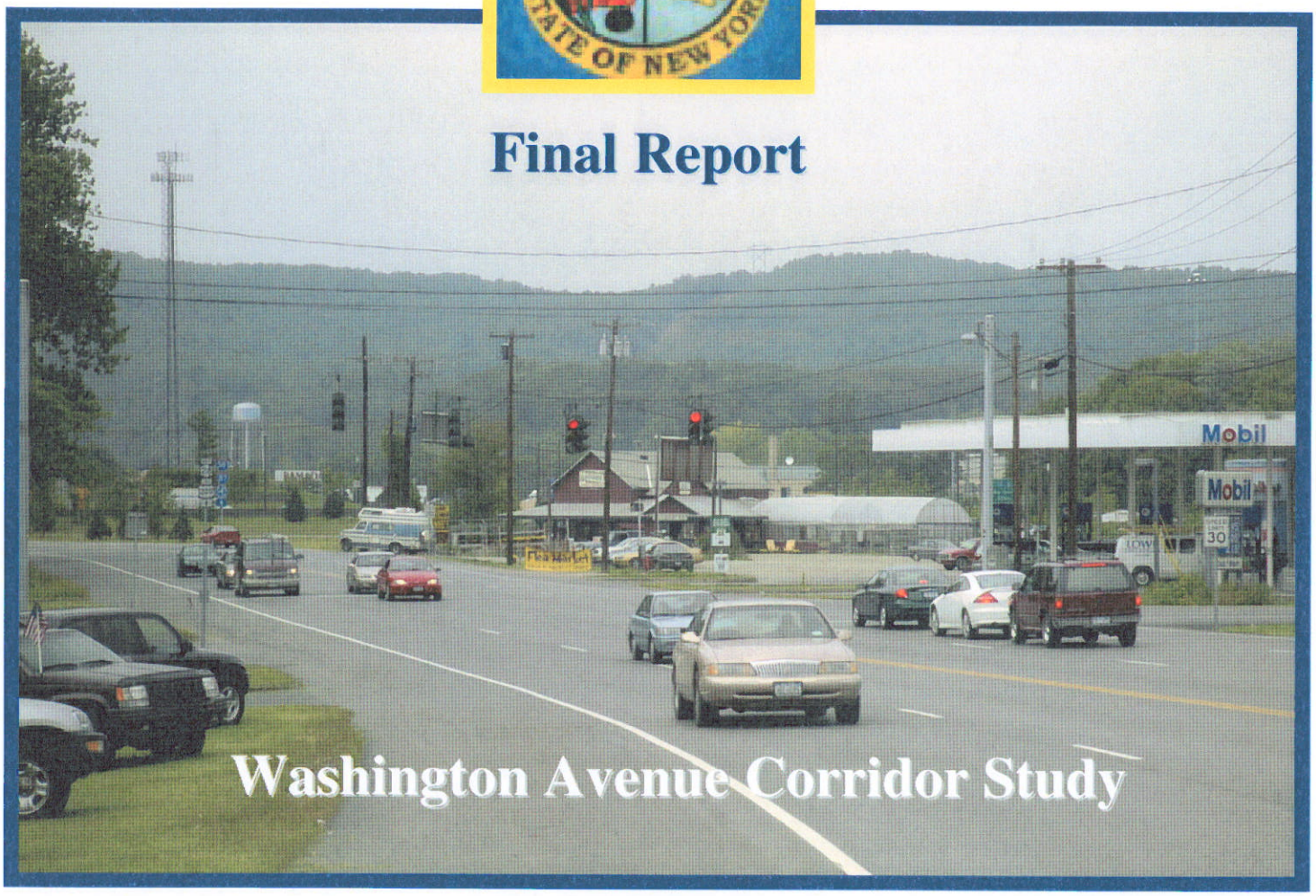
Final Report



Washington Avenue Corridor Study

Prepared by:

CME
CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

Project #04-143

Prepared for:

Town of Ulster
1 Town Hall Drive
Lake Katrine, NY 12449

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1.0 Introduction and project objective

The Town of Ulster has established a sewer district that will extend public sewers to non-residential properties located along Washington Avenue between the existing roundabout and the Esopus Creek. The planned sewer extension will potentially induce commercial land development in the corridor, which will result in increased traffic. The corridor already experiences some traffic congestion, vehicular weaving conflicts, and a higher than average crash rate, all of which may be exacerbated by increased traffic.

The New York State Department of Transportation (NYSDOT) has indicated that individual developments within the Washington Avenue Corridor will only be allowed right-in/right-out access to Washington Avenue. NYSDOT has agreed to fund the construction phase of a project that offers a long-term solution to the overall capacity and access problems in the corridor. This report summarizes the development of various alternatives to satisfy the long-term traffic growth and site access issues. The objectives for this project are as follows:

- Provide adequate capacity to accommodate future traffic volumes
- Provide reasonable access to properties in the corridor
- Satisfy NYSDOT and Ulster County access restrictions
- Ensure safety

2.0 Project location

The proposed sewer district expansion includes an area in the Town of Ulster that is bounded by the Esopus Creek, Colonel Chandler Drive (Interstate 587), and the New York State Thruway (Interstate 87). Non-residential properties within this area will be connected to the sewer system. The boundary of the proposed sewer district and the current land uses in the study area are shown on Figure 1. This study is concerned with the section of Washington Avenue between the existing roundabout (Thruway Exit 19) and the Esopus Creek.

In addition to Washington Avenue, there are three other roads within the study area. Sawkill Road carries traffic over Colonel Chandler Drive. Powell Lane and Sandy Road are both minor local roads that dead-end at Colonel Chandler Drive. Powell Lane intersects Sawkill Road and Sandy Road intersects Washington Avenue

The intersection of Sawkill Road and Washington Avenue is the major intersection and is the only signalized intersection within the corridor.

Washington Avenue Corridor Study

Current Land Use Map

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Project: 04-143	Date: 10.29.04	Figure 1

3.0 Existing conditions

3.1 Land use

Most of the corridor is currently vacant or commercial land. There are some residential properties along the Esopus Creek that are outside of the sewer district. The commercial uses are typical for an area that is located in close proximity to a major interchange: gas stations, convenience markets and automobile repair shops. There is also a park-and-ride facility next to the existing roundabout. Existing land uses are summarized in Table 1 and additional details are provided in Appendix A.

3.2 Traffic volumes

Existing traffic volumes at the Washington Avenue/Sawkill Road intersection were obtained from NYSDOT turning movement counts conducted on March 3, 2004. Short-term trip generation counts were conducted by CME at the existing site driveways on August 26, 2004. Based on the latest NYSDOT *Traffic Volume Report,* the existing average annual daily traffic (AADT) on Washington Avenue is approximately 22,000 vehicles per day. The existing traffic volumes are shown in Appendix B.

3.3 Roadway geometry, traffic control and access

Washington Avenue is an undivided, four-lane urban principal arterial. Sawkill Road is an undivided, two-lane county roadway. Currently, the intersection of Washington Avenue and Sawkill Road is controlled by an actuated traffic signal with an advanced eastbound phase. The current lane configuration includes shared turn/through lanes on each approach, plus a right turn lane on the westbound Washington Avenue approach.

The Sandy Road/Washington Avenue intersection and the Powell Lane/Sawkill Road intersection are both controlled by stop signs on the minor approach.

The park-and-ride lot is configured so that ingress is provided by a right-turn movement from Colonel Chandler Drive and egress is provided by a right-turn movement onto Washington Avenue. All other properties along Washington Avenue and Sawkill Road have full-access driveways.

3.4 Existing level of service

Level of service (LOS) analysis was conducted for the Washington Avenue/Sawkill Road intersection using highway capacity software (HCS version 4.1e), which automates the procedures contained in the *2000 Highway Capacity Manual.* The results of this analysis show that the Washington Avenue/Sawkill Road intersection currently operates at LOS B with approximately fifteen seconds of delay during the AM peak hour and LOS C with approximately 25 seconds of delay during the PM peak hour. The detailed HCS reports and descriptions of the LOS criteria are contained in Appendix C.

3.5 Crash Experience

Based on a review of crash data on Washington Avenue for the six-year period extending from 1998 to 2003, there were a total of 104 crashes in the corridor between the existing roundabout and the Esopus Creek. This represents a crash rate of approximately 9.5 accidents per million vehicle miles traveled (MVM), which is above the statewide average of 5.7 accidents per MVM for similar segments.

4.0 Future conditions

4.1 Projected land uses

The parcels within the corridor were aggregated into five zones for the purpose of traffic volume forecasts. Future land use assumptions were established based on local zoning regulations, with input from local landowners and the Ulster County Transportation Council. The future land uses and the associated change in trip generation are summarized in Table 1. Appendix A contains additional details on the future land uses and trip generation.

4.2 Future traffic

Background traffic - The estimated time of completion (ETC) for this project is expected to be during 2007. Future traffic volumes were estimated for the year 2030 (ETC + 23) by summing the background traffic volumes and the change in site-generated traffic. Background traffic volumes were estimated by applying a growth rate to the existing traffic volumes at the Washington Avenue/Sawkill Road intersection. A background traffic growth rate of 0.5 percent per year was used, based on Ulster County's regional travel demand forecasting model (TMODEL). Background traffic volumes are shown in Appendix B.

Trip generation - The change in site-generated traffic was determined by comparing the existing trip generation for each property with the trip generation for the projected future land use. Trip generation was generally based on the rates and equations published by the Institute of Transportation Engineers in *Trip Generation,* 7th Edition. A summary of the trip generation results is presented in Table 1. Detailed trip generation information is included in Appendix A.

Table 1 – Land Uses and Associated Change in Trip Generation By Zone

Zone	Existing land uses	Future land uses	Change in trip generation*			
			AM Peak Hour		PM Peak Hour	
			IN	OUT	IN	OUT
1	Gas station with convenience store	Multiuse gas station/fast food/convenience store	43 (14)	44 (14)	37 (12)	38 (12)
2	Diner, vacant properties, gas station	Retail, gas station, bank, office building	97 (4)	28 (4)	116 (18)	174 (18)
3	Used auto sales	No changes	---	---	---	---
4	Small auto garage	Fast food	80 (27)	74 (27)	52 (17)	45 (17)
5	Vacant	Hotel, restaurant	57 (7)	44 (7)	64 (7)	40 (7)
		TOTAL	277 (52)	190 (52)	269 (54)	297 (54)

*Primary trips (Pass-by trips)

Table 1 shows that the area is expected to generate approximately 600 new trips during the PM peak hour. Pass-by traffic represents approximately 25 percent of the total trips for selected land uses.

Trip distribution - Regionally, 45 percent of new trips are expected to originate east of the corridor (City of Kingston), 40 percent of new trips are expected to originate west of the corridor (Thruway) and 15 percent of new trips are expected to originate north of the corridor. The regional distribution was developed based on previous work in the area as well as the County's regional travel demand forecasting model (TMODEL). The total change in trip generation for each zone was distributed according to this regional distribution.

Traffic assignment - Trips were assigned to each driveway and to the Washington Avenue/Sawkill Road intersection under the assumption that left turn movements would be prohibited on both Washington Avenue and Sawkill Road. The left-turn prohibitions also necessitated the reassignment of existing site-generated traffic within the corridor. Cross-access between parcels is assumed. The site-generated traffic, the reassignment of existing trips, and the final 2030 traffic volumes are shown in Appendix B.

Based on these peak hour forecasts, the 2030 AADT in the corridor is approximately 28,500 vehicles per day, which represents a total growth rate (including background growth and new trips) of approximately 1 percent per year for 26 years.

5.0 Alternative concept plans

Concept plans were developed for numerous alternatives. Some of these alternatives were eliminated in the early stages of this project because they did not provide adequate capacity or meet the restrictions imposed by NYSDOT and Ulster County. The following alternatives were dismissed early in the project:

- 3-lane section on Washington Avenue
- Two-way continuous left-turn lane on Washington Avenue
- Full access on Sawkill Road
- Oval roundabout
- 3-leg roundabout

The three remaining alternatives, plus the null alternative, are detailed below.

All of the build alternatives include a raised median on Washington Avenue and provide right-in/right-out access at all driveways on Washington Avenue and Sawkill Road The build alternatives require connections between adjacent properties within each zone.

5.1 Null

The null alternative includes the existing lane geometry and traffic signal phasing, but assumes that left turns will be prohibited on Washington Avenue and Sawkill Road with no opportunities for U-turns at the Washington Avenue/Sawkill Road intersection.

5.2 Four-way traffic signal

This alternative includes four travel lanes on Washington Avenue. Left turn lanes are provided on all approaches at the Washington Avenue/Sawkill Road intersection. The westbound approach to this intersection also includes a right turn lane. This concept plan is shown in Figure 2.

5.3 Jughandle

Similar to the four-way traffic signal alternative, the jughandle traffic signal includes four travel lanes on Washington Avenue and maintains the westbound right turn lane at the Washington Avenue/Sawkill Road intersection. Left turn lanes are provided on all approaches except for the eastbound approach at the Washington Avenue/Sawkill Road intersection. Instead of a left turn lane, a jughandle is provided on the eastbound approach. This concept plan is shown in Figure 3.

5.4 Roundabout

This is a four-leg, two-lane roundabout alternative with four travel lanes on Washington Avenue. Single-lane approaches are provided on Sawkill Road and the fourth leg of the roundabout (Zone 3/4/5 driveway). The roundabout alternative is shown in Figure 4.

FIGURE 2
ALTERNATIVE 2A
4-WAY SIGNAL/5-LANE SECTION
WITH RAISED MEDIAN & U-TURNS AT SIGNAL
WASHINGTON AVE.
TOWN OF ULSTER, NEW YORK

INTERSTATE 587

SAWKILL RD

POWELL LANE

SANDY RD

WASHINGTON AVE

28

PARK & RIDE

ZONE 1

ZONE 2

ZONE 3

ZONE 4

ZONE 5

LEGEND:

- VEHICLE CONNECTION
- SIDEWALK CONNECTION
- POSSIBLE TRANSIT STOP

0 80 160

1" = 80'

(1" = 160' 1/2 SCALE)

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FIGURE 3
ALTERNATIVE 3A
4-LANE SECTION JUG HANDLE
WITH RAISED MEDIAN
WASHINGTON AVE.
TOWN OF ULSTER, NEW YORK

INTERSTATE 587

SAWKILL RD

POWELL LANE

SANDY RD

WASHINGTON AVE

28

ZONE 1

ZONE 2

ZONE 3

ZONE 4

ZONE 5

PARK & RIDE

LEGEND:

- VEHICLE CONNECTION
- SIDEWALK CONNECTION
- POSSIBLE TRANSIT STOP

0 80 160

1" = 80'

(1" = 160' 1/2 SCALE)

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FIGURE 4
ALTERNATIVE 4A
4-WAY ROUNDABOUT (2-LANE)
WASHINGTON AVE.
TOWN OF ULSTER, NEW YORK

INTERSTATE 587

SAWKILL RD

POWELL LANE

SANDY RD

WASHINGTON AVE

28

PARK & RIDE

ZONE 1

ZONE 2

ZONE 3

ZONE 4

ZONE 5

LEGEND:

- VEHICLE CONNECTION
- SIDEWALK CONNECTION
- POSSIBLE TRANSIT STOP

0 80 160

1" = 80'

(1" = 160' 1/2 SCALE)

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6.0 Evaluation of alternatives

As discussed, the future improvements for this corridor should:

- Provide adequate capacity to accommodate future traffic volumes
- Provide reasonable access to properties in the corridor
- Satisfy NYSDOT and Ulster County access restrictions
- Ensure safety

In addition, any improvement in the corridor will provide the opportunity to create a gateway to the City of Kingston, along with bicycle, pedestrian, and transit improvements.

6.1 Level of service at primary intersection

Level of service analysis was conducted at the Washington Avenue/Sawkill Road intersection for each of the alternatives and at unsignalized site driveways. Detailed reports for the level of service analysis are included in Appendix C. The following table summarizes the results of the level of service analysis.

Table 2 – Level of Service Summary for Washington Avenue/Sawkill Road Intersection

Intersection		Level of Service (seconds of delay)							
		AM Peak Hour				PM Peak Hour			
Washington Avenue/Sawkill Road		Alt. 1 (Null)	Alt. 2A (Signal)	Alt. 3A (Jug-handle)	Alt. 4A (Round-about)	Alt. 1 (Null)	Alt. 2A (Signal)	Alt. 3A (Jug-handle)	Alt. 4A (Round-about)
EB	LTR	D(37.8)	-	-	-	D(51.5)	-	-	-
	L	-	D(49.0)	D(49.0)	A(8.4)	-	D(47.7)	D(47.7)	A(6.0)
	TR	-	C(31.9)	C(31.9)		-	C(28.2)	C(28.2)	
WB	LT	F(276.1)	-	-	-	F(292.3)	-	-	-
	L	-	D(38.3)	D(38.3)	A(8.4)	-	D(44.1)	D(44.1)	C(21.0)
	T	-	C(26.0)	C(26.0)		-	C(33.9)	C(33.9)	
	R	A(9.4)	B(13.7)	B(13.7)		F(247.2)	C(23.1)	C(23.1)	
NB	LTR	F(142.3)	-	-	-	E(60.9)	-	-	-
	L	-	D(45.3)	D(45.3)	A(3.0)	-	D(49.9)	D(49.9)	B(13.8)
	TR	-	D(44.3)	D(44.3)		-	D(47.2)	D(47.2)	
SB	LTR	C(25.1)	-	-	-	B(19.1)	-	-	-
	L	-	C(28.9)	C(28.9)	A(4.2)	-	C(32.3)	C(32.3)	A(3.6)
	TR	-	C(21.0)	C(21.0)		-	C(26.0)	C(26.0)	
Overall		D(51.5)	C(30.1)	C(30.1)	A(5.0)	F(165.3)	C(32.6)	C(32.6)	B(11.9)

This table shows that from a level of service standpoint, the traffic signal, the jughandle and the roundabout can all accommodate the future traffic volumes, although there are differences in the level of service provided by each alternative.

The four-way traffic signal and the jughandle will function with approximately the same amount of delay. Both of these alternatives will function at LOS C with approximately

30 seconds of delay during the AM peak hour and LOS C with approximately 33 seconds of delay during the PM peak hour.

The roundabout was analyzed using the New York State approved methodology (RODEL software). The results of this analysis show that a two-lane roundabout will operate at LOS A with approximately 5 seconds of average delay during the AM peak hour and LOS B with approximately 10 seconds of average delay during the PM peak hour for the year 2030.

6.2 Level of service at unsignalized driveways

Regardless of the specific alternative, the level of service for the unsignalized driveways essentially remains the same:

- The right turn movements exiting Zone 1 and Zone 2 onto Sawkill Road will both operate at LOS B during the AM and PM peak hours for the year 2030, with less than 15 seconds of delay.
- The right turn movements exiting Zone 2 and Zone 3 onto Washington Avenue will operate at LOS B with less than 14 seconds of delay in the AM peak period for the year 2030. During the PM peak period, the right turn movement out of Zone 2 will operate at LOS E with approximately 41 seconds of delay.

6.3 Other considerations

6.3.1 Access

Under the four-way traffic signal alternative, U-turns will be possible from the eastbound and westbound approaches to the Washington Avenue/Sawkill Road intersection but U-turns will not be possible from the northbound or southbound approaches. Since southbound drivers on Sawkill Road will not be able to make a U-turn at the traffic signal, these drivers would find it difficult to access Zone 2.

As with the four-way traffic signal, the jughandle alternative will not permit U-turns from Sawkill Road and will make Zone 2 difficult to access for some drivers.

A roundabout will allow U-turn movements from every approach at the Washington Avenue/Sawkill Road intersection; therefore, Zone 2 will be easier to access with a roundabout than with a traffic signal.

6.3.2 Weaving

Each of the alternatives will improve the weaving problem somewhat by construction of a raised median; however, the four-way traffic signal alternative has the potential to create an additional weaving problem between westbound vehicles on Washington Avenue and vehicles that will attempt to exit Zone 2 and merge into the left lane before Sawkill Road. Similarly, the eastbound approach would replace the existing two-lane weave with a three-lane weave, potentially exacerbating the weaving problem.

Providing a jughandle, rather than a left turn lane, on the eastbound approach may alleviate some of the weaving problem on Washington Avenue between the existing roundabout and Sawkill Road

The roundabout will minimize weaving problems in the corridor.

6.3.3 Traffic signal queuing

Design vehicular queue lengths for the left-turn maneuver on each approach were calculated for the 2030 PM peak hour. Table 3 below presents the results of this analysis; details of the calculations are included in Appendix A.

Table 3 - Design Queue Lengths for Left Turn Lanes (2030 PM Peak Hour)

Alternative	Lane	Design queue length (ft.)
Signal (2A)	Eastbound	300
	Westbound	300
	Northbound	100
	Southbound	350
Jughandle (3A)	Eastbound	300
	Westbound	300
	Northbound	100
	Southbound	350

As shown by Table 3, the traffic signal and jughandle alternatives would require long left turn lanes to accommodate the 2030 PM peak hour design queues. It does not appear that sufficient distance exists to provide the necessary storage between the existing intersection and the Esopus Creek. Since traffic is expected to move continuously through a roundabout, shorter queues should be experienced with the roundabout alternative.

6.4 Summary of evaluation

Table 4, shown below, summarizes the evaluation of the three build alternatives.

Table 4 – Summary of Evaluation of Alternatives

	Signal alternatives			Roundabout
	Null	Alt.2A	Alt. 3A	Alt. 4A
Overall LOS - 2030 PM peak*	F(165.3)	C(33)	C(33)	B(12)
Worst case approach LOS - 2030 PM peak*	F(292.3)	D(48)	D(42)	C(21)
Improves weaving problem?	N	Y/N	Y/N	Y
Accommodates U-turns?	N	Y/N	Y/N	Y

*Delay, in seconds, is given in parentheses

7.0 Conclusion

Three factors influenced the development of alternative concepts for the Washington Avenue corridor:

- There is a significant amount of undeveloped, and underdeveloped, land in this corridor that will become more attractive to development after the expansion of the sewer district.

- The future land uses projected for this corridor will generate a large increase in the traffic volumes.

- Based on the recommendations of the NYSDOT and Ulster County, a high level of access restriction will be imposed in this corridor for any future alternative design.

The traffic signal alternative, the jughandle, and the roundabout will all accommodate the future traffic volumes at an acceptable level of service. The roundabout operates at a higher level of service – both overall and on individual approaches – than either of the other two alternatives. The roundabout also minimizes the weaving problem, vehicular queuing, and simplifies site access by allowing U-turns from all approaches. For these reasons, the roundabout appears to represent the preferred alternative. For the project to be successful, cross-access easements will be necessary between all parcels.

8.0 Public comments

A public information meeting was held on December 15, 2005, at which Creighton Manning Engineering presented preliminary results of this corridor study. The public was asked to submit comments within 14 days of this meeting. Comments were received by mail, email, and telephone from five individuals plus the Ulster County Department of Highways and Bridges following the public information meeting. An additional verbal comment was received at the January 7, 2005, technical committee meeting. These comments are summarized below. The unedited comments are included in Appendix D.

- Any changes at Washington Ave./Sawkill Rd. should not force more traffic to use the existing roundabout.

- The roundabout alternative should consider linking Powell Lane directly into the roundabout.

- A new roundabout in the corridor should be designed differently than the existing roundabout; in particular, there should not be a raised center section and there should be more descriptive signage approaching the roundabout and within the roundabout. Descriptive signs are necessary because drivers are generally

unfamiliar with roundabouts. (Two comments were received advocating better signage.)

- A jughandle would be easier for drivers to navigate than a roundabout because drivers are generally more familiar with traffic signals. Drivers who are unfamiliar with a roundabout will use incorrect lanes and cut-off other vehicles in order to exit the roundabout.

- The computer simulation of traffic in the corridor does not show aggressive drivers and the potential effects of accidents within the roundabout.

- Roundabouts may result in less average delay; however, they are less safe than signals and contribute to more accidents.

- Cross-connections will cut through private property and may not be feasible.

- Raising Powell Lane to meet Sawkill Road will be difficult due to grade and utilities in the area.

- Ulster County Department of Highways and Bridges is in support of the roundabout alternative with a raised median on Sawkill Road.

- The current location of the Citgo driveway on Washington Ave. should be maintained. The current location is closer to Sawkill Road than what is shown on any of the concept plans. (Comment from 1/7/05 technical committee meeting.)

Appendix A

Detailed tables

Land Use and Trip Generation for Washington Avenue Corridor

KEY:

land use	Current land use and associated trip generation
land use	Future land use and associated trip generation
	Change in trip generation

*Parcel ID numbers correspond to Land Use map (Figure 1)

PROPERTIES WITHIN THE SEWER DISTRICT

Zone	Parcel ID*	Area (acres)	Land Use	ITE land use code	Size of trip generator	Trip Generation AM In Total	AM In Pass-By Credit	AM Out Total	AM Out Pass-By Credit	PM In Total	PM In Pass-By Credit	PM Out Total	PM Out Pass-By Credit
1	4304	1.73	Farm stand ~~Farm stand~~			NO CHANGE							
	4307 + 4317	2.5 + 0.4 = 2.9	Gas station with convenience store ~~Multiuse highway commercial development (gas station/fast food/convenience store)~~[1]		8 fueling positions 5.6 KSF gross floor area 2.5 KSF fast-food area 10 fueling positions 50 seats	60 117	15 29	60 118	15 29	80 129	20 32	80 130	20 32
					Change	57	14	58	14	49	12	50	12
2	4320	0.28	vacant	NA	0	0	0	0	0	0	0	0	0
			~~Specialty retail~~	814	6 KSF	3	1	1	1	7	2	9	2
						3	1	1	1	7	2	9	2
	4314	0.27	vacant	NA	0	0	0	0	0	0	0	0	0
			~~Specialty retail~~	814	5.8 KSF	3	1	1	1	7	2	9	2
						3	1	1	1	7	2	9	2
	4311	0.57	Specialty car repair shop ~~Specialty car repair shop~~			NO CHANGE							
	4328	0.00	Gas station w/ convenience market ~~Gas station w/ convenience market~~			NO CHANGE							
	4323	1.90	Single-family home	210	1 unit	0	0	1	0	1	0	0	0
			~~Bank with drive through~~	912	4 KSF	28	2	22	2	91	9	91	9
					Change	27	2	21	2	91	9	91	9
	4316	4.00	vacant	NA	0	0	0	0	0	0	0	0	0
			~~General office building~~	710	50 KSF	68	0	9	0	13	0	62	0
					Change	68	0	9	0	13	0	62	0
	4341	1.90	Diner	932	4 KSF	24	6	22	6	27	5	17	5
			Beverage store - vacant			0	0	0	0	0	0	0	0
			~~Diner~~	932	4 KSF	24	6	22	6	27	5	17	5
			~~Beverage store - occupied~~	814	6.5 KSF	0	0	0	0	16	5	21	5
					Change	0	0	0	0	16	5	21	5
3	4333	0.96	Used auto sales & service ~~Used auto sales & service~~			NO CHANGE							
4	4327	0.70	Small auto garage		3 service bays	1	0	3	0	3	0	5	0
			~~Fast food with drive through~~	934	4 KSF	108	27	104	27	72	17	67	17
					Change	107	27	101	27	69	17	62	17
5	4254	14.80	vacant	NA		0	0	0	0	0	0	0	0
			~~County park~~	412	14.8 acres	0	0	0	0	0	0	1	0
					Change	0	0	0	0	0	0	1	0
	4302	2.80	vacant			0	0	0	0	0	0	0	0
			~~Business hotel~~	312	100 occupied rooms	34	0	24	0	37	0	25	0
			~~High turnover sit-down restaurant~~	932	5 KSF	30	7	28	7	33	7	21	7
					Change	64	7	51	7	71	7	46	7
NA		1.50	Park-N-Ride		36 spaces	52	0	26	0	26	0	52	0
			~~Visitor's Center~~[2]		6 KSF	32	26	32	26	32	26	32	26
			~~Park-N-Ride~~[3]		34 spaces	52	0	26	0	26	0	52	0
					Change	32	26	32	26	32	26	32	26
			TOTAL CHANGE IN TRIP GENERATION (SEWER DISTRICT ONLY)			362	78	275	78	355	80	382	80

PROPERTIES OUTSIDE OF THE SEWER DISTRICT

2	4331	10.00	vacant	NA	0	0	0	0	0	0	0	0	0
			~~2-family residences~~	210	20 dwelling units	4	0	11	0	13	0	7	0
					Change	4	0	11	0	13	0	7	0
	various	various	Single-family home	210	7 units								
			~~Single-family home~~	210	7 units	NO CHANGE							
			TOTAL CHANGE IN TRIP GENERATION (ALL PROPERTIES)			366	78	286	78	368	80	389	80
			TOTAL NEW TRIPS			497				596			

Notes

[1] Used multiple regression model from "Trip-Generation Models for Multiuse Highway Commercial Developments" by Datta, Datta, and Nannapaneni, *ITE Journal*, February 1998, pp. 24-30.

[2] New trips based on CME assumption of 1 vehicle every 10 minutes during peak hour. Pass-by trips based on estimates by Ulster County Planning Dept., March 2004.

[3] CME assumption: 2-person car pools only

Design queue length calculations for Washington Ave/Sawkill Road alternatives
2030 PM Peak Hour

Alt. #	Lane	Lane volume (vph)	Cycle length (s)	PHF	G/C	# cycles/hr	Adjusted flow (vph)	arrivals/cycle	# vehs arriving on red each cycle	safety factor	Design queue length (ft)
2A	EBL	236	105	0.95	0.19	34.29	248	7	6	2	300
	WBL	214	105	0.95	0.19	34.29	225	7	6	2	300
	NBL	50	105	0.95	0.1	34.29	53	2	2	2	100
	SBL	318	105	0.95	0.33	34.29	335	10	7	2	350
3A	EBL	236	105	0.95	0.19	34.29	248	7	6	2	300
	WBL	214	105	0.95	0.19	34.29	225	7	6	2	300
	NBL	50	105	0.95	0.1	34.29	53	2	2	2	100
	SBL	318	105	0.95	0.33	34.29	335	10	7	2	350

Appendix B

Traffic volume figures

Figure B-1 2004 Existing Traffic Volumes

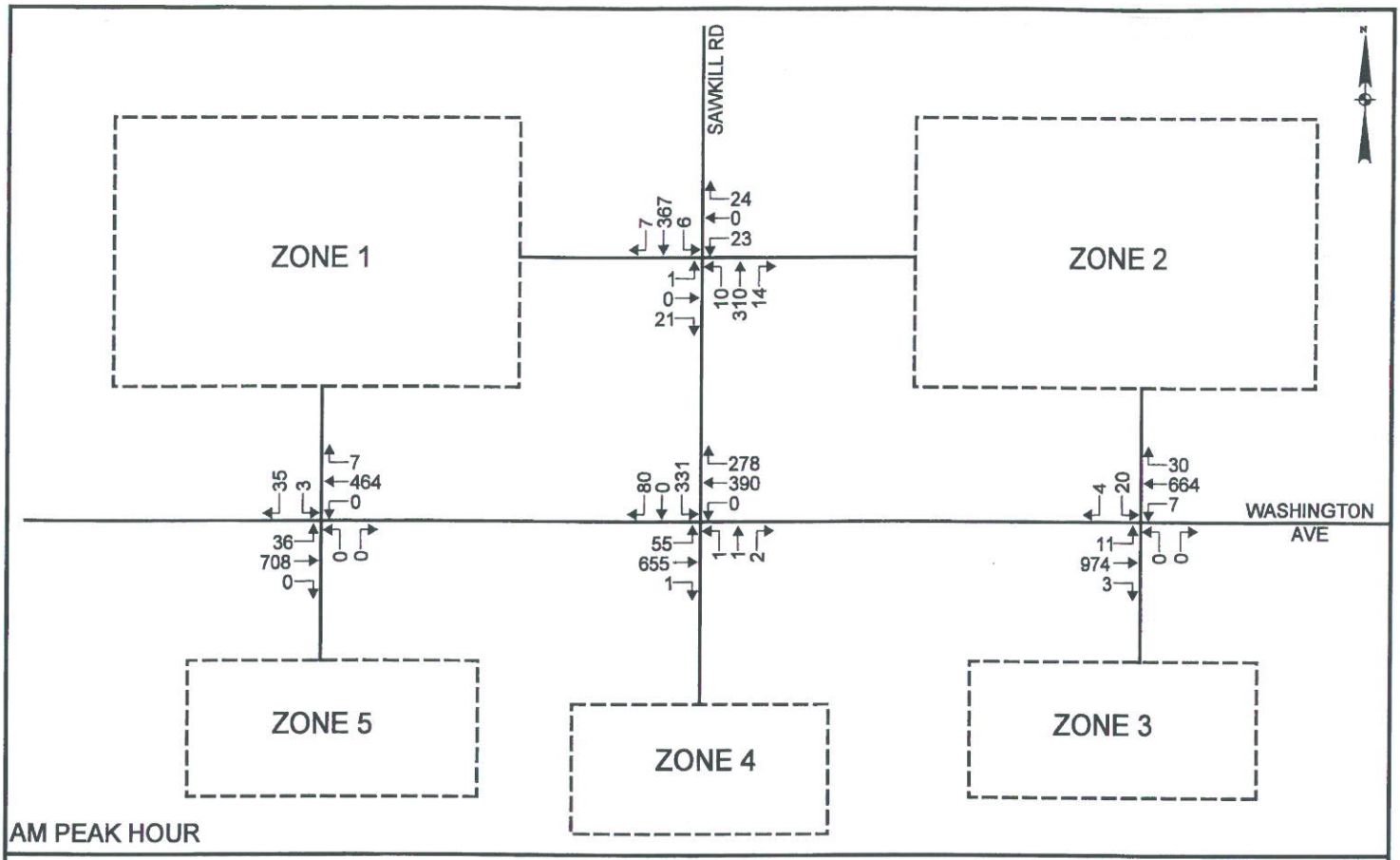
Figure B-2 2030 Background Traffic Volumes

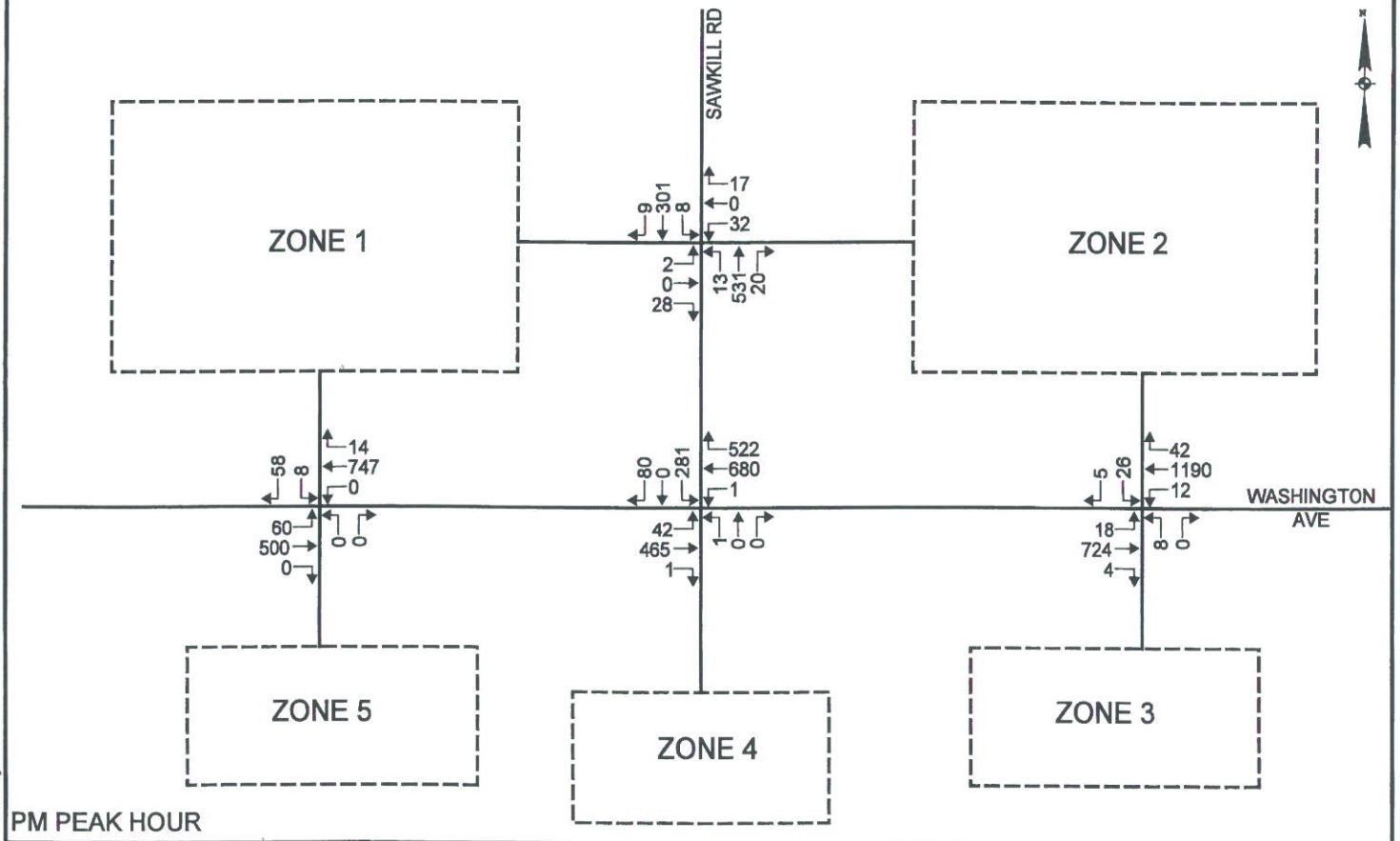
Figure B-3 Reassignment of existing trips due to left-turn prohibition on Washington Avenue

Figure B-4 2030 Trip Assignment, Summary of Change in Trip Generation

Figure B-5 Reassignment of trips due to left-turn prohibition on Sawkill Road

Figure B-6 2030 Traffic Volumes





2004 EXISTING
TRAFFIC VOLUMES

WASHINGTON AVENUE CORRIDOR STUDY
TOWN OF ULSTER, NEW YORK

CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 04-143 | DATE: 11/04 | FIGURE: B-1

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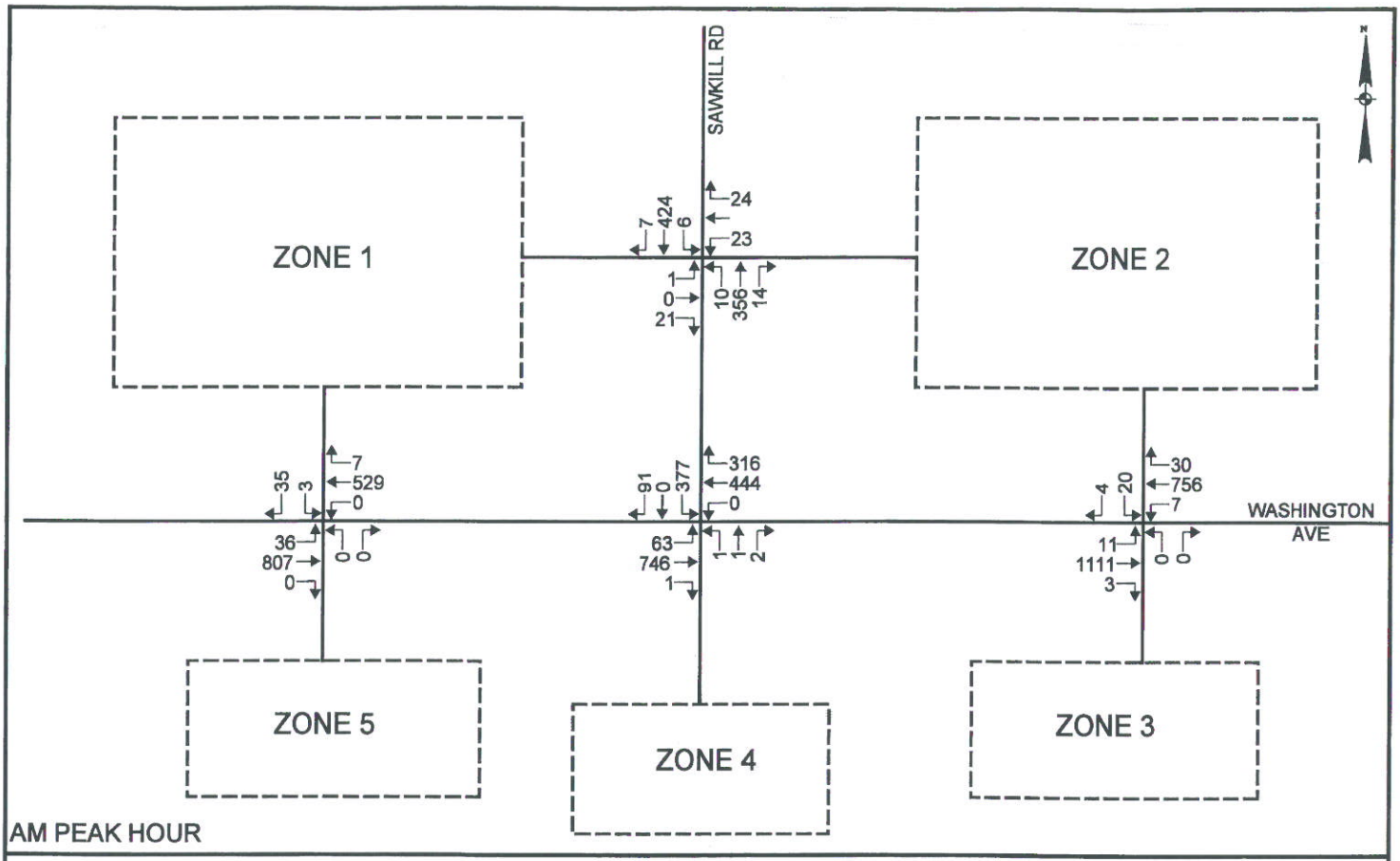

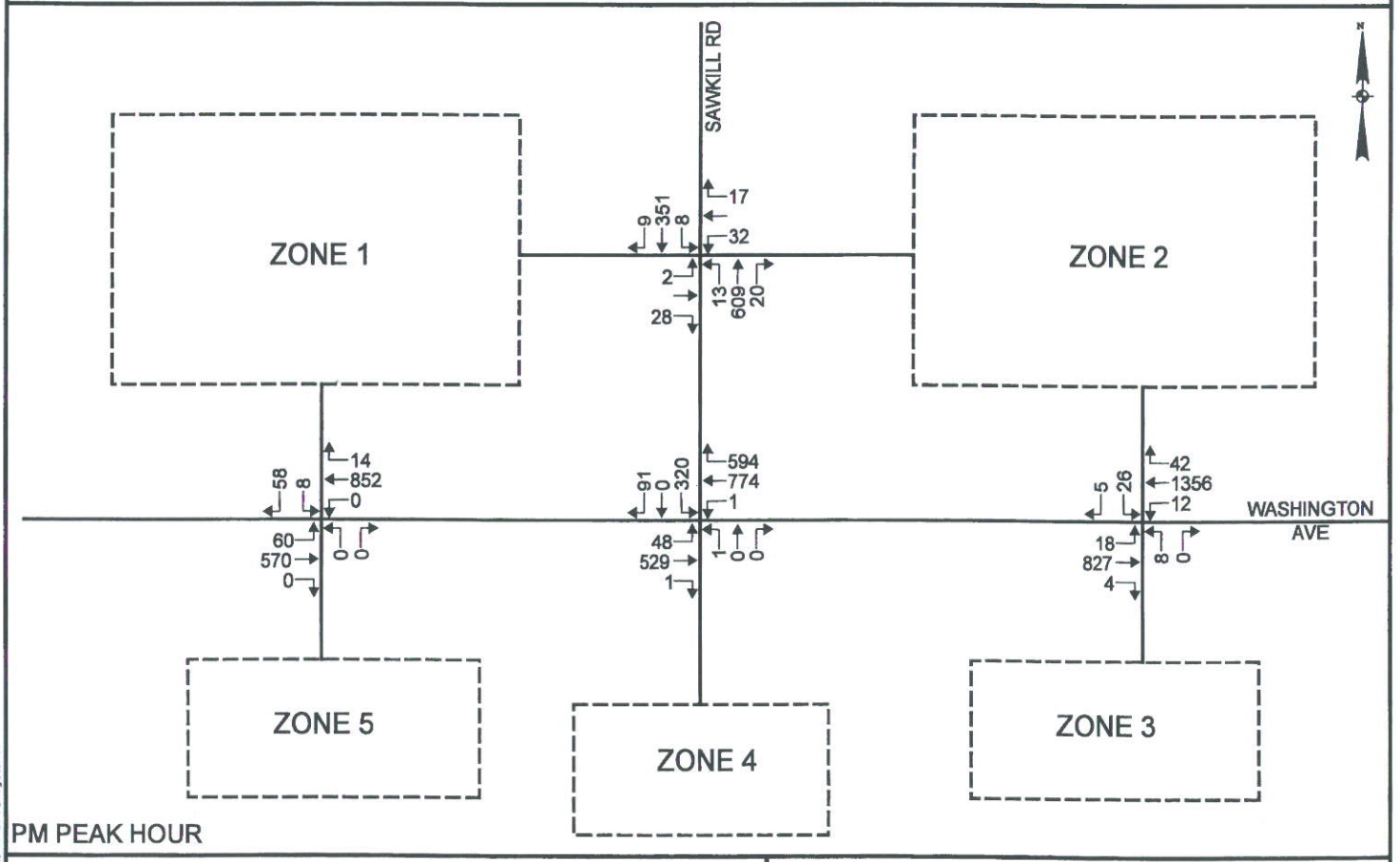

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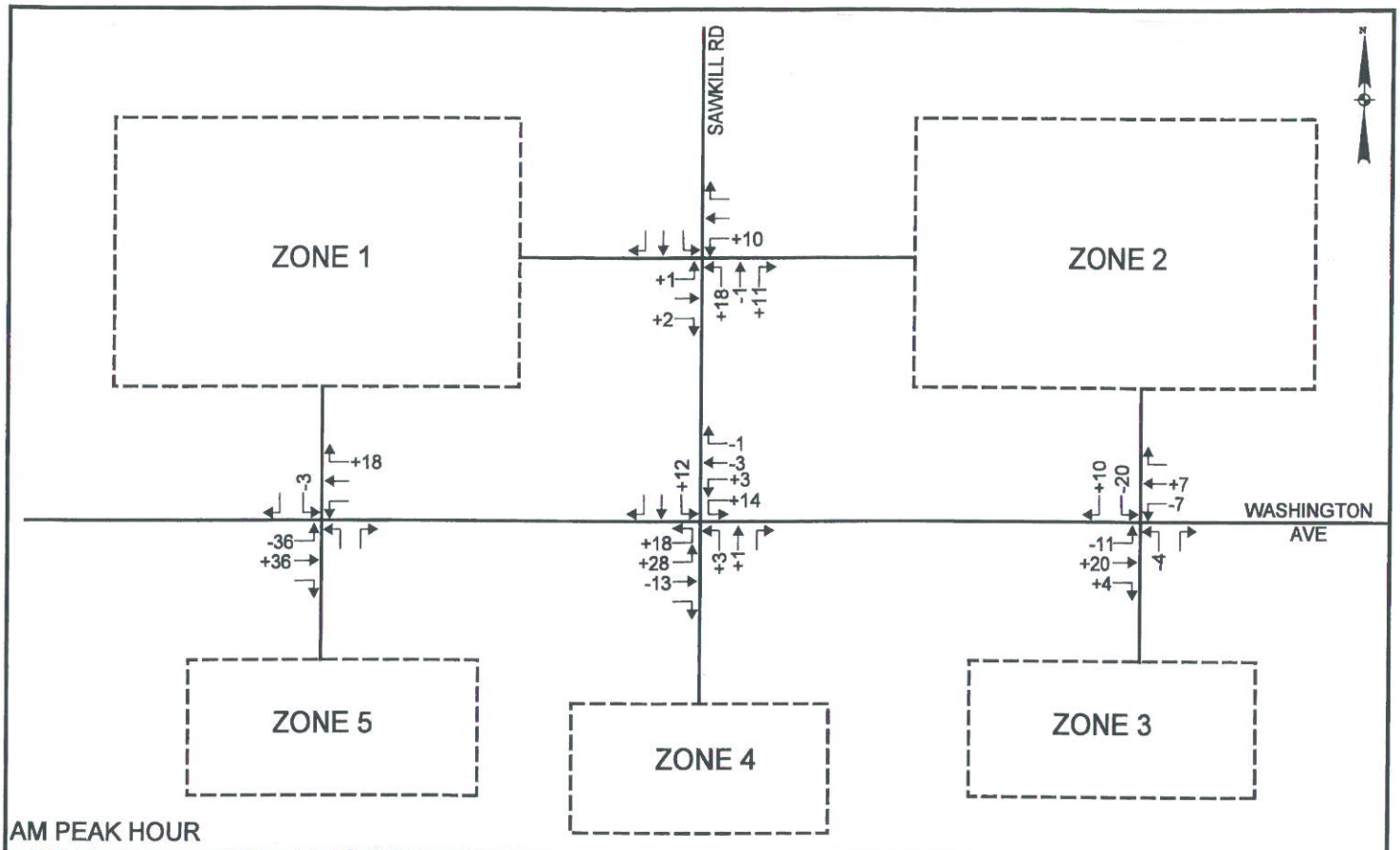
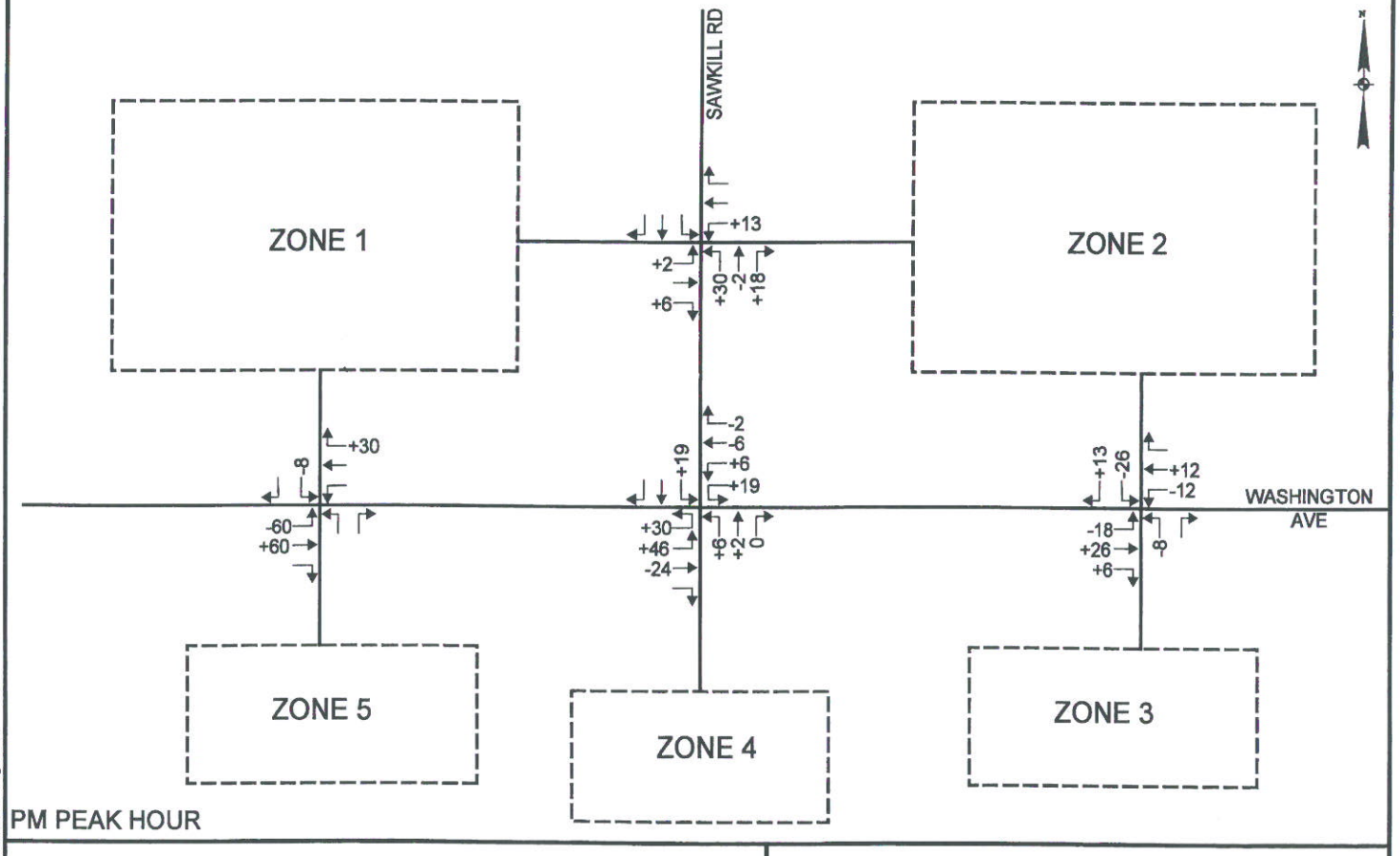
2030 BACKGROUND TRAFFIC VOLUMES

WASHINGTON AVENUE CORRIDOR STUDY
TOWN OF ULSTER, NEW YORK

CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 04-143 | DATE: 11/04 | FIGURE: B-2





REASSIGNMENT OF EXISTING TRIPS DUE TO LEFT-TURN PROHIBITION ON WASHINGTON AVE.

WASHINGTON AVENUE CORRIDOR STUDY
TOWN OF ULSTER, NEW YORK

CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 04-143	DATE: 11/04	FIGURE: B-3

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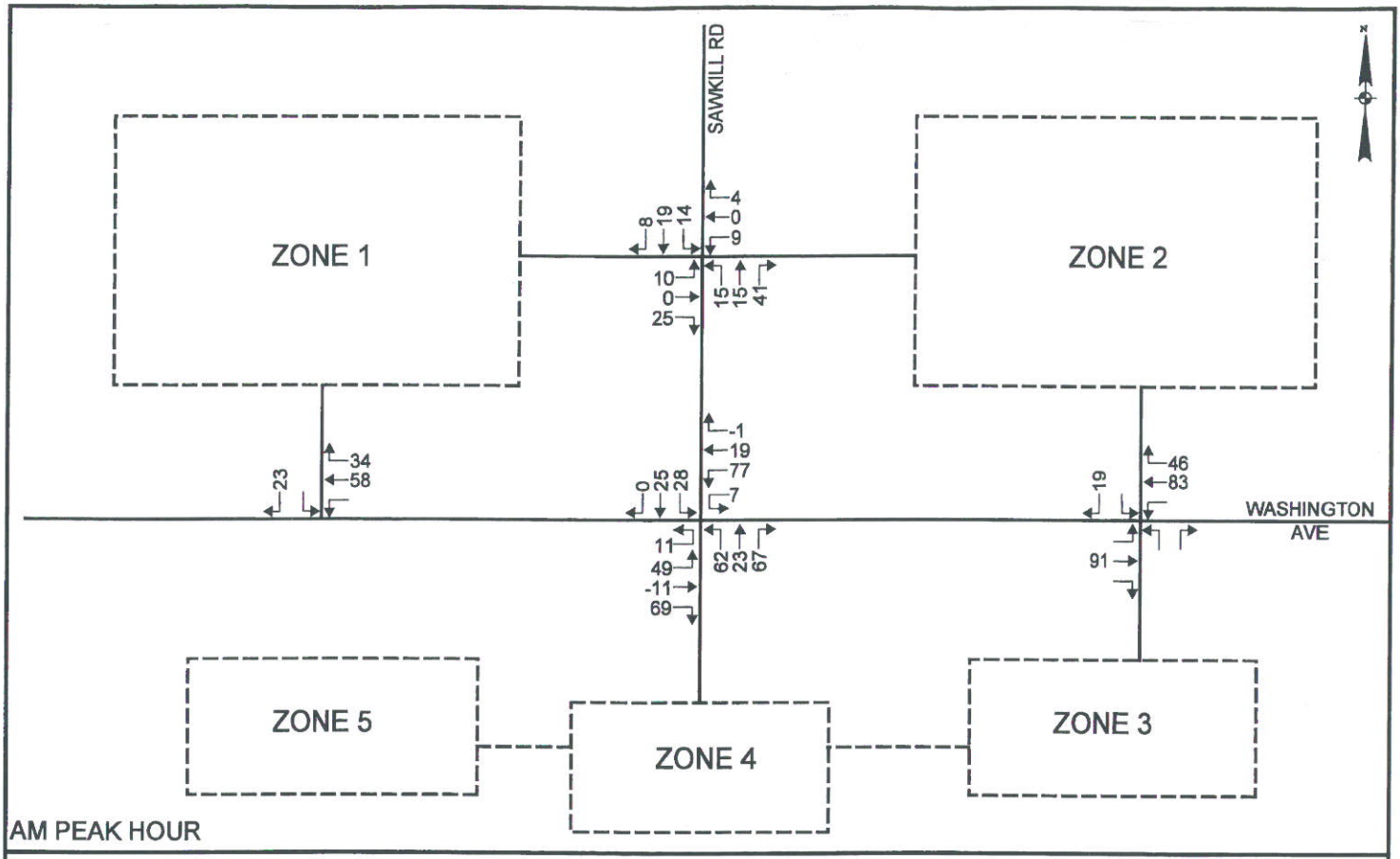

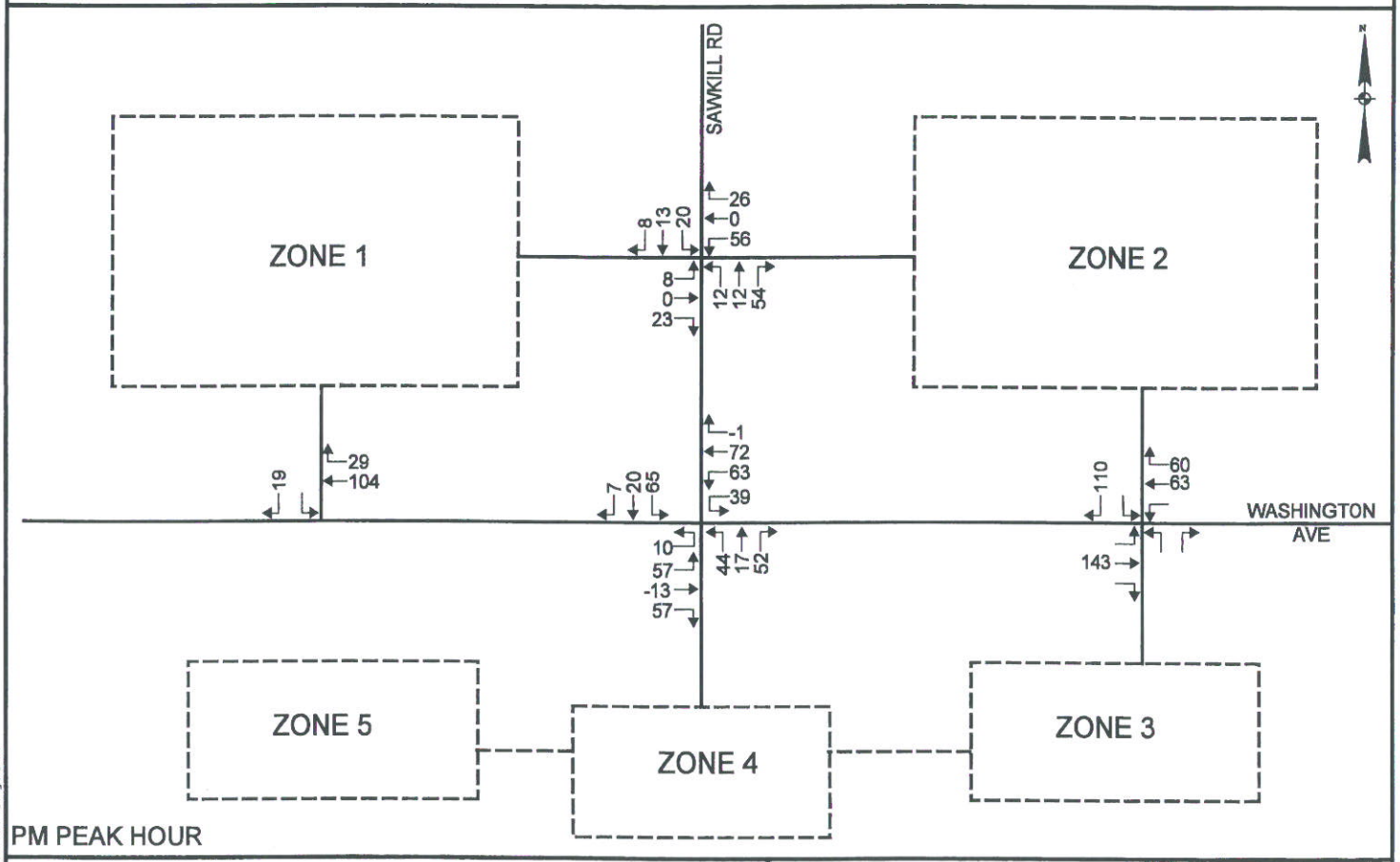

2030 TRIP ASSIGNMENT
SUMMARY OF CHANGE IN TRIP GENERATION

WASHINGTON AVENUE CORRIDOR STUDY
TOWN OF ULSTER, NEW YORK

CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 04-143 | DATE: 11/04 | FIGURE: B-4

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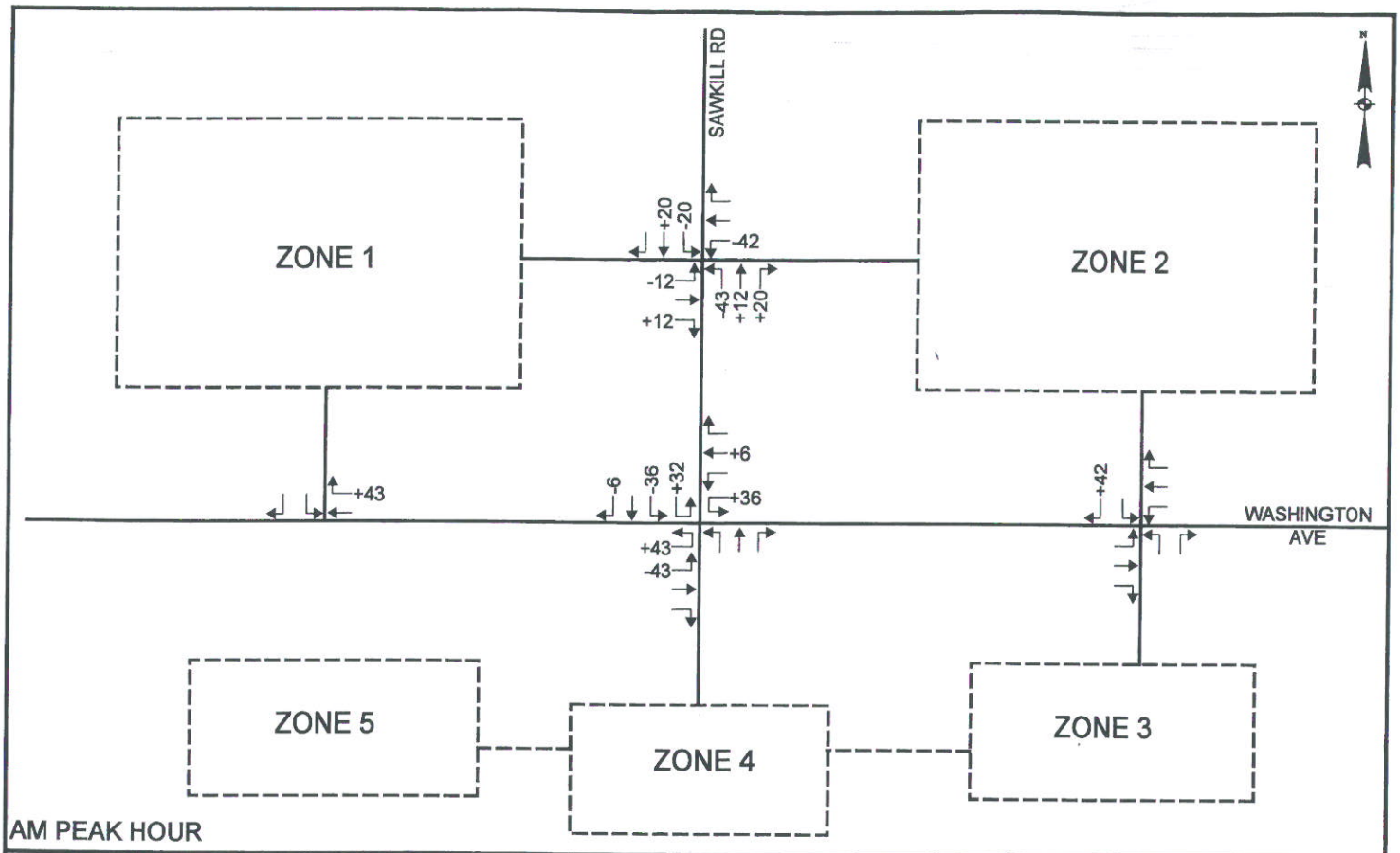

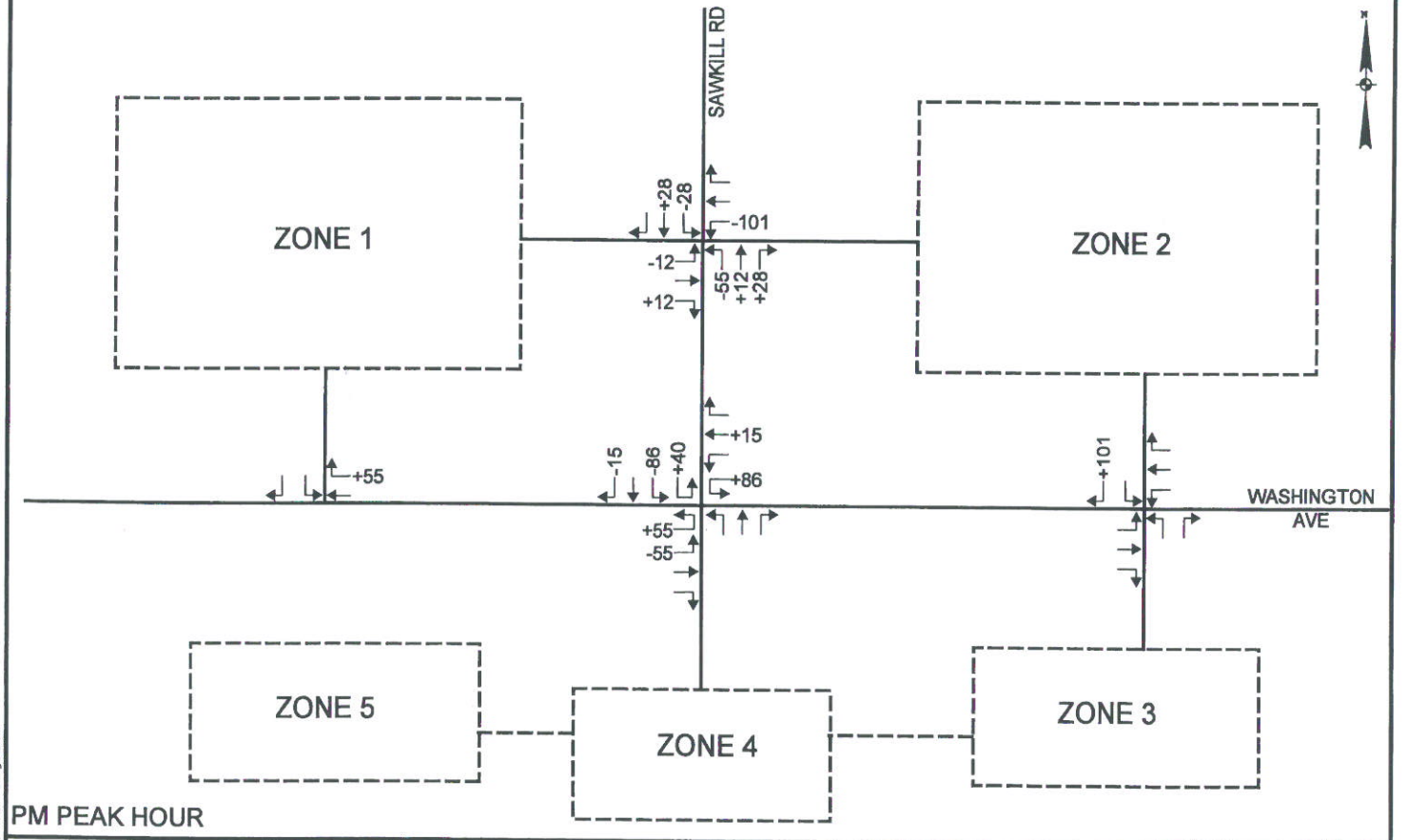

REASSIGNMENT OF TRIPS DUE TO LEFT-TURN PROHIBITION ON SAWKILL RD.

WASHINGTON AVENUE CORRIDOR STUDY
TOWN OF ULSTER, NEW YORK

CME
CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 04-143	DATE: 11/04	FIGURE: B-5

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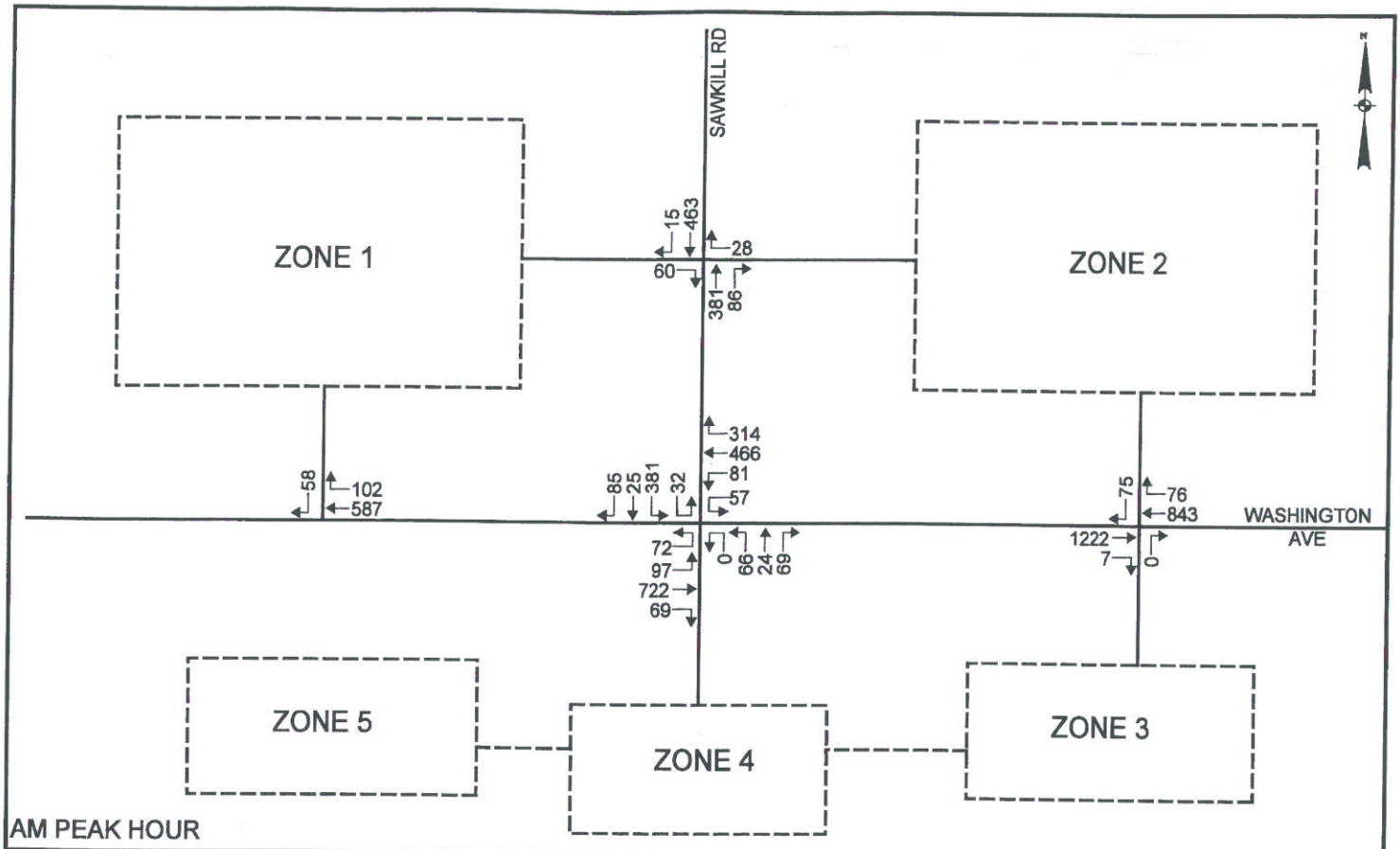

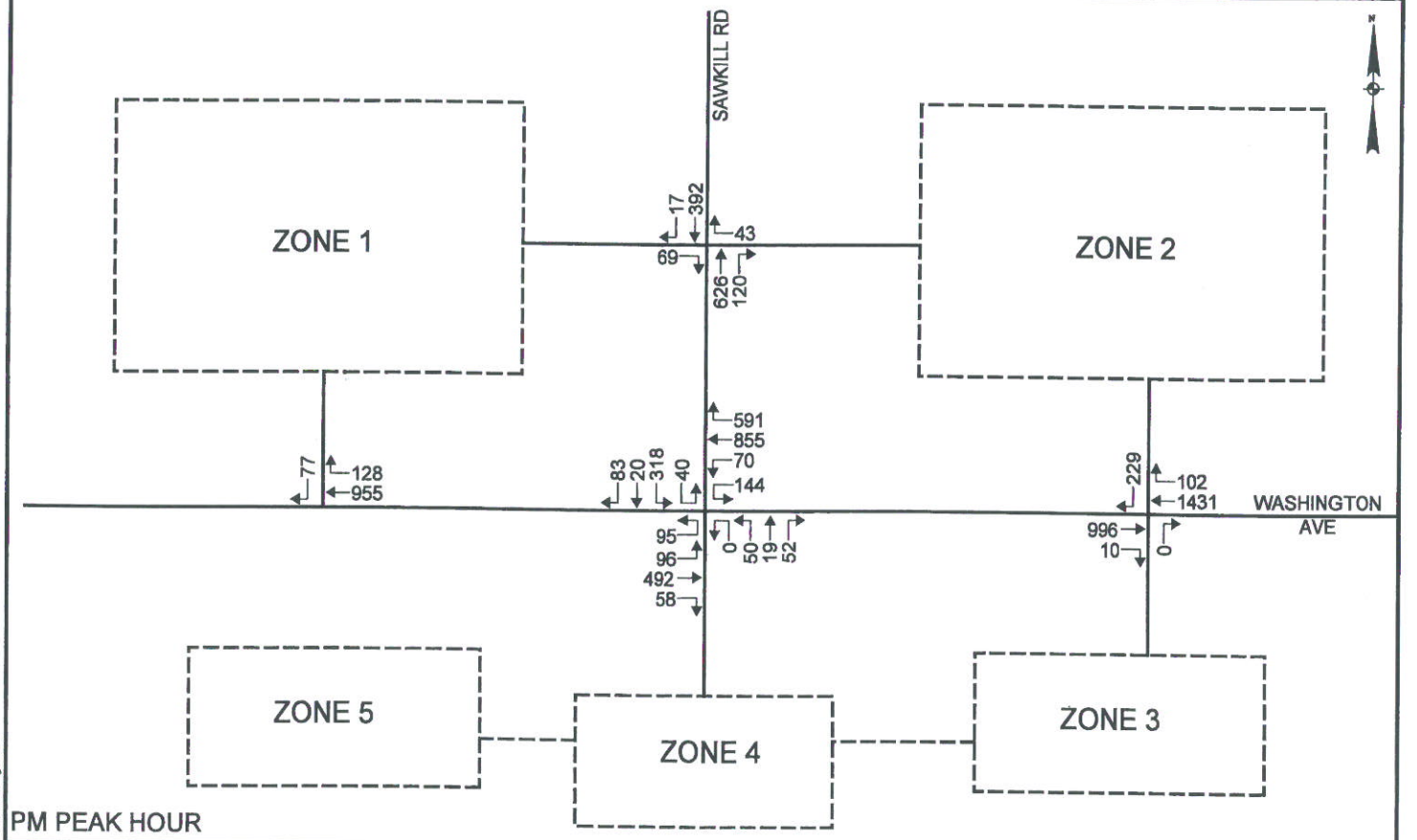

2030 TRAFFIC VOLUMES

WASHINGTON AVENUE CORRIDOR STUDY
TOWN OF ULSTER, NEW YORK

CREIGHTON MANNING ENGINEERING, LLP
17 COMPUTER DRIVE WEST, ALBANY, NY 12205

PROJECT: 04-143 | DATE: 11/04 | FIGURE: B-6

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Appendix C

Level of service reports

SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME, AMexisting	Area Type	All other areas
Date Performed	9/20/2004	Jurisdiction	Town of Ulster
Time Period	AM Peak Hour	Analysis Year	2004 existing

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	0	2	1	0	0	0	0	0	0
Lane group		LT			T	R					LR	
Volume (vph)	55	655			390	278				331		80
% Heavy veh	1	1			1	1				1		1
PHF	0.90	0.90			0.90	0.90				0.90		0.90
Actuated (P/A)	A	A			A	A				A		A
Startup lost time		2.0			2.0	2.0					2.0	
Ext. eff. green		2.0			2.0	2.0					2.0	
Arrival type		3			3	3					3	
Unit Extension		3.0			3.0	3.0					3.0	
Ped/Bike/RTOR Volume				0		0	0			0		0
Lane Width		12.0			12.0	12.0					12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N		N	N	0	N
Parking/hr												
Bus stops/hr		0			0	0					0	
Unit Extension		3.0			3.0	3.0					3.0	

Phasing	EW Perm	EB Only	03	04	SB Only	06	07	08
Timing	G = 22.0	G = 3.0	G =	G =	G = 20.0	G =	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 60.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		789			433	309					457	
Lane group cap.		1635			1313	586					587	
v/c ratio		0.48			0.33	0.53					0.78	
Green ratio		0.50			0.37	0.37					0.33	
Unif. delay d1		9.9			13.7	14.9					18.0	
Delay factor k		0.11			0.11	0.13					0.33	
Increm. delay d2		0.2			0.1	0.9					6.6	
PF factor		1.000			1.000	1.000					1.000	
Control delay		10.1			13.8	15.8					24.6	
Lane group LOS		B			B	B					C	
Apprch. delay	10.1			14.7						24.6		
Approach LOS	B			B						C		
Intersec. delay	15.1			Intersection LOS						B		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME, PMexisting	Area Type	All other areas
Date Performed	9/20/2004	Jurisdiction	Town of Ulster
Time Period	PM Peak Hour	Analysis Year	2004 existing

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	0	2	1	0	0	0	0	0	0
Lane group		LT			T	R					LR	
Volume (vph)	42	465			680	522				281		80
% Heavy veh	1	1			1	1				1		1
PHF	0.90	0.90			0.90	0.90				0.90		0.90
Actuated (P/A)	A	A			A	A				A		A
Startup lost time		2.0			2.0	2.0					2.0	
Ext. eff. green		2.0			2.0	2.0					2.0	
Arrival type		3			3	3					3	
Unit Extension		3.0			3.0	3.0					3.0	
Ped/Bike/RTOR Volume				0		0	0			0		0
Lane Width		12.0			12.0	12.0					12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N		N	N	0	N
Parking/hr												
Bus stops/hr		0			0	0					0	
Unit Extension		3.0			3.0	3.0					3.0	

Phasing	EW Perm	EB Only	03	04	SB Only	06	07	08
Timing	G = 22.0	G = 3.0	G =	G =	G = 20.0	G =	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 60.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		564			756	580					401	
Lane group cap.		1578			1313	586					585	
v/c ratio		0.36			0.58	0.99					0.69	
Green ratio		0.50			0.37	0.37					0.33	
Unif. delay d1		9.1			15.3	18.9					17.3	
Delay factor k		0.11			0.17	0.49					0.25	
Increm. delay d2		0.1			0.6	34.5					3.3	
PF factor		1.000			1.000	1.000					1.000	
Control delay		9.3			15.9	53.3					20.6	
Lane group LOS		A			B	D					C	
Apprch. delay	9.3			32.1						20.6		
Approach LOS	A			C						C		
Intersec. delay	24.5			Intersection LOS						C		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME, AMnull2030_revised	Area Type	All other areas
Date Performed	9/20/2004	Jurisdiction	Town of Ulster
Time Period	AM Peak Hour	Analysis Year	2030 no roadway improvements

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	0	2	1	0	1	0	0	1	0
Lane group		LTR		DefL	T	R		LTR			LTR	
Volume (vph)	201	722	69	138	466	314	66	24	69	381	25	117
% Heavy veh	1	1	1	1	1	1	1	1	1	1	1	1
PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0		2.0	2.0	2.0		2.0			2.0	
Ext. eff. green		2.0		2.0	2.0	2.0		2.0			2.0	
Arrival type		3		3	3	3		3			3	
Unit Extension		3.0		3.0	3.0	3.0		3.0			3.0	
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width		12.0		12.0	12.0	12.0		12.0			12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0		0	0	0		0			0	
Unit Extension		3.0		3.0	3.0	3.0		3.0			3.0	

Phasing	EW Perm	EB Only	03	04	SB Only	NS Perm	07	08
Timing	G = 22.0	G = 3.0	G =	G =	G = 20.0	G = 10.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 75.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		1045		145	491	331		167			550	
Lane group cap.		1103		100	552	895		149			673	
v/c ratio		0.95		1.45	0.89	0.37		1.12			0.82	
Green ratio		0.40		0.29	0.29	0.56		0.13			0.47	
Unif. delay d1		21.7		26.5	25.3	9.2		32.5			17.2	
Delay factor k		0.46		0.50	0.41	0.11		0.50			0.36	
Increm. delay d2		16.1		249.6	16.3	0.3		109.8			7.8	
PF factor		1.000		1.000	1.000	1.000		1.000			1.000	
Control delay		37.8		276.1	41.7	9.4		142.3			25.1	
Lane group LOS		D		F	D	A		F			C	
Apprch. delay	37.8			65.8			142.3			25.1		
Approach LOS	D			E			F			C		
Intersec. delay	51.5			Intersection LOS						D		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME, PMnull2030_revised	Area Type	All other areas
Date Performed	9/20/2004	Jurisdiction	Town of Ulster
Time Period	PM Peak Hour	Analysis Year	2030 no roadway improvements

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	2	0	0	2	1	0	1	0	0	1	0
Lane group	DefL	TR			LT	R		LTR			LTR	
Volume (vph)	236	492	58	214	855	591	50	19	52	318	20	123
% Heavy veh	1	1	1	1	1	1	1	1	1	1	1	1
PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Actuated (P/A)	A	A	A	A	A		A	A	A	A	A	A
Startup lost time	2.0	2.0			2.0	2.0		2.0			2.0	
Ext. eff. green	2.0	2.0			2.0	2.0		2.0			2.0	
Arrival type	3	3			3	3		3			3	
Unit Extension	3.0	3.0			3.0	3.0		3.0			3.0	
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0			12.0	12.0		12.0			12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0			0	0		0			0	
Unit Extension	3.0	3.0			3.0	3.0		3.0			3.0	

Phasing	EW Perm	EB Only	03	04	SB Only	NS Perm	07	08
Timing	G = 22.0	G = 3.0	G =	G =	G = 20.0	G = 10.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 75.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	248	579			1125	622		128			485	
Lane group cap.	291	740			714	426		155			690	
v/c ratio	0.85	0.78			1.58	1.46		0.83			0.70	
Green ratio	0.40	0.40			0.29	0.27		0.13			0.47	
Unif. delay d1	30.6	19.6			26.5	27.5		31.7			15.9	
Delay factor k	0.38	0.33			0.50	0.50		0.36			0.27	
Increm. delay d2	20.9	5.5			265.8	219.7		29.2			3.2	
PF factor	1.000	1.000			1.000	1.000		1.000			1.000	
Control delay	51.5	25.1			292.3	247.2		60.9			19.1	
Lane group LOS	D	C			F	F		E			B	
Apprch. delay	33.0			276.2			60.9			19.1		
Approach LOS	C			F			E			B		
Intersec. delay	165.3			Intersection LOS						F		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME; Alt2A_AM2030_rev	Area Type	All other areas
Date Performed	10/4/2004	Jurisdiction	Town of Ulster
Time Period	AM Peak Hour	Analysis Year	ETC+23 (2030)

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	2	0	1	2	1	1	1	0	1	1	0
Lane group	L	TR		L	T	R	L	TR		L	TR	
Volume (vph)	201	722	69	138	466	314	66	24	69	381	25	117
% Heavy veh	1	1	1	1	1	1	1	1	1	1	1	1
PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3		3	3	3	3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0		0	0	0	0	0		0	0	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

Phasing	Excl. Left	Thru & RT	03	04	NS Perm	SB Only	07	08
Timing	G = 15.0	G = 30.0	G =	G =	G = 10.0	G = 20.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 95.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	212	833		145	491	331	69	98		401	149	
Lane group cap.	282	1116		282	1131	842	126	176		607	607	
v/c ratio	0.75	0.75		0.51	0.43	0.39	0.55	0.56		0.66	0.25	
Green ratio	0.16	0.32		0.16	0.32	0.53	0.11	0.11		0.37	0.37	
Unif. delay d1	38.2	29.1		36.7	25.8	13.4	40.4	40.4		26.2	20.8	
Delay factor k	0.31	0.30		0.12	0.11	0.11	0.15	0.15		0.24	0.11	
Increm. delay d2	10.8	2.8		1.6	0.3	0.3	5.0	3.9		2.7	0.2	
PF factor	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	49.0	31.9		38.3	26.0	13.7	45.3	44.3		28.9	21.0	
Lane group LOS	D	C		D	C	B	D	D		C	C	
Apprch. delay	35.4			23.7			44.7			26.8		
Approach LOS	D			C			D			C		
Intersec. delay	30.1			Intersection LOS						C		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME; Alt2A_PM2030_rev	Area Type	All other areas
Date Performed	10/4/2004	Jurisdiction	Town of Ulster
Time Period	PM Peak Hour	Analysis Year	ETC+23 (2030)

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	2	0	1	2	1	1	1	0	1	1	0
Lane group	L	TR		L	T	R	L	TR		L	TR	
Volume (vph)	236	492	58	214	855	591	50	19	52	318	20	123
% Heavy veh	1	1	1	1	1	1	1	1	1	1	1	1
PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3		3	3	3	3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0		0	0	0	0	0		0	0	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

Phasing	Excl. Left	Thru & RT	03	04	NS Perm	SB Only	07	08
Timing	G = 20.0	G = 35.0	G =	G =	G = 10.0	G = 20.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 105.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	248	579		225	900	622	53	75		335	150	
Lane group cap.	340	1175		340	1194	838	102	159		552	546	
v/c ratio	0.73	0.49		0.66	0.75	0.74	0.52	0.47		0.61	0.27	
Green ratio	0.19	0.33		0.19	0.33	0.52	0.10	0.10		0.33	0.33	
Unif. delay d1	40.0	27.9		39.4	31.2	19.5	45.2	45.0		30.4	25.7	
Delay factor k	0.29	0.11		0.24	0.31	0.30	0.13	0.11		0.19	0.11	
Increm. delay d2	7.8	0.3		4.7	2.8	3.6	4.7	2.2		1.9	0.3	
PF factor	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	47.7	28.2		44.1	33.9	23.1	49.9	47.2		32.3	26.0	
Lane group LOS	D	C		D	C	C	D	D		C	C	
Apprch. delay	34.1			31.4			48.3			30.3		
Approach LOS	C			C			D			C		
Intersec. delay	32.6			Intersection LOS						C		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME; Alt3A_AM2030_rev	Area Type	All other areas
Date Performed	9/21/2004	Jurisdiction	Town of Ulster
Time Period	AM Peak Hour	Analysis Year	ETC+23 (2030)

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	2	0	1	2	1	1	1	0	1	1	0
Lane group	L	TR		L	T	R	L	TR		L	TR	
Volume (vph)	201	722	69	138	466	314	66	24	69	381	25	117
% Heavy veh	1	1	1	1	1	1	1	1	1	1	1	1
PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3		3	3	3	3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0		0	0	0	0	0		0	0	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

Phasing	Excl. Left	Thru & RT	03	04	NS Perm	SB Only	07	08
Timing	G = 15.0	G = 30.0	G =	G =	G = 10.0	G = 20.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 95.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	212	833		145	491	331	69	98		401	149	
Lane group cap.	282	1116		282	1131	842	126	176		607	607	
v/c ratio	0.75	0.75		0.51	0.43	0.39	0.55	0.56		0.66	0.25	
Green ratio	0.16	0.32		0.16	0.32	0.53	0.11	0.11		0.37	0.37	
Unif. delay d1	38.2	29.1		36.7	25.8	13.4	40.4	40.4		26.2	20.8	
Delay factor k	0.31	0.30		0.12	0.11	0.11	0.15	0.15		0.24	0.11	
Increm. delay d2	10.8	2.8		1.6	0.3	0.3	5.0	3.9		2.7	0.2	
PF factor	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	49.0	31.9		38.3	26.0	13.7	45.3	44.3		28.9	21.0	
Lane group LOS	D	C		D	C	B	D	D		C	C	
Apprch. delay	35.4			23.7			44.7			26.8		
Approach LOS	D			C			D			C		
Intersec. delay	30.1			Intersection LOS						C		

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SHORT REPORT

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Sawkill Rd
Agency or Co.	CME; Alt3A_PM2030_rev	Area Type	All other areas
Date Performed	9/21/2004	Jurisdiction	Town of Ulster
Time Period	PM Peak Hour	Analysis Year	ETC+23 (2030)

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	2	0	1	2	1	1	1	0	1	1	0
Lane group	L	TR		L	T	R	L	TR		L	TR	
Volume (vph)	236	492	58	214	855	591	50	19	52	318	20	123
% Heavy veh	1	1	1	1	1	1	1	1	1	1	1	1
PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3		3	3	3	3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0		0	0	0	0	0		0	0	
Unit Extension	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

Phasing	Excl. Left	Thru & RT	03	04	NS Perm	SB Only	07	08
Timing	G = 20.0	G = 35.0	G =	G =	G = 10.0	G = 20.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 105.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	248	579		225	900	622	53	75		335	150	
Lane group cap.	340	1175		340	1194	838	102	159		552	546	
v/c ratio	0.73	0.49		0.66	0.75	0.74	0.52	0.47		0.61	0.27	
Green ratio	0.19	0.33		0.19	0.33	0.52	0.10	0.10		0.33	0.33	
Unif. delay d1	40.0	27.9		39.4	31.2	19.5	45.2	45.0		30.4	25.7	
Delay factor k	0.29	0.11		0.24	0.31	0.30	0.13	0.11		0.19	0.11	
Increm. delay d2	7.8	0.3		4.7	2.8	3.6	4.7	2.2		1.9	0.3	
PF factor	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	47.7	28.2		44.1	33.9	23.1	49.9	47.2		32.3	26.0	
Lane group LOS	D	C		D	C	C	D	D		C	C	
Apprch. delay	34.1			31.4			48.3			30.3		
Approach LOS	C			C			D			C		
Intersec. delay	32.6			Intersection LOS						C		

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E	(m)	09.00	05.00	09.00	05.00
L'	(m)	30.00	20.00	30.00	20.00
V	(m)	4.20	3.30	4.20	3.30
RAD	(m)	30.00	30.00	30.00	30.00
PHI	(d)	20.00	20.00	20.00	20.00
DIA	(m)	45.00	45.00	45.00	45.00
GRAD SEP		0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	FLOWS (1st exit 2nd etc...U)				FLOF	CL	FLOW RATIO	FLOW TIME
WASH SB	1.05	029	510	107	103	1.00	50	0.75 1.125 0.75	15 45 75
DRWY EB	1.05	031	013	042	000	1.00	50	0.75 1.125 0.75	15 45 75
WASH NB	1.05	591	855	070	144	1.00	50	0.75 1.125 0.75	15 45 75
SAW KIL WB	1.05	083	020	318	040	1.00	50	0.75 1.125 0.75	15 45 75

FLOW	veh	749	86	1660	461
CAPACITY	veh	1782	674	2002	679
AVE DELAY	mins	0.06	0.10	0.23	0.35
MAX DELAY	mins	0.08	0.14	0.41	0.64
AVE QUEUE	veh	1	0	6	3
MAX QUEUE	veh	1	0	11	5

AVDEL s	11.9
L O S	B
VEH HRS	9.8
COST $	146.5

A(2.2) B(6.0) C(9.0) C(20.0)

21:10:04 WASHINGTON AVE KING 2030 DOUBLE 40

E	(m)	09.00	05.00	09.00	05.00
L'	(m)	30.00	20.00	30.00	20.00
V	(m)	4.20	3.30	4.20	3.30
RAD	(m)	30.00	30.00	30.00	30.00
PHI	(d)	20.00	20.00	20.00	20.00
DIA	(m)	45.00	45.00	45.00	45.00
GRAD SEP		0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	FLOWS (1st exit 2nd etc...U)				FLOF	CL	FLOW RATIO	FLOW TIME
WASH SB	1.05	043	742	103	081	1.00	50	0.75 1.125 0.75	15 45 75
DRWY EB	1.05	046	018	057	000	1.00	50	0.75 1.125 0.75	15 45 75
WASH NB	1.05	314	466	081	057	1.00	50	0.75 1.125 0.75	15 45 75
SAW KIL WB	1.05	085	025	381	032	1.00	50	0.75 1.125 0.75	15 45 75

		SB	EB	NB	WB
FLOW	veh	969	121	918	523
CAPACITY	veh	1793	570	2013	962
AVE DELAY	mins	0.07	0.14	0.05	0.14
MAX DELAY	mins	0.11	0.21	0.07	0.21
AVE QUEUE	veh	1	0	1	1
MAX QUEUE	veh	2	0	1	2

AVDEL s	5.0
L O S	A
VEH HRS	3.5
COST $	52.8

A(4.2) A(3.4) A(3.0) A(3.4)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Zones 2&3 drive
Agency/Co.	CME; AM2030_zones23_wash	Jurisdiction	Town of Ulster
Date Performed	10/4/2004	Analysis Year	ETC+27 (2030)
Analysis Time Period	AM Peak Hour		

Project Description	04-143 Washington Avenue Corridor Study
East/West Street: Washington Avenue	North/South Street: Zone 2/Zone 3 driveways
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	1219	7	0	843	76
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate (veh/h)	0	1283	7	0	887	80
Proportion of heavy vehicles, P_{HV}	0	–	–	0	–	–
Median type	Raised curb					
RT Channelized?			0			0
Lanes	0	2	0	0	2	0
Configuration		T	TR		T	TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	0	0	75
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate (veh/h)	0	0	0	0	0	78
Proportion of heavy vehicles, P_{HV}	0	0	1	0	0	1
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					R			R
Volume, v (vph)					0			78
Capacity, c_m (vph)					417			531
v/c ratio					0.00			0.15
Queue length (95%)					0.00			0.51
Control Delay (s/veh)					13.6			12.9
LOS					B			B
Approach delay (s/veh)	--	--				12.9		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	MBH	Intersection	Washington Ave/Zones 2&3 drive
Agency/Co.	CME; PM2030_zones23_wash	Jurisdiction	Town of Ulster
Date Performed	10/4/2004	Analysis Year	ETC+27 (2030)
Analysis Time Period	PM Peak Hour		

Project Description: 04-143 Washington Ave Corridor Study RIRO on Sawkill

East/West Street: Washington Avenue | North/South Street: Zone 2/Zone 3 driveways

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	993	10	0	1431	102
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate (veh/h)	0	1045	10	0	1506	107
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Raised curb					
RT Channelized?			0			0
Lanes	0	2	0	0	2	0
Configuration		T	TR		T	TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	0	0	229
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate (veh/h)	0	0	0	0	0	241
Proportion of heavy vehicles, P_{HV}	0	0	1	0	0	1
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					R			R
Volume, v (vph)					0			241
Capacity, c_m (vph)					498			327
v/c ratio					0.00			0.74
Queue length (95%)					0.00			5.55
Control Delay (s/veh)					12.2			41.4
LOS					B			E
Approach delay (s/veh)	--	--				41.4		
Approach LOS	--	--				E		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	MBH	Intersection	Zones 1&2/Sawkill Rd
Agency/Co.	CME; AM2030_sawkill_noleft	Jurisdiction	Town of Ulster
Date Performed	9/22/2004	Analysis Year	ETC+26 (2030)
Analysis Time Period	AM Peak Hour		
Project Description	04-143 Washington Avenue Corridor Study		
East/West Street:	Zone 1/Zone 2 driveways	North/South Street:	Sawkill Rd
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	381	86	0	463	15
Peak-Hour Factor, PHF	1.00	0.95	0.95	1.00	0.95	0.95
Hourly Flow Rate, HFR	0	401	90	0	487	15
Percent Heavy Vehicles	1	--	--	1	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR			TR
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	28	0	0	60
Peak-Hour Factor, PHF	1.00	0.95	0.95	1.00	0.95	0.95
Hourly Flow Rate, HFR	0	0	29	0	0	63
Percent Heavy Vehicles	1	0	1	1	0	1
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					R			R
v (vph)					29			63
C (m) (vph)					614			577
v/c					0.05			0.11
95% queue length					0.15			0.37
Control Delay					11.2			12.0
LOS					B			B
Approach Delay	--	--	11.2			12.0		
Approach LOS	--	--	B			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*MBH*	Intersection	*Zones 1&2/Sawkill Rd*
Agency/Co.	*CME; PM2030_sawkill_noleft*	Jurisdiction	*Town of Ulster*
Date Performed	*10/6/2004*	Analysis Year	*ETC+26 (2030)*
Analysis Time Period	*PM Peak Hour*		
Project Description	*04-143 Washington Avenue Corridor Study RIRO on Sawkill*		
East/West Street:	*Zone 1/Zone 2 driveways*	North/South Street:	*Sawkill Rd*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*629*	*120*	*0*	*392*	*17*
Peak-Hour Factor, PHF	*1.00*	*0.95*	*0.95*	*1.00*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*662*	*126*	*0*	*412*	*17*
Percent Heavy Vehicles	*1*	--	--	*1*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*			*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*43*	*0*	*0*	*69*
Peak-Hour Factor, PHF	*1.00*	*0.95*	*0.95*	*1.00*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*0*	*45*	*0*	*0*	*72*
Percent Heavy Vehicles	*1*	*0*	*1*	*1*	*0*	*1*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*1*
Configuration			*R*			*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			*R*
v (vph)					*45*			*72*
C (m) (vph)					*427*			*635*
v/c					*0.11*			*0.11*
95% queue length					*0.35*			*0.38*
Control Delay					*14.4*			*11.4*
LOS					*B*			*B*
Approach Delay	--	--	*14.4*			*11.4*		
Approach LOS	--	--	*B*			*B*		

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Appendix D

Public comments

Received 12/2 [illegible]

COUNTY OF ULSTER

P.O. BOX 1800
KINGSTON, NEW YORK 12401-0800

Department of Highways & Bridges
317 Shamrock Lane
Kingston, NY 12401-2810

PHONE: 845-340-3100
FAX: 845-340-3113

David A. Sheeley
Commissioner

November 30, 2004

Creighton Manning Engineering, LLP
17 Computer Drive West
Albany, NY 12205

ATTENTION: Mr. Mark A. Sargent, P.E., PTOE

Dear Mr. Sargent:

This department is in support of the roundabout alternative shown in the concept plan dated November 17, 2004 at the intersection of Washington Avenue and county Sawkill Road.

We would recommend, however, that the raised median on Sawkill Road be extended to a point beyond the proposed entrance at Powell Lane to help channelise the traffic and prevent a left turn movement into Powell Lane.

Feel free to contact us at 845-340-3120.

Sincerely,

David A. Sheeley
Commissioner of Highways & Bridges
DAS/MC/kd

Dec. 17, 2004 comments on Washington Ave.
Corridor study

I realize this is a must however I also realize that there needs to be further studies on the present roundabout.
There needs to be more, clear signage at ground level. People do not know which lane to be in for their destinations.
Coming from Washington Ave, there should be a sign which simply says thruway keep right or thruway with an arrow.
The same holds true for any of the other roads coming off that circle.
If there is to be a new roundabout, the same should hold true for that.
A driver cannot retain information which is long winded, on a sign over head or even at ground level.
A woman wanting to get on the thruway, was in the left lane of the circle and in trying to cross lanes, she ran into the side of my vehicle.
That is an example of people not knowing where to be on that roundabout.
These things ARE workable and do reduce speed. I agree that they are safe however if one doesn't know how to drive in it or is not directed to each exit from it with good, short, easily understood signs, then it is a nightmare. Right now it is a nightmare.
I have had policemen, fire rescue personnel, citizens who use it frequently and know where they should be, tell me that it is not good the way it is.
Since the collision with my vehicle, I have heard about friends who have been rear-ended twice, hit like I was and others who were forced to go around the blasted thing again because there was someone in front of them blocking their route.
I know this is a preliminary study and there is much work to do yet but please keep this simple request in mind be cause it will reduce even the fender benders. My damage amounted to close to $3000.and that is not acceptable as a "fender bender" in my view.

Name Barbara Grossbohlin Date 12/17/04
Address 563 Linderman Ave Ext
City/Town Kingston State NY Zip Code 12401

I/We wish to comment about the following aspects of the project:

WASHINGTON AVENUE CORRIDOR STUDY
Town of Ulster, NY

Public Informational Meeting

Name VICTOR J. MELVILLE Date 12/17/04

Address Props at 155-195 Sawkill Rd.

City/Town Ulster State NY Zip Code 12401

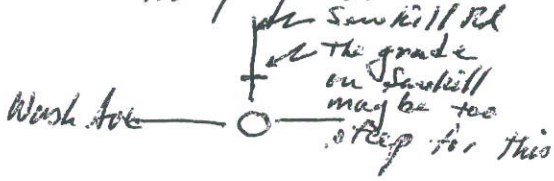
I/We wish to comment about the following aspects of the project:

The Washington Ave. Corridor project should be completed ASAP preceding the sewer project.

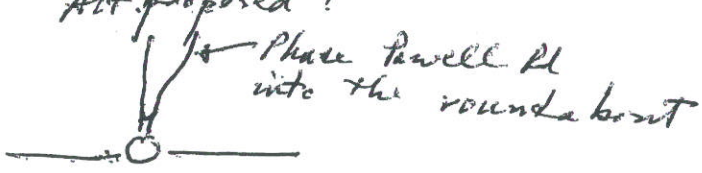
I favor the roundabout option. Other options need to be persued if left turns are not allowed off Sawkill.

Any design should not force more traffic on the current roundabout. (One proposal required more traffic on this roundabout in order to avoid a left turn off Sawkill when going south!

As proposed:



Alt. proposed!



Return to:

Ms. Meghan Hammerle
Creighton Manning Engineering
17 Computer Drive West
Albany, NY 12205