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MEMORANDUM

Date: June 8, 2011 Project #: 11310.02

To: Mike Faught, City of Ashland

From: Susan L. Wright, P.E., Matt J. Bell, and Erin M. Ferguson, P.E.

Project: North Main Street Road Diet Demonstration Project

Subject: Updated Traffic Operations Analysis

The City of Ashland is considering implementing a road diet demonstration project (i.e., a temporary road diet) on North Main Street extending from Helman Street to the northern city limits (i.e., where the railroad crosses over North Main Street). Kittelson & Associates, Inc. (KAI) prepared preliminary traffic operations analysis for the road diet as part of the City's Transportation System Plan (TSP) update. Using those preliminary traffic operations analysis and general information about road diets, the City held initial discussions about a temporary road diet on North Main Street with the Oregon Department of Transportation (ODOT), the City of Ashland's Transportation Commission (TC), and community members.

The road diet would be implemented by re-striping the roadway with three vehicle lanes (two lanes in each direction with a center turn lane) and bicycle lanes. The revised striping would be in-place for a period of months and at the end of the trial period, the City and community would determine if the road diet should become permanent, or if the roadway should be returned to its existing four-lane cross-section. During initial discussions held by the City, some community members showed support for the road diet. These community members see it as an opportunity to slow vehicle speeds and make North Main Street friendlier to pedestrians and bicyclists; however, project stakeholders and community members also asked questions regarding and/or made requests for:

- More detailed traffic operations analysis of the local side streets that may be impacted by restricted turns on and off of North Main; and
- Clear evaluation measures to determine whether or not the temporary road diet is successful.

This memorandum summarizes the results of the more detailed traffic operations analysis and presents potential evaluation measures.

Updated Traffic Operations Analysis

The traffic operations analysis was updated based on requests from ODOT as well as questions posed by City Staff, the Transportation Commission, and the broader public. Activities to update the traffic operations analysis included the items below.

- Refining queuing and travel time analysis using a calibrated traffic operations analysis model for North Main Street.
- Evaluating the impacts of the road diet to the adjacent street network including:
    - Maple Street;
    - Coolidge Street – Glenn Street;
    - Nursery Street;
    - Wimer Street – Hersey Street;
    - VanNess Avenue;
    - Manzanita Street;
    - Central Avenue; and
    - Laurel Street.
- Collecting additional data regarding speeds, vehicle volumes, pedestrian volumes, and bicycle volumes. (Note: This information will also be used as part of the evaluation framework.)

The refined queuing and travel time analyses are summarized in the sub-sections below along with the impacts to the adjacent street network and highlights form the additional data collected.

QUEUING AND TRAVEL TIME ANALYSIS RESULTS

After preliminary traffic operations analyses were conducted for the proposed temporary road diet, ODOT requested the analysis be updated using a calibrated traffic operations model. KAI used more detailed data such as a saturation flow rate study, additional traffic volume counts, travel time data and speed data to calibrate the traffic operations model to more accurately reflect existing operations on North Main Street. Improved estimates for traffic operations, queuing and travel time were

obtained from the calibrated model for the existing conditions on North Main Street and the proposed temporary road diet.

The traffic operations analysis results presented below have been seasonally adjusted correspond to the 30th highest hour traffic volumes estimated to occur on North Main Street (approximately the peak hour of the day during the peak month of the year); this means the operations results below represent a reasonable worst case scenario. Operations on North Main Street are expected to be better than what is presented below the large majority of the year. *Appendix A* contains the model output for the updated traffic operations analysis.

Table 1 summarizes the intersection operations at the primary intersections along North Main Street.

Table 1 Intersection Operations

Intersection	Measure	Existing Traffic Conditions	
		Existing	Road Diet
North Main Street/Maple Street	V/C	0.58	0.89
	Delay (sec)	7.8	19.3
	LOS	A	B
North Main Street/Wimer-Hersey Street	V/C	1.25	0.63[1]
	Delay (sec)	282.2	43.9[1]
	LOS	F	E[1]
North Main Street/Laurel Street	V/C	0.45	0.70
	Delay (sec)	4.9	7.5
	LOS	A	A

[1]Operations at the North Main Street/Wimer-Hersey Street intersection improve under Road Diet conditions do to the restriction of the east, west, and northbound left turn movements at the intersection.

As illustrated in Table 1, the intersection operations at the primary intersections along North Main Street are estimated to operate at approximately the same level of service (i.e., with approximately the same amount of delay) with the road diet as compared to existing operations.

Table 2 summarizes the queuing analysis at the primary intersections along North Main Street.

Table 2 95th Percentile Queues

Intersection	Movement	Existing Traffic Conditions – 95th Percentile Queue Lengths (feet)	
		Existing[1]	Road Diet
North Main Street/Maple Street	NBT	147/179	508
	SBT	144/163	550
North Main Street/Wimer-Hersey Street	NBT	107/67	54
	SBT	104/82	158
North Main Street/Laurel Street	NBT	154/168	320
	SBT	57/61	146

[1]The 95th percentile queues reflect the through and through-right queues in the northbound and southbound directions (NBT/NBTR, SBT/SBTR) at the Maple Street intersection and the through-left and through-right queues in the north and southbound direction (NBTL/NBTR, NBTL/NBTR) at the Wimer-Hersey Street and Laurel Street intersections.

Based on the information in Table 2, the road diet is estimated to increase 95th percentile vehicle queue lengths the most at the North Main Street/Maple Street intersection with an estimated increase of approximately 15 vehicles. The estimated increase in vehicle queues at other intersections along North Main Street varies from one to four vehicles. However, as will be seen by the travel time information in Table 3, despite the longer queue lengths, travel time along North Main Street is estimated to increase only marginally.

Table 3 summarizes the travel time estimates along North Main Street for the temporary road diet compared to existing conditions.

Table 3 Travel Time

Segment	Length (Miles)	Existing Traffic Conditions – Travel Time (Seconds)		
		Existing	Road Diet	Change
Helman Street to Maple Street (NB)	0.58	90.3	111.8	+21.5
Maple Street to Valley View Road (NB)	1.41	145.2	145.2	+0.0
Total Travel Time (NB)		***235.5***	***257.0***	***+21.5***
Valley View Road to Maple Street (SB)	1.41	144.2	150.0	+5.8
Maple Street to Helman Street (SB)	0.58	89.3	91.3	+2.0
Total Travel Time (SB)		***233.5***	***241.3***	***+7.8***

As can be seen in Table 3, the total travel time on North Main Street from Helmand Street to Valley View Road in the northbound direction is estimated to increase approximately 22 seconds with the road diet. In the southbound direction, travel time is estimated to increase approximately 8 seconds.

ADJACENT STREET NETWORK IMPACTS

As noted above, additional traffic operations analysis was conducted to examine the impacts the road diet could have on local streets intersecting North Main Street. Concerns regarding the impacts to these streets were primarily: 1) The impact turn restrictions at Wimer Street – Hersey Street intersection may have on adjacent intersections; and 2) Additional delay experienced on the minor streets due to the reduced number of lanes on North Main Street. The analysis summarized below addresses these questions for the following intersections:

- Maple Street/North Main Street;
- Coolidge Street – Glenn Street/North Main Street;
- Nursery Street/North Main Street;
- Wimer Street – Hersey Street/North Main Street;
- VanNess Avenue/North Main Street;
- Manzanita Street/North Main Street;

- Central Avenue/North Main Street; and
- Laurel Street/North Main Street.

The following sub-sections present how traffic was rerouted given the turn restrictions at the Wimer Street-Hersey Street/North Main Street intersection and the estimated traffic operations for each intersection under the proposed road diet configuration.

Rerouted Local Traffic

Under the road diet configuration, turn movements at the Wimer Street-Hersey Street/North Main Street, Coolidge-Glenn Street/North Main Street, VanNess Avenue/North Main Street, and Central Avenue/North Main Street intersections would be restricted to primarily right-in/right-out access to/from North Main Street. At the Wimer Street-Hersey Street/North Main Street intersection the left-turn movement from North Main Street onto Hersey Street would be maintained.

As part of the traffic operations analysis for the road diet configuration, existing traffic volumes were rerouted and assumed to occur at adjacent intersections. The process for rerouting the traffic started by considering existing lane configurations and traffic control devices for the intersections on North Main Street as well as the existing vehicle volumes. Figure 1 illustrates the existing lane configurations and traffic control devices for each of the intersections above. Figure 2 summarizes the existing traffic volumes and traffic operations analysis for each intersection.

Figure 1 illustrates the Maple Street/North Main Street and Laurel Street/North Main Street intersections are signalized; the remaining intersections are stop-controlled with the minor street approach stopping for traffic on North Main Street. In rerouting the traffic volumes, a higher proportion of rerouted traffic was assumed to use the signalized intersections than adjacent stop-controlled (i.e., unsignalized) intersections because signalized intersections tend to be more attractive in urban areas to facilitate movements from minor streets to more major streets. This is the clear pattern of existing side street movements on the corridor.

As can be seen from Figure 2, there are relatively few minor street turning movements occurring at the unsignalized intersections along North Main Street currently. Based on existing counts, the majority of existing minor street left-turn movements or through movements are occurring at the existing signalized intersections on North Main Street.

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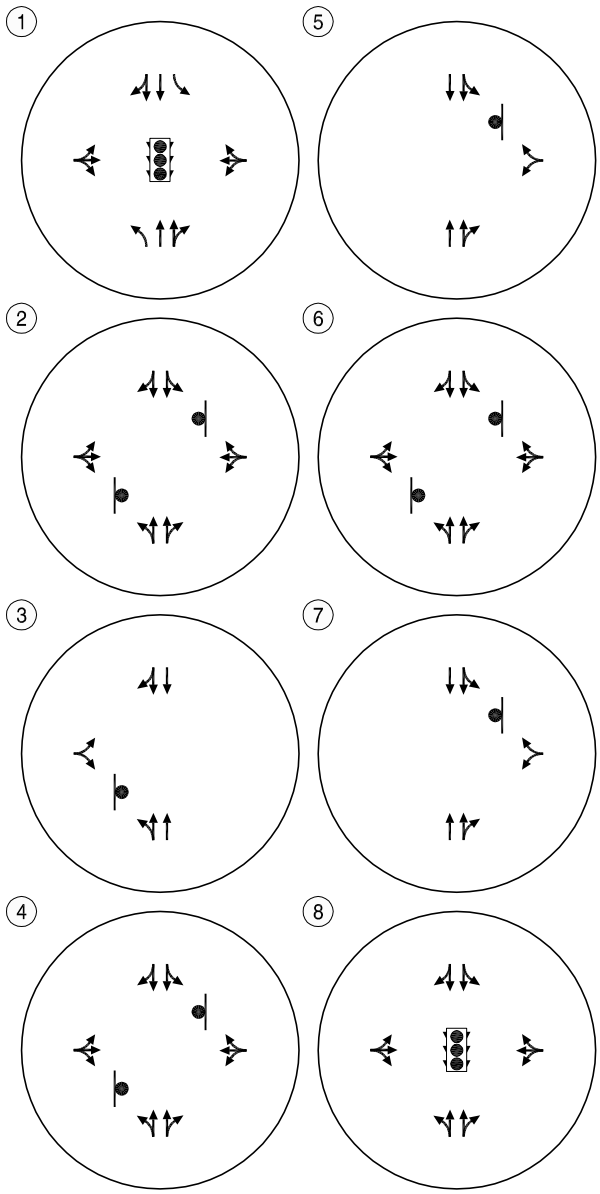

LEGEND

- STOP SIGN
- TRAFFIC SIGNAL

EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES ASHLAND, OREGON

FIGURE 1

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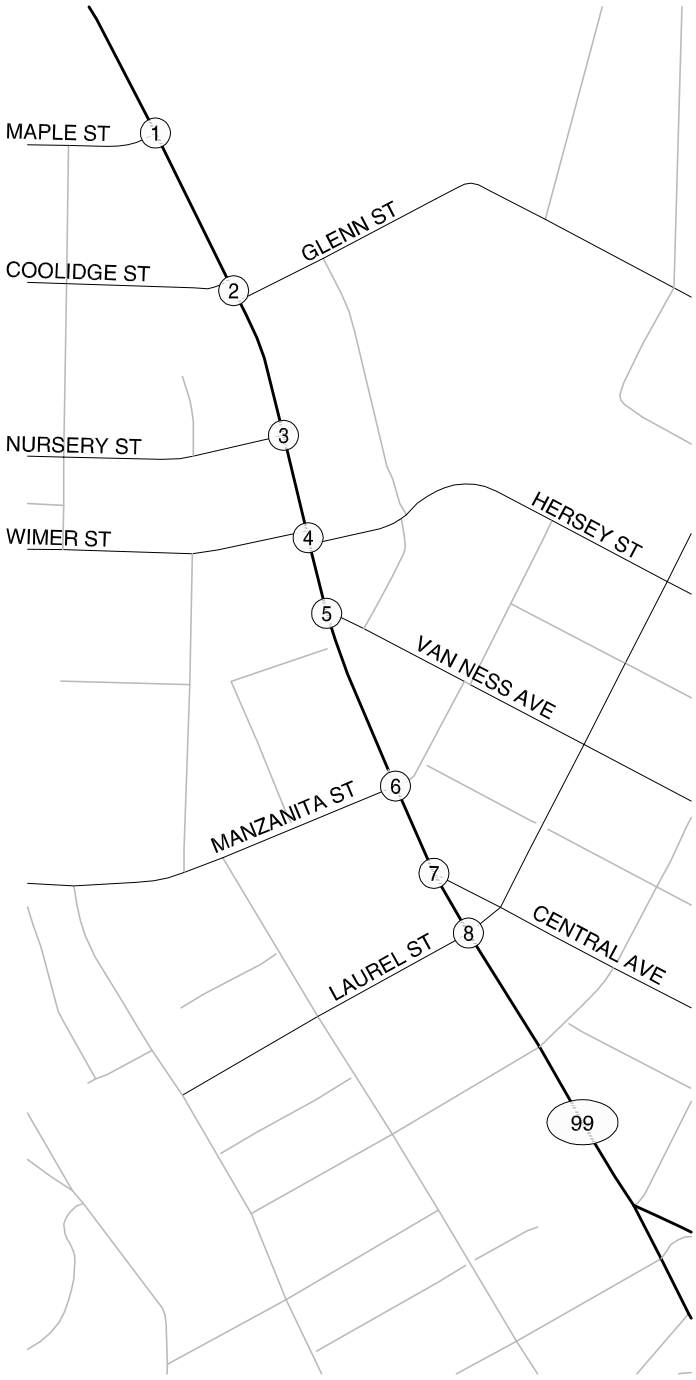

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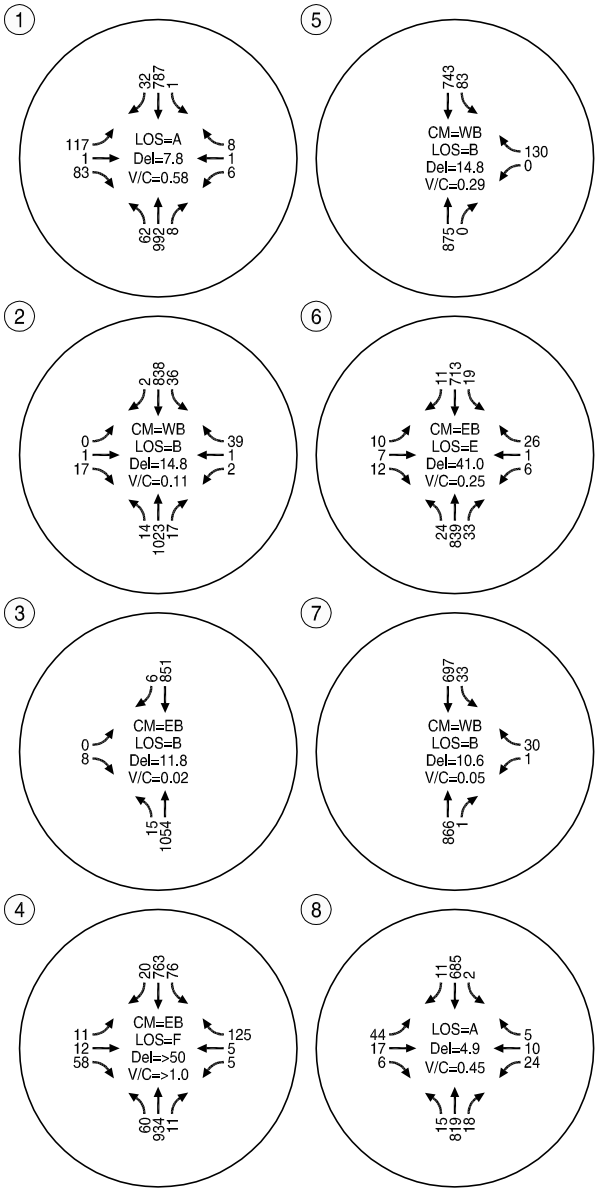

LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

EXISTING TRAFFIC CONDITIONS - SEASONALLY ADJUSTED
ASHLAND, OREGON

FIGURE 2

Figure 3 illustrates the lane configurations at each intersection under the road diet scenario. Under the road diet lane configurations, turn restrictions would be in place at the Wimer Street-Hersey Street/North Main Street, Coolidge Street-Glenn Street/North Main Street, VanNess Avenue/North Main Street, and Central Avenue/North Main Street intersections. The minor street left-turn and/or through movements occurring at those intersections were routed as shown in Figure 4. These numbers are for the one hour weekday p.m. peak period. A negative number indicates a reduction in the number of vehicles making a turning or through movement as a result of a turn restriction. A positive number indicates the location where rerouted vehicles would relocate their turning movement.

As can be seen from Figure 4, the majority of the restricted movements are anticipated to shift to occur at the Laurel Street/North Main Street, Manzanita Street/North Main Street and Maple Street/North Main Street intersections. The following sub-section discusses the resulting traffic operations for each intersection.

Minor Street Traffic Operations Analysis

Traffic operations analysis for the road diet lane configuration and traffic volumes was conducted using the calibrated model and the 30th highest hour traffic volumes, as discussed above. Results from the analysis are summarized in Figure 5.

As can be seen by comparing Figure 2 (traffic operations under existing conditions) and Figure 5 (traffic operations under road diet conditions), delay is reduced at two intersections, increased marginally (by less than 10 seconds) at three intersections, and moderately increased by 12 to 13 seconds at two intersections.

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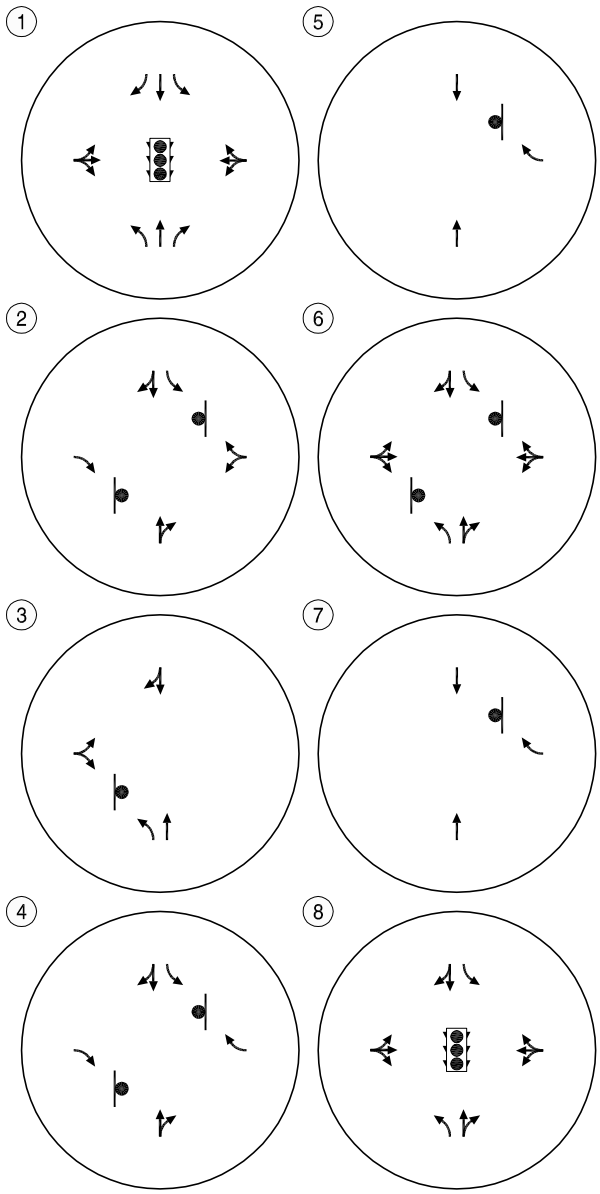

LEGEND

- STOP SIGN
- TRAFFIC SIGNAL

ASSUMED ROAD DIET LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES ASHLAND, OREGON

FIGURE 3

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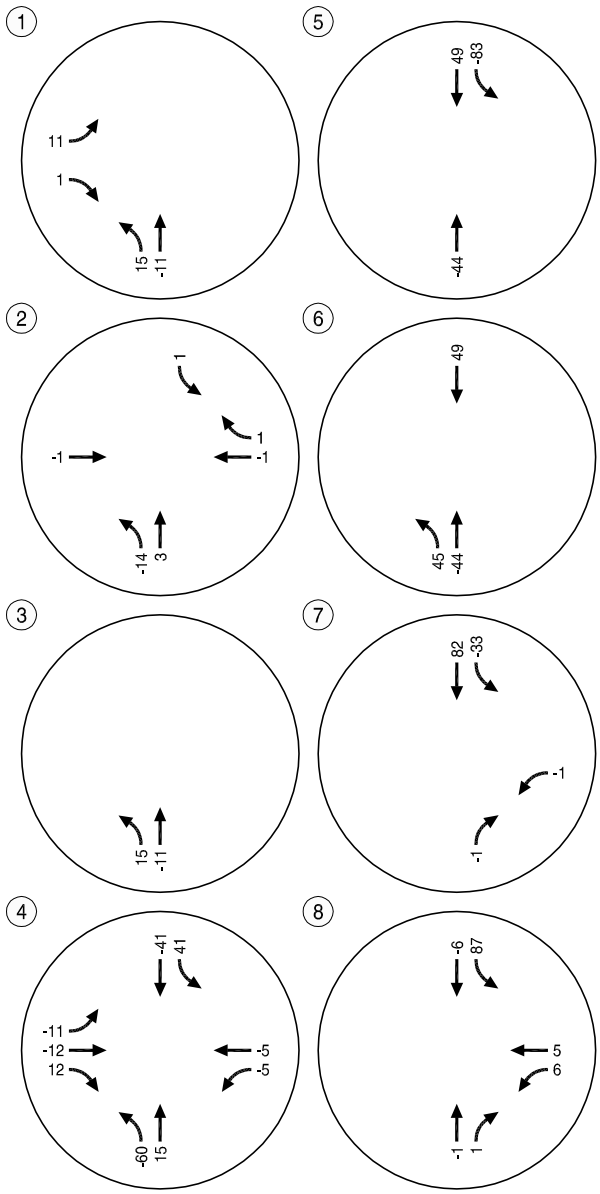

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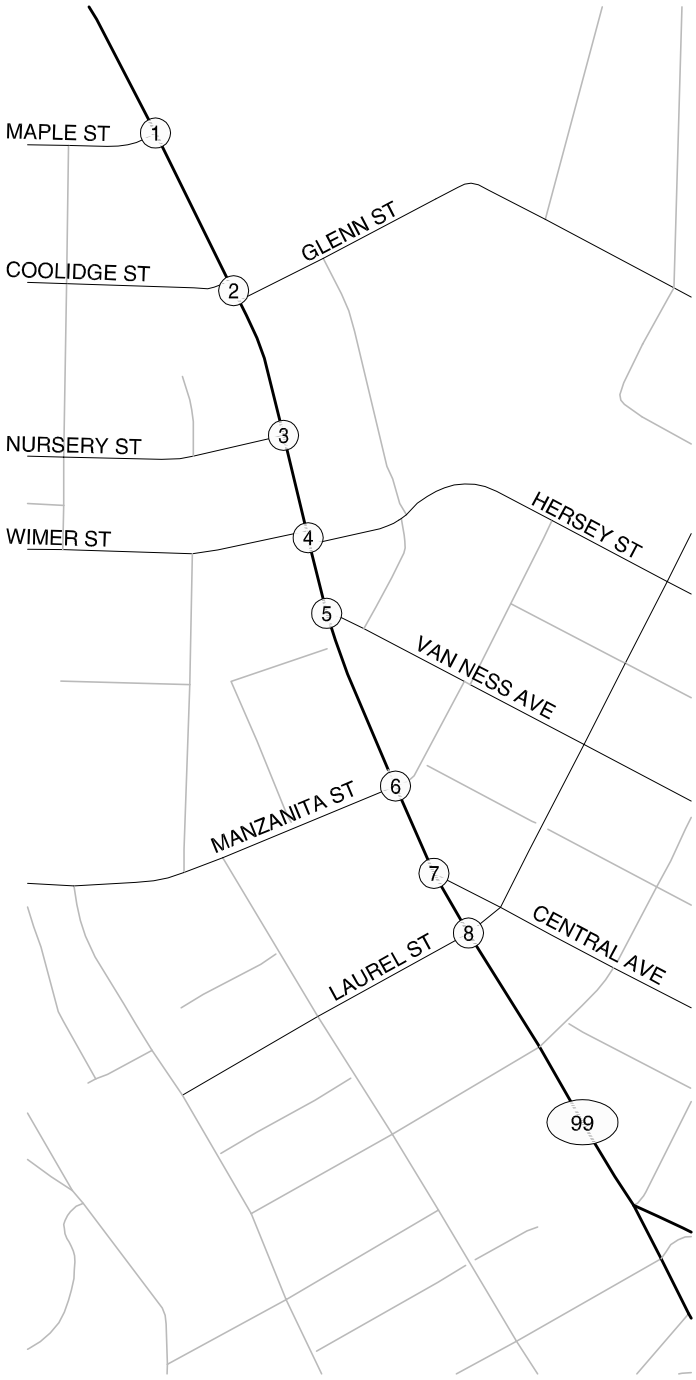
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

REROUTED TRIPS
ASHLAND, OREGON

FIGURE
4



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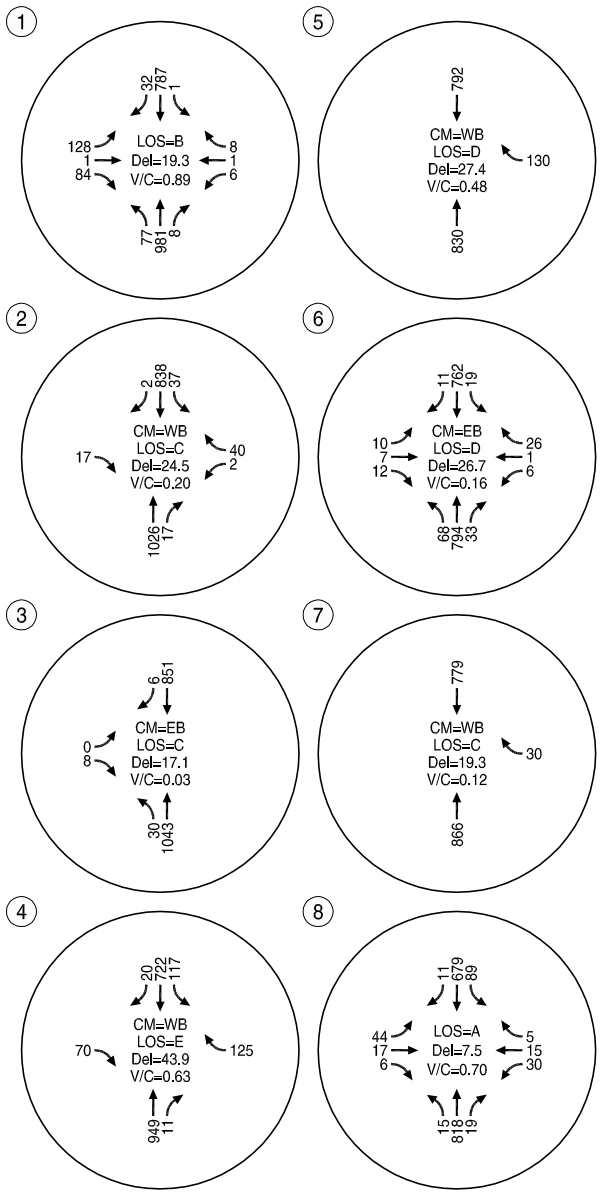

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V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

2011 ROAD DIET TRAFFIC CONDITIONS - SEASONALLY ADJUSTED
ASHLAND, OREGON

FIGURE 5

Changes in Average Daily Traffic on Minor Streets

The City of Ashland collected daily traffic counts at the potentially impacted side streets. Table 4 summarizes the Average Daily Traffic (ADT) under existing conditions with an estimate of the potential change in traffic on a daily basis.

Table 4 Estimated Change in ADT Due to Road Diet

Street Name (Functional Classification)	From	To	Existing ADT	Change in ADT Due to Road Diet[1]	Estimated ADT with Road Diet	ADT Range based on Street Functional Classification[2]
Maple Street (Avenue)	N. Main Street	Rock Street	3,240	+270	3,510	3,000 to 10,000
Coolidge Street (Neighborhood Street)	N. Main Street	Rock Street	403	-160	243	Less than 1,500
Nursery Street (Neighborhood Street)	N. Main Street	Rock Street	403	+150	190	Less than 1,500
Wimer Street (Avenue)	N. Main Street	High Street	1,477	-760	717	3,000 to 10,000
Manzanita Street (Neighborhood Street)	N. Main Street	High Street	690	+450	1,140	Less than 1,500
Laurel Street (Neighborhood Street)	N. Main Street	High Street	989	+50	1,039	Less than 1,500
Laurel Street (Avenue)	N. Main Street	Central Avenue	887	+990	1,877	3,000 to 10,000
Central Avenue (Neighborhood Street)	N. Main Street	Laurel Street	303	-300	3	Less than 1,500
Skidmore Street (Neighborhood Street)	N. Main Street	Van Ness Street	538	0	538	Less than 1,500
Van Ness Avenue (Neighborhood Street)	N. Main Street	Skidmore Street	1,807	-830	977	Less than 1,500
Hersey Street (Avenue)	N. Main Street	Lori Lane	2,300	+310	2,610	3,000 to 10,000
Glenn Street (Avenue)	N. Main Street	Lori Lane	1,011	0	1,011	3,000 to 10,000

[1]ADT for the road diet configuration was estimated from the rerouted trips shown in Figure 4. Negative numbers in this column indicate ADT is expected to decrease with the road diet lane configuration. Positive numbers in this column indicate ADT is expected to increase with the road diet lane configuration.

[2]ADT ranges per street functional classification were obtained from the City of Ashland's Street Standards Handbook.

As illustrated in Table 4, the side street daily traffic volumes with the road diet configuration on North Main Street are estimated to remain within the range of their existing street functional classification or in some instances below the range (e.g., Wimer Street). This indicates, based on the City of Ashland's current street standards, the side streets adjacent to North Main Street are designed to accommodate the estimated daily traffic volumes with a road diet in-place on North Main Street.

The road diet configuration is estimated to reduce daily traffic on Coolidge Street, Wimer Street, Central Avenue, and Van Ness Avenue. As a result, daily traffic is expected to increase on Maple Street, Nursery Street, Manzanita Street, Laurel Street, and Hersey Street. The largest decreases in daily traffic are estimated to occur on:

- Van Ness Avenue - A reduction of approximately 830 vehicles per day;
- Wimer Street - A reduction of approximately 760 vehicles per day; and
- Central Avenue - A reduction of approximately 300 vehicles per day.

The largest increases in daily traffic (to offset the decreases above) are estimated to occur on:

- Laurel Street – An increase of approximately 990 vehicles per day;
- Manzanita Street – An increase of approximately 450 vehicles per day; and
- Hersey Street – An increase of approximately 310 vehicles per day.

The daily traffic volumes above and the estimated shifts in those volumes due to the road diet indicate the majority of traffic will adjust to use the signalized intersection at Laurel Street as the primary access for North Main Street with support from other adjacent neighborhood streets.

HIGHLIGHTS FROM ADDITIONAL DATA COLLECTED

As noted above, additional data was collected to inform the traffic operations model calibration and the evaluation measures discussed in the following section. Additional data collected included:

- Speed data
- Travel time runs
- Additional vehicle volume counts
- Bicycle and pedestrian volume counts

Highlights and/or interesting pieces of information from this data are listed below.

- The current 85th percentile speed on North Main Street is approximately 32 mph, which is 7 mph higher than posted speed of 25 mph.
- Travel time runs during the weekday p.m. peak period (between 3:30 and 5:30 p.m. on April 13, 2011) indicate the average travel time for vehicles along the corridor (between Helman Street and Valley View Road) today is approximately 3 minutes and 50 seconds.
- Bicycle and pedestrian volume counts at two locations on North Main Street recorded the following on September 14, 2009:
    - At Wimer Street – Hersey Street/North Main Street from 2:00 p.m. to 6:00 p.m. 67 bicyclists and 67 pedestrians; and
    - At Maple Street/North Main Street from 2:00 p.m. to 6:00 p.m. 36 bicyclists and 39 pedestrians.

The additional data collected and highlights from that data were considered in developing the proposed evaluation measures below. *Appendix B* contains the worksheets summarizing the additional data collected.

Evaluation Measures

At the end of the road diet trial period, the City and community will need to determine if they would like to keep the road diet on North Main Street or return it to its current form (i.e., four-lane cross-section). Project stakeholders and community members requested a clear set of evaluation measures the City and community can use to determine if the road diet is successful. The evaluation measures presented in this memorandum were developed with an awareness that there are trade-offs associated with the road diet that should be considered when evaluating the success of the project. For example, slower vehicle speeds make the environment friendlier to pedestrians and bicyclists, but may increase travel time for vehicles. Ultimately the success of the project will be determined by how well the roadway serves all users.

The current draft set of evaluation measures include:

- Improve Safety – Reduce the annual average number and severity of crashes on North Main Street.
- Reduce Vehicle Speeds – Reduce the 85th Percentile Speed closer to the posted speed of 25 mph.

- Increase Bicycle and Pedestrian Volumes – An increase in bicycle and pedestrian volumes during the trial period would indicate an element of success at better serving all modes along North Main Street.
- Maintain Acceptable Vehicle Travel Time – Maintain an average vehicle travel time of 4 minutes and 20 seconds or less from Helman Street to the northern city limits; this measure ensures the road diet does not place an undue burden on motorists.
- Gain Community Support – An increase in and/or majority support for keeping the road diet after the trial period would indicate a successful project.

Each of the evaluation measures above are discussed in more detail in the following sub-sections.

IMPROVE SAFETY

Reducing the annual average number and severity of crashes on North Main Street would help indicate if the road diet has helped improve safety. Based on ODOT crash data for the ten-year period from January 1, 2000 through December 31, 2009, 177 crashes were reported to have occurred on North Main Street. A majority of the crashes involved rear-end and turn-movement crashes, which generally occurred when people waiting to turn left from North Main Street were rear-ended or people turning left across North Main Street were struck by on-coming traffic. National research has indicated implementing road diets can reduce crashes 25% to 33%[1]. **In order for this measure to be valid and used, the temporary road diet must be in-place for at least two years**.

REDUCE VEHICLE SPEEDS

Another proposed measure of success is reducing vehicle speeds on North Main Street to the posted speed. Reducing vehicle speeds improves the environment for pedestrians and bicyclists, reduces the severity of crashes (if a crash occurs), and improves livability for residents with homes along North Main Street. The current posted speed on North Main Street is 25 mph for the majority of the proposed road diet section. As noted above, the current 85th Percentile Speed on North Main Street is 32 mph. If the temporary road diet reduces the 85th Percentile Speed on North Main Street closer to 25 mph, then that will be an indication of success.

INCREASE BICYCLE AND PEDESTRIAN VOLUMES

One of the motivations for the North Main Street temporary road diet is to make it easier and more attractive for bicyclists and pedestrians to use North Main Street. An increase in bicycle and

[1] American Association of State Highway Officials (AASHTO). *Highway Safety Manual*. (2010).

pedestrian volumes during the trial period would be an indication of better serving all modes along North Main Street.

MAINTAIN ACCEPTABLE VEHICLE TRAVEL TIME

An increase in vehicle travel time from Helman Street to the northern city limits is expected, because road diets are intended to reduce vehicle speeds. However, the increase in travel time should not be so great as to create an undue burden on motorists. An acceptable vehicle travel time between Helman Street and Valley View Road is considered 4 minutes and 20 seconds. This number is based on the current travel time runs of approximately 3 minutes and 50 seconds (between Helman Street and Valley View Road) and assumes an approximate 10% increase (i.e., an additional 30 seconds) in vehicle travel time is generally acceptable. An indication that the road diet is successful would be maintaining an acceptable average vehicle travel time of 4 minutes and 20 seconds or less. The traffic analysis indicates that the additional travel time is likely to be less than 30 seconds.

GAIN COMMUNITY SUPPORT

If the general community in Ashland is supportive of the road diet after the trial period, this will be a strong indication of success. Community support can be assessed by the City through a citizens' poll or vote before and after the road diet trial period. An increase in support and/or majority support after the trial period would indicate success. If before/after citizens' poll or vote is taken, they should be conducted in a manner that gathers a statistically sound representation of all community members (i.e., a random sampling of community members that is large enough to provide statistically significant results).

Next Steps

The City's TC will be holding a meeting on June 14, 2011 to discuss the contents of this memorandum, consider additional community input, and decide whether or not to recommend the temporary road diet to City Council for their consideration.

Appendix

APPENDIX A – TRAFFIC OPERATIONS ANALYSIS

APPENDIX B – DATA COLLECTION WORKSHEETS