



EXISTING CONDITIONS MEMORANDUM

TO: Cliff Sinnott, Executive Director, Rockingham Planning Commission

FROM: Gene McCarthy, P.E., Project Manager, McFarland Johnson, Inc.

DATE: June 29, 2010

PROJECT: Windham NH Route 111 Corridor and Wall Street Extension Study

McFarland Johnson (MJ) has conducted an existing roadway conditions evaluation as part of the NH Route 111 Corridor and Wall Street Extension Study. The study limits are NH Route 111 from west of South Lowell Road to Interstate 93 at Exit 3 and includes Wall Street and North Lowell Road in Windham NH. Figure A-1 in Appendix A depicts the study area. The following sections outline the existing conditions of the various roadways and intersections within the project limits. An analysis of crash history is also included.

NH Route 111

The existing NH Route 111 (NH 111) corridor within the study limits is a two-lane Urban Principal Arterial that conveys approximately 21,000 vehicles per day (2007). It is the most southerly east-west highway in New Hampshire and therefore serves as a major corridor for regional traffic. Peak flows travel eastbound towards Interstate 93 (I-93) in the morning and westbound from I-93 in the afternoon. The speed limit is posted as 40 mph but with shoulders and minimal roadside features, the roadway has the feeling of a highway causing vehicles to travel at higher speeds. The corridor has one lane in each direction with a center turn lane in several locations and right turn lanes at several intersections and entrances. Within the study limits there are a limited number of driveways, which reduces conflicts for NH 111 traffic. There are no sidewalks or bike paths along the roadway, but crosswalks and concrete sidewalk ramps are present at the signalized intersections.



NH Route 111 Looking West from No. Lowell Road



NH Route 111 Looking East from Church Street

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The existing pavement conditions vary as it appears recent road re-surfacing has taken place. The intersection of North Lowell Road and NH 111 has been recently paved and is therefore in good condition. The same is true of the intersection of NH 111 and Church Street and the pavement east towards the shopping plazas. A section of pavement exists between the intersection of Church Street and the intersection of North Lowell Road where the pavement has not been rehabilitated and large cracks have appeared along the shoulders with smaller cracks appearing within the travel way. The pavement along NH 111 west of the North Lowell Road intersection and east of the Hardwood Road intersection appears to be in good condition. Photos of the NH 111 pavement can be seen below. The pavement markings appear to be in good condition along both the new and old sections of pavement. The site distances throughout the corridor are all satisfactory as the roadway is wide.



Section of "Old" Pavement on NH Route 111



Cracks in Pavement on NH Route 111



Intersection of NH Route 111 and North Lowell Road



Intersection of NH Route 111 and Hardwood Road

Traffic counts collected in December 2009 included a breakdown of the number of cars and large trucks. From this information the percentage of trucks on NH 111 was determined. The overall percentage of trucks was between 2½% and 3% with the peak occurring in the morning with percentages around 4%. These percentages are consistent with a highway of this type. However, it is believed there is an increase in the percentage of trucks when the truck weigh station on I-93 is open. Southbound trucks on I-93 are believed to exit at Exit 4 to bypass the Windham Weigh Station located north of Exit 3 and then use North Lowell Road and NH 111 to re-enter I-93 at Exit 3.

The commercial properties along NH 111 all have their own individual driveways. If a customer wishes to patronize two businesses in adjoining shopping malls, they must drive on NH 111 to access the two parking lots. These trips reduce capacity and increase vehicle conflicts for those traveling on NH 111. The lack of sidewalks and interconnection between businesses also means that those willing to walk between two shopping centers cannot do so without walking on the shoulders of NH 111. If access between adjoining commercial properties could be managed effectively, trips on NH 111 could be reduced.

The four traffic signals along NH 111 within the project limits are coordinated to optimize the flow of east-west traffic. The green phases are coordinated so that a vehicle should be able to drive the corridor without having to stop.

North Lowell Road

North Lowell Road north of NH Route 111 is an Urban Collector Road that conveys approximately 5,100 vehicles per day (2009). It provides access to I-93 via NH Route 111 for the residential areas in northern Windham, southern Derry, and southern Londonderry. Peak flows travel southbound in the morning and northbound in the afternoon, coinciding with the peak flows directed to I-93. The alternate route for these commuters is to use Exit 4 on I-93, which is 6 miles further north. The posted speed limit is 35 mph with one lane in each direction and shoulders 1 to 2-feet in width. There are no sidewalks or bike paths along the roadway and the narrow shoulders make pedestrian and bicycle use difficult.

Residents along North Lowell Road have stated that many large trucks use the road. The traffic counts collected December 2009 were used to determine the overall percentage of trucks was less than 2% with the peak occurring in the morning with slightly less than 3%. These percentages are low and consistent with this class of roadway. However, as stated above the belief is that the percentage is higher when the Windham Weigh Station on I-93 is open.

The horizontal and vertical grades are adequate except near the intersection with NH 111. North Lowell Road has an immediate sharp curve and a moderately steep grade north of the intersection with NH 111. Site distances along the southern 600-700 feet, near the town offices, are poor due to the combination of horizontal and vertical curvature. The pavement has significant cracking along the edges and within the travel ways in this area as well.



Limited Sight Distance Exiting Town Offices



Paved Drainage Ditch, North Lowell Road



Cracks in Pavement along North Lowell Road



North Lowell Road, Looking North

Church Street

Church Street is a local road that connects NH 111 to North Lowell Road and allows vehicles traveling west on NH 111 to bypass the signalized intersection at NH 111 and North Lowell Road. Approximately half way down Church Street there is a driveway that leads north to the *Windham Terrace* Assisted Living facility. From this driveway to the east, Church Street is one-way. Vehicles can enter Church Street from NH 111 but cannot exit. West of the driveway Church Street permits traffic in both directions for access to *Windham Terrace*.

The pavement is in poor condition with significant cracking and frost heaves. There is a new section of pavement where Church Street crosses over Golden Brook. It appears the culvert has been recently improved including new guardrail. Church Street once was a two-way street with traffic permitted to exit on to NH 111, as double yellow pavement markings are still evident down the centerline. There are no sight distance issues created by the geometry of the roadway but it may be difficult to see oncoming traffic heading north on North Lowell Road when attempting to exit Church Street. No sidewalks or bike paths exist along the roadway. There is no posted speed limit along the roadway but it is estimated to be 35 mph.



Looking West Down Church Street



Intersection with North Lowell Road, Looking South

Wall Street

Wall Street is a dead-end local road that provides access to commercial properties. It is connected to NH 111 via a signalized intersection. Wall Street provides access to a shopping mall that includes a Shaw's supermarket, a state park and ride lot, a bank, an office building, and an industrial business via International Road. There is direct access to the shopping mall from NH 111, however, only for westbound traffic. All eastbound traffic heading to the shopping mall must use Wall Street. There is no posted speed limit along the roadway and there are no sidewalks or bike paths. The pavement is in good condition.



Looking at Wall Street from NH Route 111



Wall Street, Looking North

NH Route 111 / South Lowell Road / Hardwood Road Intersection

The NH 111/South Lowell Road/Hardwood Road Intersection is a 4-way signalized intersection at the western edge of the Windham Village Center. South Lowell Road is a local road that provides a connection to NH Route 111A south of this intersection. Hardwood Road is a local road that connects to residential neighborhoods in Windham.

Traffic counts were collected at this intersection in December 2009 for both the morning and afternoon peak periods. Figure B-1 in Appendix B shows the peak hour volumes in the morning and afternoon. The traffic analysis for the intersection indicates that it operates at Level of Service (LOS) C for both the morning and afternoon peak hour. See Appendix C for a description of Level of Service (LOS). The relatively good level of service is a result of the low turning volumes at this intersection. However, the eastbound queue on NH 111 in the morning can reach up to 30 vehicles and 800 feet. The high volume of traffic on NH 111 causes long queues even with a short delay.

NH 111 is on a horizontal curve as it passes through the intersection, which creates some sight distance issues. Vehicles traveling on NH 111 have an adequate view of the signalized intersection, but not of the roadway beyond. The left turning vehicles are controlled by the signal and therefore do not pose any safety concerns. Vehicles turning right onto NH 111 from South Lowell Road have sufficient views of the highway because the corridor is wide in this area. However, vehicles turning right onto NH 111 from Hardwood Road have insufficient sight distance. As a result, no right turns on red are allowed from Hardwood Road.



*NH Route 111, Looking East at South Lowell Road and
Hardwood Road*



Limited Sight Distance turning from Hardwood Road

NH Route 111 / North Lowell Road / Fellows Road Intersection

The NH 111/North Lowell Road/Fellows Road Intersection is a 4-way signalized intersection at the Village Center in Windham. Fellows Road is a dead-end local road that provides access to the Windham Police Station, Windham Fire Station, and the Nesmith Library. As the junction between the two commuter routes, NH 111 and North Lowell Road, the intersection experiences significant queuing on North Lowell Road and NH 111. The queue for vehicles making a left turn from North Lowell Road backs up past the right turn lane, prohibiting these vehicles from entering the right turn lane queue.

Traffic counts were collected at the intersection in December 2009 for both the morning and afternoon peak periods. Figure B-2 in Appendix B shows the morning and afternoon peak hour volumes. The traffic analysis for the intersection indicates that it operates at LOS D during the morning peak hour and LOS C during the afternoon peak hour. The lower LOS in the morning is due to the heavy movement from southbound North Lowell Road to eastbound NH 111 since this movement must wait for a green left arrow. The queue on North Lowell Road can reach 25 vehicles and 500 feet in length. The return movement for this traffic in the afternoon uses Church Street to bypass the signal. The queues on NH 111 can reach 40 vehicles and 900 feet in the morning for eastbound traffic and in the afternoon for westbound traffic.

Residents have reported that the detectors in the pavement for the North Lowell Road approach to the intersection are not working properly, causing improper traffic phasing that decreases the level of service of the intersection.

NH 111 is on a horizontal curve as it passes North Lowell Road and Fellows Road, which creates some sight distance issues. Vehicles traveling on NH 111 have an adequate view of the signalized intersection, but not of the roadway beyond. However, vehicles turning on to NH 111 from North Lowell Road and Fellows Road have restricted views of the highway. The left turning vehicles are controlled by the signal and therefore do not pose any safety concerns. Vehicles turning right from Fellows Road have restricted views of NH 111 due to the roadway curvature, roadside signs, and roadside vegetation. This restricted sight distance poses safety concerns for turns made on a red light. Right turning vehicles from North Lowell Road have sufficient sight distance on NH 111.



*Queuing on North Lowell Road near
NH Route 111*



*NH Route 111, Looking West at North Lowell Road and
Fellows Road*



Limited Sight Distance turning from Fellows Road



Looking at Fellows Road from NH Route 111

NH Route 111 / Windham Village Green / US Post Office Intersection

The NH 111 / Windham Village Green / US Post Office Intersection is a 4-way signalized intersection that provides access to two retail destinations. The Windham Village Green shopping plaza and the Windham Post Office legs of the intersection are more driveways than roadways as both are dead ends.

The traffic generation for both the Windham Village Green shopping plaza and the Windham Post Office were calculated using Institute of Transportation Engineers (ITE) Trip Generation curves. These values were confirmed by traffic counts conducted at the intersection in March 2010. The NH 111 counts were collected in December 2009. Figure B-3 in Appendix B shows morning and afternoon peak hour volumes. The traffic analysis for the intersection indicates that it operates at LOS A during the morning peak hour and LOS A during the afternoon peak hour. The good level of service is a result of the low turning volumes at this intersection.

NH 111 through this intersection is a straight roadway with wide lanes and shoulders. However, there is a vertical crest curve east of the intersection that has a high point approximately 400 feet from the intersection. Vehicles traveling westbound on NH 111 have an adequate view of the signal, but not necessarily of the queue of vehicles waiting at the intersection. Vehicles turning right onto NH 111 from

the Post Office have sufficient views of the highway. However, vehicles turning right onto NH 111 from the Windham Village Green shopping have restricted views. The sight distance is adequate for the posted speed, however, vehicles often travel above the speed limit and this does pose a potential safety issue.



NH Route 111, Looking West at Windham Village Green and Windham Post Office



Looking at Windham Village Green Plaza from NH Route 111



Limited Sight Distance turning from Windham Village Green Plaza



NH Route 111, Looking East at Windham Village Green and Windham Post Office

NH Route 111 / Wall Street Intersection

The NH 111/Wall Street Intersection is a 3-way signalized intersection that provides access to Wall Street. As mentioned above, Wall Street is a dead-end local street that provides access to several commercial properties.

Traffic counts were collected in December 2009 at the intersection for both the morning and afternoon peak periods. Figure B-4 in Appendix B shows the morning and afternoon peak hour volumes. The traffic analysis indicates that this intersection operates at LOS A during the morning peak hour and LOS B during the afternoon peak hour. The good level of service is a result of the low turning volumes at this intersection. However, the queue on NH 111 in the afternoon for westbound travel can reach 30 vehicles and 750 feet. The high volume of traffic on NH 111 backs up quickly even with a short delay.

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Through this intersection NH 111 is a straight roadway with wide lanes and shoulders. However, there is a vertical crest curve east of the intersection that has a high point approximately 450 feet from the intersection. Vehicles turning right onto NH 111 from Wall Street have restricted views. The sight distance is adequate for the posted speed, however, vehicles often travel above the speed limit and this does pose a potential safety issue.



Looking at NH Route 111 from Wall Street



NH Route 111, Looking West at Wall Street



Limited Sight Distance turning from Wall Street

Safety Issues/Crash History

The majority of crashes along NH 111 were attributed to driver inattention, distraction, or error. A high percentage of these crashes were rear end collisions. Typically, these types of crashes indicate congestion in the area. A majority of the crashes along the corridor occurred at intersections or at the Interstate ramps.

The data analyzed in this study dates from January 2004 to December 2009. The data was collected along NH 111 from South Lowell Road/Hardwood Road to the I-93 Southbound ramps at Exit 3. A total of 266 crashes were reported during that timeframe. Of these crashes, 65 resulted in a total of 85 injuries. There were 169 rear end collisions, 64% of the total number of crashes. The congestion during peak periods appears to contribute to the high percentage of rear end collisions. Most crashes have been categorized as property damage only.

The following table summarizes the time of day for all of the reported crashes between 2004 and 2009. While the two peak periods account for only about 17% of the day, 42% of the crashes occurred during these four hours. This again suggests congestion plays a role in these crashes. Also, 84% of the crashes occurred during the day.

Time of Day Summary

Morning Peak (7 AM – 9 AM)	Day time (9 AM – 4 PM)	Afternoon Peak (4 PM – 6 PM)	Night Time (6 PM – 7 AM)
39	112	72	43

The NH 111/South Lowell Road Intersection reported six crashes, with none resulting in an injury. Three of these crashes were rear end collisions and involved vehicles approaching the signal from the east. The restricted sight distance due to the horizontal curve at the intersection may conceal those vehicles in the left turn lane queue. The congestion during peak periods may contribute to the number of rear end collisions.

The NH 111/North Lowell Road Intersection reported 67 crashes, with 16 crashes resulting in 17 injuries. Most of the crashes were rear end collisions caused by inattentive drivers. The high percentage of rear end collisions are most likely the result of congestion. There was an even distribution of crashes to traffic approaching from the east and approaching from the west, indicating congestion in both directions.

The NH 111/Wall Street Intersection reported 38 crashes, with nine of the crashes resulting in ten injuries. A large number of the crashes were rear end collisions which indicate congestion in the area. There were also crashes that occurred while making turning movements and merging with other vehicles. These crashes can sometimes be attributed to improper sight distance or poor intersection design. Specifically, when traffic is exiting Wall Street and looking towards the east there is a crest vertical curve that may hinder the ability to see approaching traffic. Combining this poor sight distance with the high rate of speed in this area creates an unsafe right hand turn for vehicles stopped at the red light exiting Wall Street. Prohibiting the right turn on red movement when exiting Wall Street may reduce the crash rate at this intersection.

Where the I-93 southbound ramps intersect with NH 111 there were 62 crashes reported with 18 of those crashes resulting in 25 injuries. Of these crashes, 34 were rear end collisions, mostly exiting the ramp attempting to merge onto NH 111. It should be noted that heavy construction has been taking place in this area, which affects the normal roadway condition and geometry. At the intersection of NH

111 and the I-93 southbound ramps there are no traffic signals, while traffic signals do exist at the intersection of NH 111 and the I-93 northbound ramps. There were a number of sideswipe collisions that occurred when vehicles were attempting to make a left hand turn onto NH 111 from the I-93 southbound off ramp. The widening of I-93 currently under construction will change the configuration of Exit 3. The new NH 111 intersections with the I-93 ramps will both be signalized.

There were 28 crashes reported along NH 111 in the area of the lake access roads. Twelve of these crashes resulted in 20 injuries. The high injury rate is attributed to the high speeds of vehicles traveling along NH 111. Vehicles attempting to exit the lake access roads must merge with high volumes and fast moving traffic while negotiating a number of other access points in the area. There is thick brush surrounding this area which creates poor site distance. The widening of I-93 currently under construction will eliminate this stretch of NH 111 creating less access points. The new configuration will allow vehicles to access the lake through a signalized intersection which should reduce crashes in this area.

There were 44 crashes located in front of the post office and shopping plaza along NH 111. Six of these crashes resulted in nine injuries. Of these crashes, 29 were a result of rear end collisions, which indicates congestion in the area. The low percentage of injury related accidents is also a sign of congestion as vehicles are usually operating at low speeds.

There were 25 crashes where no major intersections were located. Four of these crashes resulted in four injuries. These remaining crashes along NH 111 had no apparent pattern and were caused by driver error or weather conditions. Another contributing factor to crashes through the corridor is sun glare which is a result of the east/west direction of NH 111. The table on the next page summarizes the crash history for the various road segments.

Two of the crashes occurring in 2005 resulted in fatalities. One of the fatalities was the result of an impaired driver. The other was a motorcycle rider whose vision may have been impaired by the glare of the sun. The rider skidded as he attempted to stop behind queued vehicles. This crash occurred in the westbound direction at 5:00 pm when the sun was setting.

Crash Summary

Segment	Number of Crashes	Injury Crashes	Number of Rear End Collisions (Percentage of Total)
NH 111/Hardwood Intersection	6	0	3 (50%)
NH 111/North Lowell Road Intersection	67	16	55 (82%)
NH 111/Wall Street Intersection	38	9	25 (74%)
NH 111/Church Street-Shopping Plaza Area	44	6	29 (66%)
NH 111/Lake Access Roads	28	12	13 (46%)
NH 111/I-93 SB Ramps Intersection	62	18	34 (55%)
NH 111 Remaining Roadway (No Patterns)	25	4	13 (52%)
Totals	266	65	169 (64%)

Circulation and Operational Issues

As mentioned in the sections above, there are several important roadway corridors in the study area. I-93 is the primary north to south corridor in the State of New Hampshire. NH 111 is the most southern, and one of the few, east to west corridors in the state. These two corridors meet at Exit 3 in Windham. As a result, significant volumes of commuter traffic utilize NH 111 to access I-93.

North Lowell Street is the first collector road that crosses NH 111 on the west side of I-93, and this is why there is significant commuter traffic on North Lowell Street. A new connection to NH 111 would help to alleviate the congestion on North Lowell Street through the Windham Village Center. An extension of Wall Street has been identified as a possible solution since a portion of the road exists and a signalized intersection connects it to NH 111. The Wall Street extension could attract much of this commute traffic and keep it away from the Village Center.

APPENDICES

Appendix A - Figures

Appendix B – Peak Hour Traffic Volumes 2009

Appendix C – Signalized Intersection Level of Service (LOS)

DRAFT

APPENDIX A

Figures

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NH III CORRIDOR & WALL STREET EXTENSION FEASIBILITY STUDY



APPENDIX B

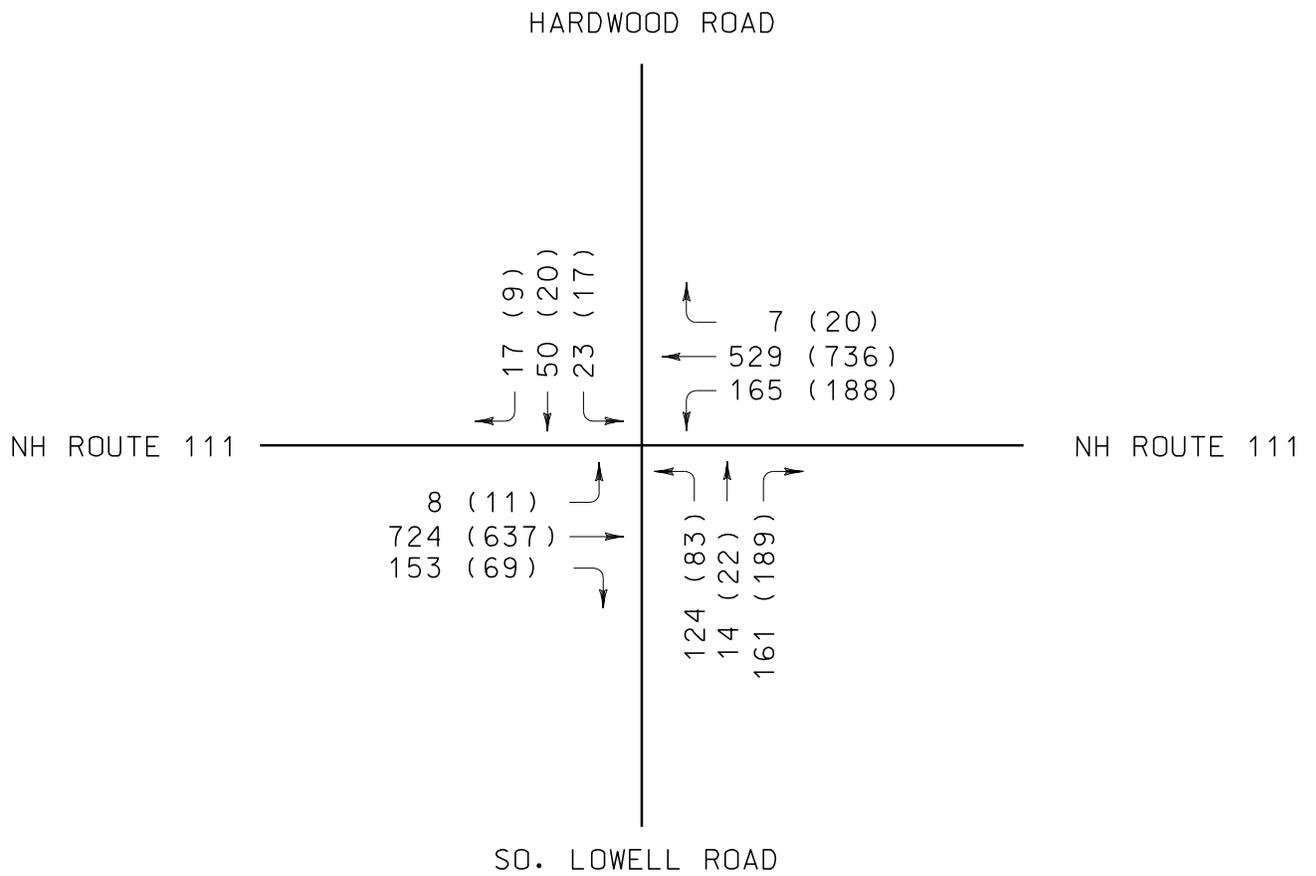
Peak Hour Traffic Volumes 2009

DRAFT

XXX - 2009 PM PEAK
(XXX) - 2009 PM PEAK

Turning Movements

LEGEND



WINDHAM NH 111 CORRIDOR AND WALL STREET
EXTENSION FEASIBILITY STUDY

NH ROUTE 111/
SO. LOWELL ROAD/
HARDWOOD ROAD
INTERSECTION

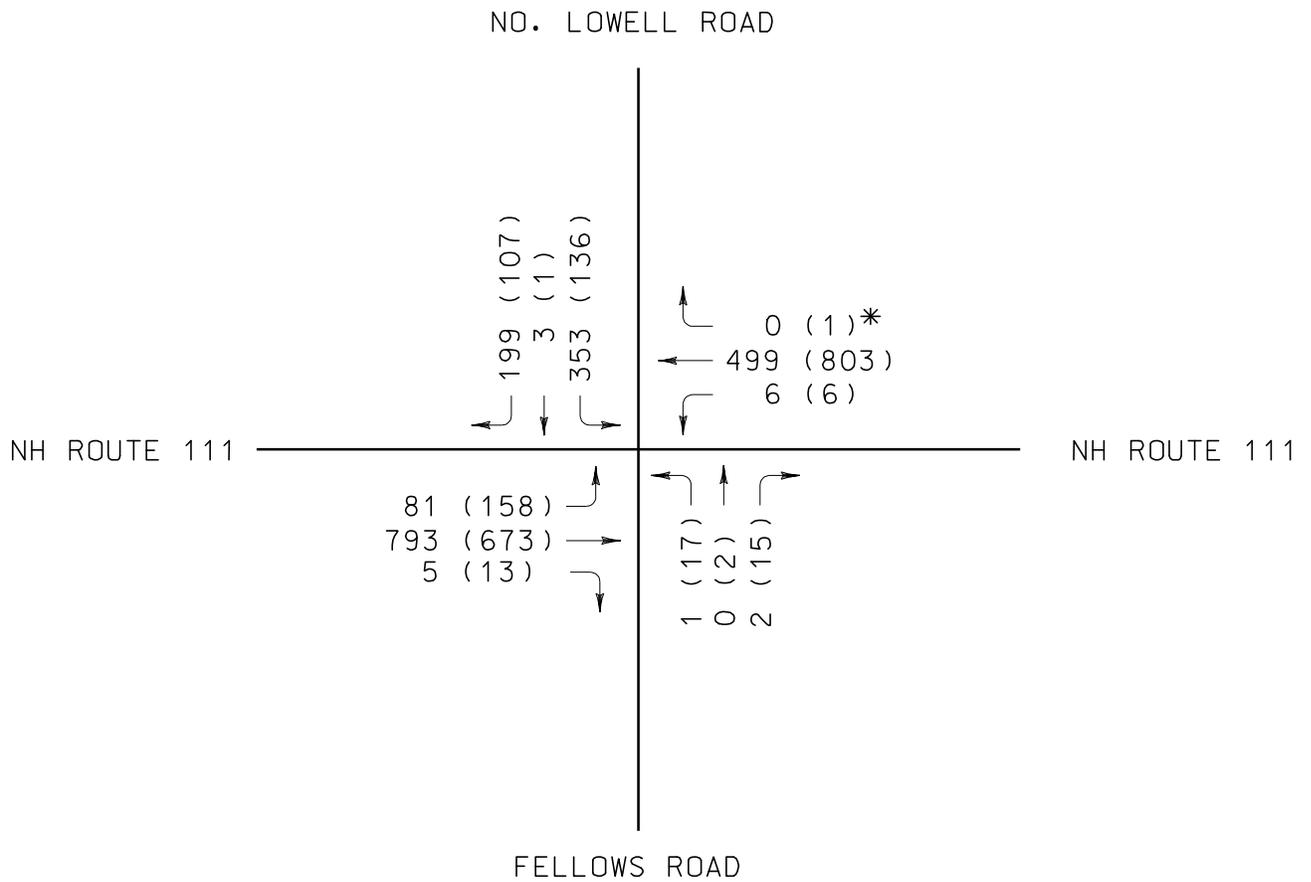


FIGURE B-1

XXX - 2009 PM PEAK
 (XXX) - 2009 PM PEAK

Turning Movements

LEGEND



* VEHICLES USE CHURCH STREET AS A BYPASS FOR THIS TURN.



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WINDHAM NH 111 CORRIDOR AND WALL STREET
 EXTENSION FEASIBILITY STUDY

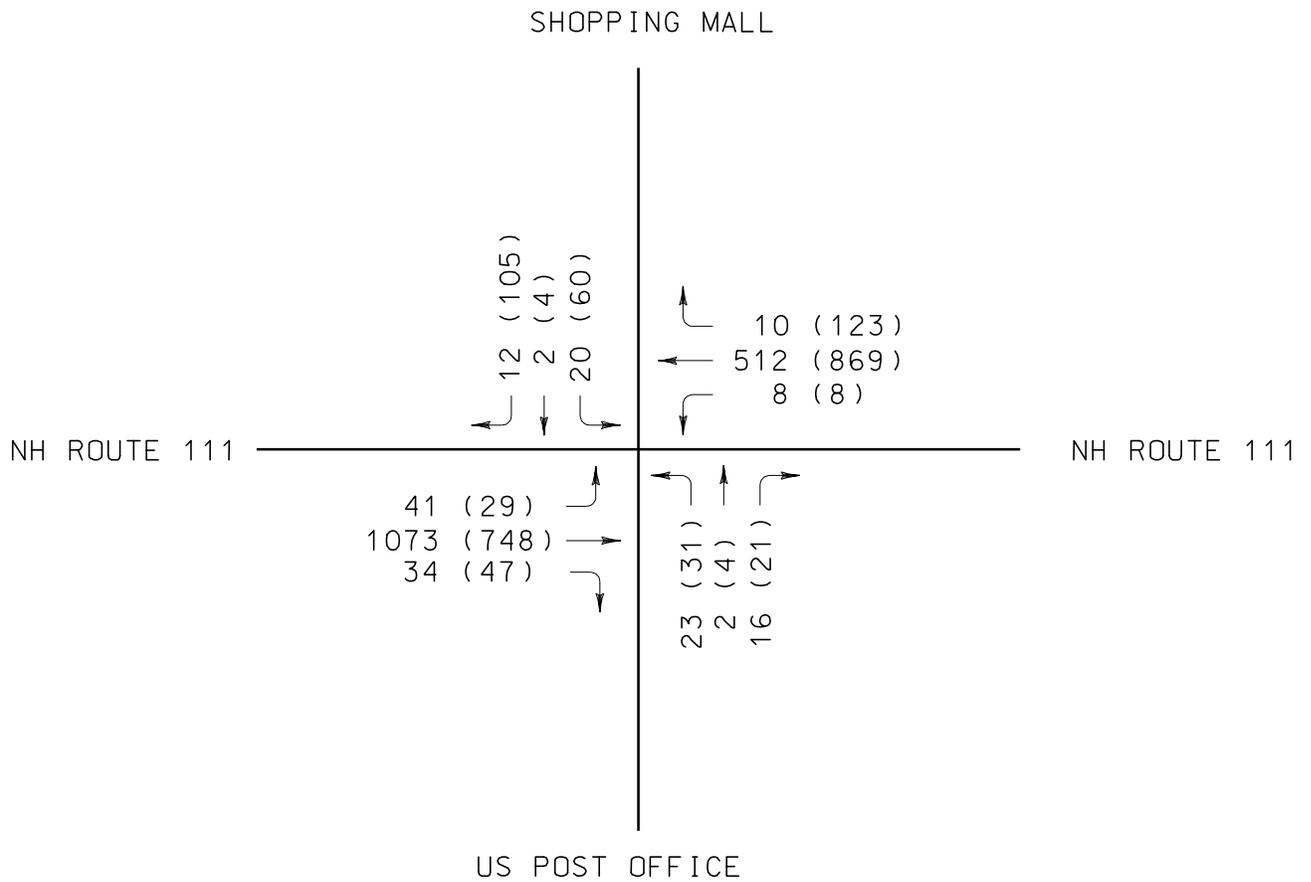
NH ROUTE 111/
 NO. LOWELL ROAD/
 FELLOWS ROAD
 INTERSECTION

FIGURE B-2

XXX - 2009 PM PEAK
(XXX) - 2009 PM PEAK

Turning Movements

LEGEND



WINDHAM NH 111 CORRIDOR AND & WALL STREET
EXTENSION FEASIBILITY STUDY

NH ROUTE 111/
SHOPPING MALL/
US POST OFFICE
INTERSECTION

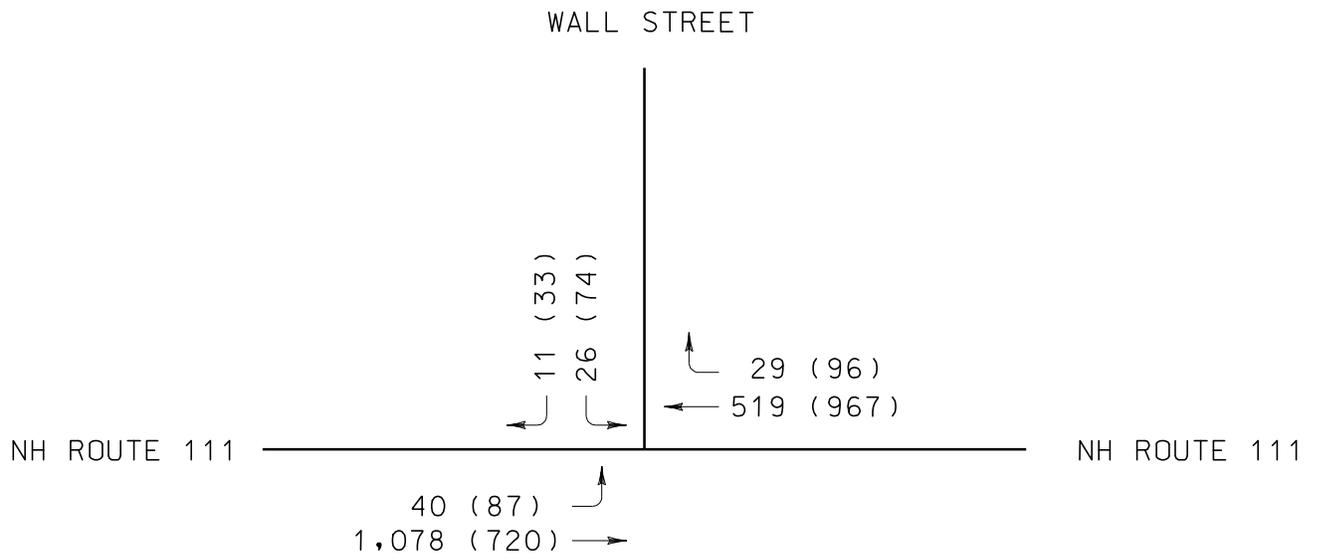


FIGURE B-3

XXX - 2009 PM PEAK
(XXX) - 2009 PM PEAK

Turning Movements

LEGEND



WINDHAM NH 111 CORRIDOR AND WALL STREET
EXTENSION FEASIBILITY STUDY

NH ROUTE 111/
WALL STREET
INTERSECTION



APPENDIX C

Signalized Intersection Level of Service (LOS)

The operating Level of Service (LOS) of a signalized intersection is based on the average control delay per vehicle. The control delay per vehicle is estimated for each lane group, combined for each approach and the intersection as a whole. The criteria, i.e., the delays associated with the corresponding LOS's for signalized intersections, as specified by the *2000 Highway Capacity Manual* are shown in the table below.

LOS	Average Control Delay (Seconds)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80