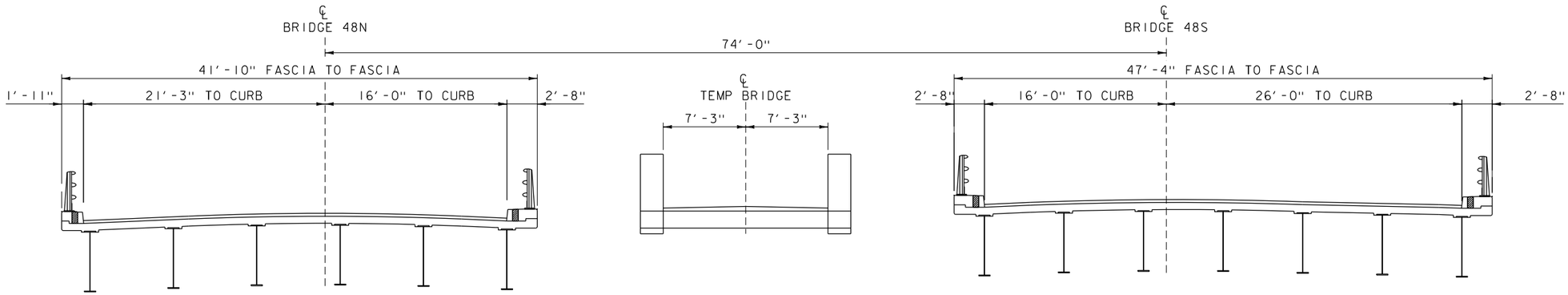
20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568border.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
REPLACEMENT LAYOUT	SHEET 30 OF 86



EXISTING I-91 TYPICAL SECTION

SCALE 3/16" = 1'-0"
ACCELERATION LANE NOT SHOWN



BRIDGE 48 N/S TEMPORARY BRIDGE TYPICAL SECTION

SCALE 3/16" = 1'-0"

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-3(53)
FILE NAME: l2a568/sl2a568traffic.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
TEMP BRIDGE TYPICAL SECTIONS	SHEET 31 OF 86

INTERSTATE 91
SOUTHBOUND

3924+00

3925+00

3926+00

3927+00

3928+00

3929+00

PC STA 3926+49.14

INTERSTATE 91
NORTHBOUND

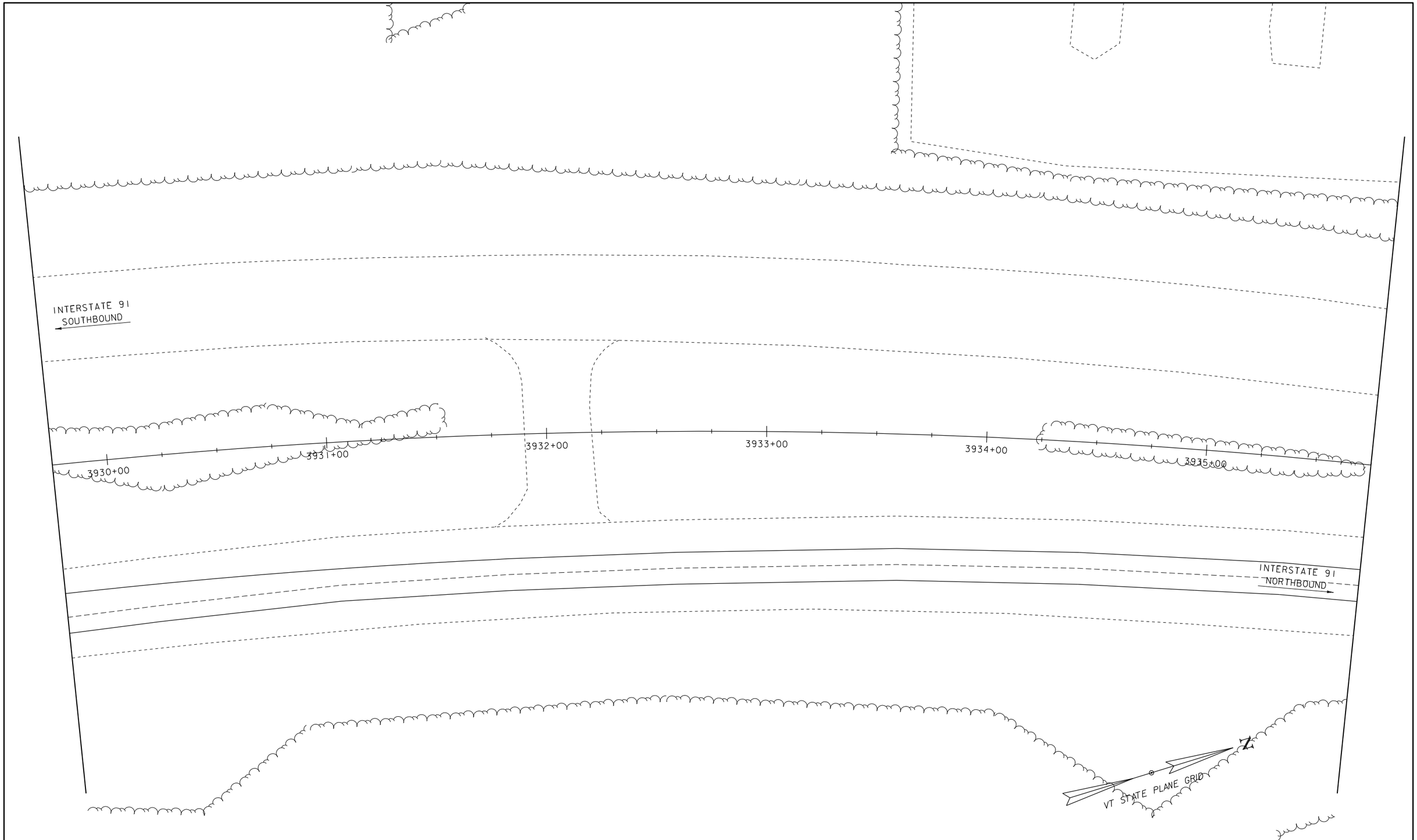
N

VT STATE PLANE GRID

NORTHBOUND TEMPORARY BRIDGE

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB TEMP BRIDGELAYOUT 2	SHEET 32 OF 86



NORTHBOUND TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB TEMP BRIDGE LAYOUT 3	SHEET 33 OF 86

N

VT STATE PLANE GRID

INTERSTATE 91
SOUTHBOUND

D1

3936+00

3937+00

3938+00

3939+00

3940+00

3941+00

D1

PT STA 3940+89.76

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP D

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

ECT

ECT

ECT

NORTHBOUND TEMPORARY BRIDGE

SCALE 1" = 20'-0"

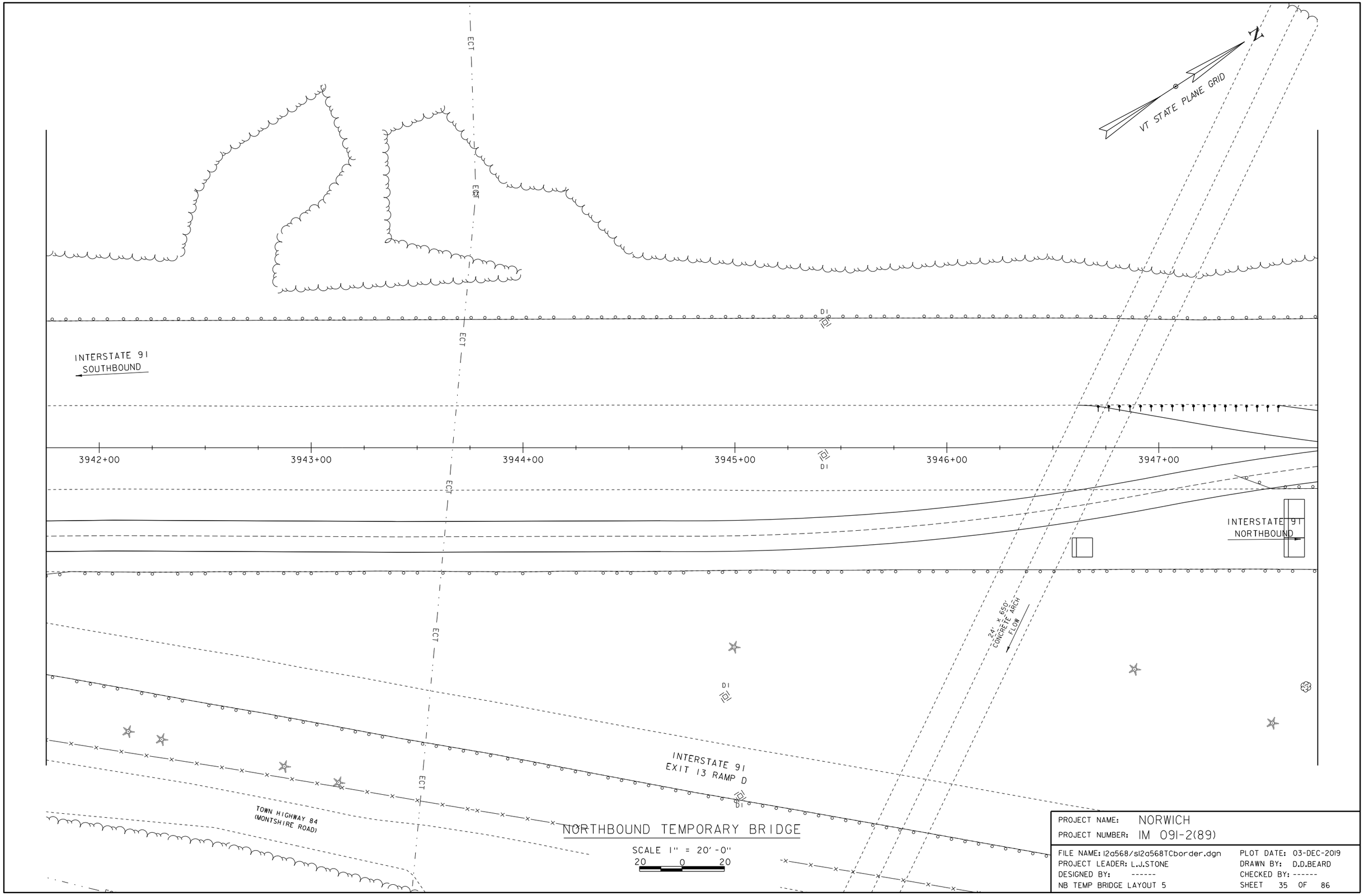
20 0 20

PROJECT NAME: NORWICH

PROJECT NUMBER: IM 091-2(89)

FILE NAME: l2a568/sl2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NB TEMP BRIDGE LAYOUT 4

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 34 OF 86

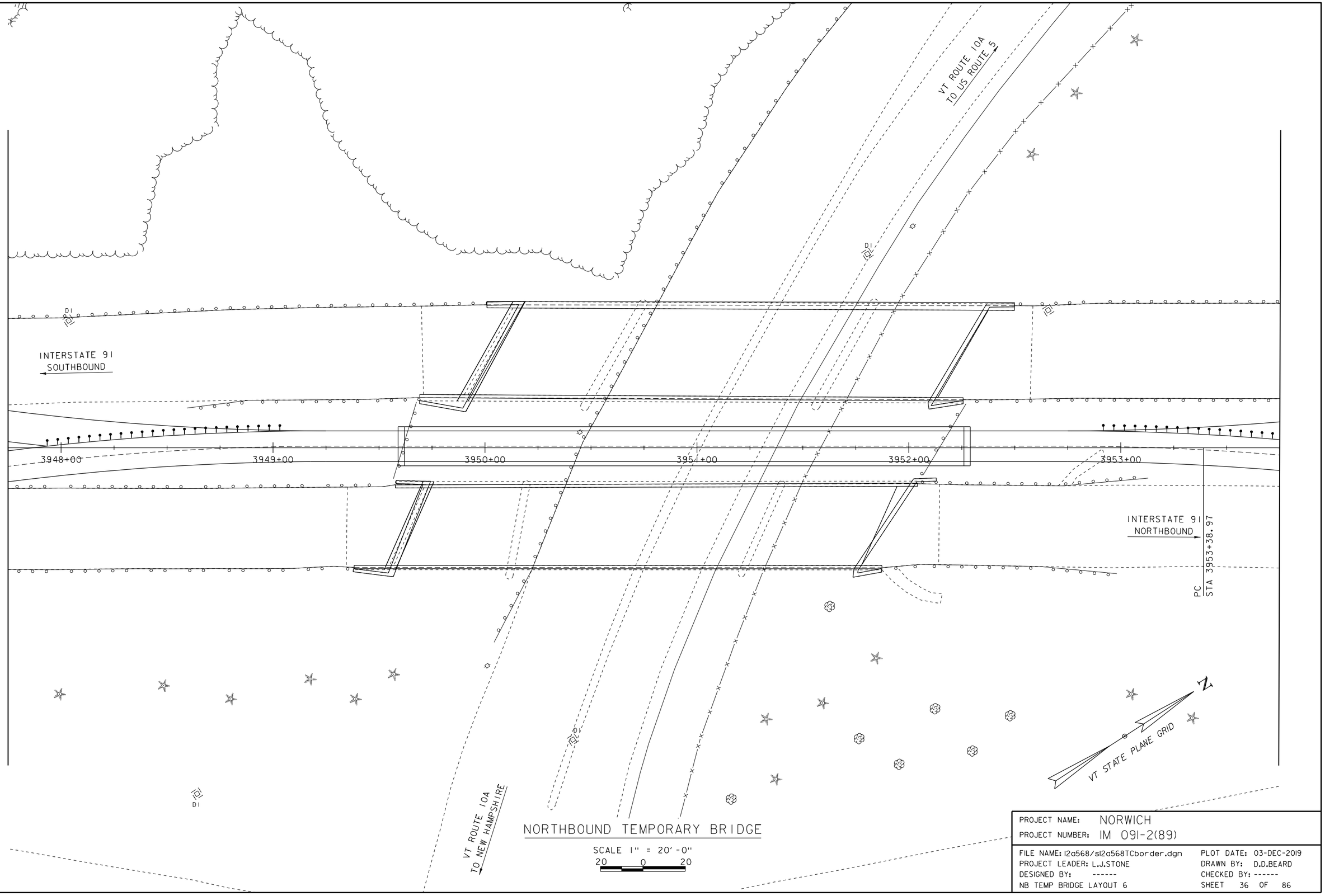


NORTHBOUND TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB TEMP BRIDGE LAYOUT 5	SHEET 35 OF 86



NORTHBOUND TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB TEMP BRIDGE LAYOUT 6	SHEET 36 OF 86

INTERSTATE 91
EXIT 13 RAMP B

INTERSTATE 91
SOUTHBOUND

3954+00

3955+00

3956+00

3957+00

3958+00

3959+00

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP A

N

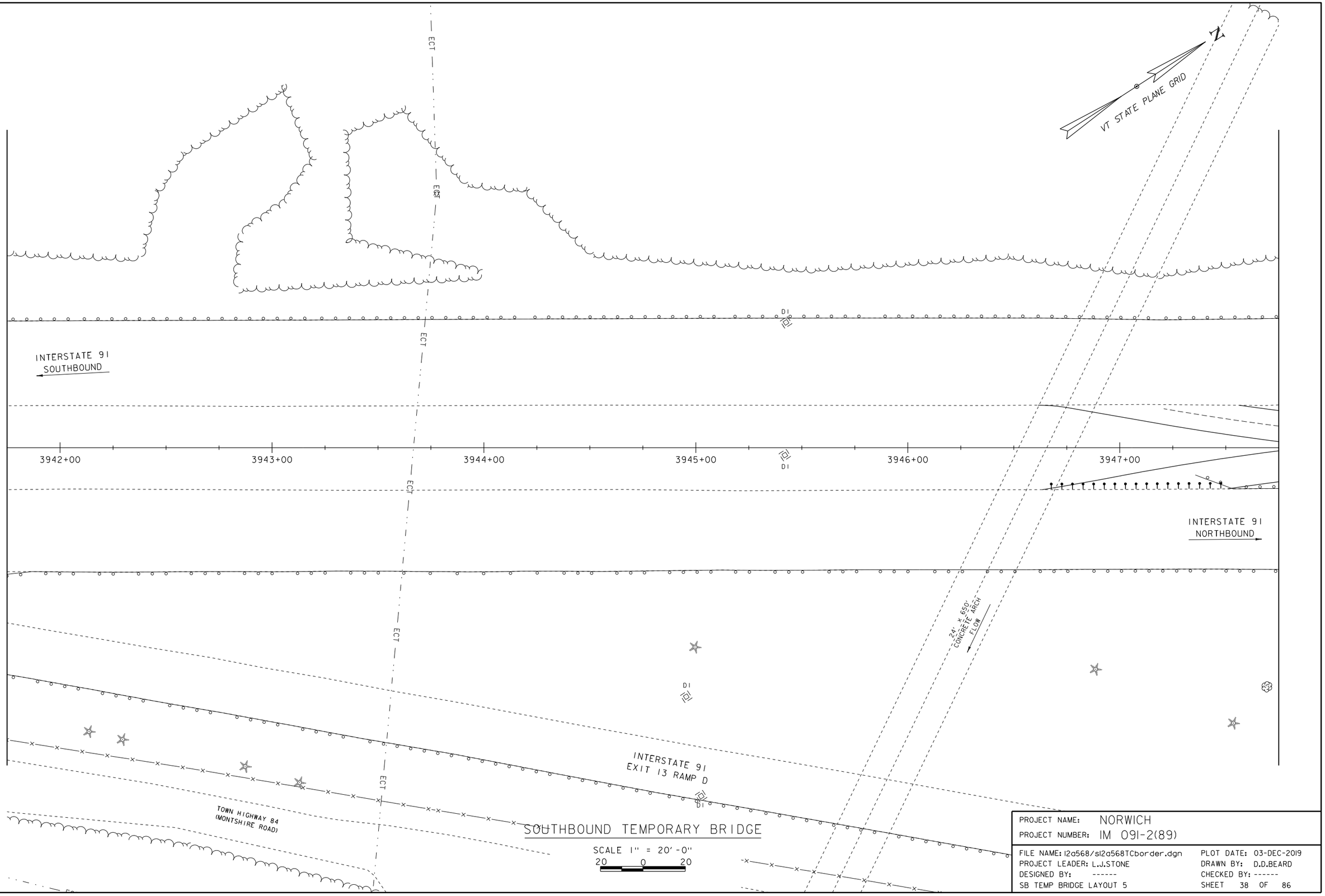
VT STATE PLANE GRID

NORTHBOUND TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

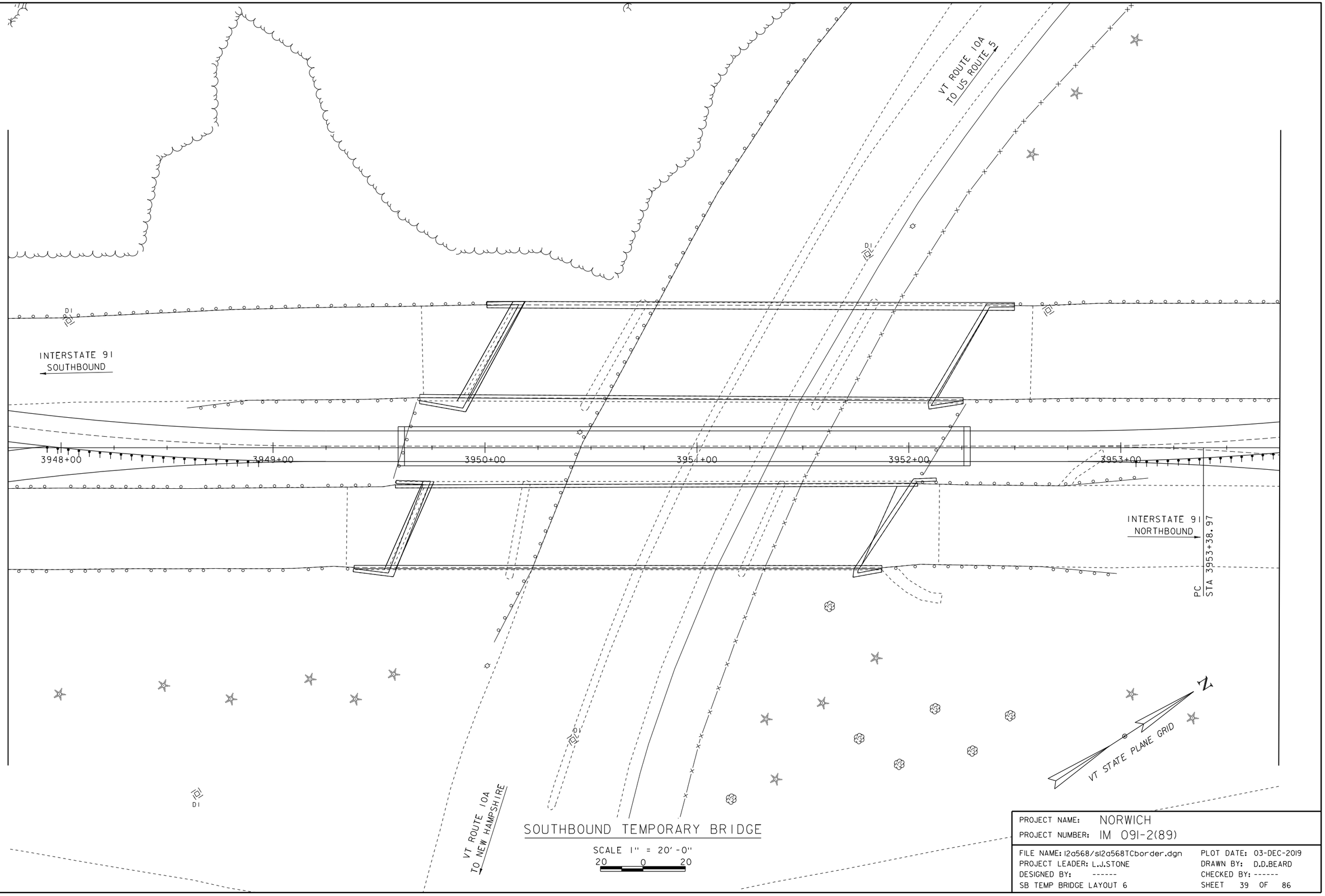
PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: l2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB TEMP BRIDGE LAYOUT 7	SHEET 37 OF 86



SOUTHBOUND TEMPORARY BRIDGE

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB TEMP BRIDGE LAYOUT 5	SHEET 38 OF 86



SOUTHBOUND TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: 12a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB TEMP BRIDGE LAYOUT 6	SHEET 39 OF 86

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
EXIT 13 RAMP B

3954+00

3955+00

3956+00

3957+00

3958+00

3959+00

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP A

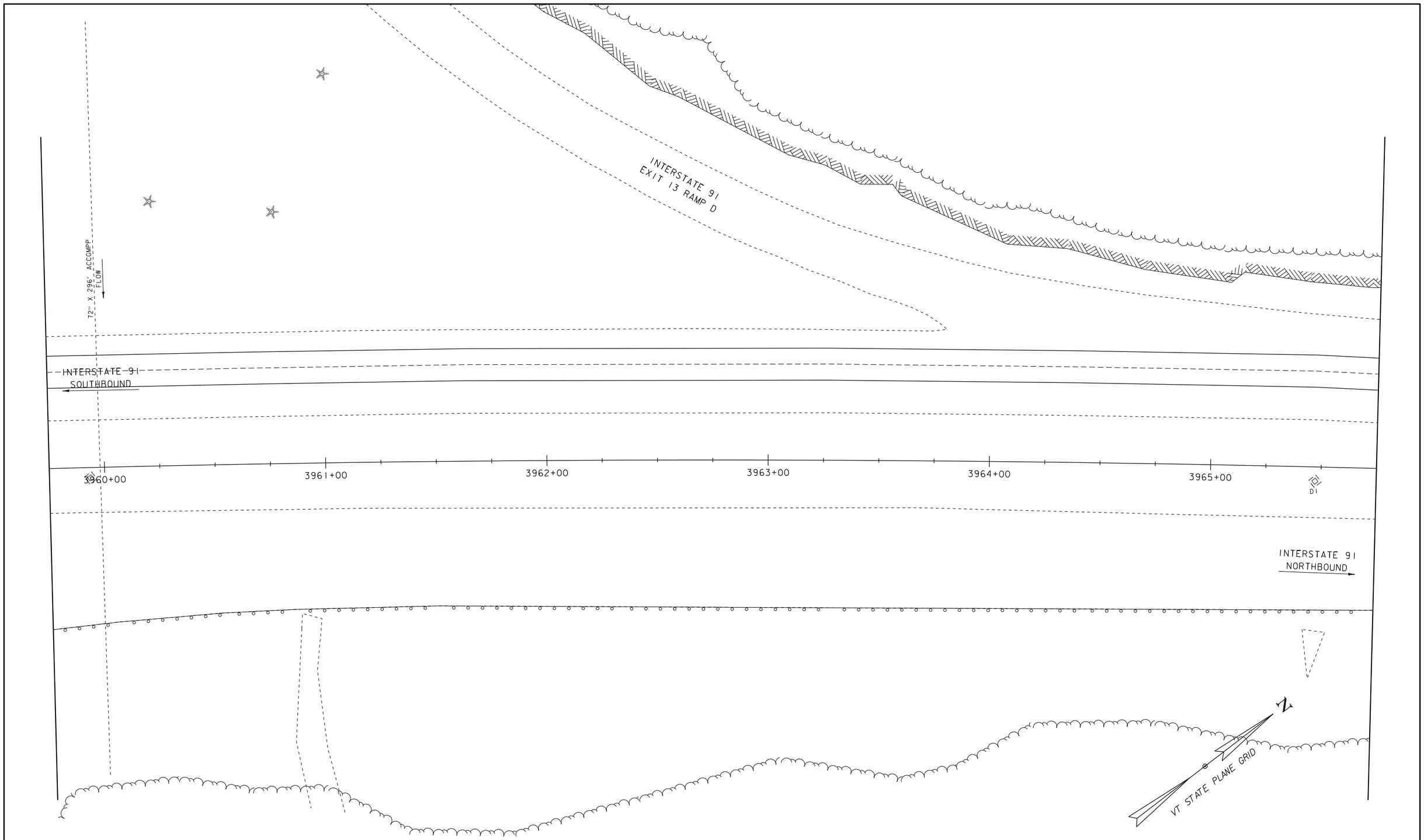
VT STATE PLANE GRID

SOUTHBOUND TEMPORARY BRIDGE

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)

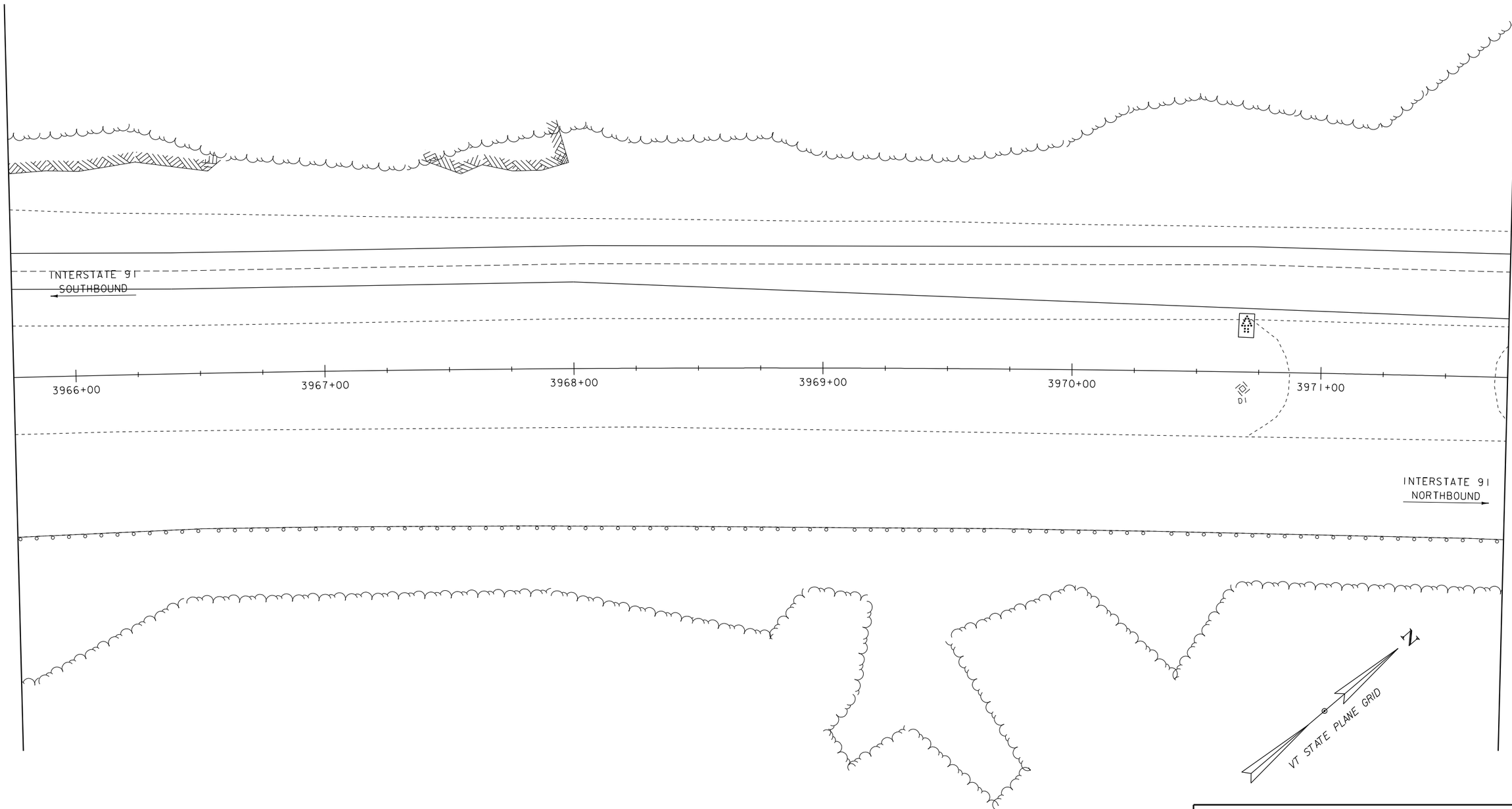
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB TEMP BRIDGE LAYOUT 7	SHEET 40 OF 86



SOUTHBOUND TEMPORARY BRIDGE

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB TEMP BRIDGE LAYOUT 8	SHEET 41 OF 86



SOUTHBOUND TEMPORARY BRIDGE

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB TEMP BRIDGE LAYOUT 9	SHEET 42 OF 86

INTERSTATE 91
SOUTHBOUND

3972+00 3973+00 3974+00 3975+00 3976+00 3977+00

D1

PT STA 3974+08.31

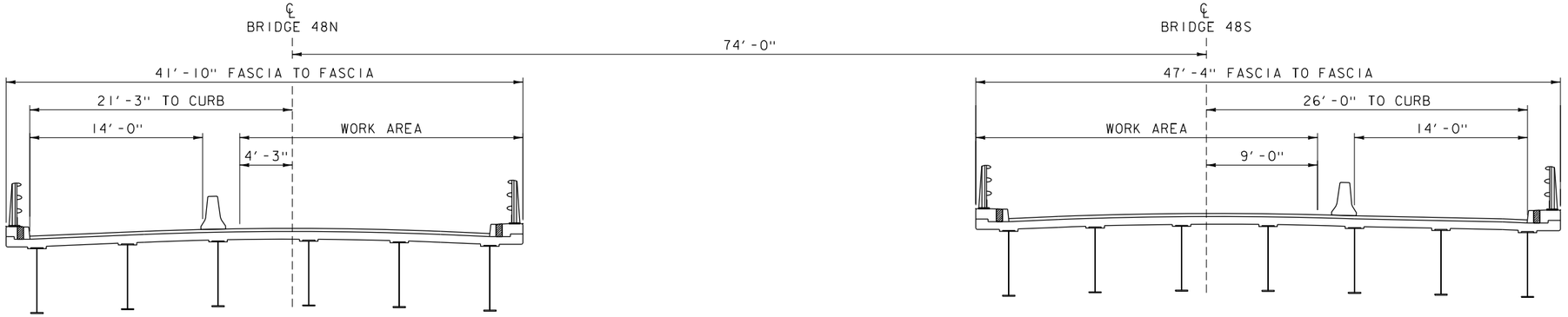
INTERSTATE 91
NORTHBOUND

VT STATE PLANE GRID

SOUTHBOUND TEMPORARY BRIDGE

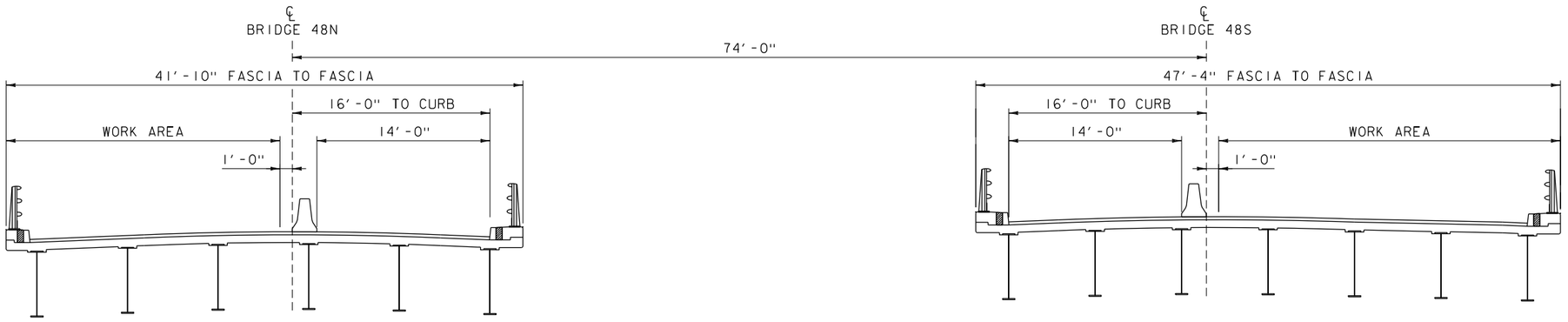
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB TEMP BRIDGE LAYOUT 10	SHEET 43 OF 86



BRIDGE 48 N/S PHASE #1

SCALE 3/16" = 1'-0"



BRIDGE 48 N/S PHASE #2

SCALE 3/16" = 1'-0"

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-3(53)	
FILE NAME: 12a568/sl2a568traffic.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASING TYPICAL SECTIONS	SHEET 44 OF 86

INTERSTATE 91
SOUTHBOUND

3918+00

3919+00

3920+00

3921+00

3922+00

3923+00

INTERSTATE 91
NORTHBOUND

N

VT STATE PLANE GRID

PHASE I LAYOUT

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

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: I2a568/sI2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE I LAYOUT I

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 45 OF 86

INTERSTATE 91
SOUTHBOUND

3924+00

3925+00

3926+00

3927+00

3928+00

3929+00

PC STA 3926+49.14

INTERSTATE 91
NORTHBOUND

N

VT STATE PLANE GRID

PHASE I LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT 2	SHEET 46 OF 86

INTERSTATE 91
SOUTHBOUND

3930+00
3931+00
3932+00
3933+00
3934+00
3935+00

INTERSTATE 91
NORTHBOUND

VT STATE PLANE GRID
N

PHASE I LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT 3	SHEET 47 OF 86

N

VT STATE PLANE GRID

INTERSTATE 91
SOUTHBOUND

D1

3936+00

3937+00

3938+00

3939+00

3940+00

3941+00

D1

PT STA 3940+89.76

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP D

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

ECT

ECT

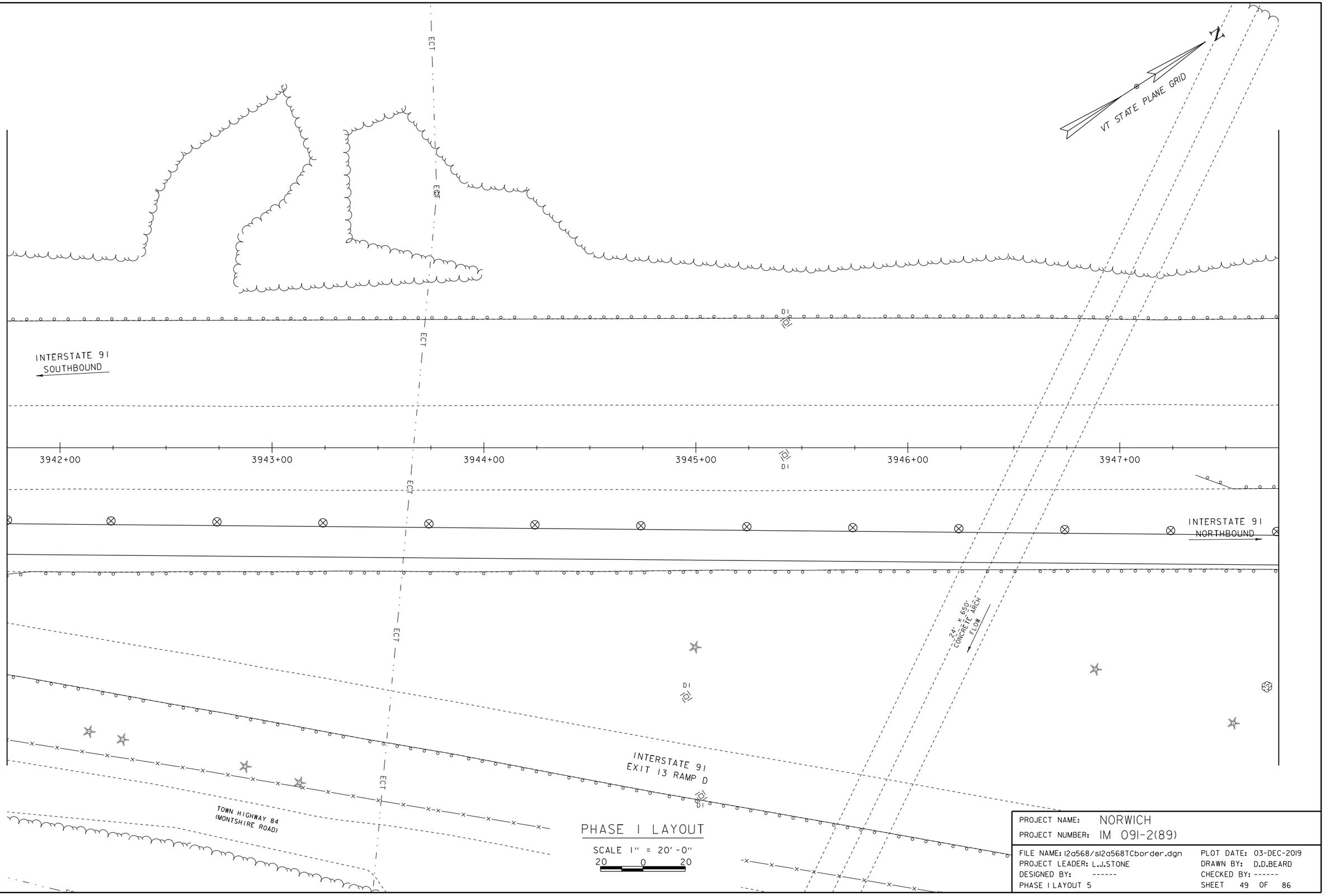
ECT

PHASE I LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME:	I2a568/sI2a568TCborder.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
PHASE I LAYOUT 4	
PLOT DATE:	03-DEC-2019
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	48 OF 86

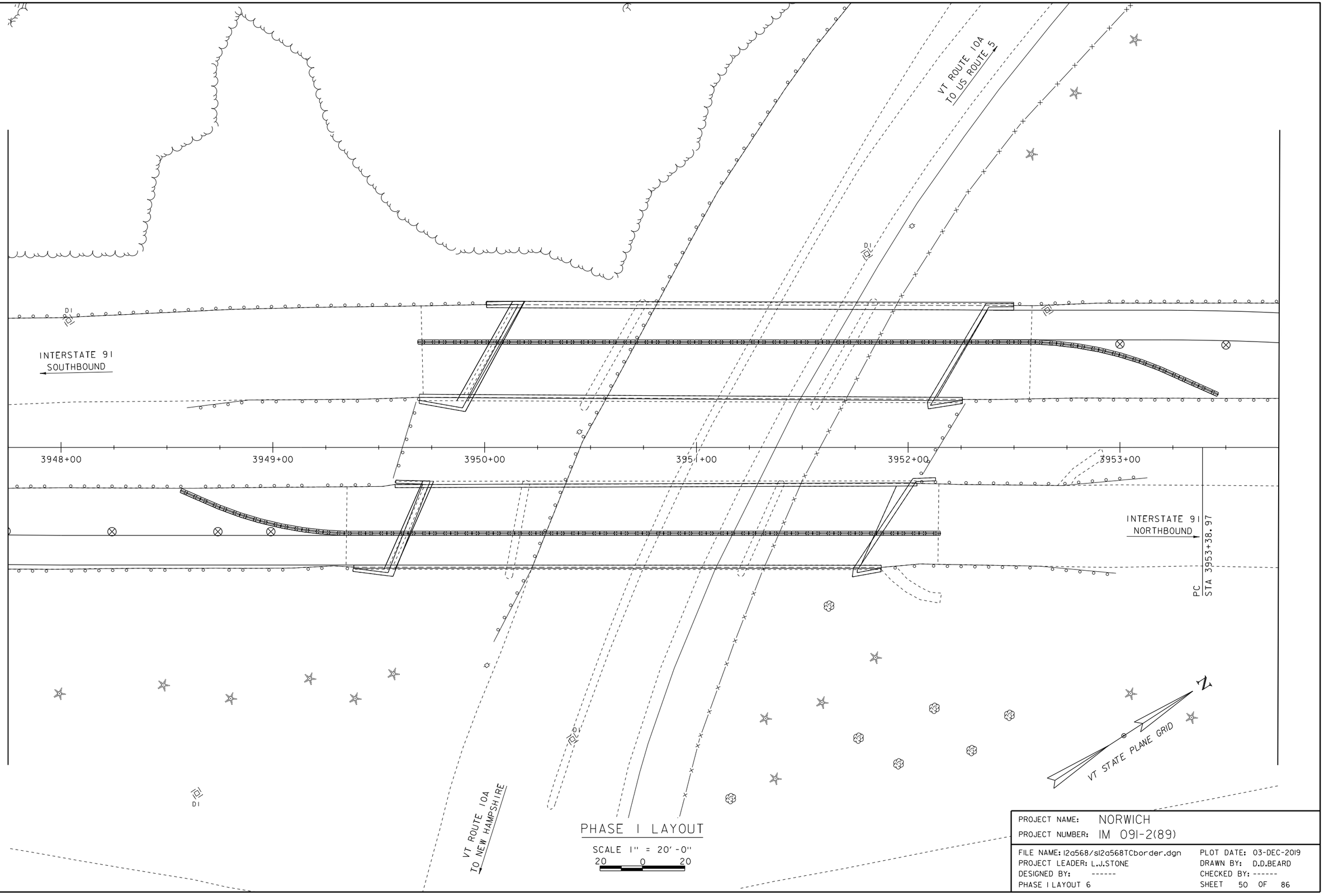


PHASE I LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: l2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT 5	SHEET 49 OF 86



PHASE I LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH

PROJECT NUMBER: IM 091-2(89)

FILE NAME: l2a568/sl2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE I LAYOUT 6

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 50 OF 86

INTERSTATE 91
EXIT 13 RAMP B

INTERSTATE 91
SOUTHBOUND

3954+00

3955+00

3956+00

3957+00

3958+00

3959+00

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP A

N

VT STATE PLANE GRID

PHASE I LAYOUT

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

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: I2a568/sI2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE I LAYOUT 7

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 51 OF 86

INTERSTATE 91
EXIT 13 RAMP D

72" X 296' ACCGMPP
FLOW

INTERSTATE 91
SOUTHBOUND

3960+00

3961+00

3962+00

3963+00

3964+00

3965+00

D1

INTERSTATE 91
NORTHBOUND

N

VT STATE PLANE GRID

PHASE I LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT 8	SHEET 52 OF 86

INTERSTATE 91
SOUTHBOUND

3966+00
3967+00
3968+00
3969+00
3970+00
3971+00

D1

INTERSTATE 91
NORTHBOUND

VT STATE PLANE GRID

PHASE I LAYOUT

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

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: I2a568/sI2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE I LAYOUT 9

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 53 OF 86

INTERSTATE 91
SOUTHBOUND

3918+00
3919+00
3920+00
3921+00
3922+00
3923+00

INTERSTATE 91
NORTHBOUND

N

VT STATE PLANE GRID

PHASE 2 LAYOUT

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

PROJECT NAME: NORWICH
PROJECT NUMBER: IM 091-2(89)

FILE NAME: I2a568/sI2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PHASE 2 LAYOUT 1

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 54 OF 86

INTERSTATE 91
SOUTHBOUND

3924+00

3925+00

3926+00

3927+00

3928+00

3929+00

PC STA 3926+49.14

INTERSTATE 91
NORTHBOUND

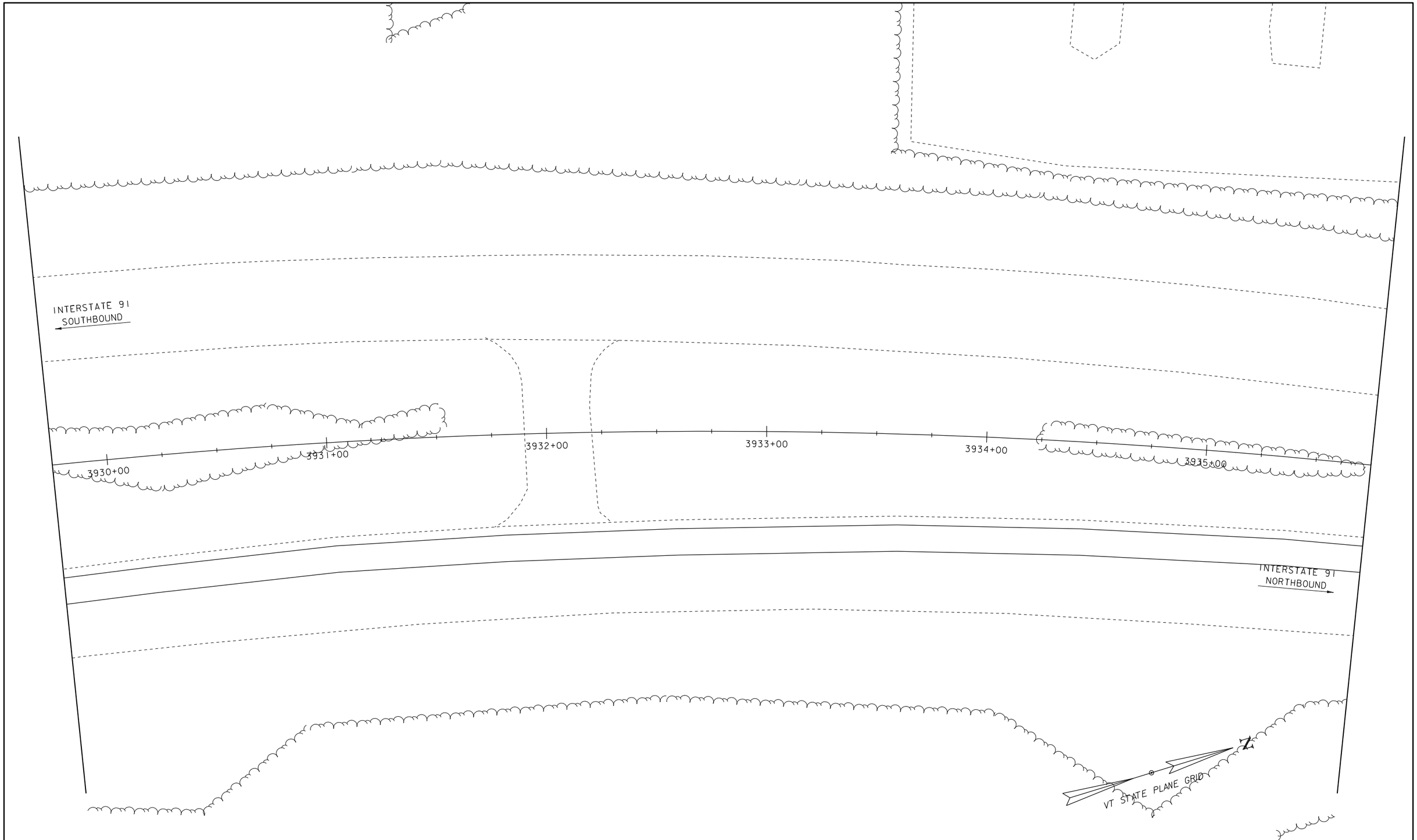
N

VT STATE PLANE GRID

PHASE 2 LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 2	SHEET 55 OF 86



PHASE 2 LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 3	SHEET 56 OF 86

N

VT STATE PLANE GRID

INTERSTATE 91
SOUTHBOUND

D1

3936+00

3937+00

3938+00

3939+00

3940+00

3941+00

D1

PT STA 3940+89.76

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP D

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

ECT

ECT

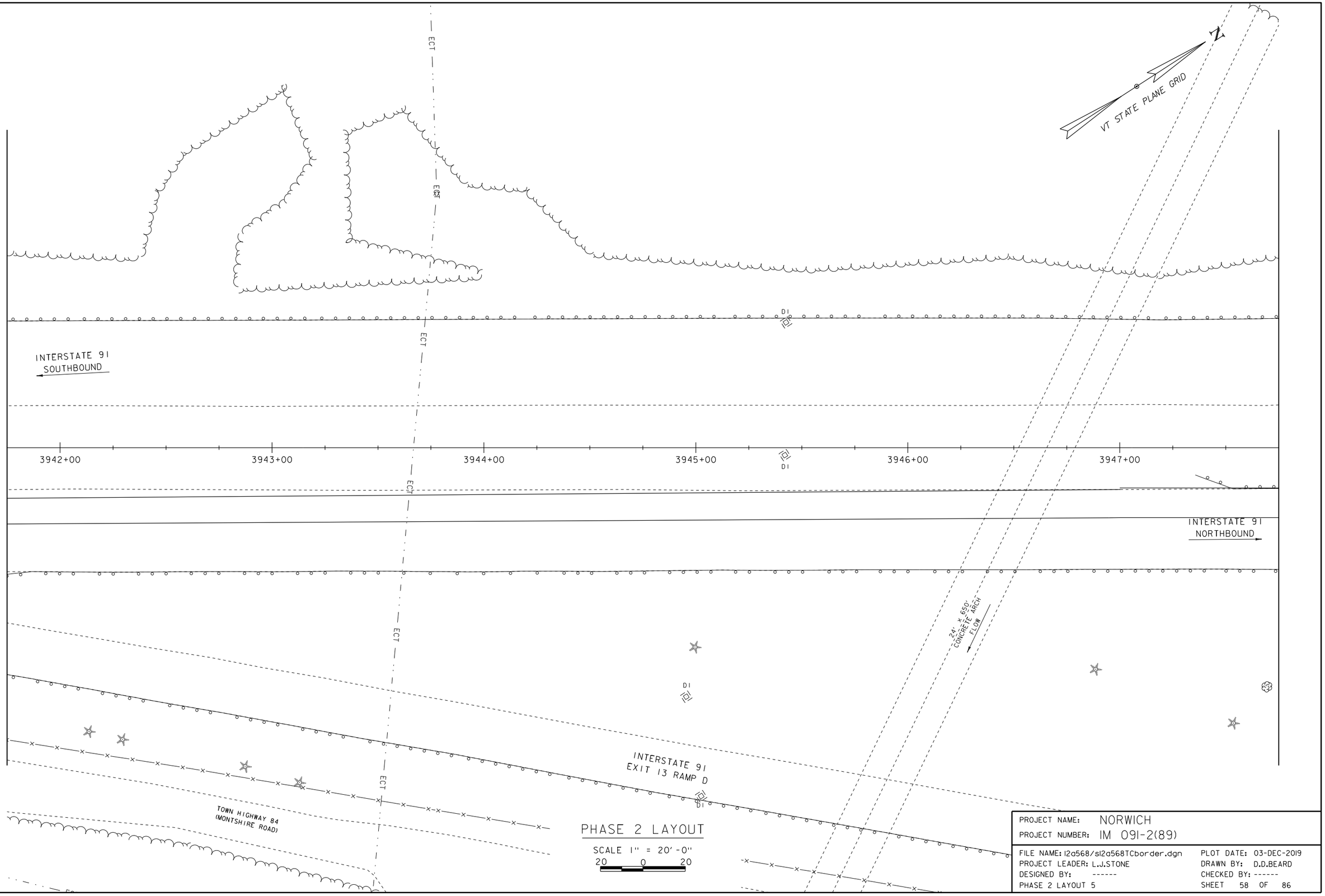
ECT

PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME:	I2a568/sI2a568TCborder.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
PHASE 2 LAYOUT 4	
PLOT DATE:	03-DEC-2019
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	57 OF 86

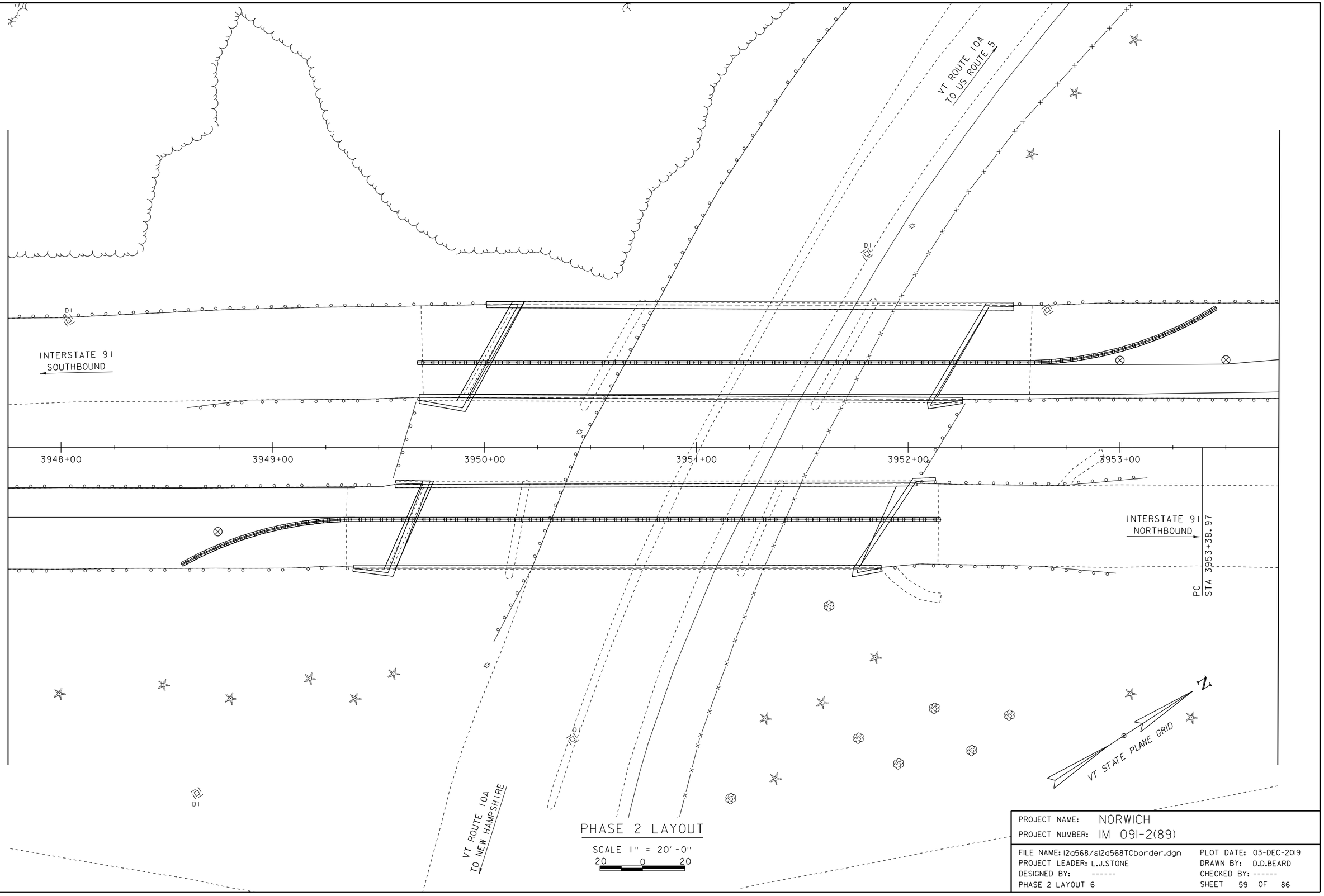


PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: l2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 5	SHEET 58 OF 86



PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 6	SHEET 59 OF 86

INTERSTATE 91
EXIT 13 RAMP B

INTERSTATE 91
SOUTHBOUND

3954+00

3955+00

3956+00

3957+00

3958+00

3959+00

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP A

N

VT STATE PLANE GRID

PHASE 2 LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 7	SHEET 60 OF 86

INTERSTATE 91
EXIT 13 RAMP D

72" X 296' ACCGMPP
FLOW

INTERSTATE 91
SOUTHBOUND

3960+00
3961+00
3962+00
3963+00
3964+00
3965+00
D1

INTERSTATE 91
NORTHBOUND

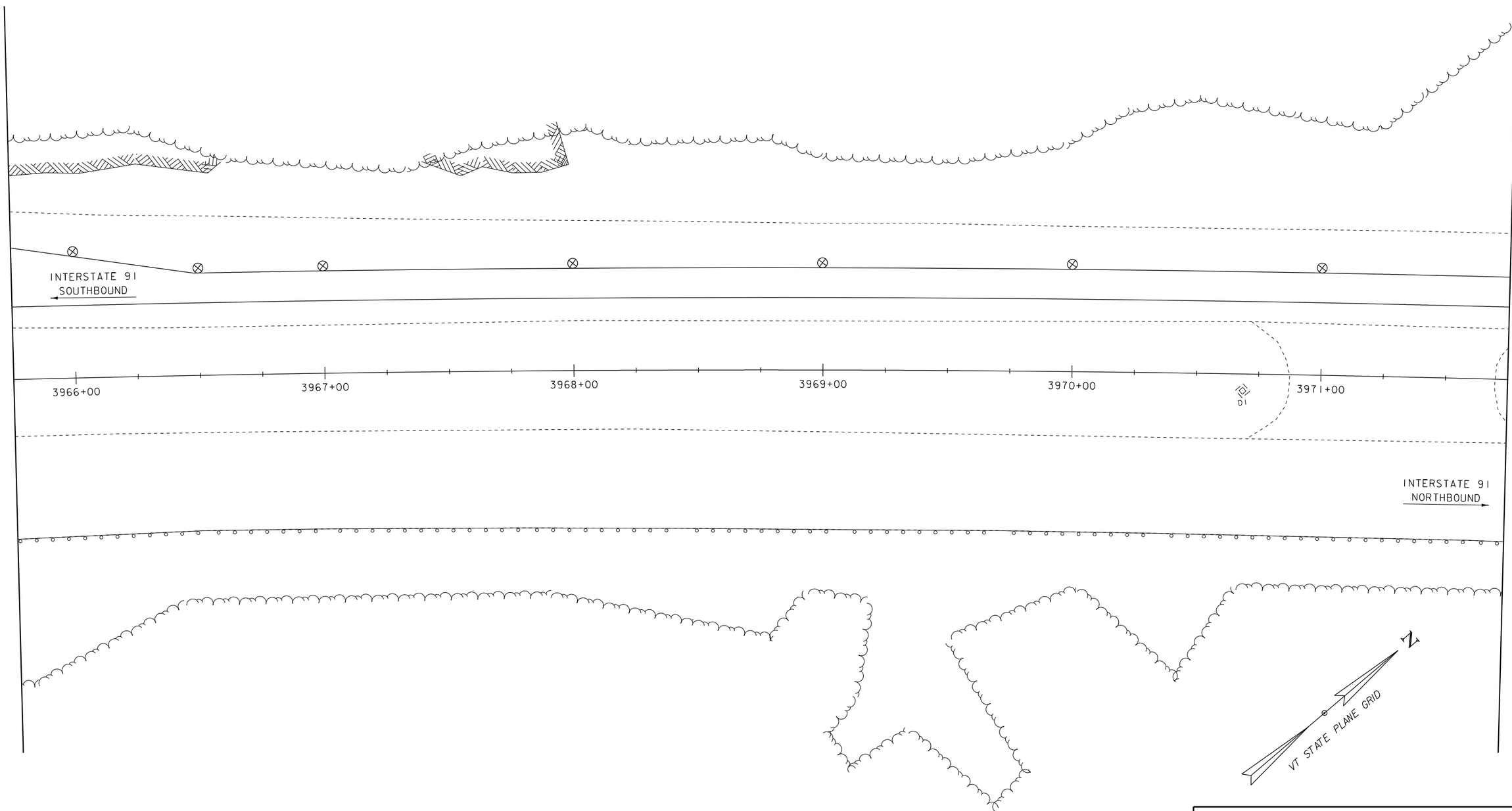
N

VT STATE PLANE GRID

PHASE 2 LAYOUT

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 8	SHEET 61 OF 86

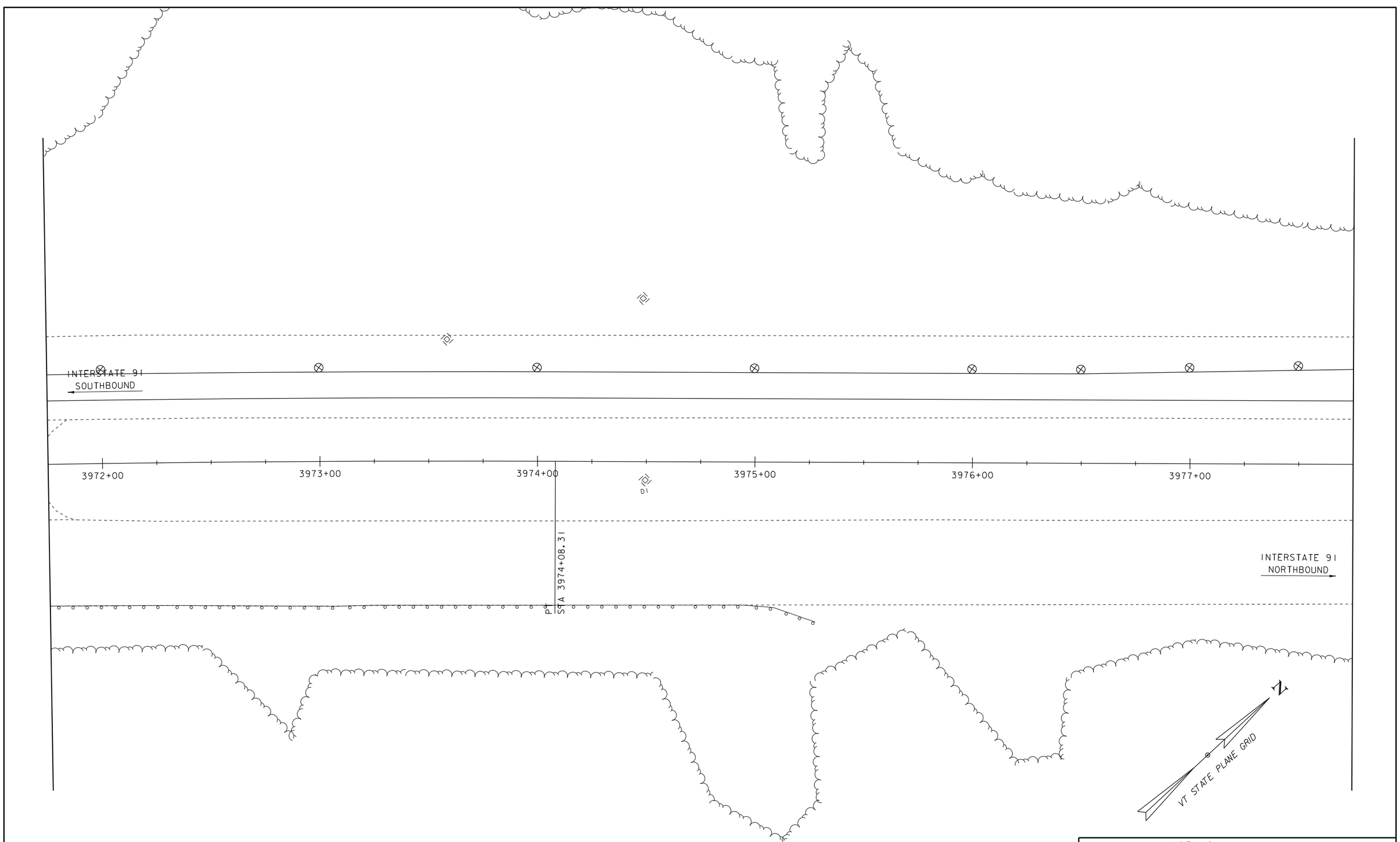


PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 9	SHEET 62 OF 86



PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT 10	SHEET 63 OF 86

INTERSTATE 91
SOUTHBOUND

3978+00 3979+00 3980+00 3981+00 3982+00 3983+00

D1 D1 D1

INTERSTATE 91
NORTHBOUND

N

VT STATE PLANE GRID

PHASE 2 LAYOUT

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT II	SHEET 64 OF 86

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

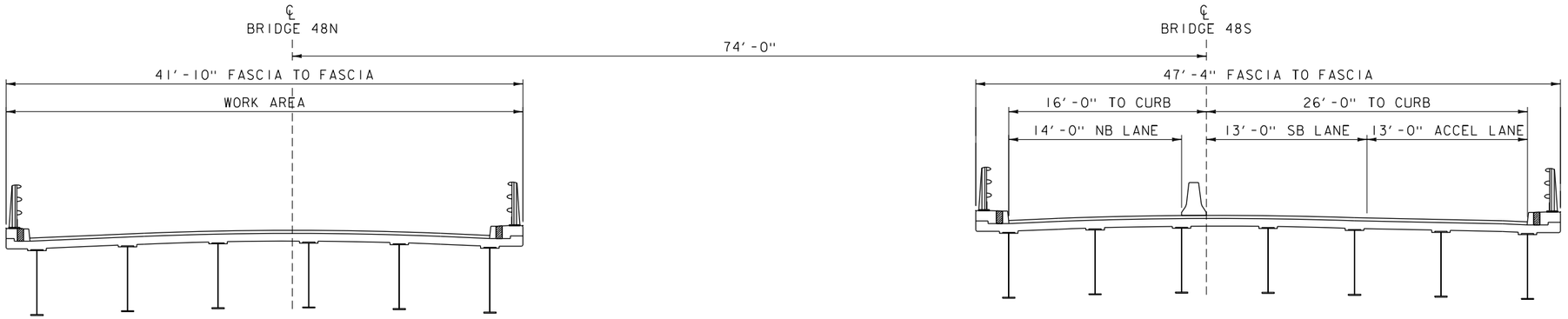
3984+00
3985+00
3986+00
3987+00
3988+00
3989+00

VT STATE PLANE GRID

PHASE 2 LAYOUT

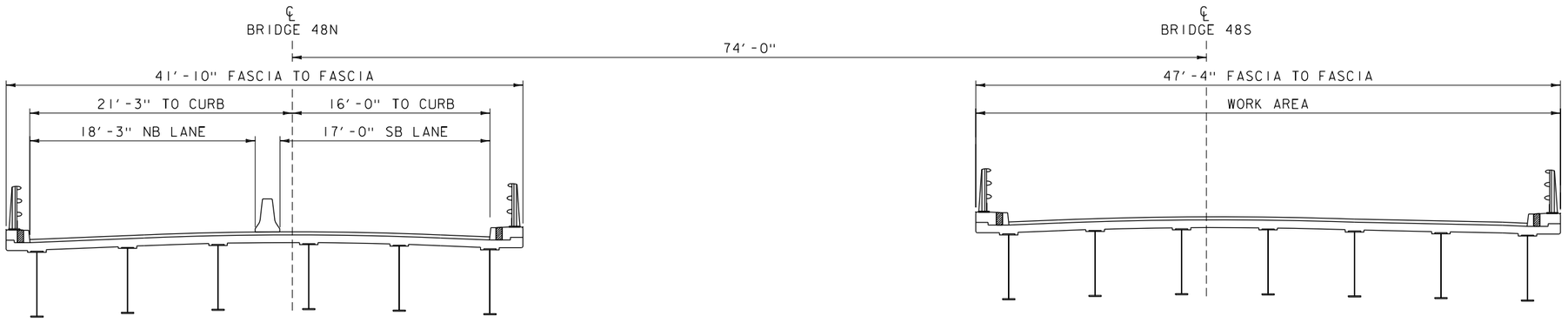
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: l2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT l2	SHEET 65 OF 86



BRIDGE 48 N/S NORTH BOUND CROSSOVER

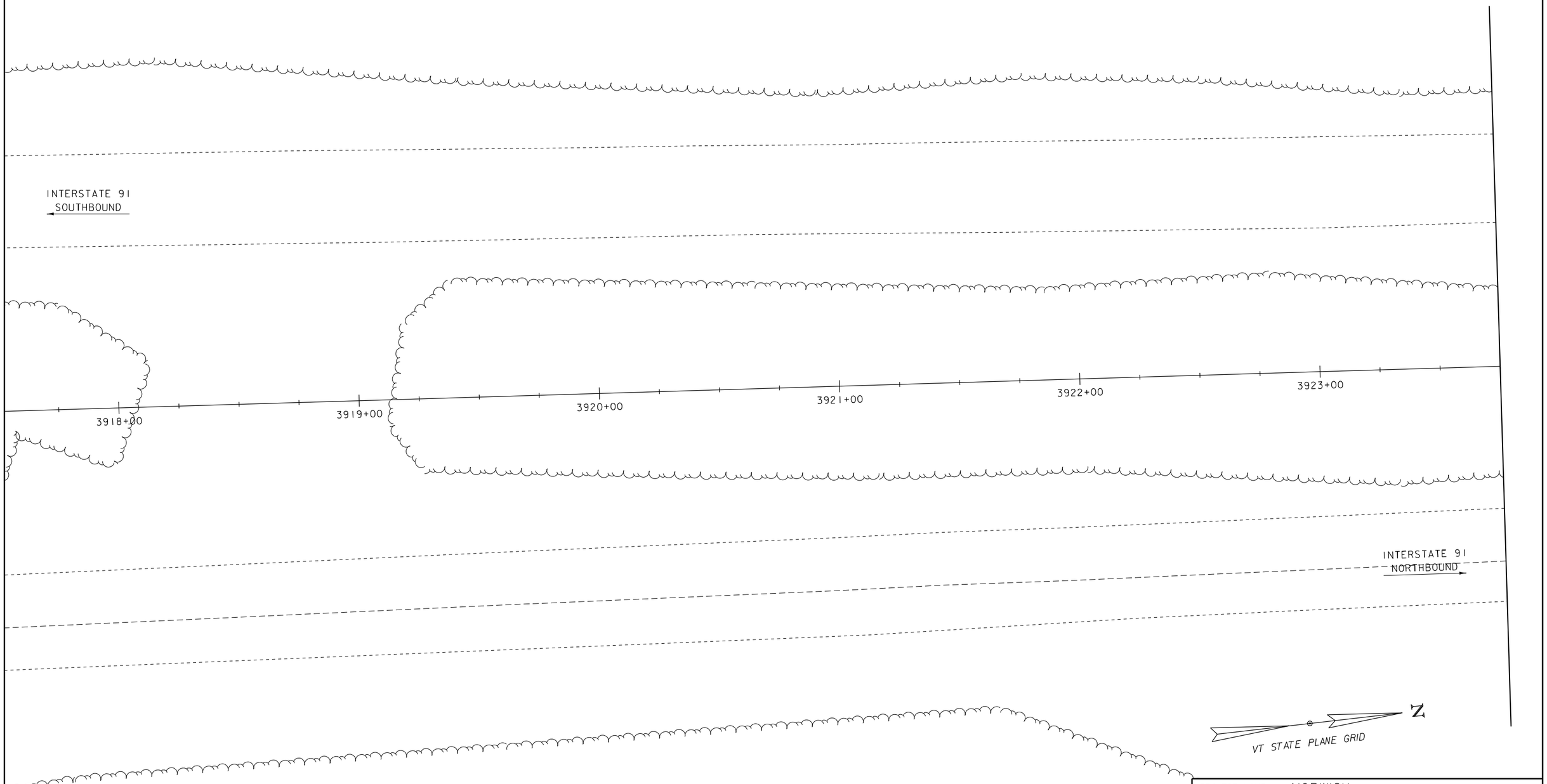
SCALE 3/16" = 1'-0"



BRIDGE 48 N/S SOUTHBOUND CROSSOVER

SCALE 3/16" = 1'-0"

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-3(53)
FILE NAME: l2a568/sl2a568traffic.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
CROSSOVER TYPICAL SECTIONS	SHEET 66 OF 86



NORTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 1	SHEET 67 OF 86

INTERSTATE 91
SOUTHBOUND

3924+00

3925+00

3926+00

3927+00

3928+00

3929+00

PC STA 3926+49.14

INTERSTATE 91
NORTHBOUND

N

VT STATE PLANE GRID

NORTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 2	SHEET 68 OF 86

INTERSTATE 91
SOUTHBOUND

3930+00
3931+00
3932+00
3933+00
3934+00
3935+00

INTERSTATE 91
NORTHBOUND

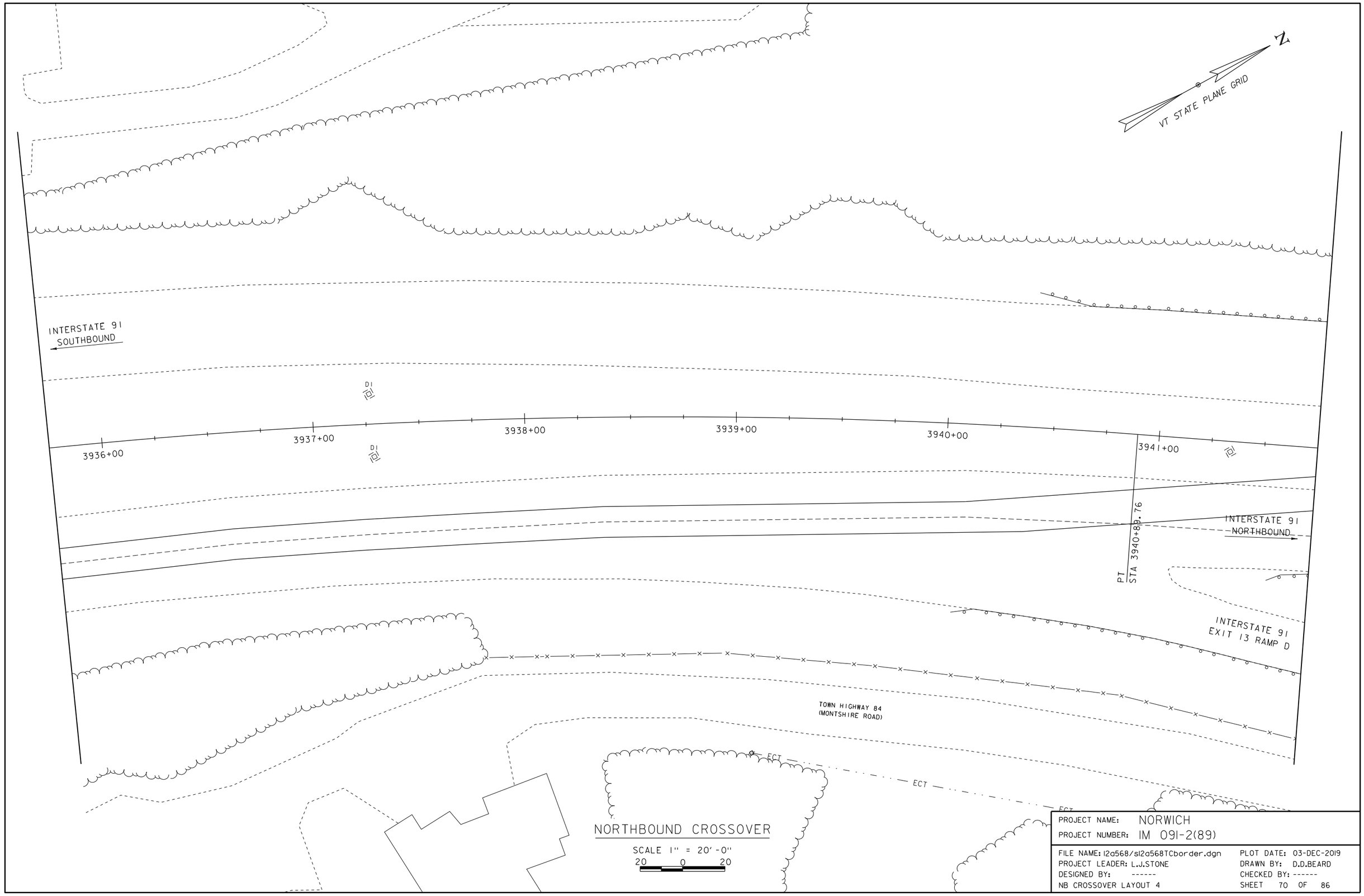
VT STATE PLANE GRID

N

NORTHBOUND CROSSOVER

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 3	SHEET 69 OF 86



NORTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME:	I2a568/sI2a568TCborder.dgn
PROJECT LEADER:	L.J.STONE
DESIGNED BY:	------
NB CROSSOVER LAYOUT 4	
PLOT DATE:	03-DEC-2019
DRAWN BY:	D.D.BEARD
CHECKED BY:	------
SHEET	70 OF 86

ECT

ECT

ECT

ECT

ECT

D1

D1

D1

D1

D1

INTERSTATE 91
SOUTHBOUND

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP D

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

24' x 650'
CONCRETE ARCH
FLOW

3942+00

3943+00

3944+00

3945+00

3946+00

3947+00

N

VT STATE PLANE GRID

NORTHBOUND CROSSOVER

SCALE 1" = 20'-0"

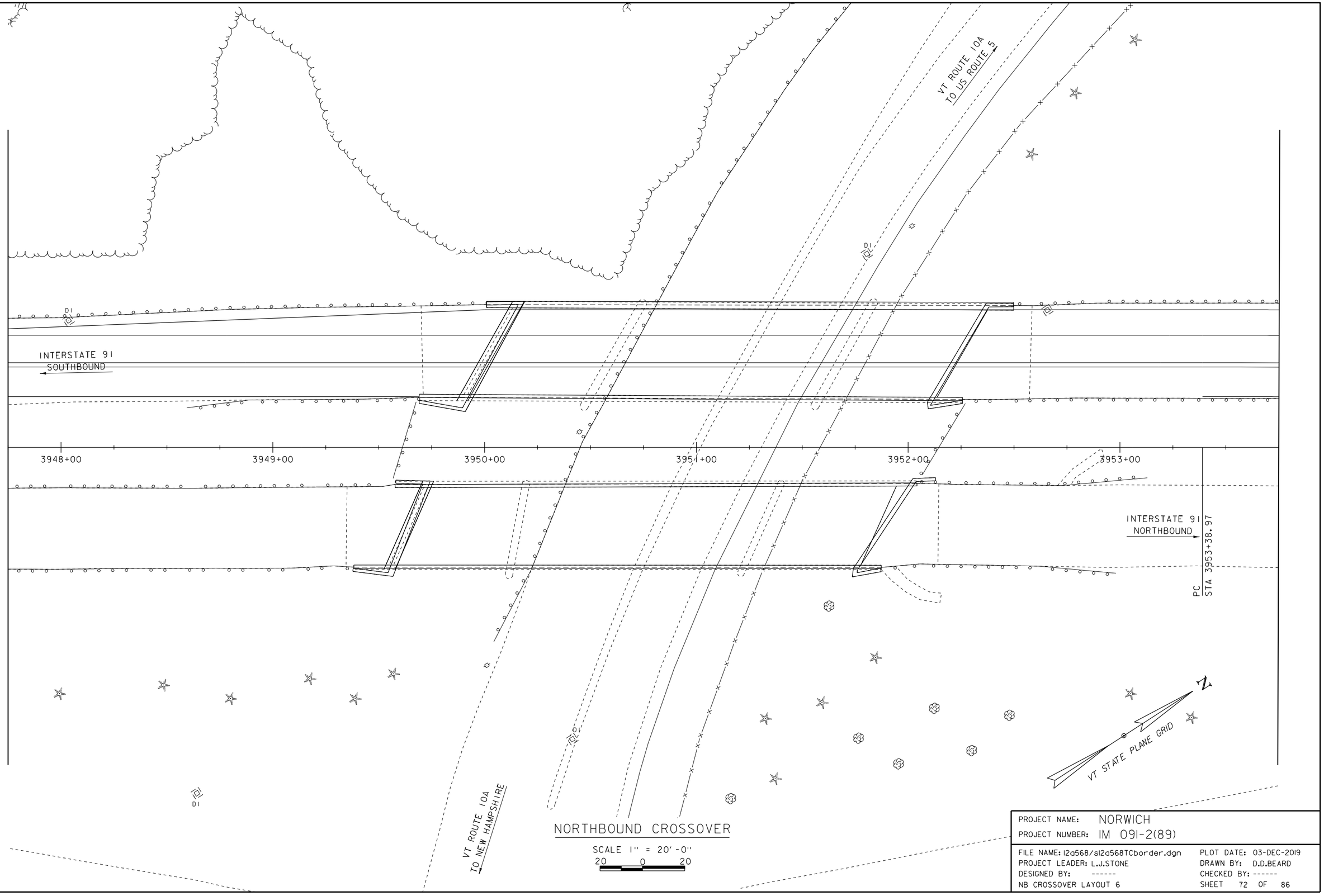
20 0 20

PROJECT NAME: NORWICH

PROJECT NUMBER: IM 091-2(89)

FILE NAME: l2a568/sl2a568TCborder.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NB CROSSOVER LAYOUT 5

PLOT DATE: 03-DEC-2019
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 71 OF 86



NORTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 6	SHEET 72 OF 86

INTERSTATE 91
EXIT 13 RAMP B

INTERSTATE 91
SOUTHBOUND

3954+00

3955+00

3956+00

3957+00

3958+00

3959+00

INTERSTATE 91
NORTHBOUND

INTERSTATE 91
EXIT 13 RAMP A

N

VT STATE PLANE GRID

NORTHBOUND CROSSOVER

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)

FILE NAME: l2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 7	SHEET 73 OF 86

INTERSTATE 91
EXIT 13 RAMP D

72" X 296' ACCGMPP
FLOW

INTERSTATE 91
SOUTHBOUND

3960+00

3961+00

3962+00

3963+00

3964+00

3965+00

D1

INTERSTATE 91
NORTHBOUND

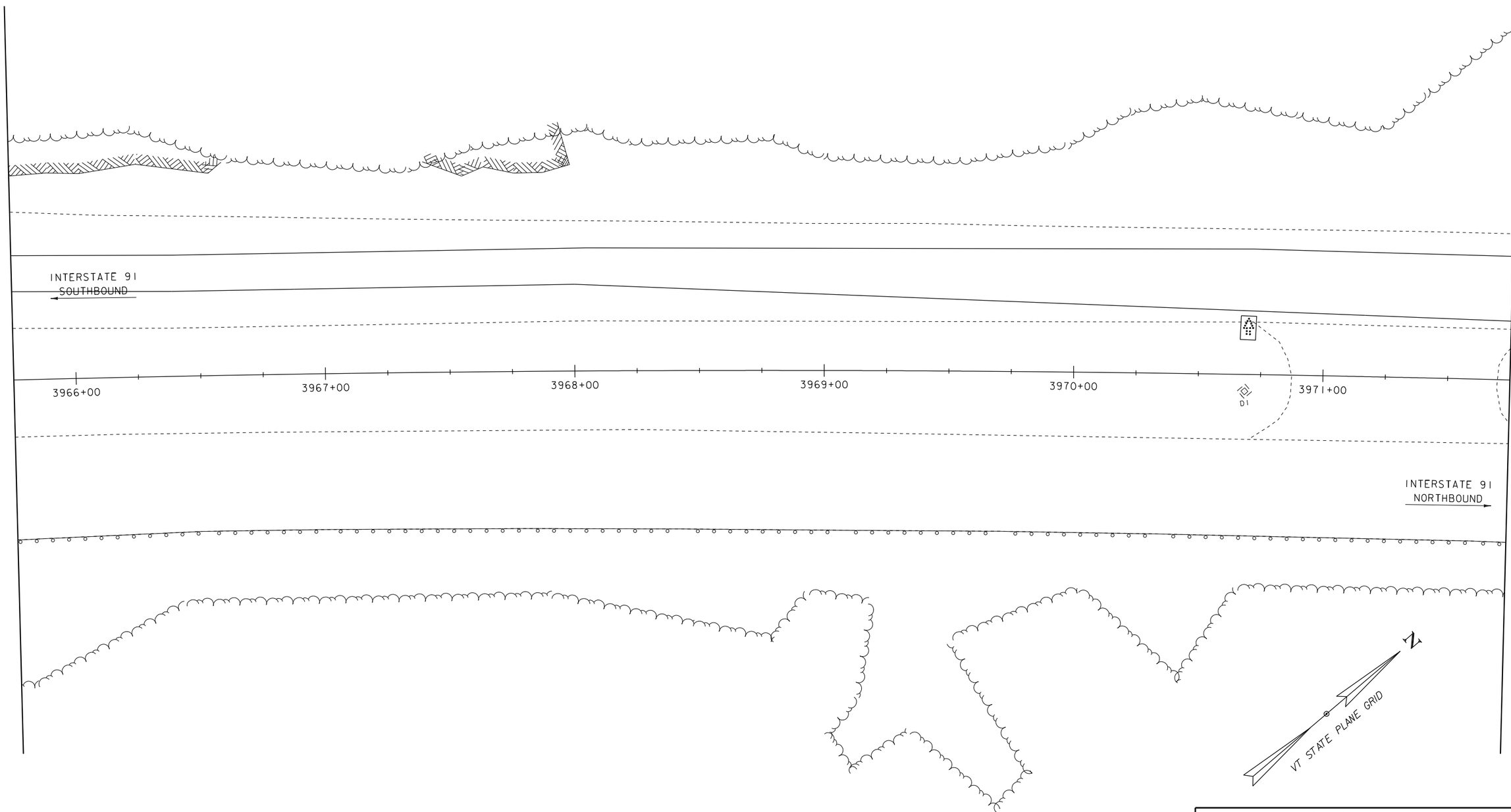
N

VT STATE PLANE GRID

NORTHBOUND CROSSOVER

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 8	SHEET 74 OF 86



NORTHBOUND CROSSOVER

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 9	SHEET 75 OF 86

INTERSTATE 91
SOUTHBOUND

3972+00 3973+00 3974+00 3975+00 3976+00 3977+00

D1

PT STA 3974+08.31

INTERSTATE 91
NORTHBOUND

VT STATE PLANE GRID

NORTHBOUND CROSSOVER

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT 10	SHEET 76 OF 86

INTERSTATE 91
SOUTHBOUND

3978+00 D1 3979+00 3980+00 3981+00 3982+00 D1 3983+00

INTERSTATE 91
NORTHBOUND

D1

N

VT STATE PLANE GRID

NORTHBOUND CROSSOVER

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NB CROSSOVER LAYOUT II	SHEET 77 OF 86

INTERSTATE 91
SOUTHBOUND

3924+00
3925+00
3926+00
3927+00
3928+00
3929+00

PC STA 3926+49.14

INTERSTATE 91
NORTHBOUND

VT STATE PLANE GRID

N

SOUTHBOUND CROSSOVER

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 2	SHEET 78 OF 86

INTERSTATE 91
SOUTHBOUND

3930+00
3931+00
3932+00
3933+00
3934+00
3935+00

INTERSTATE 91
NORTHBOUND

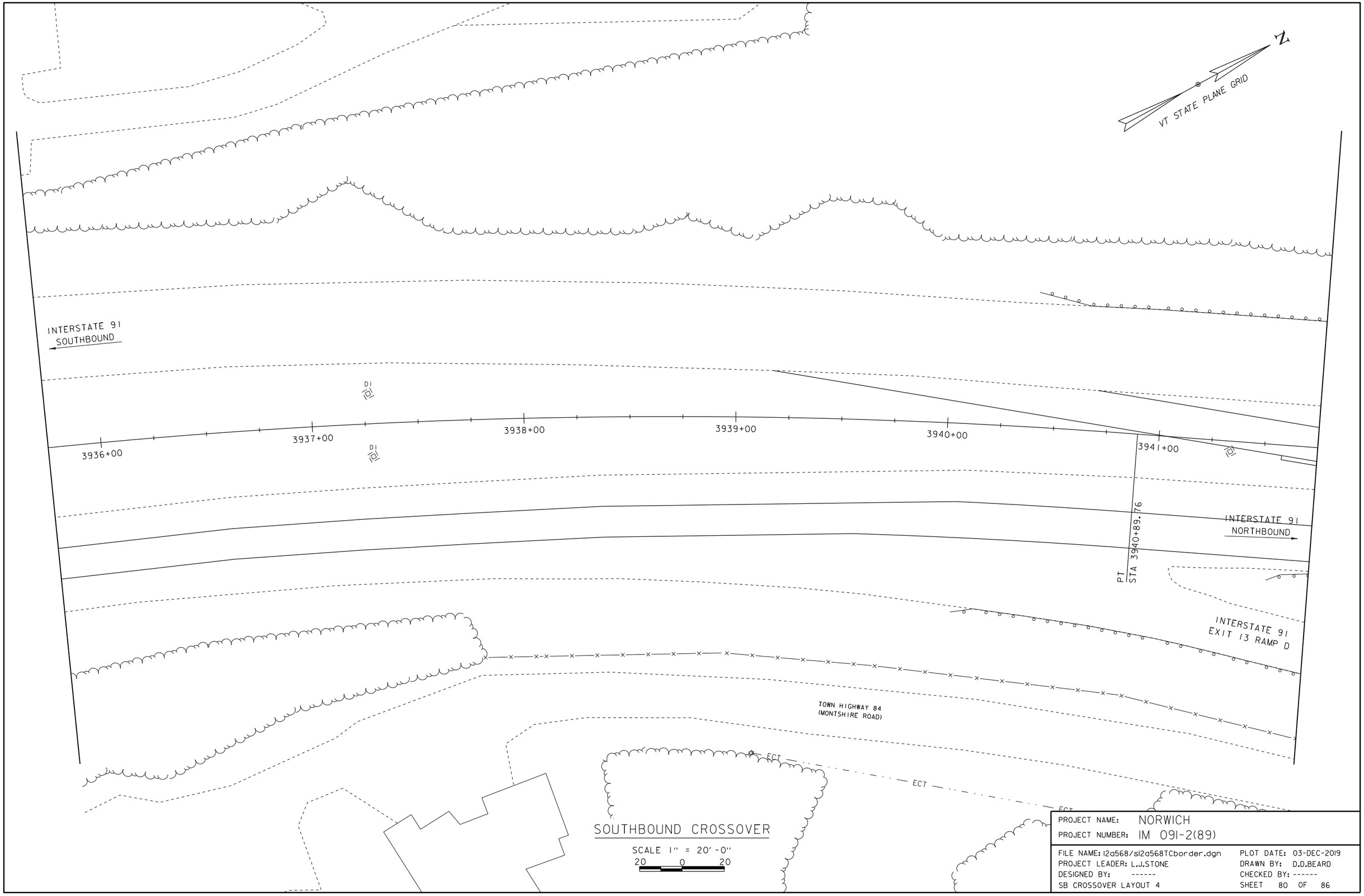
VT STATE PLANE GRID

N

SOUTHBOUND CROSSOVER

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 3	SHEET 79 OF 86



SOUTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)

FILE NAME: I2a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 4	SHEET 80 OF 86

N

VT STATE PLANE GRID

ECT

ECT

ECT

ECT

ECT

D1

D1

D1

D1

D1

INTERSTATE 91
SOUTHBOUND

3942+00

3943+00

3944+00

3945+00

3946+00

3947+00

INTERSTATE 91
NORTHBOUND

24' x 650'
CONCRETE ARCH
FLOW

INTERSTATE 91
EXIT 13 RAMP D

TOWN HIGHWAY 84
(MONTSHIRE ROAD)

SOUTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 5	SHEET 81 OF 86

VT ROUTE 10A
TO US ROUTE 5

D1

INTERSTATE 91
SOUTHBOUND

3948+00 3949+00 3950+00 3951+00 3952+00 3953+00

INTERSTATE 91
NORTHBOUND

PC
STA 3953+38.97

VT STATE PLANE GRID

VT ROUTE 10A
TO NEW HAMPSHIRE

SOUTHBOUND CROSSOVER

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 6	SHEET 82 OF 86

INTERSTATE 91
EXIT 13 RAMP B

INTERSTATE 91
SOUTHBOUND

3954+00

3955+00

3956+00

3957+00

3958+00

3959+00

INTERSTATE 91
NORTHBOUND

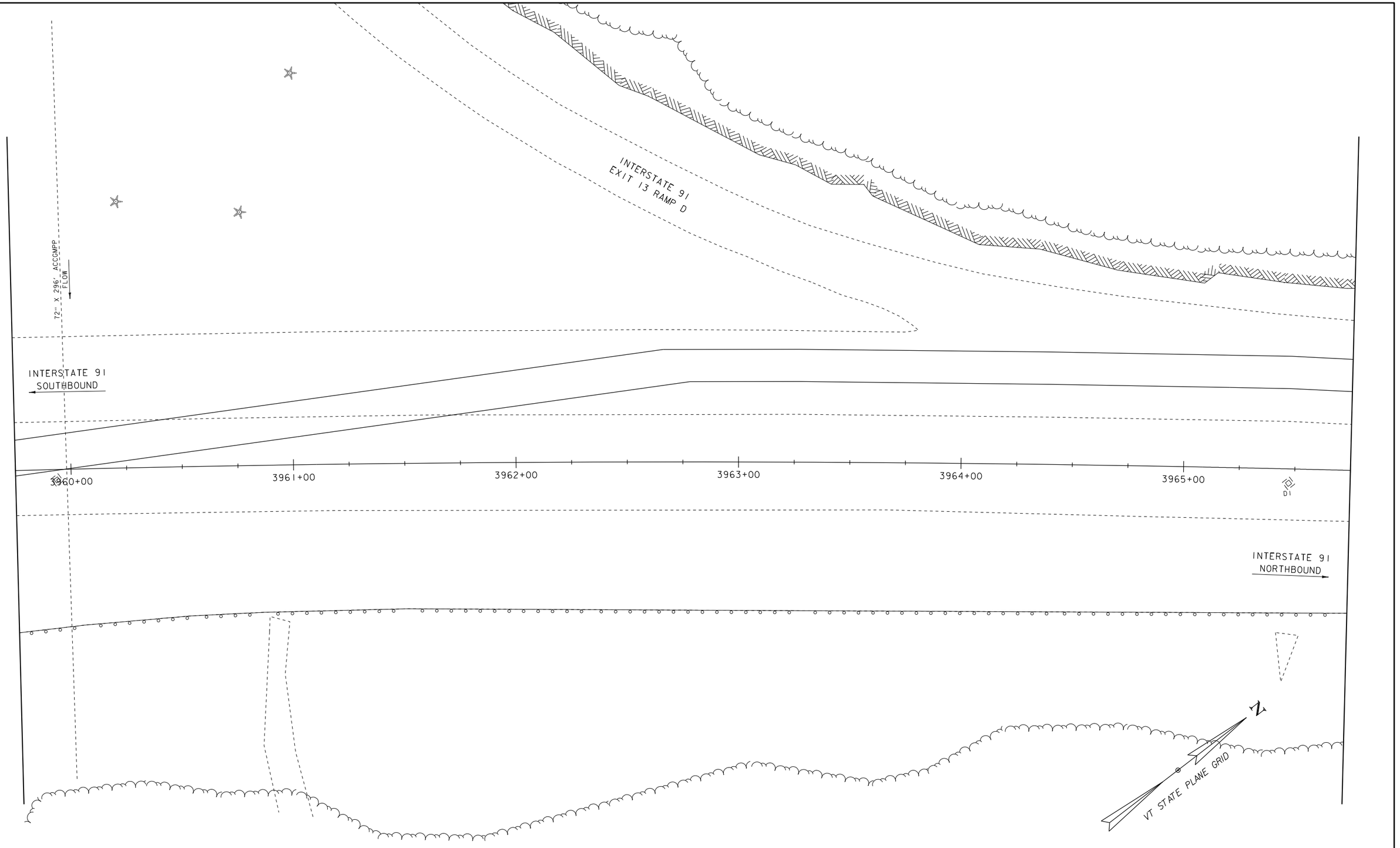
INTERSTATE 91
EXIT 13 RAMP A

VT STATE PLANE GRID

SOUTHBOUND CROSSOVER

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

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 7	SHEET 83 OF 86

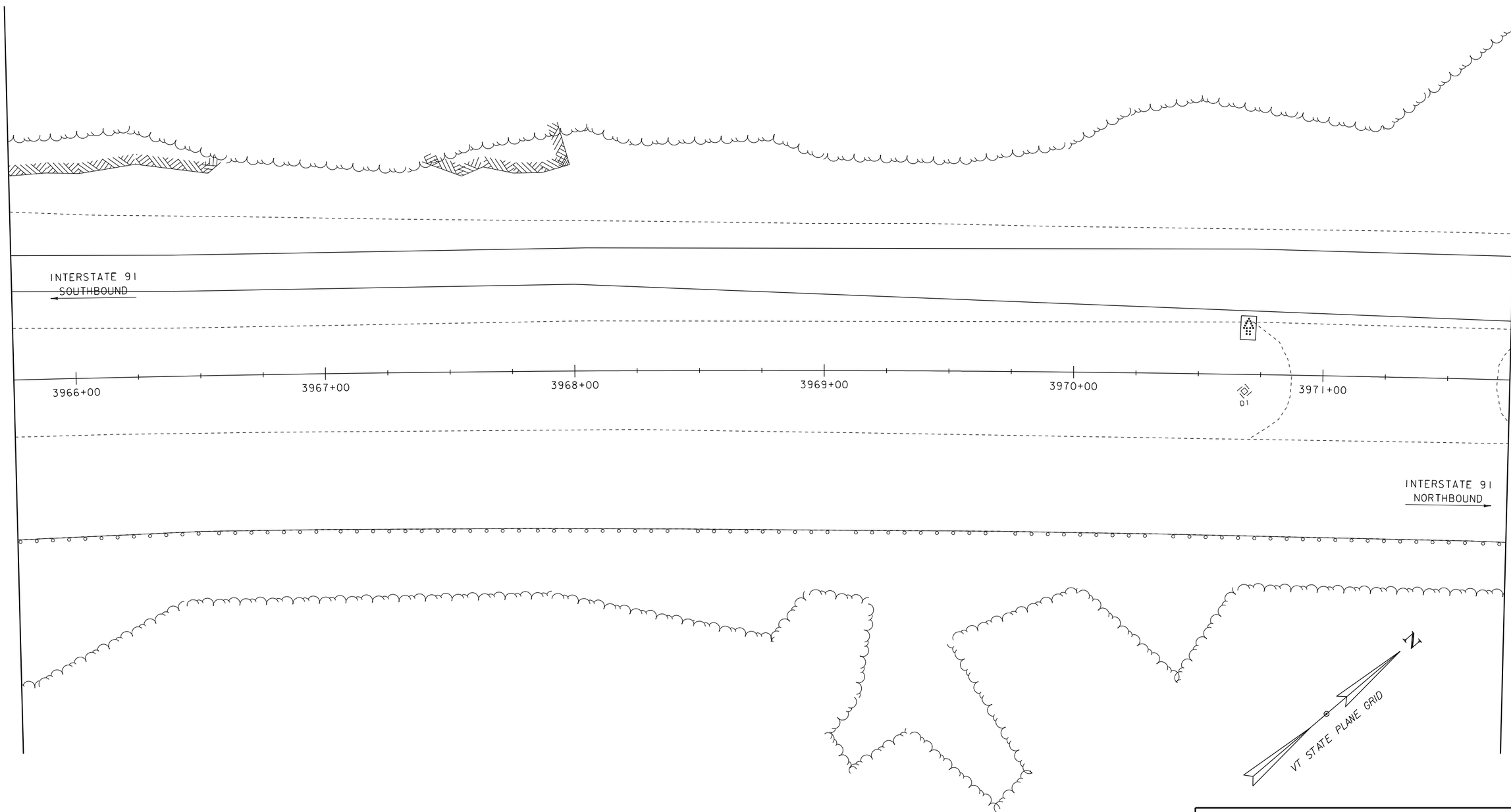


SOUTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	NORWICH
PROJECT NUMBER:	IM 091-2(89)
FILE NAME: 12a568/sl2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 8	SHEET 84 OF 86



SOUTHBOUND CROSSOVER

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
FILE NAME: I2a568/sI2a568TCborder.dgn	PLOT DATE: 03-DEC-2019
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 9	SHEET 85 OF 86

INTERSTATE 91
SOUTHBOUND

3972+00 3973+00 3974+00 3975+00 3976+00 3977+00

D1

PT STA 3974+08.31

INTERSTATE 91
NORTHBOUND

VT STATE PLANE GRID

SOUTHBOUND CROSSOVER

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

PROJECT NAME: NORWICH	
PROJECT NUMBER: IM 091-2(89)	
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PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
SB CROSSOVER LAYOUT 10	SHEET 86 OF 86