

# FINAL SCOPING REPORT

## Bennington Streetscape Improvement Project BENNINGTON STP SDWK (12)

August 2014



Bennington County Regional Commission



# Table of Contents

Purpose & Need	3
Project Area Photos	5
Conceptual Plans	
Aldi Driveway to Performance Drive	6
Performance Drive to East Road	13
Cost Estimate	17
Appendix	
Bike/Pedestrian Count	21
Capacity and Delay Analysis	22
Traffic Count	27

# PURPOSE & NEED

**Statement of Purpose and Need**  
**Bennington Streetscape Improvement Project**  
**Bennington STP SDWK (12)**

**Project Purpose**

The purpose of this project is to create safe and appealing pedestrian access, with accommodations for bicycles where possible, along Northside Drive / Kocher Drive near the intersection with US Route 7.

**Project need**

The project area has high traffic volume but no facilities for pedestrians or cyclists who must tolerate unsafe conditions to use the roadway. Kocher Drive/Northside Drive is the only east-west passage for 2.3 miles between Houghton Lane and County Street and is a key link in the local transportation network.

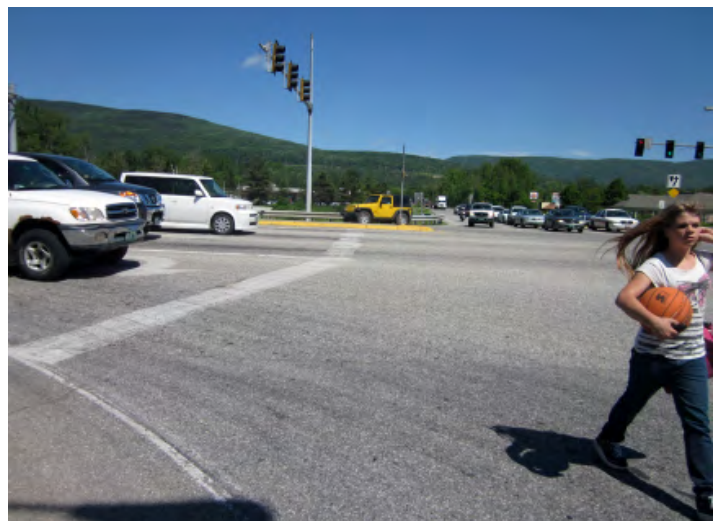
The route is a developed commercial “strip” with large retail stores, offices, and industrial parks. US 7 is a 6-lane wide limited-access highway immediately north of the Kocher Drive/US 7 intersection which has no pedestrian accommodations, acting as a barrier to east-west pedestrian movement, and has the highest traffic volume in the region. These roadways and intersections are a deterrent, discouraging pedestrian travel between the region’s most populous residential neighborhood to the south and the commercial uses to the north and west.

Mount Anthony Union Middle School, Mount Anthony Union High School, Grace Christian School and Molly Stark Elementary School are all nearby, and many children walk along the edge of the roadway and cross the Kocher Drive/US 7 intersection. Notably, the middle school has a wide multi-use path used by many students, which extends to the eastern edge of the project area, yet does not connect west through the project area to the neighborhoods on the western side. It is likely that many other children choose not to walk to school because of the lack of safe and appealing pedestrian facilities. There is growing evidence that infrastructure that promotes driving over “active transportation” has contributed to the public health epidemics of childhood obesity and type 2 diabetes.

Many additional concerns and deficiencies with the project area’s intersections and roadways support the purpose including:

- Despite the numerous pedestrians and cyclists who use the roadway, there are no sidewalks (except on Northside Drive west of Benmont Avenue), crosswalks, pedestrian signals, or bike lanes, and only limited paved roadway shoulders.
- The lack of pedestrian facilities encourages driving, even for short trips, and limits transportation options.
- All three of the project area’s intersections are high crash locations (HCLs).
- The bridge on Kocher Drive is too narrow to safely accommodate pedestrians, cyclists and motor vehicles.
- Roadway hardware (guardrail, signal mast poles and drainage structures) adjacent to the roadway pushes pedestrians and cyclists close to motor vehicle traffic.
- Steep slopes at the roadway’s edge limit space for pedestrians.
- The lack of street trees or landscaping makes walking less appealing and does not promote traffic calming.
- Inadequate lighting makes it difficult to see pedestrians and cyclists at night.

# Project Area Photos



CONCEPTUAL PLANS

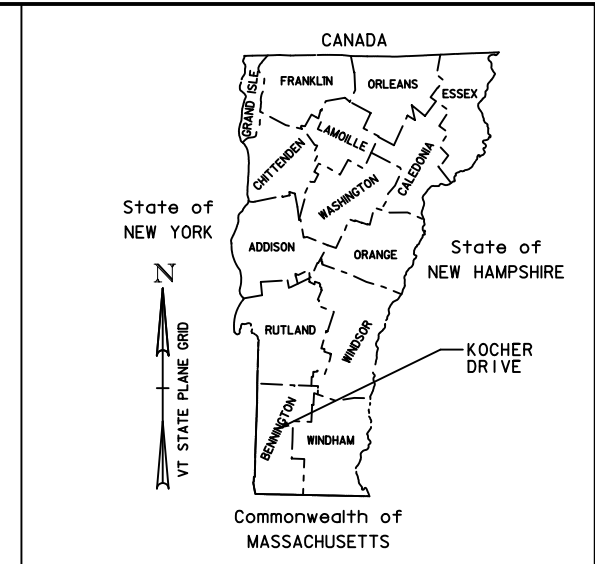
ALDI DRIVEWAY TO  
PERFORMANCE DRIVE

(STATE PROJECT)

# BENNINGTON COUNTY REGIONAL COMMISSION

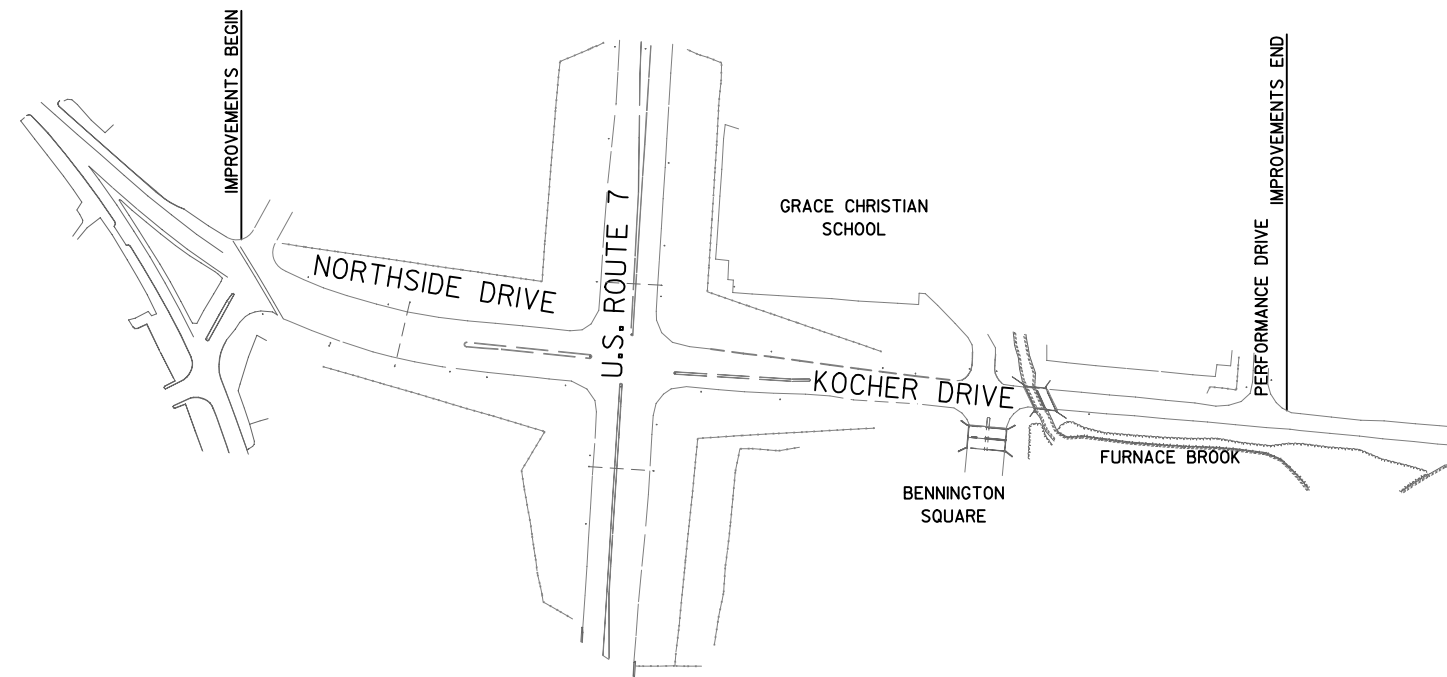


## KOCHER DRIVE STREETScape IMPROVEMENTS ALDI DRIVEWAY TO PERFORMANCE DRIVE BENNINGTON STP SDWK (12)



### INDEX OF SHEETS

- 1 TITLE SHEET
- 2 GENERAL PROJECT LAYOUT
- 3 CONCEPTUAL PLAN 1
- 4 CONCEPTUAL PLAN 2
- 5 TYPICAL SECTIONS 1
- 6 TYPICAL SECTIONS 2



### CONVENTIONAL SYMBOLS

COUNTY LINE	
TOWN LINE	
LIMITS OF ACCESS	
POINT OF ACCESS	
FENCE LINE	
STONE WALL	
TRAVELED WAY	
GUARD RAIL	
RAILROAD	
SURVEY LINE	
CULVERT	
POWER POLE	
TELEPHONE POLE	
TREES	
CONTROL OF ACCESS	
PROPERTY LINE	
R.O.W. TAKING LINE	
SLOPE RIGHTS	
TOP OF CUT	
TOE OF SLOPE	

### DATUM

VERTICAL NGVD 88  
HORIZONTAL NAD 83

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION

PLANS PREPARED BY:



URS CORPORATION  
3 CORPORATE DRIVE, SUITE 203  
CLIFTON PARK, NY 12065  
PH\* (518) 688-0015



112 SPRING STREET, SUITE 305  
SARATOGA SPRINGS, NY 12866  
(518) 583-4335

BCRC PROJECT MANAGER : MARK ANDERS

URS PROJECT MANAGER : MARK ARMBRUST

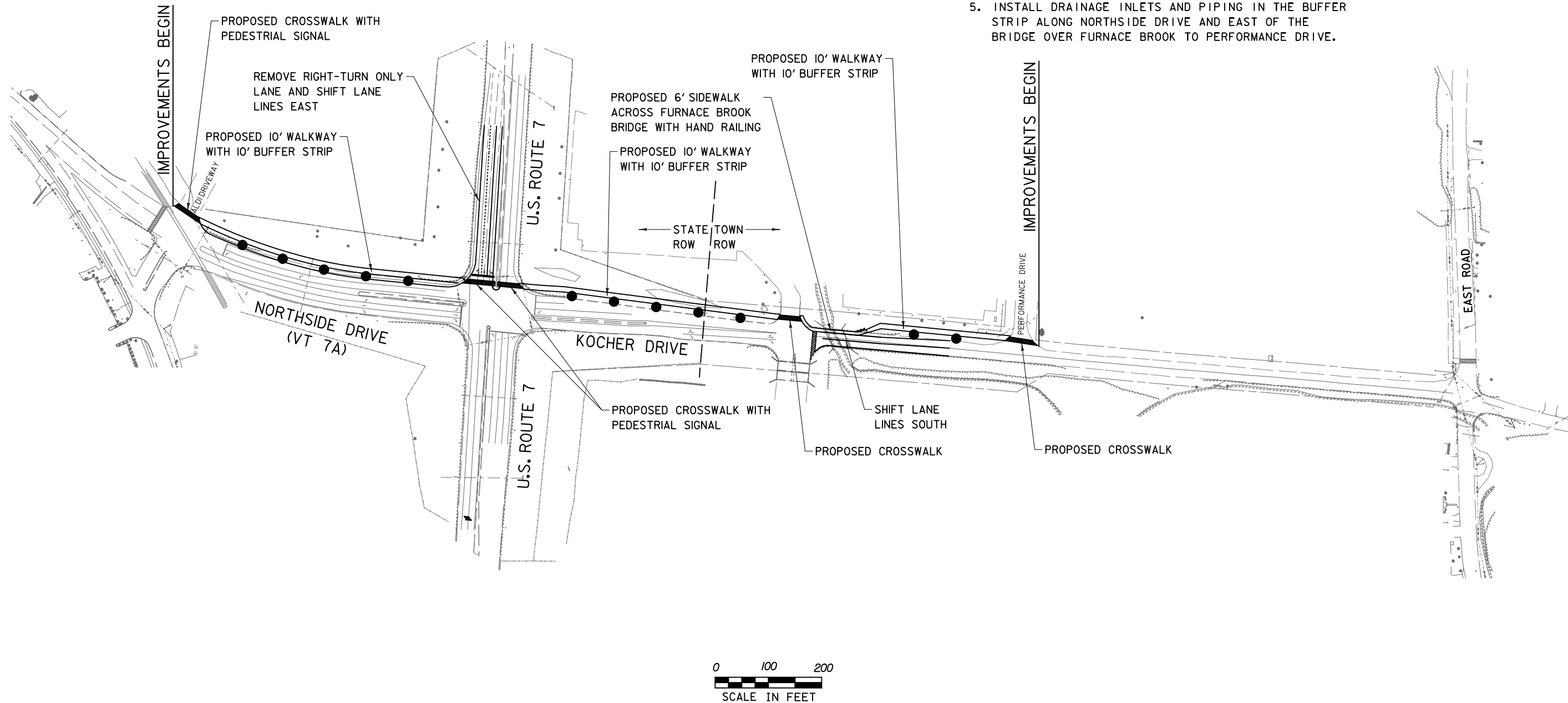
PROJECT NAME : KOCHER DRIVE STREETScape IMPROVEMENTS

PROJECT NUMBER : STP SDWK (12)  
SHEET 1 OF 6 SHEETS

URS PROJECT NO.  
38397221

8/14/2014 J:\3839722\Kocher Drive Streetscape Phase A\6.0 CADD\concept\_design\_gp1\_VTrans.dgn

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION



**PROJECT DESCRIPTION**

1. CONSTRUCT A 10' WIDE WALKWAY WITH BUFFER STRIP FROM EDGE OF TRAVEL LANE TO THE WALKWAY (APPROXIMATELY 10' WIDE) ALONG THE NORTH SIDE OF NORTHSIDE DRIVE AND KOCHER DRIVE FROM THE ALDI DRIVEWAY TO PERFORMANCE DRIVE.
2. INSTALL PEDESTRIAN SIGNALS AT THE ALDI INTERSECTION AND THE ROUTE 7 INTERSECTION.
3. INSTALL CROSSWALK PAVEMENT MARKINGS AT STREET AND DRIVEWAY CROSSINGS.
4. CONSTRUCT A CONCRETE SIDEWALK WITH CURB ACROSS THE FURNACE BROOK BRIDGE, INCLUDING INSTALLATION OF A PEDESTRIAL RAILING AND LANE SHIFT.
5. INSTALL DRAINAGE INLETS AND PIPING IN THE BUFFER STRIP ALONG NORTHSIDE DRIVE AND EAST OF THE BRIDGE OVER FURNACE BROOK TO PERFORMANCE DRIVE.



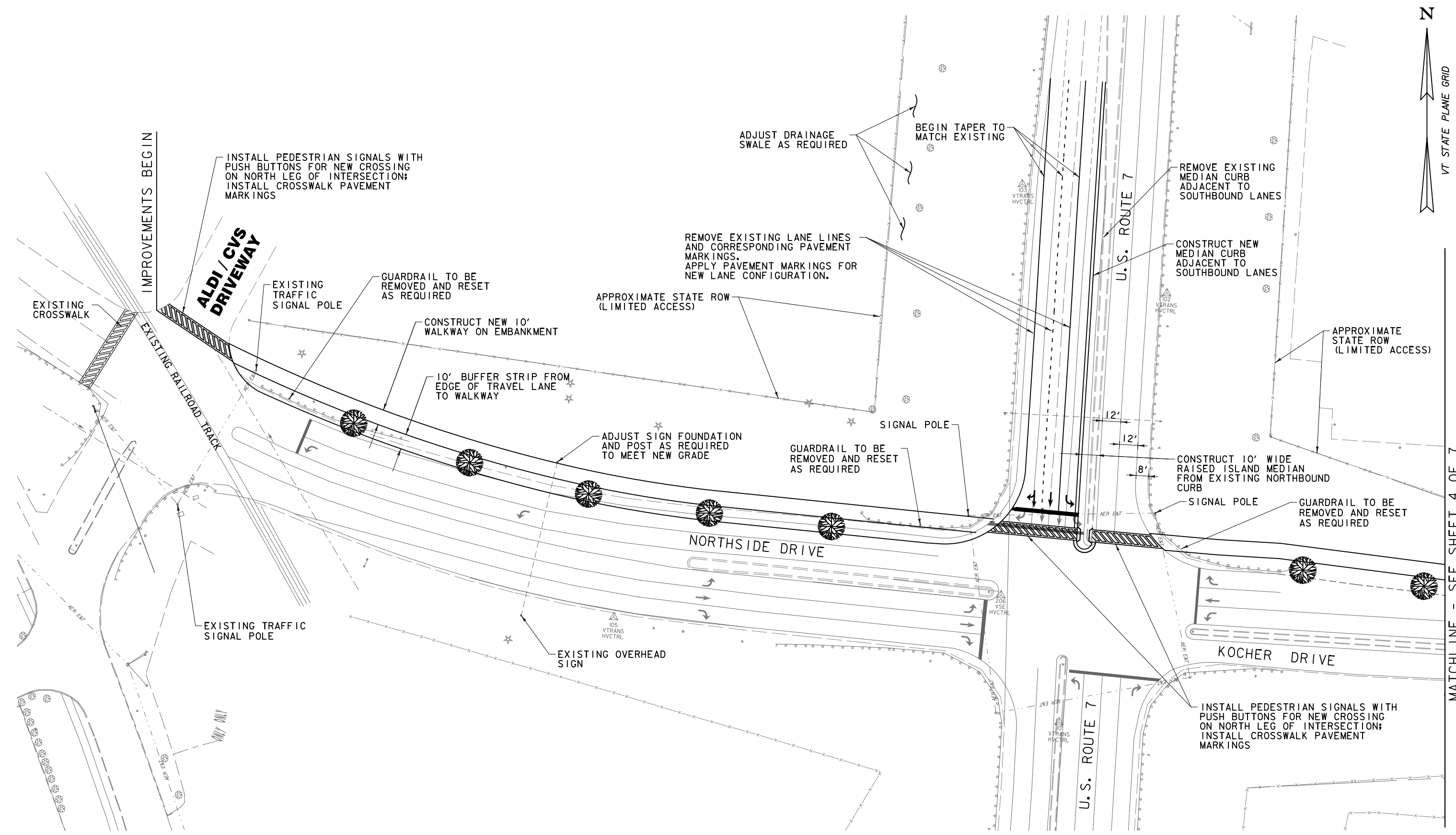
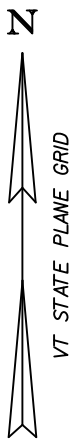
**TOWN OF BENNINGTON, VERMONT**



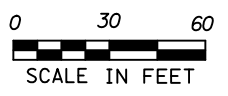
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PROJECT NUMBER: STP SDWK (12)  
FILE NAME: concep\_design\_gp1\_VTrans.dgn  
PROJECT LEADER: M. ARMBRUST  
DESIGNED BY: C. BEHAN  
GENERAL PROJECT LAYOUT  
DRAWN BY: M. WASSON  
CHECKED BY:  
SHEET 2 OF 6



8/14/2014 J:\38397221\Kocher Drive Streetscape Phase A\6.0 CADD\concept\_design\VTans.dgn



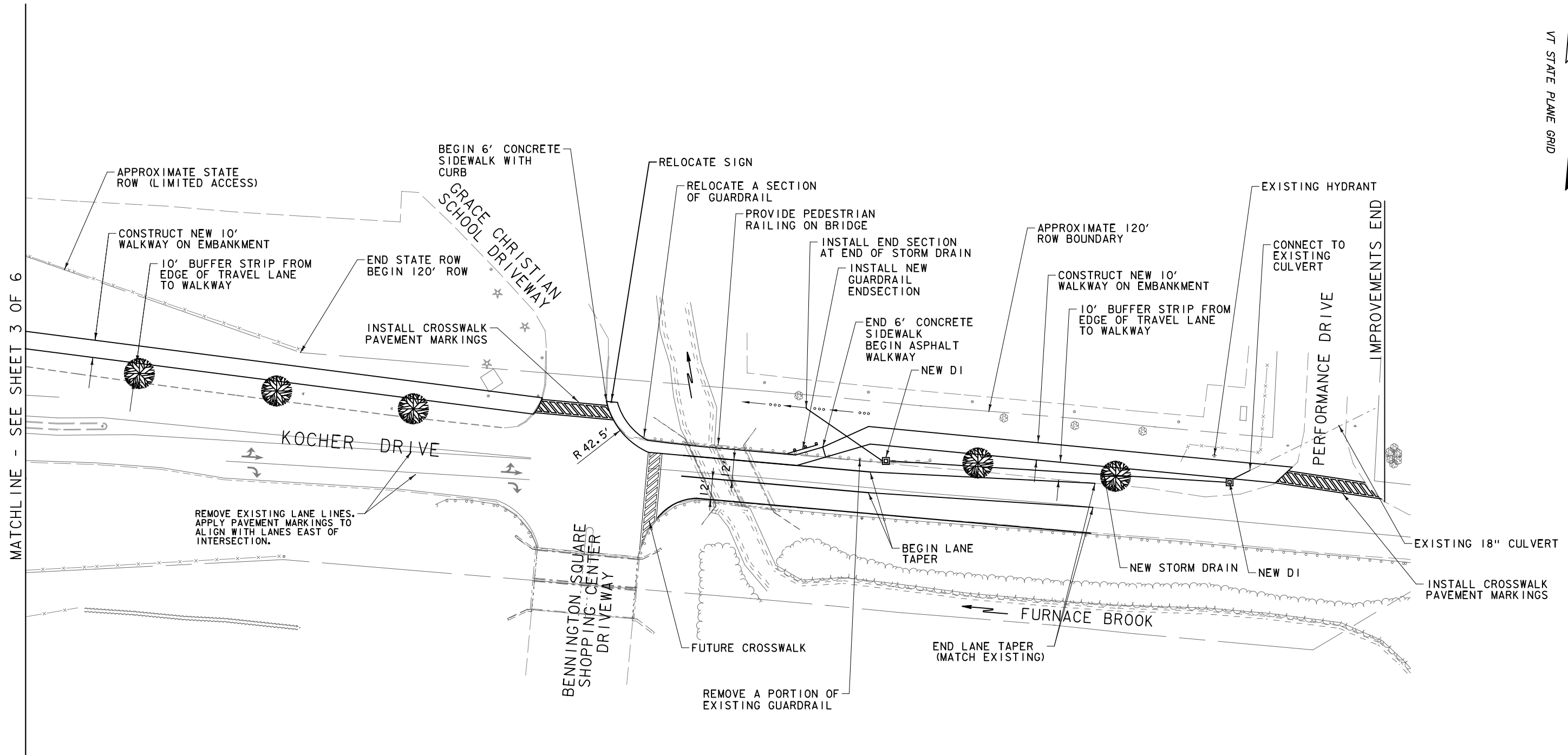
CONCEPTUAL PLAN - NOT FOR CONSTRUCTION



### TOWN OF BENNINGTON, VERMONT

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 PROJECT NUMBER: STP SDWK (12)  
 FILE NAME: concep\_design\VTans.dgn PLOT DATE: 8/14/2014  
 PROJECT LEADER: M. ARMBRUST DRAWN BY: M. WASSON  
 DESIGNED BY: C. BEHAN CHECKED BY:  
 CONCEPTUAL PLANS 1 SHEET 3 OF 6

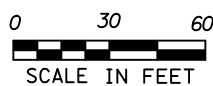
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MATCHLINE - SEE SHEET 3 OF 6

IMPROVEMENTS END

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION



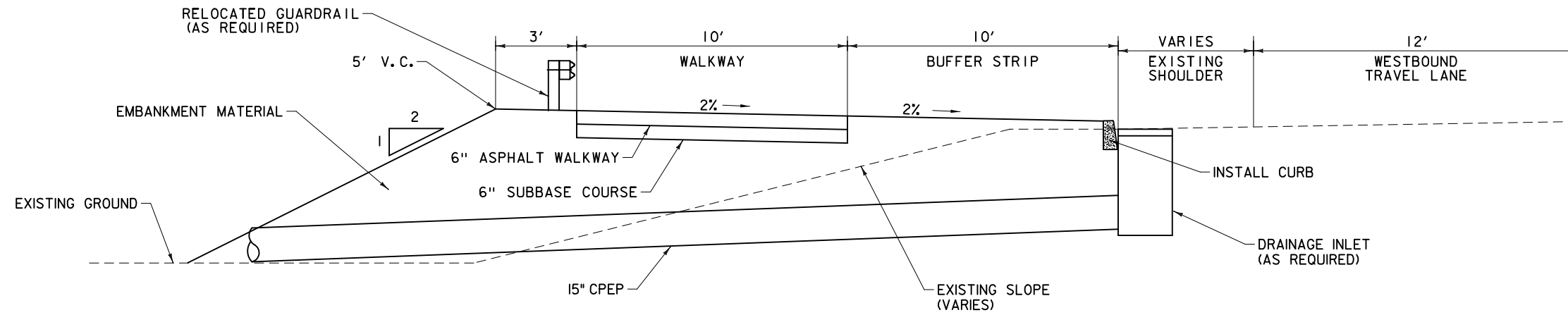
**BEHAN PLANNING AND DESIGN**  
112 SPRING STREET, SUITE 305  
SARATOGA SPRINGS, NY 12866  
(518) 583-4335

**TOWN OF BENNINGTON, VERMONT**

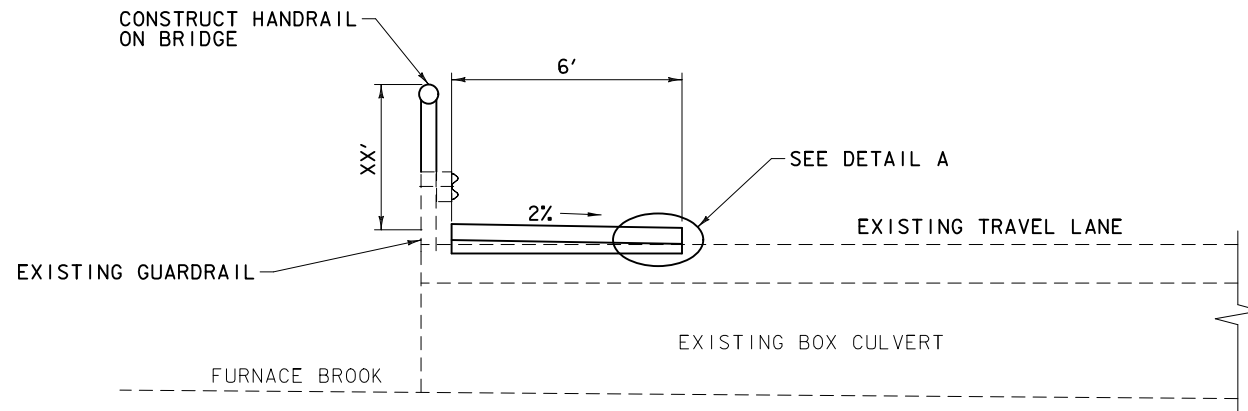
**URS CORPORATION**  
3 CORPORATE DRIVE, SUITE 203  
CLIFTON PARK, NY 12065  
(518) 688-0015

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PROJECT NUMBER: STP SDWK (12)	PROJECT LEADER: M. ARMBRUST	DRAWN BY: M. WASSON
	DESIGNED BY: C. BEHAN	CHECKED BY:
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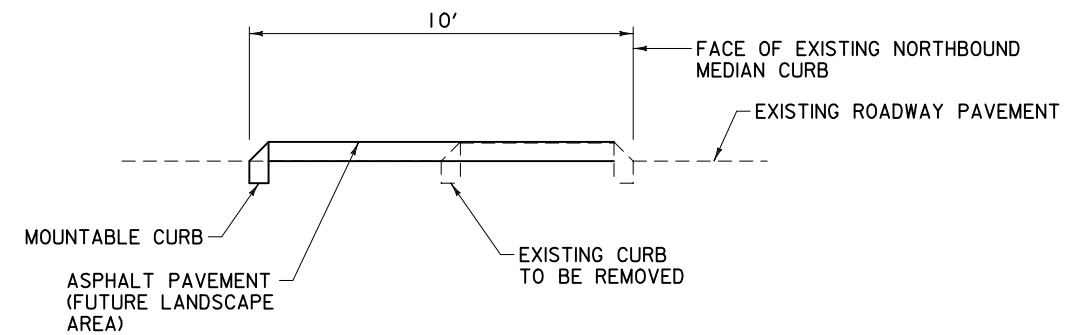
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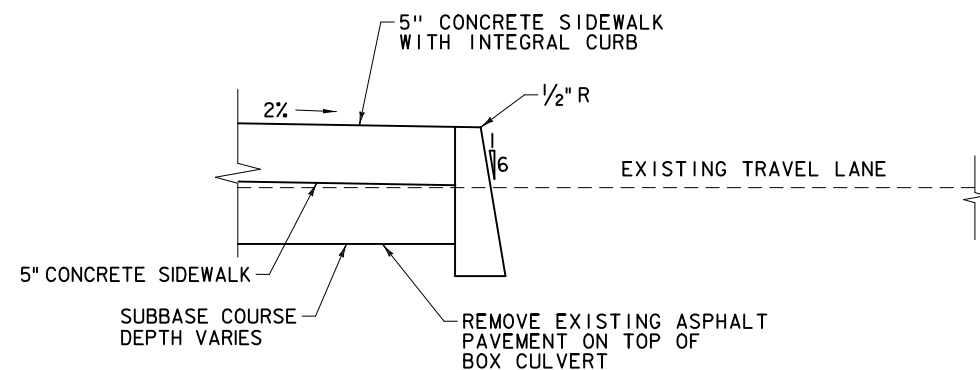
**TYPICAL SECTION I**  
 NORTHSIDE DRIVE / KOCHER DRIVE (US7 TO GRACE CHRISTIAN SCHOOL DRIVEWAY)  
 NOT TO SCALE



**TYPICAL SECTION 2**  
 KOCHER DRIVE - BRIDGE OVER FURNACE BROOK  
 NOT TO SCALE



**TYPICAL SECTION 3**  
 US ROUTE 7 - KOCHER DRIVE TO 305 FEET NORTH OF KOCHER DRIVE  
 NOT TO SCALE



**DETAIL A**  
 NOT TO SCALE

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION

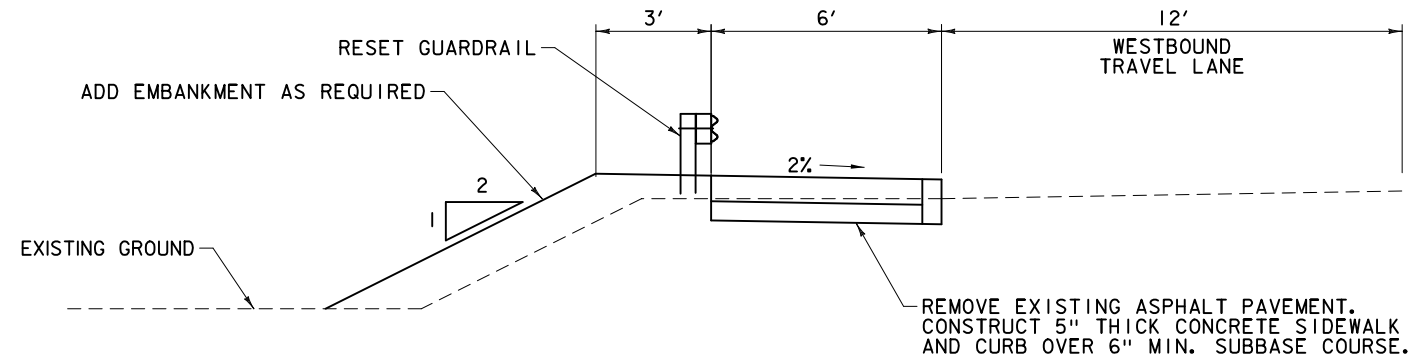


**TOWN OF BENNINGTON, VERMONT**

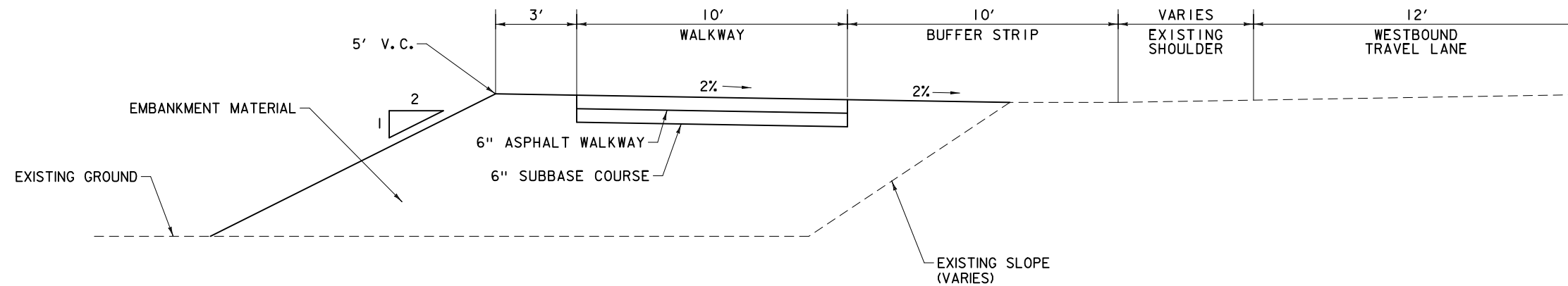
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 PROJECT LEADER: M. ARMBRUST  
 DESIGNED BY: C. BEHAN  
 TYPICAL SECTIONS I

DATE: 8/14/2014  
 DRAWN BY: M. WASSON  
 CHECKED BY:  
 SHEET 5 OF 6

8/14/2014 J:\38397221\Kocher Drive Streetscape Phase A\6.0 CADD\concept\_design\_typ\_VTrans.dgn



**TYPICAL SECTION 4**  
 KOCHER DRIVE - AT APPROACHES TO BRIDGE OVER FURNACE BROOK (WITHIN EXISTING ROADWAY)  
 NOT TO SCALE



**TYPICAL SECTION 5**  
 KOCHER DRIVE - EAST OF FURNACE BROOK TO PERFORMANCE DRIVE  
 NOT TO SCALE

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION



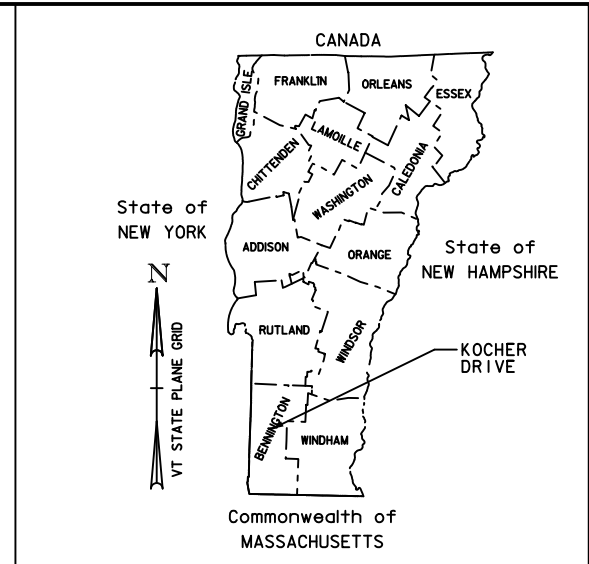
<b>TOWN OF BENNINGTON, VERMONT</b>	
<b>URS</b>	
URS CORPORATION 3 CORPORATE DRIVE, SUITE 203 CLIFTON PARK, NY 12065 (518) 688-0015	
PROJECT NAME: KOCHER DRIVE STREETScape IMPROVEMENTS PROJECT NUMBER: STP SDWK (12)	FILE NAME: concep_design_typ_VTrans.dgn PROJECT LEADER: M. ARMBRUST DESIGNED BY: C. BEHAN TYPICAL SECTIONS 2
DATE: 8/14/2014 DRAWN BY: M. WASSON CHECKED BY: SHEET 6 OF 6	

CONCEPTUAL PLANS  
PERFORMANCE DRIVE  
TO EAST ROAD  
(TOWN PROJECT)

# BENNINGTON COUNTY REGIONAL COMMISSION

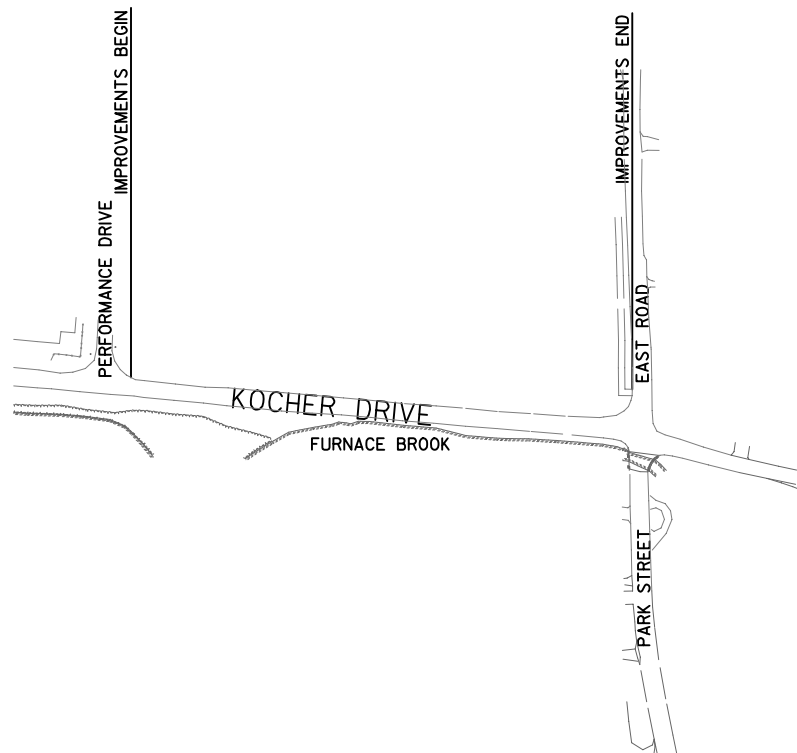


## KOCHER DRIVE STREETScape IMPROVEMENTS PERFORMANCE DRIVE TO EAST ROAD



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TREES	
CONTROL OF ACCESS	
PROPERTY LINE	
R.O.W. TAKING LINE	
SLOPE RIGHTS	
TOP OF CUT	
TOE OF SLOPE	

### DATUM

VERTICAL NGVD 88  
HORIZONTAL NAD 83

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION

PLANS PREPARED BY:



URS CORPORATION  
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BCRC PROJECT MANAGER : MARK ANDERS

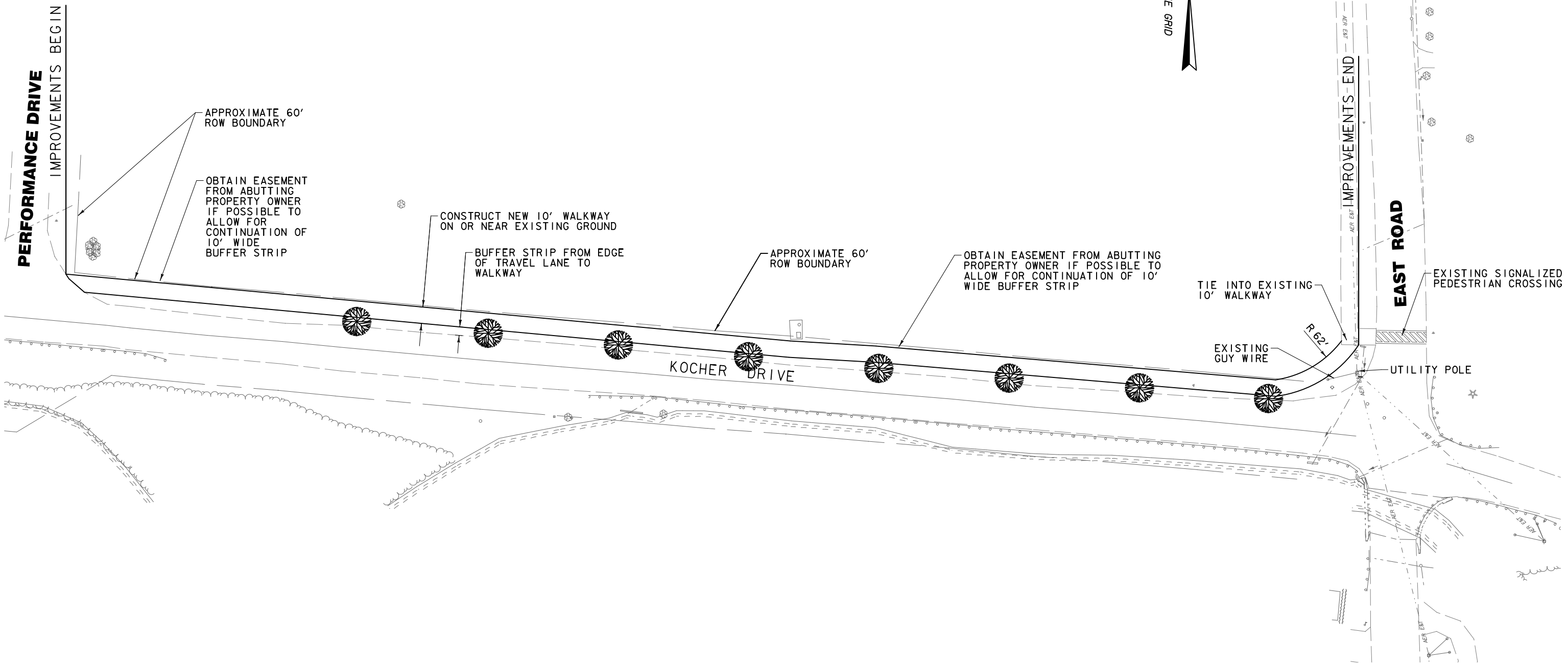
URS PROJECT MANAGER : MARK ARMBRUST

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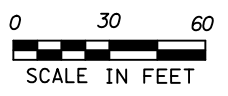
PROJECT NUMBER : TBD  
SHEET 1 OF 3 SHEETS

URS PROJECT NO.  
38397221

8/14/2014 J:\38397221\Kocher Drive Streetscape Phase A\6.0 CADD\concept\_design3\_Town.dgn



CONCEPTUAL PLAN - NOT FOR CONSTRUCTION



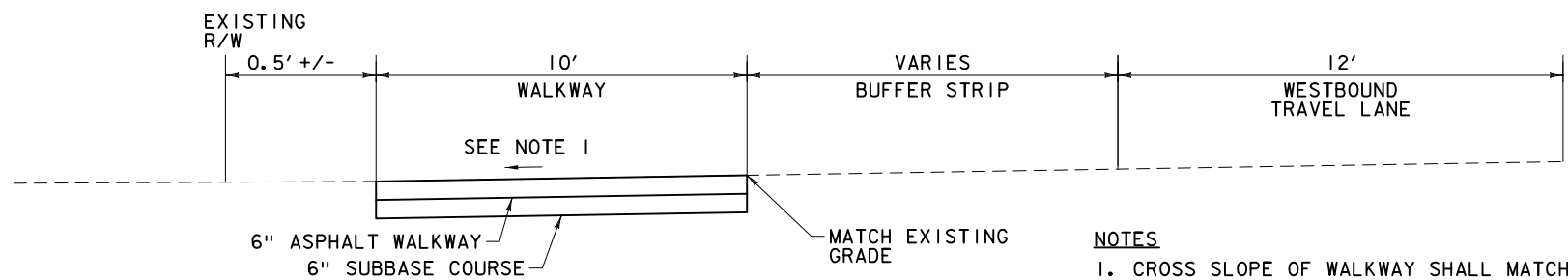
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**TOWN OF BENNINGTON, VERMONT**

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PROJECT NAME: KOCHER DRIVE STREETScape IMPROVEMENTS	PROJECT NUMBER: TBD
FILE NAME: concep_des igh3_Town.dgn	PLOT DATE: 8/14/2014
PROJECT LEADER: M. ARMBRUST	DRAWN BY: M. WASSON
DESIGNED BY: C. BEHAN	CHECKED BY:
CONCEPTUAL PLAN	SHEET 2 OF 3

8/14/2014 J:\38397221\Kocher Drive Streetscape Phase A\6.0 CADD\concept\_design\_typ\_Town.dgn




- NOTES**
- CROSS SLOPE OF WALKWAY SHALL MATCH EXISTING TERRAIN. WALKWAY SHALL BE CONSTRUCTED SO AS NOT TO IMPEDE EXISTING DRAINAGE CONDITIONS.

TYPICAL SECTION  
 KOCHER DRIVE - PERFORMANCE DRIVE TO EAST ROAD  
 NOT TO SCALE

CONCEPTUAL PLAN - NOT FOR CONSTRUCTION



<b>TOWN OF BENNINGTON, VERMONT</b>	
	PROJECT NAME: KOCHER DRIVE STREETScape IMPROVEMENTS
URS CORPORATION 3 CORPORATE DRIVE, SUITE 203 CLIFTON PARK, NY 12065 (518) 688-0015	PROJECT NUMBER: TBD
FILE NAME: concep_design_typ_Town.dgn	LOT DATE: 8/14/2014
DESIGNED BY: C. BEHAN	DRAWN BY: M. WASSON
TYPICAL SECTIONS	CHECKED BY:
	SHEET 3 OF 3



# COST ESTIMATE

**Kocher Drive Streetscape Improvements  
Construction Estimate - State  
August 2014**

ITEM NO.	DESCRIPTION	UNIT	VAOT 5 YR AVG PRICE	ESTIMATED QUANTITY STATE	TOTAL COST STATE
201.11	CLEARING AND GRUBBING	ACRE	\$12,400.00	0.4	\$4,960.00
203.30	EARTH BORROW	CY	\$9.82	5760	\$56,563.20
301.25	SUBBASE OF CRUSHED GRAVEL, COARSE GRADED	CY	\$33.90	320	\$10,848.00
525.44	BRIDGE RAILING	LF	\$110.00	40	\$4,400.00
601.2610	15" DIA. CPEP (SL)	LF	\$30.90	50	\$1,545.00
601.2615	18" DIA. CPEP (SL)	LF	\$35.80	263	\$9,415.40
601.7010	15" CPEPES	EA	\$371.00	2	\$742.00
601.7015	18" CPEPES	EA	\$357.00	1	\$357.00
604.18	PRECAST REINFORCED CONCRETE CATCH BASIN WITH CAST IRON GATE	EA	\$2,750.00	4	\$11,000.00
616.41	REMOVAL OF EXISTING CURB	LF	\$5.28	320	\$1,689.60
618.10	PORTLAND CEMENT CONCRETE SIDEWALK, 5 INCH	SY	\$60.70	100	\$6,070.00
618.15	BITUMINOUS CONCRETE SIDEWALK	TON	\$215.00	730	\$156,950.00
621.50	MANUFACTURED TERMINAL SECTION, FLARED	EA	\$1,780.00	1	\$1,780.00
621.70	GUARDRAIL APPROACH SECTION, GALVANIZED TYPE I	EA	\$1,940.00	1	\$1,940.00
621.75	REMOVE AND RESET GUARDRAIL	LF	\$5.78	300	\$1,734.00
621.80	REMOVAL AND DISPOSAL OF GUARDRAIL	LF	\$2.02	100	\$202.00
621.81	REMOVAL AND DISPOSAL OF GUIDE POSTS	EA	\$6.99	20	\$139.80
635.11	MOBILIZATION/DEMOBILIZATION	LS	N/A	1	\$16,100.00
641.10	TRAFFIC CONTROL	LS	N/A	1	\$20,000.00
646.20	4" WHITE LINE	LF	\$0.08	1650	\$132.00
646.21	4" YELLOW LINE	LF	\$0.06	620	\$37.20
646.214	6" WHITE LINE	LF	\$0.09	1500	\$135.00
646.215	6" YELLOW LINE	LF	\$0.09	500	\$45.00
646.26	24" STOP BAR	LF	\$1.33	50	\$66.50
646.30	LETTER OR SYMBOL	EA	\$19.90	7	\$139.30
646.31	CROSSWALK MARKING	LF	\$3.53	230	\$811.90
646.85	REMOVAL OF PAVEMENT MARKINGS	SF	\$0.47	1820	\$855.40
656.30	DECIDUOUS TREES	EA	\$244.00	6	\$1,464.00
675.50	REMOVING SIGNS	EA	\$15.10	9	\$135.90
675.60	ERECTING SALVAGED SIGNS	EA	\$24.10	9	\$216.90
677.25	REMOVE AND RESET OVERHEAD TRAFFIC SIGN SUPPORT	EA	\$19,100.00	1	\$19,100.00
900.620	PEDESTRIAN SIGNALS WITH ACTUATION	EA	N/A	2	\$30,000.00

Total =	\$360,000
25% contingency =	\$90,000
25% Detail Design & Construction Admin =	\$90,000
<b>Total within State ROW =</b>	<b>\$540,000</b>

**NOTE:** This is a budgetary cost estimate for Kocher Drive Streetscape Improvements Project as noted on the Conceptual Design Plans dated August 14, 2014. This estimate is based on limited available site information. Additional costs could be incurred due to unforeseen issues that would be identified either during the detailed design phase or during construction.

Estimated By: Melissa Wasson  
Checked By: Mark Armbrust, PE

Date: 12/12/2013  
Date: 12/12/2013

Revised: August 14, 2014



**Kocher Drive Streetscape Improvements  
Construction Estimate - Town  
August 2014**

ITEM NO.	DESCRIPTION	UNIT	VAOT 5 YR AVG PRICE	ESTIMATED QUANTITY TOWN	TOTAL COST WITHIN TOWN ROW - MATLS	TOTAL COST WITHIN TOWN ROW - LABOR	TOTAL COST WITHIN TOWN ROW - EQUIPMT	TOTAL COST TOWN
201.11	CLEARING AND GRUBBING	ACRE	\$12,400.00	0.05	\$0.00	\$279.00	\$341.00	\$620.00
301.25	SUBBASE OF CRUSHED GRAVEL, COARSE GRADED	CY	\$33.90	85	\$1,613.64	\$864.45	\$403.41	\$2,881.50
618.15	BITUMINOUS CONCRETE SIDEWALK	TON	\$215.00	170	\$23,757.50	\$5,482.50	\$7,310.00	\$36,550.00
656.30	DECIDUOUS TREES	EA	\$244.00	8	\$976.00	\$780.80	\$195.20	\$1,952.00
Total=					\$26,000.00	\$7,000.00	\$8,000.00	\$42,000
25% contingency =					\$6,500.00	\$1,750.00	\$2,000.00	\$10,500
25% Detail Design & Construction Admin =					\$6,500.00	\$1,750.00	\$2,000.00	\$10,500
<b>Total within Town ROW =</b>								<b>\$63,000</b>

**NOTE:** This is a budgetary cost estimate for Kocher Drive Streetscape Improvements Project as noted on the Conceptual Design Plans dated August 14, 2014. This estimate is based on limited available site information. Additional costs could be incurred due to unforeseen issues that would be identified either during the detailed design phase or during construction.

Estimated By: Melissa Wasson  
Checked By: Mark Armbrust, PE

Date: 12/12/2013  
Date: 12/12/2013

Revised: August 14, 2014



# APPENDIX

Count date 6/19/13  
 Location Bennington: US7/VT7A/Kocher Drive  
 Counted by BCRC (Chris Manfredi)  
 Weather Sunny  
 Notes 1/2 day of school, no after-school activities

Start		Kocher Dr from East			US 7 from south			VT 7A from West			Total
		Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
9am	Peds	0	1	0	0	0	0	2	1	0	4
	Bikes	0	0	0	0	0	0	1	1	0	2
	<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>6</b>
10am	Peds	0	4	0	0	0	0	0	4	0	8
	Bikes	0	0	1	0	0	0	0	1	0	2
	<b>Total</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>10</b>
11am	Peds	0	1	0	2	0	0	2	0	0	5
	Bikes	0	0	0	0	0	0	1	0	0	1
	<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>6</b>
12pm	Peds	0	1	0	0	0	1	0	0	0	2
	Bikes	0	1	0	1	0	0	0	0	0	2
	<b>Total</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>
1pm	Peds	0	1	0	1	0	0	4	0	0	6
	Bikes	0	0	0	0	0	0	0	0	0	0
	<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>6</b>
2pm	Peds	0	3	1	1	0	2	0	0	0	7
	Bikes	0	1	0	1	0	1	0	0	0	3
	<b>Total</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>
3pm	Peds	0	4	0	0	0	1	0	2	0	7
	Bikes	0	0	0	0	0	0	0	2	0	2
	<b>Total</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>9</b>
4pm	Peds	0	0	0	0	0	0	1	4	0	5
	Bikes	0	1	0	0	0	0	0	0	0	1
	<b>Total</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>6</b>
	<b>Total</b>	<b>0</b>	<b>18</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>5</b>	<b>11</b>	<b>15</b>	<b>0</b>	<b>57</b>

Bennington US-7 and Kocher Drive  
Capacity and Delay Analysis  
September 4, 2013  
Ian Degutis, Traffic Design  
Vermont Agency of Transportation

Introduction:

In response to a request from the Bennington Regional Planning Commission (BRPC), an analysis of the intersection of US-7 and Kocher Drive in Bennington, VT was performed to assess the traffic impacts associated with the construction of a crosswalk. This signal, MS-106, is part of a 5-signal coordinated corridor which runs east along Kocher Drive and Northside Drive (both VT-7A).

Analysis:

Three concepts were provided to the Agency by the BRPC; Concept 2 was examined in this study, having been selected as the only preferred alternative before the study was requested.

Concept 2 involves the removal of two lanes from the intersection and constructing a sidewalk with crosswalk and pedestrian refuge island. Figure 1, below, is extracted from the conceptual layout provided by the BRPC. The crosswalk would run east-west along the northern edge of Kocher Drive, crossing US-7 at the north side of the intersection. In order to construct the sidewalk the existing dedicated right-turn lane on the eastern leg of Kocher drive would be removed, and the existing through-only lane would become a through-right lane. The refuge island would be constructed in the middle of the north leg of the intersection, US-7, by removing the existing dedicated right-turn lane and shifting the remaining three lanes to the west, with the right-most lane becoming a through-right lane.

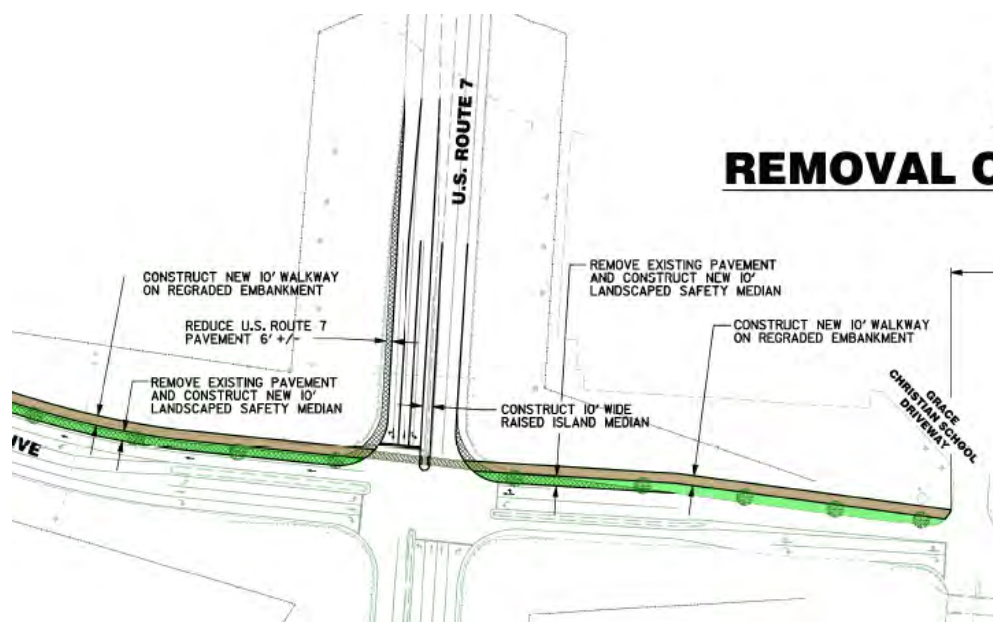


Figure 1: Concept 2 in the Area of the Intersection

Traffic counts were performed by the Agency of Transportation's Traffic Research section on May 23, 2013. These counts were taken after the opening of the newly-constructed segment of the Bennington Bypass, and were done on a school-day to account for that traffic as well. Peak hour volumes and factors were included in the report; AM peak hour is from 7:15-8:15, and PM peak hour is from 3:15-4:15. Pedestrian counts were taken by the BRPC on June 19, 2013.

The analysis was performed using Synchro 8 software. Only this intersection was analyzed; current traffic volumes for the entire corridor were not available and a complete corridor analysis is beyond the scope of this study.

Six scenarios were analyzed, each at for AM and PM peak-hour traffic volumes. The scenarios were:

- Existing condition
- Existing geometry with concurrent pedestrian phase
- Dedicated right-turn lane removed from Kocher Drive westbound only, with concurrent pedestrian phase
- Dedicated right-turn lane removed from US-7 southbound only, with concurrent pedestrian phase
- Dedicated right-turn lanes removed from US-7 southbound and Kocher Drive westbound (**Concept 2**), with concurrent pedestrian phase
- Existing geometry with an exclusive pedestrian phase

For each scenario analyzed, AM and PM peak traffic volumes were examined, using the existing cycle lengths for the signal corridor, 76 seconds for the AM peak, and 90 seconds for the PM peak. Synchro was used to optimize the timings for each scenario at the existing cycle lengths.

Adding the exclusive pedestrian phase requires a longer cycle length to serve all the phases, so a cycle length of 110 seconds was used. **It should be noted that this cycle length represents a minimum for this intersection with an exclusive pedestrian phase, and the effect of this cycle length on the rest of the coordinated corridor was not analyzed as part of this study, so these results cannot be directly compared to other results in the table.**

The concurrent pedestrian phase was added to Phase 8, the westbound movement on Kocher Drive adjacent to the proposed crosswalk location. For the analysis a Walk time of seven seconds was used, with a Pedestrian Clear time of 25 seconds, both in accordance with guidance in the Manual on Uniform Traffic Control Devices (MUTCD). For the exclusive pedestrian analysis, the same timings were used for the pedestrian phase. An advance pedestrian phase, or delayed green, should be considered. This was not included in this analysis, but would likely have a slight negative impact on delays.

Results of these analyses are shown below, in Table 1.

Table 1: Intersection Delay and Capacity

	<i>Cycle Length (s)</i>	<i>Max V/C ratio</i>	<i>Intersection Delay (s)</i>	<i>Intersection LOS</i>	<i>ICU</i>	<i>ICU LOS</i>
<b>Existing Condition</b>						
AM Peak	76	0.75	25.1	C	0.45	A
PM Peak	90	0.81	28.8	C	0.59	B
<b>Existing Geometry; Add Concurrent Pedestrian Phase</b>						
AM Peak	76	<b>1.28</b>	53.2	D	0.45	A
PM Peak	90	0.88	31.0	C	0.59	B
<b>Remove right turn lane from Kocher Drive westbound ; Concurrent Pedestrian Phase</b>						
AM Peak	76	<b>1.28</b>	53.9	D	0.50	A
PM Peak	90	0.91	36.9	D	0.70	C
<b>Remove right turn lane from US-7 southbound; Concurrent Pedestrian Phase</b>						
AM Peak	76	<b>1.28</b>	57.6	E	0.47	A
PM Peak	90	<b>1.01</b>	38.9	D	0.63	B
<b>Remove right turn lanes from Kocher Drive WB and US-7 SB; Concurrent Pedestrian Phase</b>						
AM Peak	76	<b>1.28</b>	58.2	E	0.52	A
PM Peak	90	<b>1.01</b>	42.9	D	0.73	D

<b>Existing Geometry; Add Exclusive Pedestrian Phase</b>						
AM Peak	<b>110</b>	0.64	34.7	C	0.45	A
PM Peak	<b>110</b>	<b>1.12</b>	43.0	D	0.59	B

As seen above, adding a concurrent pedestrian phase, even without any geometric changes, doubles the delay at the intersection during the AM peak, and pushes the volume/capacity ratio well above 1.0 for the same time period. The PM peak experiences an increase in delay and higher v/c ratio as well, but the increase is much less. The variation between the results for the two peak hours is caused by the directional splits in traffic volumes. Adding a concurrent pedestrian phase with sufficient time to allow pedestrians to cross the full width of US-7 results in removing green time from the through movements on US-7 and adds it to the through movement on Kocher Drive. The negative effect on intersection is much more pronounced when the predominant traffic movement is on US-7, in the morning.

A complete analysis and potential retiming of the corridor timing would be required as part of the design of any of these alternatives, including comprehensive analysis of delays at all intersections.

The Synchro analysis also determines the Levels of Service for each approach. The results of this analysis, for the same six scenarios, are presented below in Table 2. As above, the values for the exclusive pedestrian phase cannot be directly compared to the other values in the table because the cycle length is increased; the impacts of the longer cycle length were not assessed as part of this study.



Table 2: Level of Service by Approach

	Intersection LOS		Kocher Drive Eastbound Approach		Kocher Drive Westbound Approach		US-7 Northbound Approach		US-7 Southbound Approach	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
<b>Existing Condition</b>										
AM Peak	C	25.1	B	18.2	C	21.8	C	31.8	C	26.8
PM Peak	C	28.8	C	24.2	C	24.6	C	32.1	D	35.9
<b>Existing Geometry; Add Concurrent Pedestrian Phase</b>										
AM Peak	D	53.2	B	14.6	B	16.0	D	43.0	F	99.1
PM Peak	C	31.0	C	24.9	C	21.1	D	38.9	D	41.2
<b>Remove right turn lane from Kocher Drive westbound ; Concurrent Pedestrian Phase</b>										
AM Peak	D	53.9	B	14.6	B	19.3	D	43.0	F	99.1
PM Peak	D	36.9	C	26.1	C	34.0	D	42.3	D	48.1
<b>Remove right turn lane from US-7 southbound; Concurrent Pedestrian Phase</b>										
AM Peak	E	57.6	B	14.6	B	16.0	D	50.0	F	106.6
PM Peak	D	38.9	C	25.0	C	21.2	D	38.8	E	71.2
<b>Remove right turn lanes from Kocher Drive WB and US-7 SB; Concurrent Pedestrian Phase</b>										
AM Peak	E	58.2	B	14.6	B	19.3	D	50.0	F	106.6
PM Peak	D	42.9	C	26.3	D	36.3	D	41.9	E	77.2
<b>Existing Geometry; Add Exclusive Pedestrian Phase</b>										
AM Peak	C	34.7	C	28.8	C	29.9	D	44.3	C	35.0
PM Peak	D	43.0	D	52.3	C	34.1	C	31.8	E	58.3

From these results it is clear that the most-significant increase in delay is on the US-7 southbound approach during the AM peak, and that that increase is caused primarily by the addition of the pedestrian phase, not the removal of the dedicated right turn lane.

Conclusion:

Addition of a crosswalk on the north leg of the intersection of US-7 and Kocher Drive in Bennington will push the intersection’s volume/capacity ratio well above 1.0 and more than double delay at certain times of day. Delay on the north approach will nearly quadruple during morning peak-hour traffic flows. The lane removal proposed in Concept 2, as provided by the BRPC, has a slight additional negative impact on traffic, but does not make a significant difference to the intersection delay or capacity.

Recommendation:

If feasible alternatives to the proposed pedestrian crossing at this location exist, they should be pursued first. If no feasible alternative to a crosswalk at this intersection can be identified and a crosswalk is to be constructed at this intersection, VTrans finds no objection to the lane removal as shown in Concept 2.

Proper engineering plans will need to be developed for review by the Agency, and the design consultant should be required to perform a corridor timing optimization analysis of the entire coordinated corridor as a part of the design and plan preparation. The pedestrian phase should be concurrent with the adjacent through movement, but should lead the green. All timings and phasing should be in compliance with the MUTCD, VTrans standards and any other applicable standards or guidance.

# The Vermont Agency of Transportation

Traffic Research/Policy Planning & Intermodal Development  
Turning Movement Report

Counter: Miovision camera  
Counted By: R Gustafson  
Weather: Sunny, windy  
Town: 7-2.33 Bennington

File Name : 7-2.33Merged13  
Site Code : 30202770  
Start Date : 5/23/2013  
Page No : 1

**Groups Printed- Auto - Medium - Heavy**

Start Time	US 7 from Shaftsbury From North				Kocher Dr from East Rd From East				US 7 from VT 9 From South				VT 7A from VT 67A From West				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00 AM	3	9	4	0	1	14	10	0	15	16	4	0	10	14	7	0	107
06:15 AM	17	12	10	0	2	18	18	0	21	23	2	0	9	17	20	0	169
06:30 AM	21	17	10	0	7	34	25	0	35	45	7	0	5	35	16	0	257
06:45 AM	53	29	16	0	12	28	19	0	32	25	14	0	11	39	15	0	293
Total	94	67	40	0	22	94	72	0	103	109	27	0	35	105	58	0	826
07:00 AM	35	20	8	0	11	40	11	0	24	31	14	0	9	46	20	0	269
07:15 AM	65	48	14	0	17	54	19	0	22	28	14	0	13	40	33	0	367
07:30 AM	79	68	17	0	14	44	20	0	20	39	11	0	13	33	24	0	382
07:45 AM	30	64	34	0	11	54	22	0	41	41	13	0	17	42	39	0	408
Total	209	200	73	0	53	192	72	0	107	139	52	0	52	161	116	0	1426
08:00 AM	19	57	22	0	12	47	13	0	37	29	18	0	10	35	39	0	338
08:15 AM	25	47	23	0	12	45	15	0	46	32	16	0	13	46	34	0	354
08:30 AM	16	64	18	0	15	34	11	0	40	25	8	0	14	38	46	0	329
08:45 AM	22	51	20	0	16	36	8	0	35	39	11	0	8	38	46	0	330
Total	82	219	83	0	55	162	47	0	158	125	53	0	45	157	165	0	1351
09:00 AM	17	36	10	0	11	30	10	0	41	34	14	0	13	34	29	0	279
09:15 AM	21	27	13	0	10	29	16	0	43	28	17	0	12	36	41	0	293
09:30 AM	8	42	7	0	10	35	14	0	45	30	18	0	7	30	49	0	295
09:45 AM	14	38	7	0	12	41	18	0	45	43	20	0	14	34	25	0	311
Total	60	143	37	0	43	135	58	0	174	135	69	0	46	134	144	0	1178
10:00 AM	14	40	14	0	18	42	15	0	44	28	22	0	15	30	25	0	307
10:15 AM	19	23	9	0	25	43	17	0	49	31	21	0	10	38	38	0	323
10:30 AM	17	36	15	0	11	41	22	0	45	32	22	0	6	47	43	0	337
10:45 AM	22	34	17	0	12	46	8	0	50	28	25	0	15	56	35	0	348
Total	72	133	55	0	66	172	62	0	188	119	90	0	46	171	141	0	1315
11:00 AM	12	35	12	0	21	53	17	0	59	29	16	0	14	63	38	0	369
11:15 AM	20	23	11	0	10	35	21	0	50	23	34	0	16	44	57	0	344
11:30 AM	20	42	15	0	20	56	18	0	62	30	20	0	14	45	42	0	384
11:45 AM	10	33	9	0	23	54	19	0	56	36	20	0	15	48	36	0	359
Total	62	133	47	0	74	198	75	0	227	118	90	0	59	200	173	0	1456
12:00 PM	14	32	12	0	24	74	29	0	62	55	32	0	16	60	44	0	454
12:15 PM	15	47	15	0	16	52	24	0	74	46	49	0	12	60	58	0	468
12:30 PM	14	27	9	0	20	51	24	0	49	36	32	0	12	57	42	0	373
12:45 PM	20	38	17	0	22	54	21	0	56	31	20	0	13	60	55	0	407
Total	63	144	53	0	82	231	98	0	241	168	133	0	53	237	199	0	1702
01:00 PM	24	40	14	0	19	54	24	0	47	34	26	0	16	44	53	0	395
01:15 PM	15	33	12	0	26	59	12	0	60	36	32	0	13	66	44	0	408
01:30 PM	21	29	12	0	34	50	18	0	71	36	18	0	10	67	52	0	418
01:45 PM	29	32	12	0	19	47	17	0	62	36	26	0	21	55	43	0	399
Total	89	134	50	0	98	210	71	0	240	142	102	0	60	232	192	0	1620
02:00 PM	27	28	13	0	19	53	25	0	69	50	29	0	19	56	46	0	434
02:15 PM	14	33	12	0	20	75	35	0	64	41	31	0	31	52	47	0	455
02:30 PM	18	36	13	0	53	121	50	0	64	61	29	0	20	68	54	0	587
02:45 PM	35	44	17	0	22	68	36	0	63	51	29	0	25	72	52	0	514
Total	94	141	55	0	114	317	146	0	260	203	118	0	95	248	199	0	1990

# The Vermont Agency of Transportation

Traffic Research/Policy Planning & Intermodal Development  
Turning Movement Report

Counter: Miovision camera  
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Town: 7-2.33 Bennington

File Name : 7-2.33Merged13  
Site Code : 30202770  
Start Date : 5/23/2013  
Page No : 2

## Groups Printed- Auto - Medium - Heavy

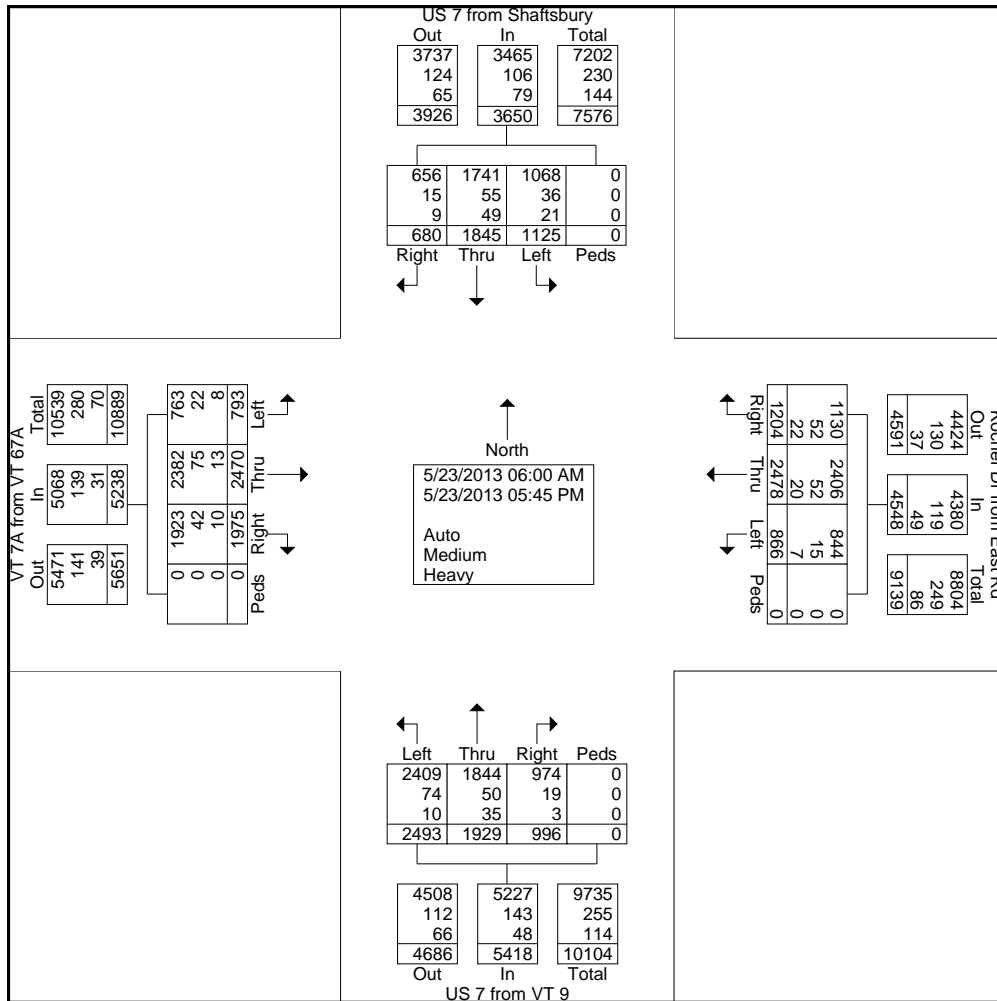
Start Time	US 7 from Shaftsbury From North				Kocher Dr from East Rd From East				US 7 from VT 9 From South				VT 7A from VT 67A From West				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	23	32	13	0	33	78	57	0	72	54	19	0	30	65	49	0	525
03:15 PM	22	59	16	0	23	75	38	0	61	57	30	0	21	74	52	0	528
03:30 PM	30	44	12	0	21	67	40	0	66	66	15	0	27	78	52	0	518
03:45 PM	25	64	21	0	27	56	37	0	77	45	24	0	20	72	55	0	523
Total	100	199	62	0	104	276	172	0	276	222	88	0	98	289	208	0	2094
04:00 PM	28	47	18	0	23	77	52	0	68	63	27	0	24	67	60	0	554
04:15 PM	28	35	19	0	21	65	45	0	64	55	25	0	26	69	56	0	508
04:30 PM	23	45	16	0	25	61	36	0	69	79	28	0	27	68	42	0	519
04:45 PM	30	48	15	0	18	62	40	0	75	47	15	0	22	81	51	0	504
Total	109	175	68	0	87	265	173	0	276	244	95	0	99	285	209	0	2085
05:00 PM	21	35	13	0	17	69	55	0	76	65	24	0	35	76	37	0	523
05:15 PM	38	51	8	0	16	66	51	0	58	56	22	0	29	78	48	0	521
05:30 PM	14	41	19	0	19	53	28	0	51	51	22	0	25	45	38	0	406
05:45 PM	18	30	17	0	16	38	24	0	58	33	11	0	16	52	48	0	361
Total	91	157	57	0	68	226	158	0	243	205	79	0	105	251	171	0	1811
Grand Total	1125	1845	680	0	866	2478	1204	0	2493	1929	996	0	793	2470	1975	0	18854
Apprch %	30.8	50.5	18.6	0	19	54.5	26.5	0	46	35.6	18.4	0	15.1	47.2	37.7	0	
Total %	6	9.8	3.6	0	4.6	13.1	6.4	0	13.2	10.2	5.3	0	4.2	13.1	10.5	0	
Auto	1068	1741	656	0	844	2406	1130	0	2409	1844	974	0	763	2382	1923	0	18140
% Auto	94.9	94.4	96.5	0	97.5	97.1	93.9	0	96.6	95.6	97.8	0	96.2	96.4	97.4	0	96.2
Medium	36	55	15	0	15	52	52	0	74	50	19	0	22	75	42	0	507
% Medium	3.2	3	2.2	0	1.7	2.1	4.3	0	3	2.6	1.9	0	2.8	3	2.1	0	2.7
Heavy	21	49	9	0	7	20	22	0	10	35	3	0	8	13	10	0	207
% Heavy	1.9	2.7	1.3	0	0.8	0.8	1.8	0	0.4	1.8	0.3	0	1	0.5	0.5	0	1.1

# The Vermont Agency of Transportation

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Turning Movement Report

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Page No : 3



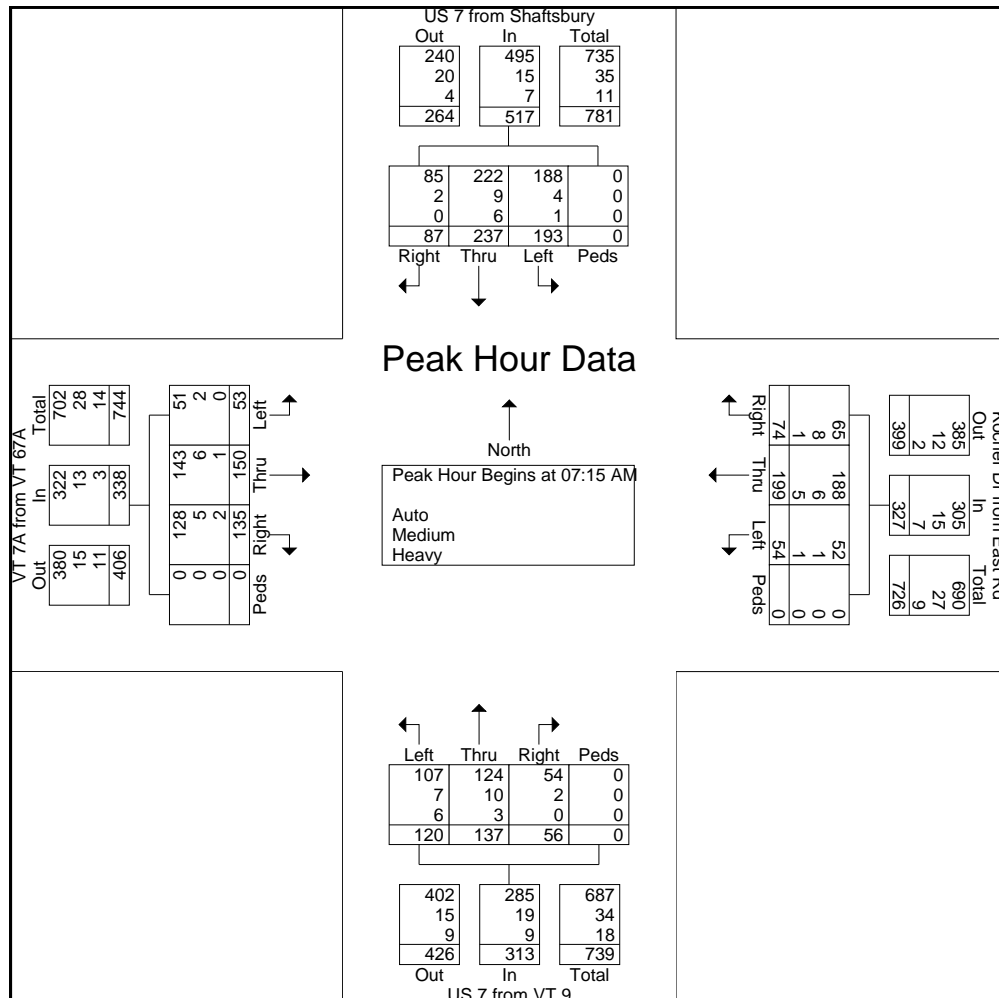
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Start Time	US 7 from Shaftsbury From North					Kocher Dr from East Rd From East					US 7 from VT 9 From South					VT 7A from VT 67A From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	65	48	14	0	127	17	54	19	0	90	22	28	14	0	64	13	40	33	0	86	367
07:30 AM	79	68	17	0	164	14	44	20	0	78	20	39	11	0	70	13	33	24	0	70	382
07:45 AM	30	64	34	0	128	11	54	22	0	87	41	41	13	0	95	17	42	39	0	98	408
08:00 AM	19	57	22	0	98	12	47	13	0	72	37	29	18	0	84	10	35	39	0	84	338
Total Volume	193	237	87	0	517	54	199	74	0	327	120	137	56	0	313	53	150	135	0	338	1495
% App. Total	37.3	45.8	16.8	0		16.5	60.9	22.6	0		38.3	43.8	17.9	0		15.7	44.4	39.9	0		
PHF	.611	.871	.640	.000	.788	.794	.921	.841	.000	.908	.732	.835	.778	.000	.824	.779	.893	.865	.000	.862	.916
Auto	188	222	85	0	495	52	188	65	0	305	107	124	54	0	285	51	143	128	0	322	1407
% Auto	97.4	93.7	97.7	0	95.7	96.3	94.5	87.8	0	93.3	89.2	90.5	96.4	0	91.1	96.2	95.3	94.8	0	95.3	94.1
Medium	4	9	2	0	15	1	6	8	0	15	7	10	2	0	19	2	6	5	0	13	62
% Medium								10.8	0	4.6	5.8	7.3	3.6	0	6.1	3.8	4.0	3.7	0	3.8	4.1
Heavy	1	6	0	0	7	1	5	1	0	7	6	3	0	0	9	0	1	2	0	3	26
% Heavy	0.5	2.5	0	0	1.4	1.9	2.5	1.4	0	2.1	5.0	2.2	0	0	2.9	0	0.7	1.5	0	0.9	1.7



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Weather: Sunny, windy  
Town: 7-2.33 Bennington

File Name : 7-2.33Merged13  
Site Code : 30202770  
Start Date : 5/23/2013  
Page No : 5

Start Time	US 7 from Shaftsbury From North					Kocher Dr from East Rd From East					US 7 from VT 9 From South					VT 7A from VT 67A From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	22	59	16	0	97	23	75	38	0	136	61	57	30	0	148	21	74	52	0	147	528
03:30 PM	30	44	12	0	86	21	67	40	0	128	66	66	15	0	147	27	78	52	0	157	518
03:45 PM	25	64	21	0	110	27	56	37	0	120	77	45	24	0	146	20	72	55	0	147	523
04:00 PM	28	47	18	0	93	23	77	52	0	152	68	63	27	0	158	24	67	60	0	151	554
Total Volume	105	214	67	0	386	94	275	167	0	536	272	231	96	0	599	92	291	219	0	602	2123
% App. Total	27.2	55.4	17.4	0		17.5	51.3	31.2	0		45.4	38.6	16	0		15.3	48.3	36.4	0		
PHF	.875	.836	.798	.000	.877	.870	.893	.803	.000	.882	.883	.875	.800	.000	.948	.852	.933	.913	.000	.959	.958
Auto	102	211	65	0	378	92	267	159	0	518	265	226	94	0	585	90	283	217	0	590	2071
% Auto	97.1	98.6	97.0	0	97.9	97.9	97.1	95.2	0	96.6	97.4	97.8	97.9	0	97.7	97.8	97.3	99.1	0	98.0	97.6
Medium	0	2	1	0	3	1	6	4	0	11	7	3	2	0	12	2	5	1	0	8	34
% Medium																					
Heavy	3	1	1	0	5	1	2	4	0	7	0	2	0	2	2	0	3	1	0	4	18
% Heavy	2.9	0.5	1.5	0	1.3	1.1	0.7	2.4	0	1.3	0	0.9	0	0.3	0	0	1.0	0.5	0	0.7	0.8

