VT 2A Scoping Study – Industrial Avenue / Mountain View Road to River Cove Road

Williston, Vermont

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Final Report

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This study is the result of the support and strong interest of the Project Committee Members. Much of the background, history, local input, existing conditions, and consensus documented in the study are attributed to the Committee member's involvement. The study's quality and success is due to their contributions.

Executive Summary

The *VT 2A Scoping Study – Industrial Avenue/Mountain View Road to River Cove Road* was prepared at the request of the Town of Williston and the Chittenden County Regional Planning Commission (CCRPC) to evaluate alternative strategies to address existing and expected future travel demands at the VT 2A/Industrial Avenue/Mountain View Road intersection and along VT 2A north of this intersection. The operational and safety benefits associated with multiple improvement strategies were determined in the context of projected future peak hour traffic flows in the corridor. Alternatives were also evaluated with respect to their expected impacts on parcels abutting the roadways. Implementation costs for the various improvements were also considered. At the conclusion of an extensive public review process in which the findings of this evaluation were presented and reviewed, the Williston Selectboard chose a preferred alternative for implementation. The preferred plan includes the addition of left-turn lanes to the Industrial Avenue and Mountain View Road approaches to their intersection with VT 2A and the addition of a second northbound through lane on VT 2A at this location. North of the intersection to River Cove Road a widening of VT 2A to provide a two-way, left-turn lane consistent with a treatment planned for VT 2A north of River Cove Road is supported.

Existing Conditions

VT 2A is a state highway and is the principal roadway link between Tafts Corner in Williston and Essex Junction. It generally functions as a two-lane, two-way roadway with paved shoulders that are generally suitable for bicycle traffic. Sidewalks or multi-use paths parallel the roadway in some sections. In the project study area a multiuse path follows the west side of the roadway. Bus transit services are provided along VT 2A by the Chittenden County Transportation Authority. Traffic operations are generally controlled by the signalized intersections in the corridor. The VT 2A/Industrial Avenue/Mountain View Road intersection is a high-volume, signalized intersection which contributes to peak hour traffic congestion. The existing lane configuration of the VT 2A/Industrial Avenue/Mountain View Road intersection consists of the following by approach:

- Southbound VT 2A – One 125-foot long left-turn lane, one through lane and one 250 foot long right-turn lane;
- Northbound VT 2A – One 75-foot long left-turn lane and one shared through/right-turn lane;
- Eastbound Industrial Ave – One 200-foot long left-turn lane and one shared through/ right-turn lane;
- Westbound Mountain View Road – One 150-foot long right-turn lane and one shared through/left-turn lane.

Pedestrian crosswalks are present on the west side of the intersection across Industrial Avenue and across VT 2A on the south side of the intersection. There is an existing sidewalk along the west side of VT 2A to the north and on the east side south of the intersection. Land use in the vicinity of the intersection is primarily residential although significant truck traffic uses the intersection generated in part by land uses further west along Industrial Avenue.

Existing Traffic Demands and Traffic Operations

VT 2A carries 12,600 vehicles per day (vpd) south of Industrial Avenue and 18,100 vpd north of Industrial Avenue. The higher volumes north of the intersection reflect the fact that most of the traffic using Industrial Avenue also uses VT 2A north of the intersection. Industrial Avenue carries 8400 vpd. Mountain View Road carries 5600 vpd. Approximately 11 percent of the daily traffic on VT 2A passes through the Industrial Avenue/Mountain View Road intersection during the evening commuter peak hour. Volumes are lighter during the morning commuter peak hour with hourly volumes during this hour accounting for only nine percent of the daily total.

The higher volumes during the PM peak traffic hour combined with a heavy left-turn demand from Industrial Avenue eastbound to VT 2A northbound causes some traffic congestion during this time period. The VT 2A/Industrial Avenue/ Mountain View Road intersection presently operates at 98 percent of its capacity during the PM peak hour. During the afternoon peak hour vehicle queues on Industrial Avenue can extend as far west as Avenue C, a distance of approximately one-half mile from VT 2A. Morning peak hour conditions are less severe with the intersection operating at only 79 percent of its capacity during this hour.

Future Conditions

Projections of future traffic conditions in the study area were made by considering planned area roadway improvements and potential future traffic growth. Area-wide land use and traffic forecasting models employed the CCRPC were used to define an expected traffic growth rate for the area. A growth rate of approximately one percent per year was used to project traffic flows over a 20-year time horizon to 2033. This growth rate will be supported by planned improvements to VT 2A and Industrial Avenue. North of River Cove Road VTrans is proposing to widen VT 2A from its existing two-lane cross section to a three-lane cross section with a two-way center left-turn lane. At the west end of Industrial Avenue where it meets Route 2 plans are being developed to construct a second left-turn lane from Route 2 eastbound to Industrial Avenue eastbound. A section of industrial Avenue near the intersection will be widened to accept the additional traffic flows that the proposed double left-turn lanes will be able to deliver.

Analyses of the projected year 2033 peak hour traffic flows at the VT 2A/Industrial Avenue/Mountain View Road intersection indicate a significant worsening of traffic operations relative to existing conditions. PM peak hour traffic demands will exceed the theoretical intersection capacity by 19 percent. During the AM peak traffic hour conditions will match existing PM peak hour conditions. For the AM peak hour the intersection is expected to operate at 98 percent of capacity in 2033, the same "volume-to-capacity ratio" experienced during the PM peak hour today.

Alternatives

Various alternative improvement plans were developed for the Route 2A/Mountain View Road/Industrial Avenue intersection with the objective of providing sufficient vehicular carrying capacity to accommodate the projected 2033 peak hour traffic demands while maintaining a high level of pedestrian and bicycle accommodations. In this regard, two strategies were pursued. The first considered building upon the existing signalized intersection configuration by adding lanes and/or changing lane use conditions incrementally to achieve the desired level of operations. The second strategy examined a whole new intersection configuration, a modern roundabout. Here again, lanes were added incrementally until the desired operating condition could be achieved. At the same time, alternative plans were developed for the widening of VT 2A north of the Industrial Avenue intersection with the goal of improving traffic flow, safety and pedestrian accommodations. These alternatives included the addition of a sidewalk on the east side of the road and/or a center two-way, left-turn lane as currently proposed for VT 2A north of River Cove Road.

Findings

A detailed evaluation of all of the intersection improvement alternatives indicated that only two alternatives would enable the intersection to operate comfortably below capacity under the projected 2033 peak hour traffic flow conditions. These included the most aggressive signalized intersection expansion plan, Option 3, which allowed the intersection operate at only 89 percent of capacity under 2033 PM peak hour conditions. Option 3 would add to the intersection a westbound left-turn lane; a second eastbound left-turn lane; and a second northbound through lane.

The other "viable" alternative was a two-lane, modern roundabout which could operate at only 85 percent of capacity under 2033 PM peak hour traffic conditions. The signalized intersection alternative was found to have greater land area impacts as it involves roadway widening along all four of the intersection approaches. Roadway widenings to implement the roundabout alternative were mostly concentrated at just the location of the intersection itself. Plans to widen VT 2A north of the intersection to include both a two-way, left-turn lane and a new sidewalk on the east side of the roadway were found to have land area impacts well beyond the existing roadway right-of-way. Consequently, viable alternatives for this roadway segment were limited to just adding a two-way, left-turn lane or a sidewalk.

Recommended Alternative

The alternative improvement plans for the study area were presented to Town officials and residents at a series of public meetings. At the conclusion of the public review process the Williston Selectboard voted to advance intersection Option 3, the expanded signalized intersection alternative shown below. In selecting intersection Option 3 over the multilane roundabout alternative, the Selectboard noted concerns regarding limited public acceptance of roundabouts in Williston. The addition of a two-way, left-turn lane as shown below was supported for the roadway segment treatment as it would facilitate safer left-turn movements to and from VT 2A and allow for enhanced pedestrian crossings. The proposed cross section is also consistent with the treatment proposed for VT 2A just north of River Cove Road. The

Selectboard recommendations were accepted by the CIRC Alternatives Task Force allowing the CCRPC and the Town of Williston to now pursue funding for the permitting and design of the recommended improvement plans.

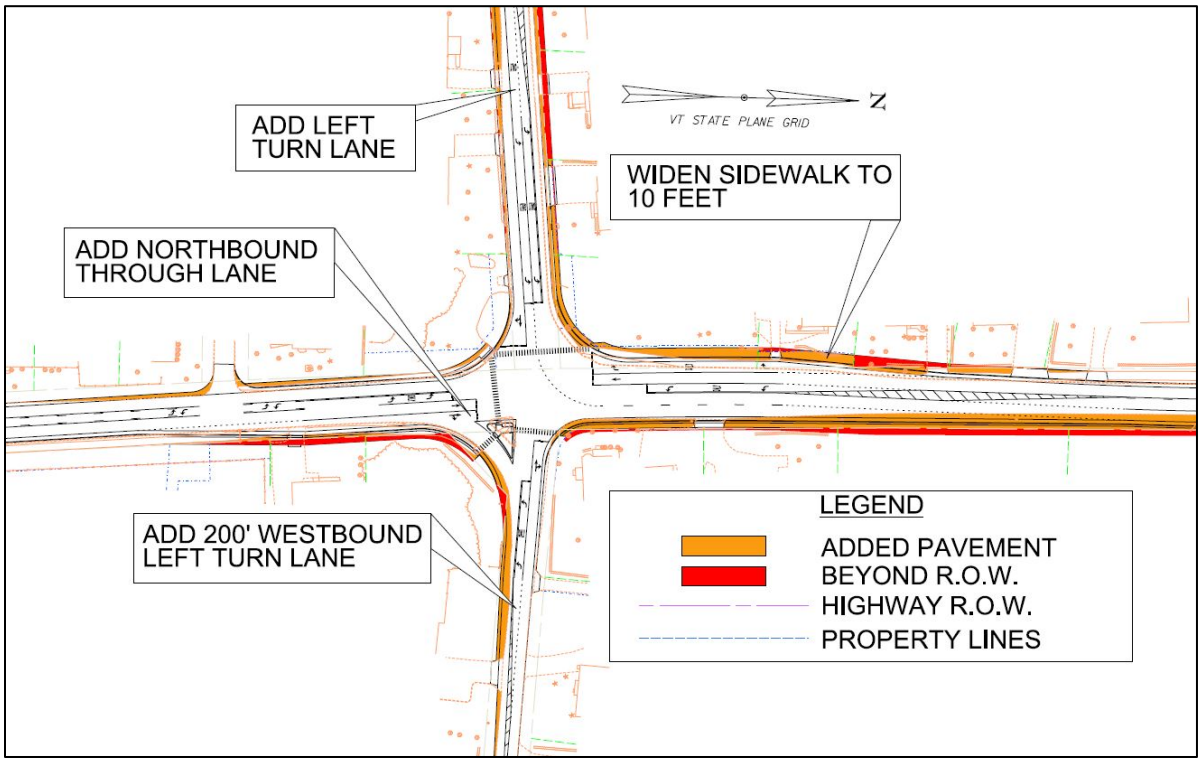

Figure ES-1 Proposed VT 2A/Industrial Avenue/Mountain View Road Intersection Plan

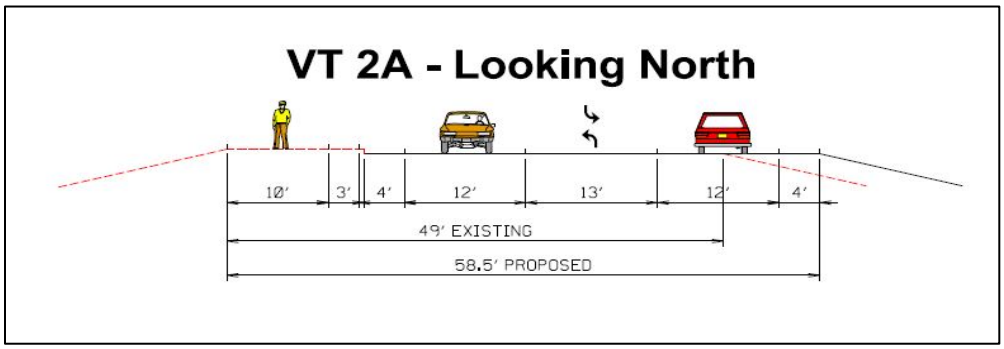

Figure ES-2 Proposed VT 2A Cross Section Treatment North of Industrial Avenue

Contents

Figure List

Table List

1.0 Introduction

The *VT 2A Scoping Study – Industrial Avenue/Mountain View Road to River Cove Road* was prepared at the request of the Town of Williston and the Chittenden County Regional Planning Commission (CCRPC) to evaluate alternative strategies to address existing and expected future travel demands at the VT 2A/Industrial Avenue/Mountain View Road intersection and along VT 2A north of this intersection. The operational and safety benefits associated with multiple improvement strategies were determined in the context of projected future peak hour traffic flows in the corridor. Alternatives were also evaluated with respect to their expected impacts on parcels abutting the roadways. Implementation costs for the various improvements were also considered. At the conclusion of an extensive public review process in which the findings of this evaluation were presented and reviewed, the Williston Selectboard chose a preferred alternative for implementation. The preferred plan includes the addition of left-turn lanes to the Industrial Avenue and Mountain View Road approaches to their intersection with VT 2A and the addition of a second northbound through lane on VT 2A at this location. North of the intersection to River Cove Road a widening of VT 2A to provide a two-way, left-turn lane consistent with a treatment planned for VT 2A north of River Cove Road is supported. This study documents the analyses leading to this recommendation.

1.1 Project Background

The Chittenden County Regional Planning Commission (CCRPC) has been working with numerous communities in Chittenden County to address area transportation issues now that plans for further development of the Circumferential Highway (The CIRC) have been cancelled by the State of Vermont. A CIRC Alternatives Task Force was formed comprised of representatives of each of the communities affected by cancellation of the CIRC and other key stakeholders. Likewise, the CCRPC commissioned various studies to develop alternative transportation system improvement plans. The Williston-Essex Network Transportation Study (WENTS) is one such study recently completed that outlined broad strategies to address congestion and mobility issues in Williston. The WENTS study flagged the VT 2A/Industrial Avenue/Mountain View Road intersection as an existing bottleneck where conditions will worsen over time with future traffic growth. Accordingly, the WENTS recommended that a more detailed scoping study be prepared to define a preferred improvement plan for this location.

The WENTS also recommended bicycle and pedestrian facility improvements in the project area. These included:

- A shared path facility on Mountain View Road (south side) from Old Stage Road to VT 2A.
- A sidewalk on the east side of VT 2A from Mountain View Road to River Cove Road. (A sidewalk is also proposed on the east side of VT 2A from Morgan Parkway north to Eastview Circle as part of the ongoing VT 2A/James Brown Drive project.))

Based on these recommendations, the Town of Williston and the CCRPC commissioned this study to define a preferred improvement plan for VT 2A between Industrial Avenue/Mountain View Road and River Cove Road inclusive of the VT 2A/Industrial Avenue/Mountain View Road intersection.

1.2 Project Area

The project study area includes the VT 2A/Industrial Avenue/Mountain View Road intersection and extends northerly along VT 2A to River Cove Road. The segment of VT 2A north of Industrial Avenue includes intersections with Hillside Drive and Sharon Drive entering from the west and Bittersweet Circle entering from the east. Figure 1 shows the location of the project area within the Town of Williston.

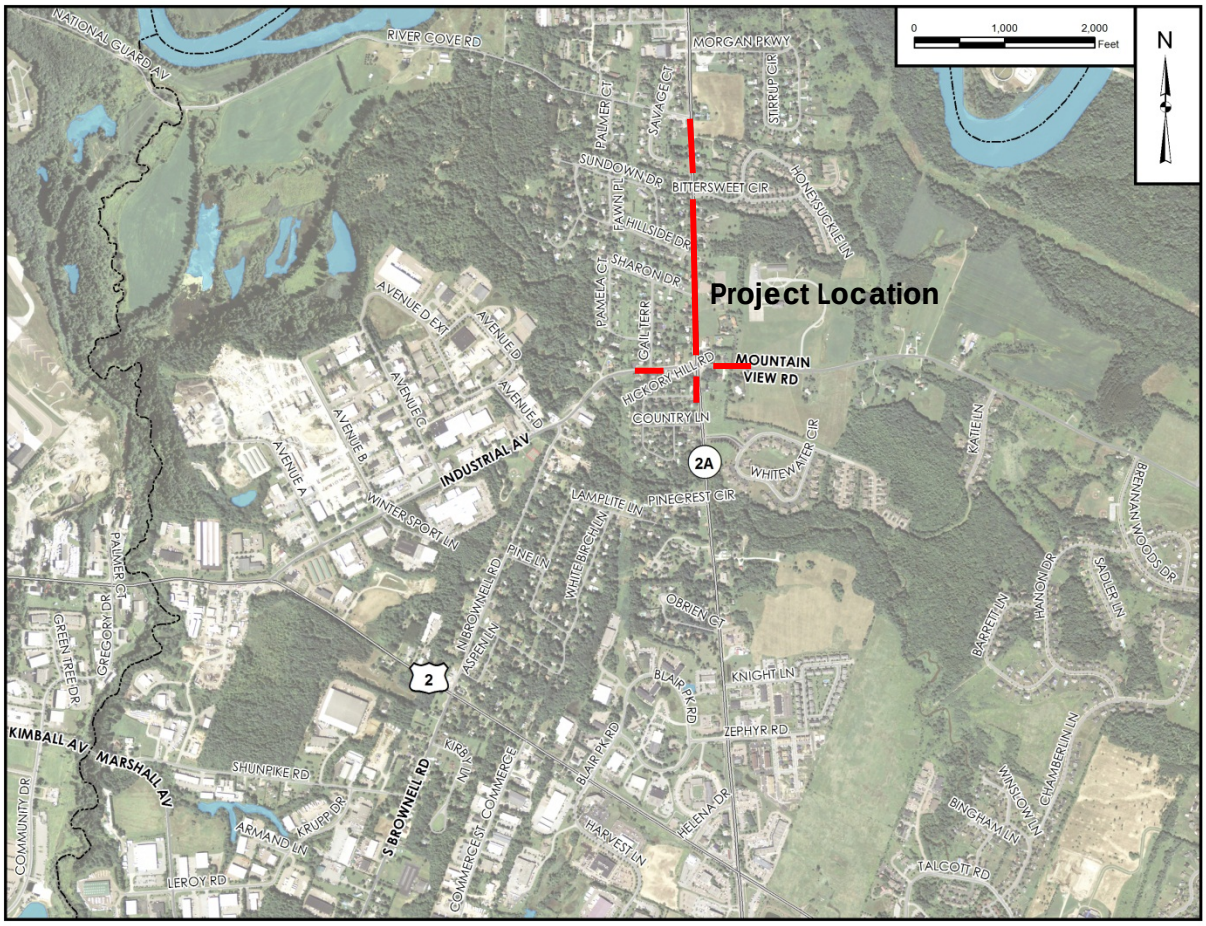

Figure 1: Project Location Plan

1.3 Study Process

A multi-step planning process was completed that included the following major steps listed below.

- Project Initiation
- Data Collection and Quantification of Existing Conditions
- Future Traffic Forecasts and Analysis
- Local Concerns Meeting
- Development and Evaluation of Alternatives
- Public Hearings
- Selection of Preferred Alternative
- Documentation

During the project initiation phase the study team was assembled and a work plan was developed. Data were then collected including a topographic survey of the study area, a natural resources review, and an historic/archeological survey to define existing roadway, traffic and environmental conditions. Traffic forecasts were then developed and used to evaluate expected roadway operations during peak traffic hours under future conditions for a 2035 design year. The findings of this investigation and existing conditions plans were presented to area residents at a Local Concerns Meeting where residents were asked to comment on their priorities and concerns for the study area. Alternative plans were then developed by the project team to address the concerns raised in the meeting. A project Purpose and Need Statement was also drafted at this time to provide guidance in evaluating the alternatives. The alternative plans were then presented to area residents and Town officials in a series of public meetings. At these meetings the expected performance of each alternative in terms of traffic operations, safety and multi-modal accommodations were weighed against the impacts of each alternative measured in terms of construction cost, potential land takings and loss of mature trees. (Environmental, historical and archeological impacts are not expected to be significantly different among the alternatives considered based on the existing conditions analysis.) Based on the public comments received and its own evaluation of the alternatives presented, the Williston Selectboard selected a preferred alternative. This report was completed subsequent to the Selectboard decision to document the study findings and process.

2.0 Existing Conditions

Existing land, roadway and traffic conditions for the study area were developed through the assemblage of existing data and through the collection of new data. Compiled information includes:

- Roadway conditions including roadway cross sections, right-of-way, sidewalks, bike lanes or shoulders, driveways, and traffic controls. (A topographic survey conducted by VSE as part of this study was used to compile roadway base plans for the study area.)
- Existing potential environmental constraints. (A field inspection and resource/map review was conducted by an environmental scientist as part of this study.)
- Existing potential historical and archeological constraints. (Field visits and file research were conducted by Hartgen Archeological Associates, Inc. for this study.)
- Travel demands including AM and PM commuter peak hour vehicular traffic volumes, daily traffic volumes, and pedestrian and bicycle volumes. (Recent traffic counts conducted by VTrans were used to define existing volumes for the Industrial Avenue/VT 2A intersection and new counts were conducted for the Sharon Drive and Hillside Drive intersections with VT 2A.)
- Public transit facilities, services and usage. (These were defined by published route information and field observations.)
- Recent crash experience. (Crash data were compiled from VTrans' database.)
- Peak hour roadway performance based on capacity analyses for intersections.

The existing conditions data collection efforts and findings are presented below.

2.1 Existing Roadway Conditions

The project study area includes approximately one half mile of VT 2A from its intersection with Industrial Avenue and Mountain View Road and extending north to River Cove Road. North of Industrial Avenue, Hillside Drive and Sharon Drive enter VT 2A from the west and Bittersweet Circle enters from the east. These side streets are two-lane Town roads used for local access to residential properties. Existing roadway conditions in the corridor are described below.

2.1.1 VT 2A

Route 2A is classified as an urban, minor arterial. Its orientation through the project study area is north-south. To the south VT 2A intersects with US Route 2 at Tafts Corner approximately one mile south of Industrial Avenue. Still farther south (approximately 1.5 miles south of Industrial Avenue) VT 2A has an interchange with Interstate Route 89. To the north VT 2A passes through Essex Junction at Five

Corners. Primarily residential land uses abut the roadway in the study area although commercial uses are present along the west side of the roadway north of River Cove Road and on both sides of the roadway in the Tafts Corner area. Throughout the study area VT 2A is a two-lane, two-way roadway with turning lanes added at the Industrial Avenue/Mountain View Road intersection. The typical section includes 12-foot wide travel lanes and paved four-foot wide shoulders. An eight to ten-foot wide multi-use path is provided on the west side of the roadway separated from the roadway by a greenbelt of varying width. At the intersection with Industrial Avenue/Mountain View Road the multi-use path meets a five-foot sidewalk running along the north side of Industrial Avenue. South of Industrial Avenue, a five-foot sidewalk continues on the west side of VT 2A for about 250 feet while the multi-use path continues on the east side of VT 2A for about 750 feet to the Meadow Run neighborhood.

2.1.2 Intersections

The intersection of VT 2A/Industrial Avenue/Mountain View Road is state-owned and controlled by a traffic signal under the authority of the Vermont Agency of Transportation (VTrans). The existing lane configurations of the VT 2A/Industrial Avenue/Mountain View Road intersection approaches consist of the following:

- Southbound VT 2A – One 125-foot long left turn lane, one through lane and one 250-foot long right turn lane.
- Northbound VT 2A – One 75-foot long left turn lane and one shared thru/right turn lane. A raised island provides channelization for the right-turn movement.
- Eastbound Industrial Ave – One 200-foot long left turn lane and one shared thru/ right turn lane.
- Westbound Mountain View Road – One shared approach lane.

Pedestrian crosswalks are present on the west side of the intersection across Industrial Avenue and on the south side of the intersection across VT 2A. There is a multi-use path along the west side of VT 2A to the north and on the east side to the south of the intersection as well as a sidewalk on the west side of VT 2A to the south. A sidewalk is also present along the north side of Industrial Avenue at the intersection. There are no bike lanes designated at the intersection however, the existing paved shoulders on VT 2A accommodate bike traffic. The surveyed plan for this intersection is provided in Appendix A.

The VT 2A/Industrial Avenue/Mountain View Road intersection is under traffic signal control. The traffic signal provides an advanced protected left-turn phase for the eastbound Industrial Avenue approach. South bound right-turns from VT 2A to Industrial Avenue receive a green signal indication during this phase. The traffic signal is not coordinated with other signalized intersections along VT 2A. An “all walk” pedestrian signal phase can be activated via pushbuttons.

Sharon Drive intersects VT 2A from the west approximately 500 feet north of Industrial Avenue, and Hillside Drive intersects VT 2A from the west approximately 900 feet north of Industrial Avenue. Bittersweet Circle meets VT 2A from the east approximately 1400 feet north of Industrial Avenue. Each of these two-lane, two-way side streets join VT 2A at a T-type intersection with STOP-sign control on the side street. No turn lanes are provide on VT 2A at these intersections. As noted above, the multi-use path continues along the west side of VT 2A at these

intersections. A sidewalk is provided on the south side of Bittersweet Circle leading out to VT 2A. There are no sidewalks on Sharon Drive or Hillside Drive. The surveyed plan for VT 2A north of Industrial Avenue is provided in Appendix A.

2.2 Traffic Volumes

Traffic volume data for the study area were collected from various sources. Twelve hour turning movement counts were available from VTrans and the CCRPC for the VT 2A / Industrial Avenue / Mountain View Road intersection for 2012. These counts were recorded during the first two weeks of June. Vehicle turning movement and classification counts were taken by Stantec at the VT 2A intersections with Sharon Drive and Hillside Drive during April 2013. The commuter period volumes generally peaked from 7:45 to 8:45 AM and from 4:45 to 5:45 PM.

The collected traffic data were used to create "Design Hour Volume" (DHV) traffic flow networks. The DHV networks are meant to represent the 30th highest hourly volumes that would occur on the roadway over the course of a year. Since volumes are not counted continuously for a year at this location, VTrans provides formulas to estimated DHV's based on continuous traffic count data for nearby and/or similar roadways. The observed VT 2A / Industrial Avenue / Mountain View Road intersection volumes were increased to 2013 DHV levels per VTrans standards. Then the Hillside Drive and Sharon Drive volumes were balanced with the VT 2A / Industrial Avenue / Mountain View Road DHV's to create the existing traffic flow networks for AM and PM commuter peak hours shown in Figures 2 and 3. The collected traffic data and DHV calculations are included in Appendix B

Daily traffic volumes for the study area roadways were obtained from CCRPC and VTrans records as well. As noted in Table 2, VT 2A carries 12,600 vehicles per day (vpd) south of Industrial Avenue and 18,100 vpd north of Industrial Avenue. Volumes are much lower on Industrial Avenue and Mountain View Road with Industrial Avenue carrying approximately 8,400 vpd and Mountain View Road carrying 5,600 vpd. Based on the peak period turning movement counts estimated volumes on Sharon Drive and Hillside Drive are fewer than 500 vehicles per day. Similarly, based on the number of residences on Bittersweet Circle, Bittersweet Circle carries approximately 500 vehicles per day.

Location	Daily Traffic Volume	Count Date
VT 2A-South of Industrial Avenue	12,600	2010
VT 2A-North of Industrial Avenue	18,100	2012
Industrial Ave – West of VT 2A	8,400	2009
Mountain View Road - East of VT 2A	5,600	2011

Table 1: Existing Daily Traffic Volumes

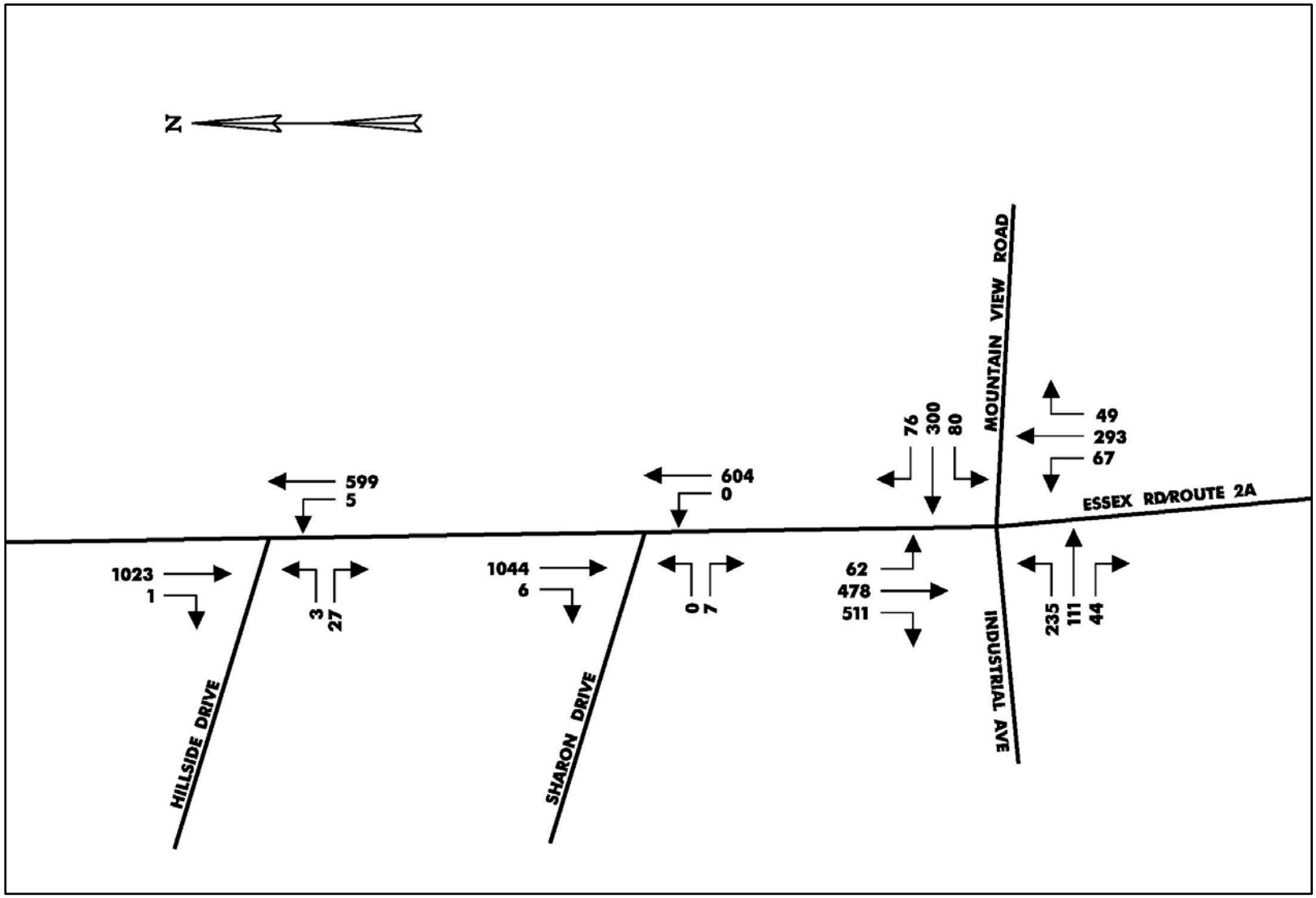

Figure 2: 2013 AM Peak Hour Volumes

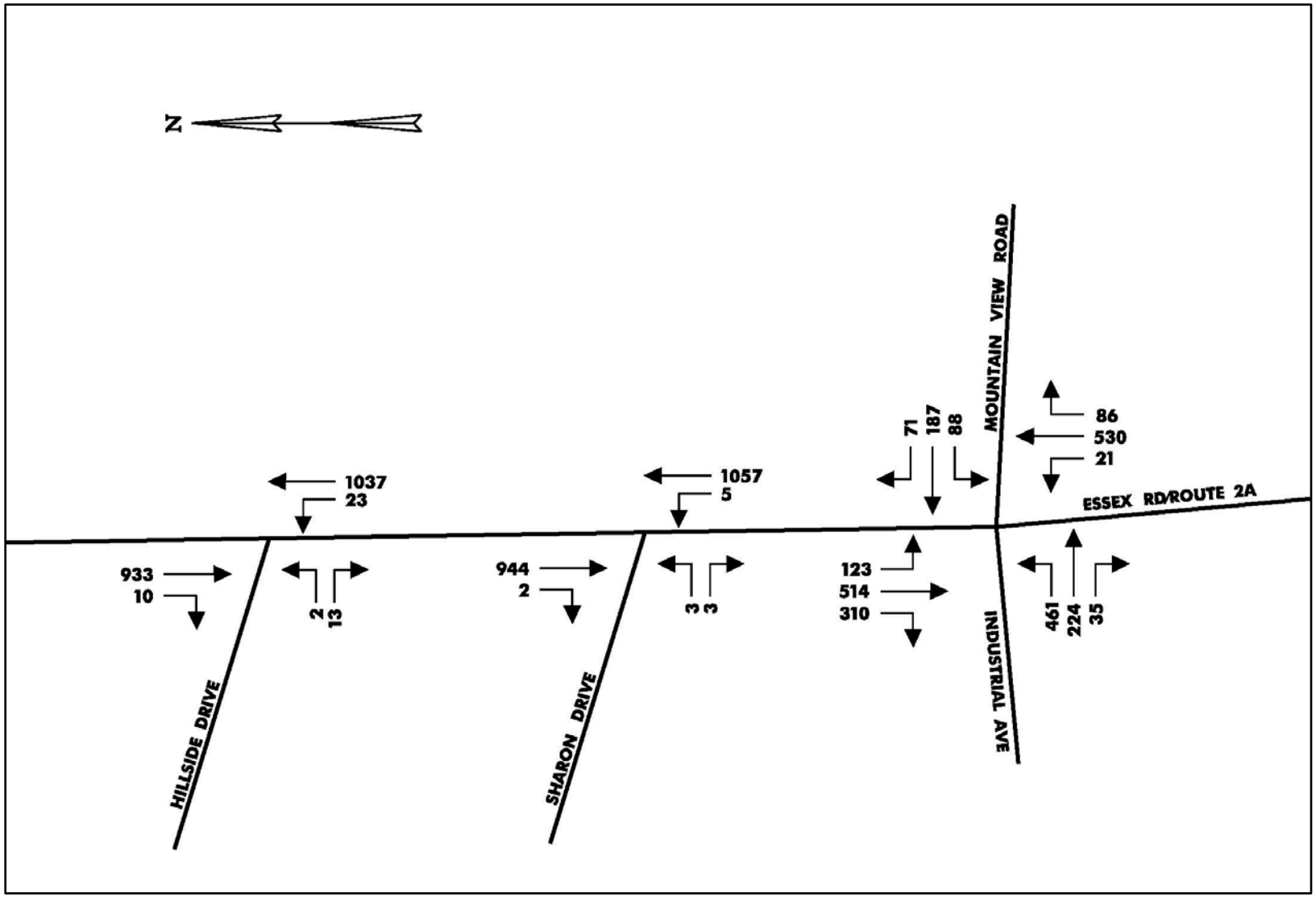

Figure 3: 2013 PM Peak Hour Volumes

2.3 Traffic Operations

Intersection and roadway operating levels of service (LOS) are calculated for the study area intersections based on the traffic volume, geometry and traffic control data provided above.

2.3.1 Level of Service Criteria

Level of service is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway system capacity to roadway system travel demand. Operating levels of service are reported on a scale of A to F, with A representing the best operating conditions with little or no delay to motorists, and F representing the worst operating conditions with long delays and traffic demands sometimes exceeding roadway capacity.

Intersection operating levels of service are calculated following procedures defined in the *Highway Capacity Manual*, published by the Transportation Research Board. For unsignalized and signalized intersections the operating level of service is based on travel delays. Delays can be measured in the field but generally are calculated as a function of traffic volume; peaking characteristic of traffic flow; percentage of heavy vehicles in the traffic stream; type of traffic control; number of travel lanes and lane use; intersection approach grades; and, pedestrian activity. Through this analysis volume-to-capacity ratios can be calculated for individual movements or for the intersection as a whole. A volume-to-capacity ratio of 1.0 indicates that a movement or intersection is operating at its theoretical capacity. The specific delay criteria applied per the *2000 Highway Capacity Manual* to determine operating levels of service are summarized in Table 2.

	Average Delay per Vehicle (Seconds)	
Level of Service	**Signalized Intersections**	**Unsignalized Intersections**
A	≤10.0	≤10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F[1]	>80.0	>50.0

Table 2: Intersection Level of Service Criteria

[1]Level of Service F is also assigned if the volume-to-capacity ratio exceeds 1.0.

Source: *HCM 2010 Highway Capacity Manual*, Transportation Research Board, National Academy of Sciences, Washington, DC, 2010.

For unsignalized intersections, it is assumed that through movements on the main street have the right-of-way and are not delayed by side street traffic. Main street traffic may be exposed to delays from traffic turning left from the main street. Generally, and in the case of this study, the longest delays at unsignalized

intersections are experienced on the side streets by traffic waiting to enter or cross the main street (VT 2A).

2.3.2 Calculated Operating Levels of Service

Capacity analysis results for the study area intersections were calculated using the software Synchro and are presented in Table 3 below. Capacity analysis worksheets are included in Appendix C. It was found that the AM peak hour level of service was at LOS D or better at both the side streets analyzed (Hillside Drive and Sharon Drive) as well as at the VT 2A/Mountain View Road/Industrial Avenue intersection. Afternoon peak hour conditions are worse. Calculated side street delays are greater than 100 seconds per vehicle. However, the side street volumes are relatively low and the side street volume-to-capacity ratios are well below 1.0. PM peak hour conditions at the signalized intersection are at LOS E with the intersection virtually operating at capacity (volume-to-capacity ratio is 0.98). This is consistent with field observations that noted very long queues on Industrial Avenue eastbound during the PM peak hour as noted below.

		Existing (2013)		
	Peak Hour	**LOS[1]**	**Delay[2]**	**V/C[3]**
Unsignalized Intersections				
VT 2A / Hillside Drive				
	AM	*D*	*26.0*	*0.16*
	PM	*F*	*>100*	*0.31*
VT 2A / Sharon Drive				
	AM	*C*	*20.2*	*0.03*
	PM	*F*	*>100*	*0.41*
Signalized Intersections				
VT 2A/Mountain View Road /Industrial Avenue				
	AM	D	37.1	0.79
	PM	E	58.8	0.98

Notes: Results shown are for the worst operating minor street approach for unsignalized conditions.

[1] LOS= Level of Service

[2] Delay = Average delay expressed in seconds per vehicle

[3] V/C = Volume-to-capacity ratio for critical movements

Table 3: Existing Intersection Capacity Analysis Results

2.3.3 Field Observations

During field visits observations were made of existing traffic operations. These observations help to validate and/or qualify findings based on the analytical methods presented above. In fact, field observations confirm the above capacity analysis results for the VT 2A/Industrial Avenue/Mountain View Road intersection. During peak hours long queues can be observed on any of the intersection approaches. During the evening peak hour long queues are regularly observed on the eastbound Industrial Avenue approach often spilling back up to one half-mile. At the intersection the eastbound left-turn vehicle queue exceeds the capacity of the left-turn lane and blocks the through lane. When this occurs queues build quite rapidly in the single approach lane extending west of the intersection.

2.4 Safety

The crash history for the study area was investigated using the VTrans crash database. VTrans keeps records of crashes by roadway link or segment and VTrans reports for 2008 through 2012 were reviewed for this scoping study. Over this five year period, VTrans reported 87 crashes along VT 2A from approximately 300 feet south of the Industrial Avenue/Mountain View Road intersection to approximately one-half mile north of the intersection including the intersections with Sharon Drive and Hillside Drive. In the immediate area of the Route VT2A/Industrial Avenue/Mountain Road intersection there were 42 crashes plus: another six within the 300 feet south of the intersection; eight within the 500 feet north of the intersection; and, another 31 crashes along the next 2000 feet north of the intersection.

Table 5 provides a summary of the number of crashes by type, time of day, weather and location. The original crash data, provided by VTrans, is included in Appendix D. As noted, none of the crashes involved fatalities. A great majority (76) of the crashes involved property damage only. The most frequent crashes were rear end crashes (67 percent) which is typical of signalized intersections. There were 11 angle type crashes (13%) and three head-on crashes.

VTrans also maintains a High Crash Location (HCL) list for intersections statewide. This list was most recently updated to include crash experience from 2008 through 2012. The VT 2A/Industrial Avenue/Mountain View Road intersection was listed as Number 71 on the HCL list with 45 crashes reported over this five year period. Again, no fatalities were reported at this intersection and only seven of the crashes involved injuries.

	Segment	Industrial Ave / Mountain View Road	Segment	Sharon Drive	Segment	Hillside Drive	Segment	Total
Mile marker	**4.72-4.78**	**4.79 -4.81**	**4.82-4.92**	**4.93-4.95**	**4.97**	**5.02-5.04**	**5.07-5.32**	
Year								
2008	2	10	3	4			4	23
2009	1	5	1	1		1	3	12
2010		10				1	4	15
2011		9	1	2	1	1	2	16
2012	3	8	3	3		2	2	21
Total	**6**	**42**	**8**	**10**	**1**	**5**	**15**	**87**
Type								
Angle		10					1	11
Rear-end	4	24	7	9	1	4	9	58
Head-on		2					1	3
Unknown-other	2	6	1	1		1	4	15
Total	**6**	**42**	**8**	**10**	**1**	**5**	**15**	**87**
Severity								
Property Damage	6	37	8	8	1	4	12	76
Personal Injury		5		2		1	3	11
Fatality								
Other								

	Segment	Industrial Ave / Mountain View Road	Segment	Sharon Drive	Segment	Hillside Drive	Segment	Total
Total	**6**	**42**	**8**	**10**	**1**	**5**	**15**	**87**
Weather								
Clear	4	19	7	6	1	5	15	**57**
Cloudy		11	1	1				13
Rain	1	5		2				8
Snow/Ice		3		1				4
Fog								
Unknown	1	4						5
Total	**6**	**42**	**8**	**10**	**1**	**5**	**15**	**87**
Time								
7:00AM to 9:00AM		6	1	1	1	1	1	11
9:00AM to 4:00PM	2	13	6	7		2	9	39
4:00PM to 6:00PM	2	11	1	1		2	4	21
6:00PM to 7:00AM	2	12		1			1	16
Total	**6**	**42**	**8**	**10**	**1**	**5**	**15**	**87**

Table 4 VT 2A Reported Crashes (2008-2012)

2.5 Transit Services

The Chittenden County Transit Authority provides regularly scheduled bus service to the project area by way of Route 1, the "Williston" route. There are several variations of Route 1, however all buses pass through the Route 2/Industrial Avenue intersection offering service at approximately 30-minute intervals at this location during commuter peak periods. The Williston-Essex variation of the route has buses on VT 2A passing through the Industrial Avenue intersection on one-hour headways. Buses on the Williston Village variation travel the length of Industrial Avenue and continue on to Mountain View Road. Two buses make this trip during the AM commuter peak period and again during the PM commuter peak period. Route maps are shown in Figures 4 and 5 below. There are no bus shelters provided on VT 2A within the project area but some are present at other points along VT 2A.

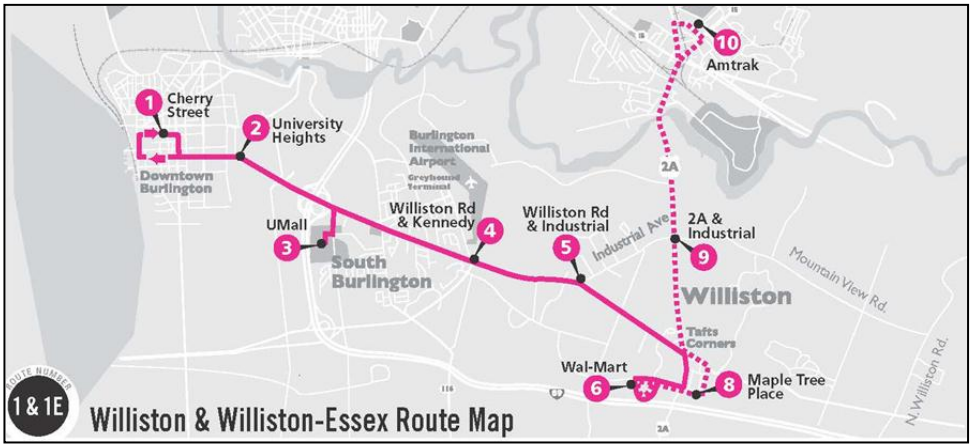

Figure 4: CCTA Williston Route

Figure 5: CCTA Williston Village Route

2.6 Natural Resources

Stantec evaluated the natural resources present within the VT 2A/Industrial Avenue/Mountain View Road to River Cove Road project area as of May 7, 2013 (see Appendix E). Specifically, Stantec identified and characterized wetlands, streams, observable rare, threatened or endangered (RTE) species, wildlife habitat, agricultural land, and public conservation lands. Approximate wetland boundaries under state and federal jurisdiction were based on the technical criteria described in the *2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*. Only reconnaissance-level investigations were carried out, and formal wetland delineations were not conducted. Natural resources were reviewed within 50 feet of roadway edges in order to assess potential wetland buffer impacts. Locations were sketched on the project base map. Following is a summary of the findings.

2.6.1 Review of Existing Materials

Stantec used the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas mapping program to assess the likelihood of the presence of mapped Vermont Significant Wetland Inventory (VSWI) wetlands. According to this program,[1] there are no Class 2 VSWI wetlands mapped within the project area, nor are there any known RTE species (see ANR Map in Appendix E).

According to the Natural Resource Conservation Service (NRCS) Web Soil Survey[2] for Chittenden County, Vermont, the soils within the project corridor are mapped as Belgrade and Eldridge soils, 0-3% slopes, 3-8% slopes, and 8-15% slopes; Munson and Raynham silt loams, 3-8% slopes; and Peru stony loam, 5-12% slopes. The Belgrade and Eldridge soils, 0-3% slopes are considered Prime Farmland soils, while the remaining soil types are considered Farmland Soils of Statewide Importance.

[1] http://anrmaps.vermont.gov/websites/anra/
[2] Natural Resource Conservation Service Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Refer to map for Chittenden County, Vermont. Accessed on May 13, 2013.

2.6.2 Wetlands and Streams

There are no mapped wetlands or streams within the project area. However, three small wetland areas were identified during the May 7, 2013 site investigation. These are all located near the northern limits of the project area, adjacent to VT 2A (see Wetland Sketch in Appendix E). All three are small palustrine emergent wetlands. The wetland located on the west side of VT 2A, just south of River Cove Road, appears to be an overgrown stormwater detention pond dominated by common reed (*Phragmites australis*). The other two small wetland areas are dominated by cattail (*Typha latifolia*).

2.6.3 RTE Species

Stantec identified no RTE species during the May 7, 2013 site visit. The project corridor has been disturbed to some degree by mowing, clearing, fill, or previous development. As a result, it is unlikely that any RTE plant or animal species occur within the project corridor.

2.6.4 Wildlife and Wildlife Habitat

The project area provides habitat for various wildlife species common to Vermont's urbanizing areas such as blue jay (*Cyanocitta cristata*), raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*), gray squirrel (*Sciurus carolinensis*), as well as other species that may travel through the area. The Town of Williston was studied as part of the PLACE (Place-based Landscape Analysis and Community Education) Program[3]. Part of the evaluation included identifying core forest, edge forest, and wildlife habitat corridors. The project corridor does not include any of these identified features, and does not provide significant wildlife habitat.

2.6.5 Agricultural Land

According to the NRCS Web Soil Survey for Chittenden County, Vermont, the project corridor includes soils rated as Farmland of Statewide Importance as well as Prime Farmland soils. However, the project corridor is not currently in active agriculture, and any proposed improvements would be constructed within a narrow strip alongside the existing pavement. Any proposed work in these areas will require authorization from the NRCS via form CPA-106, the Farmland Conversion Impact Rating form for corridor projects.

2.6.6 Conservation Zones

No designated state or town conservation zones are present within the narrow project corridor. Therefore, the project area does not include public recreation lands (a Section 4(f) resource) or public lands developed with Land and Water Conservation Funds (a Section 6(f) resource).

2.6.7 Federal and State Wetland Regulations

The US Army Corps of Engineers (Corps) regulates wetland and streams under the provisions of Section 404 of the Clean Water Act. The Corps has issued a Programmatic General Permit for the State of Vermont. Typically, wetland and

[3] http://www.uvm.edu/place/towns/williston/index.php

stream impacts of less than one acre may be covered by a Programmatic General Permit, with impacts of less than 3,000 s.f. often eligible for approval via a one-page Self-Verification Form.

The three small wetland areas identified near VT 2A near the northern limits of the project would likely be considered Vermont Class 3 wetlands, and any impacts to these wetlands would likely not require authorization from ANR under the Vermont Wetland Permit or Vermont General Permit. However, any impacts to the wetlands would require authorization from the Corps.

2.6.8 Summary

In summary, the project area includes three small Vermont Class 3 wetlands. Any impacts to these resources may require authorization from the Corps. In addition, the project corridor includes Prime Farmland soils and Farmland Soils of Statewide Significance. Any impacts to these soils will require coordination with the NRCS via form CPA-106, the Farmland Conversion Impact Rating form for corridor projects.

2.7 Archeological Resources and Historic Preservation Assessment

Hartgen Archeological Associates, Inc. (Hartgen) was contracted by Stantec to conduct an Archeological Resource and Historic Preservation Assessment for this study (see Appendix F). This review is required according to Section 16 of the National Historic Preservation Act of 1966, as amended.

Hartgen identified the project area of potential effects (APE), which extends along both sides of VT 2A from River Cove Road in the north to Meadowrun Road in the south, a distance of approximately 3,637 feet (1.1 km). The APE also extends west from VT 2A along Industrial Avenue approximately 699 feet (213 m) and east from VT 2A along Mountain View Road approximately 547 feet (167 m). The width of the APE is estimated at 170 feet (51.8 m). Given these dimensions, the APE encompasses approximately 19.05 acres (7.71 ha).

Hartgen conducted a site visit to the project area on June 12, 2013 and identified areas of disturbance along much of the APE related to the installation of several utilities and existing sidewalks. Outside of this disturbance there is some disturbance from grading and filling around house lots, but the archeological sensitivity remains high in undisturbed areas. A large number of archeological sites have been documented for the project vicinity, indicating a high potential for unknown archeological sites to be present in undisturbed portions of the APE. If these undisturbed areas cannot be avoided in project design, Phase IB archeological reconnaissance survey is recommended.

Historic preservation concerns are focused on mature trees that are located along the APE. Such large trees should be avoided in the project design. Any draft plans for roadway changes, once developed, should be reviewed for historic preservation issues.

3.0 Purpose and Need

As noted earlier, the purpose of this study is to define improvements for the VT 2A corridor as an alternative to construction of the CIRC Highway. The CIRC would have provided an alternative north-south travel corridor through Williston providing some relief to travel demands on VT 2A. In the absence of the CIRC, travel demands on VT 2A are expected to grow with future new land development in Williston and surrounding communities. Consequently, this study seeks to define capacity improvements for the corridor allowing it to more safely handle future vehicular travel demands with reduced congestion. Recognizing that the use of alternative travel modes might help to reduce future vehicular travel demands, the study also looks to enhance accommodations for pedestrians, bicyclists and transit riders. In consideration of the above, a Purpose and Need Statement for the project has been defined as follows:

To address existing and future traffic congestion; enhance safety for all users; and, improve bike-pedestrian travel along VT 2A in Williston between Industrial Avenue/Mountain View Road and River Cove Road.

The need for improvements is indicated by the evaluation of existing and future traffic operations included in this study. The VT 2A/Industrial Avenue/Mountain View Road intersection presently operates at or near capacity during commuter peak hours with significant congestion experienced particularly on the Industrial Avenue approach during the PM peak hours. Vehicle queues on this leg of the intersection regularly extend more than one-half mile to the west during peak times. Regional traffic and land use models suggest that travel demands will grow at this location by nearly one percent per year worsening traffic congestion conditions over time. The WENTS indicated that the overall intersection peak hour operating level of service would degrade from LOS D to LOS F for the design year 2033.

From a multi-modal perspective, the study area is now served by public transit; however, there are limited sidewalk facilities to support users of the existing bus services. Bike lanes are absent from Industrial Avenue and Mountain View Road. Bicyclists are presently accommodated along VT 2A where a multi-use path parallels the west side of the road for a short distance and shoulders are provided on VT 2A. However, the multi-use path narrows to a substandard width near Industrial Avenue as do the shoulders on VT 2A.

4.0 Future Conditions

Traffic conditions in the project study area were projected to a 2033 design-year. These forecasts consider anticipated future traffic growth and planned roadway improvements in the project area. Each of these factors are described below.

4.1 Future Traffic Growth

Historic traffic volumes for the project area roadways were first examined in considering potential future traffic growth patterns. Data published by VTrans and the CCRPC for area roadways were combined in Figure 6. Daily traffic volumes are provided from 1977 to present for Industrial Avenue, Route 2 and VT 2A. As shown, there was a period of significant traffic growth on Route 2 from 1977 to 1996 when traffic volumes peaked. Volumes have generally been in decline since then except for a slight "uptick" in 2012. A similar, albeit somewhat delayed, growth pattern occurred on VT 2A and Industrial Avenue. Volumes on these roads grew until approximately 2005 when daily volumes began to show some decline. Again, 2012 data indicates a slight uptick and may indicate the start of a new growth trend.

In the absence of a clearly defined traffic growth pattern from the historic data, the CCRPC's regional land use and traffic model was used to develop an assumed future traffic growth rate. The model when applied to 2033 conditions indicated a regional traffic growth of approximately one percent per year. Accordingly, existing Design Hour Volumes were increased by an annual growth factor of approximately one-percent per year to represent 2033 traffic conditions. The resulting 2033 AM and PM peak hour traffic flow networks are presented in Figures 7 and 8, respectively.

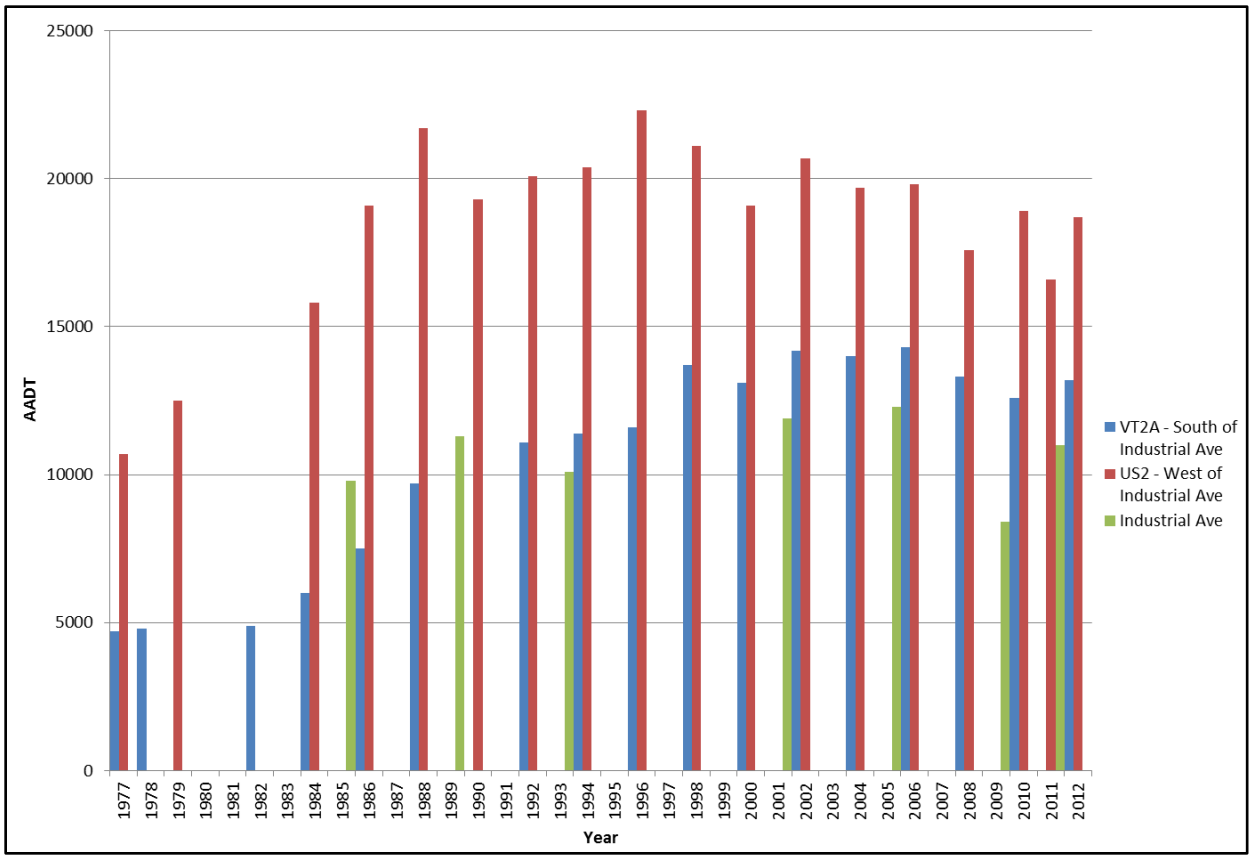

Figure 6: Historic Traffic Volumes

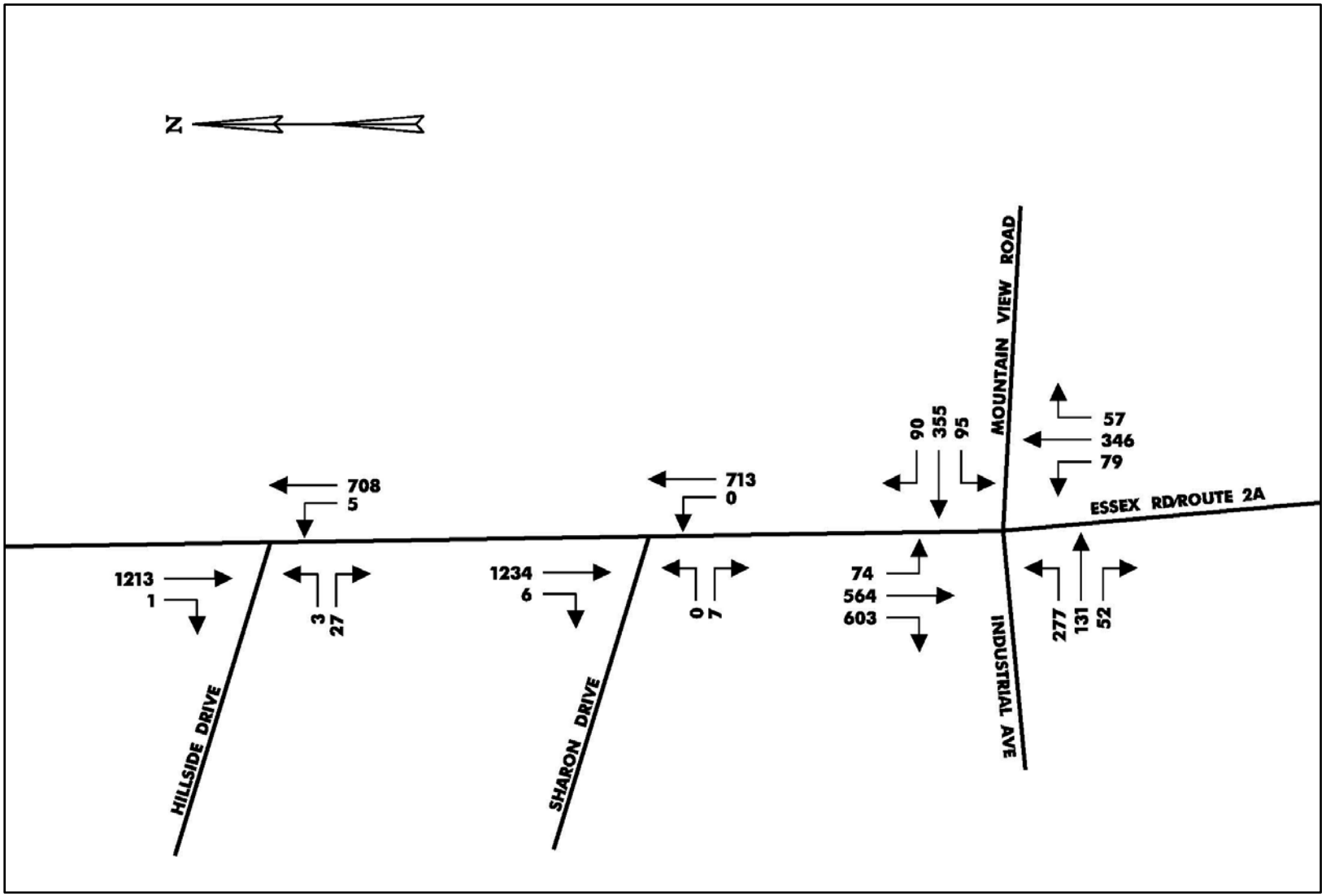

Figure 7: 2033 AM Peak Hour Traffic Volumes

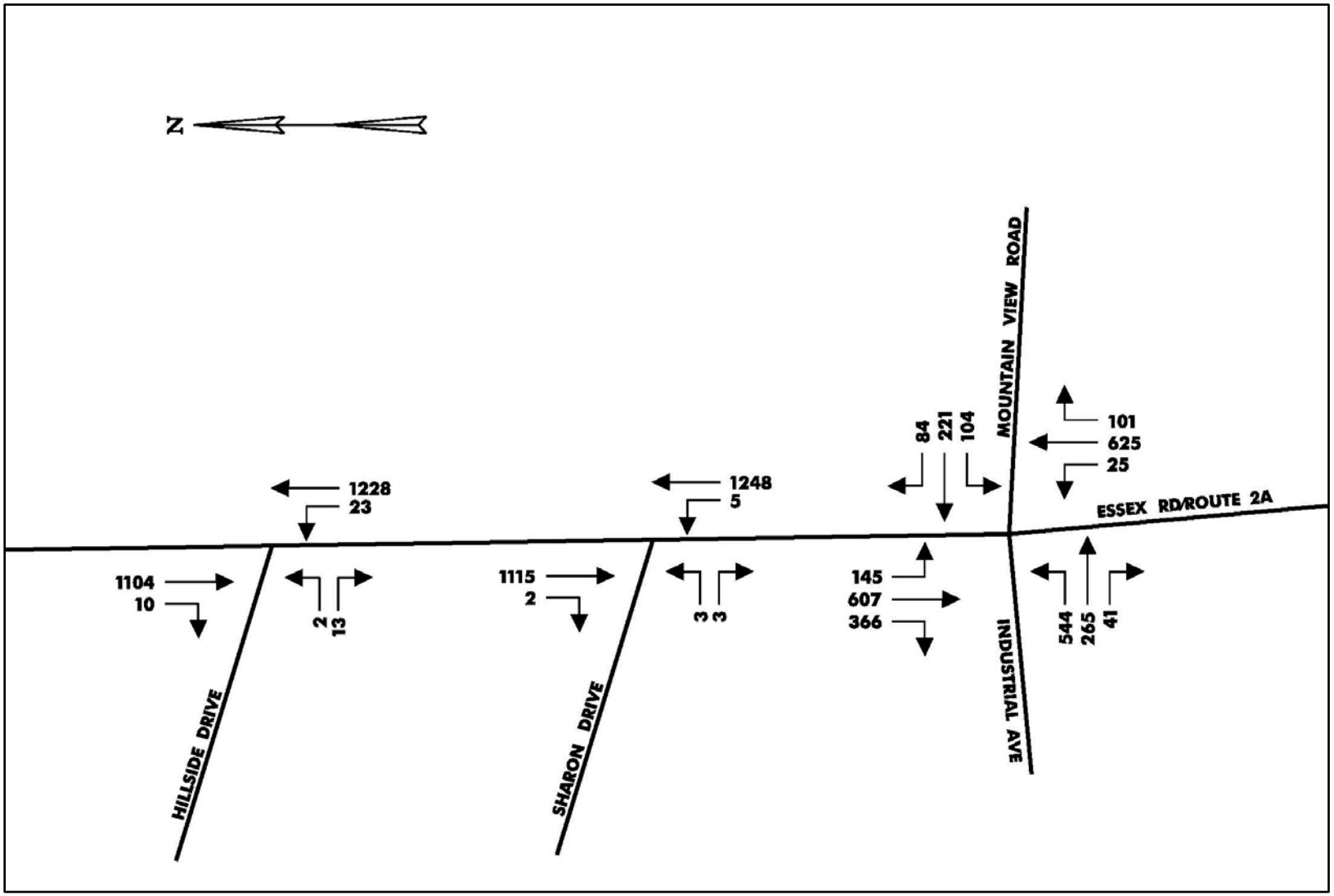

Figure 8: 2033 PM Peak Hour Traffic Volumes

4.2 Proposed Transportation System Improvements

Three transportation system improvements are proposed in vicinity of the study area which should be constructed well in advance of the 2033 design year used in this study. First, VTrans is developing plans to reconstruct the Industrial Avenue/Route 2 intersection. The current conceptual plans include the addition of a second eastbound left-turn lane on Route 2 to Industrial Avenue. This added lane would support potential future growth in peak hour volumes on Industrial Avenue eastbound at VT 2A. Second, just north of the study area VTrans is developing plans to reconstruct VT 2A between River Cove Road and James Brown Drive. A traffic signal will be installed at the James Brown Drive intersection. VT 2A will be widened to provide a three-lane cross section with a center two-way, left-turn lane (TWLTL). The widened VT 2A cross section at River Cove Road is illustrated in Figure 9. Implementation of this improvement will help support the assumed future traffic growth on VT 2A. Finally, the Town of Williston and the CCRPC recently completed a corridor study for Industrial Avenue. This planning study recommended a minor widening of Industrial Avenue at VT 2A to the south in order to provide on-street bike lanes in both directions along Industrial Avenue. Detailed plans for this improvement have not been developed.

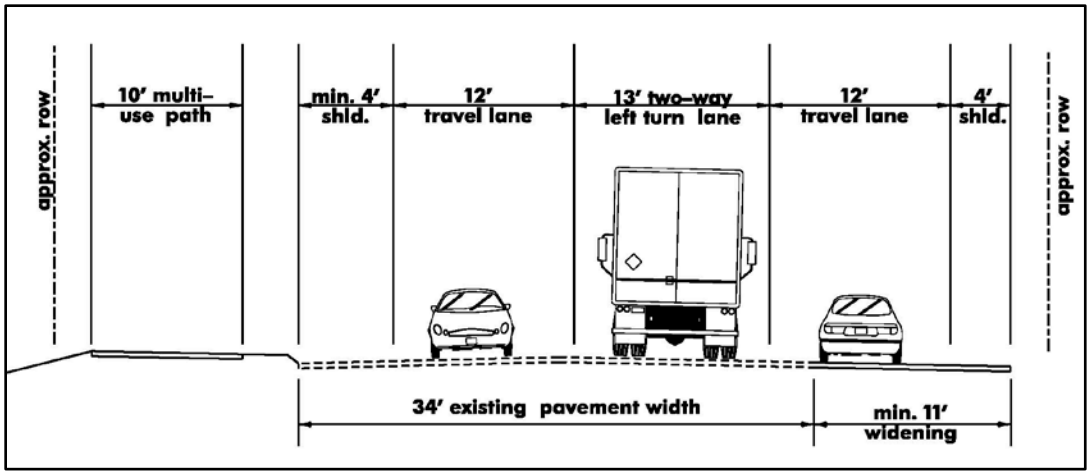

Figure 9: Proposed VT 2A Cross-section Just South of River Cove Road

4.3 Future Traffic Operations

Future traffic operations analyses were completed for the study area intersections following the procedures used to assess existing operating conditions. Capacity analysis results for the study area intersections are compared in Table 5 for Existing and 2033 Future conditions. As shown, little change is anticipated at the level of service ratings for the unsignalized intersections studied. Calculated volume-to-capacity ratios for eastbound traffic on the two side streets do exceed 1.0 under future PM peak hour conditions suggesting long delays for traffic turning left from the side streets. Conditions will worse measurably for the AM peak hour at the VT 2A/Industrial Avenue/Mountain View Road intersection with the assumed traffic growth. The peak hour volume-to-capacity will reach 0.92 (92 percent of capacity). Traffic demands at this location during the PM peak hour will exceed capacity with delays in the Level of Service F range (almost 100 seconds per vehicle). Existing vehicle queues will grow dramatically with the higher travel demands.

Peak Hour	Existing (2013)				Future (2033)			
	LOS[1]	Delay[2]	V/C[3]	Queue[4]	LOS	Delay	V/C	Queue
Unsignalized Intersections								
Hillside Drive/VT 2A								
AM								
Northbound	A	0.2	0.01	1	A	0.3	0.01	1
Eastbound	D	26.0	0.16	14	E	41.3	0.25	23
PM								
Northbound	A	1.4	0.04	3	A	2.5	0.04	3
Eastbound	F	>100	0.31	27	F	>100	2.75	80
Sharon Drive/VT 2A								
AM								
Northbound	A	0.0	-	0	A	0.0	-	0
Eastbound	C	20.2	0.03	2	D	25.2	0.04	3
PM								
Northbound	A	0.3	0.01	1	A	0.6	0.01	1
Eastbound	F	>100	0.41	27	F	>100	4.28	-
Signalized Intersections								
Industrial Ave/Mountain View Dr/Essex Rd (VT 2A)								
AM								
Northbound Left	C	27.0	0.39	68	C	32.9	0.55	82
Northbound Through/Right	C	33.2	0.62	356	D	35.2	0.67	447
Southbound Left	C	24.4	0.23	64	C	25.4	0.28	76
Southbound Through	D	45.4	0.84	#594	D	51.6	0.89	#757
Southbound Right	C	29.6	0.40	143	C	33.5	0.58	298
Eastbound Left	C	31.0	0.72	#270	E	76.5	0.96	#411
Eastbound Through/Right	B	19.0	0.21	132	C	22.3	0.25	166
Westbound	D	52.3	0.89	#617	F	>100	1.07	#810
Overall	**D**	**37.1**	**0.79**	**-**	**D**	**54.2**	**0.92**	**-**
PM								
Northbound Left	C	26.1	0.13	30	C	28.9	0.23	34
Northbound Through/Right	D	51.0	0.90	#829	F	95.2	1.08	#1043
Southbound Left	E	56.5	0.81	#188	F	89.3	0.95	#233
Southbound Through	D	35.6	0.72	#655	D	48.9	0.89	#834
Southbound Right	C	26.2	0.28	126	C	28.5	0.39	191
Eastbound Left	F	81.6	1.03	#580	F	>100	1.26	#768
Eastbound Through/Right	C	25.0	0.34	240	C	25.4	0.4	289
Westbound	F	>100	1.11	#570	F	>100	1.28	#692
Overall	**E**	**58.8**	**0.98**	**-**	**F**	**96.5**	**1.19**	**-**

[1] LOS= Level of Service [2] Delay = Average delay expressed in seconds per vehicle
[3] V/C = Volume-to-Capacity ratio [4] 95th Percentile Vehicle Queue (feet) # Queue volume exceeds capacity

Table 5: Future Capacity Analysis Results

5.0 Alternatives

Alternative improvement plans were developed and analyzed for the study area. For this analysis options to improve intersection operations were considered separately from options to improve travel accommodations along VT 2A recognizing that all intersection options can be made compatible with all roadway segment options. The range of options considered for each element of the study area are described below.

5.1 Intersection Alternatives

Various alternative improvement plans were developed for the Route 2A/Mountain View Road/Industrial Avenue intersection with the objective of providing sufficient vehicular carrying capacity to accommodate the projected 2033 peak hour traffic demands while maintaining a high level of pedestrian and bicycle accommodations. In this regard, two strategies were pursued. The first considered building upon the existing signalized intersection configuration by adding lanes and/or changing lane use conditions incrementally to achieve the desired level of operations. The second strategy examined a whole new intersection configuration, a modern roundabout. Here again, lanes were added incrementally until the desired operating condition could be achieved.

For each of the alternatives described, information is provided relative to their expected performance and their associated environmental consequences. From a performance perspective, the overall intersection PM peak hour volume-to-capacity ratio is provided as a quantitative measure of the improvement's ability to satisfy the Purpose and Need Statement. The volume-to-capacity ratio is also used to estimate the "life expectancy" of the improvement. Specifically, the life expectancy reflects the number of years that the intersection will operate below capacity assuming that existing traffic demands grow at one percent per year. For all calculations involving signalized intersection operations it is assumed that signal timings include a 24-second pedestrian phase and ten pedestrian calls per hour. This assumption addresses the multi-modal aspect of the Purpose and Need Statement. From an environmental consequences perspective, principal attention is given to land and right-of-way impacts. The impacts of added pavement and/or land takings will be directly felt by abutters to the roadway. Quantified land area impacts generally indicate the magnitude of impacts in other areas such as wetlands, prime agricultural soils, archeological and historic preservation. Related to the land area impacts is documentation of the number of mature trees expected to be impacted by each alternative.

5.1.1 Option 1 - Add Westbound Left-turn Lane

The lowest level of improvement considered is the addition of a westbound left-turn lane on Mountain View Road at the VT 2A/Mountain View Road/Industrial Avenue intersection. (This improvement was recommended as an "early action" item in a ten-year old study of the intersection.) A conceptual plan of this improvement is shown in Appendix G1. As shown, the addition of a 200 foot long left-turn lane adds approximately 10,000 square feet of pavement to the east leg of the intersection. This

is indicated by the orange shaded area in the figure. Most of this pavement can be provided within the existing public roadway layout. However, some land takings in the southeast corner of the intersection, approximately 500 square feet as indicated by the red shading, are anticipated. The takings would impact two landowners. This change would improve operations relative to the existing geometric conditions but would result in the intersection still experiencing travel demands well in excess of capacity under the 2033 traffic conditions. The projected 2033 PM peak hour volume-to-capacity ratio is 1.17 indicating that peak hour traffic demands would exceed the intersection capacity by 17 percent. These findings are summarized in Appendix I, which documents the impacts and benefits of this alternative relative to the "Do Nothing" condition and relative to other alternatives described below.

5.1.2 Option 2 - Add Westbound Left-turn Lane and Eastbound Left-turn Lane (Add eastbound left-turn lane to Option 1)

Given the shortcomings of Option 1 from an operations perspective, a higher level of improvement was considered for Option 2. As shown in Appendix G2, Option 2 adds an eastbound left-turn lane to Option 1. In effect, double left-turn lanes would be provided for traffic on Industrial Avenue entering VT 2A northbound providing at least 500 feet of queuing space for left-turning vehicles. In addition, the five-foot wide sidewalk on the west side of VT 2A is widened to 10 feet matching the width of the multi-use path that exists north of the intersection. In order to accommodate the double left-turn movement VT 2A northbound would also need to be widened to include two "receiving" lanes for a short distance before tapering back to a single lane. The required widening can be concentrated on the west or east side of 2A as shown in Options 2A and 2B, respectively. This plan provides more significant improvements to traffic operations with the future PM peak hour volume-to-capacity ratio dropping from 1.19 under the Do Nothing condition to 0.99 with the Option 2 improvements. The added benefit however, comes with additional impacts. Option 2 has the same right-of-way impacts on the east leg of the intersection as Option 1 but also has new impacts on the west and north legs of the intersection. The required widening impacts up to 13 different parcels and up to 3,800 square feet of property from a right-of-way perspective. It adds up to 20,000 square feet of pavement. The roadway edge moves close to several mature trees on the east side of the road and one mature tree on the west side. (One tree on the east side of the road suffered extreme storm damage and was removed during the conduct of this study. The remaining trees appear to be of similar age and health as the tree that was just removed.)

5.1.3 Option 3 - Add Westbound Left-turn Lane, Eastbound Left-turn Lane and Northbound Through Lane (Add northbound through lane to Option 2)

Whereas Option 2 yields a 2033 PM peak hour intersection volume-to-capacity ratio that is close to 1.0 for the VT 2A/Mountain View Road/Industrial Avenue intersection an even higher level of improvement was considered. As shown in Appendix G3, Option 3 builds upon Option 2 by also adding a northbound through lane on VT 2A at the intersection. This lane addition takes advantage of the pavement that would be added under Option 2 on the north leg of the intersection to accommodate two northbound receiving lanes to accept traffic from the two lanes turning left from Industrial Avenue. This plan provides significant improvements to traffic operations with the future PM peak hour volume-to-capacity ratio dropping

from 1.19 under the Do Nothing condition to 0.89 with the Option 3 improvements. In fact, Option 3 results in traffic operations that are better than existing conditions. (The calculated 2013 PM peak hour volume-to-capacity ratio is higher at 0.98.) The additional operational benefits however, can be realized with only nominal additional impacts. Relative to Option 2, Option 3 only adds pavement and new right-of-way impacts to the south leg of the intersection. In total, Option 3 adds 25,000 square feet of pavement at the intersection and has right-of-way impacts of 5,200 square feet on 15 different parcels. The drawing in Appendix G3 shows both a two-way-left-turn and a sidewalk being added to VT 2A north of the intersection as discussed in Option N2 below. Any of the three options to the north of the intersection (N1, N2, or N3) are compatible with this option, and impacts stated here are irrespective of which northern option is chosen.

Impacts to mature trees are similar to those anticipated for Option 2 with up to seven trees impacted.

5.1.4 Option 4 - Add Westbound Left-turn Lane, Add Northbound Through Lane and Change Lane Use on Industrial Avenue (Delete eastbound left-turn lane addition from Option 3)

Since Option 3 yields a 2033 PM peak hour intersection performance level that is much better than existing conditions, another alternative was considered to determine if the below capacity performance could be achieved with lesser right-of-way impacts. Option 4 is consistent with Option 3 except that there is no eastbound left-turn lane added to Industrial Avenue. Instead, the existing through/right-turn lane would be converted to an all-purpose lane. (Left turns would be allowed from this lane.) Split signal phasing would also be implemented to allow traffic to safely turn left-from both eastbound lanes. With split phasing the eastbound Industrial Avenue approach would operate during its own dedicated signal phase separate from the westbound phase for Mountain View Road. As with Option 3 the addition of a westbound left-turn lane and a northbound through lane are part of this plan. VT 2A northbound north of the intersection would also be widened to accept traffic from the two northbound lanes provided on the south leg of the intersection. This improvement option is illustrated in Appendix G4. As shown, the principal benefit of this plan is that pavement widening and right-of-way impacts on the Industrial Avenue leg of the intersection are relatively minor. As summarized in Appendix I, new pavement added under Option 4 is only 14,000 square feet compared with 25,000 square feet under Option 3. Similarly, only seven parcels would be impacted by land takings under Option 4 compared to 15 parcels under Option 3. However, from an operations perspective, Option 4 results in a 2033 PM peak hour intersection volume-to-capacity ratio of 0.98. This volume-to-capacity ratio matches the existing PM peak hour volume-to-capacity ratio. Consequently, implementation of this plan would generate significant improvements in traffic operations when first implemented but operations would deteriorate to existing levels at or around 2033 should the traffic growth forecasts considered in this study be realized.

5.1.5 Option 5 - Reconstruct Intersection as a Single-lane Roundabout

VTrans policy requires that roundabouts be considered as an alternative for all intersection improvement projects that may be eligible for federal funding. Roundabouts must be considered as they offer certain benefits relative to conventional, signal-controlled intersections. These benefits generally include:

- Lesser roadway widenings on intersection approaches. (Roadway networks comprised of roundabout intersections consist of “narrow roads and wide nodes”.)
- No traffic signal operations (electricity) and maintenance costs.
- Fewer crashes and less severe crashes due to low traffic speeds and one-directional flow.
- Less delay during off-peak hours when traffic demands do not warrant signal control.
- Suitable as a gateway treatment and traffic calming device.

Common concerns with roundabouts include:

- Higher maintenance costs with respect to snow removal.
- Wide diameters required to accommodate large trucks.
- Challenging for blind pedestrians.
- Less effective when traffic flows are heavily unbalanced.

Option 5, illustrated in Appendix G5, defines a single-lane roundabout plan for the VT 2A/Industrial Avenue/Mountain View Road intersection. The inscribed diameter of the roundabout is approximately 150 feet. All four approaches to the roundabout provide deflection to slow entering traffic. Traffic entering the roundabout on all approaches will be required to yield to circulating traffic. Splitter islands are shown on the south and west legs providing refuge areas for pedestrians following the existing travel paths through the intersection.

Roundabout operations were considered following procedures defined in the 2010 Highway Capacity Manual. These procedures can be used to determine volume-to-capacity ratios for each of the four individual merge areas within the roundabout where an entering approach flow meets a circulating flow. Calculation sheets for roundabout operations are provided in the report appendix indicating volume-to-capacity ratios for all merge areas. For presentation purposes, only the worst performing merge operations are shown in Appendix I. As shown, the single-lane roundabout fails to improve operations relative to the existing intersection conditions with a PM peak hour volume-to-capacity ratio of 1.37 in 2033 during the PM peak hour. However, it does have much more limited right-of way impacts relative to the signalized intersection alternatives. The roadway widenings for the roundabout occur in close proximity to the intersection on parcels that are presently owned by the Town or the State on the west side of VT 2A. Only 400 square feet of takings are associated with Option 5 impacting only two privately owned parcels.

5.1.6 Option 6 - Reconstruct Intersection as a Multi-lane Roundabout

Given the limited capacity of a single-lane roundabout conceptual plans were also prepared for a multi-lane roundabout offering much greater traffic carrying capacity. The multilane roundabout alternative, Option 6, is shown in Appendix G6. Two-lane approaches are provided on all entries and two circulating lanes are provided in all but the northwest quadrant of the roundabout. As with the single-lane roundabout right-of way impacts are generally limited to the immediate vicinity of the roundabout. Two privately owned parcels along the Industrial Avenue leg of the intersection would be subject to takings. One parcel is impacted on the west side of VT 2A north of the intersection where expansion of the existing sidewalk to a multi-

use path is assumed, and one parcel on each of the remaining legs is impacted to accommodate the splitter islands on those legs.

Performance expectations for Option 6 are shown in Appendix I. As noted, this alternative yields the lowest 2035 PM peak hour volume-to-capacity ratio for all scenarios. At 0.85 this volume-to-capacity ratio is lower than the volume-to-capacity ratio, 0.89, associated with best performing signalized intersection alternative, Option 3. Based on the assumed traffic growth rate in this study, the "life expectancy" of the multilane roundabout alternative is about 35 years if the traffic growth forecasts considered in this study are realized. Implementation of this improvement would allow traffic to operate at levels that are better than existing conditions for the next 35 years.

5.1.7 Intersection Options Summary

The attributes of the intersection improvement options are compared side-by-side in Table 6. (An expanded evaluation matrix in the standard VTrans format is in Appendix M.) As shown, only improvement Option 3, which includes the most extensive intersection widening, and Option 6, the multilane roundabout, add sufficient roadway capacity (and low enough PM peak hour volume-to-capacity ratios) to be considered effective alternatives. For these two alternatives, construction cost estimates were developed and are provided in Appendix J. As shown, at $3.8 million the multilane roundabout is the most expensive but also performs the best with an expected 2033 PM peak hour volume-to-capacity ratio of 0.85. This is accomplished with 24,000 square feet of added pavement but only 1300 square feet of land takings affecting five parcels. The roundabout option is also expected to achieve a reduction in crash rates relative to existing conditions. Option 3 adds approximately the same amount of pavement as Option 6 but 5100 square feet of takings are anticipated impacting 15 different parcels. Operational benefits are not quite as good as those afforded by the multilane roundabout alternative but the expected construction cost is somewhat lower at $3.3 million.

Performance / Impacts	No Build	Option 1: Add WB Left Extend EB Left	Option 2A: Add EB Left to Opt. 1, Widen to West	Option 2B: Add EB Left to Opt. 1, Widen to East	Option 3: Add NB Through to Opt. 2	Option 4: Add NB Through to Opt. 1, Change EB Use	Option 5: Singe Lane Roundabout	Option 6: Dual Lane Roundabout
PM Volume to Capacity Ratio (2033)	1.19	1.17	0.99	0.99	0.89	0.98	1.37	0.85
Added Pavement	None	10,000 SF	20,000 SF	17,000 SF	25,000 SF	14,000 SF	13,000 SF	24,000 SF
ROW Takings								
East Leg (Mtn. View)	None	400 SF	400 SF	400 SF	400 SF	400 SF	400 SF	500 SF
West Leg (Industrial)	None	None	2,300 SF	2,300 SF	2,300 SF	None	None	600 SF
North Leg (VT 2A)	None	100 SF	1,100 SF	500 SF	1,100 SF	1,100 SF	None	None
South Leg (VT 2A)	None	None	None	None	1,300 SF	1,300 SF	None	200 SF
Total SF	None	500 SF	3,800 SF	3,200	5,100 SF	2,800 SF	400 SF	1,300 SF
Number of Parcels Impacted	None	2	12	13	15	7	2	5
Utility Poles to be Moved	None	7	12	13	14	11	7	12
Number of Mature Trees Removed	None	2	3	6	7	3	4	5
Typical Crash Reduction[1]	None	None	None	None	None	None	51%	29%
Total Cost	None	Not Calculated	Not Calculated	Not Calculated	$3.3 Million	Not Calculated	Not Calculated	$3.8 Million

Table 6: Intersection Options Summary

5.2 Segment Alternatives

Three alternative improvement plans were also developed for the VT 2A roadway segment between Mountain View Road and River Cove Road. The existing roadway cross section generally consists of a single travel lane and four-foot wide shoulder in each direction and a 10-foot wide multiuse path on the west side of the roadway. (The path narrows to a six-foot wide sidewalk just north of the intersection with Industrial Avenue.) The improvements first include widening the roadway to the east to provide a two-way center left-turn lane. The second alternative then widens further to the east to provide a sidewalk on the east side of the roadway. The third alternative only adds the east side sidewalk to existing conditions. Each of these plans are described in greater detail below.

The descriptions of the alternative segment treatments consider performance from a traffic flow and safety perspective and consequences from an added pavement and land takings perspective. Traffic operations benefits are more difficult to quantify here as there is very little interruption to traffic flow under existing conditions. As noted in Table 5, calculated delays to through northbound traffic due to left-turns into Sharon and Hillside Drives amount to less than one second per vehicle. Two of the options will reduce these delays but this reduction is not significant with regard to satisfying the overall project Purpose and Need Statement. Two options offered will make the roadway safer. Two options support the Purpose and Need Statement by adding pedestrian accommodations. “Consequences” are also considered by quantifying anticipated roadway construction costs.

5.2.1 Option N1 - Add Two-way Left-turn Lane

Improvements considered for VT 2A under Option N1 are illustrated in cross section view and in plan view in Appendix H1. As shown, a third lane, two-way left-turn lane would be added to the roadway by widening the roadway to the east. A widening of approximately 10 feet is assumed. Existing shoulders would be maintained to accommodate bike traffic along the roadway. As shown in the figure the proposed improvements can fit within the available 66 foot roadway right-of-way. However, associated drainage improvements and relocation of drainage swales may extend beyond the public right-of-way requiring alterations on private property. Easements may be required to make necessary drainage improvements. The proposed widening would also impact all utility poles located along the east side of the roadway. In order to relocate the utility lines within the public right-of-way it may be necessary to install curbing along the roadway edge. (With curbing the utility poles can be located closer to the edge of the roadway. Without curbing greater separation is required to establish a clear zone for roadway safety.) The proposed two-way, left-turn lane addition should help smooth traffic flow on this roadway segment as left-turning vehicles will be removed from the VT 2A through traffic streams. Also, motorists making left-turns from intersecting side streets and driveways may experience less delay as the left-turn lane can be used to make a staged left-turn movement. Side Street traffic can first turn left into the left-turn lane and then merge with traffic in the adjacent through lane as the second phase of the left-turn procedure. The Traffic Engineering Handbook (Institute of Transportation Engineers, Washington, D.C. 2009) reports that “providing two-way left-turn lanes on streets without left-turn lanes can significantly reduce crashes”. This proposed treatment is consistent with

plans being developed for VT 2A north of River Cover Road. As such, implementation of this plan would provide a consistent cross section for an extended section of VT 2A. The consistency of the roadway treatment would likely provide further safety benefits.

Appendix I summarizes the impacts associated with construction of Option N1. As shown, 27,000 square feet of pavement would be added all within the available public right-of-way. Six mature trees would be removed and 14 utility poles would be relocated on this segment. As noted above, utility pole relocation and drainage improvements could have impacts outside of the public right-of-way. A cost breakdown for this option is included in Appendix J. The $2.1 million total cost estimate assumes that curbing and a closed drainage system is installed on the east side of the roadway to minimize drainage and utility pole impacts.

5.2.2 Option N2 - Add Two-way Left-turn Lane and East Side Sidewalk

The second improvement plan considered for VT 2A north of Industrial Avenue included the above two-way, left-turn lane addition and provision of a five-foot wide sidewalk on the east side of the roadway. The sidewalk would be separated from the edge of the traveled way by a five-foot wide greenbelt. As shown in Appendix H2, the additional widening would occur on the east side of the roadway so as to not disturb the existing multiuse path located on the west side of the roadway. The two-way left turn lane would provide the same operational and safety benefits noted above. The new sidewalk would serve residential properties located along the east side of the roadway.

Impacts from construction of Option N2 are also noted in Appendix I. As shown, 50,000 square feet of new pavement would be installed for the roadway widening and sidewalk. Since the roadway widening itself brings the edge of pavement very close to the limit of the public right-of-way, the sidewalk addition would occur mostly on private property. Hence, 15,000 square feet of sidewalk would be built on what is now private property impacting 17 parcels. On two of those parcels the outside edge of the sidewalk would shrink driveways to less than 25 feet in length. These driveways would need to be reconstructed, relocated or abandoned. Tree loss would include 11 mature trees, five more than anticipated with just the two-way, left-turn lane addition. Again, 14 utility poles would need to be relocated. In this case the poles would need to be relocated to what is now private property. Provision of the sidewalk adds approximately $0.4 million to the construction cost for Option N1 not including right-of-way costs. As noted for Option N1, the approach to managing roadway drainage can affect construction costs and utility relocations. Similarly, it can influence right-of-way impacts under Option N2. If curbing were installed along the east side of the roadway and a closed drainage system were installed then the sidewalk could be located directly adjacent to the roadway. The proposed five-foot wide green belt could be eliminated lessening the right-of-way and driveway impacts accordingly.

5.2.3 Option N3 - Add East Side Sidewalk

The third improvement plan considered for VT 2A north of Industrial Avenue is a scaled back version of Option N2. The proposed two-way, left-turn lane is removed from the plan and only the five feet wide sidewalk on the east side of the roadway is

added. The new sidewalk would serve residential properties located along the east side of the roadway as shown in Appendix H3.

This plan does not provide the traffic operations and safety benefits associated with the other alternatives but does provide pedestrian accommodations on the east side of the roadway. With this plan only 19,000 square feet of new pavement is added and the new sidewalk, with a five-foot wide greenbelt, can be located fully within the available roadway right-of-way. As noted in Appendix I, five mature trees would be lost and 14 utility poles would need to be relocated. If curbing were provided and the sidewalk were constructed immediately adjacent to the roadway some utility pole relocation may be avoided. The estimated construction cost for the sidewalk with the five-foot greenbelt and pole relocations is approximately $0.6 million.

5.2.3 Roadway Segment Options Summary

The attributes of the roadway segment improvement options are compared side-by-side in Table 7. (An expanded evaluation matrix in the standard VTrans format is in Appendix M.) As shown, Option N3, adding just and east side sidewalk to VT 2A is the least expensive alternative at $600,000. While this improvement benefits pedestrian mobility it offers no benefit to vehicular traffic flow and results in a roadway cross section that is inconsistent with the treatment proposed for VT 2A north of this roadway segment. Options N1 and N2 offer a consistent roadway cross section, both include a three-lane section, but Option N2 adds an east side sidewalk with significant added impacts in terms of right-of-way and new pavement. The estimated cost of Option N2 is $2.5 million compared to $2.1 million for Option N1.

The figures presented in Table 7 assume that a closed drainage system will be provided along VT 2A to convey and treat the additional stormwater runoff associated with the proposed improvements. This design assumption affects the construction cost estimate, provided in Appendix J, and estimate right-of-way impacts. If the “country drainage” system remains in place and is deemed adequate during the project permitting phase to treat runoff then, there could be substantial construction cost savings. However, the right-of-way impacts of moving the utility poles out of the clear zone without curbing provided along the roadway may be more costly to address than installing curbing and drainage treatment systems.

		Option N1	Option N2	Option N3
Performance / Impacts	**No Build**	**3-Lane Cross Section**	**3-Lane Cross Section + Sidewalk**	**Existing + Sidewalk**
"Bike Lanes"	On Street	On Street	On Street	On Street
Refuge Islands	No	Potential	Potential	No
New Pavement	None	27,000 SF	50,000 SF	19,000 SF
ROW Takings-Area	None	None	15,000 SF	None
ROW Takings-Parcels	None	None	17 Parcels	None
< 25 Feet of Driveway	None	None	2 Parcels	None
Tree Loss	None	6 Trees	11 Trees	5 Trees
Utility Poles	None	14	14	14
Construction Cost	None	$2.1 million	$2.5 million	$0.6 million

Table 7: Roadway Segment Options Summary

5.3 Pedestrian Crossings/Transit Access

As noted above, the CCTA operates bus service along VT 2A and several bus stops are located on VT 2A in the project study area. These locations are noted on the plans for Alternatives N1, N2, and N3 in Appendix H. Some transit riders accessing these bus stops must cross VT 2A. The proposed two-way, left-turn addition on VT 2A creates opportunities to better serve these transit riders and other pedestrians crossing VT 2A. Figure 10 illustrates how sections of the suggested two-way, left-turn lane could be treated as designated left-turn lanes at cross streets. Opposite the dedicated left-turn lanes, raised, center median islands can be installed with a pedestrian cut-through. The center median can function as a refuge island allowing pedestrians to make a staged crossing of the roadway. Also, pedestrian crossing signs would be installed at these locations. Figure 11 shows a similar treatment with the addition of pedestrian actuated rectangular rapid flashing beacons to accentuate the crossing location. These crossings can be installed with the flashing beacons for approximately $10,000 per location.

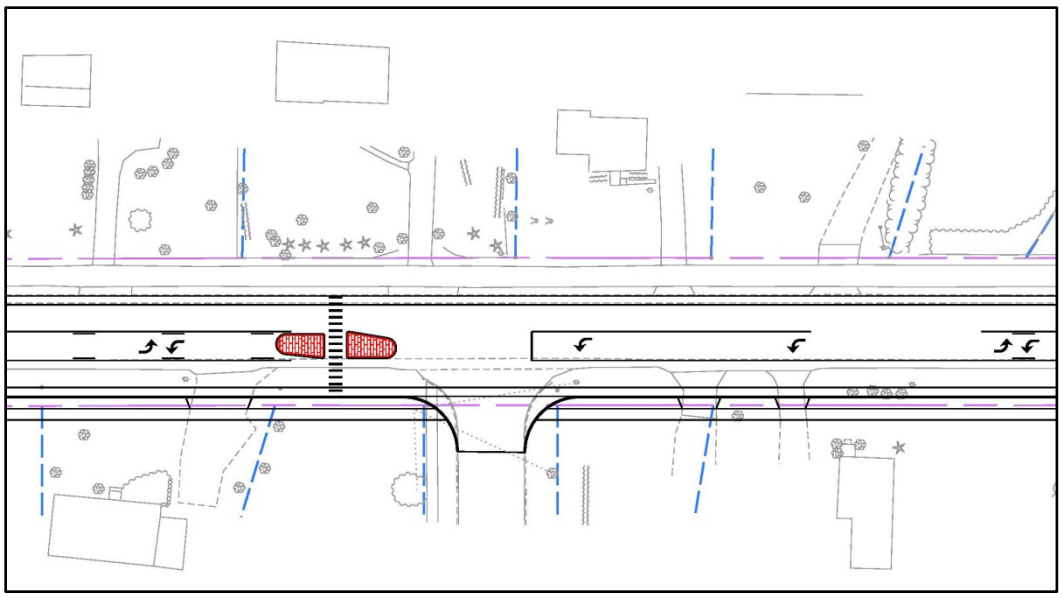

Figure 10: Two-Way, Left-Turn-Lane withPedestrian RefugeIisland

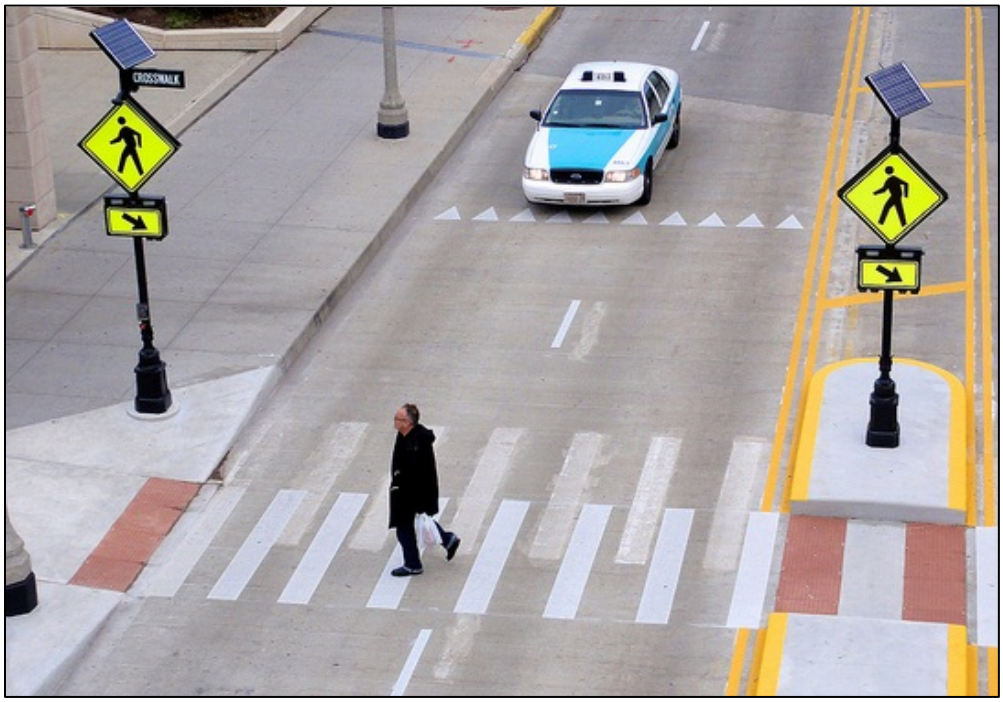

Figure 11: Example of Crosswalk Highlighted with Rapid Flashing Beacons and Signage

6.0 Recommendations

The alternative improvement plans for the study area were presented to Town officials and residents at a series of public meetings. Copies of meeting minutes and written comments received in response to presentations made at the meetings are included in Appendices K and L. At the conclusion of the public review process the Williston Selectboard voted to advance intersection *Option 3-Add Westbound Left-turn Lane, Eastbound Left-turn Lane and Northbound Through Lane* and segment *Option N1-Add Two-way Left-turn Lane*. In selecting intersection Option 3 over *Option 6-Mutlilane Roundabout*, the Selectboard noted concerns regarding limited public acceptance of roundabouts in Williston. Of the signalized intersection alternatives, Option 3 provides the most improvement in traffic operations and likewise has the greatest longevity. *Option N1-Add Two-way, Left-turn Lane* was supported for the roadway segment treatment as it would create a consistent and safer roadway cross section along VT 2A and avoid the significant right-of-way issues associated with the addition of a sidewalk to the plan as proposed in Option N2. The Selectboard recommendations were presented to and accepted by the CIRC Alternatives Task Force. The CCRPC and the Town of Williston will work with VTrans to secure funding for the design of the recommended improvement plan. Table 8 provides an overall description and implementation budget for the recommended alternatives.

Proposal:	**Implement Intersection Option 3-*Add Westbound Left-turn Lane, Eastbound Left-turn Lane and Northbound Through Lane* and Segment Option N1-*Add Two-way Left-turn Lane***	
Operational Benefits	VT 2A/Industrial Avenue/Mountain View Road Intersection Operations Improve from Level of Service F to Level of Service D for 2033 PM Peak Hour Conditions	
Environmental Impacts	9 Mature Trees Removed	
Construction Impacts	50,000 square feet of Additional Pavement 28 Utility Poles Relocated	
Right of Way Impacts	Permanent Land takings from 15 Parcels 5,200 square feet of takings to edge of pavement (Additional takings would be warranted to accommodate utilities, snow storage, etc, in the public right-of-way.)	
Permits	Wetlands: Self Verification Form Class III wetlands are present on site, impacts likely less than 3,000 square feet Stormwater: Treatment: Permit Likely required Allen Brook watershed: impaired waters Historical: Section 106 Historical properties and mature trees present Archaeological: Highly sensitive in undisturbed areas Phase IB required if work is performed outside of previously disturbed areas NEPA Documents: Categorical Exclusion	
Cost		
	Construction	$4,000,000
	Preliminary Engineering (15%)	$600,000
	Construction Engineering (10%)	$400,000
	Municipal Project Manager (7%)	$280,000
	Legal Fees (estimate)	$30,000
	ROW Fees	Unknown
Total		**$5,310,000**

Table 8: Summary of Recommended Alternatives

APPENDIX A

EXISTING CONDITIONS SURVEY

N

VT STATE PLANE GRID

INDUSTRIAL AVENUE

SHARON DRIVE

VT 2A

VT 2A

MOUNTAIN VIEW ROAD

EXISTING CONDITIONS SURVEY
PREPARED BY VSE
DATED : 05/25/2013
REVISED: 09/02/2013

0 50 100

SCALE IN FEET

N

VT STATE PLANE GRID

SHARON DRIVE

HILLSIDE DRIVE

VT 2A

BITTERSWEET CIRCLE

EXISTING CONDITIONS SURVEY
PREPARED BY VSE
DATED : 05/25/2013
REVISED: 09/02/2013

0 50 100

SCALE IN FEET

APPENDIX B

TRAFFIC COUNTS AND CALCULATIONS

File Name: G:\TechSupp\Traffic\TRFCRES\TR_TM\JAMAR\PETRA\Data Files\2012\2A-2am12.ppd
Start Date: 6/1/2012
Start Time: 6:00:00 AM
Site Code: 30417825
Comment 1: Counter: T12-1489
Comment 2: Counted by: M Deforge
Comment 3: Weather: Sunny
Comment 4: Town: 2A-2 Williston

	VT 2A from Essex From North				Mountain View Rd from N Williston Rd From East				VT 2A from US 2 From South				Industrial Ave from US 2 From West					
Start Time	Left	Thru	Right	ROR	Left	Thru	Right	ROR	Left	Thru	Right	ROR	Left	Thru	Right	ROR		
06:00 AM	1	26	37	27	0	21	2	0	0	33	3	0	12	7	3	1	173	
06:15 AM	0	35	50	28	3	28	13	2	1	36	8	0	21	6	3	0	234	
06:30 AM	7	53	71	35	3	31	8	7	4	57	4	0	35	20	6	0	341	
06:45 AM	13	83	89	33	11	48	8	0	8	68	13	0	35	7	3	1	420	1168
07:00 AM	4	94	67	51	6	43	13	1	6	66	13	0	41	13	5	1	424	1419
07:15 AM	10	94	117	17	21	61	18	2	16	66	9	0	48	32	6	1	518	1703
07:30 AM	12	113	115	6	8	99	20	2	14	61	11	0	46	23	7	1	538	1900
07:45 AM	13	122	134	18	13	94	17	3	13	74	8	0	74	22	7	0	612	2092
08:00 AM	10	100	80	44	16	63	13	2	16	80	10	0	48	29	9	7	527	2195
08:15 AM	16	125	88	21	25	75	21	6	24	67	8	0	57	28	6	5	572	2249
08:30 AM	20	105	64	34	22	52	8	2	10	56	20	0	43	26	8	0	470	2181
08:45 AM	12	108	66	28	15	42	12	7	18	66	12	0	46	32	7	2	473	2042
09:00 AM	11	85	62	17	10	34	16	2	11	70	8	0	44	21	8	0	399	1914
09:15 AM	2	87	90	24	9	24	8	3	9	78	10	0	51	21	5	1	422	1764
09:30 AM	11	85	66	11	10	41	4	4	7	75	2	0	50	23	12	0	401	1695
09:45 AM	15	112	64	18	11	27	13	7	9	92	9	0	50	18	2	3	450	1672
10:00 AM	7	108	55	9	8	22	3	1	6	92	10	0	60	22	11	1	415	1688
10:15 AM	7	111	52	11	14	13	12	8	4	66	19	0	50	17	9	2	395	1661
10:30 AM	5	73	48	9	6	20	8	1	7	73	9	1	48	17	6	2	333	1593
10:45 AM	12	72	44	11	8	16	5	6	7	80	8	0	46	13	2	3	333	1476
11:00 AM	11	91	57	16	12	20	9	4	9	88	7	0	60	13	6	5	408	1469
11:15 AM	10	111	66	22	17	22	11	2	9	101	10	0	68	12	7	8	476	1550
11:30 AM	13	105	51	12	24	24	18	1	5	114	7	0	66	18	6	6	470	1687
11:45 AM	7	136	69	33	18	22	17	4	8	106	20	0	91	17	10	2	560	1914
Peak Hour	59	452	366	117	76	284	59	13	63	277	46	0	222	105	30	12		

File Name: G:\TechSupp\Traffic\TRFCRES\TR_TM\JAMAR\PETRA\Data Files\2012\2A-2pm12.ppd
Start Date: 5/31/2012
Start Time: 3:00:00 PM
Site Code: 30417825
Comment 1: Counter: T12-1489
Comment 2: Counted by: M Deforge
Comment 3: Weather: Partly cloudy
Comment 4: Town: 2A-2 Williston

	VT 2A from Essex From North				Mountain View Rd from N Williston Rd From East				VT 2A from US 2 From South				Industrial Ave from US 2 From West					
Start Time	Left	Thru	Right	ROR	Left	Thru	Right	ROR	Left	Thru	Right	ROR	Left	Thru	Right	ROR		
03:00 PM	16	114	63	15	15	30	14	3	7	87	13	0	75	24	8	5	489	
03:15 PM	7	97	64	5	18	26	16	1	8	117	11	0	92	31	6	2	501	
03:30 PM	32	108	63	6	21	35	25	2	8	122	13	0	103	35	5	5	583	
03:45 PM	18	119	65	10	8	34	16	3	16	97	13	0	97	43	7	2	548	2121
04:00 PM	22	100	74	7	8	31	12	4	2	98	3	0	115	48	15	0	539	2171
04:15 PM	20	109	62	25	22	35	12	0	5	130	19	0	118	46	11	1	615	2285
04:30 PM	18	129	53	18	25	40	17	3	9	123	12	0	100	42	9	1	599	2301
04:45 PM	33	126	69	18	11	42	15	1	3	128	16	0	105	54	7	1	629	2382
05:00 PM	31	123	65	8	28	39	21	2	10	117	21	0	111	48	6	1	631	2474
05:15 PM	23	123	75	9	22	46	11	1	3	126	12	0	113	61	9	2	636	2495
05:30 PM	29	114	40	9	22	50	15	1	4	130	30	2	107	49	6	1	609	2505
05:45 PM	15	94	35	2	14	6	9	0	20	81	17	0	81	48	3	1	426	2302
Peak Hour	116	486	249	44	83	177	62	5	20	501	79	2	436	212	28	5		

VERMONT AGENCY OF TRANSPORTATION
POLICY, PLANNING AND INTERMODAL DEVELOPMENT DIVISION
Traffic Research Unit

				BEGINNING REFERENCE:			ENDING REFERENCE:					2008	2010	2012	
TYPE	NO.	NAME	FC	TOWN	MM	NAME	NUMBER	MM	NAME	NUMBER	ATR STA	STATUS	AADT	AADT	AADT	
VT	2A		07	ST GEORGE	0.000	VT 116		1.982	WILLISTON TL			H	5600 E	5600 E	5600 E	
VT	2A		16	WILLISTON	0.000	ST GEORGE TL		2.117	OLD CREAMERY RD	TH-3	D128	H/A	5600 A	5600 A	5600 A	
VT	2A		16	WILLISTON	2.117	OLD CREAMERY RD	TH-3	2.929	I 89 RAMPS B/C: EXIT 12			H	7900 E	7900 E	8400 E	
VT	2A		14	WILLISTON	2.929	I 89 RAMPS B/C: EXIT 12		3.012	I 89 RAMPS A/D: EXIT 12			H	16800 E	19400 E	19300 E	
VT	2A		14	WILLISTON	3.012	I 89 RAMPS A/D: EXIT 12		3.335	MARSHALL AVE	FAU 5505	D239	H	27000 E	26800 A	26700 E	
VT	2A		14	WILLISTON	3.335	MARSHALL AVE	FAU 5505	3.721	US 2		D129	C/H	17100 A	17000 A	17400 A	
VT	2A		16	WILLISTON	3.721	US 2		4.793	INDUSTRIAL AVE/MTN VIEW	TH-2/9	D115	H/A	13300 A	12600 A	13200 E	←
VT	2A		16	WILLISTON	4.793	INDUSTRIAL AVE/MTN VIEW	TH-2/TH-9	5.940	ESSEX TL		D135	H	19200 A	17900 A	18100 A	←
VT	2A		16	ESSEX	0.000	WILLISTON TL		0.188	RIVER ST CONN			H	19200 E	17900 E	18100 E	
VT	2A		16	ESSEX	0.188	RIVER ST CONN		0.310	SOUTH ST/RIVER ST	TH-5/	D189	H/A	23800 E	18500 E	17400 E	
VT	2A		16	ESSEX	0.310	SOUTH ST/RIVER ST	TH-5/	0.669	MAIN ST/PEARL ST/MAPLE ST	VT 15/VT 117	D175	H/A	20900 A	16300 A	15400 A	
VT	2A		16	ESSEX	0.669	MAIN ST/PEARL ST/MAPLE ST	VT 15/VT 117	1.044	NORTH ST		D178	H/A	7300 A	7200 A	7200 E	
VT	2A		16	ESSEX	1.044	NORTH ST		1.873	PINE CREST DR/OLD COLCHESTER RD	TH-6/TH-20	D041	H	7000 A	7200 A	7700 A	
VT	2A		16	ESSEX	1.873	PINE CREST DR/OLD COLCHESTER RD	TH-6/TH-20	2.487	SUSIE WILSON RD/VT 289: RMP A:EX7	TH-3	D042	H	6800 A	6500 A	6500 E	
VT	2A		16	ESSEX	2.487	SUSIE WILSON RD/VT 289: RMP A:EX7	TH-3	2.702	VT 289: RAMP D: EXIT 7			H	15000 E	16200 E	15500 E	
VT	2A		16	ESSEX	2.702	VT 289: RAMP D: EXIT 7		3.500	COLCHESTER TL		D116	H	9400 A	10300 A	10900 A	
VT	2A		16	COLCHESTER	0.000	ESSEX TL		1.473	EAST RD/MILL POND RD	TH-2/TH-27		H	10000 E	10500 E	10900 E	
VT	2A		16	COLCHESTER	1.473	EAST RD/MILL POND RD	TH-2/TH-27	2.204	VT 127		D117	H/A	9300 A	9700 A	9700 E	
VT	2A		16	COLCHESTER	2.204	VT 127		2.431	US 7			H	5500 E	6000 E	6200 E	
VT ROUTE 2B																
VT	2B		07	DANVILLE	0.000	US 2		0.166	PARKER RD	TH-124	CYAH		320 E	400 E	410 E	
VT	2B		07	DANVILLE	0.166	PARKER RD	TH-124	1.916	ST JOHNSBURY TL		C111	A	800 E	780 E	390 E	
VT	2B		16	ST JOHNSBURY	0.000	DANVILLE TL		1.543	US 2			H	800 E	780 E	390 E	
VT ROUTE 3																
VT	3		16	RUTLAND TOWN	0.000	BR US 4		1.695	PROCTOR TL		R098/079	H(R098	3100 A	3200 A	3300 A	
VT	3		16	PROCTOR	0.000	RUTLAND TOWN TL		1.804	SOUTH ST	TH-56			3100 E	3200 E	3300 E	
VT	3		16	PROCTOR	1.804	SOUTH ST	TH-56	2.599	MAIN ST	TH-3	R189	A	2600 E	3000 E	3000 E	
VT	3		16	PROCTOR	2.599	MAIN ST	TH-3	3.078	WILLIAMS ST/FIELD ST	TH-34/TH-31	R188	A/H	1800 E	2100 E	2200 E	
VT	3		16	PROCTOR	3.078	WILLIAMS ST/FIELD ST	TH-34/TH-31	3.283	PITTSFORD TL				1400 E	1500 E	1600 E	
VT	3		07	PITTSFORD	0.000	PROCTOR TL		2.480	CORN HILL RD	TH-6	R137	A	1400 A	1500 A	1600 A	
VT	3		07	PITTSFORD	2.480	CORN HILL RD	TH-6	2.850	US 7				2600 E	2800 E	2800 E	
VT ROUTE 4A																
VT	4A		07	FAIR HAVEN	0.000	US 4		1.092	CEDAR ST	TH-55	R151	A	900 A	900 A	910 E	
VT	4A		07	FAIR HAVEN	1.092	CEDAR ST	TH-9	1.505	VT 22A S	TH-2	R171	A	1400 E	1300 E	1800 E	
VT	4A		07	FAIR HAVEN	1.505	VT 22A S	TH-2	1.701	S PARK PLACE	TH-53	R048	A	4800 A	4700 E	5800 A	
VT	4A		07	FAIR HAVEN	1.701	S PARK PLACE	TH-55	1.785	N PARK PLACE	TH-3			7200 E	7000 E	6100 E	
VT	4A		07	FAIR HAVEN	1.785	N PARK PLACE	TH-3	1.845	VT 22A N	TH-3			4200 E	4100 E	3800 E	
VT	4A		07	FAIR HAVEN	1.845	VT 22A N	TH-3	2.236	FAIR HAVEN SH	TH-8	R167	A	4300 A	4200 E	4200 E	
VT	4A		07	FAIR HAVEN	2.236	FAIR HAVEN SH	TH-8	3.253	CASTLETON TL		R149	A	4500 E	4500 E	3400 A	
VT	4A		07	CASTLETON	0.000	FAIR HAVEN T/L		0.493	CREEK RD	TH-2			4100 E	4100 E	4800 E	

Site Id	Town	Route	Alt Route	Street Name	Location	mm	fc	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
S6CZFC	Wheelock	NONE	TH5	800' N of S Wheelock Rd	MinisterHRdjustNof SWheelockRd		9	100						80			
S6CZFQ	Wheelock	NONE	TH5	750' N of Morgan Rd	Vertical Mile Rd 750' Nof TH15		9							110			
S6C709	Wheelock	VT122	VT122		VT122 at Lyndon TL		7						1600			1800	1700
S6A359	Whiting	MC0160	TH1	Leicester Whiting Rd	betw Sawyer Rd & Walker Rd	2.7	7		900				930				870
S6AXCF	Whiting	NONE	TH2	Sawyer-Needham Rd	TH2 just SofLeicester-WhitingRd		9		240								
S6A121	Whiting	VT30	VT30	N Main St	VT30 0.6 mi S of StickneyRd-TH4	3.0	7			1800		1600		1800		1900	
S6A157	Whiting	VT30	VT30		VT30 0.7 mi S of MurrayRd-TH15	5.6	7							1700		1600	
S6X209	Whitingham	MC0105	TH2	Tunnel St 100 ft s of Bosley Hill Rd	TH2 100 ftSof Bosley Hill Rd	0.2	7						210				270
S6X019	Whitingham	MC0111	VT8A	0.2 mi s of Burrington Hill Rd	VT8A-0.2mSofBurringtonHillRd	0.2	7		150				240				260
S6X391	Whitingham	MC0111	VT8A	0.1 mi w of Maple Hill Ln	VT8A 0.1 miWof Maple Hill Ln	3.0	7		420				490				370
S6XXBP	Whitingham	NONE	TH18	Reed Hill Rd	ReedHillRd betwHolland/Allen		9	120									
S6X022	Whitingham	NONE	TH3		TH3 0.5 Mi Nof Massachusetts	0.2	8						130				120
S6X039	Whitingham	NONE	TH3	0.1 mi n of Sadawga Lake Rd	TH3- 0.1 m Nof SadawgaLakeRd	4.3	8						290				260
S6X393	Whitingham	NONE	TH3		TH3 0.3 mi S of VT100	6.2	8						530				510
S6X392	Whitingham	NONE	TH3	0.3 mi n of Fowler Rd	TH3 0.3 mi N of Fowler Rd		9						990				1100
S6XXBG	Whitingham	NONE	TH38	Merrifield Rd	Merrifield Rd just S ofVT100		9	60									
S6XXBO	Whitingham	NONE	TH41	Gates Pond Rd N of VT100	GatesPondRd 0.16mi Nof VT100		9	690									
S6XXBQ	Whitingham	NONE	TH41	Gates Pond Rd just N of Laurel Lake Rd	GatesPondRd just Nof LaurelL		9	370									
S6XXBM	Whitingham	NONE	TH5	Allard Rd S of VT 100	Allard Rd 0.24 mi S of VT100		9	60									
S6XXBK	Whitingham	NONE	TH5	Town Hill Rd E of Goodnow	TownHillRd 0.31miEof Goodnow		9	40									
S6XXBI	Whitingham	NONE	TH55	Sadawga Lake Rd	Sadawga Lake Rd justSofVT100		9	280									
S6XXBH	Whitingham	NONE	TH56	Dam Rd	Dam Rd just W of VT100		9	10									
S6XXBN	Whitingham	NONE	TH58	Ginny Morse Rd S of VT100	GinnyMorseRd just S of VT100		9	230									
S6XXBJ	Whitingham	NONE	TH6	Sadawga Lake Rd	SadawgaLakeRd NofKentfieldRd		9	130									
S6XXBL	Whitingham	NONE	TH7	Burrington Hill Rd 1.3mi S of Kentfield	BurringtonHilRd SofKentfield		9	140									
S6X119	Whitingham	VT100	VT100		VT100 0.3mi S of Dam Rd	2.7	7			830		720				850	
S6X042	Whitingham	VT100	VT100	0.3 mi n of Ginny Morse Rd	VT100 0.1 miNof GinnyMorseRd	6.5	7	910		1100				980		1200	
S6X117	Whitingham	VT100	VT100		VT100 0.2 miSof FowlerRd-T21	8.7	6			1800		1600		2100		2100	
S6X138	Whitingham	VT112	VT112		VT112 0.4 mi Sof HolbrookRd	0.8	6	1600		1700		1500				1600	
S6N003	Williamstown	I89	I89		I89 betw exits 5 & 6	44.9	1				18300				16200		
S6N077	Williamstown	I89	I89 RAMP	branch from VT64 WB	I89 exit 5 NB on-ramp B	0.0	99				670				590		
S6N072	Williamstown	I89	I89 RAMP		I89 Exit 5 NB on ramp B	0.1	99				2700				2200		
S6N073	Williamstown	I89	I89 RAMP		I89 Exit 5 SB off ramp D	0.1	99				2600				2200		
S6N071	Williamstown	I89	I89 RAMP		I89 Exit 5 NB off ramp A	0.1	99				740				620		
S6N074	Williamstown	I89	I89 RAMP		I89 Exit 5 SB on ramp C	0.1	99				710				630		
S6N070	Williamstown	I89	I89 RAMP	Spur to VT64 WB	I89 exit 5 SB off-ramp D	0.2	99				1900				1600		
S6N079	Williamstown	I89	I89 RAMP	branch to VT64 EB	I89 exit 5 NB off-ramp A	0.2	99				210				200		
S6N075	Williamstown	I89	I89 RAMP	Spur to VT64 EB	I89 exit 5 SB off-ramp D		99				560						
S6N324	Williamstown	MC0205	TH1	Graniteville Rd	TH1 Graniteville Rd MM 020	1.6	7		1100								1200
S6N707	Williamstown	MC0205	TH1	Graniteville Rd	GranitevilleRdEofMcGlynnRd		7					1100					
S6N056	Williamstown	NONE	TH16	Baptist Street	TH16 - 500' N of Chelsea Rd		9									200	
S6N057	Williamstown	NONE	TH16	Baptist Street	TH16-500'SofGranitevilleRd		9									130	
S6N005	Williamstown	NONE	TH24	Construction Hill Road	TH 24 W of VT14		9					470				380	
S6N055	Williamstown	NONE	TH30	Martin Road	TH30-500'SWofGranitevilleRd		9									300	
S6N060	Williamstown	NONE	TH30	Sugarhouse Road	TH30 - 500' E of Tower Rd		9									150	
S6N058	Williamstown	NONE	TH33	Tower Road	TH33 - 500' S of Robar Rd		9									260	
S6N012	Williamstown	NONE	TH39	Pleasant Street	TH39 - 1000' s of VT14		9									380	
S6N050	Williamstown	NONE	TH42	Gilbert Road	TH42 - 500' S of Meadow St		9									350	
S6N059	Williamstown	NONE	TH45	Tower Road	TH45-2000' Sof TherriaultRd		9									180	
S6N011	Williamstown	NONE	TH94	Brush Hill Road	TH94 S of Const.HillRd		9					1100				550	
S6N706	Williamstown	VT 14		VT 14	VT14-150'SofSpiderWebFarmRd		7									3800	
S6N122	Williamstown	VT14	VT14		VT14 0.4miSofWinchesterH.Rd	1.7	7			820		810		870		940	
S6N190	Williamstown	VT14	VT14		VT14 0.4miSof ChelseaRd-TH3	3.0	7		1300		1300				1200		
S6N121	Williamstown	VT14	VT14		VT14 0.5mi NofChelseaRd-TH5	3.8	7				2800				2400		
S6N326	Williamstown	VT64	VT64		VT64 0.2 mi wof clarkRd-T88	2.2	7	1700			1700				1700		
S6N020	Williamstown	VT64	VT64		VT64 0.1mi Eof PineRidge Rd	3.6	7	2100		2200		2000		2000		2100	
S6N179	Williamstown	VT64	VT64	Brook St	VT64 0.1 mi W of VT14	4.2	7								2800		
S6DYAO	Williston	FAU5408	TH1	N Williston Rd N of Mtn View Rd	N Williston Rd N of MtnViewRd		17						5500				
S6D070	Williston	FAU5504		Industrial Ave	Industrial 0.1miEof N Brwnell	0.8	17				8400				12300		

Site Id	Town	Route	Alt Route	Street Name	Location	mm	fc	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
S6D087	Williston	FAU5504	TH2	Industrial Ave	Industrial betw AveB/AveC	0.4	17				8000				10600		
S6D606	Williston	FAU5505	TH6	Marshall Ave	Marshall BetwHarvest/Brownell	1.0	17			8800							
S6D521	Williston	FAU5506	TH 4	Mountain View Dr	Mountain View .3miWof Redmond	0.8	17				4800				5800		
S6D777	Williston	FAU5506	TH4	Mountain View Road	TH4 - Mountain View Rd		17										6300
S6D345	Williston	FAU5508	TH1	N Williston Rd	N Williston 0.5 miSof MtnView	0.5	17				4500		4900		4400		
S6D026	Williston	FAU5508	TH1	N Williston Rd	N Williston Rd 1.0 Mi Nof US2	2.1	17						5200				5400
S6D346	Williston	FAU5510	TH1		TH1 0.4 Mi Nof Th-4	1.5	17						2800				2800
S6D422	Williston	I89	I89 RAMP		I89 Exit 12 NB on ramp D	0.1	99				8400				9000		
S6D423	Williston	I89	I89 RAMP		I89 Exit 12 SB off ramp C	0.1	99								8500		
S6D421	Williston	I89	I89 RAMP		I89 Exit 12 NB off-ramp A	0.1	99				3700				3800		
S6D424	Williston	I89	I89 RAMP		I89 Exit 12 SB on ramp B	0.1	99				3800				3700		
S6DZAQ	Williston	None	TH 10	Fay Lane	Fay Ln - 100' W ofWillistonRd		19		170						220		
S6DZAR	Williston	None	TH 11		ChapmanLn0.1miEofNWillistonRd		19		90						180		
S6DZAP	Williston	None	TH 14	1000' e of Williston Rd	GovChitt-1000'EofWillistonRd		19		410						320		
S6DZAM	Williston	None	TH 25	200'wofStGeorge Rd	Lincoln- 200' Wof St GeorgeRd		19		110						130		
S6DZAN	Williston	None	TH 26	Butternut Rd 0.7mi E of VT2A	Butternut RD 0.7mi E of VT2A		19			150					170		
S6DZAO	Williston	None	TH21	500' w of Oak Hill	SunsetHill-500' W of Oak Hill		19		160						180		
S6D062	Williston	NONE	TH3	S Brownell Rd	S Brownell 0.16 mi S of I 89		19				3500				4800		
S6D247	Williston	NONE	TH3		TH3 0.4 Mi E of Rt-2A		19						3000				2500
S6D727	Williston	None	TH5	South Brownell Road S of VanSicklen R	TH5 - So. Brownell Rd		19			1900							
S6D036	Williston	US2	US2	Williston Rd	US2 0.2mi W of Industrial Ave	0.1	14		16600	18900		17600		19800		19700	
P6D061	Williston	US2	US2	Williston Rd	US2 0.2 mi E of Industrial Av	0.5	14	10700		10900	11200	11200	11400	11600	11500	11300	10900
S6D061	Williston	US2	US2	Williston Rd	US2 Williston Rd	0.5	14		10500								
S6D134	Williston	US2	US2	Williston Rd	US2 0.2 mi W of VT 2A	1.1	14			12300		11700		12800		12000	
S6D111	Williston	US2	US2	Williston Rd	US2 0.8 mi E of VT2A	2.2	16			11400		11100		11500		11400	
S6D110	Williston	US2	US2	Williston Rd	US 2 .1mi W of N.WillistonRd	3.6	16				8200		8200				
S6DXAS	Williston	US2	US2	WILL51 Williston Rd	US 2 0.2mi E of NWilliston Rd	3.9	16				4000						
S6D284	Williston	US2	US2	on French Hill	US2 0.18 mi W of Sunrise Dr	4.7	16			3800							
S6D285	Williston	US2	US2	French Hill	US2 just W of Sunrise Dr	4.9	16			3700							
S6D130	Williston	US2	US2	Williston Rd	US2 0.4mi E of Gov.Chitten Rd	5.8	16			3700		3900		4100		3800	
S6D128	Williston	VT2A	VT2A	St George Rd	VT2A 0.1 miNof Butternut-TH26	0.4	16	5600		5600		5600		5700		5600	
S6D239	Williston	VT2A	VT2A	St George Rd	VT2A just S of Marshall	3.2	14			26800							
P6D129	Williston	VT2A	VT2A	St George Rd	VT2A just N of Marshall Ave	3.4	14		17200	17000	16900	17100	18300	18700	18400	18700	18600
S6D129	Williston	VT2A	VT2A	St George Rd	VT2A just N of Marshall Ave	3.4	14	1740									
S6D115	Williston	VT2A	VT2A	Essex Rd	VT2A 0.3 mi S of IndustrialAv	4.6	16			12600		13300		14300		14000	
S6D135	Williston	VT2A	VT2A	0.3 mi n of River Cover Rd	VT2A 0.1mi Nof JamesBrown Rd	5.6	16	18100		17900		19200				18900	
S6X359	Wilmington	MC0106	TH2	E Dover Rd	TH2 E Dover Rd 0.6 Mi S of D	0.3	7						940				950
P6X068	Wilmington	MC0115	TH1	Haystack Access Rd 0.1 mi w of VT100	TH1 ColdbrookRd0.1mWof VT100	0.1	7	950	890	950	950	930	940			1000	
S6X068	Wilmington	MC0115	TH1	Coldbrook Rd	TH1 Coldbrook Rd (Haystack).	0.1	7							840			850
S6X040	Wilmington	MC0115	TH1	Coldbrook Rd	TH1 0.4 mi N of VT100	1.8	7						770				930
S6XXAC	Wilmington	minor0522	TH8	Ray Hill Rd betw VT/Wilmington Heights	RayHillRd betw VT9/WilmHghts	0.6	8	650									
S6X201	Wilmington	minor0522	TH8	Mann Rd 0.2mi S of Sturgis Rd	MannRd 0.2 mi S of SturgisRd	3.1	8	640				690					
S6X360	Wilmington	minor0526	TH3		TH3 0.3 mi E of VT100	0.4	8						810				1100
S6X361	Wilmington	minor0541	TH4	0.6 mi s of Stowe Hill Rd	TH4 0.6 mi Sof Stowe Hill Rd	1.8	8						350				370
S6XXDW	Wilmington	NONE	TH21	Stowe Hill Rd	Stowe Hill Rd .2mi EofVT100		9	350									
S6XXDY	Wilmington	NONE	TH32	Fairview Ave	FairviewAv .2miNofCastleHRd		9	340									
S6X192	Wilmington	NONE	TH33	S Main St just W of VT100	S Main St just W of VT9		9	1500									
S6XXDX	Wilmington	NONE	TH33	Castle Hill Rd	Castle Hill Rd just WofBoyd		9	430									
S6X708	Wilmington	NONE	TH40	Shearer Hill Rd	ShearerHillRd 0.1mi Wof VT9		9	460			520						510
S6XXFP	Wilmington	NONE	TH40	Shearer Hill RD	ShearerHill0.1miSof Parsons		9				240						
S6XYCD	Wilmington	NONE	TH5	Haystack Rd N of VT9	Haystack Rd 0.14 mi N of VT9		9	810				870					
S6XYCE	Wilmington	NONE	TH5	Ray Hill Rd	Ray Hill Rd just W of MannRd		9	460				420					
S6XXEA	Wilmington	NONE	TH64	Beaver St	Beaver St just Wof SchoolSt		9	720									
S6X116	Wilmington	VT100	VT100		VT100	0.6	6		2600								
S6X043	Wilmington	VT100	VT100		VT100 0.1 mi S of VT9	2.4	6	2900		3200		2300		3200		3400	
S6X190	Wilmington	VT100	VT100	N Main St	VT100 0.25 mi N of VT9	2.8	6			5000				5500		6200	
S6X400	Wilmington	VT100	VT100	0.4 mi s if TH1 Colebrook Rd	VT100 0.4mi S of ColdbrookRd	4.6	6			4600		4500		4800		5200	
S6X079	Wilmington	VT100	VT100		VT100 0.2 mi Nof ColebrookRd	5.2	6			4100		4600				4600	
P6X027	Wilmington	VT9	VT9		VT9 0.7 mi W of Haystack Rd	1.2	2	3700	3500	3800	3600	3600	3800	3700			

B: Urban

					Short Term Growth				2007	to	2012	0.99 ←
					20 Year Growth				2012	to	2032	0.96 ←
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2007	1.00											
2008	1.00	1.00										
2009	1.00	1.00	1.00									
2010	0.99	1.00	1.00	1.00								
2011	0.99	0.99	1.00	1.00	1.00							
2012	0.99	0.99	0.99	1.00	1.00	1.00						
2013						1.00	1.00					
2014						1.00	1.00	1.00				
2015						0.99	1.00	1.00	1.00			
2016						0.99	0.99	1.00	1.00	1.00		
2017						0.99	0.99	0.99	1.00	1.00	1.00	
2018						0.99	0.99	0.99	0.99	1.00	1.00	1.00
2019						0.99	0.99	0.99	0.99	0.99	1.00	1.00
2020						0.98	0.99	0.99	0.99	0.99	0.99	1.00
2021						0.98	0.98	0.99	0.99	0.99	0.99	0.99
2022						0.98	0.98	0.98	0.99	0.99	0.99	0.99
2023						0.98	0.98	0.98	0.98	0.99	0.99	0.99
2024						0.98	0.98	0.98	0.98	0.98	0.99	0.99
2025						0.97	0.98	0.98	0.98	0.98	0.98	0.99
2026						0.97	0.97	0.98	0.98	0.98	0.98	0.98
2027						0.97	0.97	0.97	0.98	0.98	0.98	0.98
2028						0.97	0.97	0.97	0.97	0.98	0.98	0.98
2029						0.97	0.97	0.97	0.97	0.97	0.98	0.98
2030						0.96	0.97	0.97	0.97	0.97	0.97	0.98
2031						0.96	0.96	0.97	0.97	0.97	0.97	0.97
2032						0.96	0.96	0.96	0.97	0.97	0.97	0.97
2033						0.96	0.96	0.96	0.96	0.97	0.97	0.97
2034						0.96	0.96	0.96	0.96	0.96	0.97	0.97
2035						0.95	0.96	0.96	0.96	0.96	0.96	0.97
2036						0.95	0.95	0.96	0.96	0.96	0.96	0.96
2037						0.95	0.95	0.95	0.96	0.96	0.96	0.96
2038						0.95	0.95	0.95	0.95	0.96	0.96	0.96
2039						0.95	0.95	0.95	0.95	0.95	0.96	0.96
2040						0.94	0.95	0.95	0.95	0.95	0.95	0.96
2041						0.94	0.94	0.95	0.95	0.95	0.95	0.95
2042						0.94	0.94	0.94	0.95	0.95	0.95	0.95
2043						0.94	0.94	0.94	0.94	0.95	0.95	0.95
2044						0.94	0.94	0.94	0.94	0.94	0.95	0.95
2045						0.93	0.94	0.94	0.94	0.94	0.94	0.95
2046						0.93	0.93	0.94	0.94	0.94	0.94	0.94
2047						0.93	0.93	0.93	0.94	0.94	0.94	0.94
2048						0.93	0.93	0.93	0.93	0.94	0.94	0.94
2049						0.93	0.93	0.93	0.93	0.93	0.94	0.94
2050						0.92	0.93	0.93	0.93	0.93	0.93	0.94
2051						0.92	0.92	0.93	0.93	0.93	0.93	0.93
2052						0.92	0.92	0.92	0.93	0.93	0.93	0.93
2053						0.92	0.92	0.92	0.92	0.93	0.93	0.93
2054						0.92	0.92	0.92	0.92	0.92	0.93	0.93
2055						0.91	0.92	0.92	0.92	0.92	0.92	0.93
2056						0.91	0.91	0.92	0.92	0.92	0.92	0.92
2057						0.91	0.91	0.91	0.92	0.92	0.92	0.92

C: Rural Primary and Secondary

					Short Term Growth				2007	to	2012	1.03
					20 Year Growth				2012	to	2032	1.06
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2007	1.00											
2008	1.01	1.00										
2009	1.01	1.01	1.00									
2010	1.02	1.01	1.01	1.00								
2011	1.02	1.02	1.01	1.01	1.00							
2012	1.03	1.02	1.02	1.01	1.01	1.00						
2013						1.00	1.00					
2014						1.01	1.00	1.00				
2015						1.01	1.01	1.00	1.00			
2016						1.01	1.01	1.01	1.00	1.00		
2017						1.02	1.01	1.01	1.01	1.00	1.00	
2018						1.02	1.01	1.01	1.01	1.01	1.00	1.00
2019						1.02	1.02	1.01	1.01	1.01	1.01	1.00
2020						1.02	1.02	1.02	1.01	1.01	1.01	1.01
2021						1.03	1.02	1.02	1.02	1.01	1.01	1.01
2022						1.03	1.03	1.02	1.02	1.02	1.01	1.01
2023						1.03	1.03	1.03	1.02	1.02	1.02	1.01
2024						1.04	1.03	1.03	1.03	1.02	1.02	1.02
2025						1.04	1.04	1.03	1.03	1.03	1.02	1.02
2026						1.04	1.04	1.04	1.03	1.03	1.03	1.02
2027						1.05	1.04	1.04	1.04	1.03	1.03	1.03
2028						1.05	1.04	1.04	1.04	1.04	1.03	1.03
2029						1.05	1.05	1.04	1.04	1.04	1.04	1.03
2030						1.05	1.05	1.05	1.04	1.04	1.04	1.04
2031						1.06	1.05	1.05	1.05	1.04	1.04	1.04
2032						1.06	1.06	1.05	1.05	1.05	1.04	1.04
2033						1.06	1.06	1.06	1.05	1.05	1.05	1.04
2034						1.07	1.06	1.06	1.06	1.05	1.05	1.05
2035						1.07	1.07	1.06	1.06	1.06	1.05	1.05
2036						1.07	1.07	1.07	1.06	1.06	1.06	1.05
2037						1.08	1.07	1.07	1.07	1.06	1.06	1.06
2038						1.08	1.07	1.07	1.07	1.07	1.06	1.06
2039						1.08	1.08	1.07	1.07	1.07	1.07	1.06
2040						1.08	1.08	1.08	1.07	1.07	1.07	1.06
2041						1.09	1.08	1.08	1.08	1.07	1.07	1.07
2042						1.09	1.09	1.08	1.08	1.08	1.07	1.07
2043						1.09	1.09	1.09	1.08	1.08	1.08	1.07
2044						1.10	1.09	1.09	1.09	1.08	1.08	1.08
2045						1.10	1.10	1.09	1.09	1.09	1.08	1.08
2046						1.10	1.10	1.10	1.09	1.09	1.09	1.08
2047						1.11	1.10	1.10	1.10	1.09	1.09	1.09
2048						1.11	1.10	1.10	1.10	1.09	1.09	1.09
2049						1.11	1.11	1.10	1.10	1.10	1.09	1.09
2050						1.11	1.11	1.11	1.10	1.10	1.10	1.09
2051						1.12	1.11	1.11	1.11	1.10	1.10	1.10
2052						1.12	1.12	1.11	1.11	1.11	1.10	1.10
2053						1.12	1.12	1.12	1.11	1.11	1.11	1.10
2054						1.13	1.12	1.12	1.12	1.11	1.11	1.11
2055						1.13	1.13	1.12	1.12	1.12	1.11	1.11
2056						1.13	1.13	1.13	1.12	1.12	1.12	1.11
2057						1.14	1.13	1.13	1.12	1.12	1.12	1.11

2012 CTC Summary

Site ID	Route	Town	Seasonal Adjustment Factor Group	Regression Group	AADT	AAWDT	#1 High Hour	30th High Hour	%k
P6A018	US7	Leicester	2	C	6200	6600	746	659	10.6
P6A019	VT22A	Orwell	2	C	3500	3500	582	427	12.2
P6A041	US7	New Haven	2	C	6800	7300	796	712	10.5
P6A111	VT22A	Addison	2	C	4900	4900	721	584	11.9
P6B015	VT67	Shaftsbury	2	C	3000	3100	391	333	11.1
P6B026	VT11	Winhall	5	C	4100	4000	834	621	15.1
P6B037	US7	Pownal	2	C	6700	6900	876	729	10.9
P6B041	VT9	Bennington	2	B	5400	5500	837	571	10.6
P6B282	US7	Shaftsbury	2	C	6000	6200	1015	792	13.2
P6C002	I91	Sheffield	4	A	4600	4800	872	680	14.8
P6C007	VT15	Hardwick	2	C	4900	5200	656	549	11.2
P6C015	I93	Waterford	4	A	5900	5800	1075	875	14.8
P6C028	US2	Danville	2	C	6800	7200	910	759	11.2
P6C043	VT114	Burke	2	E	3500	3400	601	420	12.0
P6C309	MC0268	Burke	6	E	1100	1100	487	258	23.5
P6D001	VT127	Burlington	3	B	14500	15600	1631	1545	10.7
P6D040	US7	Colchester	3	B	15200	16600	1910	1777	11.7
P6D059	MC0223	Bolton	6	E	910	800	438	286	31.4
P6D061	US2	Williston	3	B	10700	11700	1313	1183	11.1
P6D091	I89	South Burlington	3	A	55000	59400	6149	5901	10.7
P6D092	I89	Colchester	3	A	30100	32600	3654	3496	11.6
P6D099	I189	South Burlington	3	A	40400	44200	4446	4279	10.6
P6D132	US7	Charlotte	2	C	11000	11400	1307	1107	10.1
P6D530	VT289	Essex	3	B	16500	17500	1862	1767	10.7
P6D531	VT289	Essex	3	B	5500	5900	899	705	12.8
P6E131	US2	Guildhall	4	C	3200	3300	500	407	12.7
P6F029	US7	Georgia	3	C	3800	4100	541	456	12.0
P6F096	I89	Swanton	1	A	9700	10100	1376	1090	11.2
P6G005	US2	South Hero	4	C	8700	8900	1111	1006	11.6
P6G025	US2	Grand Isle	4	C	3000	3000	559	481	16.0
P6G118	US2	Alburg	4	C	4400	4300	618	535	12.2
P6L047	VT12	Elmore	2	C	1000	1100	174	143	14.3
P6L057	VT108	Stowe	6	C	3800	3400	1178	889	23.4
P6N002	I91	Bradford	1	A	7500	7800	1077	879	11.7
P6N151	US302	Newbury	2	C	7500	7700	1011	835	11.1
P6P004	VT100	Westfield	2	C	2200	2300	302	234	10.6
P6P082	I91	Derby	4	A	3000	3100	567	449	15.0
P6P215	US5	Derby	2	C	10000	10900	1694	1113	11.1
P6R001	US4	Fair Haven	1	A	6800	6500	1138	829	12.2
P6R005	US4	Killington	5	C	8700	8600	1498	1073	12.3
P6R017	VT103	Mt Holly	2	C	4700	4900	595	521	11.1
P6R022	US7	Rutland Town	3	B	21500	22800	2504	2169	10.1
P6R054	MC0159	Killington	6	E	4200	3900	1267	852	20.3
P6R084	US4	West Rutland	1	C	13100	13800	1810	1420	10.8
P6R100	US7	Brandon	2	C	5700	6000	684	604	10.6
P6W002	I89	Berlin	1	A	21200	22200	3244	2661	12.6
P6W004	VT62	Barre City	3	B	10500	11600	1362	1182	11.3
P6W006	US302	Berlin	3	B	13200	14300	1520	1392	10.5
P6W024	US2	Montpelier	3	B	11900	12900	1450	1326	11.1

DHV Determination Method

(Based on data through 2012)

To determine the Design Hour Volume (DHV), normally the 30th highest hourly volume of the year, from the Annual Average Daily Traffic (AADT), apply the procedures outlined below in TABLE I.

Poll Group* (Seasonal Adjustment Factor Group)	Equation	"k" Factor
1. Rural Interstate	DHV = 0.1192 * AADT + 73	0.1233
2. Rural Non-Interstate	DHV = 0.1088 * AADT + 27	0.1126
3. Urban	None – Use "k" Factor	0.1059
4. Summer Recreational	$DHV = AADT^{0.7620}$	0.1326
5. Summer/Winter Recreational US and VT Routes	DHV = 0.1191 * AADT + 128	0.1398
6. Summer/Winter Recreational Town Highways	Use locally derived equations or "k" factors.	

USED 0.111

TABLE I. DHV Calculation by Poll Group (seasonal adjustment factor group).

For poll groups 1, 2, 4 & 5, calculate DHV using both the equation and the "k" factor. Use the lower value. For poll group 3, use the "k" factor of 10.6%. For poll group 6, use locally derived equations or "k" factors. After calculation, values are to be rounded to the nearest 10 for volumes less than 1000, and to the nearest 100 for volumes greater than or equal to 1000.

Following are a series of charts illustrating the data on which these determinations are based. Each chart shows a number of parameters and a plot of the data points on which the parameters are based. The parameters include the number of data points, the "k" factor (the ratio of DHV to AADT) and the fitted curve equation. The "k" factor is derived by Linear Regression forcing the line through the origin. The fitted curve equation is derived by Linear Regression without forcing the line through the origin. Also shown is a description of the distribution of the individual "k" factors, including the minimum, maximum, mean and standard deviation. In the plot are shown the individual data points plus the fitted curve equation(s) and the "k" factor.

* If the project is located within the vicinity of a Continuous Traffic Counter (CTC), the "k" Factor for the CTC may be applied directly, rather than using the Poll Group Equation or the Poll Group "k" factor. Refer to pages 9 and 10 of this publication for a list of CTCs and their "k" factors.

WILL-17 : INDUSTRIAL AVENUE
DIR 1 : WB / DIR 2 : EB
CITY : WILLISTON
COUNTERS : RD / TS

Chittenden County MPO

110 West Canal St. Suite 202
Winooski, VT 05404
http://www.ccmpo.org

Site Code: WILL-17
Station ID: WILL-17
INDUSTRIAL AVE. WEST OF VT-2A

Latitude: 0' 0.000 Undefined

Start	18-Jul-11		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	*	*	16	32	14	32	10	19	19	48	25	36	32	27	19	32
01:00	*	*	9	14	3	15	6	10	11	21	14	29	14	28	10	20
02:00	*	*	7	8	4	9	8	13	9	10	13	14	7	16	8	12
03:00	*	*	28	11	25	14	37	16	35	13	20	9	11	11	26	12
04:00	*	*	74	32	79	32	57	21	63	22	32	14	22	15	54	23
05:00	*	*	199	61	222	56	204	50	215	58	66	13	26	15	155	42
06:00	*	*	534	211	543	231	520	215	472	223	92	48	53	32	369	160
07:00	*	*	**813**	353	**788**	**418**	**806**	384	**781**	355	159	89	79	57	**571**	276
08:00	*	*	696	388	735	385	701	364	619	402	264	157	154	104	528	300
09:00	*	*	446	328	430	361	398	339	431	333	294	217	190	124	365	284
10:00	*	*	393	379	352	329	372	322	421	362	**361**	299	227	171	354	310
11:00	*	*	415	**417**	377	412	385	**402**	455	**433**	327	**332**	**262**	**198**	370	**366**
12:00 PM	*	*	441	458	**429**	431	427	444	405	427	**278**	**328**	**247**	**252**	**371**	390
01:00	*	*	426	395	390	431	447	367	**433**	385	259	278	230	212	364	345
02:00	*	*	340	457	415	461	416	443	397	441	241	263	197	244	334	385
03:00	*	*	392	530	400	572	412	556	396	533	201	268	214	202	336	444
04:00	**405**	622	**449**	**640**	425	**648**	446	582	408	**616**	197	225	196	198	361	**504**
05:00	401	**638**	437	613	420	526	**452**	**605**	359	550	172	193	170	230	344	479
06:00	242	436	241	396	252	409	250	350	249	305	121	193	152	180	215	324
07:00	168	239	223	265	217	251	194	265	195	197	136	140	137	130	181	212
08:00	134	182	158	203	146	201	142	232	104	146	82	144	82	108	121	174
09:00	54	128	95	162	93	151	84	138	74	180	81	121	56	89	77	138
10:00	38	66	49	85	41	87	42	79	46	87	55	65	22	43	42	73
11:00	21	37	30	60	15	48	39	46	32	56	32	46	27	36	28	47
Lane	1463	2348	6911	6498	6815	6510	6855	6262	6629	6203	3522	3521	2807	2722	5603	5352
Day	3811		13409		13325		13117		12832		7043		5529		10955	
AM Peak			07:00	11:00	07:00	07:00	07:00	11:00	07:00	11:00	10:00	11:00	11:00	11:00	07:00	11:00
Vol.			813	417	788	418	806	402	781	433	361	332	262	198	571	366
PM Peak	16:00	17:00	16:00	16:00	12:00	16:00	17:00	17:00	13:00	16:00	12:00	12:00	12:00	12:00	12:00	16:00
Vol.	405	638	449	640	429	648	452	605	433	616	278	328	247	252	371	504

Williston: Historical AADT

Station ID:	D115
Location:	VT 2A SOUTH OF MOUNTAIN VIEW RD.
Road Class:	STATE HIGHWAY
Functional Class:	URBAN MINOR ARTERIAL
AADT_2010	12600
AADT_2008	13300
AADT_2004	14000
AADT_2002	14200
AADT_2000	13100
AADT_1998	13700
AADT_1996	11600
AADT_1994	11350
AADT_1992	11120
AADT_1988	9710
AADT_1986	7490
AADT_1984	5950
AADT_1982	4920
AADT_1978	4780
AADT_1977	4700

Williston: Historical AADT

Station ID:	WILL01
Location:	MOUNTAIN VIEW RD. EAST OF VT 2A
Road Class:	CLASS II TOWN HIGHWAY
Functional Class:	URBAN COLLECTOR

AADT_2011	5600
AADT_2003	6500
AADT_1994	5120
AADT_1993	4020
AADT_1989	3390

WILL-17 : INDUSTRIAL AVENUE
DIR 1 : WB / DIR 2 : EB
CITY : WILLISTON
COUNTERS : RD / TS

Chittenden County MPO

110 West Canal St. Suite 202
Winooski, VT 05404
http://www.ccmpo.org

Site Code: WILL-17
Station ID: WILL-17
INDUSTRIAL AVE. WEST OF VT-2A

Latitude: 0' 0.000 Undefined

Start Time	25-Jul-11 WB	25-Jul-11 EB	Tue WB	Tue EB	Wed WB	Wed EB	Thu WB	Thu EB	Fri WB	Fri EB	Sat WB	Sat EB	Sun WB	Sun EB	Week Average WB	Week Average EB
12:00 AM	21	27	*	*	*	*	*	*	*	*	*	*	*	*	21	27
01:00	10	9	*	*	*	*	*	*	*	*	*	*	*	*	10	9
02:00	6	10	*	*	*	*	*	*	*	*	*	*	*	*	6	10
03:00	23	7	*	*	*	*	*	*	*	*	*	*	*	*	23	7
04:00	69	25	*	*	*	*	*	*	*	*	*	*	*	*	69	25
05:00	205	49	*	*	*	*	*	*	*	*	*	*	*	*	205	49
06:00	536	248	*	*	*	*	*	*	*	*	*	*	*	*	536	248
07:00	**790**	335	*	*	*	*	*	*	*	*	*	*	*	*	**790**	335
08:00	638	354	*	*	*	*	*	*	*	*	*	*	*	*	638	354
09:00	407	**356**	*	*	*	*	*	*	*	*	*	*	*	*	407	**356**
10:00	342	285	*	*	*	*	*	*	*	*	*	*	*	*	342	285
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12:00 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lane	3047	1705	0	0	0	0	0	0	0	0	0	0	0	0	3047	1705
Day	4752		0		0		0		0		0		0		4752	
AM Peak	07:00	09:00													07:00	09:00
Vol.	790	356													790	356
PM Peak																
Vol.																

Comb. Total	8563	13409	13325	13117	12832	7043	5529	15707

ADT ADT 10,876 AADT 10,876

WILL01 : MOUNTAIN VIEW RD. EAST OF VT 2A
DIR1 : WESTBOUND / DIR2 : EASTBOUND
TOWN : WILLISTON
COUNTERS : TS RD

Chittenden County MPO
110 West Canal St., Suite 202
Winooski, Vermont, USA 05404
http://www.ccmpo.org

Site Code: WILL01
Station ID: WILL01
MOUNTAIN VIEW RD. EAST OF VT 2A

Date Start: 18-Jul-11
Date End: 25-Jul-11

Start	18-Jul-11		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	*	*	3	11	3	15	8	6	8	20	5	20	14	23	7	16
01:00	*	*	5	5	2	2	4	7	4	9	4	13	4	12	4	8
02:00	*	*	2	4	0	2	0	5	2	5	5	5	2	9	2	5
03:00	*	*	6	1	7	2	9	0	9	1	7	5	3	2	7	2
04:00	*	*	25	6	22	7	16	8	22	2	8	4	5	4	16	5
05:00	*	*	43	25	58	24	51	31	50	22	18	10	17	5	40	20
06:00	*	*	152	129	180	144	176	125	137	113	32	43	18	30	116	97
07:00	*	*	**379**	230	**419**	247	367	258	351	215	67	50	42	32	271	172
08:00	*	*	369	**310**	379	**313**	**391**	**277**	**364**	**308**	124	90	92	95	**286**	**232**
09:00	*	*	201	188	215	191	194	178	208	201	180	125	105	**120**	184	167
10:00	*	*	205	168	191	179	165	145	203	158	**205**	171	129	101	183	154
11:00	*	*	218	220	231	202	211	186	234	173	199	**178**	**222**	117	219	179
12:00 PM	*	*	221	240	201	239	238	243	249	237	**173**	176	130	130	202	211
01:00	*	*	216	205	194	217	181	196	215	238	144	**187**	129	128	180	195
02:00	*	*	191	206	200	208	188	182	210	226	154	171	102	119	174	185
03:00	*	*	250	272	213	296	213	255	215	272	139	158	99	116	188	228
04:00	*	*	262	**382**	270	341	262	349	**266**	**309**	131	113	**133**	118	221	269
05:00	**285**	**375**	**309**	382	**306**	**361**	**292**	**375**	244	291	102	92	99	**152**	**234**	**290**
06:00	174	203	175	215	189	287	152	174	136	144	85	128	88	112	143	180
07:00	118	136	176	115	152	177	135	134	124	114	95	89	124	77	132	120
08:00	73	106	104	118	162	132	69	109	55	85	57	63	71	73	84	98
09:00	29	53	45	73	75	68	43	80	33	91	37	60	39	50	43	68
10:00	10	34	17	31	15	51	29	33	26	41	33	45	10	24	20	37
11:00	5	19	10	15	7	30	16	26	17	21	21	27	10	22	12	23
Lane	694	926	3584	3551	3691	3735	3410	3382	3382	3296	2025	2023	1687	1671	2968	2961
Day	1620		7135		7426		6792		6678		4048		3358		5929	
AM Peak			07:00	08:00	07:00	08:00	08:00	08:00	08:00	08:00	10:00	11:00	11:00	09:00	08:00	08:00
Vol.			379	310	419	313	391	277	364	308	205	178	222	120	286	232
PM Peak	17:00	17:00	17:00	16:00	17:00	17:00	17:00	17:00	16:00	16:00	12:00	13:00	16:00	17:00	17:00	17:00
Vol.	285	375	309	382	306	361	292	375	266	309	173	187	133	152	234	290

WILL01 : MOUNTAIN VIEW RD. EAST OF VT 2A
DIR1 : WESTBOUND / DIR2 : EASTBOUND
TOWN : WILLISTON
COUNTERS : TS RD

Chittenden County MPO
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Winooski, Vermont, USA 05404
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Site Code: WILL01
Station ID: WILL01
MOUNTAIN VIEW RD. EAST OF VT 2A

Date Start: 18-Jul-11
Date End: 25-Jul-11

Start	25-Jul-11		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	5	12	*	*	*	*	*	*	*	*	*	*	*	*	5	12
01:00	4	8	*	*	*	*	*	*	*	*	*	*	*	*	4	8
02:00	2	3	*	*	*	*	*	*	*	*	*	*	*	*	2	3
03:00	3	3	*	*	*	*	*	*	*	*	*	*	*	*	3	3
04:00	18	4	*	*	*	*	*	*	*	*	*	*	*	*	18	4
05:00	46	25	*	*	*	*	*	*	*	*	*	*	*	*	46	25
06:00	169	125	*	*	*	*	*	*	*	*	*	*	*	*	169	125
07:00	**371**	240	*	*	*	*	*	*	*	*	*	*	*	*	**371**	240
08:00	315	**285**	*	*	*	*	*	*	*	*	*	*	*	*	315	**285**
09:00	204	180	*	*	*	*	*	*	*	*	*	*	*	*	204	180
10:00	152	153	*	*	*	*	*	*	*	*	*	*	*	*	152	153
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12:00 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lane	1289	1038	0	0	0	0	0	0	0	0	0	0	0	0	1289	1038
Day	2327		0		0		0		0		0		0		2327	
AM Peak	07:00	08:00													07:00	08:00
Vol.	371	285													371	285
PM Peak																
Vol.																

Comb. Total	3947	7135	7426	6792	6678	4048	3358	8256

ADT ADT 5,906 AADT 5,906

DHV Determination Method

(Based on data through 2012)

To determine the Design Hour Volume (DHV), normally the 30th highest hourly volume of the year, from the Annual Average Daily Traffic (AADT), apply the procedures outlined below in TABLE I.

Poll Group* (Seasonal Adjustment Factor Group)	Equation	"k" Factor
1. Rural Interstate	DHV = 0.1192 * AADT + 73	0.1233
2. Rural Non-Interstate	DHV = 0.1088 * AADT + 27	0.1126
3. Urban	None – Use "k" Factor	0.1059
4. Summer Recreational	$DHV = AADT^{0.7620}$	0.1326
5. Summer/Winter Recreational US and VT Routes	DHV = 0.1191 * AADT + 128	0.1398
6. Summer/Winter Recreational Town Highways	Use locally derived equations or "k" factors.	

TABLE I. DHV Calculation by Poll Group (seasonal adjustment factor group).

For poll groups 1, 2, 4 & 5, calculate DHV using both the equation and the "k" factor. Use the lower value. For poll group 3, use the "k" factor of 10.6%. For poll group 6, use locally derived equations or "k" factors. After calculation, values are to be rounded to the nearest 10 for volumes less than 1000, and to the nearest 100 for volumes greater than or equal to 1000.

Following are a series of charts illustrating the data on which these determinations are based. Each chart shows a number of parameters and a plot of the data points on which the parameters are based. The parameters include the number of data points, the "k" factor (the ratio of DHV to AADT) and the fitted curve equation. The "k" factor is derived by Linear Regression forcing the line through the origin. The fitted curve equation is derived by Linear Regression without forcing the line through the origin. Also shown is a description of the distribution of the individual "k" factors, including the minimum, maximum, mean and standard deviation. In the plot are shown the individual data points plus the fitted curve equation(s) and the "k" factor.

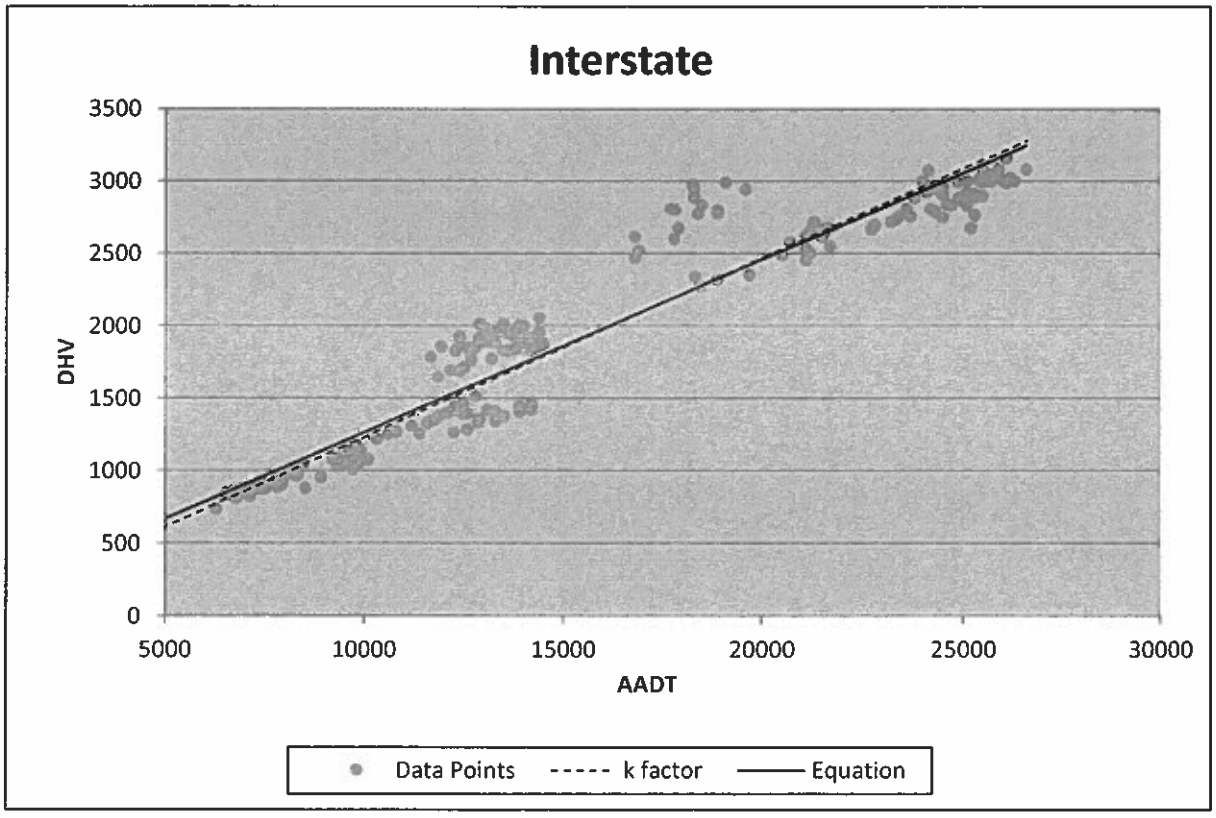
* If the project is located within the vicinity of a Continuous Traffic Counter (CTC), the "k" Factor for the CTC may be applied directly, rather than using the Poll Group Equation or the Poll Group "k" factor. Refer to pages 9 and 10 of this publication for a list of CTCs and their "k" factors.

Poll Group 1: Interstate

Number of Points:	236
k Factor (from regression):	0.1233
Fitted Curve Equation:	DHV = 0.1192 * AADT + 73

%k Minimum	10.0
%k Maximum	16.3
%k Average	12.43
%k St. Dev.	1.45

Data Plot



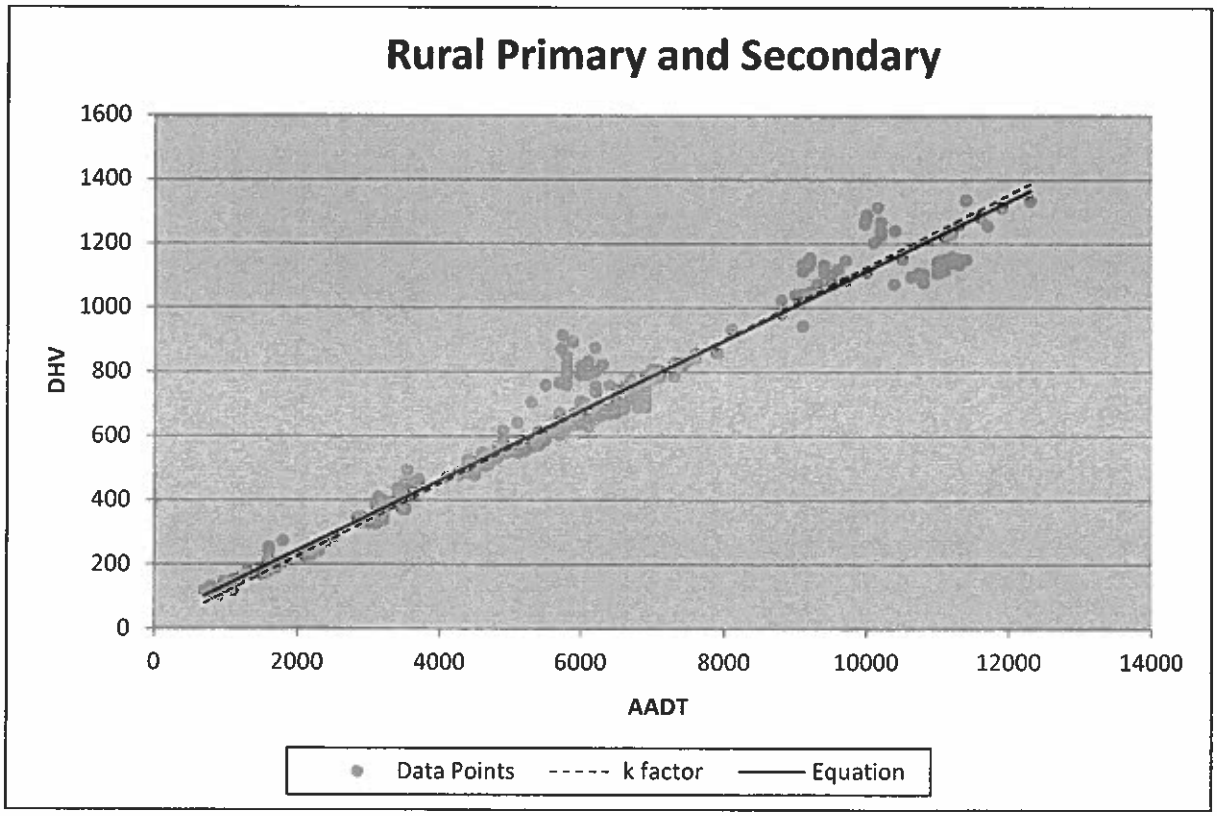
Recommended Procedure: Calculate DHV using both equation and k factor. Use lower value.

Poll Group 2: Rural Primary and Secondary

Number of Points:	344
k Factor (from regression):	0.1126
Fitted Curve Equation:	DHV = 0.1088 * AADT + 27

%k Minimum	10.0
%k Maximum	16.9
%k Average	11.62
%k St. Dev.	1.22

Data Plot



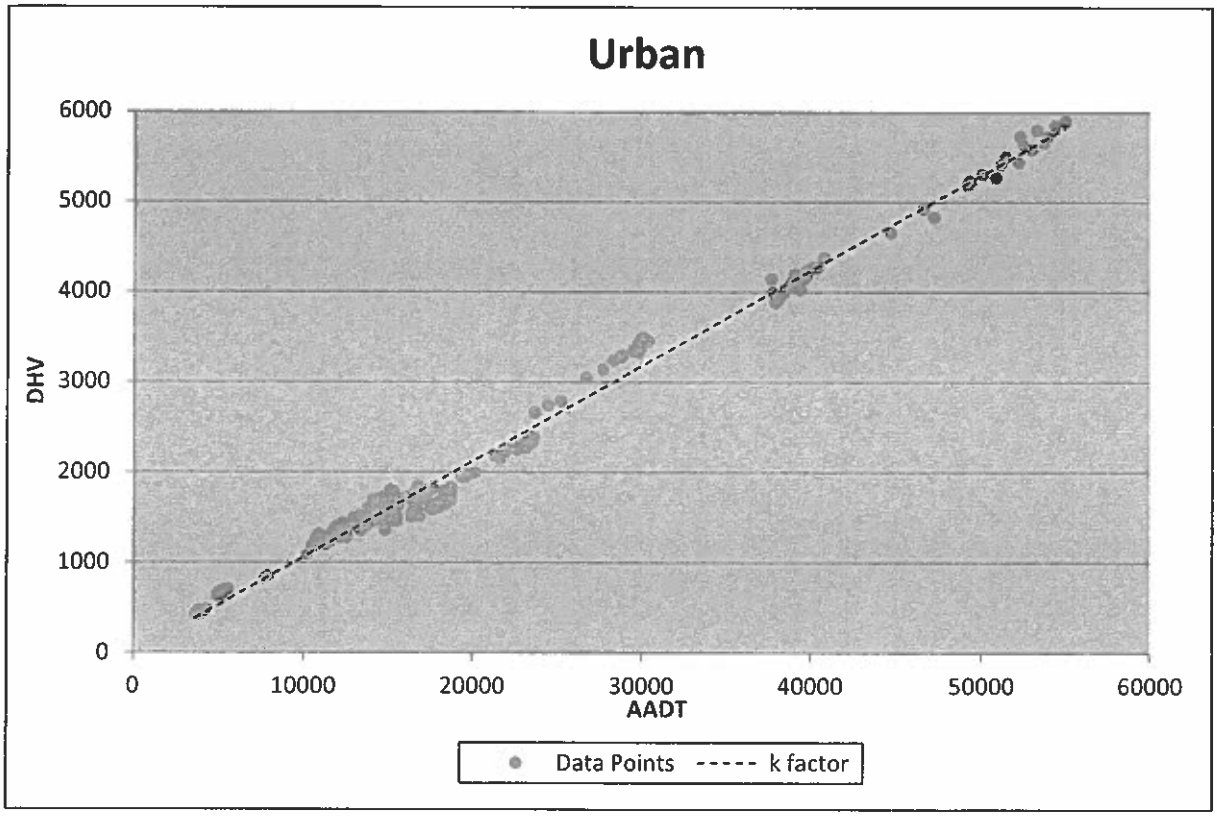
Recommended Procedure: Calculate DHV using both equation and K factor. Use lower value.

Poll Group 3: Urban

Number of Points:	276
k Factor (from regression):	0.1059
Fitted Curve Equation:	Use k factor

%k Minimum	9.0
%k Maximum	13.4
%k Average	10.73
%k St. Dev.	0.81

Data Plot



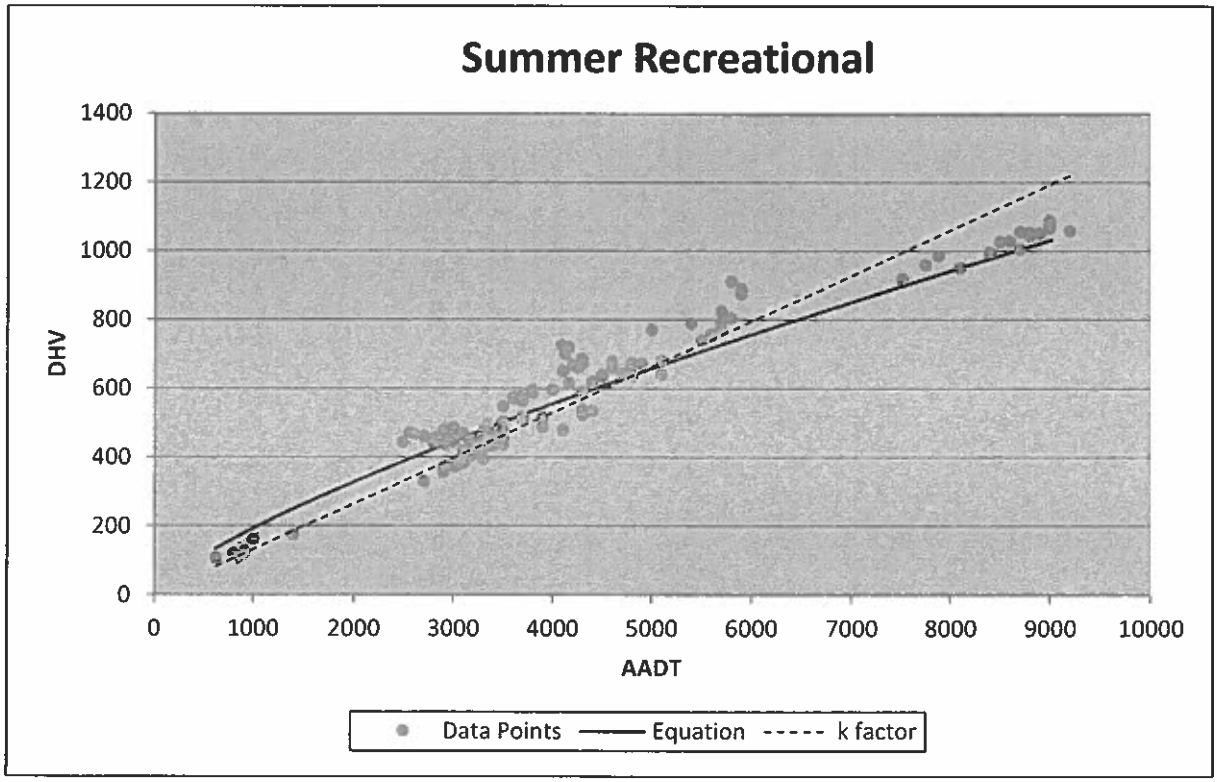
Recommended procedure: Calculate DHV using k factor.

Poll Group 4: Summer Recreational

Number of Points: 132
k Factor (from regression): 0.1326
Fitted Curve Equation: $DHV = AADT^{0.7620}$

%k Minimum	11.5
%k Maximum	18.5
%k Average	14.03
%k St. Dev.	1.63

Data Plot



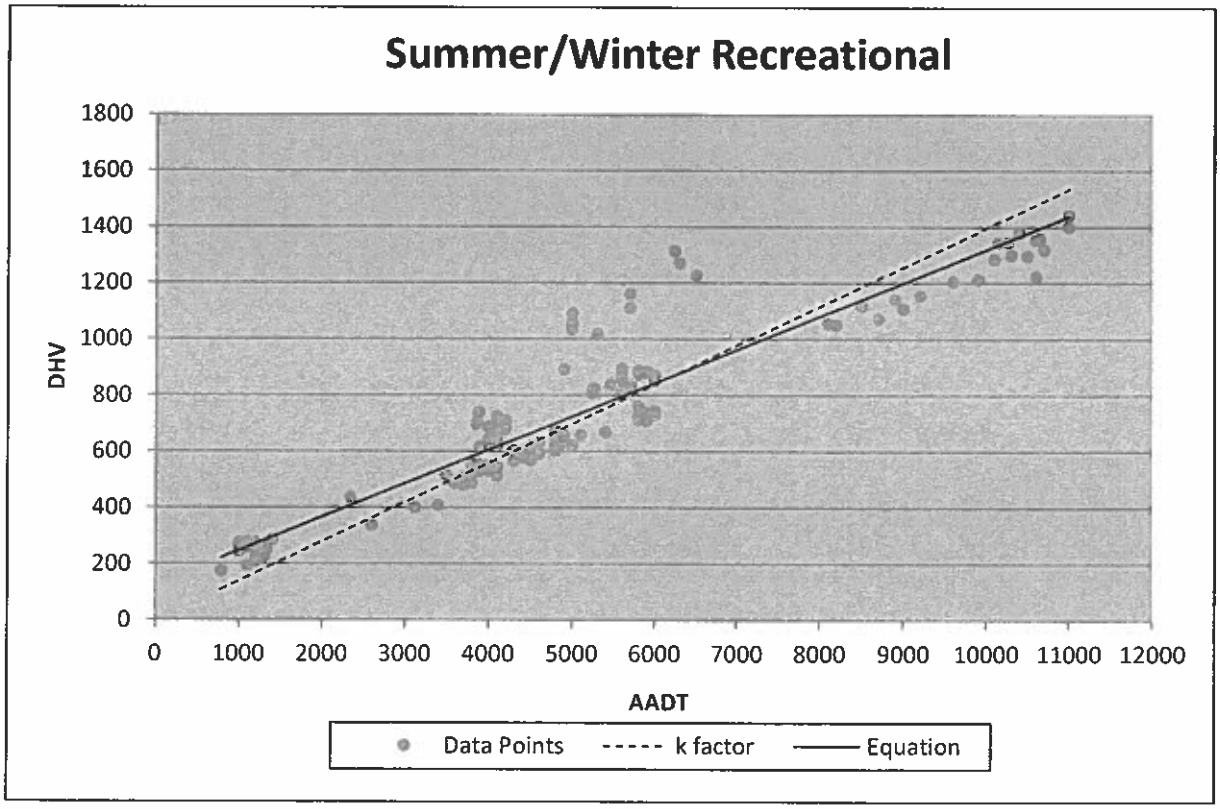
Recommended Procedure: Calculate DHV using both equation and k factor. Use lower value.

Poll Group 5: Summer/Winter Recreational – US/VT

Number of Points:	143
k Factor (from regression):	0.1398
Fitted Curve Equation:	DHV = 0.1191 * AADT + 128

%k Minimum	11.5
%k Maximum	27.5
%k Average	15.89
%k St. Dev.	3.76

Data Plot



Recommended Procedure: Calculate DHV using both equation and k factor. Use lower value.

DHV METHOD	VALIDATION	CALCULATION

a. DHV from CTC — Recorded DHV Available ? — **DHV =**

Nearest CTC			
CTC	Route	Town	Location

NOT USED

b. %K from a CTC [%K (AADT)]

Nearest CTC				CTC along	Actual			
CTC	Route	Town	Location	Route ?	AADT ?	%K	X AADT =	DHV
P6D061	US 2	Williston	0.2 mi E of Industrial	No	Yes	11.1%		
D115	VT 2A	Williston	N of Industrial Ave		Yes	11.1%	13,200	1,465
D135	VT 2A	Williston	N of US 2		Yes	11.1%	18,100	2,009

c. Alternate DHV determination [%K (AADT)] by Poll Group — **K Factor**

	K Factor
1. Rural Interstate	0.1243
2. Rural Non - Interstate	0.1127
3. Urban	0.1056
4. Summer Recreational	0.1326
5. Summer / Winter Recreational (US & VT)	0.1436

Roadway			Available AADT					
Type	Number	Town	Beginning Reference	End Reference	ATR Station	Year	AADT	Actual

Applicable Poll Group / AADT — **%K X AADT = DHV**

NOT USED

d. CTC Method using Red Book Report — **Is CTC along Route?** NO; **Is TMC along Route?** YES

Step 1. CTC near w/o traffic breaks	CTC:
Step 2. DHV for CTC that year	DHV ctc =
Step 3. PHV at CTC for date of TMC count	PHV ctc =
Step 4. Calc DHV Factor	DHV ctc / PHV ctc =
Step 5. Apply DHV factor to TMC	PHV tmc =

NOT USED

e. DHV based on AADT and Highway Class

FUTURE YEAR INTERSECTION DHV's

NOT USED

f. VTRANS Estimate

AADT	DHV	%T	%D	ADTT

NA

Intersection Count Data

	2012 Raw Counts AM	2012 Raw Counts PM
	W	
WB	830	490
EB Left	222	436
EB Thru	105	212
EB Right	42	33
Total	1,199	1,171
	E	
WB Left	76	83
WB Thru	284	177
WB Right	72	67
EB	210	409
Total	642	736
	S	
NB Left	63	20
NB Thru	277	501
NB Right	46	81
SB	570	602
Total	956	1,204
	N	
SB Left	59	116
SB Thru	452	486
SB Right	483	293
NB	571	1,004
Total	1,565	1,899
Intersection Total	2,181	2,505

DHV Factor

North on VT 2A
2,009/1,899
1.058

South on VT 2A
1,465/1,204
1.217

USE 1.058

Short Term Growth Factor

Urban : -1% / 5yr

Rural Primary and Secondary : 3% / 5yr

USE 0 % 2012-2013

	2013 DHV AM	2013 DHV PM
	W	
WB	878	518
EB Left	235	461
EB Thru	111	224
EB Right	44	35
Total	1,269	1,239
	E	
WB Left	80	88
WB Thru	300	187
WB Right	76	71
EB	222	433
Total	679	779
	S	
NB Left	67	21
NB Thru	293	530
NB Right	49	86
SB	603	637
Total	1,011	1,274
	N	
SB Left	62	123
SB Thru	478	514
SB Right	511	310
NB	604	1,062
Total	1,656	2,009
Intersection Total	2,307	2,650

20 Yr Growth Factor

Urban : -4% / 20 yr

Rural primary and Secondary : 6% / 20 Yr

CCRPC Forcast 18% growth/ 20 years (USE)

	2033 DHV AM	2033 DHV PM
	W	
WB	1036	612
EB Left	277	544
EB Thru	131	265
EB Right	52	41
Total	1,497	1,462
	E	
WB Left	95	104
WB Thru	355	221
WB Right	90	84
EB	262	511
Total	801	919
	S	
NB Left	79	25
NB Thru	346	625
NB Right	57	101
SB	712	752
Total	1,194	1,503
	N	
SB Left	74	145
SB Thru	564	607
SB Right	603	366
NB	713	1253
Total	1,954	2,371
Intersection Total	2,723	3,127

WENTS 2035	
	PM
W	
WB	738
EB Left	461
EB Thru	394
EB Right	50
Total	1,643
E	
WB Left	121
WB Thru	307
WB Right	37
EB	738
Total	1,203
S	
NB Left	51
NB Thru	789
NB Right	147
SB	706
Total	1,693
N	
SB Left	130
SB Thru	535
SB Right	380
NB	1,287
Total	2,332
Intersection Total	3,402

Williston Vermont

VT 2A / Industrial Ave Mountain View Rd Scoping Study

195310861 1/30/2014

DHV Calculation

Stantec Consulting Services Inc.
55 Green Mountain Drive.
South Burlington, VT U.S.A.
05403
Tel. 802.864.0223
Fax. 802.864.0165
www.stantec.com

APPENDIX C

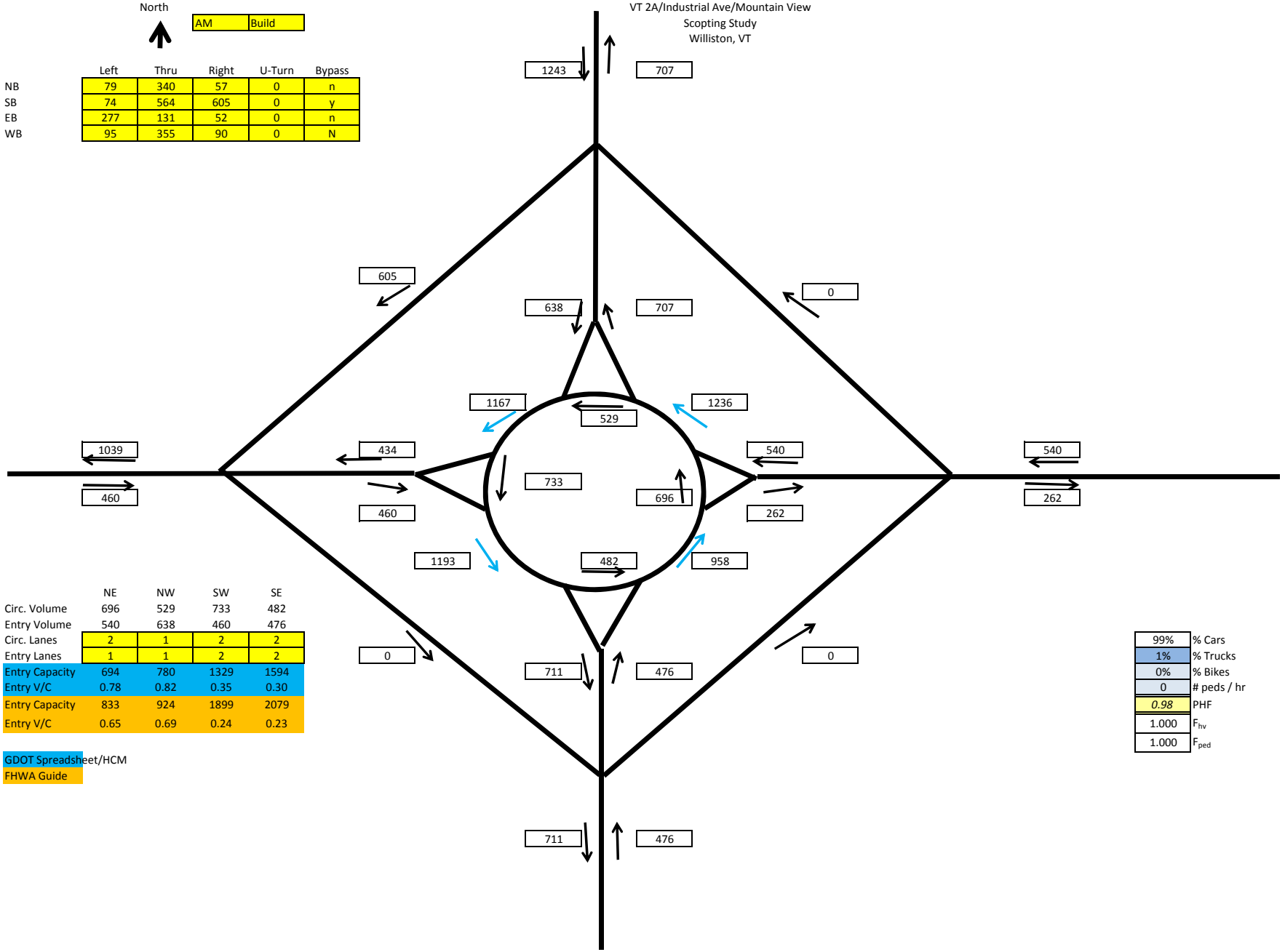
CAPACITY ANALYSIS WORKSHEETS

North

AM	Build

	Left	Thru	Right	U-Turn	Bypass
NB	79	340	57	0	n
SB	74	564	605	0	y
EB	277	131	52	0	n
WB	95	355	90	0	N

VT 2A/Industrial Ave/Mountain View
Scopting Study
Williston, VT



	NE	NW	SW	SE
Circ. Volume	696	529	733	482
Entry Volume	540	638	460	476
Circ. Lanes	2	1	2	2
Entry Lanes	1	1	2	2
Entry Capacity	694	780	1329	1594
Entry V/C	0.78	0.82	0.35	0.30
Entry Capacity	833	924	1899	2079
Entry V/C	0.65	0.69	0.24	0.23

GDOT Spreadsheet/HCM
FHWA Guide

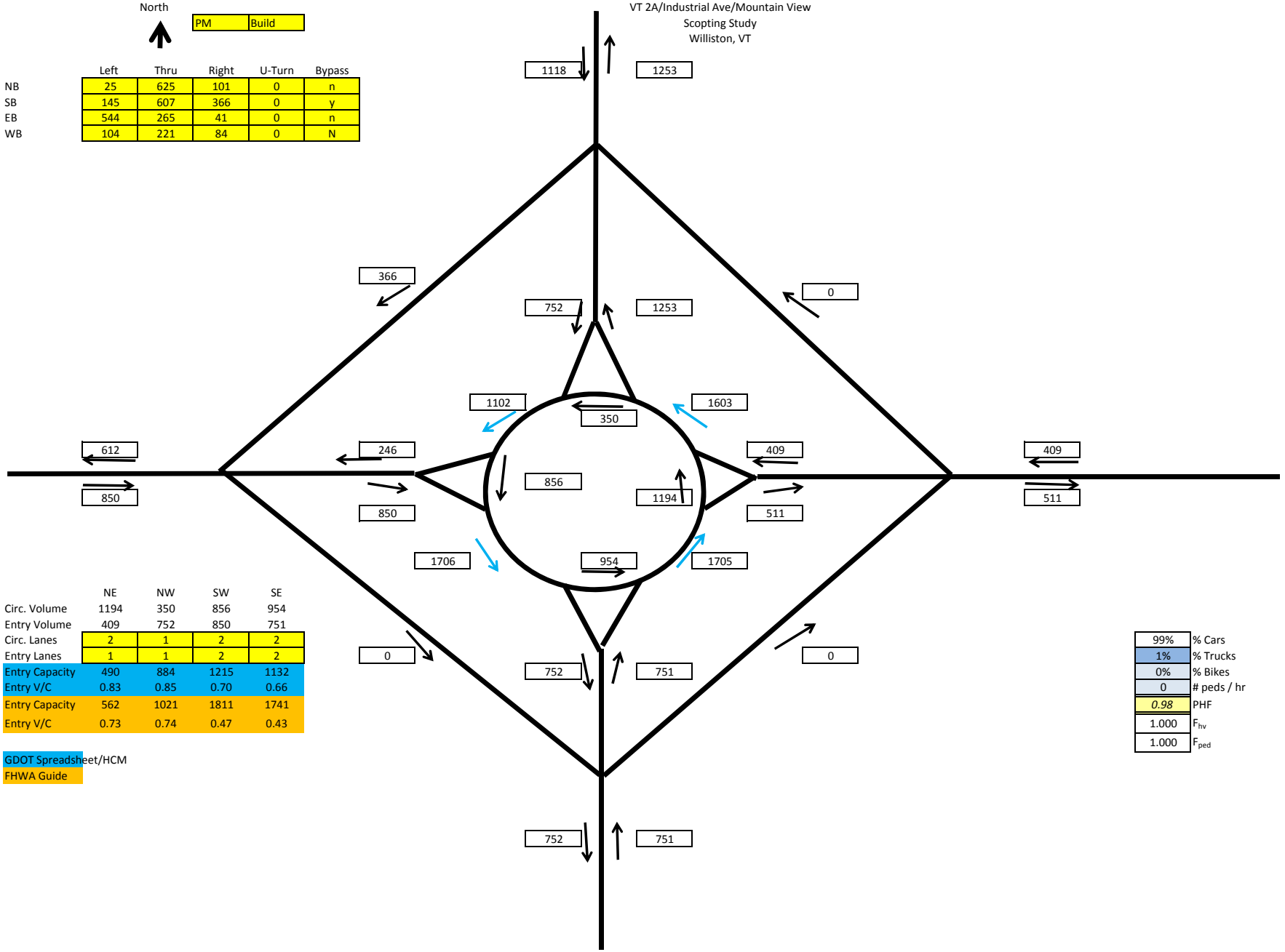
99%	% Cars
1%	% Trucks
0%	% Bikes
0	# peds / hr
0.98	PHF
1.000	F_{hv}
1.000	F_{ped}

North

PM	Build

VT 2A/Industrial Ave/Mountain View
Scopting Study
Williston, VT

	Left	Thru	Right	U-Turn	Bypass
NB	25	625	101	0	n
SB	145	607	366	0	y
EB	544	265	41	0	n
WB	104	221	84	0	N



	NE	NW	SW	SE
Circ. Volume	1194	350	856	954
Entry Volume	409	752	850	751
Circ. Lanes	2	1	2	2
Entry Lanes	1	1	2	2
Entry Capacity	490	884	1215	1132
Entry V/C	0.83	0.85	0.70	0.66
Entry Capacity	562	1021	1811	1741
Entry V/C	0.73	0.74	0.47	0.43

GDOT Spreadsheet/HCM
FHWA Guide

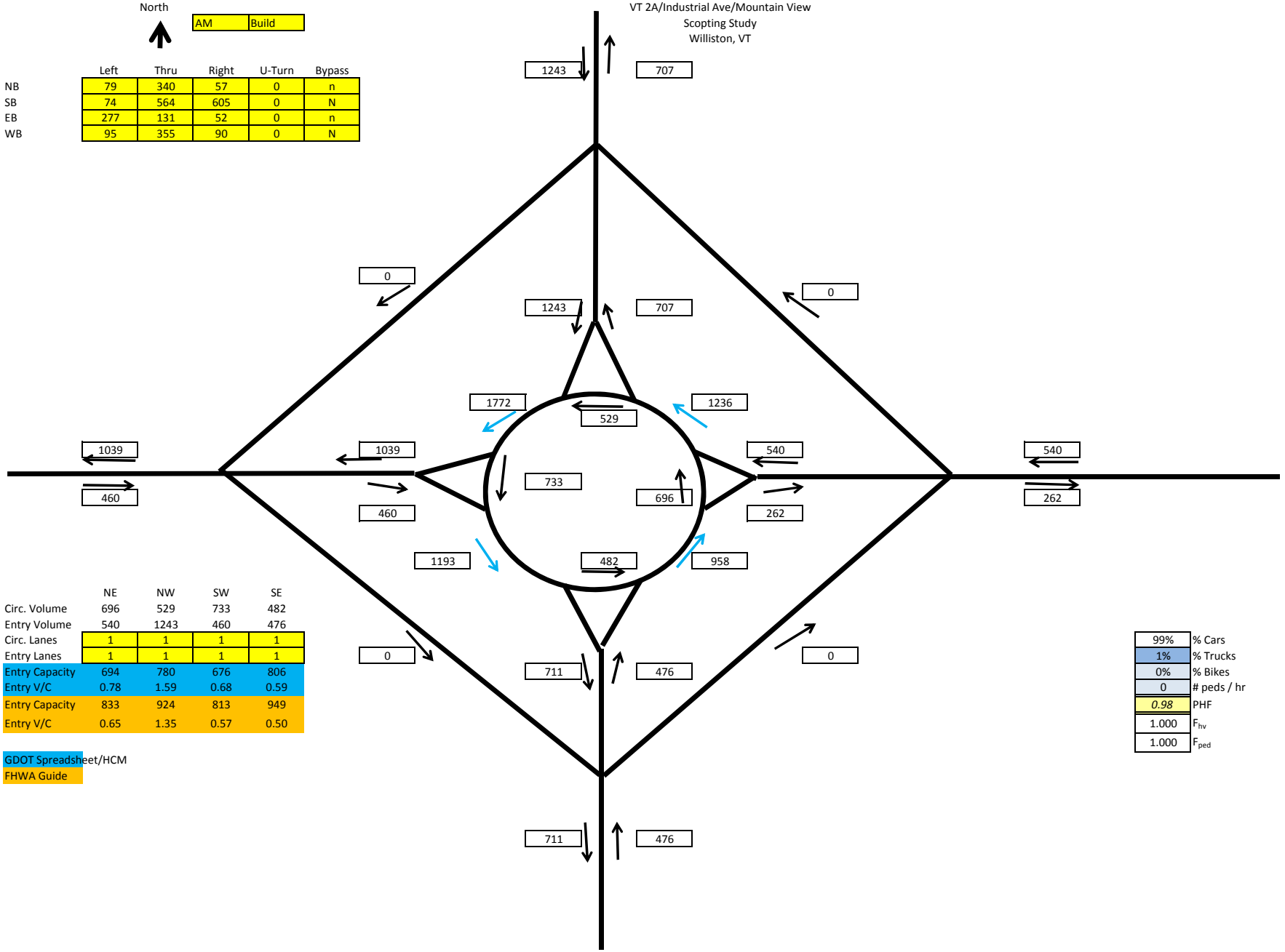
99%	% Cars
1%	% Trucks
0%	% Bikes
0	# peds / hr
0.98	PHF
1.000	F_{hv}
1.000	F_{ped}

North

AM	Build

VT 2A/Industrial Ave/Mountain View
Scopting Study
Williston, VT

	Left	Thru	Right	U-Turn	Bypass
NB	79	340	57	0	n
SB	74	564	605	0	N
EB	277	131	52	0	n
WB	95	355	90	0	N



	NE	NW	SW	SE
Circ. Volume	696	529	733	482
Entry Volume	540	1243	460	476
Circ. Lanes	1	1	1	1
Entry Lanes	1	1	1	1
Entry Capacity	694	780	676	806
Entry V/C	0.78	1.59	0.68	0.59
Entry Capacity	833	924	813	949
Entry V/C	0.65	1.35	0.57	0.50

GDOT Spreadsheet/HCM
FHWA Guide

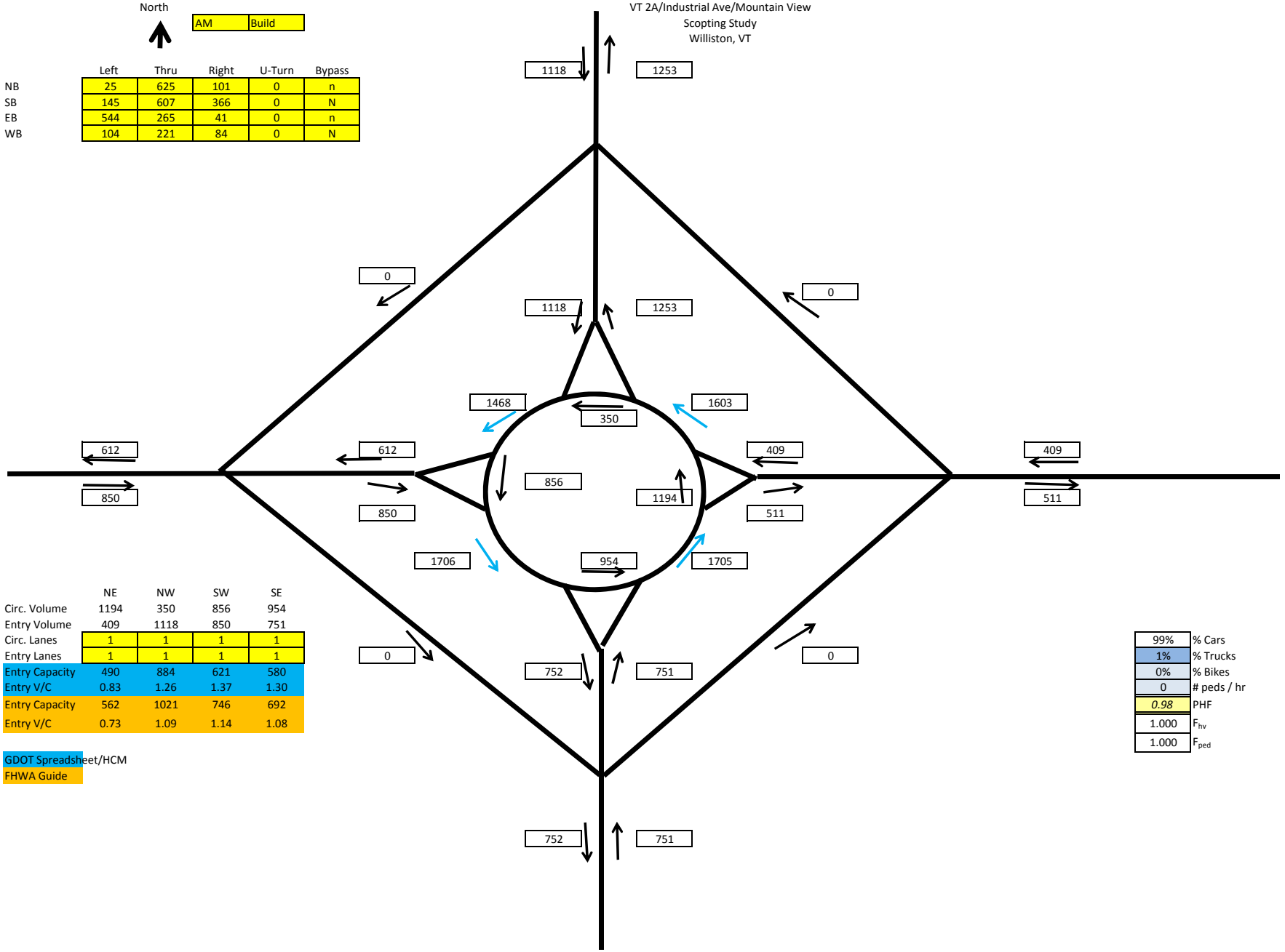
99%	% Cars
1%	% Trucks
0%	% Bikes
0	# peds / hr
0.98	PHF
1.000	F_{hv}
1.000	F_{ped}

VT 2A/Industrial Ave/Mountain View
Scopting Study
Williston, VT

North

AM	Build

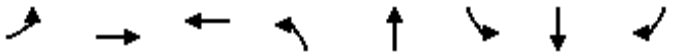
	Left	Thru	Right	U-Turn	Bypass
NB	25	625	101	0	n
SB	145	607	366	0	N
EB	544	265	41	0	n
WB	104	221	84	0	N



	NE	NW	SW	SE
Circ. Volume	1194	350	856	954
Entry Volume	409	1118	850	751
Circ. Lanes	1	1	1	1
Entry Lanes	1	1	1	1
Entry Capacity	490	884	621	580
Entry V/C	0.83	1.26	1.37	1.30
Entry Capacity	562	1021	746	692
Entry V/C	0.73	1.09	1.14	1.08

GDOT Spreadsheet/HCM
FHWA Guide

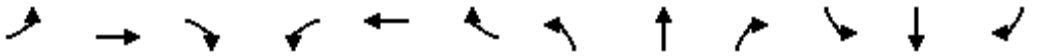
99%	% Cars
1%	% Trucks
0%	% Bikes
0	# peds / hr
0.98	PHF
1.000	F_{hv}
1.000	F_{ped}



Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	235	155	456	67	342	62	478	511
v/c Ratio	0.69	0.21	0.86	0.33	0.61	0.19	0.81	0.63
Control Delay	33.7	19.1	51.6	24.2	35.5	20.8	45.8	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.7	19.1	51.6	24.2	35.5	20.8	45.8	8.5
Queue Length 50th (ft)	93	52	270	24	174	22	273	20
Queue Length 95th (ft)	#270	132	#617	68	356	64	#594	143
Internal Link Dist (ft)		436	457		312		692	
Turn Bay Length (ft)	200			75		125		250
Base Capacity (vph)	342	736	529	206	600	320	623	832
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.21	0.86	0.33	0.57	0.19	0.77	0.61

Intersection Summary

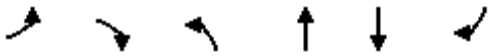
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	111	44	80	300	76	67	293	49	62	478	511
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0			4.5		4.0	6.0		3.0	6.0	6.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96			0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1612	1625			1767		1703	1710		1641	1845	1553
Flt Permitted	0.30	1.00			0.91		0.18	1.00		0.38	1.00	1.00
Satd. Flow (perm)	517	1625			1621		314	1710		664	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	111	44	80	300	76	67	293	49	62	478	511
RTOR Reduction (vph)	0	10	0	0	6	0	0	5	0	0	0	322
Lane Group Flow (vph)	235	145	0	0	450	0	67	337	0	62	478	189
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	45.8	45.8			31.7		38.3	33.7		37.3	32.7	32.7
Effective Green, g (s)	47.3	45.8			33.2		38.3	33.7		37.3	32.7	32.7
Actuated g/C Ratio	0.44	0.43			0.31		0.36	0.32		0.35	0.31	0.31
Clearance Time (s)	6.0	6.0			6.0		4.0	6.0		3.0	6.0	6.0
Vehicle Extension (s)	4.0	2.0			2.0		4.0	3.0		4.0	3.0	3.0
Lane Grp Cap (vph)	328	699			505		173	541		275	567	477
v/s Ratio Prot	c0.06	0.09					c0.02	0.20		0.01	c0.26	
v/s Ratio Perm	0.25				c0.28		0.12			0.07		0.12
v/c Ratio	0.72	0.21			0.89		0.39	0.62		0.23	0.84	0.40
Uniform Delay, d1	23.3	18.9			34.9		25.1	30.9		23.8	34.5	29.1
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.8	0.1			17.4		2.0	2.2		0.6	11.0	0.5
Delay (s)	31.0	19.0			52.3		27.0	33.2		24.4	45.4	29.6
Level of Service	C	B			D		C	C		C	D	C
Approach Delay (s)		26.2			52.3			32.2			36.5	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	106.4	Sum of lost time (s)	23.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		

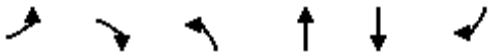
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	7	0	604	1044	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	0	657	1135	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				772	460	
pX, platoon unblocked	0.80					
vC, conflicting volume	1795	1138	1141			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1868	1138	1141			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	64	245	612			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	8	657	1141
Volume Left	0	0	0
Volume Right	8	0	7
cSH	245	612	1700
Volume to Capacity	0.03	0.00	0.67
Queue Length 95th (ft)	2	0	0
Control Delay (s)	20.2	0.0	0.0
Lane LOS	C		
Approach Delay (s)	20.2	0.0	0.0
Approach LOS	C		

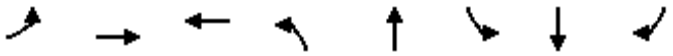
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	27	5	599	1023	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	29	5	651	1112	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1232		
pX, platoon unblocked	0.86					
vC, conflicting volume	1774	1112	1113			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1817	1112	1113			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	88	99			
cM capacity (veh/h)	73	254	627			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	33	657	1113
Volume Left	3	5	0
Volume Right	29	0	1
cSH	204	627	1700
Volume to Capacity	0.16	0.01	0.65
Queue Length 95th (ft)	14	1	0
Control Delay (s)	26.0	0.2	0.0
Lane LOS	D	A	
Approach Delay (s)	26.0	0.2	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

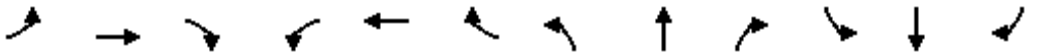


Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	461	259	346	21	616	123	514	310
v/c Ratio	0.98	0.33	1.06	0.09	0.91	0.78	0.69	0.42
Control Delay	64.9	24.5	110.0	21.5	54.0	54.8	36.8	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.9	24.5	110.0	21.5	54.0	54.8	36.8	8.8
Queue Length 50th (ft)	236	114	~258	8	399	48	271	24
Queue Length 95th (ft)	#580	240	#570	30	#829	#188	#655	126
Internal Link Dist (ft)		436	457		312		692	
Turn Bay Length (ft)	200			75		125		250
Base Capacity (vph)	471	782	326	222	677	158	748	734
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.33	1.06	0.09	0.91	0.78	0.69	0.42

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

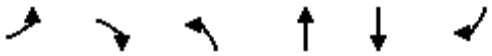
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	461	224	35	88	187	71	21	530	86	123	514	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0			4.5		4.0	4.5		3.0	6.0	6.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98			0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1828			1791		1504	1824		1805	1863	1455
Flt Permitted	0.30	1.00			0.83		0.24	1.00		0.09	1.00	1.00
Satd. Flow (perm)	559	1828			1505		386	1824		163	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	461	224	35	88	187	71	21	530	86	123	514	310
RTOR Reduction (vph)	0	4	0	0	6	0	0	4	0	0	0	155
Lane Group Flow (vph)	461	255	0	0	340	0	21	612	0	123	514	155
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	49.3	49.3			23.2		46.1	43.8		52.5	46.5	46.5
Effective Green, g (s)	50.8	49.3			24.7		46.1	45.3		52.5	46.5	46.5
Actuated g/C Ratio	0.42	0.41			0.20		0.38	0.37		0.43	0.38	0.38
Clearance Time (s)	6.0	6.0			6.0		4.0	6.0		3.0	6.0	6.0
Vehicle Extension (s)	4.0	2.0			2.0		4.0	3.0		4.0	3.0	3.0
Lane Grp Cap (vph)	449	741			305		167	680		151	713	556
v/s Ratio Prot	c0.18	0.14					0.00	c0.34		c0.04	0.28	
v/s Ratio Perm	c0.25				0.23		0.05			0.31		0.11
v/c Ratio	1.03	0.34			1.11		0.13	0.90		0.81	0.72	0.28
Uniform Delay, d1	32.1	24.9			48.4		25.6	36.0		27.9	32.0	25.9
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	49.5	0.1			85.6		0.5	15.0		28.6	3.6	0.3
Delay (s)	81.6	25.0			134.0		26.1	51.0		56.5	35.6	26.2
Level of Service	F	C			F		C	D		E	D	C
Approach Delay (s)		61.2			134.0			50.2			35.2	
Approach LOS		E			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	58.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	121.5	Sum of lost time (s)	23.0
Intersection Capacity Utilization	100.3%	ICU Level of Service	G
Analysis Period (min)	15		

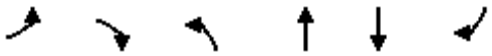
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	3	5	1057	944	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	3	5	1149	1026	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				772		
pX, platoon unblocked	0.48					
vC, conflicting volume	2187	1027	1028			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2921	1027	1028			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	60	99	99			
cM capacity (veh/h)	8	285	675			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	1154	1028
Volume Left	3	5	0
Volume Right	3	0	2
cSH	16	675	1700
Volume to Capacity	0.41	0.01	0.60
Queue Length 95th (ft)	27	1	0
Control Delay (s)	345.3	0.3	0.0
Lane LOS	F	A	
Approach Delay (s)	345.3	0.3	0.0
Approach LOS	F		

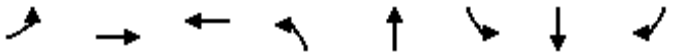
Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		69.6%	ICU Level of Service C
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	2	13	23	1037	933	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	14	25	1127	1014	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1232		
pX, platoon unblocked	0.50					
vC, conflicting volume	2197	1020	1025			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2906	1020	1025			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	74	95	96			
cM capacity (veh/h)	8	287	677			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	1152	1025
Volume Left	2	25	0
Volume Right	14	0	11
cSH	52	677	1700
Volume to Capacity	0.31	0.04	0.60
Queue Length 95th (ft)	27	3	0
Control Delay (s)	102.4	1.4	0.0
Lane LOS	F	A	
Approach Delay (s)	102.4	1.4	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		

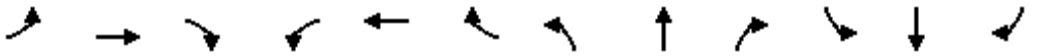


Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	277	183	540	79	403	74	564	603
v/c Ratio	0.93	0.26	1.03	0.46	0.65	0.25	0.86	0.72
Control Delay	64.5	21.8	86.7	30.3	37.6	22.3	50.2	14.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.5	21.8	86.7	30.3	37.6	22.3	50.2	14.6
Queue Length 50th (ft)	127	72	~393	30	231	28	367	86
Queue Length 95th (ft)	#411	166	#810	82	447	76	#757	298
Internal Link Dist (ft)		436	457		312		692	
Turn Bay Length (ft)	200			75		125		250
Base Capacity (vph)	298	715	523	170	625	296	654	838
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.26	1.03	0.46	0.64	0.25	0.86	0.72

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

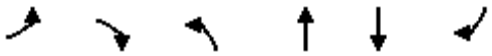
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	277	131	52	95	355	90	79	346	57	74	564	603
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0			4.5		4.0	6.0		3.0	6.0	6.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96			0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1612	1625			1766		1703	1711		1641	1845	1553
Flt Permitted	0.26	1.00			0.90		0.12	1.00		0.33	1.00	1.00
Satd. Flow (perm)	448	1625			1603		216	1711		569	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	277	131	52	95	355	90	79	346	57	74	564	603
RTOR Reduction (vph)	0	10	0	0	5	0	0	4	0	0	0	293
Lane Group Flow (vph)	277	173	0	0	535	0	79	399	0	74	564	310
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	49.4	49.4			35.3		46.1	41.4		45.1	40.4	40.4
Effective Green, g (s)	50.9	49.4			36.8		46.1	41.4		45.1	40.4	40.4
Actuated g/C Ratio	0.43	0.42			0.31		0.39	0.35		0.38	0.34	0.34
Clearance Time (s)	6.0	6.0			6.0		4.0	6.0		3.0	6.0	6.0
Vehicle Extension (s)	4.0	2.0			2.0		4.0	3.0		4.0	3.0	3.0
Lane Grp Cap (vph)	288	680			500		143	600		260	632	532
v/s Ratio Prot	c0.08	0.11					c0.02	0.23		0.01	c0.31	
v/s Ratio Perm	0.34				c0.33		0.19			0.10		0.20
v/c Ratio	0.96	0.25			1.07		0.55	0.67		0.28	0.89	0.58
Uniform Delay, d1	33.8	22.3			40.6		27.3	32.4		24.6	36.7	31.8
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	42.7	0.1			60.4		5.6	2.8		0.8	14.9	1.6
Delay (s)	76.5	22.3			100.9		32.9	35.2		25.4	51.6	33.5
Level of Service	E	C			F		C	D		C	D	C
Approach Delay (s)		55.0			100.9			34.8			41.2	
Approach LOS		D			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	54.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	117.9	Sum of lost time (s)	23.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		

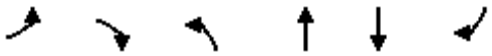
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	7	0	713	1234	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	0	775	1341	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				772		
pX, platoon unblocked	0.73					
vC, conflicting volume	2120	1345	1348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2346	1345	1348			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	29	185	511			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	8	775	1348
Volume Left	0	0	0
Volume Right	8	0	7
cSH	185	511	1700
Volume to Capacity	0.04	0.00	0.79
Queue Length 95th (ft)	3	0	0
Control Delay (s)	25.2	0.0	0.0
Lane LOS	D		
Approach Delay (s)	25.2	0.0	0.0
Approach LOS	D		

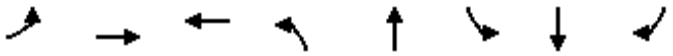
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	27	5	708	1213	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	29	5	770	1318	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1232		
pX, platoon unblocked	0.78					
vC, conflicting volume	2099	1319	1320			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2272	1319	1320			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	85	99			
cM capacity (veh/h)	34	192	524			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	33	775	1320
Volume Left	3	5	0
Volume Right	29	0	1
cSH	131	524	1700
Volume to Capacity	0.25	0.01	0.78
Queue Length 95th (ft)	23	1	0
Control Delay (s)	41.3	0.3	0.0
Lane LOS	E	A	
Approach Delay (s)	41.3	0.3	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

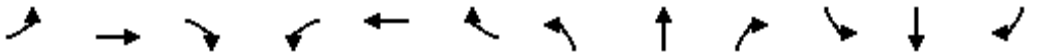


Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	544	306	409	25	726	145	607	366
v/c Ratio	1.21	0.39	1.23	0.17	1.07	0.91	0.85	0.51
Control Delay	141.0	25.7	164.6	23.1	91.1	76.3	47.2	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	141.0	25.7	164.6	23.1	91.1	76.3	47.2	12.9
Queue Length 50th (ft)	~358	140	~348	9	~555	57	407	56
Queue Length 95th (ft)	#768	289	#692	34	#1043	#233	#834	191
Internal Link Dist (ft)		436	457		312		692	
Turn Bay Length (ft)	200			75		125		250
Base Capacity (vph)	449	781	333	148	677	160	714	712
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.21	0.39	1.23	0.17	1.07	0.91	0.85	0.51

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

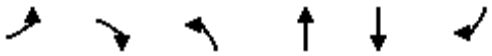
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	265	41	104	221	84	25	625	101	145	607	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0			4.5		4.0	4.5		3.0	6.0	6.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98			0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1829			1791		1504	1824		1805	1863	1455
Flt Permitted	0.28	1.00			0.81		0.12	1.00		0.09	1.00	1.00
Satd. Flow (perm)	514	1829			1478		187	1824		171	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	265	41	104	221	84	25	625	101	145	607	366
RTOR Reduction (vph)	0	4	0	0	6	0	0	4	0	0	0	159
Lane Group Flow (vph)	544	302	0	0	403	0	25	722	0	145	607	207
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	49.3	49.3			24.2		46.4	42.9		50.4	44.4	44.4
Effective Green, g (s)	50.8	49.3			25.7		46.4	44.4		50.4	44.4	44.4
Actuated g/C Ratio	0.42	0.41			0.21		0.38	0.37		0.42	0.37	0.37
Clearance Time (s)	6.0	6.0			6.0		4.0	6.0		3.0	6.0	6.0
Vehicle Extension (s)	4.0	2.0			2.0		4.0	3.0		4.0	3.0	3.0
Lane Grp Cap (vph)	431	747			314		110	671		152	685	535
v/s Ratio Prot	c0.22	0.17					0.01	c0.40		c0.05	0.33	
v/s Ratio Perm	c0.32				0.27		0.08			0.35		0.14
v/c Ratio	1.26	0.40			1.28		0.23	1.08		0.95	0.89	0.39
Uniform Delay, d1	31.3	25.3			47.4		27.4	38.1		30.1	35.7	28.1
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	135.5	0.1			149.3		1.4	57.1		59.2	13.1	0.5
Delay (s)	166.8	25.4			196.7		28.9	95.2		89.3	48.9	28.5
Level of Service	F	C			F		C	F		F	D	C
Approach Delay (s)		115.9			196.7			93.0			47.5	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	96.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	120.6	Sum of lost time (s)	23.0
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		

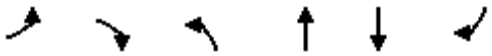
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	3	5	1248	1115	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	3	5	1357	1212	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				772		
pX, platoon unblocked	0.38					
vC, conflicting volume	2580	1213	1214			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4310	1213	1214			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	99	99			
cM capacity (veh/h)	1	222	574			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	1362	1214
Volume Left	3	5	0
Volume Right	3	0	2
cSH	2	574	1700
Volume to Capacity	4.28	0.01	0.71
Queue Length 95th (ft)	Err	1	0
Control Delay (s)	Err	0.6	0.0
Lane LOS	F	A	
Approach Delay (s)	Err	0.6	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	25.6		
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	2	13	23	1228	1104	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	14	25	1335	1200	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1232		
pX, platoon unblocked	0.39					
vC, conflicting volume	2590	1205	1211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4267	1205	1211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	94	96			
cM capacity (veh/h)	1	224	576			

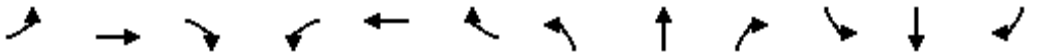
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	1360	1211
Volume Left	2	25	0
Volume Right	14	0	11
cSH	6	576	1700
Volume to Capacity	2.75	0.04	0.71
Queue Length 95th (ft)	80	3	0
Control Delay (s)	1957.3	2.5	0.0
Lane LOS	F	A	
Approach Delay (s)	1957.3	2.5	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	13.6		
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	277	183	95	445	79	403	74	564	603
v/c Ratio	0.97	0.33	0.27	0.95	0.60	0.77	0.25	0.89	0.58
Control Delay	84.4	35.0	32.1	80.2	56.2	55.0	39.4	60.1	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.4	35.0	32.1	80.2	56.2	55.0	39.4	60.1	7.4
Queue Length 50th (ft)	177	99	44	345	49	313	39	412	47
Queue Length 95th (ft)	#449	204	105	#698	#112	492	94	#793	195
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	200		200		125		200		250
Base Capacity (vph)	286	557	351	467	132	600	301	650	1038
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.33	0.27	0.95	0.60	0.67	0.25	0.87	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	277	131	52	95	355	90	79	346	57	74	564	603
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		4.0	6.0		6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1612	1625		1656	1785		1703	1711		1641	1845	1553
Flt Permitted	0.10	1.00		0.64	1.00		0.11	1.00		0.36	1.00	1.00
Satd. Flow (perm)	173	1625		1119	1785		205	1711		614	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	277	131	52	95	355	90	79	346	57	74	564	603
RTOR Reduction (vph)	0	9	0	0	6	0	0	4	0	0	0	229
Lane Group Flow (vph)	277	174	0	95	439	0	79	399	0	74	564	374
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	7	4		3	8		5	2		1	6	6 7
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	57.5	45.4		39.4	33.3		41.1	41.1		47.6	47.6	71.8
Effective Green, g (s)	59.0	45.4		39.4	34.8		41.1	41.1		47.6	47.6	71.8
Actuated g/C Ratio	0.43	0.33		0.28	0.25		0.30	0.30		0.34	0.34	0.52
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	278	533		342	448		126	508		289	634	805
v/s Ratio Prot	c0.14	0.11		0.01	0.25		0.03	c0.23		0.02	c0.31	0.24
v/s Ratio Perm	c0.28			0.07			0.16			0.07		
v/c Ratio	1.00	0.33		0.28	0.98		0.63	0.79		0.26	0.89	0.46
Uniform Delay, d1	43.0	35.0		37.6	51.5		39.5	44.6		41.5	42.9	21.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	52.6	0.4		0.4	36.8		9.4	7.8		0.5	14.3	0.4
Delay (s)	95.7	35.3		38.0	88.3		48.9	52.4		42.0	57.3	21.5
Level of Service	F	D		D	F		D	D		D	E	C
Approach Delay (s)		71.7			79.4			51.8			39.0	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	54.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	138.4	Sum of lost time (s)	28.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

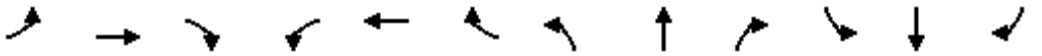
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	544	306	104	305	25	726	145	607	366
v/c Ratio	1.15	0.58	0.42	1.18	0.13	1.05	0.71	0.78	0.34
Control Delay	123.6	44.7	36.1	159.4	33.4	86.6	46.2	42.0	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	123.6	44.7	36.1	159.4	33.4	86.6	46.2	42.0	2.1
Queue Length 50th (ft)	~441	201	51	~275	12	~586	72	425	4
Queue Length 95th (ft)	#859	370	116	#569	40	#1092	#214	#830	45
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	200		200		125		125		250
Base Capacity (vph)	473	526	248	258	191	691	206	780	1077
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.15	0.58	0.42	1.18	0.13	1.05	0.70	0.78	0.34

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	265	41	104	221	84	25	625	101	145	607	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		6.0	4.5		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1829		1770	1789		1504	1824		1805	1863	1455
Flt Permitted	0.18	1.00		0.57	1.00		0.24	1.00		0.09	1.00	1.00
Satd. Flow (perm)	337	1829		1069	1789		376	1824		176	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	265	41	104	221	84	25	625	101	145	607	366
RTOR Reduction (vph)	0	4	0	0	10	0	0	4	0	0	0	132
Lane Group Flow (vph)	544	302	0	104	295	0	25	722	0	145	607	234
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	7	4		3	8		5	2		1	6	6 7
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	50.2	36.2		24.1	16.1		48.7	48.7		53.0	53.0	81.1
Effective Green, g (s)	51.7	36.2		24.1	17.6		48.7	50.2		53.0	53.0	81.1
Actuated g/C Ratio	0.39	0.27		0.18	0.13		0.37	0.38		0.40	0.40	0.61
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	452	500		237	238		168	692		191	746	892
v/s Ratio Prot	c0.27	0.17		0.03	0.17		0.00	c0.40		0.06	c0.33	0.16
v/s Ratio Perm	c0.20			0.05			0.05			0.25		
v/c Ratio	1.20	0.60		0.44	1.24		0.15	1.04		0.76	0.81	0.26
Uniform Delay, d1	39.1	41.8		47.0	57.3		42.4	41.0		32.1	35.2	11.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	111.0	2.1		1.3	139.0		0.4	46.2		15.8	6.8	0.2
Delay (s)	150.2	43.8		48.3	196.3		42.9	87.2		47.9	42.0	11.9
Level of Service	F	D		D	F		D	F		D	D	B
Approach Delay (s)		111.9			158.7			85.7			32.9	
Approach LOS		F			F			F			C	

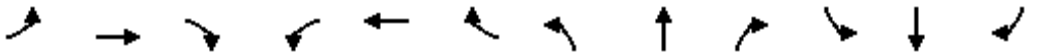
Intersection Summary			
HCM 2000 Control Delay	83.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	132.2	Sum of lost time (s)	28.0
Intersection Capacity Utilization	108.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	277	183	95	445	79	403	74	564	603
v/c Ratio	0.67	0.90	0.22	0.92	0.48	0.76	0.22	0.87	0.58
Control Delay	61.7	92.7	40.6	69.4	42.9	51.0	34.7	53.8	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.7	92.7	40.6	69.4	42.9	51.0	34.7	53.8	6.8
Queue Length 50th (ft)	107	134	58	329	47	300	38	401	44
Queue Length 95th (ft)	#195	#337	130	#677	96	475	94	#790	190
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	300		200		125		200		250
Base Capacity (vph)	413	204	424	485	169	637	342	649	1041
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.90	0.22	0.92	0.47	0.63	0.22	0.87	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	277	131	52	95	355	90	79	346	57	74	564	603
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		4.0	6.0		6.0	6.0	6.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3127	1625		1656	1785		1703	1711		1641	1845	1553
Flt Permitted	0.95	1.00		0.95	1.00		0.13	1.00		0.39	1.00	1.00
Satd. Flow (perm)	3127	1625		1656	1785		231	1711		674	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	277	131	52	95	355	90	79	346	57	74	564	603
RTOR Reduction (vph)	0	10	0	0	6	0	0	4	0	0	0	238
Lane Group Flow (vph)	277	173	0	95	439	0	79	399	0	74	564	365
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	3	3		4	4		5	2		1	6	3 6
Permitted Phases							2			6		
Actuated Green, G (s)	15.1	15.1		32.2	32.2		38.9	38.9		45.5	45.5	66.6
Effective Green, g (s)	16.6	15.1		32.2	33.7		38.9	38.9		45.5	45.5	66.6
Actuated g/C Ratio	0.13	0.12		0.25	0.26		0.30	0.30		0.35	0.35	0.51
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	398	188		409	462		157	511		327	645	795
v/s Ratio Prot	0.09	c0.11		0.06	c0.25		0.03	c0.23		0.02	c0.31	0.24
v/s Ratio Perm							0.12			0.06		
v/c Ratio	0.70	0.92		0.23	0.95		0.50	0.78		0.23	0.87	0.46
Uniform Delay, d1	54.3	56.9		39.1	47.4		36.5	41.7		36.3	39.6	20.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.2	43.8		0.3	29.5		2.5	7.6		0.4	12.6	0.4
Delay (s)	59.6	100.7		39.4	76.9		39.0	49.3		36.6	52.2	20.7
Level of Service	E	F		D	E		D	D		D	D	C
Approach Delay (s)		75.9			70.3			47.6			36.0	
Approach LOS		E			E			D			D	

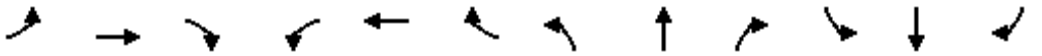
Intersection Summary			
HCM 2000 Control Delay	51.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	130.1	Sum of lost time (s)	28.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	544	306	104	305	25	726	145	607	366
v/c Ratio	0.88	0.99	0.39	1.01	0.11	0.95	0.81	0.73	0.35
Control Delay	67.3	100.0	54.7	104.7	28.8	57.3	58.7	37.6	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.3	100.0	54.7	104.7	28.8	57.3	58.7	37.6	2.6
Queue Length 50th (ft)	213	237	74	232	11	519	70	411	7
Queue Length 95th (ft)	#399	#529	156	#527	38	#1020	#237	#784	54
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	300		200		125		125		250
Base Capacity (vph)	617	310	268	302	221	768	178	833	1043
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.99	0.39	1.01	0.11	0.95	0.81	0.73	0.35

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	265	41	104	221	84	25	625	101	145	607	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		6.0	4.5		4.0	6.0	6.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	1829		1770	1789		1504	1824		1805	1863	1455
Flt Permitted	0.95	1.00		0.95	1.00		0.26	1.00		0.08	1.00	1.00
Satd. Flow (perm)	3433	1829		1770	1789		406	1824		159	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	265	41	104	221	84	25	625	101	145	607	366
RTOR Reduction (vph)	0	3	0	0	9	0	0	3	0	0	0	136
Lane Group Flow (vph)	544	303	0	104	296	0	25	723	0	145	607	230
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	3	3		4	4		5	2		1	6	3 6
Permitted Phases							2			6		
Actuated Green, G (s)	21.1	21.1		19.1	19.1		53.8	53.8		55.9	55.9	77.0
Effective Green, g (s)	22.6	21.1		19.1	20.6		53.8	55.3		55.9	55.9	77.0
Actuated g/C Ratio	0.17	0.16		0.15	0.16		0.41	0.42		0.43	0.43	0.59
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	590	293		257	280		198	767		167	791	851
v/s Ratio Prot	0.16	c0.17		0.06	c0.17		0.00	c0.40		0.05	c0.33	0.16
v/s Ratio Perm							0.05			0.32		
v/c Ratio	0.92	1.03		0.40	1.06		0.13	0.94		0.87	0.77	0.27
Uniform Delay, d1	53.6	55.2		51.0	55.5		38.0	36.6		31.6	32.3	13.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	20.0	61.4		1.0	69.3		0.3	19.7		34.8	4.5	0.2
Delay (s)	73.6	116.6		52.1	124.8		38.3	56.2		66.3	36.7	13.6
Level of Service	E	F		D	F		D	E		E	D	B
Approach Delay (s)		89.1			106.3			55.6			33.0	
Approach LOS		F			F			E			C	

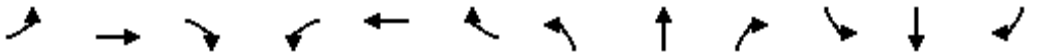
Intersection Summary			
HCM 2000 Control Delay	63.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	131.5	Sum of lost time (s)	28.0
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	277	183	95	445	79	403	74	564	603
v/c Ratio	0.67	0.90	0.22	0.92	0.47	0.53	0.16	0.87	0.58
Control Delay	61.7	92.8	40.6	69.4	52.9	47.3	32.6	53.8	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.7	92.8	40.6	69.4	52.9	47.3	32.6	53.8	6.5
Queue Length 50th (ft)	107	134	58	329	54	154	38	401	40
Queue Length 95th (ft)	#195	#337	130	#677	111	235	94	#790	180
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	300		200		125		200		250
Base Capacity (vph)	413	204	424	485	171	1212	454	649	1046
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.90	0.22	0.92	0.46	0.33	0.16	0.87	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	277	131	52	95	355	90	79	346	57	74	564	603
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		4.0	6.0		6.0	6.0	6.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3127	1625		1656	1785		1703	3250		1641	1845	1553
Flt Permitted	0.95	1.00		0.95	1.00		0.19	1.00		0.51	1.00	1.00
Satd. Flow (perm)	3127	1625		1656	1785		340	3250		889	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	277	131	52	95	355	90	79	346	57	74	564	603
RTOR Reduction (vph)	0	10	0	0	6	0	0	10	0	0	0	243
Lane Group Flow (vph)	277	173	0	95	439	0	79	393	0	74	564	360
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	3	3		4	4		5	2		1	6	3 6
Permitted Phases							2			6		
Actuated Green, G (s)	15.1	15.1		32.2	32.2		28.9	28.9		45.5	45.5	66.6
Effective Green, g (s)	16.6	15.1		32.2	33.7		28.9	28.9		45.5	45.5	66.6
Actuated g/C Ratio	0.13	0.12		0.25	0.26		0.22	0.22		0.35	0.35	0.51
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	398	188		409	462		157	721		440	645	795
v/s Ratio Prot	0.09	c0.11		0.06	c0.25		0.03	c0.12		0.03	c0.31	0.23
v/s Ratio Perm							0.08			0.03		
v/c Ratio	0.70	0.92		0.23	0.95		0.50	0.54		0.17	0.87	0.45
Uniform Delay, d1	54.3	56.9		39.1	47.4		42.5	44.8		30.0	39.6	20.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.2	43.8		0.3	29.5		2.5	0.8		0.2	12.6	0.4
Delay (s)	59.6	100.7		39.4	76.9		45.0	45.6		30.2	52.2	20.6
Level of Service	E	F		D	E		D	D		C	D	C
Approach Delay (s)		75.9			70.3			45.5			35.5	
Approach LOS		E			E			D			D	

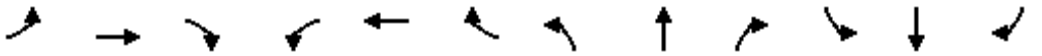
Intersection Summary			
HCM 2000 Control Delay	51.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	130.1	Sum of lost time (s)	28.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	544	306	104	305	25	726	145	607	366
v/c Ratio	0.77	0.86	0.33	0.88	0.14	0.63	0.57	0.83	0.36
Control Delay	55.0	70.9	50.4	73.7	36.8	37.3	34.9	46.3	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.0	70.9	50.4	73.7	36.8	37.3	34.9	46.3	2.9
Queue Length 50th (ft)	209	231	72	227	13	231	72	425	9
Queue Length 95th (ft)	#375	#502	153	#502	42	396	157	#835	61
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	300		200		125		125		250
Base Capacity (vph)	704	356	311	346	176	1242	304	733	996
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.86	0.33	0.88	0.14	0.58	0.48	0.83	0.37

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	265	41	104	221	84	25	625	101	145	607	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		6.0	4.5		4.0	6.0	6.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	1829		1770	1789		1504	3465		1805	1863	1455
Flt Permitted	0.95	1.00		0.95	1.00		0.22	1.00		0.15	1.00	1.00
Satd. Flow (perm)	3433	1829		1770	1789		343	3465		276	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	265	41	104	221	84	25	625	101	145	607	366
RTOR Reduction (vph)	0	4	0	0	9	0	0	9	0	0	0	141
Lane Group Flow (vph)	544	302	0	104	296	0	25	717	0	145	607	225
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	3	3		4	4		5	2		1	6	3 6
Permitted Phases							2			6		
Actuated Green, G (s)	23.3	23.3		21.2	21.2		41.3	41.3		47.2	47.2	70.5
Effective Green, g (s)	24.8	23.3		21.2	22.7		41.3	42.8		47.2	47.2	70.5
Actuated g/C Ratio	0.20	0.18		0.17	0.18		0.33	0.34		0.37	0.37	0.56
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	673	337		296	321		143	1173		239	695	811
v/s Ratio Prot	0.16	c0.17		0.06	c0.17		0.00	c0.21		0.05	c0.33	0.15
v/s Ratio Perm							0.05			0.17		
v/c Ratio	0.81	0.90		0.35	0.92		0.17	0.61		0.61	0.87	0.28
Uniform Delay, d1	48.5	50.4		46.5	51.0		44.5	34.9		29.4	36.8	14.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.1	24.8		0.7	30.8		0.6	1.0		4.3	11.7	0.2
Delay (s)	55.6	75.1		47.2	81.8		45.1	35.8		33.7	48.6	14.8
Level of Service	E	E		D	F		D	D		C	D	B
Approach Delay (s)		62.6			73.0			36.1			35.6	
Approach LOS		E			E			D			D	

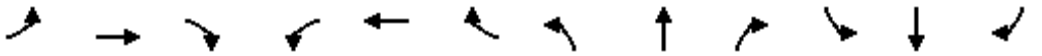
Intersection Summary			
HCM 2000 Control Delay	48.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	126.4	Sum of lost time (s)	28.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	230	230	95	445	79	403	74	564	603
v/c Ratio	0.94	0.97	0.25	1.02	0.50	0.66	0.26	0.91	0.58
Control Delay	100.5	108.0	47.3	96.8	36.3	45.8	27.7	64.5	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.5	108.0	47.3	96.8	36.3	45.8	27.7	64.5	7.3
Queue Length 50th (ft)	194	190	62	353	35	270	33	423	46
Queue Length 95th (ft)	#443	#445	136	#723	87	492	83	#818	192
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	200		200		75		125		250
Base Capacity (vph)	245	236	382	438	162	607	287	617	1046
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.97	0.25	1.02	0.49	0.66	0.26	0.91	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	277	131	52	95	355	90	79	346	57	74	564	603
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.99		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1531	1542		1656	1785		1703	1711		1641	1845	1553
Flt Permitted	0.95	0.99		0.95	1.00		0.10	1.00		0.31	1.00	1.00
Satd. Flow (perm)	1531	1542		1656	1785		170	1711		542	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	277	131	52	95	355	90	79	346	57	74	564	603
RTOR Reduction (vph)	0	7	0	0	6	0	0	4	0	0	0	229
Lane Group Flow (vph)	230	223	0	95	439	0	79	399	0	74	564	374
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	7	7		8	8		5	2		1	6	6 7
Permitted Phases							2			6		
Actuated Green, G (s)	20.2	20.2		31.2	31.2		55.6	47.8		52.4	46.2	72.4
Effective Green, g (s)	21.7	20.2		31.2	32.7		55.6	47.8		52.4	46.2	72.4
Actuated g/C Ratio	0.16	0.15		0.23	0.24		0.40	0.34		0.38	0.33	0.52
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	239	224		372	421		154	590		254	615	811
v/s Ratio Prot	c0.15	0.14		0.06	c0.25		c0.03	0.23		0.01	c0.31	0.24
v/s Ratio Perm							0.18			0.10		
v/c Ratio	0.96	1.00		0.26	1.04		0.51	0.68		0.29	0.92	0.46
Uniform Delay, d1	58.0	59.2		44.1	52.9		31.8	38.8		29.4	44.4	20.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	47.4	58.7		0.4	55.4		2.9	3.1		0.6	18.5	0.4
Delay (s)	105.5	117.9		44.5	108.3		34.6	41.9		30.1	62.9	21.2
Level of Service	F	F		D	F		C	D		C	E	C
Approach Delay (s)		111.7			97.1			40.7			40.7	
Approach LOS		F			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	63.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	138.6	Sum of lost time (s)	26.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

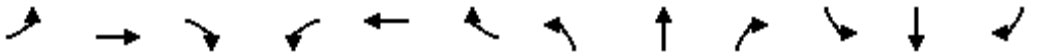
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	419	431	104	305	25	726	145	607	366
v/c Ratio	1.07	1.12	0.44	1.14	0.15	1.08	0.87	0.83	0.35
Control Delay	112.9	128.6	63.1	147.4	39.0	97.8	76.6	50.0	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	112.9	128.6	63.1	147.4	39.0	97.8	76.6	50.0	2.6
Queue Length 50th (ft)	361	~398	78	~268	13	~594	77	450	6
Queue Length 95th (ft)	#746	#781	161	#564	41	#1110	#251	#866	50
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	300		200		75		125		250
Base Capacity (vph)	393	386	236	267	163	674	166	735	1046
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.07	1.12	0.44	1.14	0.15	1.08	0.87	0.83	0.35

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	265	41	104	221	84	25	625	101	145	607	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		6.0	4.5		4.0	6.0	6.0
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.99		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1681	1722		1770	1789		1504	1824		1805	1863	1455
Flt Permitted	0.95	0.99		0.95	1.00		0.19	1.00		0.09	1.00	1.00
Satd. Flow (perm)	1681	1722		1770	1789		308	1824		167	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	265	41	104	221	84	25	625	101	145	607	366
RTOR Reduction (vph)	0	2	0	0	9	0	0	4	0	0	0	134
Lane Group Flow (vph)	419	429	0	104	296	0	25	722	0	145	607	232
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	7	7		8	8		5	2		1	6	6 7
Permitted Phases							2			6		
Actuated Green, G (s)	30.2	30.2		18.1	18.1		50.9	50.9		53.5	53.5	83.7
Effective Green, g (s)	31.7	30.2		18.1	19.6		50.9	52.4		53.5	53.5	83.7
Actuated g/C Ratio	0.23	0.21		0.13	0.14		0.36	0.37		0.38	0.38	0.60
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	379	370		228	249		141	680		158	709	866
v/s Ratio Prot	c0.25	0.25		0.06	c0.17		0.00	c0.40		0.05	c0.33	0.16
v/s Ratio Perm							0.06			0.30		
v/c Ratio	1.11	1.16		0.46	1.19		0.18	1.06		0.92	0.86	0.27
Uniform Delay, d1	54.4	55.1		56.6	60.5		49.5	44.0		35.9	40.0	13.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	77.8	97.4		1.4	118.4		0.6	52.2		47.6	10.0	0.2
Delay (s)	132.2	152.5		58.1	178.8		50.1	96.2		83.5	49.9	13.8
Level of Service	F	F		E	F		D	F		F	D	B
Approach Delay (s)		142.5			148.1			94.7			42.5	
Approach LOS		F			F			F			D	

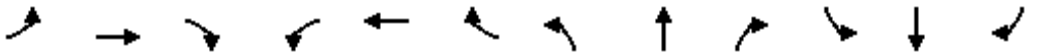
Intersection Summary			
HCM 2000 Control Delay	96.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	140.5	Sum of lost time (s)	28.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	230	230	95	445	79	403	74	564	603
v/c Ratio	0.94	0.97	0.25	1.02	0.50	0.35	0.20	0.91	0.58
Control Delay	100.5	108.0	47.3	96.9	36.2	34.7	26.6	64.5	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.5	108.0	47.3	96.9	36.2	34.7	26.6	64.5	7.3
Queue Length 50th (ft)	194	190	62	353	35	121	33	423	46
Queue Length 95th (ft)	#443	#445	136	#723	87	212	83	#818	192
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	200		200		75		125		250
Base Capacity (vph)	245	236	382	438	161	1156	377	617	1046
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.97	0.25	1.02	0.49	0.35	0.20	0.91	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	277	131	52	95	355	90	79	346	57	74	564	603
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.99		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1531	1542		1656	1785		1703	3250		1641	1845	1553
Flt Permitted	0.95	0.99		0.95	1.00		0.10	1.00		0.46	1.00	1.00
Satd. Flow (perm)	1531	1542		1656	1785		170	3250		802	1845	1553
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	277	131	52	95	355	90	79	346	57	74	564	603
RTOR Reduction (vph)	0	7	0	0	6	0	0	9	0	0	0	229
Lane Group Flow (vph)	230	223	0	95	439	0	79	394	0	74	564	374
Heavy Vehicles (%)	12%	6%	27%	9%	3%	4%	6%	9%	7%	10%	3%	4%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	7	7		8	8		5	2		1	6	6 7
Permitted Phases							2			6		
Actuated Green, G (s)	20.2	20.2		31.2	31.2		55.6	47.8		52.4	46.2	72.4
Effective Green, g (s)	21.7	20.2		31.2	32.7		55.6	47.8		52.4	46.2	72.4
Actuated g/C Ratio	0.16	0.15		0.23	0.24		0.40	0.34		0.38	0.33	0.52
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	239	224		372	421		154	1120		340	615	811
v/s Ratio Prot	c0.15	0.14		0.06	c0.25		c0.03	0.12		0.01	c0.31	0.24
v/s Ratio Perm							0.18			0.07		
v/c Ratio	0.96	1.00		0.26	1.04		0.51	0.35		0.22	0.92	0.46
Uniform Delay, d1	58.0	59.2		44.1	52.9		31.8	33.9		28.2	44.4	20.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	47.4	58.7		0.4	55.4		2.9	0.2		0.3	18.5	0.4
Delay (s)	105.5	117.9		44.5	108.3		34.6	34.0		28.5	62.9	21.2
Level of Service	F	F		D	F		C	C		C	E	C
Approach Delay (s)		111.7			97.1			34.1			40.6	
Approach LOS		F			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	62.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	138.6	Sum of lost time (s)	26.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

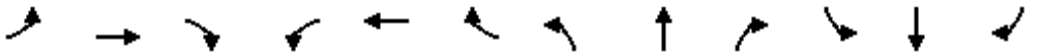
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	419	431	104	305	25	726	145	607	366
v/c Ratio	0.96	1.00	0.42	1.09	0.19	0.68	0.67	0.91	0.35
Control Delay	83.0	93.6	61.3	130.6	46.3	44.3	48.2	61.1	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.0	93.6	61.3	130.6	46.3	44.3	48.2	61.1	2.6
Queue Length 50th (ft)	352	367	78	~268	14	252	79	463	6
Queue Length 95th (ft)	#722	#755	161	#564	44	406	#187	#891	50
Internal Link Dist (ft)		436		457		312		692	
Turn Bay Length (ft)	300				75		125		250
Base Capacity (vph)	436	429	247	279	135	1178	229	665	1035
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	1.00	0.42	1.09	0.19	0.62	0.63	0.91	0.35

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

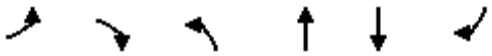
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	265	41	104	221	84	25	625	101	145	607	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	4.5		6.0	4.5		4.0	6.0	6.0
Lane Util. Factor	0.95	0.95		1.00	1.00		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.99		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1681	1722		1770	1789		1504	3465		1805	1863	1455
Flt Permitted	0.95	0.99		0.95	1.00		0.15	1.00		0.12	1.00	1.00
Satd. Flow (perm)	1681	1722		1770	1789		244	3465		221	1863	1455
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	265	41	104	221	84	25	625	101	145	607	366
RTOR Reduction (vph)	0	2	0	0	9	0	0	8	0	0	0	138
Lane Group Flow (vph)	419	429	0	104	296	0	25	718	0	145	607	228
Heavy Vehicles (%)	2%	1%	7%	2%	1%	4%	20%	2%	2%	0%	2%	11%
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	pt+ov
Protected Phases	7	7		8	8		5	2		1	6	6 7
Permitted Phases							2			6		
Actuated Green, G (s)	32.5	32.5		18.3	18.3		41.0	41.0		46.7	46.7	79.2
Effective Green, g (s)	34.0	32.5		18.3	19.8		41.0	42.5		46.7	46.7	79.2
Actuated g/C Ratio	0.25	0.24		0.13	0.15		0.30	0.31		0.34	0.34	0.58
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	420	412		238	260		104	1084		204	640	848
v/s Ratio Prot	c0.25	0.25		0.06	c0.17		0.01	c0.21		0.06	c0.33	0.16
v/s Ratio Perm							0.07			0.19		
v/c Ratio	1.00	1.04		0.44	1.14		0.24	0.66		0.71	0.95	0.27
Uniform Delay, d1	50.9	51.7		54.0	58.0		54.2	40.4		34.6	43.4	14.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	43.0	55.3		1.3	99.0		1.2	1.5		11.1	23.3	0.2
Delay (s)	93.8	106.9		55.3	157.0		55.4	42.0		45.7	66.7	14.2
Level of Service	F	F		E	F		E	D		D	E	B
Approach Delay (s)		100.5			131.1			42.4			46.8	
Approach LOS		F			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	71.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	135.8	Sum of lost time (s)	28.0
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		

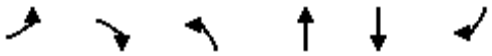
c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	7	0	713	1234	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	0	775	1341	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				772		
pX, platoon unblocked	0.73					
vC, conflicting volume	2120	1345	1348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2346	1345	1348			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	29	185	511			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	8	0	775	1348
Volume Left	0	0	0	0
Volume Right	8	0	0	7
cSH	185	1700	1700	1700
Volume to Capacity	0.04	0.00	0.46	0.79
Queue Length 95th (ft)	3	0	0	0
Control Delay (s)	25.2	0.0	0.0	0.0
Lane LOS	D			
Approach Delay (s)	25.2	0.0		0.0
Approach LOS	D			

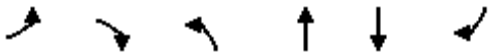
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	27	5	708	1213	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	29	5	770	1318	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1232		
pX, platoon unblocked	0.78					
vC, conflicting volume	2099	1319	1320			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2269	1319	1320			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	85	99			
cM capacity (veh/h)	34	192	524			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	33	5	770	1320
Volume Left	3	5	0	0
Volume Right	29	0	0	1
cSH	132	524	1700	1700
Volume to Capacity	0.25	0.01	0.45	0.78
Queue Length 95th (ft)	23	1	0	0
Control Delay (s)	41.1	11.9	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	41.1	0.1		0.0
Approach LOS	E			

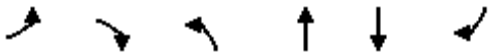
Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	3	5	1248	1115	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	3	5	1357	1212	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				772		
pX, platoon unblocked	0.39					
vC, conflicting volume	2580	1213	1214			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4303	1213	1214			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	99	99			
cM capacity (veh/h)	1	222	574			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	7	5	1357	1214
Volume Left	3	5	0	0
Volume Right	3	0	0	2
cSH	2	574	1700	1700
Volume to Capacity	4.22	0.01	0.80	0.71
Queue Length 95th (ft)	Err	1	0	0
Control Delay (s)	Err	11.3	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	Err	0.0		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	25.3		
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	2	13	23	1228	1104	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	14	25	1335	1200	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1232		
pX, platoon unblocked	0.40					
vC, conflicting volume	2590	1205	1211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4213	1205	1211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	94	96			
cM capacity (veh/h)	1	224	576			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	16	25	1335	1211
Volume Left	2	25	0	0
Volume Right	14	0	0	11
cSH	7	576	1700	1700
Volume to Capacity	2.48	0.04	0.79	0.71
Queue Length 95th (ft)	79	3	0	0
Control Delay (s)	1739.0	11.5	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	1739.0	0.2		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	11.1		
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

APPENDIX D

CRASH DATA

Date: 05/07/2013 Source: SQL Server VCSG

Vermont Agency of Transportation

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

From 01/01/08 To 12/31/12 General Yearly Summaries Information

Route: VT-2A

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
	VT0041000/09WT02113	Williston	4.72	07/16/2009	17:00	Rain	Followed too closely, No improper driving	Rear End	0	0	0	N	SH
	VT0041000/08WT02420	Williston	4.73	08/02/2008	12:27	Clear	Inattention, No improper driving	Rear End	0	0	0	N	SH
	VT0041000/08WT01431	Williston	4.74	05/08/2008	18:15	Clear	Followed too closely, Visibility obstructed, No improper driving	Rear End	0	0	0		SH
	VT0041000/12WT04433	Williston	4.75	12/11/2012	17:23	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0	N	SH
	VT0041000/12WT03332	Williston	4.76	09/21/2012	14:46	Clear	No improper driving, Visibility obstructed	Same Direction Sideswipe	0	0	0	N	SH
	VT0041000/12WT03920	Williston	4.78	11/02/2012	18:14				0	0	0	N	SH
	VT0041000/08WT00021	Williston	4.79	01/03/2008	05:00	Snow	No improper driving, Failed to yield right of way	No Turns, Thru moves only, Broadside ^<	0	0	0		SH
	VT0041000/08WT00414	Williston	4.79	02/08/2008	22:15	Cloudy	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0		SH
	VT0041000/08WT01574	Williston	4.79	05/21/2008	19:28	Clear	Inattention, No improper driving	Rear End	2	0	0	S	SH
	VT0040200/08ES03680	Williston	4.79	05/30/2008	22:35	Rain	Failed to yield right of way, No improper driving	Opp Direction Sideswipe	0	0	0	N	SH
	VT0041000/08WT01738	Williston	4.79	06/06/2008	22:28	Not Reported	Followed too closely, Distracted, No improper driving	Rear End	0	0	0	N	SH
	VT0041000/08WT02376	Williston	4.79	07/29/2008	15:03	Clear	Unknown	Same Direction Sideswipe	0	0	0	S	SH
	VT0041000/08WT03605	Williston	4.79	11/10/2008	07:06	Rain	Followed too closely, Inattention, No improper driving	Rear End	0	0	0	S	SH
	VT0041000/09WT00386	Williston	4.79	01/07/2009	18:00	Clear	Failed to yield right of way, No improper driving	Left and Right Turns, Simultaneous Turn Crash --vv--	0	0	0	E	SH
	VT0041000/09WT02094	Williston	4.79	07/13/2009	22:20	Cloudy	No improper driving, Other improper action, Inattention	Rear End	0	0	0	N	SH
	VT0041000/10WT00482	Williston	4.79	02/16/2010	06:58	Clear	No improper driving, Disregarded traffic signs, signals, road markings	No Turns, Thru moves only, Broadside ^<	0	0	0	E	SH
	VT0041000/10WT00588	Williston	4.79	02/26/2010	17:00	Cloudy	Failed to yield right of way, No improper driving	Rear End	0	0	0		SH
	VT0041000/10WT01181	Williston	4.79	04/19/2010	08:08	Cloudy	Inattention, No improper driving	Same Direction Sideswipe	0	0	0	S	SH
	VT0041000/10WT02170	Williston	4.79	07/23/2010	08:51	Cloudy	Inattention, No improper driving	Rear End	0	0	0	S	SH
	VT0041000/10WT02363	Williston	4.79	08/12/2010	10:17	Cloudy	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	N	SH
	VT0041000/10WT02480	Williston	4.79	08/20/2010	18:41	Clear	Disregarded traffic signs, signals, road markings, Failed to yield right of way, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	E	SH
	VT0041000/10WT02573	Williston	4.79	08/27/2010	11:22	Clear	Failed to yield right of way, No improper driving	Rear End	0	0	0	S	SH
	VT0041000/11WT00334	Williston	4.79	01/31/2011	13:05	Clear	Inattention, Followed too closely, No improper driving	Rear End	1	0	0	N	SH
	VT0041000/11WT00679	Williston	4.79	03/02/2011	17:00	Severe Crosswinds	Driving too fast for conditions	Single Vehicle Crash	0	0	0	S	SH
	VT0041000/11WT01557	Williston	4.79	05/14/2011	17:18		Followed too closely	Rear End	0	0	0	S	SH
	VT0041000/11WT03372	Williston	4.79	10/02/2011	19:02	Rain	No improper driving, Failed to yield right of way	Left Turn and Thru, Angle Broadside -->v--	1	0	0		SH
	VT0041000/11WT03494	Williston	4.79	10/12/2011	18:44	Clear		Rear End	0	0	0	N	SH

VT0041000/12WT00496	Williston	4.79	02/16/2012	13:09	Cloudy	Failed to yield right of way, Disregarded traffic signs, signals, road markings, No improper driving	Left Turn and Thru, Head On ^v--	0	0	0E	SH
VT0041000/12WT01234	Williston	4.79	04/20/2012	11:56				0	0	0E	SH
VT0041000/12WT02823	Williston	4.79	08/20/2012	08:00	Clear		Rear End	0	0	0E	SH
VT0041000/12WT02978	Williston	4.79	08/29/2012	07:34	Clear	Inattention, Followed too closely, No improper driving	Rear End	0	0	0S	SH
VT0041000/12WT04671	Williston	4.79	12/30/2012	20:07	Cloudy	Disregarded traffic signs, signals, road markings, Inattention, No improper driving	No Turns, Thru moves only, Broadside ^<	1	0	0N	SH
VT0041000/08WT02258	Williston	4.81	07/18/2008	16:38	Cloudy	No improper driving, Failed to yield right of way, Visibility obstructed	No Turns, Thru moves only, Broadside ^<	0	0	0	SH
VT0041000/12WT03678	Williston	4.81	10/17/2012	12:41	Clear	Inattention	Rear End	0	0	0S	SH
VT0041000/11WT03924	Williston	4.82	11/18/2011	17:00	Clear	Inattention, Distracted, No improper driving	Rear End	0	0	0S	SH
VT0041000/12WT04399	Williston	4.82	12/09/2012	13:45	Clear	Inattention, Distracted, No improper driving	Rear End	0	0	0	SH
VT0041000/12WT00686	Williston	4.85	03/05/2012	14:44	Clear	Followed too closely, No improper driving	Rear End	0	0	0S	SH
VT0041000/09WT00696	Williston	4.87	03/07/2009	14:34	Clear	Inattention, No improper driving	Rear End	0	0	0S	SH
VT0041000/08WT03063	Williston	4.88	09/26/2008	11:40	Clear	Followed too closely, Distracted, No improper driving	Rear End	0	0	0	SH
VT0041000/08WT03395	Williston	4.88	10/24/2008	11:29	Clear	No improper driving, Failed to yield right of way	Rear End	0	0	0	SH
VT0041000/08WT04100	Williston	4.88	12/19/2008	12:01	Cloudy	No improper driving, Inattention	Rear End	0	0	0S	SH
VT0041000/12WT03589	Williston	4.92	10/10/2012	08:49	Clear	No improper driving	Single Vehicle Crash	0	0	0S	SH
VT0040200/09WT1203	Williston	4.93	04/24/2009	17:33	Clear	Failed to yield right of way, No improper driving	Rear End	0	0	0S	SH
VT0041000/11WT03476	Williston	4.93	10/11/2011	07:18	Clear	No improper driving, Inattention, Followed too closely	Rear End	0	0	0S	SH
VT0041000/08WT00125	Williston	4.94	01/12/2008	13:17	Clear	Inattention, No improper driving	Rear End	0	0	0S	SH
VT0041000/08WT02073	Williston	4.94	07/03/2008	13:01	Rain	Followed too closely, Operating defective equipment, No improper driving	Rear End	0	0	0S	SH
VT0041000/08WT03693	Williston	4.94	11/18/2008	13:07	Snow	Followed too closely, No improper driving	Rear End	0	0	0S	SH
VT0041000/08WT03724	Williston	4.94	11/20/2008	16:10	Cloudy	Inattention, No improper driving	Rear End	0	0	0N	SH
VT0041000/11WT01855	Williston	4.94	06/06/2011	06:59	Clear	Driving too fast for conditions, Inattention, No improper driving	Rear End	0	0	0S	SH
VT0041000/12WT001917	Williston	4.94	06/17/2012	13:09	Clear	Inattention, No improper driving	Rear End	0	0	0S	SH
VT0041000/12WT04432	Williston	4.94	12/11/2012	15:48	Clear	Inattention, Distracted, No improper driving	Rear End	1	0	0S	SH
VT0041000/12WT01044	Williston	4.95	04/04/2012	15:46	Rain	Failure to keep in proper lane, Inattention, No improper driving	Opp Direction Sideswipe	1	0	0	SH
VT0041000/11WT01318	Williston	4.97	04/27/2011	07:26	Clear	No improper driving	Rear End	0	0	0S	SH
VT0041000/10WT01747	Williston	5.02	06/19/2010	12:41	Clear	Failed to yield right of way, Unknown, No improper driving	Rear End	0	0	0S	SH
VT0041000/11WT00438	Williston	5.02	02/09/2011	13:02	Clear	Failed to yield right of way, No improper driving	Rear End	0	0	0N	SH
VT0041000/12WT01589	Williston	5.02	05/21/2012	17:11	Clear	Inattention, No improper driving	Rear End	0	0	0S	SH
VT0041000/12WT02758	Williston	5.03	08/17/2012	17:21	Clear	Followed too closely	Rear End	1	0	0S	SH
VT0041000/09WT01489	Williston	5.04	05/23/2009	08:00	Clear	Fatigued, asleep	Single Vehicle Crash	0	0	0	SH
VT0041000/11WT03428	Williston	5.07	10/07/2011	15:13	Clear	Unknown	Same Direction Sideswipe	0	0	0S	SH
VT0041000/12WT02941	Williston	5.09	08/27/2012	10:47	Clear	Distracted	Rear End	1	0	0N	SH
VT0041000/10WT00830	Williston	5.15	03/25/2010	12:37	Clear	Failed to yield right of way, Inattention, No improper driving	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	0	0	0	SH
VT0041000/10WT02223	Williston	5.15	07/28/2010	17:29	Clear	Distracted, Followed too closely, No improper driving	Rear End	0	0	0	SH
VT0041000/09WT02172	Williston	5.2	07/22/2009	16:02	Clear	Failed to yield right of way, Inattention, No improper driving	Rear End	2	0	0N	SH
VT0041000/10WT00526	Williston	5.22	02/21/2010	12:34	Clear	Inattention, No improper driving	Rear End	0	0	0N	SH
VT0041000/11WT03374	Williston	5.23	10/03/2011	06:39		Failure to keep in proper lane, Inattention, No improper driving	Opp Direction Sideswipe	2	0	0	SH
VT0041000/08WT03515	Williston	5.3	11/01/2008	15:43	Clear	No improper driving	Single Vehicle Crash	0	0	0S	SH
VT0041000/08WT02495	Williston	5.31	08/07/2008	15:38	Clear	Followed too closely, No improper driving	Rear End	0	0	0N	SH
VT0041000/09WT03289	Williston	5.31	11/05/2009	16:12	Clear	Inattention, No improper driving	Rear End	0	0	0N	SH
VT0041000/08WT01009	Williston	5.32	04/01/2008	17:32	Clear	No improper driving, Inattention	Rear End	0	0	0	SH
VT0041000/08WT02568	Williston	5.32	08/13/2008	08:19	Clear	Visibility obstructed, No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0E	SH
VT0041000/09WT00521	Williston	5.32	02/19/2009	14:17	Clear	Failed to yield right of way, No improper driving	Rear End	0	0	0	SH
VT0041000/10WT01197	Williston	5.32	04/30/2010	10:53	Clear	No improper driving, Failed to yield right of way	Left Turn and Thru, Head On ^v--	0	0	0N	SH
VT0041000/12WT01521	Williston	5.32	05/17/2012	15:53	Clear	Inattention, No improper driving	Rear End	0	0	0N	SH
							Totals:	**13**	**0**	**0**	

Total Crash Count = 73 **Fatal Crash Count = 0** **Injury Crash Count = 10** **PDO Crash Count = 63**

Note: VT-2A MM 4.69-5.32.
Industrial Ave./Mountainview Rd. intersects VT-2A at mile point 4.79.
River Cove Rd. intersects VT-2A at mile point 5.32.
Untimely Deaths are the result of death prior to a crash event. These deaths are not counted in the Fatal/Fatality type counts. They are considered an Incapacitating Injury and are counted in Injury Type crashes.

THIS DOCUMENT IS EXEMPT FROM DISCOVERY OR ADMISSION UNDER 23 U.S.C 409.

Date: 05/07/2013 Source: SQL Server VCSG

Vermont Agency of Transportation

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

From 01/01/08 To 12/31/12 General Yearly Summaries Information

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
Route: INDUSTRIAL AVE., WILLISTON													
	VT0041000/08WT04007	Williston	1.04	12/12/2008	11:38	Snow	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, No improper driving	Rear End	0	0	0	E	FAU
	VT0041000/09WT01510	Williston	1.04	05/24/2009	17:07	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	W	FAU
	VT0041000/09WT01914	Williston	1.04	06/26/2009	21:34	Clear	No improper driving, Made an improper turn, Failure to keep in proper lane	Left Turn and Thru, Head On ^v--	2	0	0	S	FAU
	VT0041000/09WT02865	Williston	1.04	09/23/2009	16:34	Rain	Followed too closely, Inattention, No improper driving	Rear End	0	0	0	E	FAU
	VT0041000/10WT03724	Williston	1.04	12/07/2010	15:21	Clear	Inattention, No improper driving	Rear End	0	0	0	E	FAU
	VT0041000/11WT02534	Williston	1.04	07/27/2011	15:16	Cloudy	Inattention, No improper driving	Rear End	0	0	0	W	FAU
	VT0041000/11WT02853	Williston	1.04	08/19/2011	16:53	Clear	Inattention, No improper driving	Rear End	0	0	0	E	FAU
	VT0041000/11WT03401	Williston	1.04	10/05/2011	16:32	Clear	No improper driving, Failed to yield right of way	Rear End	0	0	0	E	FAU
	VT0041000/11WT03510	Williston	1.04	10/14/2011	15:35	Clear		Left Turn and Thru, Angle Broadside -->v--	0	0	0	N	FAU
	VT0041000/12WT00582	Williston	1.04	02/24/2012	16:08	Snow	Inattention, No improper driving	Rear End	0	0	0		FAU
	VT0041000/08WT01395	Williston	1.04	05/05/2008	14:01	Clear	Inattention, No improper driving	Rear End	0	0	0	E	FAU
	VT0041000/10WT01805	Williston	1.04	06/24/2010	12:13	Clear	Failed to yield right of way, No improper driving	Rear End	0	0	0	E	FAU
	VT0041000/10WT02477	Williston	1.04	08/20/2010	16:28	Cloudy		Rear End	0	0	0	E	FAU
	VT0041000/12T01486	Williston	1.04	05/15/2012	08:30	Rain	Inattention, No improper driving	Rear End	0	0	0	E	FAU
								Totals:	**2**	**0**	**0**		

Total Crash Count = 14 **Fatal Crash Count = 0** **Injury Crash Count = 1** **PDO Crash Count = 13**

Note: FAU-5504 (Industrial Ave.) MM 1.04-1.05.
VT-2A intersects Industrial Ave. at mile point 1.04.
Untimely Deaths are the result of death prior to a crash event. These deaths are not counted in the Fatal/Fatality type counts. They are considered an Incapacitating Injury and are counted in Injury Type crashes.

THIS DOCUMENT IS EXEMPT FROM DISCOVERY OR ADMISSION UNDER 23 U.S.C 409.

Date: 05/07/2013 Source: SQL Server VCSG

Vermont Agency of Transportation

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

From 01/01/08 To 12/31/12 General Yearly Summaries Information

*	Reporting Agency/ Number	Town	Mile Marker	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Direction	Road Group
Route: MT. VIEW ROAD, WILLISTON													
	VT0041000/09WT00772	Williston	003	14/2009	13:10	Clear	No improper driving	Opp Direction Sideswipe	0	0	0	E	FAU
	VT0041000/09WT01385	Williston	005	13/2009	08:53	Clear	Followed too closely, No improper driving	Rear End	0	0	0	W	FAU
	VT0041000/10WT01885	Williston	006	30/2010	18:39	Cloudy	Followed too closely, No improper driving	Rear End	0	0	0	W	FAU
	VT0041000/11WT02780	Williston	008	15/2011	11:31	Cloudy	Inattention, No improper driving	Rear End	0	0	0	W	FAU
								Totals:	**0**	**0**	**0**		

Total Crash Count = 4 **Fatal Crash Count = 0** **Injury Crash Count = 0** **PDO Crash Count = 4**

Note: FAU-5506 (Mountainview Rd..) MM 0.00-0.01.
VT-2A intersects Mountainview Rd. at mile point 0.00.
Untimely Deaths are the result of death prior to a crash event. These deaths are not counted in the Fatal/Fatality type counts. They are considered an Incapacitating Injury and are counted in Injury Type crashes.

THIS DOCUMENT IS EXEMPT FROM DISCOVERY OR ADMISSION UNDER 23 U.S.C 409.

APPENDIX E

ENVIRONMENTAL RESOURCES

Memo

Stantec

To:	Rick Bryant South Burlington, VT	From:	Polly Harris South Burlington, VT
File:	CCRPC VT 2A/Industrial Ave 195310861	Date:	May 14, 2013

Reference: CCRPC VT 2A/Industrial Ave to River Cove Road, Williston Natural Resources Review

As requested, on May 7, 2013, Stantec Consulting (Stantec) evaluated the natural resources present within the Chittenden County Regional Planning Commission (CCRPC) VT 2A/Industrial Avenue to River Cove Road project area in Williston, Vermont. Specifically, as part of this investigation, Stantec identified and characterized wetlands, streams, observable rare, threatened or endangered (RTE) species, wildlife habitat, agricultural land, and public conservation lands. Approximate wetland boundaries under state and federal jurisdiction were based on the technical criteria described in the *2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*. Note that only reconnaissance-level investigations were carried out, and formal wetland delineations were not conducted. Locations were sketched on the project base map. Following is a summary of our findings.

General Site Description

Industrial Avenue in Williston is an arterial route connecting VT Route 2 and 2A. Near VT Route 2, the road is flanked by office and industrial buildings, while near VT 2A, it is flanked by residential dwellings. Parcels along VT 2A and Mountain View Road within the project area contain residential dwellings and associated outbuildings, as well as two churches. Vegetation varies from mowed lawn and field to partially forested habitats, and utility lines are present (see attached photos).

The proposed project area includes Industrial Ave from the power line right-of-way east to the intersection with VT 2A, and continues east approximately 600 feet east along Mountain View Road. The project area includes approximately 3,700 feet along VT 2A, extending from south of Meadowrun Road north to near River Cove Road (see attached Project Area map). Natural resources were reviewed within 50 feet of centerline in order to assess potential buffer impacts.

Natural Resource Review Summary

Review of Existing Materials

Stantec used the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas mapping program to assess the likelihood of the presence of mapped Vermont Significant Wetland Inventory (VSWI) wetlands. According to this program,[1] there are no Class 2 VSWI wetlands mapped within the project area, nor are there any known RTE species (see attached ANR Map).

[1] http://anrmaps.vermont.gov/websites/anra/

Reference: CCRPC VT 2A/Industrial Ave Natural Resource Review

According to the *Natural Resource Conservation Service (NRCS) Web Soil Survey*[2] *for Chittenden County, Vermont*, the soils within the project corridor are mapped as Belgrade and Eldridge soils, 0-3% slopes, 3-8% slopes, and 8-15% slopes; Munson and Raynham silt loams, 3-8% slopes; and Peru stony loam, 5-12% slopes. The Belgrade and Eldridge soils, 0-3% slopes are considered Prime Farmland soils, while the remaining soil types are considered Farmland Soils of Statewide Importance.

Wetlands and Streams

There are no mapped wetlands or streams within the project area. However, three small wetland areas were identified during the May 7, 2013 site investigation. These are all located near the northern limits of the project area, adjacent to VT 2A (see attached Wetland Sketch). All three are small palustrine emergent wetlands. The wetland located on the west side of VT 2A, just south of River Cove Road, appears to be an overgrown stormwater detention pond dominated by common reed (*Phragmites australis*). The other two small wetland areas are dominated by cattail (*Typha latifolia*).

In addition, Allen Brook flows from east to west, crossing under both Route 2A and Industrial Avenue just outside the project area. A large wetland area is associated with this stream in the vicinity of Route 2A, outside of the project area.

RTE Species

Stantec identified no RTE species during the May 7, 2013 site visit. The project corridor has been disturbed to some degree by mowing, clearing, fill, or previous development. As a result, it is unlikely that any RTE plant or animal species occur within the project corridor.

Wildlife and Wildlife Habitat

The project area provides habitat for various wildlife species common to Vermont's urbanizing areas such as blue jay (*Cyanocitta cristata*), raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*), gray squirrel (*Sciurus carolinensis*), as well as other species that may travel through the area. The Town of Williston was studied as part of the PLACE (Place-based Landscape Analysis and Community Education) Program[3]. Part of the evaluation included identifying core forest, edge forest, and wildlife habitat corridors. The project corridor does not include any of these identified features, and does not provide significant wildlife habitat.

Agricultural Land

According to the NRCS Web Soil Survey for Chittenden County, Vermont, the project corridor includes soils rated as Farmland of Statewide Importance as well as Prime Farmland soils. However, the project corridor is not currently in active agriculture, and any proposed improvements would be constructed within a narrow strip alongside the existing pavement; this portion of the project area does not provide agricultural value as the affected land is already in

[2] Natural Resource Conservation Service Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Refer to map for Chittenden County, Vermont. Accessed on May 13, 2013.
[3] http://www.uvm.edu/place/towns/williston/index.php

Reference: CCRPC VT 2A/Industrial Ave Natural Resource Review

"urban use." Note, however, that any proposed work in these areas may require authorization from the NRCS via form AD1006, the Farmland Conversion Impact Rating form.

Conservation Zones

No designated state or town conservation zones are present within the narrow project corridor. Therefore, the project area does not include public recreation lands (a Section 4(f) resource) or public lands developed with Land and Water Conservation Funds (a Section 6(f) resource).

Federal and State Wetland Regulations

The US Army Corps of Engineers (Corps) regulates wetland and streams under the provisions of Section 404 of the Clean Water Act. The Corps has issued a Programmatic General Permit for the State of Vermont. Typically, wetland and stream impacts of less than one acre may be covered by a Programmatic General Permit, with impacts of less than 3,000 s.f. often eligible for approval via a one-page Self-Verification Form.

The three small wetland areas identified near VT 2A near the northern limits of the project would likely be considered Vermont Class 3 wetlands, and any impacts to these wetlands would likely *not* require authorization under the Vermont Wetland Permit or Vermont General Permit.

Summary

In summary, the CCRPC VT 2A/Industrial Ave project area includes three small Vermont Class 3 wetlands. Any impacts to these resources may require authorization from the Corps. In addition, the project corridor includes Prime Farmland soils and Farmland Soils of Statewide Significance. Any impacts to these soils may require coordination with the NRCS via form AD1006, the Farmland Conversion Impact Rating form.

STANTEC CONSULTING SERVICES INC.

Polly Harris
Environmental Project Manager
Polly.Harris@stantec.com

Attachment: Photographs, ANR Mapping

Reference: CCRPC VT 2A/Industrial Ave Natural Resource Review

CCRPC VT 2A/Industrial Ave
Photographs

Photo 1. View looking south along VT 2A at typical sidewalk section and adjacent landscaping. 5/7/13

Photo 2. View looking east along Industrial Ave at typical sidewalk section with utility corridors. 5/7/13

Reference: CCRPC VT 2A/Industrial Ave Natural Resource Review

Photo 3. View looking south on VT 2A, with small wetland area shown on right. 5/7/13

Photo 4. View looking east across VT 2A at small wetland. 5/7/13

Natural Resources Atlas - VT 2A/Industrial Ave

Vermont Agency of Natural Resources

vermont.gov

LEGEND

- Hazardous Waste Site
- Rare Threatened Endangered
  - Threatened or Endangered
  - Rare
- Significant Natural Community
- 303(d) List of Streams (Part A)
- 303(d) List - Watersheds
- Wetlands - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
- Wetlands - VSWI Advisory Lay
- DFIRM Floodways
- DFIRM Preliminary Floodways
- Special Flood Hazard Areas (A Counties)
  - AE (1-percent annual chance flood
  - A (1-percent annual chance floodpl
  - AO (1-percent annual chance zone feet)
  - 0.2-percent annual chance flood ha
- Waterbody
- Stream
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

692.0 0 346.00 692.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1135 Ft. 1cm = 136 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Wetland Areas, 2A/Industrial Ave

Vermont Agency of Natural Resources

vermont.gov

LEGEND

Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

156.0 0 78.00 156.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 255 Ft. 1cm = 31 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

APPENDIX F

ARCHEOLOGICAL RESOURCES

HARTGEN
archeological associates inc

ARCHEOLOGICAL RESOURCE AND HISTORIC PRESERVATION ASSESSMENT

Williston Route 2A/Industrial Avenue Project

Town of Williston
Chittenden County, Vermont

HAA # 4605-11

Submitted to:
Stantec
55 Green Mountain Drive
South Burlington, Vermont 05403

Prepared by:
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An ACRA Member Firm
www.acra-crm.org

August 2013

ABSTRACT

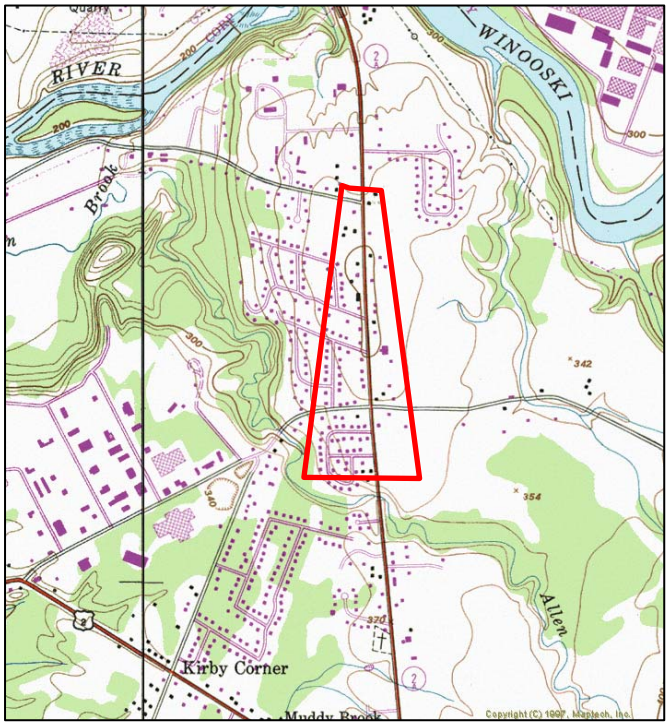
Hartgen Archeological Associates, Inc. was contracted by Stantec to conduct an Archeological Resource and Historic Preservation Assessment for the Williston Route 2A/Industrial Avenue Project located in the Town of Williston, Chittenden County, Vermont. This review is required according to Section 16 of the National Historic Preservation Act of 1966, as amended. The project sponsor is the Chittenden County Regional Planning Commission (CCRPC) in conjunction with the Vermont Agency of Transportation (VTrans).

The project area of potential effects (APE) extends along both sides of Essex Road (Route 2A) from River Cove Road in the north to Meadowrun Road in the south, a distance of approximately 3,637 ft (1.1 km). The APE also extends west from Essex Road along Industrial Avenue approximately 699 ft (213 m) and east from Essex Road along Mountain View Road approximately 547 ft (167 m). The width of the APE is estimated at 170 ft (51.8 m). Given these dimensions, the APE encompasses approximately 19.05 acres (7.71 ha). The project intends to develop transportation and traffic improvement measures along the APE such as additional lanes and/or a roundabout, spot widening, bike lanes and sidewalks.

A site visit to the project area on June 12, 2013 identified areas of disturbance along much of the APE related to the installation of several utilities and existing sidewalks. Outside of this disturbance there is some disturbance from grading and filling around house lots, but the archeological sensitivity remains high in undisturbed areas. A large number of archeological sites has been documented for the project vicinity, indicating a high potential for unknown archeological sites to be present in undisturbed portions of the APE.

Historic preservation concerns are focused on mature trees that are located along the APE. Such large trees should be avoided in the project design. Once draft plans are developed, they will be reviewed for historic preservation issues.

Archeological potential is high outside of the disturbance from sidewalk and utility installation. If these areas can not be avoided in project design, Phase IB archeological reconnaissance survey is recommended.



UTM Coordinates (NAD 1983):
NE: 180650141E, 4926143N
NW: 180649980E, 4926170N
SE: 180650358E, 4924981N
SW: 180649871E, 4924977N

TABLE *of* CONTENTS

Map List

Photograph List

Table List

ARCHEOLOGICAL RESOURCE AND HISTORIC PRESERVATION ASSESSMENT

INTRODUCTION

Hartgen Archeological Associates, Inc. (Hartgen) was retained by Stantec to conduct an Archeological Resource and Historic Preservation Assessment for the proposed Williston Vermont Route 2A/Industrial Avenue Intersection and Route 2A to River Cove Road Scoping Study. The project is located on Essex Road (Route 2A) between River Cove Road and Meadowrun Road in the Town of Williston, Chittenden County, Vermont with extensions along Industrial Avenue and Mountain View Road (Map 1). The project requires approvals by the Vermont Agency of Transportation (VTrans). The investigation was conducted to comply with Section 106 of the National Historic Preservation Act of 1966, as amended and will be reviewed by the Chittenden County Regional Planning Commission (CCRPC) and VTrans. The investigation was conducted according to the *Vermont State Historic Preservation Office's Guidelines for Conducting Archeology in Vermont* (VDHP 2002).

PROJECT INFORMATION

The project is a scoping study sponsored by the CCRPC to develop and evaluate potential transportation alternatives to address traffic congestion, bike, pedestrian and transit needs. The alternatives will probably include increasing the capacity of the intersection of Route 2A and Industrial Avenue/Mountain View Road through additional lanes and/or a roundabout. It is also assumed the Route 2A corridor will be evaluated for spot widening, bike lanes, a three lane section and sidewalks.

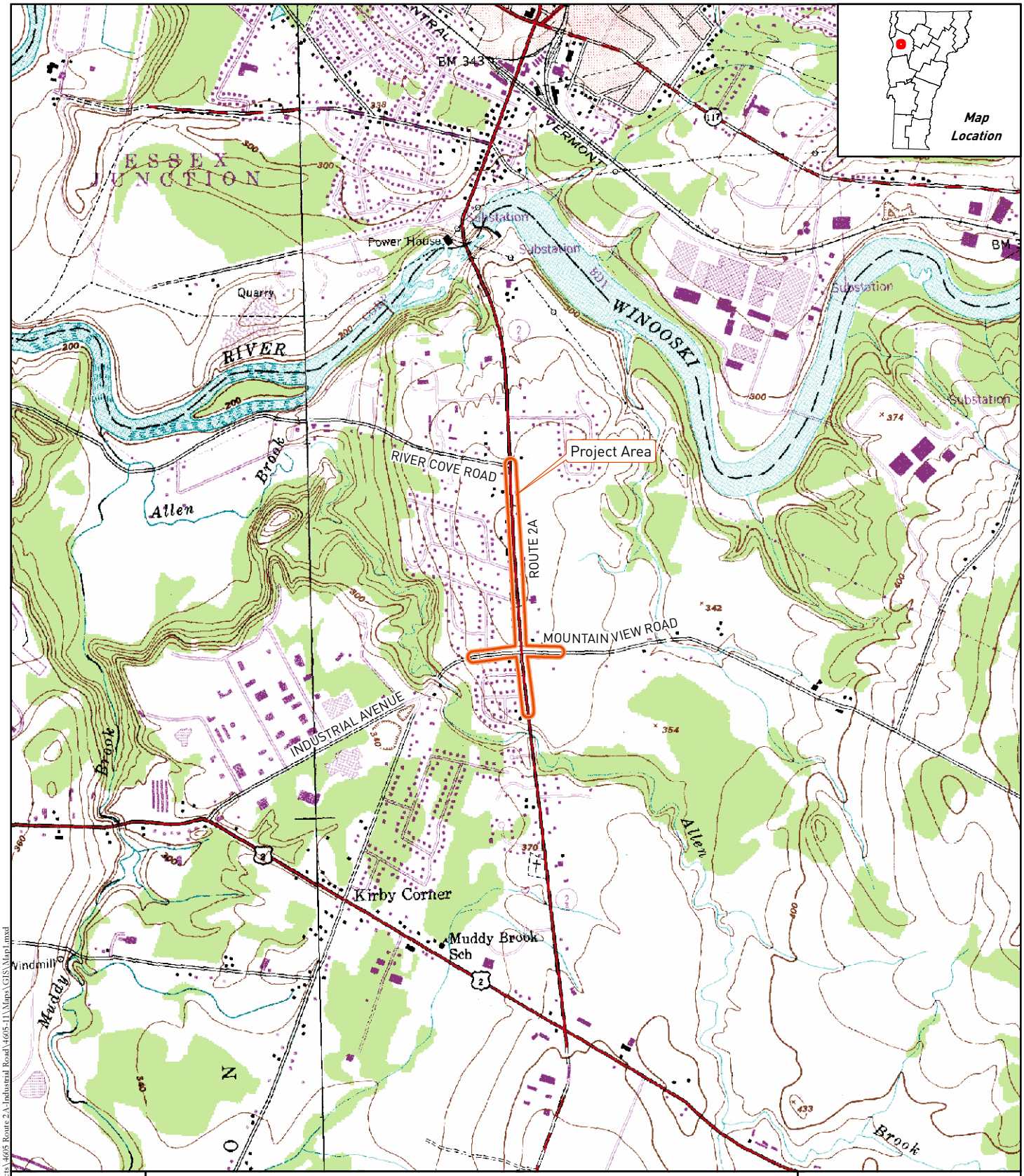
A site visit was conducted by Thomas R. Jamison on June 12, 2013 to observe and photograph existing conditions within the project area. The information gathered during the site visit is included in the relevant sections of the report.

Description of the Project Area

The Essex Road (Route 2A) section of the project area extends north to south through a dense residential area with numerous side streets leading to large and small residential developments (Maps 2 to 4; Photos 1 to 3). The northern limit is the intersection with River Cove Road and the southern limit is the intersection with Meadowrun Road, a distance of approximately 1.1 kilometers (3,637 ft). The Industrial Avenue section of the project area (Map 5; Photo 4) is also residential and extends west from Route 2A approximately 213 meters (699 ft). Mountain View Road is also residential (Map 4; Photo 5), although less densely developed, and extends east from Route 2A approximately 167 meters (547 ft).

Description of the Area of Potential Effects (APE)

The area of potential effects (APE) includes all portions of the property that will be directly or indirectly altered by the proposed undertaking. The width of the APE is unknown at this time. For this report the APE is estimated at 170 feet (51.8 m) in width. Based on the above distances, the APE encompasses approximately 19.05 acres (7.71 ha) in area.



1,000 0 1,000 2,000 Feet

300 0 300 600 Meters

Note: Contour interval is 20 feet.

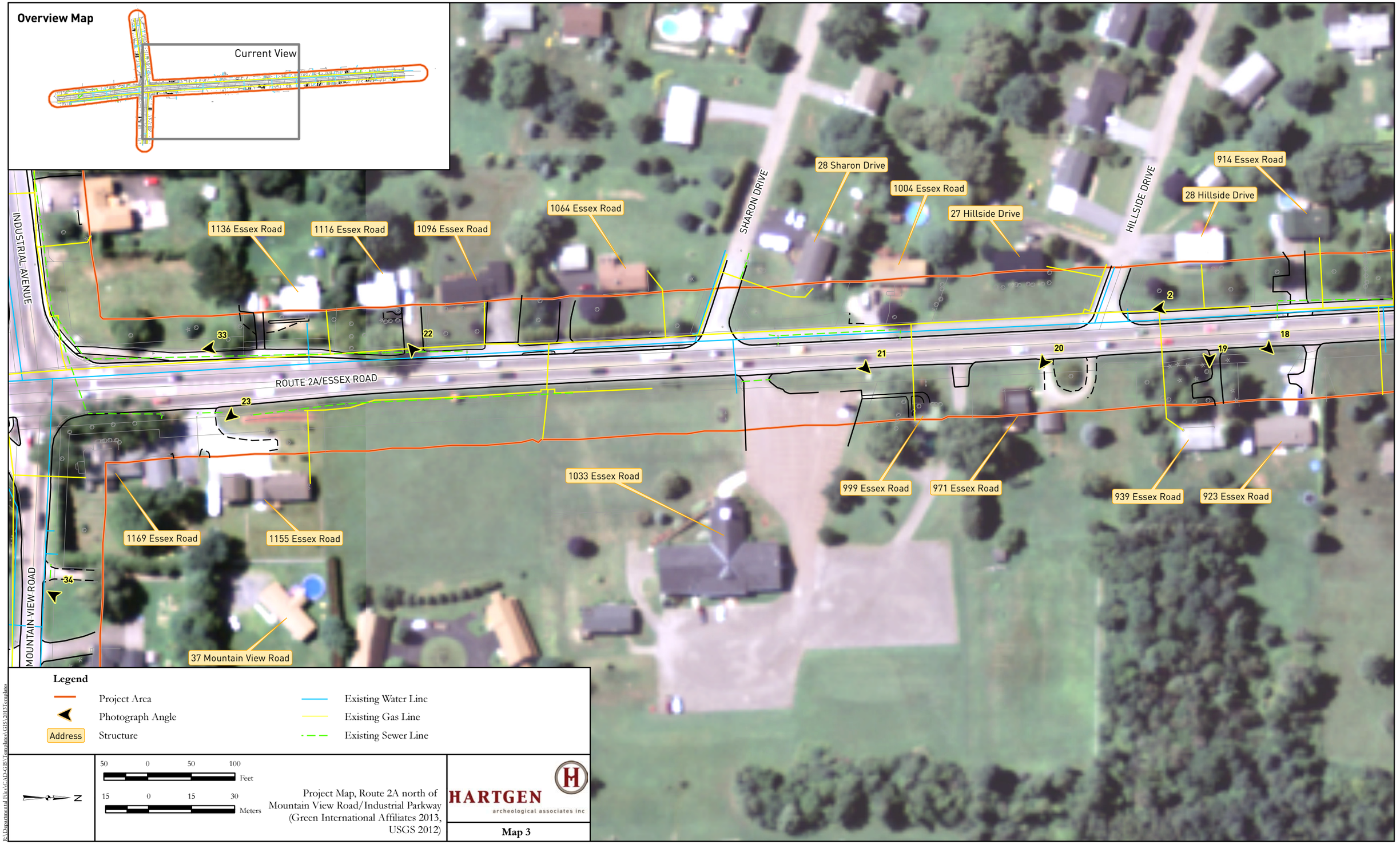
Project Location (USGS 1973)

HARTGEN archeological associates inc

Map 1

FS August 1, 2013 R:\Active Projects\4608 Route 2A-Industrial Road\4608-11\Maps\GIS\Map1.mxd


Overview Map
Current View
TERRY LANE
28 River Cove Road
23 Terry Lane
128 Terry Lane
129 Terry Lane
RIVER COVE ROAD
7
6
890 Essex Road
914 Essex Road
864 Essex Road
846 Essex Road
824 Essex Road
810 Essex Road
130 Terry Lane
7 River Cove Road
1
16
15
10
12
ROUTE 2A/ESSEX ROAD
14
13
8
9
18
17
BITTERSWEET CIRCLE
669 Essex Road
771 Essex Road
747 Essex Road
801 Essex Road
815 Essex Road
897 Essex Road
873 Essex Road
923 Essex Road
711 Essex Road
Legend
Project Area
Photograph Angle
Address
Structure
Existing Water Line
Existing Gas Line
Existing Sewer Line
50 0 50 100
Feet
15 0 15 30
Meters
N
Project Map, Route 2A
south of River Cove Road
(Green International Affiliates 2013,
USGS 2012)
HARTGEN
archeological associates inc
Map 2
ES August 1, 2013 R:\Active Projects\4605 Route 2A-Industrial Road\4605-11\Maps\GIS\ortho-north.mxd



Legend

- Project Area
- Photograph Angle
- Address — Structure
- Existing Water Line
- Existing Gas Line
- Existing Sewer Line

N

50 0 50 100 Feet

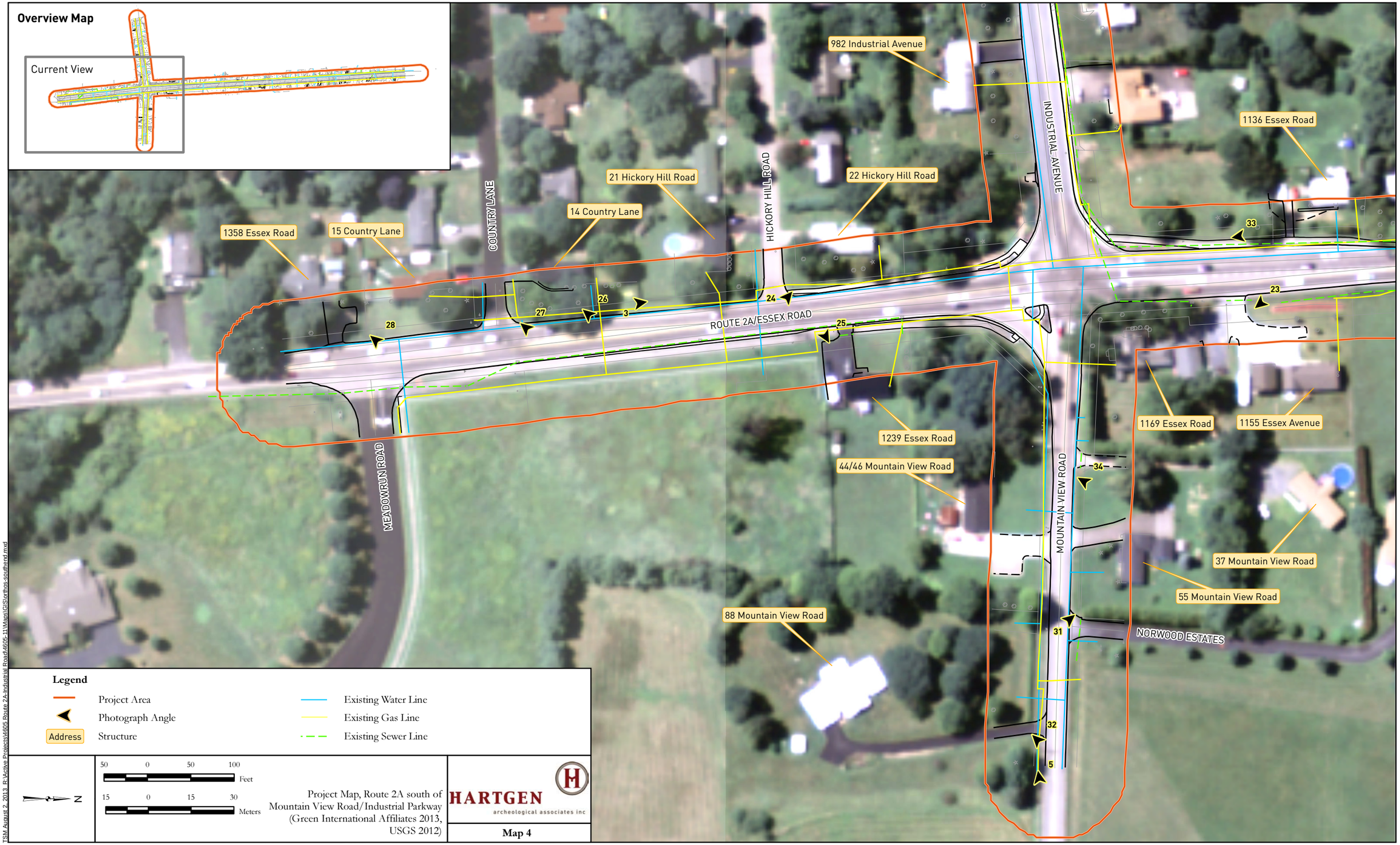
15 0 15 30 Meters

Project Map, Route 2A north of Mountain View Road/Industrial Parkway (Green International Affiliates 2013, USGS 2012)

HARTGEN archeological associates inc

Map 3

R:\Departmental Files\CAD-GIS\Templates\GIS\2013Templates



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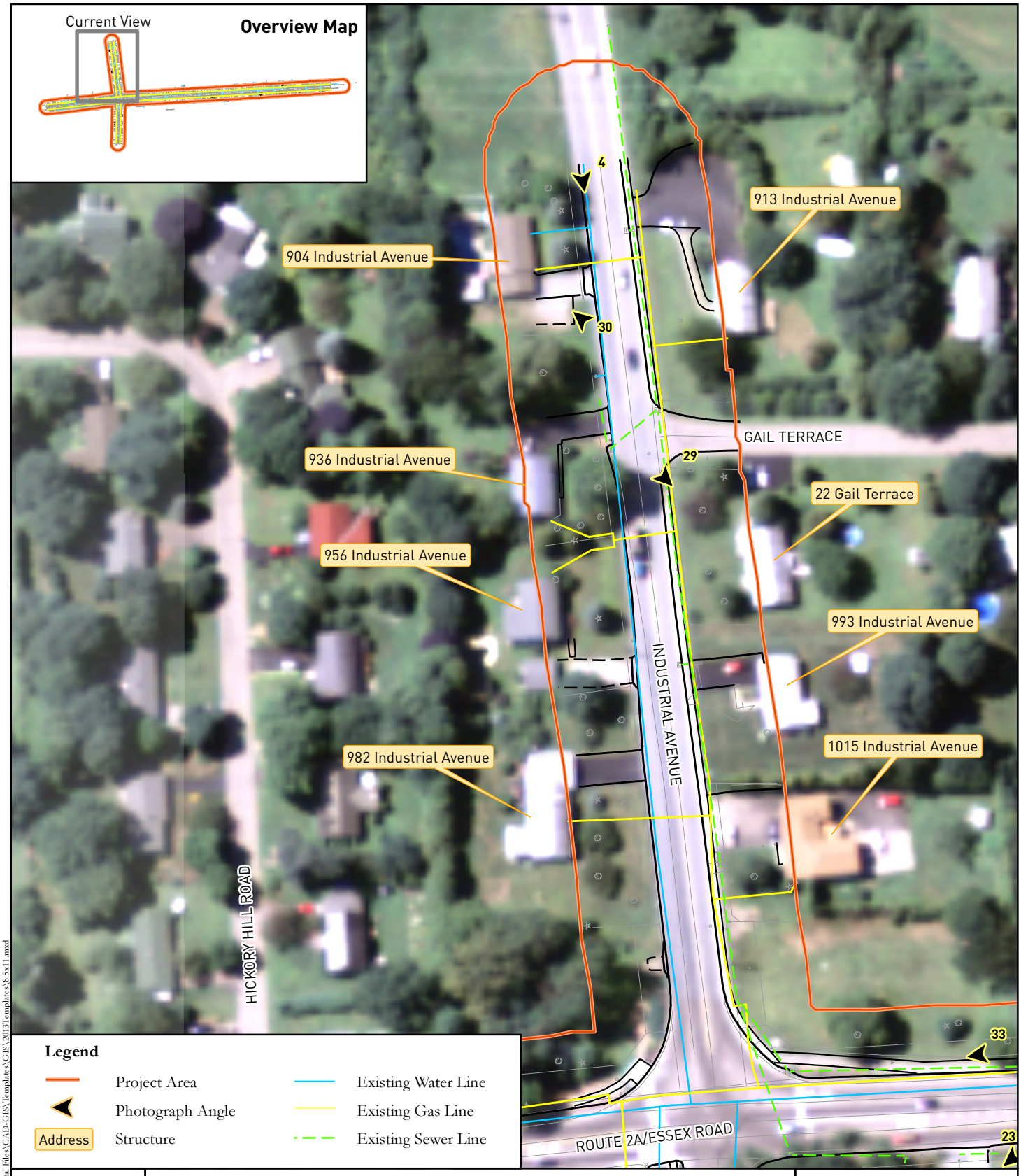


Project Map, Industrial Avenue
(Green International Affiliates 2013, USGS 2012)

HARTGEN archeological associates inc

Map 5

TSM July 26, 2013 R:\Department Files\CAD-GIS\Templates\GIS\2013Templates\8.5x11.mxd

Photo 1. North end of the APE at River Cove Road. Note utility markers and valves. View to the south.

Photo 2. Project alignment at Hillside Drive. View to the south.

Photo 3. South end of the APE. Note the intersection of Route 2A with Industrial Avenue in the distance and sidewalk ending at Hickory Hill Road. View to the north.

Photo 4. Industrial Avenue. Note intersection with Route 2A in the distance and drainage ditch on the south side and sidewalk on the north side of the road. View to the east.

Photo 5. Mountain View Road section of the APE. Note intersection with Route 2A in the background and lack of sidewalks. View to the west.

ENVIRONMENTAL BACKGROUND

The environment of an area is significant for determining the sensitivity of the project area for archeological resources. Precontact and historic groups often favored level, well-drained areas near wetlands and waterways. Therefore, topography, proximity to wetlands, and soils are examined to determine if there are landforms in the project area that are more likely to contain archeological resources. In addition, bedrock formations may contain chert or other resources that may have been quarried by precontact groups. Soil conditions can provide a clue to past climatic conditions, as well as changes in local hydrology.

Present Land Use and Current Conditions

Currently, the project area is characterized by dense, mostly, residential development. There are a few small areas that have recently been allowed to grow up in secondary growth vegetation or remain as open fields. Utility alignments for gas, storm water and waste water are present along most of the project APE. Aside from house services, these alignments are located within the right-of-way within approximately 4.6 meters (15 ft) of the edge of pavement.

Soils

Soil surveys provide a general characterization of the types and depths of soils that are found in an area. This information is an important factor in determining the appropriate methodology if and when a field study is recommended. The soil type also informs the degree of artifact visibility and likely recovery rates. For example, artifacts are more visible and more easily recovered in sand than in stiff glacial clay, which will not pass through a screen easily.

Table 1. Soils in Project Area

Symbol	Name	Texture	Slope	Drainage	Landform
BIA	Belgrade and Eldridge Soils	Silt or sand loam	0-3%	Moderately well drained	Glaciolacustrine
BIB	Belgrade and Eldridge Soils	Silt or sand loam	3-8%	Moderately well drained	Glaciolacustrine

Symbol	Name	Texture	Slope	Drainage	Landform
PeB	Peru stony loam	Sand loam with gravel	5-12%	Moderately well drained	Glacial till

The soils of the project area are mostly derived from glacial lake deposits. However, a small area at the high point of the APE, centered on Sharon and Hillside Drives, is derived from glacial till (USDA 2013). The glacial lake deposits overlie the glacial till throughout the project area, except where the lake deposits have been eroded away to expose the till (Springston and DeSimone 2007)

Bedrock Geology

The bedrock of the immediate project area is the Clarendon Springs formation, characterized as a "light to dark gray massive, granular, recrystallized dolostone and breccia with chert and dolostone clasts." (Kim et al. 2007). Clarendon Springs chert was an important resource for stone tool manufacture during the precontact era in northwest Vermont and elsewhere. Nearby to the east is an area of Cheshire quartzite also known to have been heavily utilized for stone tools.

Physiography and Hydrology

The project APE is generally level, although sections slope down to the south, east and west. From the northern end of the APE at River Cove Road to Industrial Avenue, the APE is generally level with the topography sloping off to the east and west. At the southern end of the APE the topography slopes down toward the south and Allen Brook as it flows west/northwest to the Winooski River. The Industrial Avenue section of the APE also slopes down to the west to Allen Brook, while the Mountain View Road area is generally level within the APE.

DOCUMENTARY RESEARCH

Archeological Sites

Previously reported archeological sites provide an overview of both the types of sites that may be present in the project area and relation of sites throughout the surrounding region. The presence of few reported sites, however, may result from a lack of previous systematic survey and does not necessarily indicate a decreased archeological sensitivity within the project area.

An examination of the Vermont Archeological Inventory (VAI) site files at the Vermont Division for Historic Preservation (VDHP) identified 46 reported archeological sites within a one mile (1.6 km) radius of the project area.

Table 2. VAI Archeological Sites within One Mile (1.6 km) of the Project Area

VAI No.	Site Identifier	Description	Proximity to Project Area
VT-CH-20		Unknown precontact, primary and secondary flakes	1.37 km/0.85 mi to W
VT-CH-68	Parker/Alling	Early and Late Archaic, Early and Late Woodland, projectile points, ceramics, groundstone	1.37 km/0.85 mi to E
VT-CH-209	PA	Unknown precontact, quartzite flakes, fire cracked rock	1.4 km/0.87 mi to E
VT-CH-211	PB	Unknown precontact, large chert flake	1.16 km/0.72 mi to E
VT-CH-212	PD	Unknown precontact, 2 quartzite flakes	1.07 km/0.66 mi to E
VT-CH-213	AA	Unknown precontact, quartzite and chert flakes, chert projectile point tip, fire cracked rock	0.91 km/0.57 mi to SE
VT-CH-214	AB	Unknown precontact, quartzite flake, fire cracked rock	1.07 km/0.66 mi to SE
VT-CH-215	AC	Unknown precontact, quartz and quartzite flakes	1.16 km/0.72 mi to SE
VT-CH-216	AD	Unknown precontact, quartzite cores and flakes	1.16 km/0.72 mi to SE
VT-CH-217	AE	Unknown precontact, quartz flake, fire cracked rock	1.0 km/0.63 mi to SE

VAI No.	Site Identifier	Description	Proximity to Project Area
VT-CH-218	LA	Unknown precontact, quartz and quartzite flakes, fire cracked rock	0.85 km/0.53 mi to SE
VT-CH-256	Munson Borrow Pit	Woodland, ceramics, flakes	1.19 km/0.74 mi to SW
VT-CH-257	Munson Borrow Pit-historic	19th-century barn foundation	1.19 km/0.74 mi to SW
VT-CH-487		Unknown precontact, quartz flakes, fire cracked rock; 19th-century foundation and artifacts	1.19 km/0.74 mi to N
VT-CH-488		Unknown precontact, quartz flakes, hammerstone, fire cracked rock, calcined bone	1.22 km/0.76 mi to N
VT-CH-489		Middle to Late Woodland, ceramics, projectile points, hearths	1.26 km/0.79 mi to N/NE
VT-CH-581		Late Woodland, ceramics, Madison projectile point, tools, flakes, hammerstones, cores, fire cracked rock, bone	1.57 km/0.98 mi to W
VT-CH-640	Griswold	Unknown precontact, scrapers, flakes; historic ceramics, brick	1.52 km/0.95 mi to W
VT-CH-823		Unknown precontact, chert and quartzite flakes	1.55 km/0.97 mi to W
VT-CH-851		Unknown precontact, quartzite flakes	1.48 km/0.92 mi to N
VT-CH-852		Unknown precontact, utilized flakes, flakes, fire cracked rock	1.36 km/0.84 mi to N
VT-CH-853		Unknown precontact, utilized flake, projectile point preform, flakes, fire cracked rock	1.37 km/0.85 mi to N
VT-CH-867	Riverside	Late Archaic, stemmed projectile points, gorget, tools, fire cracked rock, features	1.4 km/0.87 mi to N
VT-CH-868		Unknown precontact	1.34 km/0.83 mi to N
VT-CH-869		Unknown precontact	1.34 km/0.83 mi to N
VT-CH-884	Blair Park	Unknown precontact, tool, flakes, bone	0.82 km/0.51 mi to S
VT-CH-970	Bittersweet	Unknown precontact, quartz biface and scraper, flakes	0.38 km/0.24 mi to E
VT-CH-971	Bittersweet Residential Development	Unknown precontact, quartzite flakes, biface, utilized flake, quartz crystal	0.41 km/0.26 mi to E
VT-CH-997	Fire Cracker	Late Archaic, chert projectile point, quartzite, quartz and chert flakes	0.82 km/0.51 mi to SE
VT-CH-998	Fly Over	Unknown precontact, quartzite debitage	1.14 km/0.71 mi to SE
VT-CH-1020		Unknown precontact, quartz flakes, biface/core fragment	0.21 km/0.13 mi to S
VT-CH-111	Eco Car Wash	Late Woodland, listed on State Register 5/17/2012	0.4 km/0.25 mi to N
VT-CH-9210	Reynolds	Paleoindian, base of fluted projectile point, worked quartz fragment	0.7 km/0.44 mi to E
VT-CH-9271		Missing form	1.43 km/0.89 mi to SW
VT-CH-9272	Tafts Corner	Late Archaic, projectile point, flakes, cobble, bone	1.52 km/0.95 mi to SW
	Tafts Farm Area B	Late Archaic, chert projectile point, quartz, quartzite and chert flakes, fire cracked rock	
VT-CH-9277	Tafts Farm Area C	Possible Early Archaic quartzite projectile point, quartz fragments, chert flake	1.62 km/1.0 mi to SE
VT-CH-9278	Tafts Farm Area D	Unknown precontact, quartz, quartzite and chert flakes, quartzite biface tip	1.52 km/0.95 mi to SE
VT-CH-9280	Tafts Farm Area E	Unknown precontact, quartzite flake, utilized chert flake	1.43 km/0.89 mi to SE
VT-CH-9281	Tafts Farm Area F	Late Archaic, chert projectile point, flakes, fire cracked rock	1.34 km/0.83 mi to SE
VT-CH-9288	Tafts Farm Area I	Unknown precontact, quartz and chert flakes	1.57 km/0.98 mi to SE
VT-CH-9289	Tafts Farm Area H	Unknown precontact, quartzite bifaces and flakes, quartz flakes, fire cracked rock	

VAI No.	Site Identifier	Description	Proximity to Project Area
VT-CH-9290	Tafts Farm Area G(a)	Unknown precontact, quartzite and quartz flakes	
FS12	Fulling mill on Winooski	Mill shown on 1807 Johnson map	0.98 km/0.61 mi to N
FS13	Sawmill on Winooski	Mill shown on 1807 Johnson map	1.01 km/0.63 mi to N
FS19	Sawmill on Winooski	Mill shown on 1869 Beers map	1.19 km/0.74 mi to N
FS20	Grist mill on Winooski	Mill shown on 1869 Beers map	0.98 km/0.61 mi to N
FS23	Paper mill on Winooski	Mill shown on 1857 Walling map	1.25 km/0.78 mi to N
FS36	Mary Laliberte	Unknown precontact	1.04 km/0.64 mi to N
FS65	Sawmill on Ayer Brook	19th-century mill	0.3 km/0.19 mi to W
FS91	Muddy Brook School	Unknown precontact	1.08 km/0.67 mi to SW
FS187	Stuyck	Late and Terminal Archaic, projectile point	1.31 km/0.81 mi to N
FS204		Missing form	0.26 km/0.16 mi to W
FS207		Missing form	0.91 km/0.57 mi to W

The Town of Williston has one of the highest concentrations of known archeological sites in the state. This concentration has a great deal to do with the high degree of development that has taken place in the town over the past 50 years. However, it also is related to the proximity of the town to the Winooski River, several tributary streams and the level agriculturally desirable land that make the town archeologically sensitive. The precontact archeological sites within a mile (1.6 km) of the project area span most of the precontact occupation of the state from Paleoindian throughout the Archaic and to the end of the Late Woodland. Most of the historic archeological sites reported for the project vicinity have been gleaned from historic maps and have not been confirmed by excavation. A number of sites given site numbers for Williston could not be located in the files at VDHP and may be located in or near the project area.

State and National Register

A search of the files at VDHP identified five properties surveyed on the Vermont Historic Sites and Structures Survey (VHSSS) located directly adjacent to the project area. They range from a c. 1860 vernacular farm house to a c. 1945 Colonial Revival suburban house. The locations and a brief description of the five properties are provided in Table 3.

PREVIOUS SURVEYS

Many archeological surveys have been conducted in the project vicinity (Blair Park – Toney and Crock 2002; Eco Car Wash – Hudgell and Bart one 2012; IBM Properties – Thomas 1986, Mandel and Crock 2001; Munson Borrow Pit - Thomas and Kochan 1986, Bunker 1989; Riverside in the Village – Crock and Mandel 2005; Snyder-Brennan PRD – Werner and Werner 1997; Tafts Corners – Thomas and Dillon 1987, Thomas 1992; Taft's Farms – Thomas and Dillon 1987, Oberon 1988, Frink and Huinzika 1988; Williston M5500(7)S – Florentin and Thomas 1999; Williston STP (42)S – Hartgen 2002; Williston TH 3418 – Kochan and Thomas 1993, Florentin et al. 1997; Wood Lily PRD – Werner and Werner 1998). Of these projects, several were located quite close to the project area. The Wood Lily PRD project was located south of Mountain View Road, just east of the project APE. No archeological sites were encountered (Werner and Werner 1998). The Eco Car Wash is located a short distance north of the APE and encountered a Late Woodland habitation site that is eligible for listing on the National Register (Hudgell and Bartone 2012). There was also apparently a survey of the Bittersweet PRD adjacent to the APE and although no report was found at VDHP, two sites were found in that area (VT-CH-970 and VT-CH-971). Phase IB testing was conducted for a small section of the Williston STP BIKE (42)S project along the west side of Essex Road south of River Cove Road, within the APE (Hartgen 2002). This testing did not encounter any archeological deposits. Additional projects have been conducted in the vicinity, but reports could not be located at VDHP.

HISTORICAL MAP REVIEW

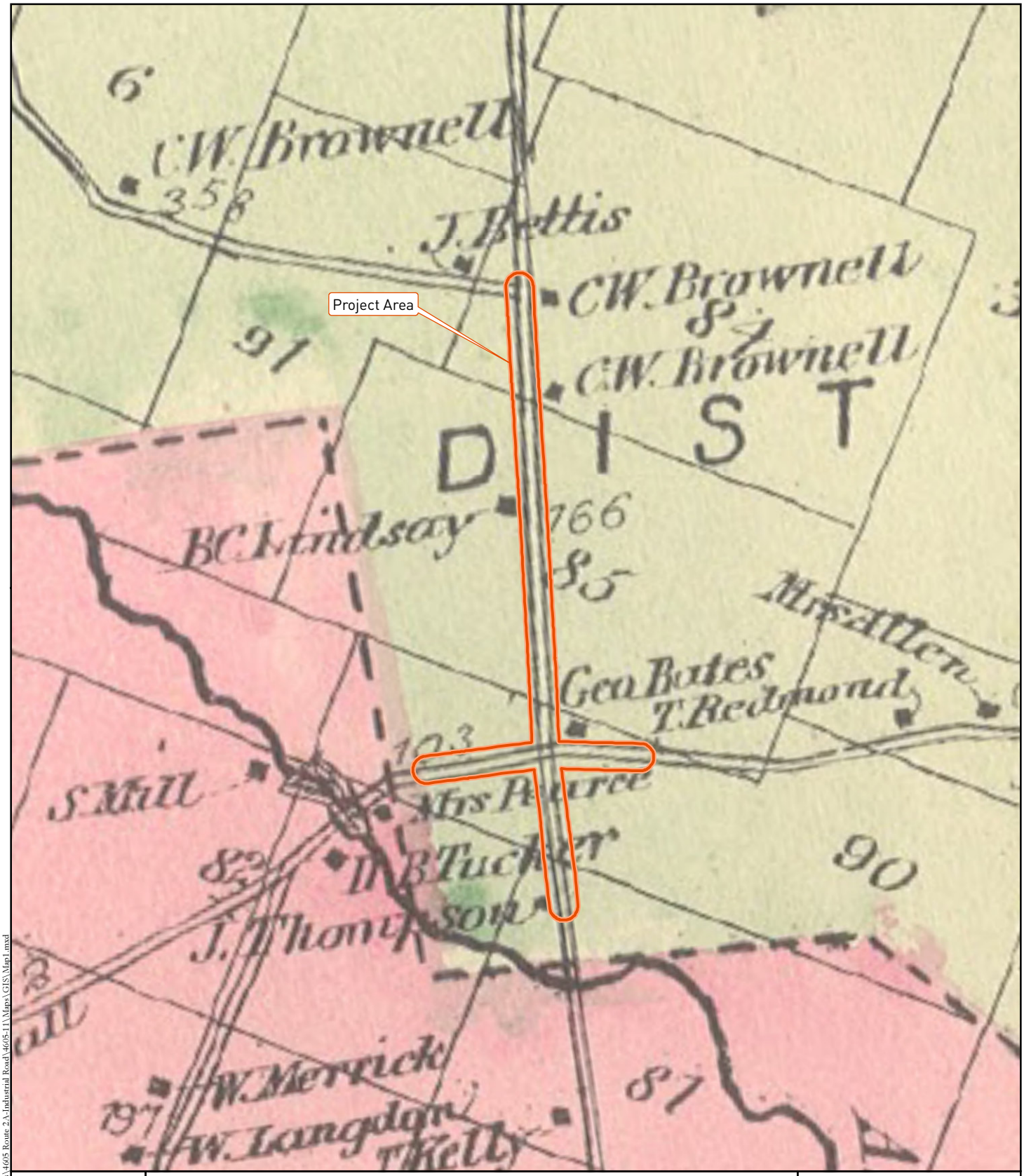
Historic maps of the project area were examined to identify the locations of historic archeological sites and standing structures in the project area. The 1857 Walling map shows three structures within the project APE, labeled "L. Foster", "N. D. Smith" and "J. Thompson". The L. Foster structure corresponds to the c. 1860 Gates House (VHSSS# 0417-4). The Smith and Thompson structures do not appear to remain standing, but may remain as archeological sites. On the 1869 Beers map (Map 6) the L. Foster structure is labeled "C. W. Brownell" and the N. D. Smith structure is labeled "B. C. Lindsay". The structure identified by the name J. Thompson on the 1857 map has the same designation on this later map. In addition, a second structure labeled "C. W. Brownell" is located at the current site of the 1870-1910 Poulas House (VHSSS# 0417-3), and a structure labeled "Geo. Bates" is located on the parcel currently occupied by the c. 1910 vernacular house (VHSSS# 0417-99). The 1906 USGS quadrangle illustrates the same structures as the Beers map. By 1948 structures have been added along the APE. Some of these structures probably relate to late 19th-early 20th-century farms; others indicate the beginning of the suburbanization of the project area (Map 7). Of particular interest is a large structure shown at the northwest quadrant of the intersection of Essex Road and Industrial Avenue. This may have been a barn associated with the c. 1910 vernacular house across the road (VHSSS# 0417-99).

ARCHITECTURAL DISCUSSION

The APE is located entirely within the Town of Williston. Standing structures within the APE were constructed between c. 1850 and the present and are chiefly vernacular in style. All are wood-framed structures; a few examples feature brick veneer on portions of their street elevations. The nineteenth century dwellings within the APE exemplify the chiefly rural and agricultural character of the development of the project area during that period (Photos 8, 9 and 23). Additional small houses from the late nineteenth and early twentieth centuries indicate the settlement of mechanics and tradesmen in the project area (Photos 14, 15, and 20). The project area developed slowly during the second quarter of the twentieth century (Photo 21).

By far the greatest number of structures represent the rapid expansion of suburbs after the close of World War II. Several houses represent "starter homes" of the type frequently constructed for new families immediately after the war (Photos 6, 12, and 26). Expansion of development in the 1950s and early 1960s is represented by several additional examples of ranch style houses (Photos 7, 17, 18, 19, 22, 24, 25, and 27 thru 32). Development accelerated during the last quarter of the twentieth century, and included the construction of the first institutional structures within the APE, Christ Memorial Church and Trinity Baptist Church. Both churches were constructed in the conservative Colonial Revival style; houses constructed during this same period were chiefly vernacular in style, with the occasional Colonial Revival detail added. House forms constructed in the late twentieth and early twenty-first centuries within the APE were chiefly of the "raised ranch" type, or clustered condominium style residences.

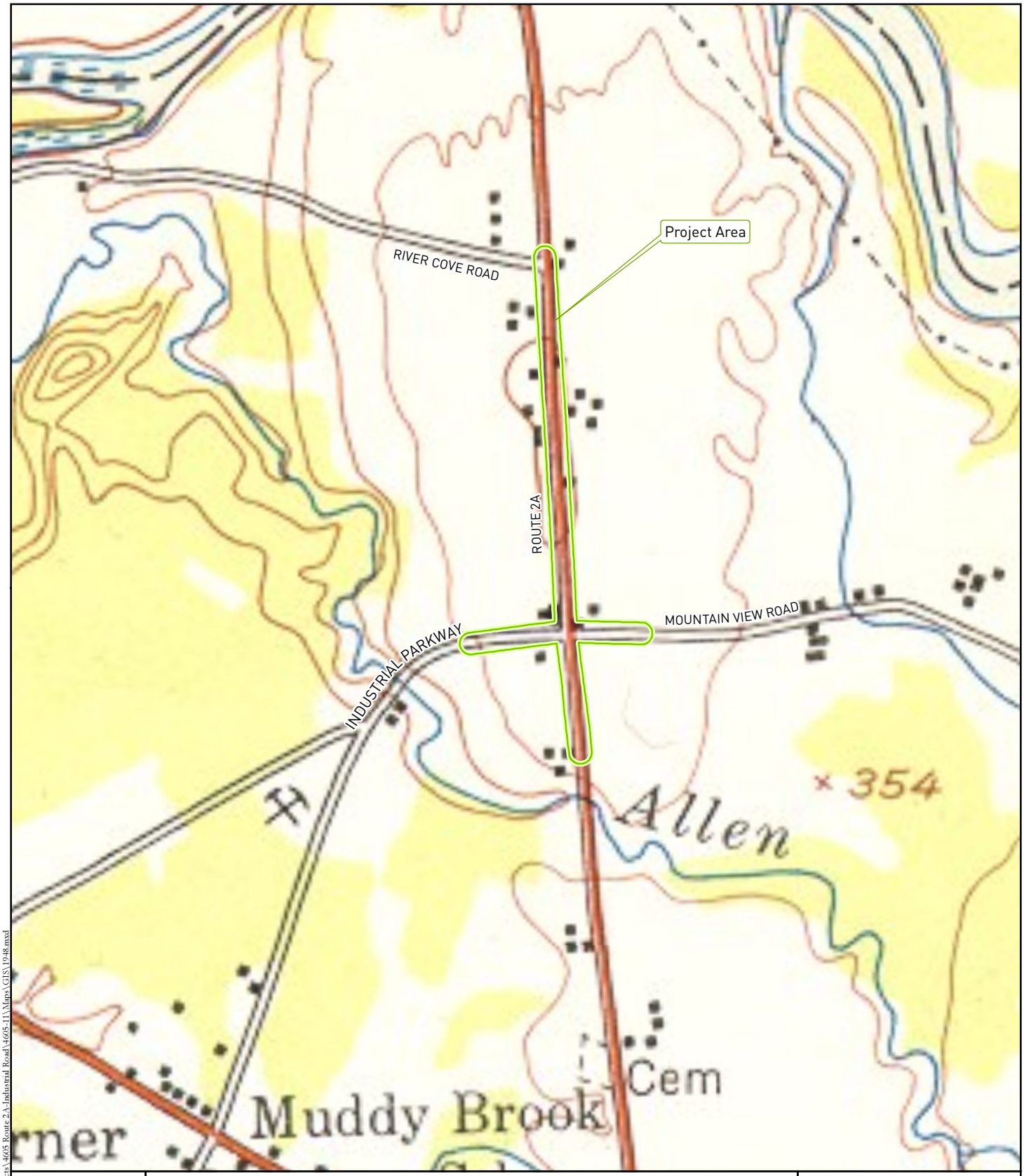
Five structures within the APE have previously been surveyed and recommended for listing on the Vermont State Register (Table 3). None of these structures are presently listed on the National Register. The present survey identified 51 additional structures within the APE, 20 of which are in excess of 50 years in age (Table 4). Photographs of all structures 50 years old or more in age, including previously inventoried properties, are included in this report (Photos 6 thru 32).



Beers 1869

HARTGEN archeological associates inc

Map 6



N

500 0 500 1,000 Feet

150 0 150 300 Meters

USGS 1948

HARTGEN archeological associates inc

Map 7

ES August 1, 2013 R:\Active Projects\4608 Route 2A-Industrial Road\4608-11\Maps\GIS\1948.mxd

Table 3. Previously Inventoried Properties Within or Adjacent to the Project Area

Photo, keyed to Maps 2-5	Address	VHSSS#	Name	Description	Location
6	28 River Cove Road	0417-97		c. 1945 vernacular Colonial Revival	N of APE
8&9	669 Essex Road	0417-3	Poulos House	1870-1910 farm house and barn	N of APE
13	801 Essex Road	0417-4	Gates House	c. 1860 farm house	E of APE
20	999 Essex Road	0417-98	Vos House	c. 1940 Colonial Revival	E of APE
22	1169 Essex Road	0417-99		c. 1910 vernacular	E of APE

Table 4. Structures Not Previously Surveyed Located Within the Project Area

Photo, keyed to Maps 2-5	Address	Description	Location
7	7 River Cove Road	c.1955-65 ranch	N of APE
	23 Terry Lane	c. 1990 vernacular	W of APE
	711 Essex Road	c. 2000 cape	E of APE
10 & 11	129 Terry Lane	Late 19th-early 20th century two-story vernacular	W of APE
12	747 Essex Road	c.1945 vernacular cottage	E of APE
	130 Terry Lane	c. 1980 two-story ranch	W of APE
	128 Terry Lane	c. 1980 two-story ranch	W of APE
13	771 Essex Road	Early 20th century cape with Colonial Revival details, later alterations	E of APE
	810 Essex Road	c. 1990 ranch with Colonial Revival details	W of APE
	815 Essex Road	c. 1980 Mobile home	E of APE
15	824 Essex Road	c. 1925 vernacular cottage	W of APE
	846 Essex Road	c. 1975 raised ranch	W of APE
16	864 Essex Road	c.1890-1930 two-story center passage vernacular	W of APE
17	873 Essex Road	c. 1960 ranch	E of APE
	890 Essex Road	c. 1975 two-story Colonial Revival	W of APE
	897 Essex Road	c. 1970 raised ranch	E of APE
	914 Essex Road	c. 1970 split level	W of APE
18	923 Essex Road	c. 1955 ranch	E of APE
	28 Hillside Drive	c. 1980 raised ranch	W of APE
19	939 Essex Road	c. 1960-65 ranch	E of APE
	27 Hillside Drive	c. 1980 raised ranch	W of APE
20	971 Essex Road	c.1860-90 vernacular cottage with c. 1930 additions	E of APE
	1004 Essex Road	c. 1980 raised ranch	W of APE
	28 Sharon Drive	c. 1970 raised ranch	W of APE
	1033 Essex Road, Christ Memorial Church	c. 1980 Colonial Revival church	E of APE
	1064 Essex Road	c. 1970 raised ranch	W of APE
	1096 Essex Road	c. 1970 ranch	W of APE
22	1116 Essex Road	c. 1955 with c. 1980 garage	W of APE
	1136 Essex Road	c. 1980 raised ranch	W of APE
	1155 Essex Road	c. 1990 raised ranch	E of APE
24	22 Hickory Hill Road	c. 1960 ranch	W of APE
25	1239 Essex Road	c. 1960 ranch	E of APE
	21 Hickory Hill Road	c. 1980 raised ranch	W of APE
26	14 Country Lane	c. 1945-55 cape	W of APE
27	15 Country Lane	c. 1960 ranch	W of APE
28	1358 Essex Road	c. 1960 ranch	W of APE
	Meadowrun Road Condominium Complex	c. 2005 condominiums	E of APE

Photo, keyed to Maps 2-5	Address	Description	Location
	1015 Industrial Parkway	c. 1970 raised ranch	N of APE
	993 Industrial Parkway	c. 1970 raised ranch	N of APE
	982 Industrial Parkway	c. 1980 raised ranch	S of APE
	956 Industrial Parkway	c. 1980 raised ranch	S of APE
29	22 Gail Terrace	c. 1960-65 ranch	N of APE
	936 Industrial Parkway	c. 1980 raised ranch	S of APE
	913 Industrial Parkway	c. 1980 raised ranch	N of APE
30	904 Industrial Parkway	c. 1960-65 ranch	S of APE
	37 Mountain View Road	c. 1980 raised ranch	N of APE
	44 and 46 Mountain View Road	c. 1990 ranches	S of APE
31	55 Mountain View Road	c. 1960-65 ranch	N of APE
32	88 Mountain View Road	c. 1955 ranch	S of APE
	300 Trinity Drive, Trinity Baptist Church	c. 1980 Colonial Revival church	N of APE
	Normandy Estates Condominium Complex	Condominiums constructed in 1988	N of APE

ARCHITECTURAL RECOMMENDATIONS

The present project may include the expansion of the road, construction of bike paths and sidewalks. Construction details for these elements are not yet available. Section 106 review of the project plans will be undertaken when they become available.

Sidewalks and curbs

There are no historic sidewalks, curbs, or pavements within the APE. Asphalt sidewalks with granite curbs are located along the west side of Rte 2A/Essex Road from the north end of the APE to Industrial Avenue. From there south to Hickory Hill Road, the sidewalks are concrete with granite curbing. South of Hickory Hill Road there are no sidewalks on the west side of Rte 2A/Essex Road; on the east side, asphalt sidewalks with granite curbs extend from Meadowrun Road to Mountain View Road and do not extend further north. There are no sidewalks on Mountain View Road. There are sidewalks on the north side of the APE on Industrial Avenue, but not on the south side.

Retaining walls, Exterior Stairs, Historic Fences, Mature Trees

There are no historic retaining walls, exterior stairs, or historic fences within the APE which need to be avoided. No retaining walls, stairs or fences are anticipated in the proposed project work scope. There are no preservation concerns with respect to these elements or other street furniture.

There are several mature trees within the APE. The location of these trees should be noted and avoided when developing project plans, and they should be protected during construction activities (Photos 11, 23 and 28).

Photo 6. 28 River Cove Road, VHSSS 0417-97. View to the northwest. This brick cape-style house was constructed c.1945.

Photo 7. 7 River Cove Road. Note Essex Road in the background. View to the south/southeast. This wood-framed ranch style house was constructed c.1955-1965.

Photo 8. 669 Essex Road, VHSSS 0417-3, Poulos House. View to the southeast. This wood-framed one-and-a-half story center passage dwelling was constructed c.1870. It occupies a stone and brick foundation.

Photo 9. 669 Essex Road, VHSSS 0417-3, Poulos House barn. View to the east. The barn appears to be roughly contemporary with the house, dating to the second half of the nineteenth century.

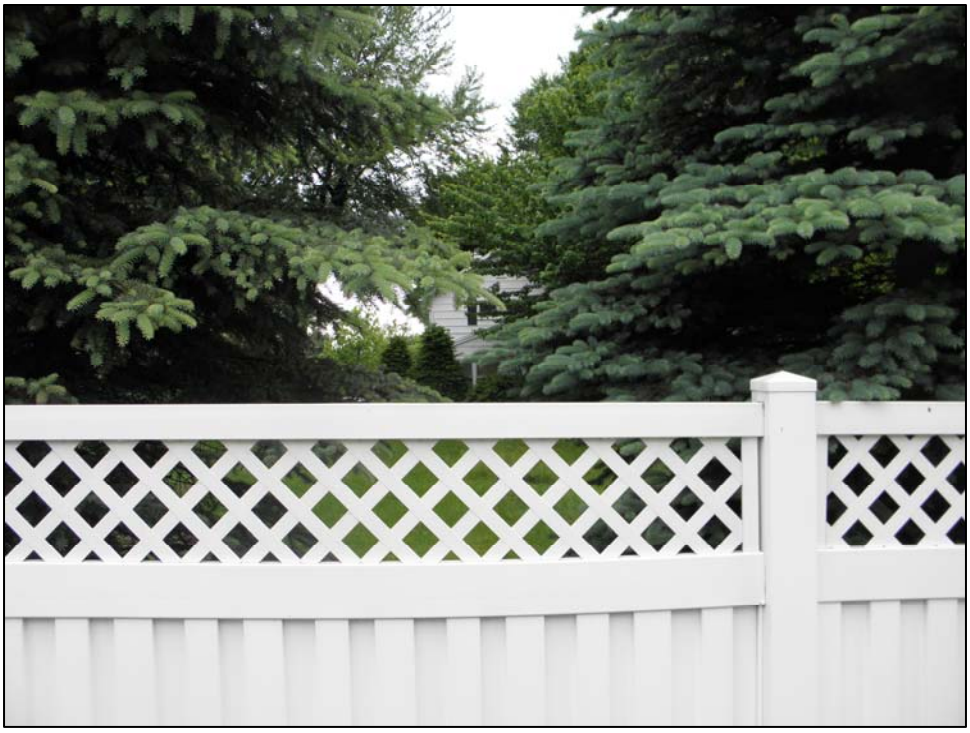


Photo 10. 129 Terry Lane. House backs up on the APE. View to the west. This wood-framed dwelling appears to date to the late nineteenth or early twentieth century.

Photo 11. 129 Terry Lane, view from above, looking south. The dense plantings around this structure do not permit the taking of a view of the front elevation, which is on the south side of the house.

Photo 12. 747 Essex Road. View to the southeast. A c.1945 wood-framed starter home, typical of those constructed immediately after World War II.

Photo 13. 771 Essex Road. View to the east. A wood-framed cape from the early twentieth century, with twentieth century alterations to its windows and entry.

Photo 14. 801 Essex Road, VHSSS 0417-4, Gates House. View to the northeast. A one-and-a-half story mechanic's cottage, likely dating to the third quarter of the nineteenth century. It occupies a later concrete block foundation.

Photo 15. 824 Essex Road. View to the southwest. A one-and-a-half story wood-framed cottage on a rusticated concrete block foundation, dating to c.1925.

Photo 16. 864 Essex Road. View to the southwest. A two-story, wood-framed center-passage house constructed some time between c.1890 and c.1935. Windows have been replaced with vinyl sash.

Photo 17. 873 Essex Road. View to the northeast. A one-story ranch-style home on a concrete block foundation. Sheathed in aluminum siding, this house dates to c.1960.

Photo 18. 923 Essex Road. View to the northeast. A one-story ranch-style home with low-slung gable roof with broad eaves. This house dates to c.1955.

Photo 19. 939 Essex Road. View to the east. A one-story ranch-type house with attached garage. Currently sheathed in vinyl siding, this gable-roofed dwelling dates to c.1960-65.

Photo 20. 971 Essex Road. View to the southeast. A one-and-a-half story wood-framed cottage with leanto on the back and enclosed porch on the street elevation. All parts of the house are sheathed with cement-asbestos shingles, and sit on a concrete block foundation. It is likely that the earliest part of the house dates to the second half of the nineteenth century.

Photo 21. 999 Essex Road, VHSSS 0417-98, Vos House. View to the northeast. A one-and-a-half story wood-framed, gambrel-roofed house dating to c.1935, with substantial two-story wood-framed addition to the rear, of recent date.

Photo 22. 1116 Essex Road. View to the southwest. A c.1955 ranch-style dwelling, wood-framed and having a low-slung gable roof with wide eaves, with detached garage dating to c.1980.

Photo 23. 1169 Essex Road, VHSSS 0417-99. View to the south/southeast. A two-story wood-framed foursquare house with pyramidal roof and wraparound porch. A one-story wing with hipped roof extends to the north. This house was constructed c.1900; its associated detached garage dates to c.1985.

Photo 24. 22 Hickory Hill Road. View to the northwest. A one-story wood-framed ranch style home with low slung gable roof, enclosed inset porch and attached garage, constructed c. 1960.

Photo 25. 1239 Essex Road. View to the northeast. A c. 1960 one-story wood-framed ranch style house with replacement windows and a one-bay addition to the south.

Photo 26. 14 Country Lane. View to the southwest. A wood-framed cape-style dwelling, constructed c. 1945-55.

Photo 27. 15 Country Lane. View to the southwest. A wood-framed ranch style dwelling with attached garage and arcaded porch, constructed c. 1960.

Photo 28. 1358 Essex Road. View to the southwest. A one-story wood-framed, ranch-style dwelling with gable roof, attached double garage, and inset porch, constructed c. 1960.

Photo 29. 22 Gail Terrace. View to the north/northeast. A one-story ranch-style home, with replacement windows. This wood-framed dwelling was constructed c. 1960-65 and received an addition to the west at a later date.

Photo 30. 904 Industrial Avenue. View to the southwest. A one-story, wood-framed ranch style home, constructed c. 1960-65.

Photo 31. 55 Mountain View Road. View to the northwest. A one-story, wood-framed ranch style dwelling with low gable roof, and attached garage. The garage was subsequently altered for additional living space. This house was constructed c. 1960-65.

Photo 32. 88 Mountain View Road. View to the south/southwest. A one-story wood-framed ranch style house with low-slung gable roof. Sheathed in vertical wood siding and brick veneer, this house, which was constructed c. 1955, has been altered by replacement of its original sash.

ARCHEOLOGICAL SENSITIVITY ASSESSMENT

Precontact Archeological Sensitivity

The high number of precontact archeological sites in the project vicinity indicates the high sensitivity of the area. Completion of the VDHP environmental predictive model form provides a score of 56 with 32 or above considered archeologically sensitive (Appendix I). This score is based on the project proximity to a permanent stream (Allen Brook), heads of drainages, wetlands, glacial lake shoreline, travel corridor and high recorded site density. The disturbance in the area from road, structure and utility construction is significant, but within the APE it is limited. Aside from service lines, the road and utility disturbance is generally limited to within about two meters (6.5 ft) of the edge of pavement. Standing structures are generally set back from the road with associated driveways, utility services and sidewalks being the primary disturbance within the APE. Therefore, areas outside of the existing utility and sidewalk disturbance should be considered sensitive for precontact archeological deposits.

Historic Archeological Sensitivity

Several historic structures remain standing along the APE. In addition, several structures that are no longer extant were once located along the APE. The potential of significant historic archeological deposits to be located within the APE is generally low due to the nature of "historic front yards" as areas of limited activity and repeated re-working of the landscape (Borstel 2005). However, front yards are also often the location of earlier structures pre-dating the known middle to late 19th-century structures on the property and intact archeological deposits may be present between standing structures and the roadside (Hartgen 2008). The location of the large structure formerly at the northwest quadrant of the Essex Road/Industrial Avenue intersection may retain intact archeological deposits (Map 7; Photo 33). Other areas in front of historic

houses or historic house sites along the APE may also retain historic archeological deposits outside of the utility and sidewalk disturbance.

Photo 33. The northwest quadrant of the intersection of Essex Road and Industrial Avenue. This site was the location of a large structure, possibly a barn in, 1948 (Map 7) and may retain intact archeological deposits. View to the south.

ARCHEOLOGICAL POTENTIAL

The archeological potential of the project APE is high in areas that have not been previously disturbed by utility and sidewalk construction. Although the intensive suburban development of the project area has contributed disturbance to the adjacent house lots, the degree of disturbance is limited in most cases. In a few instances there is evidence of cutting or filling, apparent by comparison to adjacent properties. However, most areas suggest limited disturbance outside of approximately 10 feet (3 m) from the edge of pavement on the west side of Essex Road and Industrial Avenue and less along the east side of Essex Road and Mountain View Road. One exception to this pattern is the intersection of Essex Road and Industrial Avenue/Mountain View Road. That intersection has undergone some changes related to installation of traffic lights, pedestrian crossings, etc. The adjacent southeast quadrant of the intersection may have been disturbed during that work. At present it is overgrown with small secondary growth (Photo 34).

Photo 34. Southeast quadrant of the Essex Road/Mountain View Road intersection. Note grown up area at the intersection. View to the west/southwest.

ARCHEOLOGICAL RECOMMENDATIONS

Due to the high archeological potential of undisturbed areas of the project APE, it is recommended that project design limit the extent that new disturbance encroaches on undisturbed areas. If the project will encroach on undisturbed areas outside of the sidewalk and utility disturbance, Phase IB archeological reconnaissance survey is recommended.

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APPENDIX 1: VDHP Environmental Predictive Model Form

Vermont Division for Historic Preservation
Archeological Resources Assessment Form

DHP# _____
Organization & Recorder: Hartgen Archeological Associates, Inc.
Date: June 19, 2013

Envronmental Predictive Model				ArcheoMapTool GIS Model	Field Inspection Comments
Variable	Proximity	Value	Assigned Score	Variable	
A. Rivers and Streams (Existing or relict)					
1) Proximity to Rivers and Permanent Streams*	0–90 m	12	12	Layer 1: Proximity to Rivers and Permanent Streams (0-180 m)	
	90-180 m	6			
2) Proximity to Intermittent Streams	0–90 m	12		-	
	90-180 m	6			
3) Proximity to Permanent River/Stream Confluences	0–90 m	8		Layer 6: Proximity to River/Stream Confluences (0-180 m)	
	90-180 m	4			
4) Proximity to Intermittent Stream Confluences	0–90 m	12		-	
	90-180 m	6			
5) Proximity to Waterfalls	0–90 m	8		Layer 7: Proximity to Waterfalls (0-180 m)	
	90-180 m	4			
6) Proximity to Heads of Drainages	0–90 m	8	8	Layer 5: Proximity to Heads of Permanent Drainages (0-300 m)	
	90-180 m	4			
7) Major Floodplain - Alluvial Terrace	0–90 m	8		Layer 10: Floodplain Soils Presence	
	90-180 m	4			
8) Knoll or Swamp Island		32		Layer 1: Proximity to Rivers and Permanent Streams (0-180 m)	
9) Stable Riverine Island		32		Layer 2: Proximity to Waterbodies (0-180 m)	
B. Lakes and Ponds					
10) Proximity to Pond or Lake	0–90 m	12		Layer 2: Proximity to Waterbodies (0-180 m)	
	90-180 m	6			
11) Proximity to Stream-Waterbody Confluences	0–90 m	12		Layer 4: Proximity to Stream-Waterbody Confluences (0-180 m)	
	90-180 m	6			
12) Lake Coves, Peninsulas, and Bayheads	0–90 m	12		Layer 2: Proximity to Waterbodies (0-180 m)	
	90-180 m	6			
C. Wetlands					
13) Proximity to Wetlands*	0–90 m	12	12	Layer 3: Proximity to Wetlands (0-180 m)	
	90-180 m	6			

Envronmental Predictive Model				ArcheoMapTool GIS Model	Field Inspection Comments
Variable	Proximity	Value	Assigned Score	Variable	
14) Knoll or Swamp Island		32		Layer 3: Proximity to Wetlands (0-180 m)	
D) Valley edge and Glacial Landforms					
15) High Elevated Landform (e.g. Knoll Top, Ridge Crest, Promontory)		12		See Landmarks (Info Layers) and Catchment layers (Water-related Layers)	
16) Valley Edge Features (e.g. Kame Outwash Terrace)		12		Layer 9 Glacial Outwash and Kame Terrace Soils	
17) Marine/Lake Delta Complexes		12		Layer 9 Glacial Outwash and Kame Terrace Soils Presence	
18) Champlain Sea or Glacial Lake Shore Line**		12	12	Layer 8: Paleo Lake Soils Proximity (0-180 m)	
E. Other Environmental Factors					
19) Caves and Rockshelters		32		-	
20) Natural Travel Corridors (e.g. Drainage Divides)		12	12	See Landmarks (Info Layers) and catchment layers (Water-related Layers)	
21) Existing or Relict Springs	0–90 m	8		-	
	90–180 m	4			
22) Potential or Apparent Prehistoric Quarry for Lithic Material Procurement	0–90 m	8		See Soils with "M" parent material (Under Construction)	
	90–180 m	4			
23) Special Environmental or Natural Area~	0–180 m	32		-	
F. Other High Sensitivity Layers					
24) High Likelihood of Burials		32		See VAI layer (Under Construction)	
25) High Recorded Archeological Site Density		32	32	See VAI layer (Under Construction)	
26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32		See VAI layer (Under Construction)	

Envronmental Predictive Model				ArcheoMapTool GIS Model	Field Inspection Comments
Variable	Proximity	Value	Assigned Score	Variable	
G. Negative Factors					
27) Excessive (>15%) or Steep Erosional (>20%) Slopes		-32		See Slope Layer (Info Layers folder)	
28) Previously Disturbed Land***		-32	-32	See Land Use ND Building Footprint Layers (Info Layers folder)	
Total Score:			56		

*measured from top of bank

** remains incompletely mapped; digital layer includes paleo lakes and wetlands based on soils data

*** as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)

~such as Milton acquifer, mountain top, etc. (historic or prehistoric sacred or traditional site locations, other prehistoric site types)

*Environmental predictive model limits wetlands to those > one acre in size; ArchSensMap

APPENDIX G

INTERSECTION CONCEPTUAL PLANS

OPTION 1
ADD WESTBOUND LEFT TURN LANE

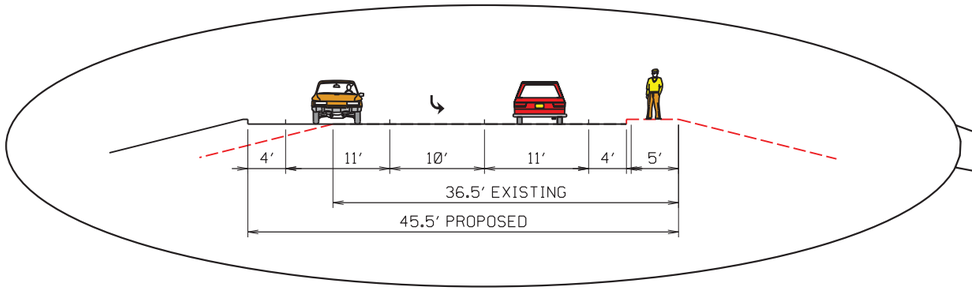
V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	0.95
P.M.	0.98	1.19	1.17

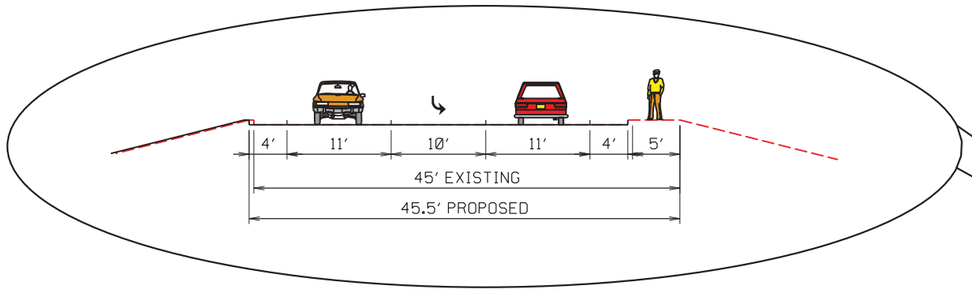
VT STATE PLANE GRID

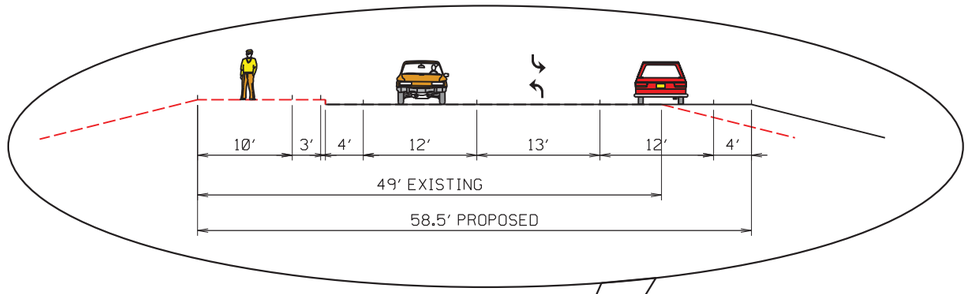
N

INDUSTRIAL AVE

EXTEND LEFT TURN LANE FROM 220 TO 545 FEET







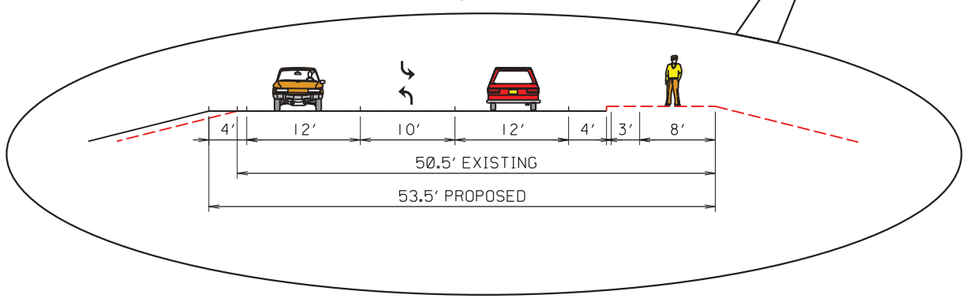
PROVIDE CONSISTENT THREE LANE SECTION

WIDEN SIDEWALK TO 10 FEET

ROUTE 2A

TO TAFT CORNERS

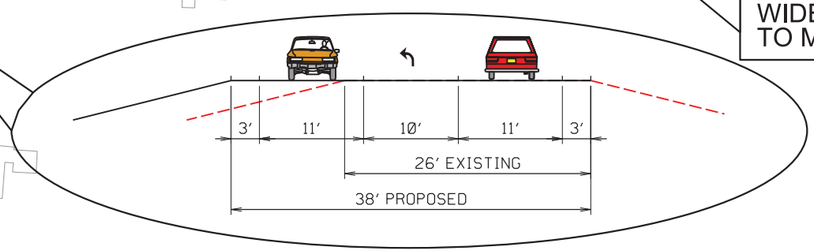
MEADOWRUN ROAD



ADD 200' WESTBOUND LEFT TURN LANE

MOUNTAIN VIEW ROAD

WIDEN TO THREE LANES TO MATCH PROPOSED



LEGEND

- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160

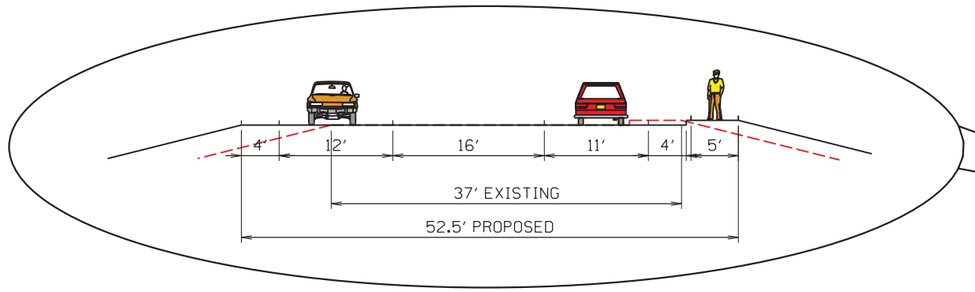
SCALE IN FEET

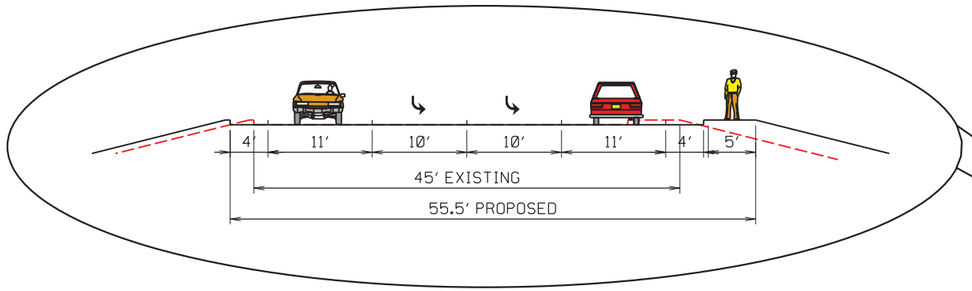
OPTION 2A
ADD EASTBOUND LEFT TURN LANE TO OPTION 1 (WIDEN VT 2A TO WEST)

V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	0.91
P.M.	0.98	1.19	0.99

VT STATE PLANE GRID

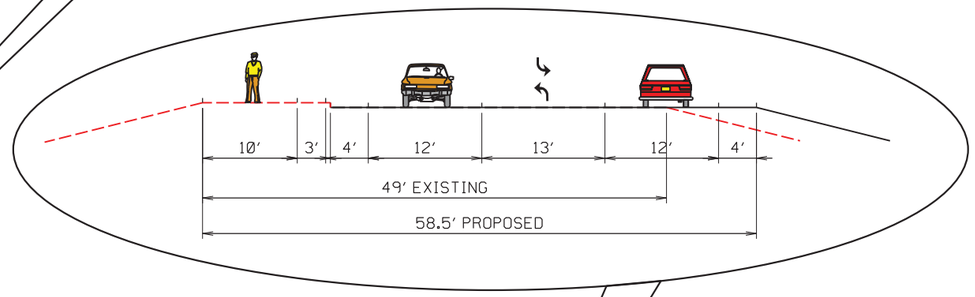
N





INDUSTRIAL AVE

ADD LEFT TURN LANE



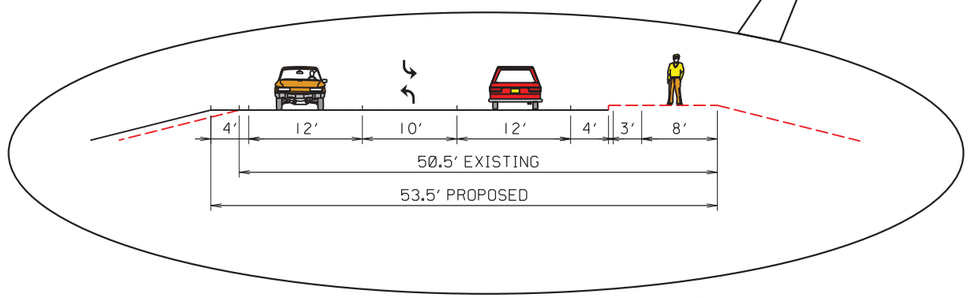
WIDEN SIDEWALK TO 10 FEET

PROVIDE CONSISTENT THREE LANE SECTION

ROUTE 2A

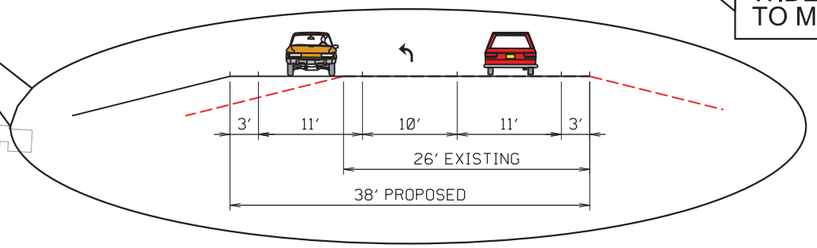
TO TAFT CORNERS

MEADOWRUN ROAD



ADD 200' WESTBOUND LEFT TURN LANE

MOUNTAIN VIEW ROAD



WIDEN TO THREE LANES TO MATCH PROPOSED

LEGEND

- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160

SCALE IN FEET

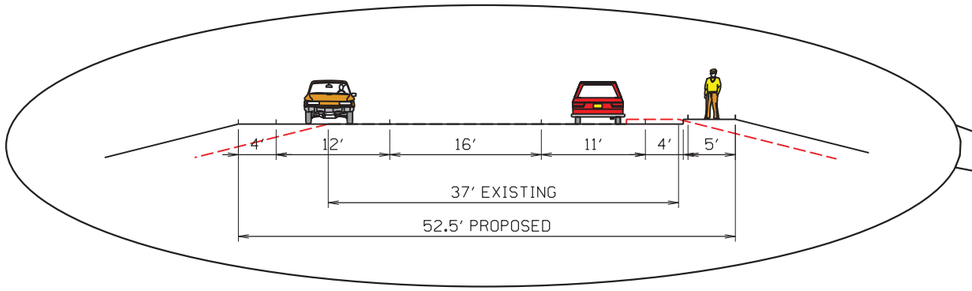
OPTION 2B
ADD EASTBOUND LEFT TURN LANE TO OPTION 1 (WIDEN VT2A TO EAST)

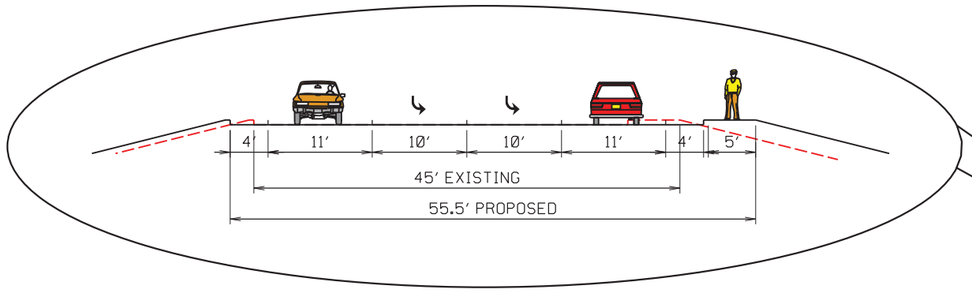
V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	0.91
P.M.	0.98	1.19	0.99

VT STATE PLANE GRID

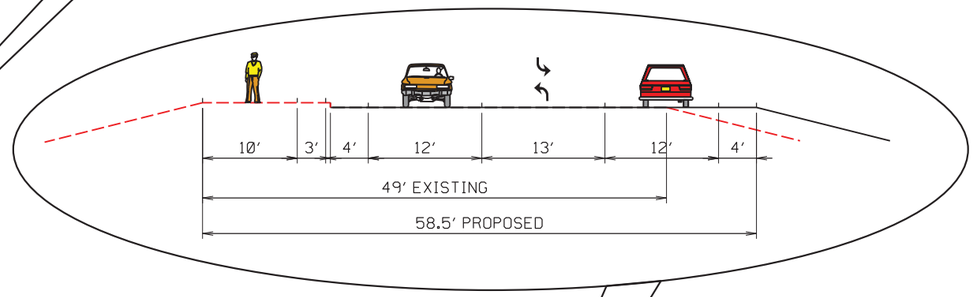
N

INDUSTRIAL AVE





ADD LEFT TURN LANE



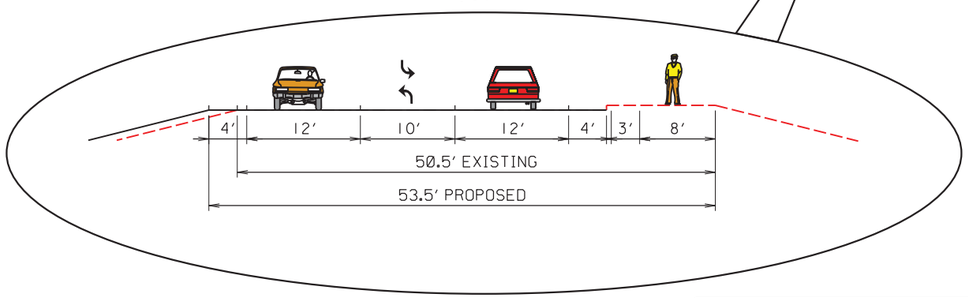
WIDEN SIDEWALK TO 10 FEET

PROVIDE CONSISTENT THREE LANE SECTION

ROUTE 2A

TO TAFT CORNERS

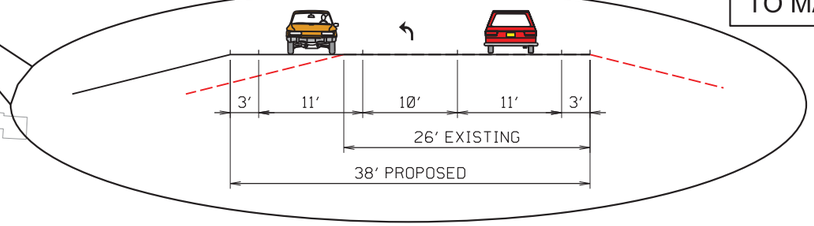
MEADOWRUN ROAD



ADD 200' WESTBOUND LEFT TURN LANE

MOUNTAIN VIEW ROAD

WIDEN TO THREE LANES TO MATCH PROPOSED



LEGEND

- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160

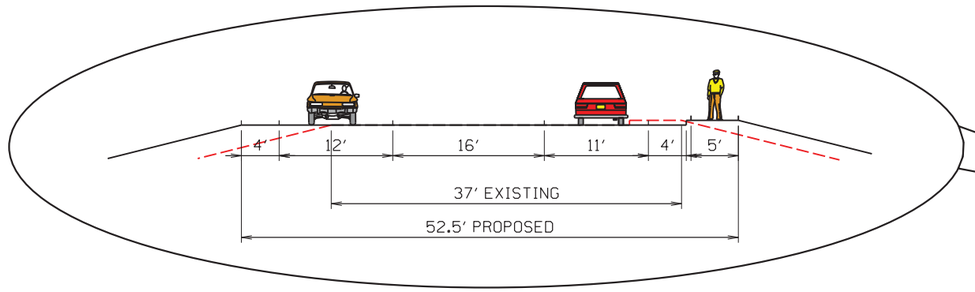
SCALE IN FEET

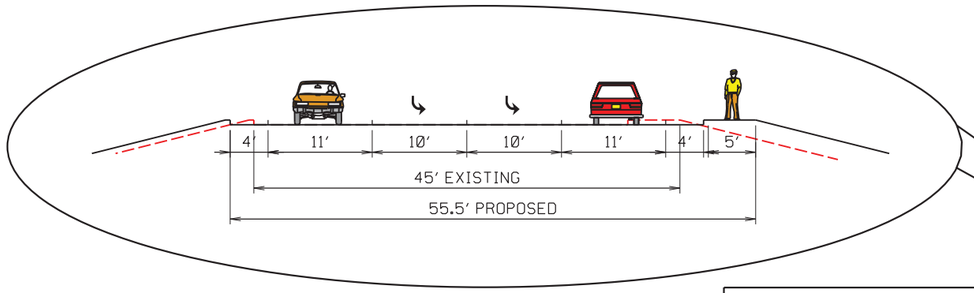
OPTION 3
ADD NORTHBOUND THROUGH LANE TO OPTION 2A (ADD 5 FOOT SIDEWALK EAST SIDE VT 2A)

V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	0.89
P.M.	0.98	1.19	0.89

VT STATE PLANE GRID

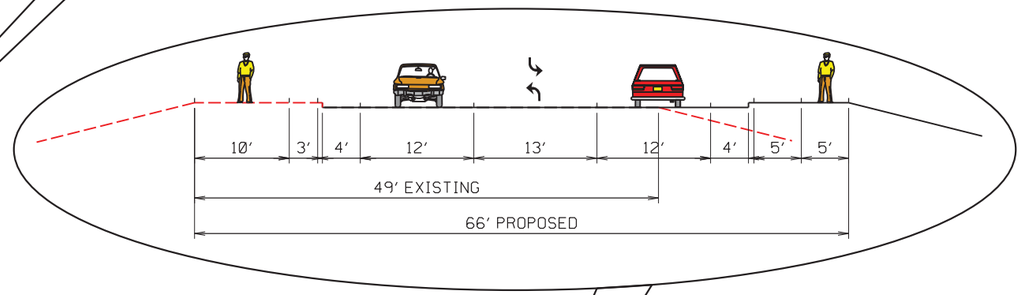
N





INDUSTRIAL AVE

ADD LEFT TURN LANE



PROVIDE CONSISTENT THREE LANE SECTION

ADD NORTHBOUND THROUGH LANE

WIDEN SIDEWALK TO 10 FEET

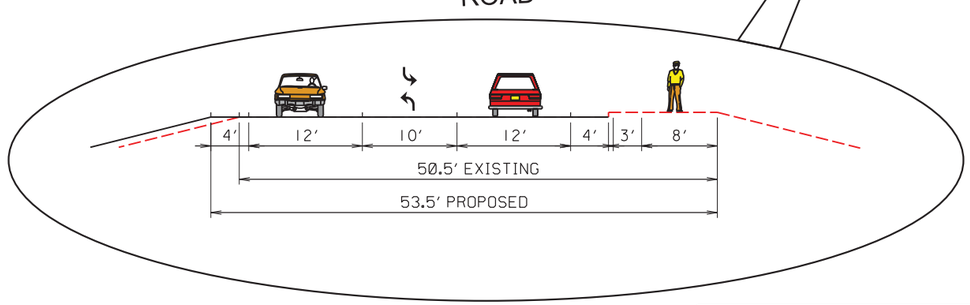
NEW 5 FOOT WIDE SIDEWALK WITH 5 FOOT WIDE GREENBELT

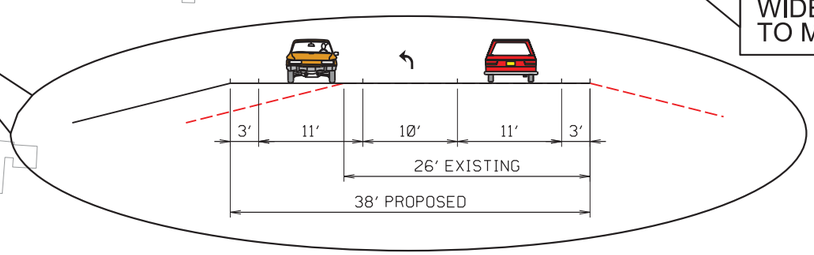
ROUTE 2A

TO TAFT CORNERS

MEADOWRUN ROAD

WIDEN TO THREE LANES TO MATCH PROPOSED





ADD 200' WESTBOUND LEFT TURN LANE

MOUNTAIN VIEW ROAD

LEGEND

- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160

SCALE IN FEET

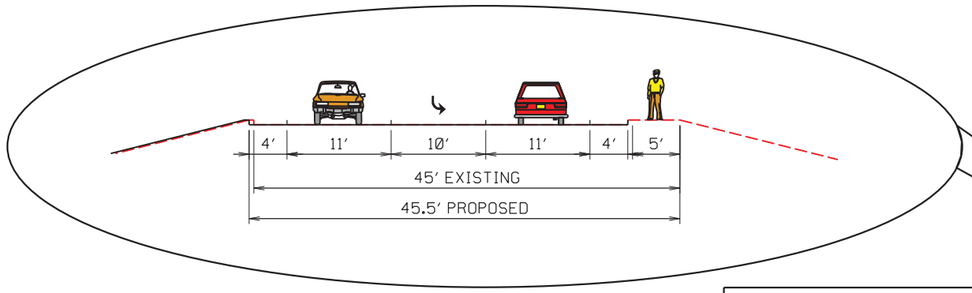
OPTION 4

CHANGE LANE USE ON INDUSTRIAL AVENUE AND ADD NORTHBOUND THROUGH LANE

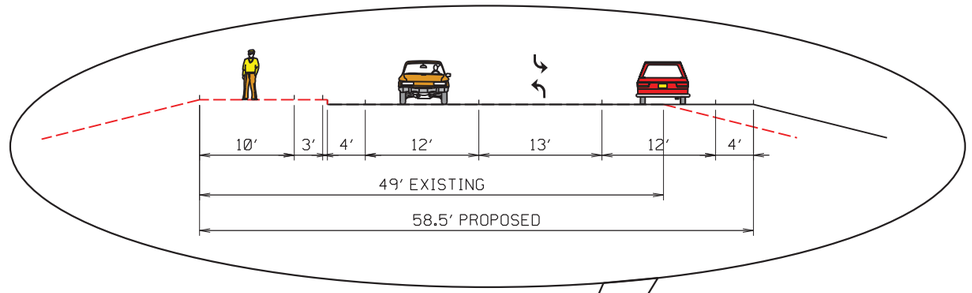
V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	0.90
P.M.	0.98	1.19	0.98

N

VT STATE PLANE GRID



ALLOW LEFT TURNS FROM RIGHT LANE



PROVIDE CONSISTENT THREE LANE SECTION

ADD NORTHBOUND THROUGH LANE

WIDEN SIDEWALK TO 10 FEET

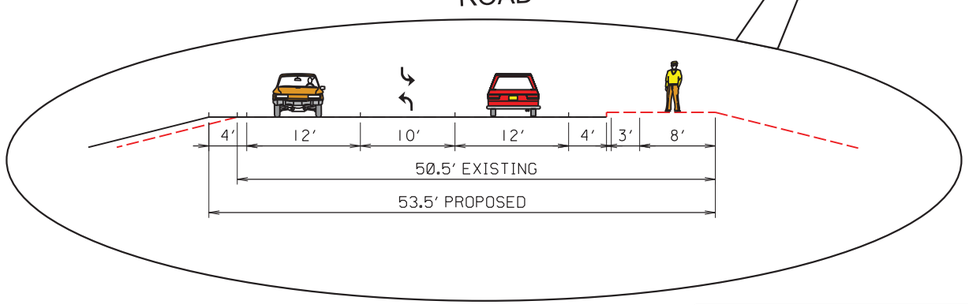
INDUSTRIAL AVE

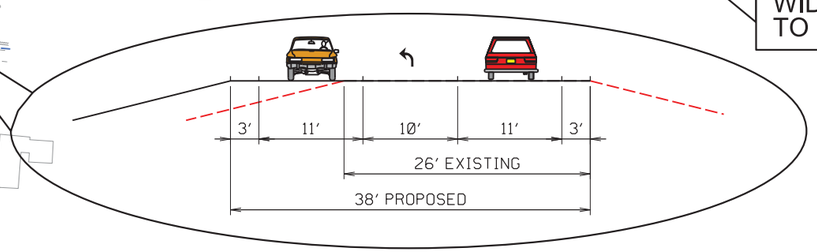
ROUTE 2A

TO TAFT CORNERS

MEADOWRUN ROAD

WIDEN TO THREE LANES TO MATCH PROPOSED





ADD 200' WESTBOUND LEFT TURN LANE

MOUNTAIN VIEW ROAD

LEGEND

- ADDED PAVEMENT
- BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

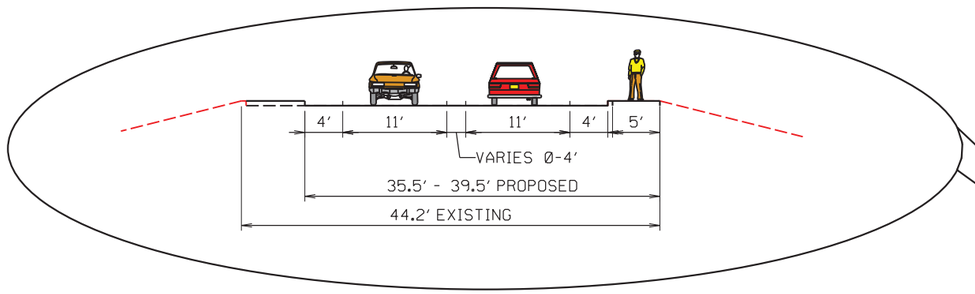
0 80 160

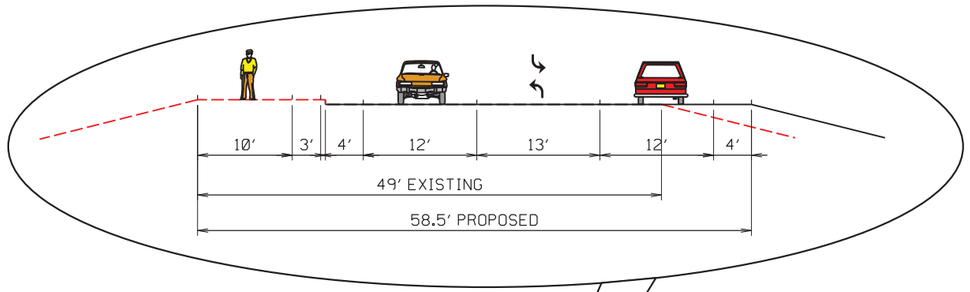
SCALE IN FEET

OPTION 5
SINGLE LANE ROUNDABOUT

V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	1.59
P.M.	0.98	1.19	1.37

VT STATE PLANE GRID N





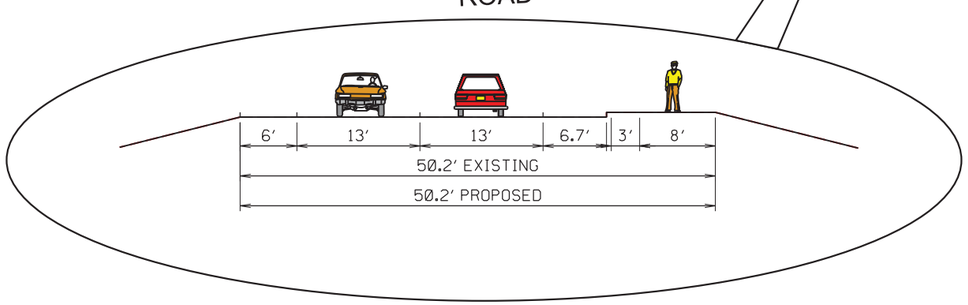
INDUSTRIAL AVE

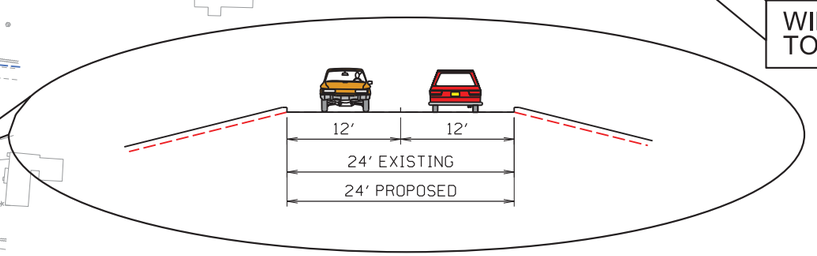
WIDEN SIDEWALK TO 10 FEET

ROUTE 2A

TO TAFT CORNERS

MEADOWRUN ROAD





WIDEN TO THREE LANES TO MATCH PROPOSED

MOUNTAIN VIEW ROAD

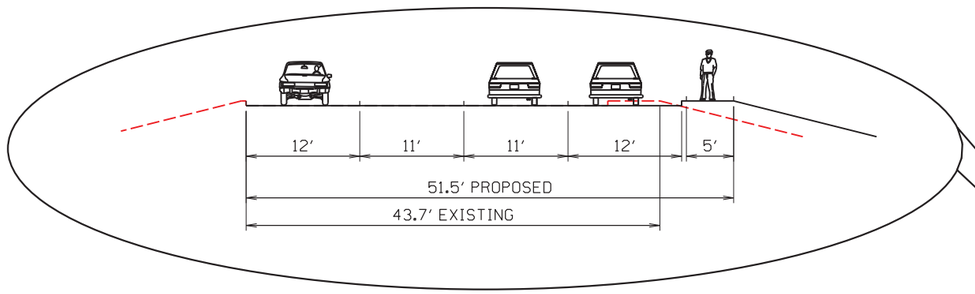
LEGEND
- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

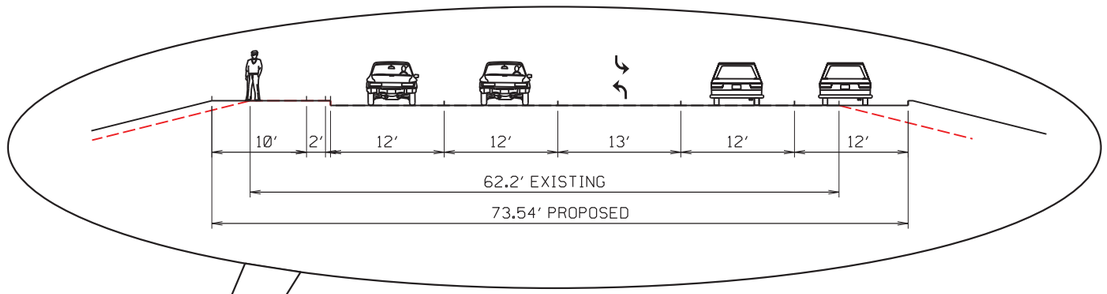
0 80 160
SCALE IN FEET

OPTION 6
PARTIAL DUAL LANE ROUNDABOUT WITH TWO LANE WESTBOUND APPROACH

V/C RATIO			
EXISTING		FUTURE	FUTURE W/ IMPROVEMENTS
A.M.	0.79	0.92	0.82
P.M.	0.98	1.19	0.85

N
VT STATE PLANE GRID





INDUSTRIAL AVE

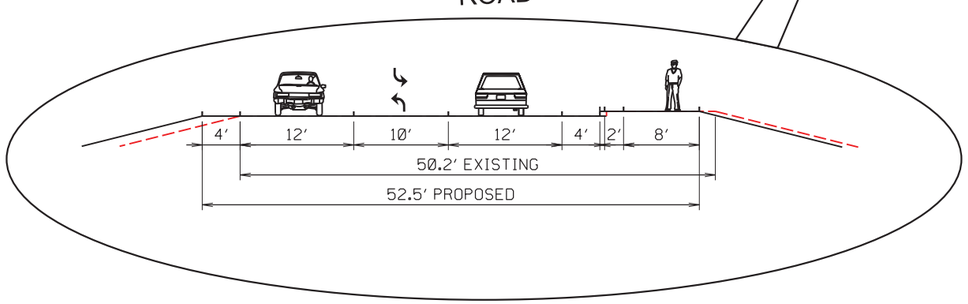
WIDEN SIDEWALK TO 10 FEET

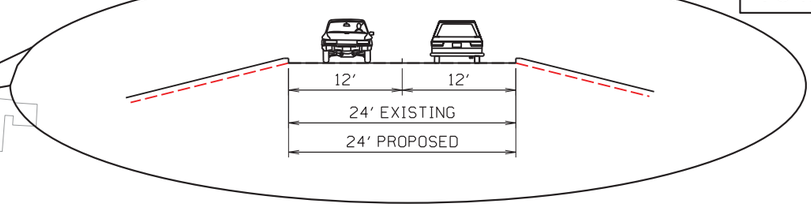
ROUTE 2A

TO TAFT CORNERS

MEADOWRUN ROAD

WIDEN TO THREE LANES TO MATCH PROPOSED





MOUNTAIN VIEW ROAD

LEGEND
- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160
SCALE IN FEET

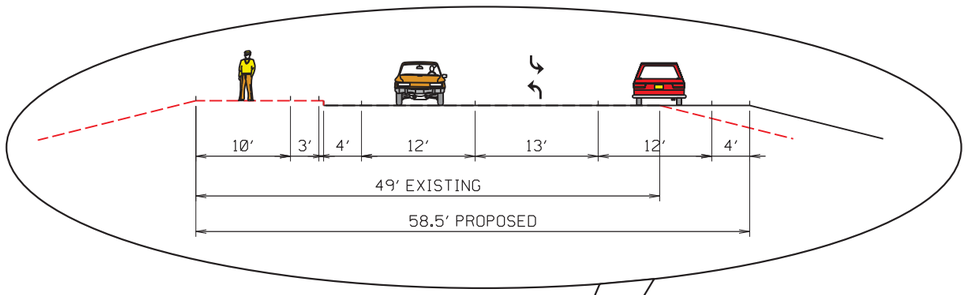
APPENDIX H

ROUTE 2A NORTH CONCEPTUAL PLANS

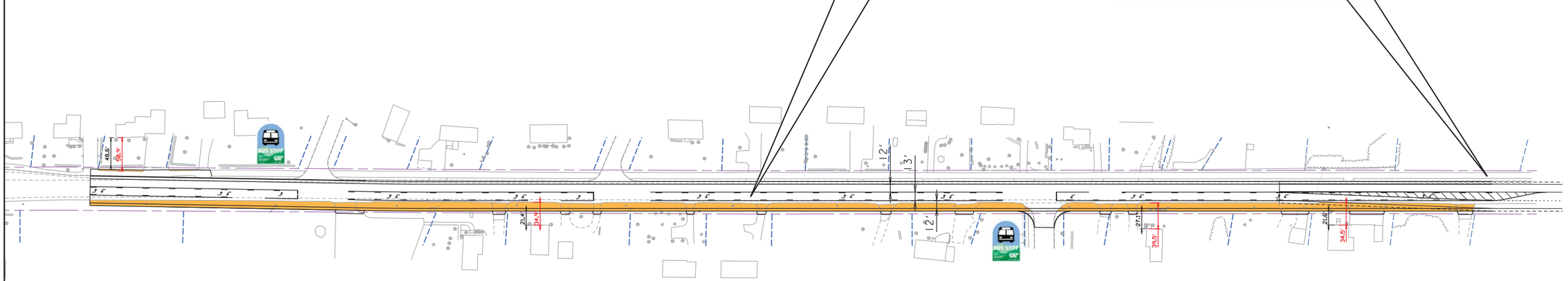
OPTION N1
TWO-WAY LEFT TURN LANE

VT STATE PLANE GRID

TO ESSEX JUNCTION



TIE INTO VT 2A - WILLISTON
PROJECT STP-HES 5500(12)



LEGEND

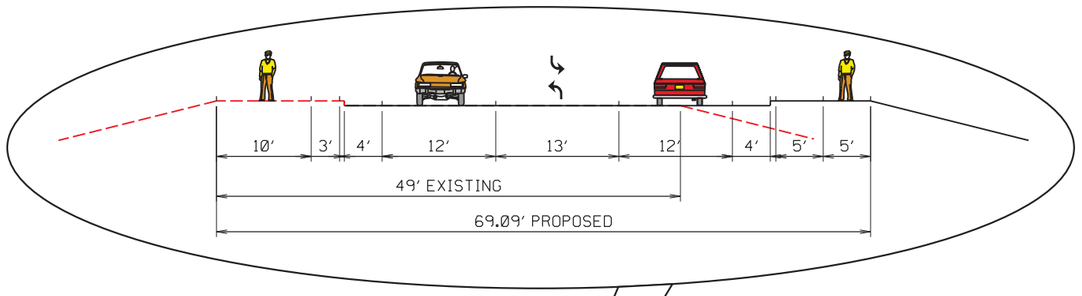
- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160
SCALE IN FEET

VT STATE PLANE GRID

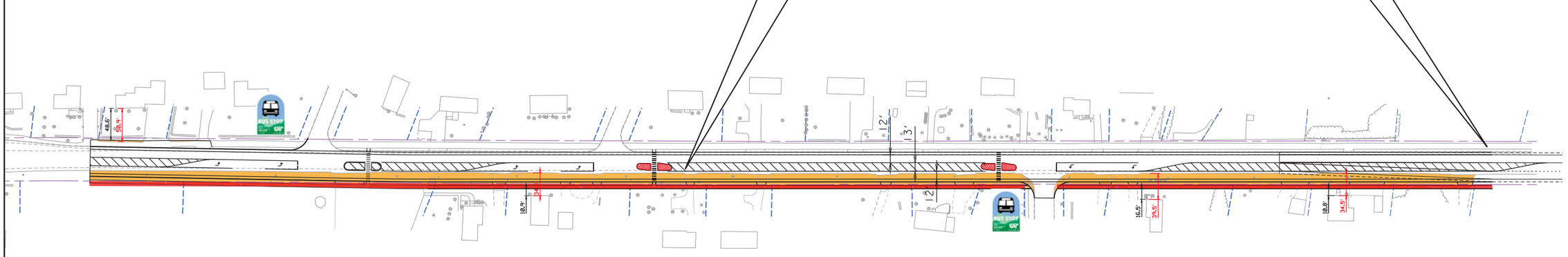
N

OPTION N2
TWO-WAY LEFT TURN LANE WITH 5 FT SIDEWALK ON EAST SIDE OF VT 2A



TO ESSEX JUNCTION →

TIE INTO VT 2A - WILLISTON
PROJECT STP-HES 5500(12)



LEGEND

- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

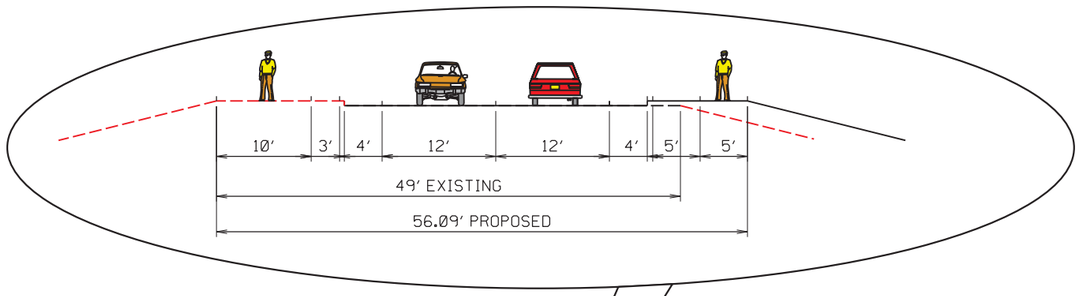
0 80 160
SCALE IN FEET

VT STATE PLANE GRID

N

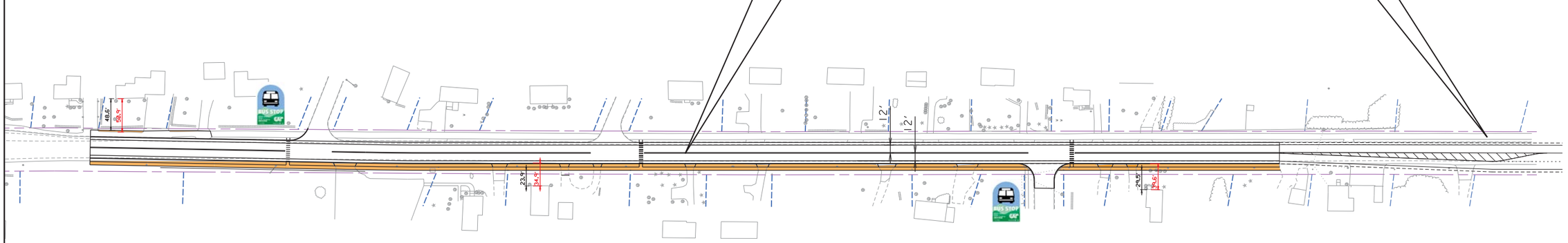
OPTION N3

5 FT SIDEWALK ON EAST SIDE OF VT 2A



TO ESSEX JUNCTION →

TIE INTO VT 2A - WILLISTON
PROJECT STP-HES 5500(12)



LEGEND

- ADDED PAVEMENT BEYOND R.O.W.
- HIGHWAY R.O.W.
- PROPERTY LINES

0 80 160

SCALE IN FEET

APPENDIX I

BENEFITS-IMPACT TABLE

Intersection Alternatives Evaluation Matrix

VT 2A / Industrial Avenue / Mountain View Road – CCRPC Scoping Study

Performance / Impacts	No Build	Option 1: Add WB Left Extend EB Left	Option 2A: Add EB Left to Opt. 1, Widen to West	Option 2B: Add EB Left to Opt. 1, Widen to East	Option 3: Add NB Through to Opt. 2	Option 4: Add NB Through to Opt. 1, Change EB Use	Option 5: Singe Lane Roundabout	Option 6: Dual Lane Roundabout
PM Volume to Capacity Ratio (2033)	1.19	1.17	0.99	0.99	0.89	0.98	1.37	0.85
Added Pavement	None	10,000 SF	20,000 SF	17,000 SF	25,000 SF	14,000 SF	13,000 SF	24,000 SF
ROW Takings								
East Leg (Mtn. View)	None	400 SF	400 SF	400 SF	400 SF	400 SF	400 SF	500 SF
West Leg (Industrial)	None	None	2,300 SF	2,300 SF	2,300 SF	None	None	600 SF
North Leg (VT 2A)	None	100 SF	1,100 SF	500 SF	1,100 SF	1,100 SF	None	None
South Leg (VT 2A)	None	None	None	None	1,300 SF	1,300 SF	None	200 SF
Total SF	None	500 SF	3,800 SF	3,200	5,100 SF	2,800 SF	400 SF	1,300 SF
Number of Parcels Impacted	None	2	12	13	15	7	2	5
Utility Poles to be Moved	None	7	12	13	14	11	7	12
Number of Mature Trees Removed	None	2	3	6	7	3	4	5
Typical Crash Reduction[1]	None	None	None	None	None	None	51%	29%
Total Cost	None	Not Calculated	Not Calculated	Not Calculated	$3.3 Million	Not Calculated	Not Calculated	$3.8 Million

[1]U.S. Department of Transportation. *ROUNDABOUTS: An Informational Guide*. By B.W. Robinson. McLean, Virginia: June 2000. (FHWA-RD-00-067).

VT 2A North Alternatives Evaluation Matrix

VT 2A / Industrial Avenue / Mountain View Road – CCRPC Scoping Study

Performance / Impacts	No Build	3-Lane Cross Section	3-Lane Cross Section + Sidewalk	Existing + Sidewalk
"Bike Lanes"	On Street	On Street	On Street	On Street
Refuge Islands	No	Yes	Yes	No
New Pavement	None	27,000 SF	50,000 SF	19,000 SF
ROW Takings-Area	None	None	15,000 SF	None
ROW Takings-Parcels	None	None	17 Parcels	None
< 25 Feet of Driveway	None	None	2 Parcels	None
Tree Loss	None	6 Trees	11 Trees	5 Trees
Utility Poles	None	14	14	14
Construction Cost	None	$2.1 million	$2.5 million	$0.6 million

APPENDIX J

COST ESTIMATES

				Full Lane Addition		Roundabout	
VTrans Item No.	Description	Unit	Unit Price [1]	Quantity	Extension	Quantity	Extension
201.10	Clearing and Grubbing, Including Individual Trees and Stumps	LS	-	1	$5,000.00	1	$15,000.00
203.15	Common Excavation	CY	$20.00	3,400	$68,000.00	6,700	$134,000.00
301.26	Subbase of Crushed Gravel, Fine Graded	CY	$70.00	1,000	$70,000.00	1,800	$126,000.00
301.35	Subbase of Dense Graded Crushed Stone	CY	$55.00	1,500	$82,500.00	3,100	$170,500.00
490.30	Bituminous Concrete Pavement	TON	$90.00	2,500	$225,000.00	3,700	$333,000.00
601.2620	24" CPEP(SL)	LF	$80.00	1,600	$128,000.00	1,700	$136,000.00
604.20	Precast Reinforced Concrete Catch Basin with Cast Iron Grate	EA	$3,500.00	10	$35,000.00	11	$38,500.00
616.21	Vertical Granite Curb	LF	$40.00	3,550	$142,000.00	3,000	$120,000.00
618.10	Portland Cement Concrete Sidewalk, 5 Inch	SY	$85.00	700	$59,500.00	500	$42,500.00
618.11	Portland Cement Concrete Sidewalk, 8 Inch	SY	$90.00	50	$4,500.00	510	$45,900.00
618.15	Bituminous Concrete Sidewalk	TON	$210.00	175	$36,750.00	175	$36,750.00
618.30	Detectable Warning Surface	SF	$55.00	60	$3,300.00	80	$4,400.00
646.460	Durable White Line	LF	$1.50	13,000	$19,500.00	9,500	$14,250.00
646.480	Durable 24 Inch Stop Bar	LF	$11.00	150	$1,650.00	0	$0.00
646.30	Letter or Symbol	Each	$20.00	54	$1,080.00	77	$1,540.00
646.500	Durable Crosswalk Marking	LF	$25.00	230	$5,750.00	130	$3,250.00
	Grass Reestablishment	LS	-	1	$40,000.00	1	$80,000.00
	Erosion Control	LS	-	1	$10,000.00	1	$20,000.00
	Stormwater Management (basins)	LS	-	1	$200,000.00	1	$200,000.00
	Precast Concrete Gravity Retaining Wall	SY	$500.00	0	$0.00	20	$10,000.00
	Landscaping	LS	-	1	$10,000.00	1	$20,000.00
	New Signals and Mast Arms	LS	$200,000.00	1	$200,000.00	0	$0.00
	Subtotal				**$1,347,530.00**		**$1,551,590.00**
	Mobilization/Demobilization (20%)				**$269,506.00**		**$310,318.00**
	Traffic Control (20%)[2]				**$269,506.00**		**$310,318.00**
	Contingency (30%)				**$565,962.60**		**$651,667.80**
	Subtotal				**$2,452,504.60**		**$2,823,893.80**
	Rounded Cost				**$2,460,000.00**		**$2,830,000.00**
	Preliminary Engineering (15%)				**$369,000.00**		**$424,500.00**
	Construction Engineering (10%)				**$246,000.00**		**$283,000.00**
	Municipal Project Manager (7%)				**$172,200.00**		**$198,100.00**
	Legal Fees				**$25,000.00**		**$25,000.00**
	Right-of-Way Costs				**TBD**		**TBD**
	Total Estimated Opinion of Probable Cost				**$3,272,200.00**		**$3,760,600.00**

1. The unit prices are drawn from recent VTrans Project Bid Tab or 5-yr Average

2. Traffic control at 20% per email from C Forde and K Robie on 10/30/2013

				TWLTL		TWLTL + Sidewalk		Sidewalk	
VTrans Item No.	Description	Unit	Unit Price [1]	Quantity	Extension	Quantity	Extension	Quantity	Extension
201.10	Clearing and Grubbing, Including Individual Trees and Stumps	LS	-	1	$5,000.00	1	$10,000.00	1	$5,000.00
203.15	Common Excavation	CY	$20.00	2,834	$56,670.37	3,785	$75,692.59	951	$19,022.22
203.30	Earth Borrow	CY	$50.00	0	$0.00	0	$0.00	0	$0.00
301.26	Subbase of Crushed Gravel, Fine Graded	CY	$70.00	687	$48,083.95	964	$67,502.47	277	$19,418.52
301.35	Subbase of Dense Graded Crushed Stone	CY	$55.00	1,374	$75,560.49	1,651	$90,817.90	277	$15,257.41
490.30	Bituminous Concrete Pavement	TON	$90.00	2,622	$235,935.00	2,622	$235,935.00	0	$0.00
601.2620	24" CPEP(SL)	LF	$80.00	2,600	$208,000.00	2,600	$208,000.00	0	$0.00
601.7020	24" CPEP	LF	$80.00		$0.00		$0.00		$0.00
604.20	Precast Reinforced Concrete Catch Basin with Cast Iron Grate	EA	$3,500.00	15	$52,500.00	15	$52,500.00	0	$0.00
616.21	Vertical Granite Curb	LF	$40.00	2,600	$104,000.00	2,600	$104,000.00	0	$0.00
618.10	Portland Cement Concrete Sidewalk, 5 Inch	SY	$85.00	0	$0.00	1,189	$101,055.56	1,189	$101,055.56
618.11	Portland Cement Concrete Sidewalk, 8 Inch	SY	$90.00	0	$0.00	0	$0.00	0	$0.00
618.15	Bituminous Concrete Sidewalk	TON	$210.00	0	$0.00	0	$0.00	0	$0.00
618.30	Detectable Warning Surface	SF	$55.00	6	$330.00	6	$330.00	6	$330.00
620.11	Chain-Link Fence, 4 Feet	LF	$35.00	0	$0.00	0	$0.00	0	$0.00
646.400	Durable White Line	LF	$1.50	12,840	$19,260.00	12,840	$19,260.00	8,560	$12,840.00
646.480	Durable 24 Inch Stop Bar	LF	$11.00	0	$0.00	0	$0.00	0	$0.00
646.30	Letter or Symbol	Each	$20.00	23	$460.00	23	$460.00	0	$0.00
646.500	Durable Crosswalk Marking	LF	$25.00	135	$3,375.00	135	$3,375.00	135	$3,375.00
675.20	Traffic Sign, Type A	SF	$8.00	0	$0.00	0	$0.00	0	$0.00
675.341	Square Tube Sign Post and Anchor	LF	$15.00	0	$0.00	0	$0.00	0	$0.00
	Grass Reestablishment	LS	-	1	$3,000.00	1	$7,000.00	1	$5,000.00
	Erosion Control	LS	-	1	$10,000.00	1	$10,000.00	1	$10,000.00
	Stormwater Management	LS	-	1	$20,000.00	1	$20,000.00	1	$20,000.00
	Landscaping	LS	-	1	$10,000.00	1	$20,000.00	1	$10,000.00
	Subtotal				**$852,174.81**		**$1,025,928.52**		**$221,298.70**
	Mobilization/Demobilization (20%)				**$170,434.96**		**$205,185.70**		**$44,259.74**
	Traffic Control (20%)[2]				**$170,434.96**		**$205,185.70**		**$44,259.74**
	Contingency (30%)				**$357,913.42**		**$430,889.98**		**$92,945.46**
	Subtotal				**$1,550,958.16**		**$1,867,189.90**		**$402,763.64**
	Rounded Cost				**$1,560,000.00**		**$1,870,000.00**		**$410,000.00**
	Preliminary Engineering (15%)				**$234,000.00**		**$280,500.00**		**$61,500.00**
	Construction Engineering (10%)				**$156,000.00**		**$187,000.00**		**$41,000.00**
	Municipal Project Manager (7%)				**$109,200.00**		**$130,900.00**		**$28,700.00**
	Legal Fees				**$25,000.00**		**$25,000.00**		**$25,000.00**
	Right-of-Way Costs				**TBD**		**TBD**		**TBD**
	Total Estimated Opinion of Probable Cost				**$2,084,200.00**		**$2,493,400.00**		**$566,200.00**

1. The unit prices are drawn from recent VTrans Project Bid Tab or 5-yr Average

2. Traffic control at 20% per email from C Forde and K Robieon 10/30/2013

APPENDIX K

MEETING MINUTES

Meeting Notes

Steering Committee Meeting

VT 2A - Industrial Avenue to River Cove Road - Scoping / 195310861

Date/Time:	June 20, 2013 / 10:30 AM
Place:	Williston Town Offices
Attendees:	Rick Bryant-Stantec; Christine Forde, Sai Sarepalli-CCRPC; Ken Belliveau, Bruce Hoar-Williston
Absentees:	None
Distribution:	Attendees, Greg Edwards, David Grover, Hartgen, VSE, Polly Harris

Summary

Purpose of meeting was to schedule the Local Concerns Meeting and review project progress. Hearing date set for July 18, 2013 6:30 PM.

Minutes

Stantec presented a status report by topic as follows.

1. **Survey:** The survey is 90 percent complete with boundary line confirmation underway. Bruce asked if wetlands were flagged and noted on the survey. Stantec to check on this.
2. **Environmental Resources:** A visual inspection has been completed as well as file research. Some Class III wetlands are present in the northern section of the study corridor.
3. **Archeological/Historic:** Field work has been completed by Hartgen and the draft Existing Resources report is in production.
4. **Traffic:** Data from prior studies has been compiled. Discussions with the RPC are nearing completion regarding future design hour volumes. Growth rate selected will be based on the regional traffic model. Bruce noted that the model may need to be updated more regularly as future traffic forecasts from the model are often not reliable. New counts done along VT 2A should be forwarded to Bruce.

   Ken suggested that we be prepared to discuss mode split at the public hearing and how future changes in mode split may impact future travel demand forecasts.

5. **Alternatives:** Stantec suggested that the alternatives analysis should at least consider all alternatives examined in prior studies. A roundabout proposal was considered but not advanced for another location in Town and Williston would be willing to consider both a single lane and multi-lane roundabout at this location. Christine expressed reluctantance to present options that lack adequate capacity. A single-lane roundabout is less complicated operationally and may be easier to gain public acceptance.

Bruce noted that making left-turns from side streets along VT 2A is an existing problem. The turns may be aided today by the signal at Industrial Avenue creating gaps. A roundabout may not provide the same gaps.

6. **Local Concerns Meeting:** Typically the Planning Commission would host the meeting however, the Commission is booked solid for the next month. The meeting is set for Thursday, July 18, 2013 at 6:30PM. A hearing notice should be provided to the local paper by Friday for publication the following Thursday. Ken to work on preparing a mailing list. Stantec to draft a meeting notice. Christine to schedule the meeting room.

   The Town must recommend a preferred plan by November. Hearings with the Planning Commission and Selectboard will need to be scheduled for the fall.

   Christine to invite VTrans to participated in the study and on the steering committee.

   Stantec distributed a draft presentation and solicited comments from team members.

Action Items

1. Prepare and distribute meeting notices. Stantec
2. Finalize design year traffic volumes. Stantec/CCRPC
3. Check wetlands mapping. Stantec.
4. Distribute traffic count data. Stantec.
5. Contact VTrans. CCRPC

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Richard Bryant, PE
Senior Project Manager
Richard.Bryant@stantec.com

Meeting Notes

Local Concerns Meeting

VT 2A-Industrial Avenue to River Cove Scoping Study / 195310861

Date/Time:	July 18, 2013 / 6:30 PM
Place:	Williston Fire Station: Training Room
Next Meeting:	TBD
Attendees:	Christine Forde-CCRPC, Ken Belliveau-Town, Rick Bryant, Tim Noordewier-Stantec, Town Residents (see "sign in" sheet)
Absentees:	None
Distribution:	C. Forde, K. Belliveau, B. Hoar, J. Schultz, D. DeBaie, D. Grover, G. Edwards

Meeting Summary: Meeting was held to explain the project to the public and solicit comments. A number of concerns were raised regarding the poor existing traffic conditions in the study area and beyond. Most in attendance were disappointed that plans to construct the Circ were cancelled. There was near unanimous support to move ahead with an alternative improvement plan now. Another meeting will be scheduled to review alternatives after these have been developed and analyzed.

Discussion Items:

1. **Meeting Agenda:** Purpose of meeting was to understand the concerns of residents and roadway users. Limits of the project were clarified to the public. A presentation described the scoping study process, existing conditions, reviewed prior studies, identified potential alternatives (briefly), and opened the discussion to the public.
2. **Scoping Study:** Rick Bryant, *Stantec Consulting Ltd.,* presented findings from the work to date. The presentation included survey data, turning movement counts, volume-to-capacity performance assessments, current public transit options, and bicycle and pedestrian accommodations. Wetlands were mentioned as potential environmental constraints, as they were present in three locations along VT 2A within the study area. Physical obstructions such as driveways, trees, and utility poles were highlighted as other possible constraints. In addition to existing performance assessments, Rick discussed a twenty-year traffic operations forecast that predicts motorist delays increasing significantly. The delays stem from the already over-capacity intersection of Industrial Ave. and VT 2A.
3. **Prior Studies:** The scoping area has been the focus of numerous prior studies. The aforementioned intersection has not been modified since 1996, despite the final recommendations of past studies. Some of the studies that affect the immediate project area or nearby locations include:
    a. *CCSWD* Plan (1996)—Widening project

b. *Dufresne-Henry* (2002)—Recommended immediately adding a westbound left turn lane and upgrading signals

c. *Wilbur Smith* (2003)—Recommended widening VT 2A to three lanes and installing a median

d. WENTS (2013)—Recommended adding westbound and eastbound left turn lanes, northbound through lanes, sidewalk to East side of 2A, widening shoulders, and multi-use path on Mountain View Rd.

e. *Stantec Consulting Ltd.* (2013)—Recommended adding bike lanes to Industrial Ave.

4. **Potential Alternatives:** Several possible alternatives that either have been studied previously, or could be the focus of further research were identified. An incomplete list includes:

   a. For VT 2A-Continuing the proposed two-way left-turn lane southerly from River Cove Road to Industrial Avenue. (The two-way left-turn lane is part of a *VTrans* project that includes a new traffic signal at James Brown Drive.

   b. Adding a dedicated left-turn lane on Mountain View Road at VT 2A.

   c. Adding a second left-turn lane on the Industrial Ave. approach and on the receiving bay on VT 2A

   d. Allowing two lanes on Industrial Avenue to turn left, with the right lane having the option to go through or right

   e. Creating a roundabout

5. **Community Input:** Upon the conclusion of the presentation, discussion was opened to the public so that stakeholders could voice their concerns on community impacts:

   a. Access vs. Mobility: Concerns regarding access to VT 2A from driveways and side streets during busy time periods. Ken Belliveau addressed this issue by mentioning the proposed signal at James Brown Drive may help create traffic gaps long enough to allow side street access to VT 2A. One person expressed specific concerns regarding difficulties accessing Morgan Parkway.

   b. Through Travel Delays: Left-turns from VT 2A were cited as an existing problem. Left-turning vehicles can quickly cause 4-5 car back-ups. Provision of a continuous two-way, left-turn lane for the entire length of VT 2A was suggested as a possible solution.

   c. Speed Limit: It was suggested by multiple community members that the speed limit along 2A is too high, and should be lowered. High travel speeds are believed to be contributing to crashes and make it difficult for side street traffic to enter the roadway. Since this is a state highway implementing a speed limit change would require VTrans approval.

   d. Safety and Noise: Noise was of particular concern to some residents. One particular source of noise, which is also a major safety concern,

involves the change in grade of the intersection. Evidently, the intersection is raised in the middle, and is uneven. Large trucks make significant noise from hitting the "bump" in the intersection. One concerned citizen described seeing a motorcyclist allegedly become airborne. Trucks using "jake brakes" were also cited as a concern as significant truck traffic is generated along Industrial Avenue.

e. Directional Signs: It was requested that I-89 directional signs be added to VT 2A southbound at the intersection to prevent/reduce the number of people who make a wrong turn and turn around in driveways

f. Preemption: It was pointed out that the signal may not have preemption and that emergency vehicles wait a long time to clear the intersection

g. Roadway Widening: Concerns were expressed that roadway widenings would have an impact on residential properties abutting VT 2A. It was however recognized that there are fewer homes on the east side of the roadway. Underground utilities are also believed to be located on the west side of the roadway. Presumably the James Brown Drive project, which shows widening to the east, considered residential impacts and sidewalk/shared use path impacts that would result if the road were widened to the west.

h. Pavement: The condition of the pavement was highlighted as aging, and needing repair**.**

i. Network Operations: Some questioned the value in improving the VT 2A/Industrial Avenue intersection fearing that it would only increase the flow of traffic north to Five Corners in Essex Junction. Existing congestion in the Junction results in back-ups on VT 2A. These back-ups may only worse if traffic can more easily head north from Industrial Avenue. (Similar concerns were expressed relative to traffic congestion south of the study area in Taft's Corner.) Christine explained that the WENTS study sought to address this concern by looking at a wide network of roadways. Essex Junction is proposing roadway improvements as part of the Circ Alternatives to help relieve congestion in Five Corners.

j. Utilities: It was suggested that overhead utilities be moved underground. Ken explained that this is generally too costly to pursue for reconstruction projects.

k. Community Poll: An informal show of hands revealed that 8 of 9 community members present wanted to see something done to mitigate current traffic conditions

6. **Next steps**: In order to have a recommendation by October 2013, an official purpose and need statement must be adopted. Alternatives must be

developed and evaluated. The alternatives must be presented at a future meeting, so that one may be adopted and gain local endorsement.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Richard Bryant, PE
Senior Project Manager
Richard. Bryant@stantec.com

Meeting Notes

Steering Committee Meeting

VT 2A - Industrial Avenue to River Cove Road - Scoping / 195310861

Date/Time:	August 29, 2013 / 1:30 PM
Place:	Williston Town Offices
Attendees:	Rick Bryant, David Grover-Stantec; Christine Forde, Sai Sarepalli-CCRPC; Ken Belliveau, Bruce Hoar, Matt Boulanger-Williston;
Absentees:	None
Distribution:	Attendees, Greg Edwards, Hartgen, VSE, Polly Harris

Summary

Purpose of meeting was to review the alternatives analysis and schedule future public meetings. The alternatives analysis was well received. It was recommended that a reduced number of alternatives be presented at the public hearing set for September 25, 2013, 6:30 PM. Planning Commission and Selectboard meetings will be held in October.

Minutes

- Stantec presented draft plans and an evaluation matrix for eight alternative intersection plans and two new VT 2A cross section plans. The intersection plans assume two alternative strategies. This first adds lanes incrementally to the existing signalized intersection concept. The second considers a new intersection configuration, that is, variations on a modern roundabout. VT 2A cross sections include: the existing two-lane condition; a three-lane condition matching proposed plans for VT 2A north of this location; and, three-lanes with a sidewalk added to the east side.

- Performance-wise, only the multilane roundabout and the most comprehensive of the signalized intersection upgrades serve projected future traffic demands with a volume-to-capacity ratio well below 1.0.

- The better preforming signalized intersection options generally have more extensive land impacts on intersection approaches. The roundabout solutions mainly impacted parcels to the west of VT 2A that are owned by the Town in one case and reportedly owned by the State in another.

- The multilane roundabout could be introduced in phases with an expected center island restricting flow to a single lane initially. As traffic demands increase and motorists become more familiar with

roundabout operations, the interior island could be reduced in size to allow two circulating lanes in all or part of the roundabout.

- Striping of the third lane on VT 2A was discussed recognizing that various alternatives exist. A two-way, left-turn lane treatment could be provided consistent with the VTrans plans for the roadway to the north. Dedicated left-turn lanes could be provided for specific locations and diagonal stripes provided elsewhere. Raised medians could be provided where pedestrian crossings and a pedestrian refuge may be desired. Bittersweet Circle, a Town Road, was cited as a location where this treatment may be warranted.

- Future meetings were discussed. Steering Committee members agreed to hold another community meeting before the Planning Commission hearing. The community meeting will be held on 9/25. The Planning Commission meeting will be held on October 1 and the Selectboard meeting will be held on October 21.

- For the community meeting it was suggested that the alternatives presentation be streamlined to include just those alternatives that provide the best operating conditions. Other alternatives should be available for discussion, if necessary.

- Stantec presented a possible Evaluation Matrix summary sheet. It was recognized that certain attributes of the alternatives may be weighted more heavily than others. However, it was agreed to leave the “weighting process” in the hands of the individuals reviewing the alternatives.

- Stantec will need to prepare a cost estimate for the preferred alternative to assist the RPC in its budgeting efforts.

- The greenbelt shown on the east side of VT 2A may need to be expanded to meet VTrans standards. The two-foot width shown is not adequate for snow storage.

Action Items

1. Christine to determine ownership of the parcel in the northwest quadrant of the intersection. (Should this parcel be publicly owned the alternatives evaluation matrix should be updated accordingly by Stantec with respect to estimated right-of-way impacts.)

2. Christine to work with Third Sector Associates to help promote the community meeting.

3. Christine to contact VTrans regarding their possible involvement in plan

review.

4. Stantec to draft and circulate a Purpose and Need Statement.

5. Stantec to locate existing bus stops along the VT 2A corridor as these may suggest areas where crosswalks should be provided.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Richard S. Bryant, PE
Senior Project Manager
Richard.Bryant@stantec.com

Meeting Minutes

Public Meeting

2A/Industrial Ave Scoping Study / 195310861

Date/Time:	September 25, 2013 / 7:00 PM
Place:	Williston Town Offices
Next Meeting:	October 1, 2013
Attendees:	Eleanora Hood, Roderic Hood, Jeffrey Hasslett, Carol Tardy, Martha Olsley, Sandy MacCallum, Beverly Cloutier, Chris Corron, Tammy Corron, Howard Kretzer, Heather Ashline, Kevin Mara, Tim Thompson, Heather Thompson, Louise Bruneele, Nancy Saiey, Kevin Batson, Greg Elices, Irene M. Lunu, Cheuler Many, Beth Gutwin, Corron, Christine Forde: CCRPC, Rick Bryant: Stantec, David Grover: Stantec
Absentees:	Absentees
Distribution:	Christine Forde, Rick Bryant

Item: **Action:**

Presentation None

Rick Bryant presented the study findings to the board. These were divided into two parts, intersection operations and roadway accommodations north of the intersection. The operations side included adding lanes or installing a roundabout. The accommodations part considered adding a two way left turn lane (TWLTL), sidewalk, or both.

Audience Comments None

Comment: Instead of a TWLTL north of the intersection, consider two northbound lanes.
Response: The River Cove Road project uses a TWLTL, and it is safest to be consistent along the roadway. Also, a second lane would not carry many additional vehicles because it would end at the River Cove Rd project limits.

Comment: Sometimes VT 2A backs up all the way from Essex to Industrial Ave.

Comment: More traffic going through Industrial Ave onto VT 2A means it will be harder for people to get in and out of their driveways.

Many residents commented that ten feet is too wide for the multi-use path and that 5 feet is plenty wide enough.

Question: Can Five-Corners in Essex handle the additional traffic that would be created if the VT 2A/Industrial Ave intersection were to operate more efficiently?

Comment: There are not many residences on the east side of the street, so a sidewalk might not be necessary.

Comment: Pave River Cover Rd to offer another arterial.
Audience Response: The additional traffic would make it impossible to turn out of River Cove Rd.
Ken: River Cove Rd is a regional road, so South Burlington would need to work with Williston if anything is to be done.
Christine: River Cover Road is pretty long and would not work as a viable alternative.

Comment: VT 2A is being asked to do what the Circ was supposed to do, but it is no accomplishing it. Improvements to VT 2A will not alleviate the traffic.
Ken: After the Circ. was abandoned, there was a study to look at the whole network, and VT 2A was a major part of that study. The intersection was identified as possibly having a large effect if it was improved. Also, Circ. Alternative projects will receive priority funding from VTrans. See also the WENTS study.

Comment: Currently, it is difficult to make a left from the east side of VT 2A. If the intersection is improved to allow more traffic through, it will make it more difficult to get out of driveways along VT 2A.

Comment: There are quite a few accidents on VT 2A where someone is waiting to make a left turn and someone else passes the on the right. The passer will slide into the ditch and sometimes flip over. Often the police are not called, so these incidents would not be on record.

Comment: Consider reducing the speed limit on VT 2A; people currently go 50 mph by Morgan Parkway.

Asked to vote on alternatives:

Intersection: Add Lanes ~ 22, Roundabout ~ 8, Do Nothing ~ 3
Accommodations: TWLTL ~ more, Do Nothing ~ fewer

The meeting adjourned at 9:00 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

David Grover, EI
Transportation Engineer in Training
Phone: 802-864-0223
Fax: 802-864-0165
david.grover@stantec.com

Attachment: Attachment

c. Cc List

Meeting Minutes

Planning Commission Meeting

VT 2A Intersection Scoping Study / 195310861

Date/Time:	October 1, 2012 / 8:30 PM
Place:	Williston Town Offices
Next Meeting:	October 21, 2013
Attendees:	Planning Commission; Christine Forde, CCRPC; Rick Bryant, Stantec; David Grover, Stantec
Absentees:	Absentees
Distribution:	Stantec, CCRPC

Item:	Action:
Presentation	None
Rick Bryant presented the study findings to the board. These were divided into two parts, intersection operations and roadway accommodations north of the intersection. The operations side included adding lanes or installing a roundabout. The accommodations part considered adding a two way left turn lane (TWLTL), sidewalk, or both.	
Questions from the Commission	None
The Planning Commission expressed interest in the 2 lane roundabout option since it would keep traffic moving and provide a better level of service than the signalized intersection. However they expressed reservations about the public's reaction to roundabouts in the past. Rick stated that a public education effort would go a long way to attaining public acceptance of a roundabout and increasing the roundabout's functionality. At the public meeting for the project, some Williston residents had expressed opposition to roundabouts in Williston.	

The meeting adjourned at 9:30 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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c. Cc List

Meeting Minutes

Planning Commission Meeting

VT 2A Intersection Scoping Study / 195310861

Date/Time:	October 21, 2012 / 8:30 PM
Place:	Williston Town Offices
Next Meeting:	October 30, 2013
Attendees:	Williston Select Board; Bruce Hoar, Williston Public Works; Christine Forde, CCRPC; Rick Bryant, Stantec; David Grover, Stantec
Absentees:	Absentees
Distribution:	Stantec, CCRPC

Item:	Action:
Presentation	None

Rick Bryant presented the study findings to the board. These were divided into two parts, intersection operations and roadway accommodations north of the intersection. The operations side included adding lanes or installing a roundabout. The accommodations part considered adding a two way left turn lane (TWLTL), sidewalk, or both.

Questions from the Board — None

Some members of the board expressed interest in the 2 lane roundabout option since it would keep traffic moving.

One member noted that the roundabout level of service was not appreciably different than the level of service obtained with a signalized intersection and might not justify dealing with public reaction to the roundabout. The board agreed that public sentiment has largely been against roundabouts in the past.

Rick stated that a public education effort would go a long way to attaining public acceptance of a roundabout and increasing the roundabout's functionality. At the public meeting for the project, some Williston residents had expressed opposition to roundabouts in Williston.

One member was dismayed that the V/C ratio for both intersection options is similar to the existing V/C ratio. He concluded that the intersection improvements would not help a great deal. Rick responded that the V/C ratio was for 2032 traffic, so the improvements would give the town 20 years of better functionality. It is also possible that the projected traffic increases might be too high, which would provide a longer life for the improvements.

Members of the audience stated that the problem is that there are too many cars on the road and a better solution would be to give the cars an alternative route to get to their destinations. Although this is beyond the scope of this study, Christine explained that a previous study had examined alternative routes in response to the Circ being canceled, and 2A was identified an important link the

network. There was not a way to redirect traffic without the Circ. The best option was to improve operations at this intersection.

A board member stated that he was hoping for something that would permanently solve the traffic problems at this location and expressed dismay that this would not. Rick responded that, given the existing constraints, this is the best that could be done. Building out the intersection to the point where it would operate at level of service A would require a great deal of additional pavement. Furthermore, improving operations to that degree would likely attract more traffic.

The meeting adjourned at 9:30 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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c. Cc List

APPENDIX L

PUBLIC COMMENTS

Island Line Trail
Causeway Bike Ferry
Bike Recycle Vermont
Safe Routes to School
Online Trail Finder
Trailside Center

LOCAL MOTION
Trails and Bikeways

1 Steele Street #103
Burlington, VT 05401
(p) 802.652.2453
(f) 802.861.2700
info@localmotion.org
www.localmotion.org

MEMORANDUM

To: Christine Forde, Senior Planner, CCRPC
From: Katelin Brewer-Colie, Complete Streets Project Manager
Date: October 28, 2013

RE: Williston VT 2A Scoping Study - Industrial Ave/Mountain View Dr. to River Cove Rd.

Local Motion appreciates the opportunity to comment on the WENTS VT 2A Scoping Study - Industrial Avenue/Mountain View to River Cove Road project in Williston. As part of our contract with the Chittenden Regional Planning Commission, Local Motion provides expertise and input related to bike and pedestrian issues as applied to various projects. The many projects that are a part of the CIRC Alternatives implementation process are a once-in-a-generation opportunity to contribute to a safe and convenient transportation network for a range of users including cyclists, pedestrians and automobiles.

Local Motion is happy to see that walk and bike facilities have been incorporated into this project. We would like to offer several suggestions that, if implemented, would reinforce and expand options for walking and biking within the design. This letter serves as our official comment related to the proposed project alternatives. We respectfully submit these comments with the recommendations below.

Intersection at VT 2A and Industrial Ave/Mountain View Road

Of the two viable options (Option 3 and 7), Local Motions supports Option 7, the dual-lane roundabout. Research shows that roundabouts have fewer conflict points and lower speeds compared to conventional intersection designs, both of which are better for bicyclists and pedestrians. We offer the following feedback in this regard:

- **Carry the existing path on the east side of 2A through the intersection to the southern boundary of the project area.** Although most of the gap in the 2A path falls outside of the project area (i.e., from Industrial Ave to just north of Blair Park Road), it will save money in the long run if the intersection is designed to safely move walk-bike traffic across the mouth of Industrial Ave.
- **Construct the intersection initially as a single-lane roundabout.** As noted by the consultant at the public meeting, a single-lane design would adequately manage traffic volumes for many years. This would postpone the need for a 5-lane cross section just north of the intersection, which would decrease project cost as well as reduce crossing distances. *VTrans' design for the Shelburne Road roundabout on the south side of Burlington is a useful model in this regard, as it has been designed as a single-lane roundabout that can be converted easily to a partial two-lane roundabout in the future if conditions warrant.*
- **Add a sidewalk on the south side of Industrial Ave. from 2A to**

just before the road crosses Allen Brook. Given the curve in the road and the high speed and volume of traffic on Industrial Ave., the north side sidewalk is not adequate for south-side destinations.

VT 2A Cross Section Improvements in Study Area

Local Motion recommends reducing lane width throughout the project to 11 feet. Lane widths in the current design -- typically 12 or 13 feet -- are inconsistent with VTrans road standards. According to VT State Design Standards, lanes on Urban and Village Minor Arterials can vary from 10 to 12 feet wide, with a preference for 11 feet. Quoting Section 4.5 of the standards:

> *"Reduced lane widths ... facilitate pedestrian crossings because of reduced distance. They are also more economical to construct. An 11-foot lane width is adequate for through lanes, continuous two-way left-turn lanes and a lane adjacent to a painted median"*

Additional recommendations are as follows:

- **We recommend Option N2 as by far the best of the proposed designs for bicyclist and pedestrian safety.** We prefer this option because it includes both on-road bike facilities and a multi-use path on one side of the road for cyclists seeking protection from cars, as well as pedestrian facilities on both sides of the roadway.
- **If option N2 is not feasible, we recommend the "Existing + Sidewalk On East Side of 2A" option as a second choice.** This option is acceptable because it provides pedestrian facilities on both sides of 2A and results in the shortest crossing distance.
- **If Option N1 is selected, we request the following modifications make it safer and more manageable for people walking and biking:**
    - **Replace the 10 foot multi-use path with a 5 foot sidewalk.** Then add bike lanes to the road to accommodate the high volumes of commuter bicycle traffic on this route.
    - **Reduce the travel lane width from 12 feet/13 feet to 11 feet.** Use the freed-up right-of-way to create a 5 foot sidewalk and 3 foot buffer on east side of 2A so pedestrians have a safe place to walk on both sides of 2A.

Finally, we very much appreciate the innovative design consideration given to pedestrian crossings north of River Cove Road with the pedestrian refuge and use of HAWK signals. This should be preserved regardless of the option selected.

We appreciate the opportunity to comment on this project. I would be happy to meet to talk more with you about our recommendations.

APPENDIX M

VTRANS ALTERNATIVES MATRIX

VT 2A - Industrial Avenue/Mountain View Road to River Cove Road
Scoping Study: Alternatives Evaluation Matrix

Stantec
Revised February 7, 2014

ITEM	Better	Neutral	Worse	Full Lane Additions To Intersection	Better	Neutral	Worse	Mordern Dual Lane Roundabout
Purpose and Need								
Address existing and future traffic congestion and enhance safety for all users		√		Yes		√		Yes
Improve bike-pedestrian travel along VT 2A between Industrial Avenue and River Cove Road		√		Yes		√		Yes
IMPACTS								
Property Impacts (including commercial)			√	15	√			5
Utility Impacts (Utility poles)		√		14		√		12
New Impervious Area Added		√		25,000± sf		√		24,000± sf
Outside of Existing ROW			√	5,100± sf	√			1,300± sf
Class II Wetland Impacts		√		none		√		none
Historic Property Impacts			√	7 Potential Trees	√			5 Potential Trees
Archeological Impacts		√		If impacting previously undisturbed land		√		If impacting previously undisturbed land
Safety								
Provides Gaps for Driveways Along the Streets	√			Yes			√	No
Number of Lanes to Cross at Crosswalks			√	4	√			2
Typical Crash Reduction[1]			√	None	√			29%
Local Familiarity with Intersection Type	√			Yes			√	No
Lighting at Intersections		√				√		
Conformance with Town Standards		√		Yes		√		Yes
Permits								
ACT 250		√		Only if connecting to a previously permitted segment		√		Only if connecting to a previously permitted segment
NEPA		√		CE		√		CE
404 COE Wetlands (< 3,000 SF Impact - Category 1: Non-Reporting)		√		Non-Reporting		√		Non-Reporting
ANR Wetlands		√		No		√		No
Stream Alteration		√		No		√		No
Stormwater Discharge		√		Yes		√		Yes
Construction General		√		Yes		√		Yes
Archaeology - Phase 1B		√		Yes		√		Yes
Section 106 / Historic		√		Yes		√		Yes
Prime Agricultural Soils		√		Yes - Need NRCS clearance via form AD-1006		√		Yes - Need NRCS clearance via form AD-1006
Rare, Threatened, Endangered Species		√		No		√		No
PROJECT COST ESTIMATE								
Conceptual Construction Cost [2 & 3]				$2,460,000.00				$2,830,000.00
Preliminary Engineering (15%)				$369,000.00				$424,500.00
Construction Engineering (10%)				$246,000.00				$283,000.00
Municipal Project Manager (7%)				$172,200.00				$198,100.00
Legal Fees				$25,000.00				$25,000.00
ROW Cost				TBD				TBD
Total Estimated Project Cost	√			$3,272,200.00			√	$3,760,600.00

Matrix Footnotes:

[1] U.S. Department of Transportation. ROUNDABOUTS: An Informational Guide. By B.W. Robinson. McLean, Virginia: June 2000. (FHWA-RD-00-067).

[2] Prices are drawn from recent VTrans Project Bid Tab or 5-yr Average

[3] Traffic control at 20% per CCRPC due to magnitude of Circ Projects

VT 2A - Industrial Avenue/Mountain View Road to River Cove Road
Scoping Study: Alternatives Evaluation Matrix

Stantec
Revised February 7, 2014

ITEM	Better	Neutral	Worse	Add Third Lane	Better	Neutral	Worse	Add Third Lane and Sidewalk
Purpose and Need								
Address existing and future traffic congestion and enhance safety for all users		√		Yes		√		Yes
Improve bike-pedestrian travel along VT 2A between Industrial Avenue and River Cove Road		√		Yes		√		Yes
IMPACTS								
Property Impacts (including commercial)	√			None			√	17
Utility Impacts (Utility poles)		√		14		√		14
New Impervious Area Added	√			27,000± sf		√		50,000± sf
Outside of Existing ROW	√			0 sf			√	15,000± sf
Class II Wetland Impacts		√		none		√		none
Historic Property Impacts	√			6 Potential Trees			√	11 Potential Trees
Archeological Impacts		√		If impacting previously undisturbed land		√		If impacting previously undisturbed land
Safety								
Bikelanes		√		Yes		√		Yes
Crosswalks		√		Yes		√		Yes
Pedestrian Refuge Island		√		Yes		√		Yes
Sidewalk/Multi-Use Path on both sides of street			√	No	√			Yes
Conformance with Town Standards		√		Yes		√		Yes
Permits								
ACT 250		√		Only if connecting to a previously permitted segment		√		Only if connecting to a previously permitted segment
NEPA		√		CE		√		CE
404 COE Wetlands (< 3,000 SF Impact - Category 1: Non-Reporting)		√		Non-Reporting		√		Non-Reporting
ANR Wetlands		√		No		√		No
Stream Alteration		√		No		√		No
Stormwater Discharge		√		Yes		√		Yes
Construction General		√		Yes		√		Yes
Archaeology - Phase 1B		√		Yes		√		Yes
Section 106 / Historic		√		Yes		√		Yes
Prime Agricultural Soils		√		Yes - Need NRCS clearance via form AD-1006		√		Yes - Need NRCS clearance via form AD-1006
Rare, Threatened, Endangered Species		√		No		√		No
PROJECT COST ESTIMATE								
Conceptual Construction Cost [2 & 3]				$1,560,000.00				$1,870,000.00
Preliminary Engineering (15%)				$234,000.00				$280,500.00
Construction Engineering (10%)				$156,000.00				$187,000.00
Municipal Project Manager (7%)				$109,200.00				$130,900.00
Legal Fees				$25,000.00				$25,000.00
ROW Cost				TBD				TBD
Total Estimated Project Cost	√			$2,084,200.00			√	$2,493,400.00