ALLEY 24

TRAFFIC STUDY

in

City of Frostburg, Maryland

January 2013

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Executive Summary

The purpose of this study is to assess the current traffic conditions of the Main Street and 1st Street corridors from Uhl Street to Water Street in Downtown Frostburg. In particular, the focus of this study examines the potential impact of closing Alley 24 to vehicular traffic.

Alley 24 is a fifteen feet wide one-way road running north from Main Street to 1st Street. Both vehicles and pedestrians utilize the alley and sight distance is restricted for motorists turning from Alley 24 onto 1st Street.

To determine what effect a closure of Alley 24 would have on the surrounding roadway network, traffic volume data was collected at six (6) study intersections including:

1. Main Street (US 40) at Broadway / Alley 24 (four-legged intersection, signalized)
2. Main Street (US 40) at Water Street (four-legged intersection, signalized)
3. Water Street at 1st Street (four-legged, unsignalized)
4. 1st Street at Welsh Street / Alley 24 (four-legged, unsignalized)
5. 1st Street at Uhl Street (four-legged, unsignalized)
6. Main Street (US 40) at Uhl Street (three-legged, unsignalized)

Turning movement counts were conducted during Friday AM peak (7-9) and PM peak (4-6) on October 19, 2012. The traffic volumes along Alley 24 were very low during the hours of the count and it was determined the redirecting of vehicle trips from Alley 24 would have little effect on the operation of the surrounding roadways and intersections.

The recommendation of this report is to close Alley 24 to vehicular traffic based on the following findings:

- Sight distance is restricted for motorists turning from Alley 24 onto1st Street
- Separation of vehicular and pedestrian traffic does not exist along Alley 24 and the construction of an adequate sidewalk for pedestrians would inhibit the roadway width to be used by vehicles
- Existing vehicular volumes are low along Alley 24 and the underutilization by vehicular traffic could result in pedestrians developing a false sense of safety and not expecting conflicting vehicular movements
- Diversion of trips to adjacent roadways and intersections from Alley 24 have minimal operational and safety impact on those roadways and intersections
- Two additional entry points exist along Water Street and Main Street to adequately serve motorists traveling to destinations along 1st Street, Welsh Street, and Uhl Street
- The renovation of the Prichard Building could result in increased use of Alley 24 by pedestrians

Additional recommendations for the study area can be found in the conclusions section of the report.

Introduction

The purpose of this report is to identify the existing traffic conditions surrounding Alley 24 in Frostburg, Maryland and to determine the potential impact of closing the roadway to vehicular traffic.

This study focuses on the traffic operational impact of the conversion of Alley 24 (show in red in **Figure 1** below) from a one-way street open to vehicles and pedestrians to a pedestrian-only boulevard. It is also anticipated that pedestrian traffic along Alley 24 could increase with the renovation of the Prichard Building which is located on the northwest side of the alley.

Motorists currently use Alley 24 to access some local businesses, parking for St. Joseph's School and a residential area along Welsh Street and Uhl Street.

Figure 1: Project Location (orientation: North ↑)
(Photo Courtesy of Google Earth)

Existing Study Area Conditions

Dennis Corporation observed existing traffic conditions at six intersections that could be impacted by the conversion of Alley 24 and this information was utilized as part of this study. The following paragraphs detail the current traffic conditions and include a description of study area intersections and traffic flow within the study area.

The following intersections were analyzed as part of this study. **Figure 4** shows the existing lane usage and traffic control for each intersection.

1. Main Street (US 40) at South Broadway / Alley 24 (four-legged intersection, signalized)
2. Main Street (US 40) at Water Street (four-legged intersection, signalized)
3. Water Street at 1st Street (four-legged, unsignalized)
4. 1st Street at Welsh Street / Alley 24 (four-legged, unsignalized)
5. 1st Street at Uhl Street (four-legged, unsignalized)
6. Main Street (US 40) at Uhl Street (three-legged, unsignalized)

The signalized intersection of Main Street (US 40) at South Broadway and Alley 24 is the first intersection. South Broadway is a two-lane roadway with one-way traffic northeast-bound, consisting of a shared left-thru lane and a right-turn lane (see Figure 2). Opposite of South Broadway is Alley 24, which serves one-way traffic traveling away from the intersection. The southeast-bound approach of Main Street is a shared thru/left-turn lane while the northwest-bound approach is a thru/right-turn lane. South Broadway, Main Street, and Alley 24 are primarily commercially developed within the study area with the historic Prichard Building located along the west side of Alley 24. The speed limit along Main Street is 25 mph throughout the study area.

Figure 2: Intersection 1 from South Broadway facing Alley 24 with Main Street

The signalized Main Street (US 40) intersection with Water Street is intersection 2. Water Street is a two lane roadway with one-way traffic traveling southwest away from the intersection. The southwest-bound approach of Water Street is a single lane allowing left/thru/right movements. The northwest-bound approach of Main Street consists of a left-turn lane extending back to South Broadway (~160-ft) and a thru/right-turn lane, while the southeast-bound approach has a left-turn lane (~130-ft) and a thru/right-turn lane. The northwest-bound approach of Main Street has a protected-permitted left turn phase. The development surrounding the intersection is commercial. A post office is located in the northwest quadrant and a church is located in the southwest quadrant of the intersection.

The third intersection is the unsignalized intersection of Water Street and 1st Street. Water Street is free flow in both approaches, while 1st Street is stop controlled on each approach. All four approaches are a shared left/thru/right-turn lane. No turning movements are prohibited at this intersection although sight distance is limited for motorists turning from westbound 1st Street onto Water Street. A mirror has been mounted on the west side of Water Street to aid motorists turning from 1st Street. Water Street provides access to residential development and Mount Savage to the northeast. The posted speed limit along Water Street is 30 mph.

The offset unsignalized intersection of 1st Street with Welsh Street and Alley 24 is the fourth intersection. Both Alley 24 and Welsh Street are stop controlled at the intersection, while 1st Street is free flow in both directions. Alley 24 is a one-way street approaching 1st Street and sight distance is limited for turning motorists due to commercial buildings located along both sides of the alley. Vehicles from southwest-bound Welsh Street can turn left or right onto 1st Street, while 1st Street motorists can either continue on 1st Street or turn onto Welsh Street. First Street provides a connection to Welsh Street, which is primarily residential, parking for St. Michael School and some local businesses.

The fifth intersection is the unsignalized intersection of 1st Street and Uhl Street. First Street ends approximately 130 feet southeast of the intersection. The 1st Street approaches are stop controlled. Both streets are two-lane and two-way with no movements prohibited. Uhl Street provides connectivity to Main Street for residences northeast of the study area. Uhl Street ties into Welsh Street to the northeast forming a loop.

The sixth intersection is the unsignalized three-legged intersection of Main Street with Uhl Street. Southwest-bound Uhl Street is a stop-controlled single lane approach with left and right turns permitted. Sight distance can be limited for motorists turning from Uhl Street onto Main Street by parked vehicles and a retaining wall along the west side of Uhl Street. Main Street is a single lane in each direction with turns onto Uhl Street permitted. The intersection is in commercial in nature in addition to a school and a church located nearby.

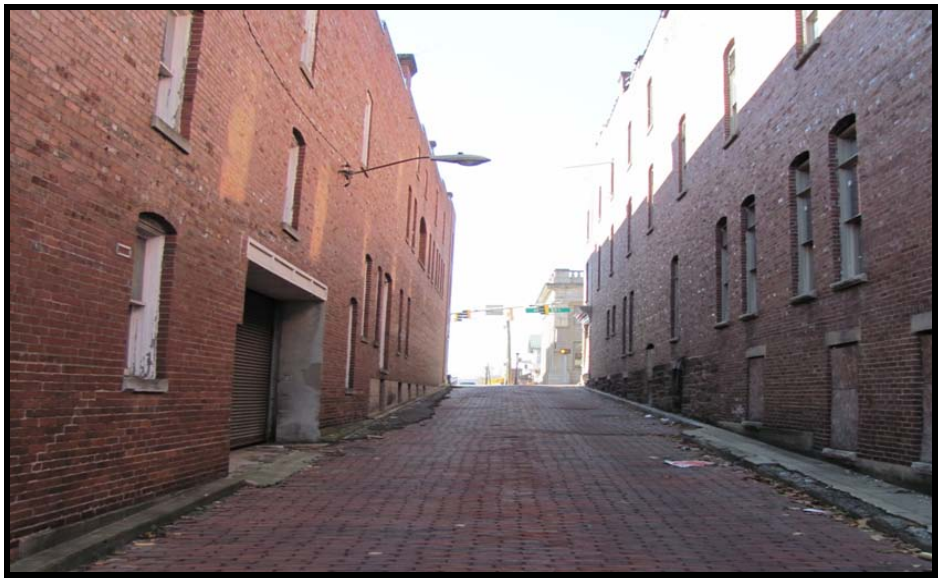


Figure 3: Alley 24 looking south toward Main Street

Existing Traffic Volumes

Turning movement counts were conducted during Friday AM peak (7-9) and PM peak (4-6) on October 19, 2012 by Quality Counts.

Figure 5 shows the turning movement counts that were used to analyze the existing traffic conditions. The turning movement count data is provided in **Appendix B**.

Diverted Traffic Volumes

The diverted traffic volumes assuming Alley 24 is closed were developed by re-routing trips to and from Alley 24 to Uhl Street and 1st Street. These volumes are shown in **Figure 6**.

Capacity Analysis

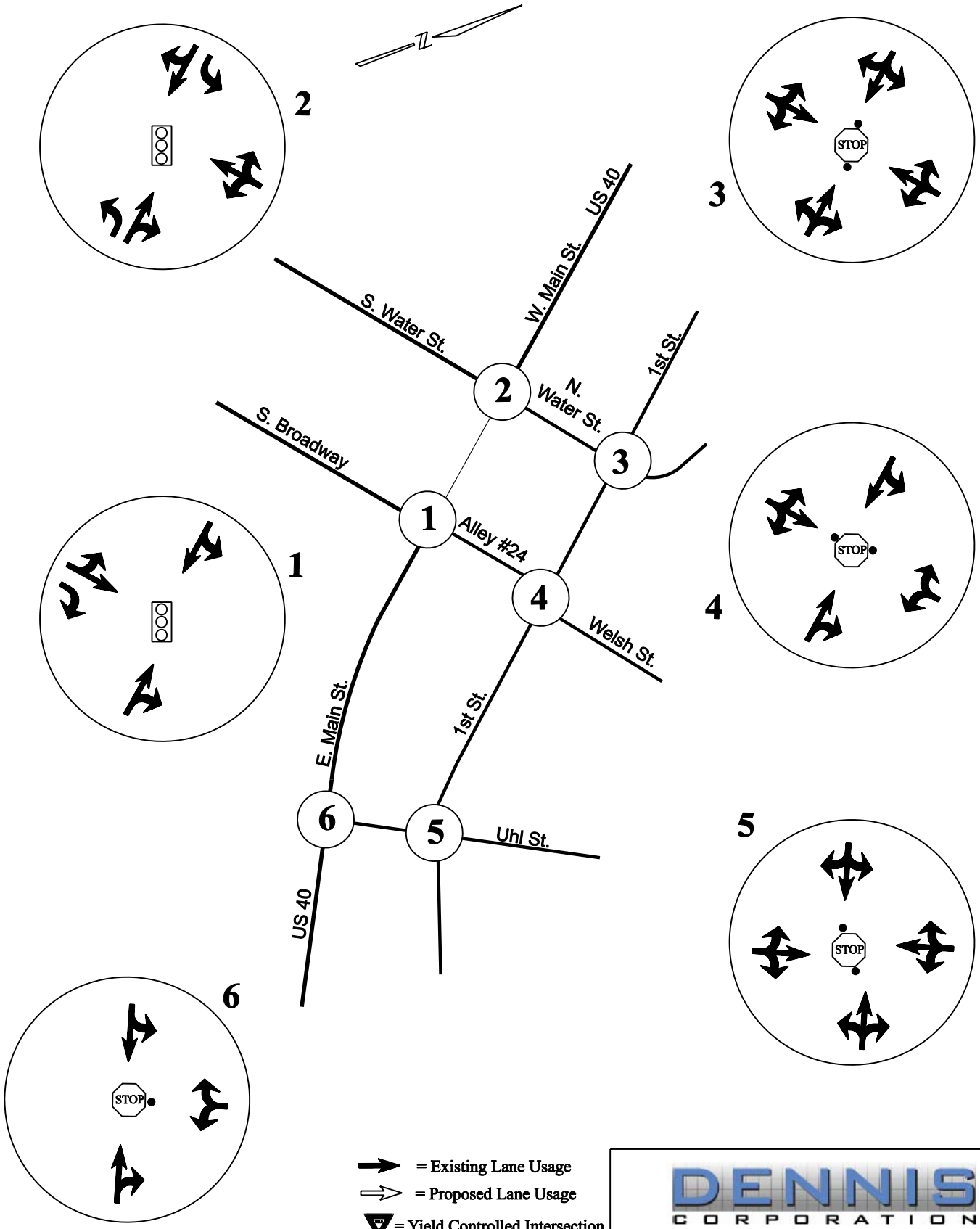
The intersections within the area of influence were analyzed to determine the level-of-service (LOS) under the 2012 existing conditions as well as the conditions with the closure of Alley 24 to vehicular traffic. LOS for signalized and unsignalized intersections is determined by the computed control delay of each lane movement. The concept of LOS is defined by the Highway Capacity Manual (HCM) as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists. The HCM defines six levels-of-service for both facility types (signalized and unsignalized intersections). They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. The HCM LOS criteria for both intersection types are shown in **Table 1**.

Table 1
HCM Level-of-Service Criteria

Signalized Intersections		Unsignalized Intersections	
Level of Service	Control Delay per Vehicle (sec/veh)	Level of Service	Average Control Delay (sec/veh)
A	≤ 10	A	0-10
B	> 10-20	B	> 10-15
C	> 20-35	C	> 15-25
D	> 35-55	D	> 25-35
E	> 55-80	E	> 35-50
F	> 80	F	> 50

Source: National Research Council. Transportation Research Board. Highway Capacity Manual, HCM 2000 Edition, Washington, DC. 2000. Chapters 16 and 17.

Synchro Traffic Signal Coordination Software (version 7) was used to determine the LOS, control delay and volume-capacity ratios (V/C) at all four intersections. Synchro implements HCM methods to perform these calculations. The V/C ratio relates the proportion of available lane capacity to the volume experienced. Ratios approaching 1.0 indicate that an intersection (signalized) or approach (unsignalized) is near congestion. On unsignalized intersection approaches, the V/C ratio of the critical movement may be low when the delays are high because the capacity is not constrained by a traffic signal, but by available traffic gaps to execute the movement.



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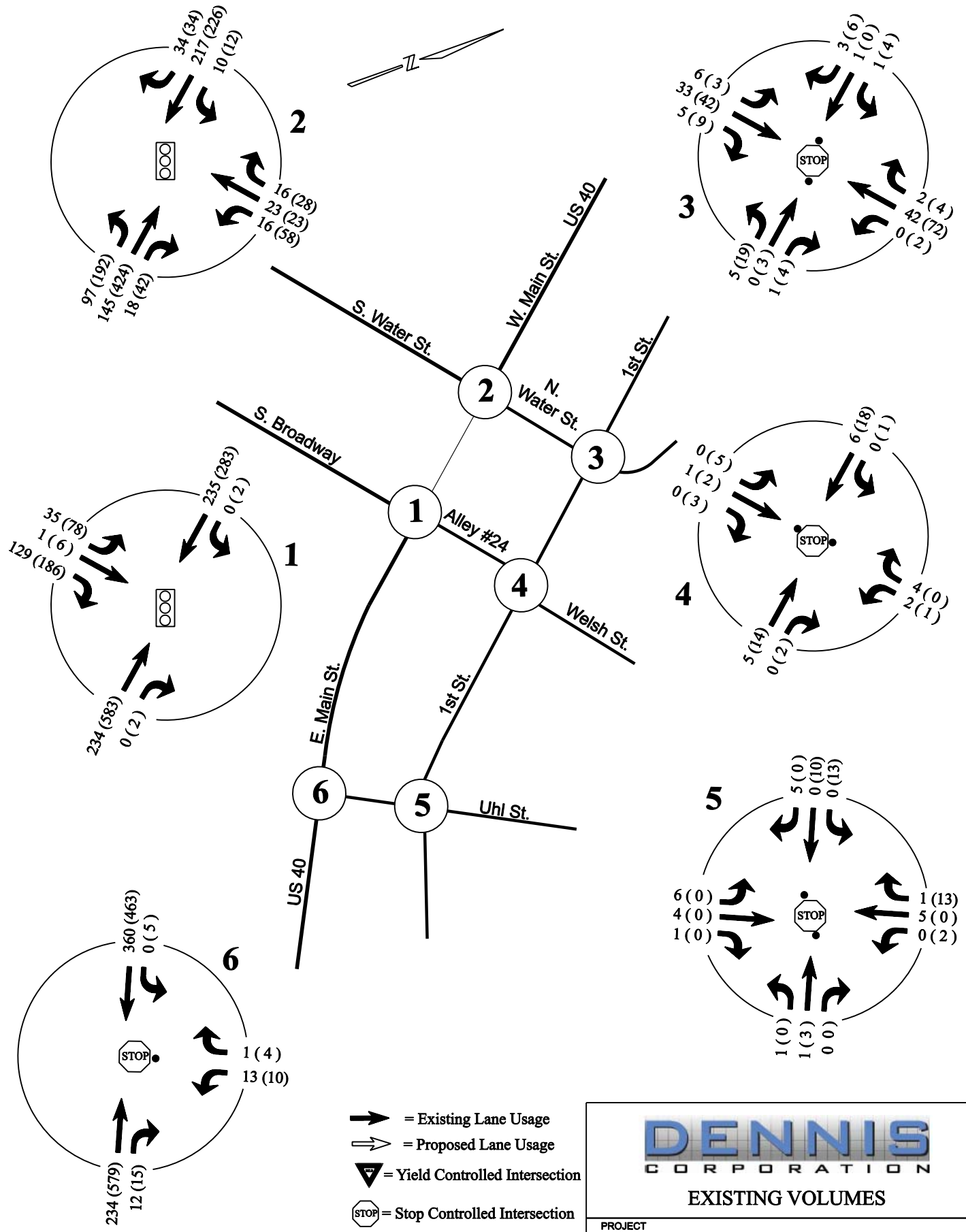
EXISTING LANE USAGE

PROJECT: ALLEY # 24 TRAFFIC STUDY

CITY: Frostburg | COUNTY: Allegany

DATE: January, 2013 | Figure 4



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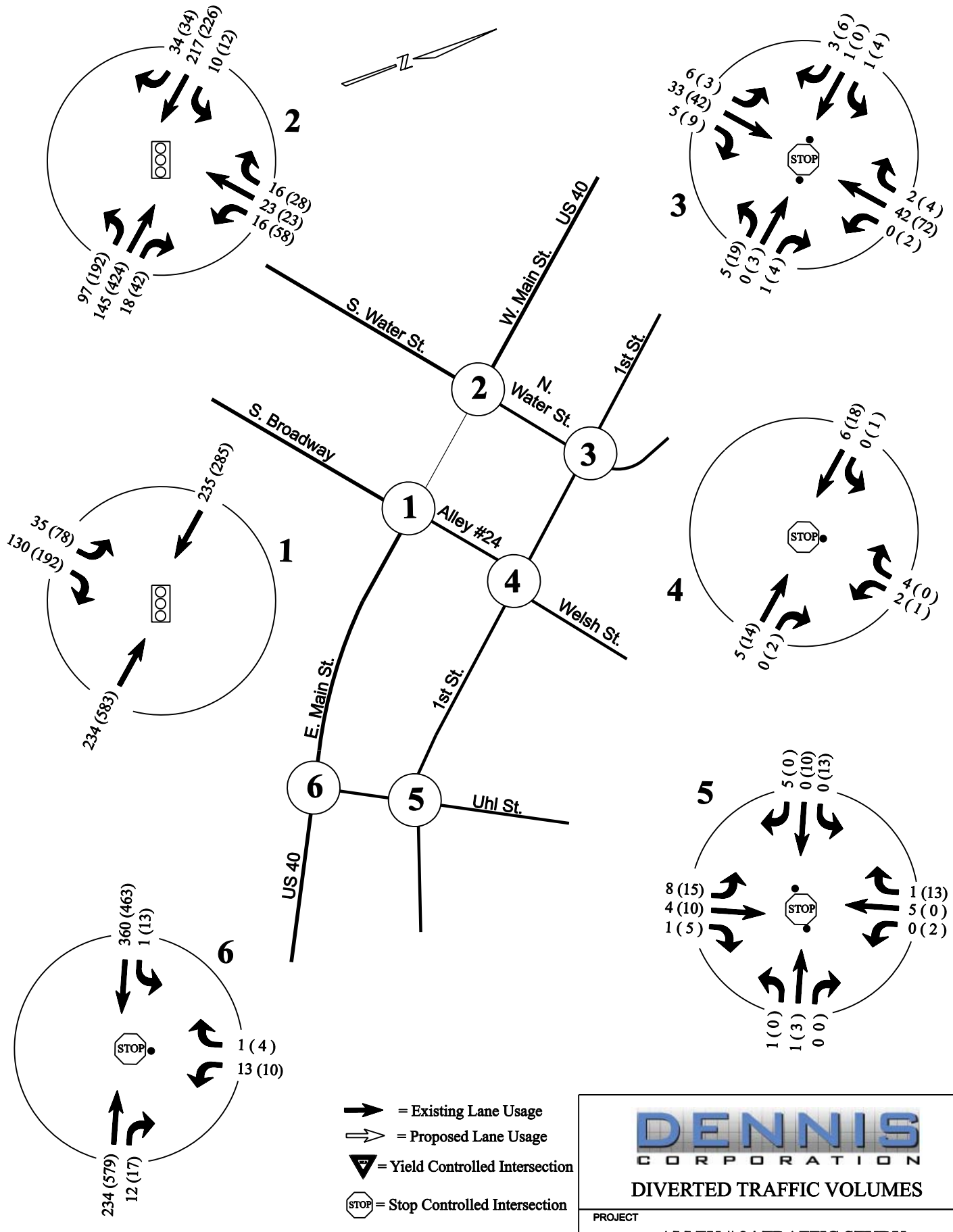
EXISTING VOLUMES

PROJECT: ALLEY # 24 TRAFFIC STUDY

CITY: Frostburg | COUNTY: Allegany

DATE: January, 2013 | Figure 5



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DIVERTED TRAFFIC VOLUMES

PROJECT: ALLEY # 24 TRAFFIC STUDY

CITY: Frostburg | COUNTY: Allegany

DATE: January, 2013 | Figure 6

Table 2 summarizes the delay and LOS designations at each intersection. The values presented for the unsignalized intersections are for the approach with the highest delays because HCM does not provide a method to determine the overall LOS for the entire intersections. The supporting Synchro reports are provided in the Appendix.

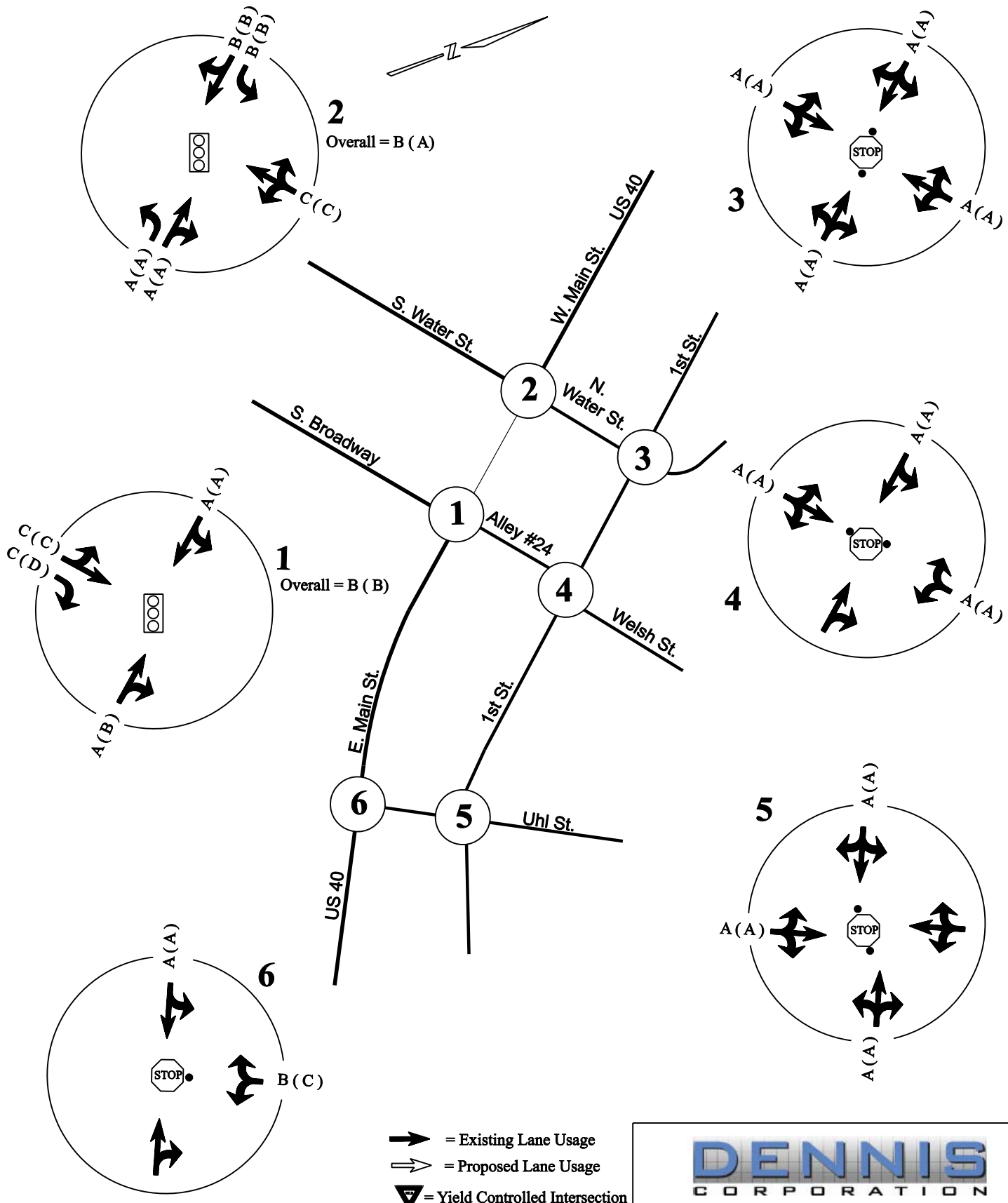
Existing Conditions

The LOS for each intersection approach for the existing traffic conditions are shown in **Figure 7**. At intersection 1 (South Broadway at Main Street and Alley 24), the overall LOS is B during each peak period. The only approach to the intersection that operates worse than LOS A is the northeast-bound approach of South Broadway, which operates at LOS C during each peak. The northeast right from South Broadway operates at a LOS D during the PM peak. At intersection 2 (Main Street at Water Street), the overall LOS is B in the AM and A in the PM peak. The only movement at the intersection that operates worse than LOS B is the southwest-bound approach (thru/right/left) on Water Street, which operates at LOS C during both peak periods.

The intersections of 1st Street at Water Street (intersection 3), Welsh Street / Alley 24 (intersection 4), and Uhl Street (intersection 4) all are stop controlled with 1st Street being the stop controlled approach at intersections 3 and 5 and the thru street at intersection 4. All intersections experienced minor delay during both peak periods with delays less than 10 seconds for most delayed approach, resulting in LOS A. The intersection of Main Street at Uhl Street is also a stop controlled intersection with Uhl Street being the controlled approach. The most delayed approach of this intersection was determined to be southbound from Uhl, which operates at a LOS B during the AM peak and LOS C during the PM peak. This LOS is most likely due to the lack of simultaneous gaps on Main Street to facilitate a left-turn movement, which is the predominant movement.

Diverted Traffic Conditions (closure of Alley 24)

The LOS for each signalized intersection and intersection approaches for proposed closure of Alley 24 to vehicular traffic are shown in **Figure 8.** Intersection 1 continues to operate at LOS B during the AM and PM with slightly greater delay for certain turning movements as thru vehicles are now being required to complete turning movements to access Water Street or Uhl Street. The remaining intersections were found to experience negligible changes due to the low volume of incremental traffic from Alley 24.



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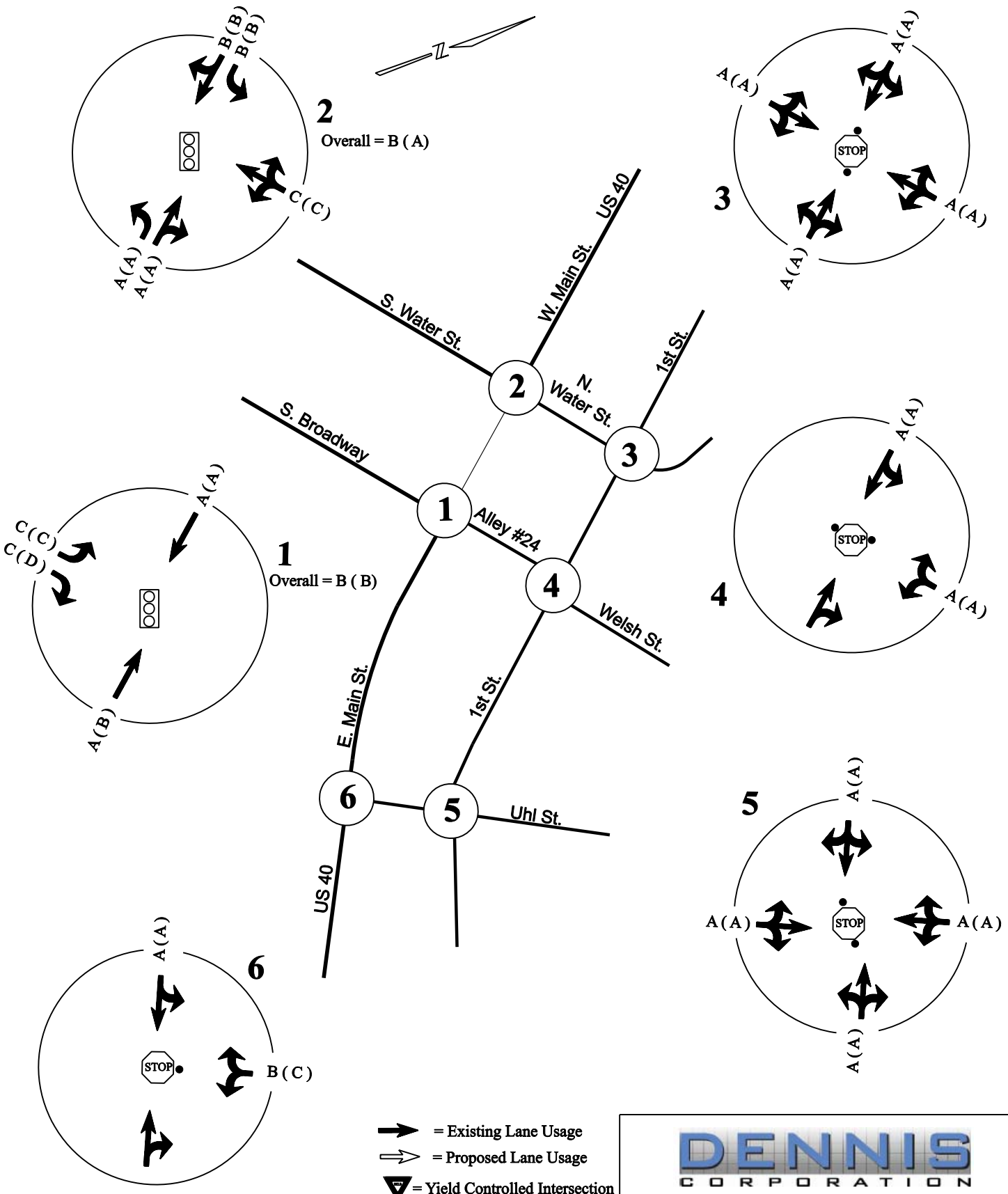
EXISTING LEVEL OF SERVICE

PROJECT: ALLEY # 24 TRAFFIC STUDY

CITY: Frostburg | COUNTY: Allegany

DATE: January, 2013

Figure 7



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DIVERTED TRAFFIC LEVEL OF SERVICE

PROJECT: ALLEY # 24 TRAFFIC STUDY	
CITY: Frostburg	COUNTY: Allegany
DATE: January, 2013	Figure 8

Table 2
Levels-of-Service

Intersection	Peak Hour	2012 Existing Conditions Delay (s/v)[1]	2012 Existing Conditions LOS[2]	2012 with closure of Alley 24 Conditions Delay (s/v)[1]	2012 with closure of Alley 24 Conditions LOS[2]
1. S. Broadway at	AM	10.7	B	10.8	B
Main Street/Alley 24	PM	14.2	B	14.4	B
2. Main Street at	AM	10.4	B	10.4	B
Water Street	PM	9.1	A	9.1	A
3. 1st Street at	AM	9.1 (NWB)	A	9.1 (NWB)	A
Water Street	PM	9.5 (NWB)	A	9.5 (NWB)	A
4. 1st Street at	AM	8.4 (SWB)	A	8.4 (SWB)	A
Welsh Street/Alley24	PM	8.7 (NEB)	A	8.5 (SWB)	A
5. 1st Street at	AM	8.9 (WB)	A	9.0 (WB)	A
Uhl Street	PM	9.1 (WB)	A	9.3 (WB)	A
6. Main Street at	AM	13.4 (SB)	B	13.4 (SB)	B
Uhl Street	PM	21.4 (SB)	C	22.0 (SB)	C

[1](s/v) - Seconds of delay per vehicle measured on the most delayed minor street approach (unsignalized intersections). Parentheses denotes direction of travel of most delayed approach
[2] LOS - Level-of-Service on the most delayed minor street approach (unsignalized intersections).

Discussion

The operational analysis pertaining to the diversion of traffic from Alley 24 does not indicate that the closure of Alley 24 would impact any existing traffic operations. Delays are minimally increased and LOS designations are not impacted by the diversion. The primary disadvantage is that vehicles normally using Alley 24 to access First Street, Welsh Street or the public parking will have to travel a slightly longer distance, but it is still reasonable. That disadvantage is outweighed by the increase in safety for both pedestrians and motorists.

Collision data for the most recent 3-year period was provided by the Maryland State Highway Administration for the intersections included in this study and summarized in Table 3 (see **Appendix D** for raw records). Although crash rates based on the average daily traffic volume were not computed for comparison to other nearby roads and intersections, the low count of the crashes and the low severity of those crashes suggest that safety is not a major concern. However, the majority of the crashes that did occur were angle crashes at the intersection of Main Street with Alley 24. This would support the decision to close Alley 24 to vehicular traffic.

Table 3 Summary of Collision Data		
Intersection	**Total Crash Count**	**Crash Type**
1. S. Broadway at Main Street/Alley 24	4	Angle (2)
2. W. Main Street at Water Street	0	N/A
3. 1st Street at N. Water Street	0	N/A
4. 1st Street at Welsh Street/Alley24	0	N/A
5. 1st Street at Uhl Street	0	N/A
6. E. Main Street at Uhl Street	0	N/A

Conclusions

Field review and analysis of the existing and diverted turning movement volumes indicate that changes can be made to improve traffic flow and safety within the study area. Following are the recommendations to address the existing vehicular and pedestrian concerns.

Alley 24 Recommendations:

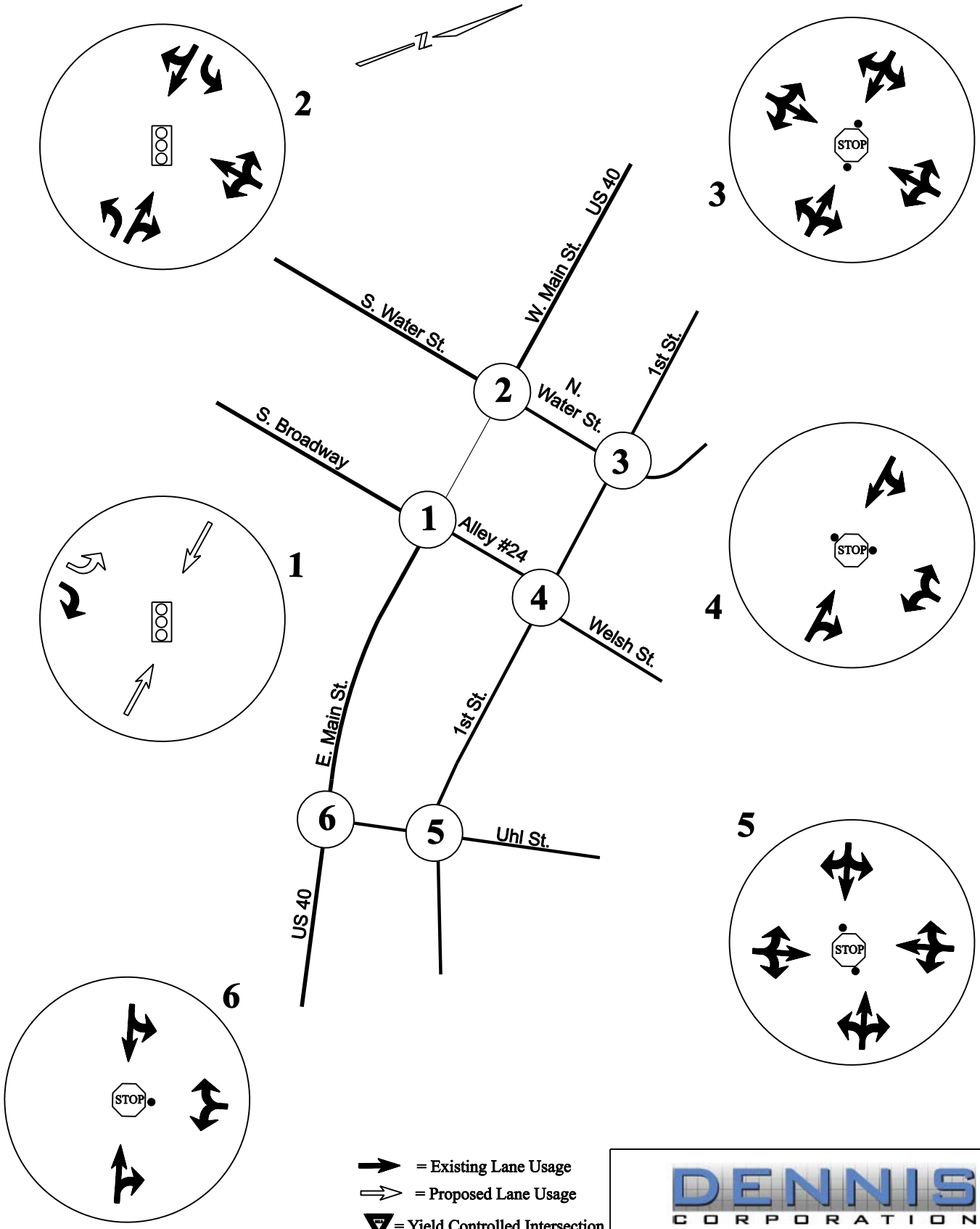
1) Prohibit vehicular movements onto Alley 24. Pavement markings and signage permitting these movements will need to be changed. The recommended lane usage and traffic control is shown in **Figure 9**.
2) Install curbing, bollards, and/or signing along the north edge of Main Street near Alley 24 to indicate that it is closed to vehicular traffic. If limited vehicular access to the buildings along Alley 24 is to be maintained, removable bollards should be considered.
3) Remove existing NO TURN ON RED (R10-11b) sign along westbound Main Street approaching Alley 24
4) Install NO TURNS (R3-3) signs along the southeast-bound and northwest-bound approaches of Main Street to Alley 24 and South Broadway.
5) Replace the existing left-through arrow sign (R3-6) adjacent to the traffic signal heads on the South Broadway approach with a left arrow sign (R3-5).
6) Consider renovating the existing lighting along the alley to make it safer and more attractive to pedestrian movements.
7) Consider conducting a streetscape project along the alley to encourage pedestrian usage

General Recommendations based on Observations:

1) The pavement markings and signing along the South Broadway approach to Main Street do not match. The pavement markings in the left lane do not indicate that a thru movement is permitted from that lane, but the overhead sign does indicate it. This should be resolved with or without changes to Alley 24. (See photo in Figure 2)
2) Speed limit signing should be installed on a separate post along 1st Street. (See photos on A-20 and A-30)
3) Consider the construction of bulb-outs (curb extensions) along the north side of Main Street at Uhl Street to prohibit vehicles from parking adjacent to the intersection. This would increase the sight distance for motorists turning from Uhl Street onto Main Street. A bulb-out is currently located on the south corner of the intersection of Main Street and South Broadway.
4) The transition of the roadway to the sidewalk at the marked pedestrian crosswalk adjacent to St. Michael School could be a tripping hazard and does not meet Americans with Disabilities Act (ADA) Accessibility Guidelines. (See photos A-28 and A-29)

Construction of the recommendations listed above will allow for safer and more efficient traffic and pedestrian flow along the roadways identified in the study area.

All new pavement markings and signing installed to implement the recommended changes within the study area shall conform to the standards found in the Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition.



= Existing Lane Usage

= Proposed Lane Usage

= Yield Controlled Intersection

= Stop Controlled Intersection

= Signalized Intersection

AM (PM) = Counts

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RECOMMENDED LANE USAGE

PROJECT: ALLEY # 24 TRAFFIC STUDY

CITY: Frostburg | COUNTY: Allegany

DATE: January, 2013 | Figure 9

Appendices

Appendix A – Intersection Photos

Appendix B - Turning Movement Counts

Appendix C – Synchro Reports

Appendix D – Miscellaneous

Traffic Signal Controller Parameters

Collision Data