Whatcom County/Lummi Nation

Reservation-Wide Traffic Study

December 2009

PREPARED BY:

RH2 ENGINEERING, INC.

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Prepared by RH2 Engineering, Inc.

Prepared for Whatcom County and Lummi Nation

Note: This Traffic Study was completed under the direct supervision of the following Licensed Professional Engineer, registered in the State of Washington.

Ken Thomas, P.E.

Principle-In-Charge

WHATCOM COUNTY/LUMMI NATION

RESERVATION WIDE TRAFFIC STUDY

TABLE OF CONTENTS

Chapter 1 - Introduction and Purpose

Purpose

This study was undertaken by Whatcom County (County) and the Lummi Nation to analyze the traffic issues within the Lummi Reservation. The intent is to provide policy guidance and develop projects and activities that will provide short term interim solutions and long term ultimate resolution for the identified issues.

The specific areas to be analyzed are:

- Existing roadway conditions
- Accident analysis with focus on Haxton Way fatalities
- Lummi Island Ferry traffic
- Lummi Nation growth and development
- This is the final of this report. It has been completed as part of the Gooseberry Point Ferry Dock Relocation Feasibility Study which was initiated in 2007 and completed in December 2009. This final report reflects the decisions and recommendations that resulted from the feasibility study.

Authorization

The County Executive was authorized to enter into a contract with RH2 Engineering, Inc. (RH2) on July 26, 2005 by action of the Finance Committee.

A copy of the contract is included in **Appendix A**.

Study Area

The study area for this project is the Lummi Indian Reservation plus Slater Road along the northern boundary of the reservation. **Figure 1-1** illustrates the study area.

The roadway segments that were included in the study are the Federally classified roads within the study area and a selected grouping of local roads that primarily serve internal circulation in the study area. **Figure 1-2** illustrates the roads selected for analysis in this study.

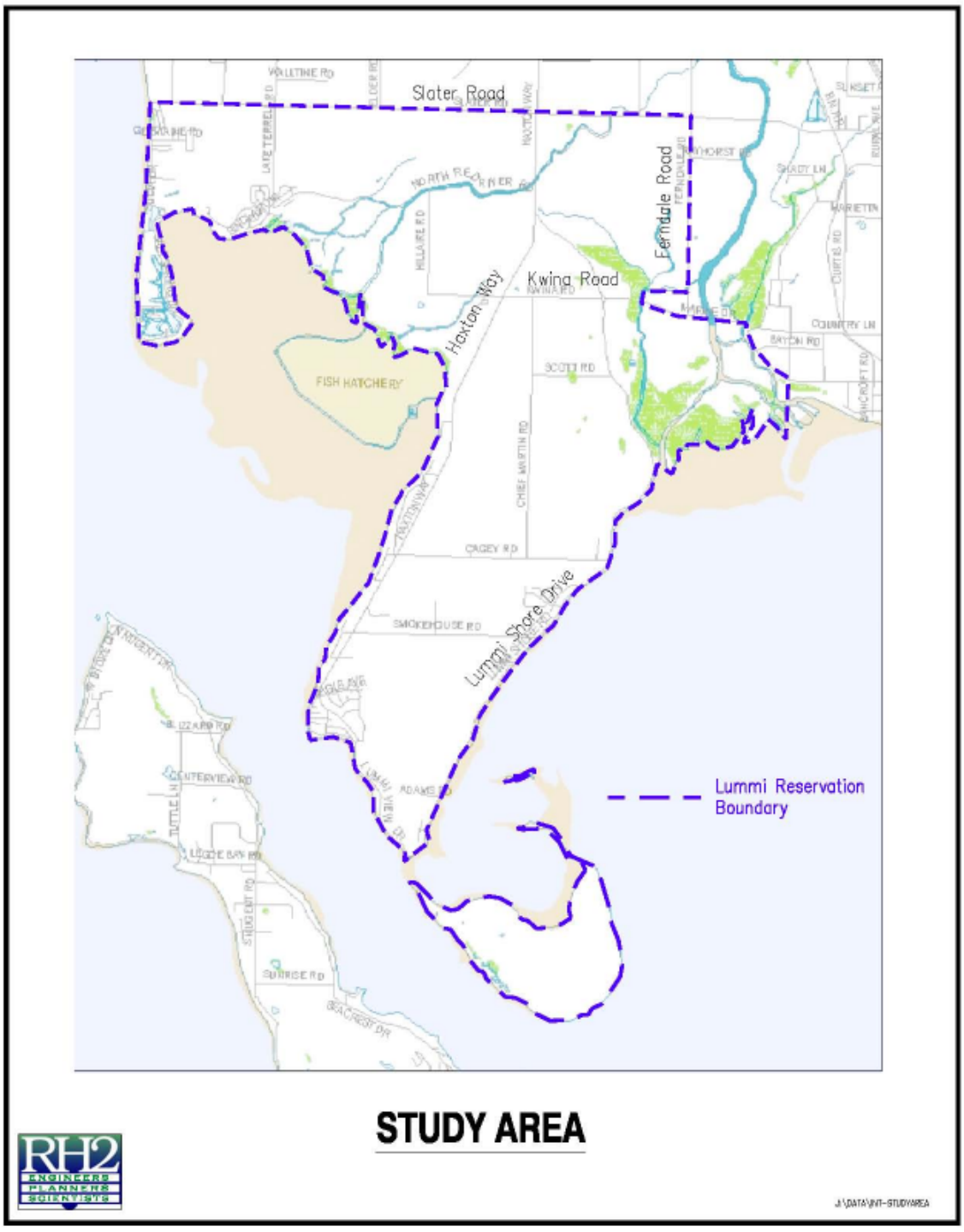


Figure 1-1 Study Area

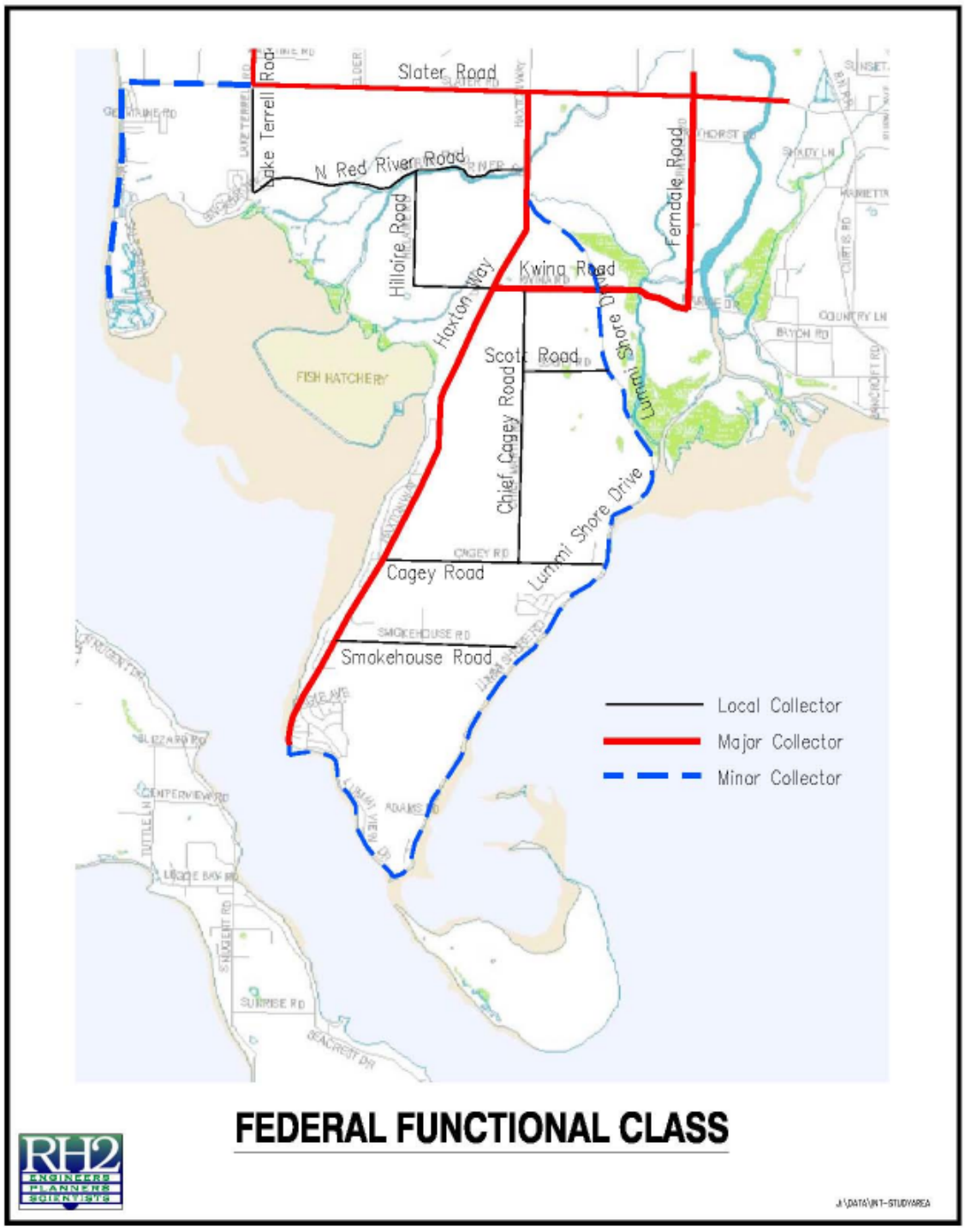


Figure 1-2 Roadways for Evaluation

Chapter 2 – Existing Roadway Conditions

Task Description

The following are the major work elements involved in this task.

- Clearly define the road and road segments to be evaluated.
- Obtain existing traffic count information from Whatcom County (County).
- Prepare a traffic flow map graphic.
- Perform turning movement counts at selected intersections during morning and afternoon peak periods and a representative off-peak time.
- Analyze and prepare graphical summaries of the results of the turning movement counts.

Existing Conditions

The Lummi Nation Reservation is a peninsula that separates Bellingham Bay from Hale Passage. The land is generally rolling and forested or used for active agriculture. The northern portion of the land area is subject to seasonal flooding from the Nooksack River.

Transportation System

Roadway

The majority of the 51-mile roadway network within the study area is under the jurisdiction of Whatcom County. **Figure 2-1** illustrates the roadway network that was analyzed as part of this study. There are approximately 3.5 miles of roadway that are catalogued under the Indian Reservation Roads Inventory. Those roadways are generally within the developed housing areas and function as local access roads. County Roads comprise the backbone of the circulation system.

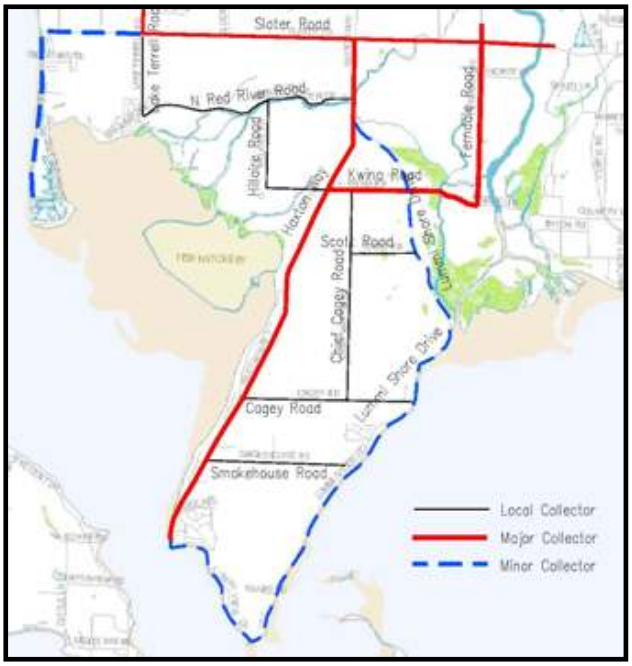


Figure 2-1, Study Area Road Classification

Primary access to the study area from the population and retail centers of Bellingham and Ferndale are provided by Slater Road, and to a lesser degree, Marine Drive. Study area circulation needs are primarily provided by the perimeter loop of Haxton Way and Lummi Shore Drive. There is some use of Marine Drive for access to Bellingham.

Pedestrian

Designated pedestrian facilities are limited within the study area. There is a sidewalk along the portion of Kwina Road adjacent to the Tribal Office and social services center. The portion of Haxton Way south of Kwina Road has paved shoulders that are used as shared use walkways.

Pedestrians share the traveled portion of the roadway with all other modes of transportation in all other areas of the study area.

Bicycle

There are currently no designated bikeways within the study area. The previously discussed shoulders along Haxton Way are used by cyclists. In addition, most of Kwina Road between Haxton Way and Lummi Shore Drive also has a delineated paved shoulder suitable for use by cyclists.

Traffic Volume

Data

Traffic count information was provided by the County which has an ongoing traffic counting program that provides general coverage for the county. Most of the locations for this study were counted during 2005 as part of this study, and to provide the most current information. There were a few locations where data from previous recent years was utilized. No traffic growth adjustment was made and the analysis used Average Daily Traffic (ADT) as recorded without conversion to Average Annual Daily Traffic (AADT). Traffic volume data provided is listed in **Appendix A**.

The existing traffic flow on the roadway system is summarized in **Table 2-1**. The expanded data showing day of week is contained in **Appendix A**.

Analysis

Traffic volumes were remarkably consistent from day-to-day during the week. Weekend volumes were generally less than weekday. There was no specific pattern for weekends, with some roads having higher volume on Saturday and others experiencing higher volumes on Sunday.

Figure 2-2 is a graphical representation of the traffic volumes by roadway segment. The actual counts are shown for reference. The traffic volumes reflect the current prevailing patterns of the area serving as a residential community with commuting to the employment centers to the north and east.

Table 2-1: Traffic Volume Summary

Traffic Volume					
Intersection			Daily	Weekend	Weekend
NS	EW	Approach	Average	Average	As % Daily
Chief Martin	Cagey Rd	North	346	227	65%
Chief Martin	Scott Rd	East 2002	236	161	68%
Ferndale Rd	Marine Dr	West 2004	3290	2485	76%
Ferndale Rd	Slater Rd	West	10191	9261	91%
Ferndale Rd	Slater Rd	East	9941	8652	87%
Ferndale Rd	Slater Rd	South	916	838	91%
Ferndale Rd	Slater Rd	North	1081	860	79%
Haxton Wy	Cagey Rd	East	736	615	84%
Haxton Wy	Cagey Rd	North	4930	3664	74%
Haxton Wy	Cagey Rd	South	4961	3478	70%
Haxton Wy	Cagey Rd	South	4812		
Haxton Wy	Cagey Rd	West	266	194	73%
Haxton Wy	Kwina Rd	East	2481	1002	40%
Haxton Wy	Kwina Rd	South	5278	3600	68%
Haxton Wy	Kwina Rd	West	876	447	51%
Haxton Wy	Lampman Rd	South 2001	1001	729	73%
Haxton Wy	McKenzie Rd	North	4371	3744	86%
Haxton Wy	McKenzie Rd	South 2001	2841	2746	97%
Haxton Wy	N Red River Rd	West	335	337	101%
Haxton Wy	Red River Rd	North 2002	5097	4346	85%
Haxton Wy	Slater Rd	North	1380	1165	84%
Haxton Wy	Slater Rd	South	6813	5904	87%
Haxton Wy	Slater Rd	West	4780	3708	78%
Haxton Wy	Smokehouse	East	1210	1179	97%
Lake Terrell Rd	Slater Rd	East	4407	3339	76%
Lake Terrell Rd	Slater Rd	South	1244	1246	100%
Lummi Shore	Cagey Rd	South 2001	948		
Lummi Shore	Kwina Rd	South 2002	2222	2017	91%
Lummi View	Finkbonner	East 2002	1534	1460	95%

Notes: Data is 2005 unless otherwise indicated in the "Approach" column
Traffic Count information from Whatcom County Engineering

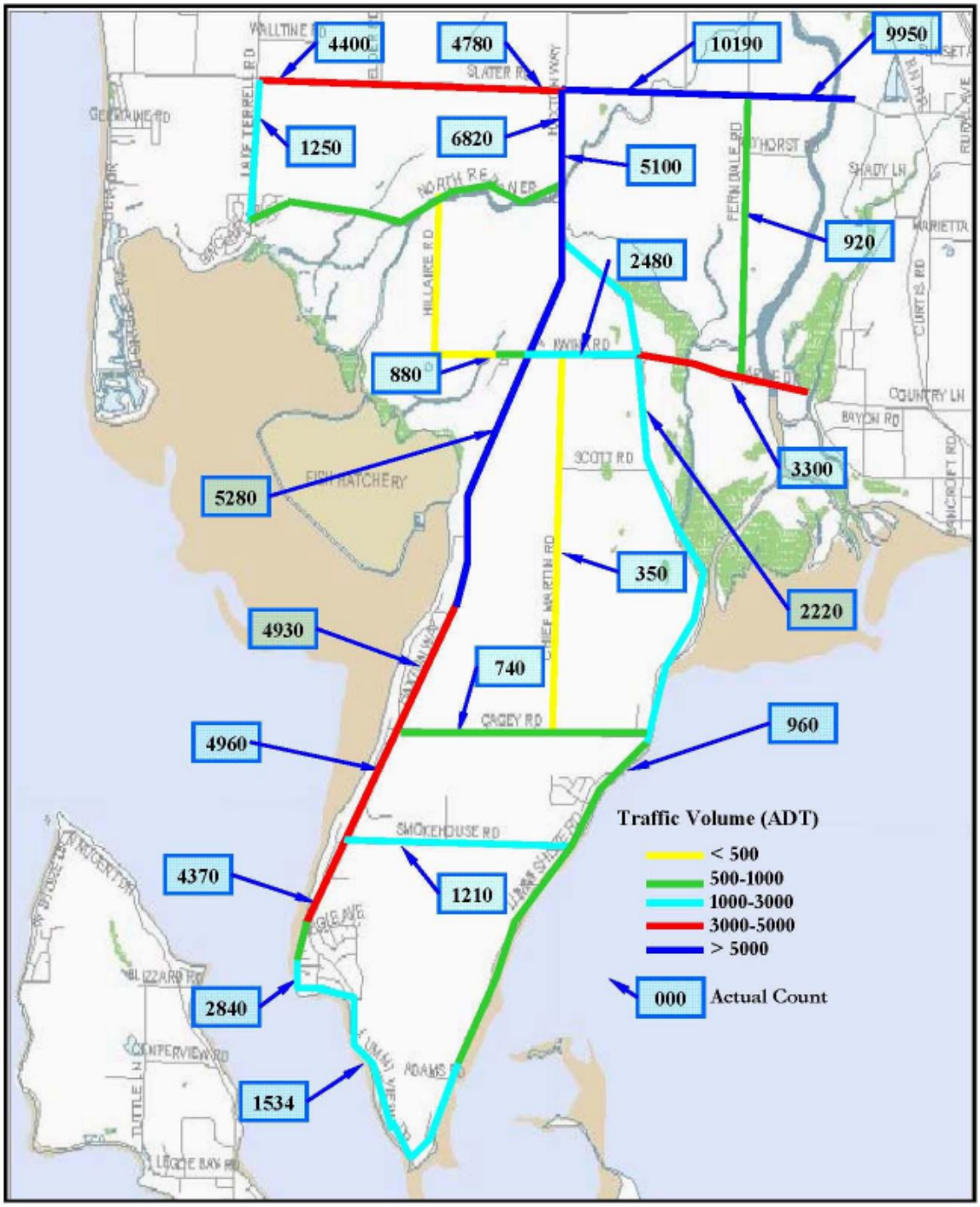


Figure 2-2: Traffic Flow Map

Turning Movements

Data Collection

Manual turning movement counts were taken at selected locations as a portion of this study. The locations were selected to provide a better understanding of the traffic movement within the study area. **Table 2-2** lists the locations where counts were taken. The actual

counts were taken during September 2005. None of the counts were taken during the time period that the Lummi Island Ferry was out of service for its annual maintenance.

Table 2-2: Turn Movement Count Locations

Intersection	Peak Hours	Off-Peak
Lake Terrell Road/ Slater Road	X	X
Slater Road/ Haxton Way	X	X
Haxton Way/ Casino Entrance	X	X
Kwina Road/ Haxton Way	X	X
Slater Road/ Ferndale Road	X	X
Lummi Shore Rd/ Kwina Road/Marine Drive	X	X

Counts were taken at all locations for a 2-hour time period containing the morning peak hour travel, a 2-hour period covering the midday travel period to reflect a non-rush hour period, and a 2-hour count containing the afternoon peak hour. This selection of count times of day allows for evaluating both peak hour and non-peak travel desires.

Analysis

Lummi Shore Drive / Marine Drive North Y

Morning

The overall traffic volume through this intersection is small. The prevailing movement is northbound and southbound through, with about 40% of the southbound traffic making the left movement towards Marine Drive.

Noon

The noon traffic volume is slightly higher than the morning. The major movements are southbound through and west to north from the Marine Drive "Y".

Afternoon

The major movements are the north and south through, with a significant westbound to northbound move from the "Y".

Lummi Shore Drive / Kwina Road

Morning

The major movements are northbound to westbound and eastbound to southbound. This pattern reflects the overall travel desire of eastbound and westbound as complicated by the intersection geometry. There is a minor north and south through movement.

Noon

The major movements are northbound to westbound and eastbound to southbound. This pattern reflects the overall travel desire of eastbound and westbound as complicated by the intersection geometry. There is a minor north and south through movement.

Afternoon

The major movements remain northbound to westbound and eastbound to southbound. There is a minor north and south through movement.

Lummi Shore Drive / Marine Drive

Morning

The northbound traffic is about equal in its desire to proceed either north or east. The other major movements reflect the geometry of these intersections and the major travel desire of east/west on Kwina Road and Marine Drive.

Noon

The northbound traffic is about equal in its desire to proceed either north or east. The other major movements reflect the geometry of these intersections and the major travel desire of east/west on Kwina Road and Marine Drive. There is also a significant travel desire from eastbound Marine Drive to southbound Lummi Shore Drive

Afternoon

The afternoon travel period at this intersection is a good example of multiple conflicting movements. The southbound and eastbound approaches are approximately equal, and again, about equally split on whether to go through the intersection or make a turn. A significant northbound volume is also split about equally, making a three-way turn conflict in the middle of this intersection.

Marine Drive / Marine Drive North Y

Morning

Virtually all of the traffic is through on Marine Drive. A minor movement from the "Y" to continue eastbound on Marine Drive is also present.

Noon

Virtually all of the traffic is through on Marine Drive. A minor movement to and from the "Y" and Marine Drive is also present.

Afternoon

Virtually all of the traffic is through on Marine Drive. A minor movement from Marine Drive to continue westbound on the "Y" is also present.

Figures 2-3, **2-4**, and **2-5** are graphical representations of the morning, noon and evening data for the intersections and clearly illustrate the geometry of this collection of intersections.

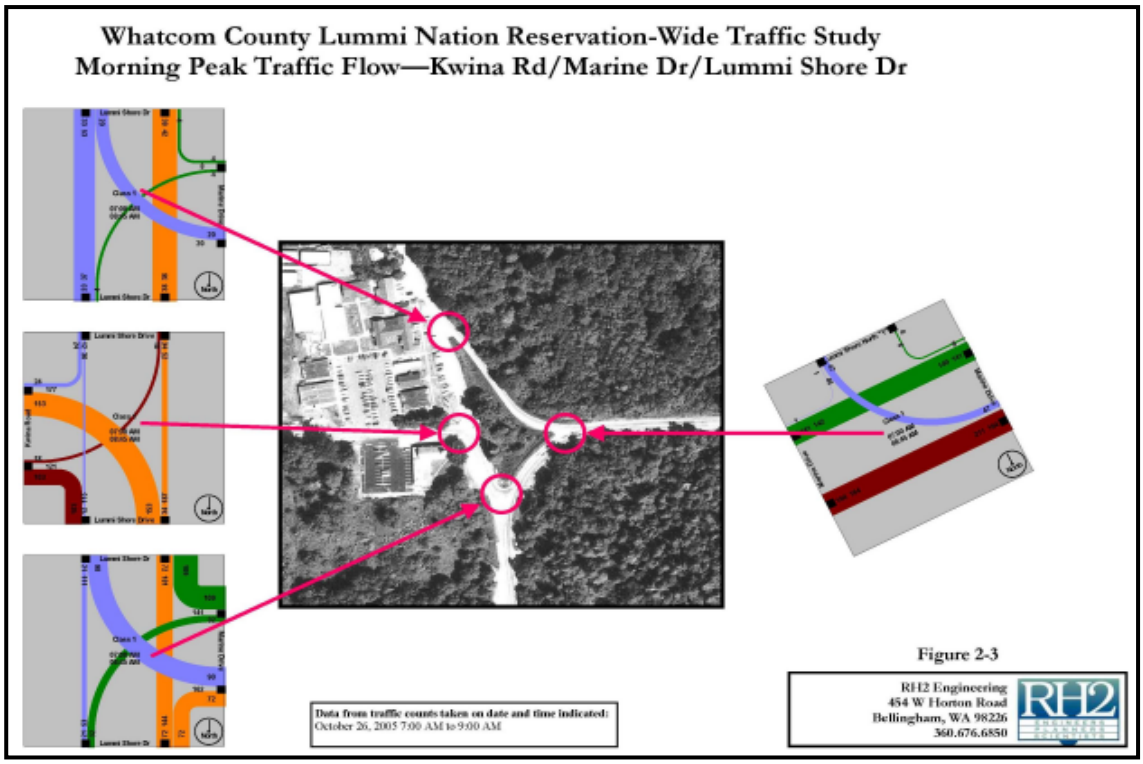


Figure 2-3: Morning Peak Traffic Flow

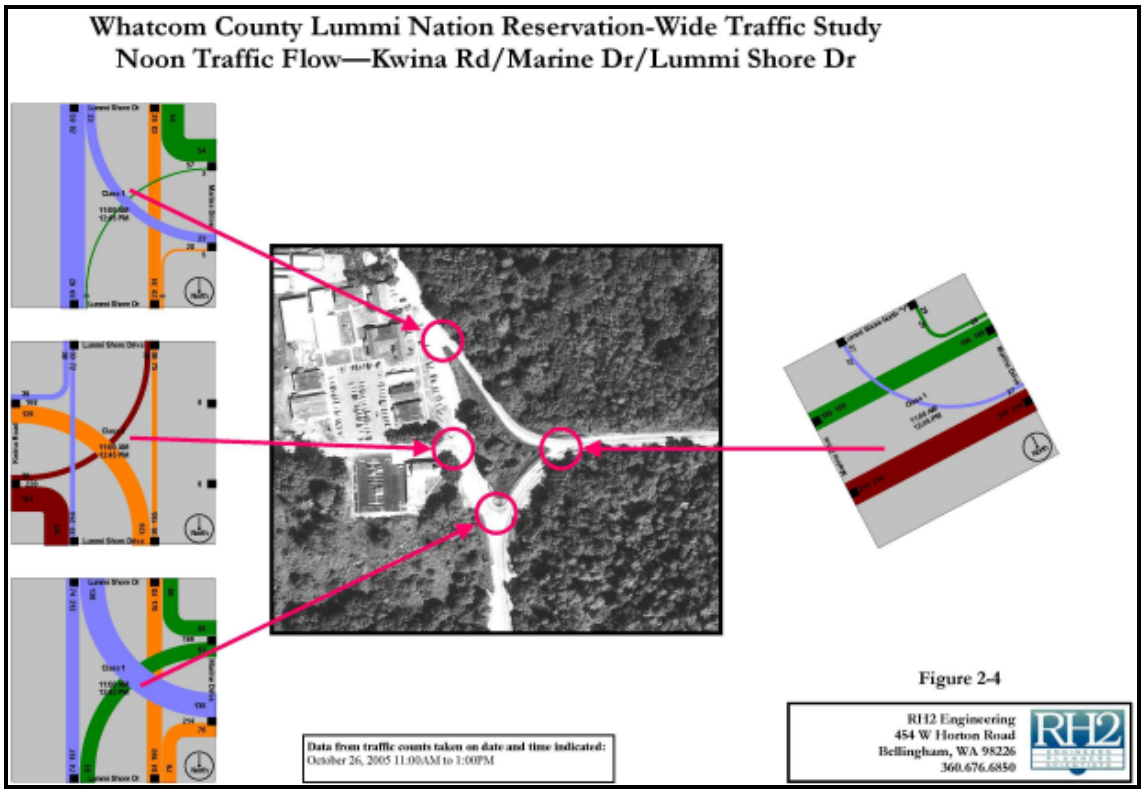


Figure 2-4: Noon Traffic Flow

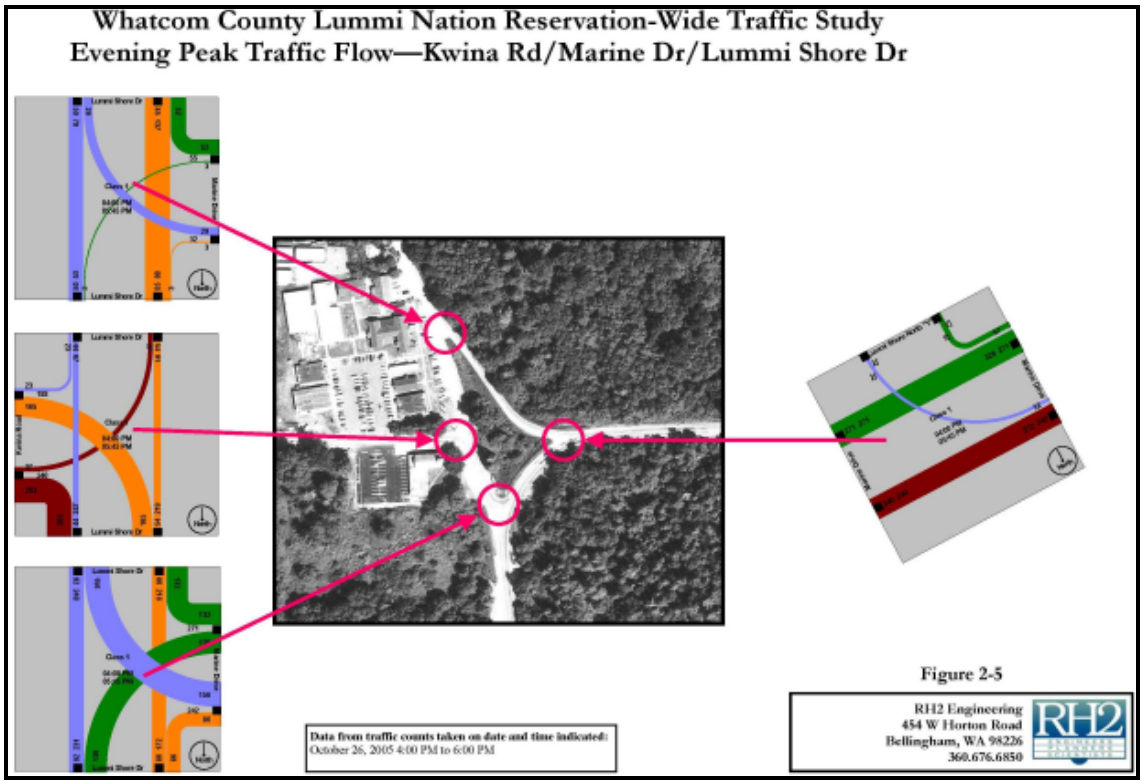


Figure 2-5: Evening Peak Traffic Flow

Lake Terrell Road / Slater Road

Morning

The major movements of traffic during the morning peak travel period are eastbound from the Sandy Point residential area and westbound to northbound from Bellingham to the industrial area. The northbound to eastbound movement from the residential area and the southbound to eastbound movement from the industrial are about equal in volume.

Noon

The major traffic flow through the intersection during the noon time period is eastbound and westbound through. The southbound to eastbound, north bound to eastbound, and westbound to northbound volumes are slightly less and approximately equal. The remaining movements are of minor significance.

Afternoon

The major movement during the late afternoon peak travel time is southbound to eastbound, reflecting the homebound travel from the Cherry Point Industrial Area towards Bellingham. This movement conflicts with the westbound traffic heading home to Sandy Point or turning south to the Georgia Manor residential area. The remainders of the traffic movements are not significant.

Haxton Way / Slater Road

Morning

The major movements of traffic during the morning peak travel period are westbound to southbound and northbound to eastbound, reflecting the travel to and from Bellingham. Of equal magnitude is the eastbound through movement from the residential and industrial area to the freeway and Bellingham.

Noon

The major traffic flow through the intersection during the noon time period remains westbound to southbound and northbound to eastbound. The eastbound and westbound through movements are approximately equal.

Afternoon

The major traffic flow through the intersection during the afternoon time period is also westbound to southbound and northbound to eastbound. The eastbound and westbound through movements are approximately equal. Traffic volume is greater than at noon, but the distribution is very similar.

Slater Road / Ferndale Road

Morning

The major movements of traffic during the morning peak travel period are westbound and eastbound through, reflecting the travel between Bellingham and the Cherry Point Industrial Area and the Lummi Reservation. The remaining movements are insignificant during the morning peak period.

Noon

The major traffic flow through the intersection during the noon time period remains westbound and eastbound through travel. The eastbound to northbound left turn movement is greater than in the morning and conflicts with the heavy westbound through movement.

Afternoon

The major movements of traffic during the evening peak travel period are westbound and eastbound through, reflecting the travel between Bellingham and the Cherry Point Industrial Area and the Lummi Reservation. The remaining movements are insignificant during the evening peak period.

Haxton Way / Silver Reef Casino Entrance

Morning

The major movements of traffic during the morning peak travel period are northbound and southbound through, reflecting the travel between Bellingham and the residential area on Lummi Reservation. The remaining movements into and out of the Silver Reef Casino (Casino) are insignificant during the morning peak period.

Noon

The major movements of traffic during the noon travel period are northbound and southbound through, reflecting the travel between Bellingham and the residential area on the Lummi Reservation. In addition, there is a significant increase of traffic to and from the Casino and the north. The remaining movements to and from the south and the casino are insignificant during the noon period.

Afternoon

The major traffic movement during the afternoon remains the through movement. The traffic in and out of the Casino and the north remains about the same as during the noon period. There is an increase in traffic from the south entering the Casino.

Haxton Way / Kwina Road

Morning

The major movements of traffic during the morning peak travel period are northbound and southbound through, reflecting the travel between Bellingham and the residential area on Lummi Reservation. There is also a significant northbound to eastbound movement, reflecting travel between the residential areas and the governmental and social service center on Kwina Road.

Noon

The major movements of traffic during the noon travel period are northbound and southbound through, reflecting the travel between Bellingham and the residential area on Lummi Reservation. The northbound to eastbound movement remains strong, and the westbound traffic has increased and is equally split between northbound and southbound desires.

Afternoon

The major traffic movement during the afternoon peak period remains the through movement. The northbound to eastbound and westbound to southbound movements are approximately equal.

Figures 2-6, **2-7**, and **2-8** are graphical representations of the morning, noon and evening data for the intersections.

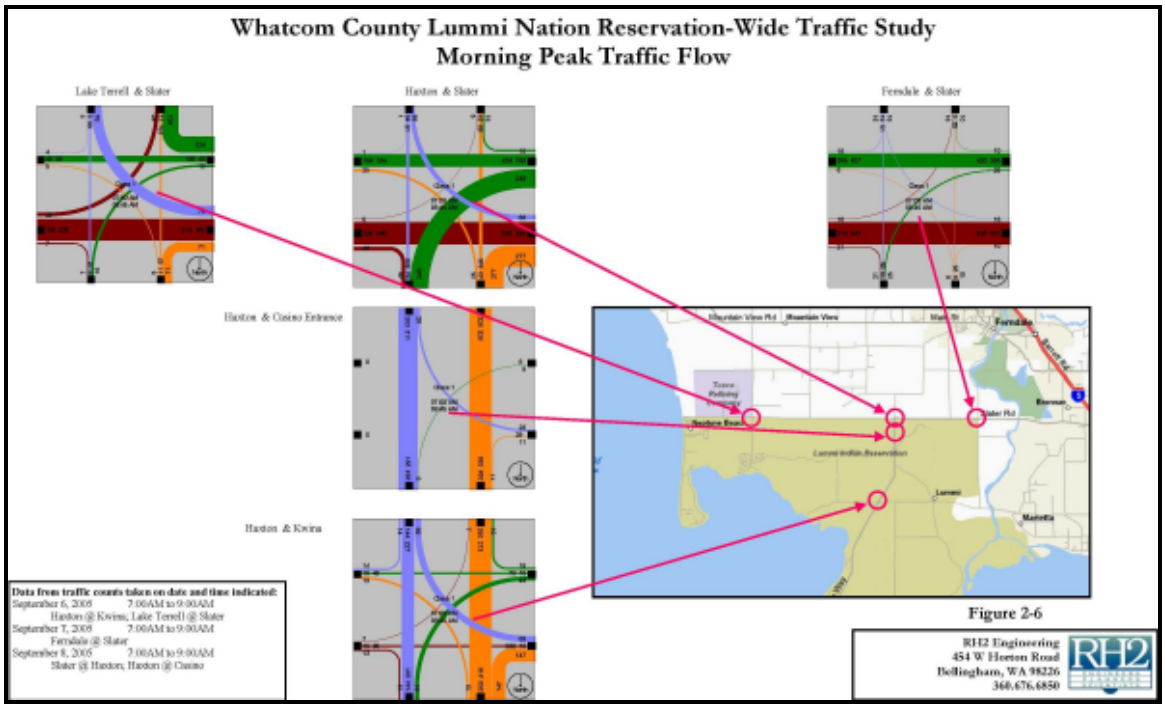


Figure 2-6: Morning Peak Traffic Flow

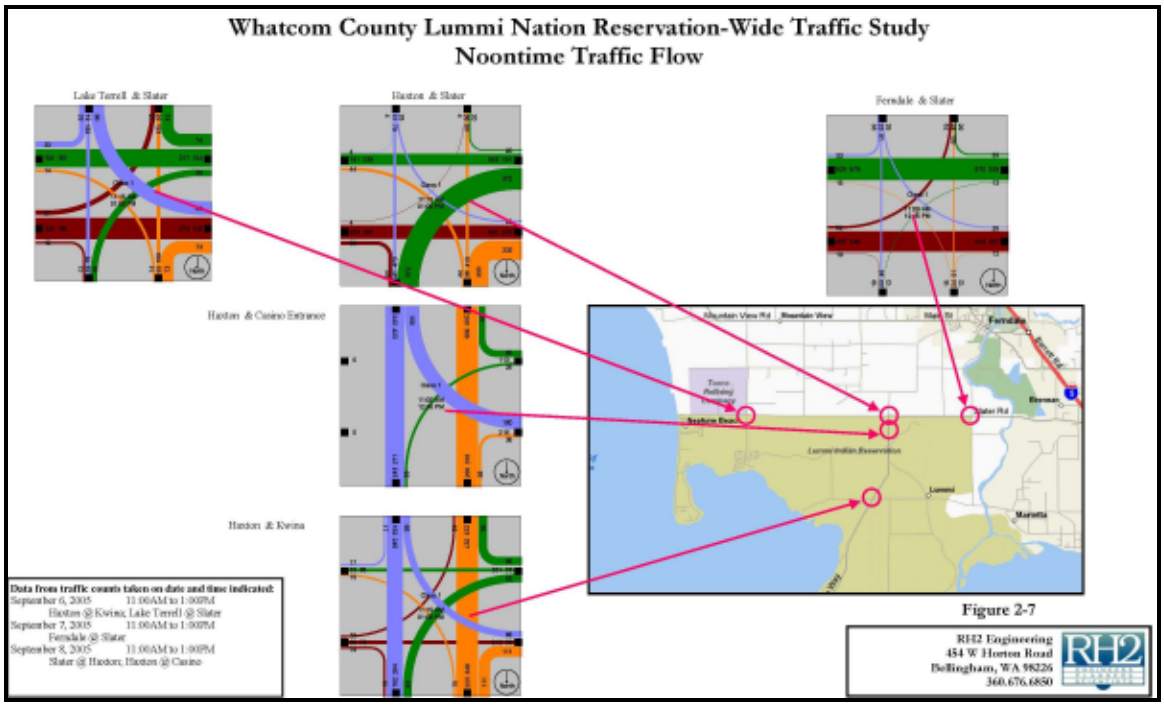


Figure 2-7: Noontime Traffic Flow

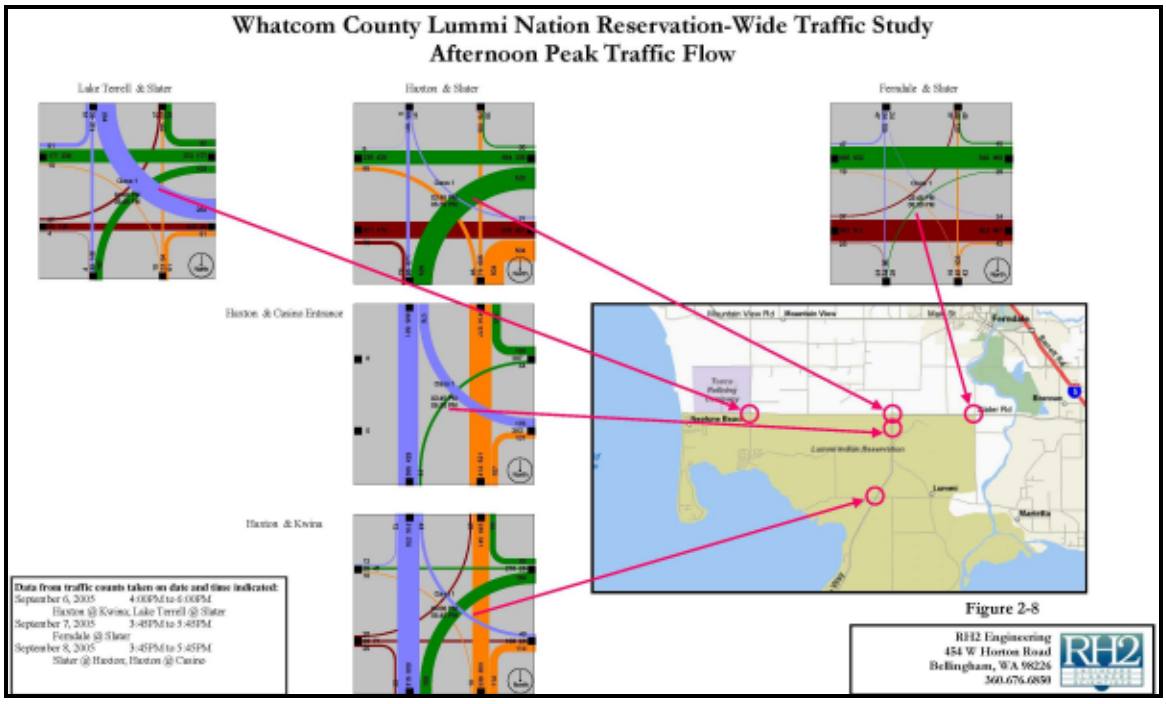


Figure 2-8: Afternoon Peak Traffic Flow

Appendix B contains larger versions of the graphics and the individual study location data sets.

Chapter 3 – Accident and Speed Analysis

Task Description

The major work elements involved in this task are as follows.

- Locate each reported motor vehicle accident on an appropriate base map using the Washington State Patrol (WSP) accident records or data provided by Whatcom County (County).
- Prepare an accident collision diagram for the intersections and other locations with multiple accident events.
- Using the data from the WSP forms, summarize the physical environment conditions, vehicle condition and driver condition for each accident.
- Analyze the data summary to determine if there are recurring conditions or situations that are contributing to the accident occurrence.
- Prepare mitigation plans for the high accident locations. Education, enforcement and engineering solutions will be considered.
- Analyze the spot speed studies for the arterials. Prepare recommendations for reducing the prevailing speed where appropriate. Education, enforcement and engineering solutions will be considered.
- Identify deficiencies and possible solutions.

Accidents

Process and Goals

Study period

It is always a challenge to select an appropriate study period for traffic accident analysis. In general, the longer the study period covers the better. The drawback to a long study period is the evolution of an area, its development and changing roadway geometrics create an unstable basis for the analysis. This study selected the time period of calendar years 2002, 2003 and 2004 as appropriate. The traffic and geometric conditions within the study area were relatively constant during this timeframe.

Data Source

The County provided a computer file of all reported accidents in the study area as compiled from the WSP files. In addition, detailed investigation data was provided for selected locations and accidents. The County also provided copies of their accident location maps.

Fatal Accidents

A special emphasis was placed on fatal accident analysis. There is a perception that an unusually high concentration of the County's fatal accident experience occurs within the study area. The analysis was conducted in two distinct segments. The first was to review fatal accidents during the study period of 2002-2004. The second was to evaluate the fatal accident experience along Haxton Way from 1978-2004.

Study Period Analysis

Accident Locations

A good overall perspective of the traffic accident experience by location is provided by the accident location maps maintained by the County. The location maps for each year were converted to individual layers in an electronic map overlay so that accident experience for combinations of years could be evaluated. The graphic result for the selected study period is shown in **Figure 3-1**. A full page version is located in **Appendix C.** A visual examination of the graphical presentation indicates that Haxton Way, Slater Road and the Kwina Road/Lummi Shore Drive vicinity have a fairly heavy accident history. There are 122 reported accidents in the study area for the time period.

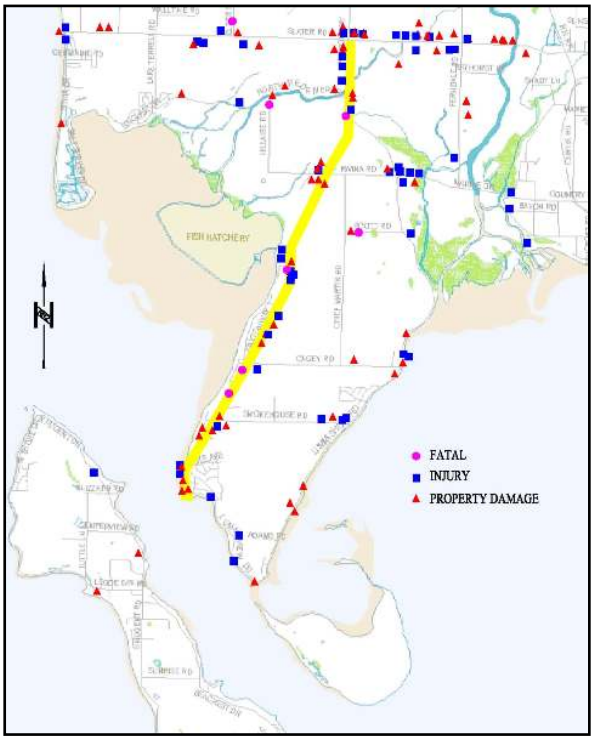


Figure 3-1, Accident Locations

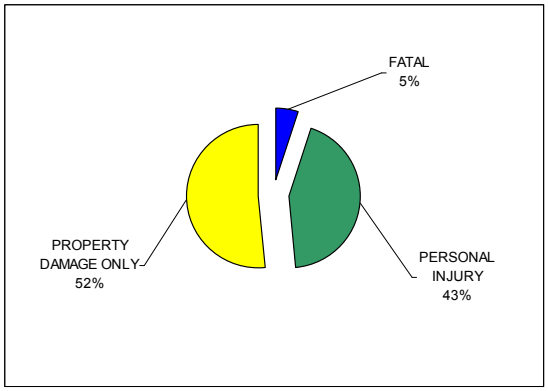


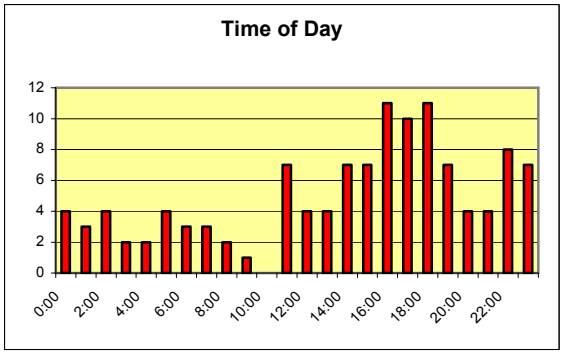
Figure 3-2, Accident Severity

The analysis of the computer data allows for evaluation of physical conditions and driver/pedestrian actions that may have contributed to an accident. The summary information spreadsheet is included in **Appendix C**.

The severity of an accident is typically quantified by using the most severe condition present in the event. An accident that does not involve any personal injury or death is classified as a "Property Damage Only" accident, regardless of the value of the physical damage. A "Personal Injury" accident has one or more people injured. Similarly, a "Fatal" accident is one with one or more fatalities. This study has a severity distribution of about half "Property Damage Only", slightly less than half "Personal Injury", and 5 percent of the accidents resulted in at least one fatality. **Figure 3-2** is a graphical presentation of that information.

Accident Physical Characteristics

The data about the 122 accidents was grouped and analyzed in several different configurations to determine if there was a pattern of contributing physical circumstances for the accidents.

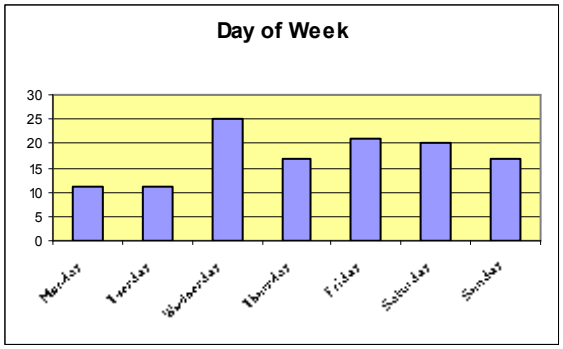


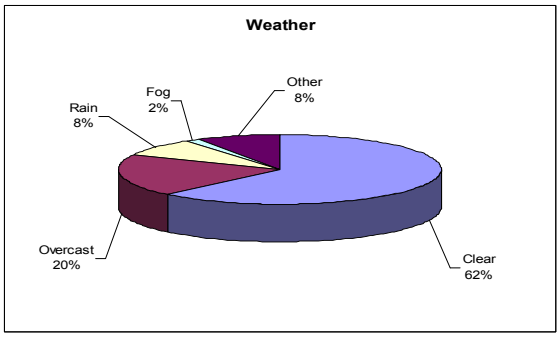
Time of Day

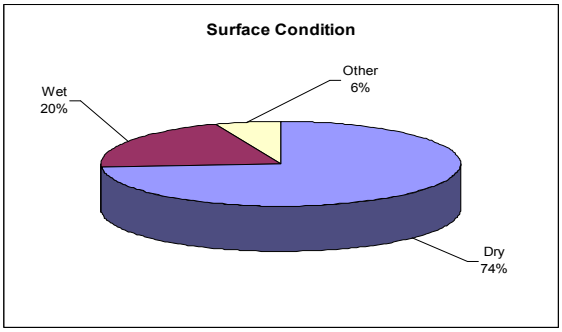
The accident records were evaluated by time of day to determine if there was a particular time period that demonstrated an unusual frequency of accidents. The general trend is fewer accidents in the morning, and more in the afternoon and evening. This generally coincides with the traffic volume changes over the day.

Day of Week

The records evaluation by day of week provides an interesting view. Monday and Tuesday are less likely to be the day of an accident. Wednesday is the most likely and the remainder of the days of the week has about an equal chance of an accident. There is no indication of why Wednesday is outstanding during the study period, or why Monday and Tuesday accidents are less than average.







Weather

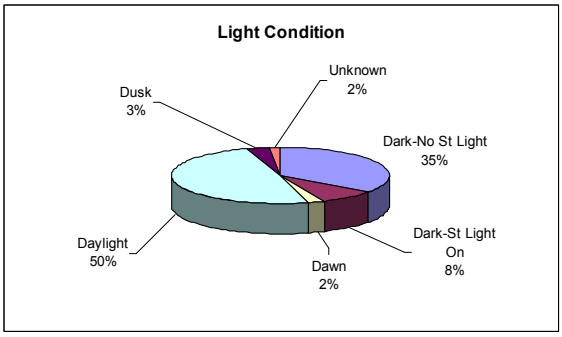
The weather condition can often influence accidents. Rain, snow, fog and other adverse environmental conditions can cause roadway and visibility situation that increase the accident experience. The analyses of records during this study period indicate that 80% of the reported accidents occurred during clear or overcast conditions were reported. Adverse weather is apparently not a significant factor in the accident history for the study area.

Surface Condition

A corollary to weather is the actual roadway surface condition. There is the possibility of clear weather and a roadway that is icy. The accidents during the study period occurred with dry road conditions about 75% of the time. Snow, ice and other conditions that would tend to encourage accidents account for only about 6 percent of the accident history.

Light Condition

Light conditions at the time of an accident can also be a measure of conditions surrounding an accident. Very few of the roads in the study area have any roadway lighting, which reflects the rural character of the area. Half of the reported accidents occurred during daylight time



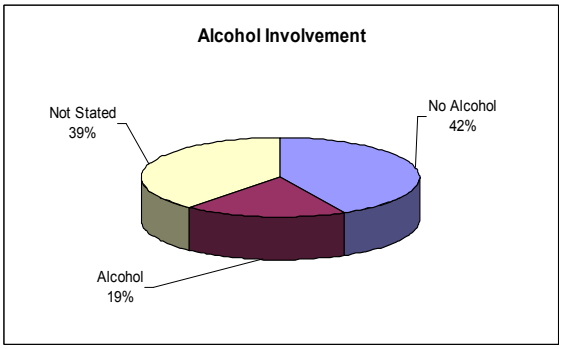
periods. About 35 percent of the accidents were during darkness in areas with no roadway lighting.

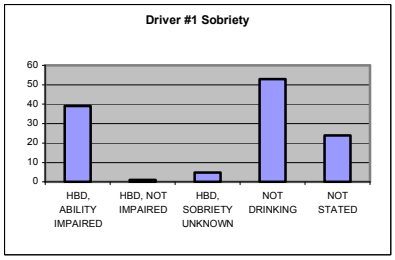
Summary of Physical Conditions

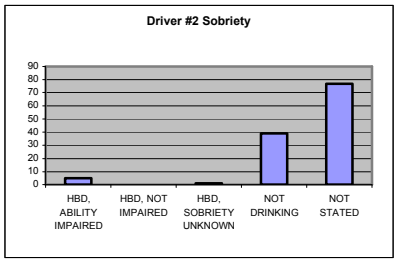
The review of physical accident characteristics does not indicate any general condition that is causing accidents. A typical accident is a property damage accident occurring in daylight, with a dry roadway surface and clear skies.

Driver Condition

There is some driver information available from the WSP records. This study reviewed the role that alcohol and other intoxicants may have had in the accidents. Complete information was not available for every accident, thus about 40% of the accidents do not indicate either a presence or absence of intoxicants. A review of accidents where either driver was listed as using intoxicants indicates that about half of the accidents where sobriety was reported involved at least one driver using intoxicants.







Driver Sobriety

The individual drivers' sobriety state was also evaluated. Driver #1 is generally the vehicle operator most "at-fault" in an accident. The Driver #1 Sobriety Chart below indicates that about one-third of the accidents involved intoxicant use by the primary responsible driver. Only a few events listed the second involved driver (or pedestrian) as having used intoxicants.

Summary of Driver Condition

The use of intoxicants, primarily alcohol, is a significant factor in the accident history within the study area. Three of the events included alcohol use by both drivers.

Multiple Accident Locations

Although the total number of accidents in an area is important, a more accurate representation of possible roadway physical issues is the number of multiple accidents at a location. In this study are, there are six locations that account for 21 percent of the total accidents, with one location with 10 percent of the total. **Figure 3-3** illustrates the multiple accident locations for this study and the number of accidents at each location.

Collision diagrams for each of the locations were prepared and are included in **Appendix C**. A discussion of the location's physical condition and summary of the accident analysis is provided for each location.

3474 Slater Road

This location is between Elder Road and Lake Terrell Road. It is a private driveway on the north side of the road. The location of the driveway is near the crest of a long vertical curve in the roadway, which makes observation of oncoming traffic difficult.

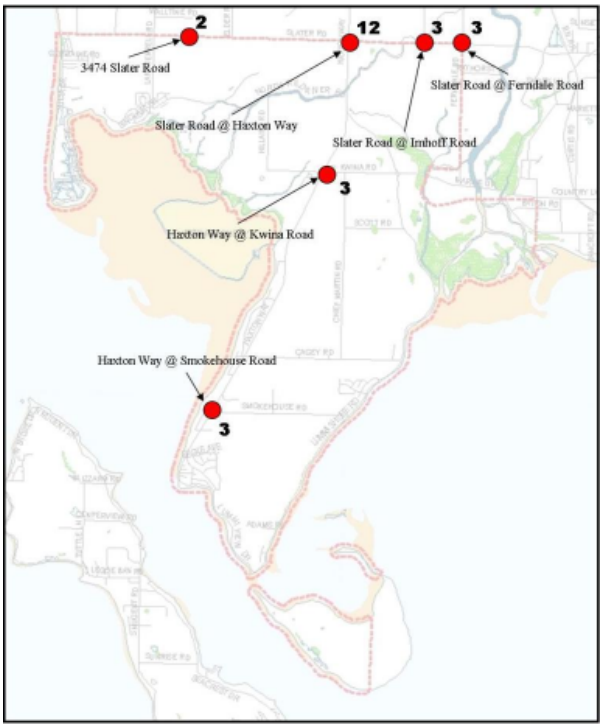


Figure 3-3, Multiple Accident Locations

One of the accidents involved a vehicle that ran off the road while traveling westbound. The other accident at this location involved an eastbound car turning into the driveway and into the path of a westbound vehicle.

There is no apparent related cause of the two accidents.

Type of Accident	Number	Contributing Factors
Run off road	1 Property Damage	Darkness
Head-on	1 Injury	Left turn in front of oncoming vehicle, darkness

Slater Road at Haxton Way

The intersection of Slater Road and Haxton Way is a signalized location. Dedicated left turn lanes are provided on Slater Road. The northbound Haxton Way approach also contains a right turn lane. All roadway surfaces are in good condition, as are the signs and roadway markings. Visibility is good on all approaches.

The traffic signal is a traffic actuated type that responds to traffic presence, thus minimizing unnecessary delay. The east and west left turns do not have a protected green arrow left turn movement.

Type of Accident	Number	Contributing Factors
Right Angle	1 Injury 2 Property Damage	Fail to yield
Same Direction	1 Injury 2 Property Damage	Following too close
Opposite Direction	3 Injury 3 Property Damage	Fail to yield to oncoming traffic when making a left turn

The same direction (or rear end) accidents are typical at a signalized intersection. They are generally property damage or less severe injury types. They are generally caused by a driver following too close or inattention on the part of the following driver. The opposite direction accidents all involve a westbound vehicle turning left in front of an eastbound through vehicle.

Slater Road at Imhoff Road

Imhoff Road tees into Slater Road with a private driveway on the south side of the intersection. Imhoff Road is used as one of the primary routes between the study area and City of Ferndale.

The intersection is in flat terrain and has clear approaches. The approach grades are flat. The trees in the northeast quadrant limit visibility somewhat, but the north leg of the intersection is required to stop, so approach visibility should not be a factor.

Type of Accident	Number	Contributing Factors
Opposite Direction	1 injury	Left turn into traffic
Fixed Object	1 Property Damage 1 Injury	Out of control, run off road

The head-on accident cause is a driver error of turning in front of an on coming vehicle. One of the fixed object collisions occurred at night with slushy road conditions which may have prevented the erring driver from regaining control; the other fixed object accident is on the west side of the intersection and does not indicate any physical issue.

Slater Road at Ferndale Road

Ferndale Road crosses Slater Road. Both roadways have 1 single through lane in each direction. Ferndale Road is used as one of the primary routes between the study area and City of Ferndale and provides a direct connection to Marine Drive to the south.

The intersection is in flat terrain and has clear approaches. The approach grades are flat. There is a home and business in the southwest quadrant that limit visibility somewhat, but Ferndale Road is required to stop, so approach visibility should not be a factor.

Type of Accident	Number	Contributing Factors
Right Angle	1 Property Damage 1 Injury	Failure to yield to approaching vehicle after stop
Same Direction	1 Injury	Rear ended car stopped to make left turn

All three of the reported accidents were daylight events. There is no particular similarity between the accidents that indicate a roadway problem.

Haxton Way at Kwina Road

This intersection is a primary access to the governmental and social service agencies located to the east on Kwina Road. There are also Tribal offices and a large housing development west of the intersection. Kwina Road is controlled by stop signs.

The intersection is generally flat terrain with vegetation in the south quadrants. Visibility after stopping at the sign is adequate in both directions. There is a dedicated right turn lane for northbound traffic.

Type of Accident	Number	Contributing Factors
Right Angle	1 Property Damage 1 Injury	Failure to yield to approaching vehicle after stop
Other	1 Property Damage	Abandoned car on fire north of intersection

Both of the right angle accidents involved northbound and westbound vehicles. The prevailing speed in this area is about 10 MPH over the posted limit, so there might be a situation where the northbound vehicles were approaching faster than expected by the westbound driver.

Haxton Way at Smokehouse Road

Smokehouse Road is at the northern fringe of the more densely developed area. It is a cross road intersection with Smokehouse Road controlled by stop signs. The roadways have a slight grade to them. All quadrants are obscured, but the sight distance for a stopped vehicle is sufficient for the posted speeds.

This intersection is where the speed limit on Haxton Way changes. It is 35 MPH to the south and 50 MPH to the north.

Type of Accident	Number	Contributing Factors
Right Angle	1 Injury	Failure to yield to approaching vehicle after stop
Opposite Direction	1 Property Damage	Fail to yield to oncoming traffic when making a left turn
Fixed Object	1 Injury	Out of control vehicle hit roadside tree

All three accidents were different, although all involved a northbound vehicle. Northbound traffic is traveling down a slight grade after a vertical crest south of the intersection. The downgrade and anticipation of the higher speed limit north of the intersection may influence drivers to increase their speed.

Summary

None of the multiple accident locations appear to have an outstanding cause. Although speed of the involved vehicles is not known, the prevailing speeds in the study area are well above the posted speeds, as discussed later in this Chapter. Speed can easily be the common factor.

Fatal Accident Locations

Fatal accidents are generally rare occurrences. Only 6 of the 122 accidents during the study period resulted in a traffic fatality. The fatal accident locations are illustrated in **Figure 3-4.**

There is particular concern about the pedestrian fatality history. Of the six accidents, three involved pedestrians. All three of those events included used of alcohol. All three also involved pedestrians in the roadway with dark clothing at night or early dawn.

Two of the non-pedestrian accidents occurred on Haxton Way. Both were at night with the driver under the influence of alcohol or other intoxicants. One accident was a "run off road", the other involved high speed and improper passing.

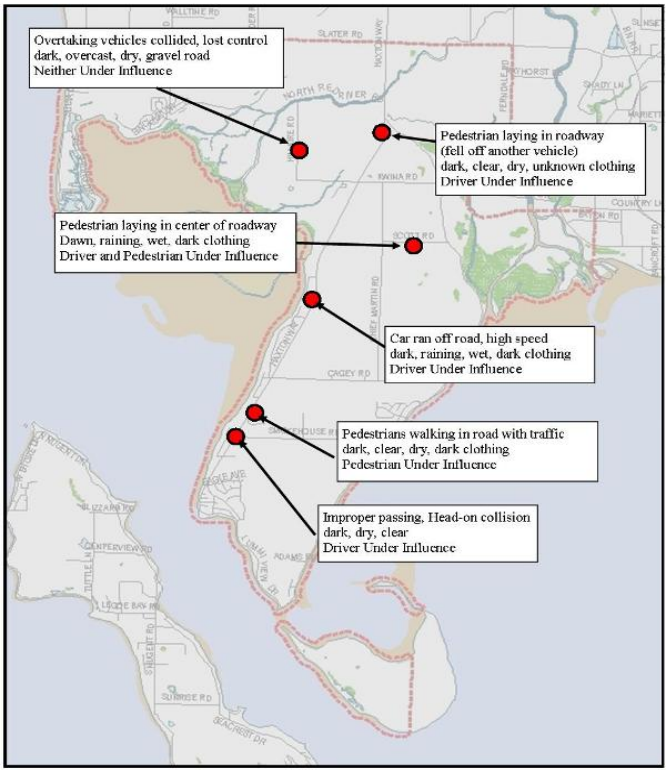


Figure 3-4, Fatal Accident Locations

There was only one fatal accident that did not involve the use of intoxicants. It occurred on Hillaire Road which is a gravel road with limited shoulders. The accident involved one vehicle passing another at night. The vehicle being overtaken was hit and lost control, overturning in the ditch.

Haxton Way Fatalities 1988-2004

A special evaluation of the fatal accident history for Haxton Way for the time period of 1988 through 2004 was part of this study. A total of 15 fatal events have been reported for Haxton Way, or approximately one fatal accident per year. The fatal accidents included seven where the driver or passenger were killed, seven where a pedestrian was the fatality and one where a bicyclist was the fatality.

A graphical representation of the locations of the fatal accidents is shown in **Figure 3-5**. **Table 3-1** is a summary of the contributing factors in the fatal accidents. Analysis of the contributing factors indicates that most of the fatal accidents occur at night or dusk. The detailed information from the WSP reports indicates that the pedestrians were wearing dark clothing, making them difficult to see at night. Only one pedestrian was walking on the correct side of the roadway, the others were in the roadway, either walking with traffic or lying in the road.

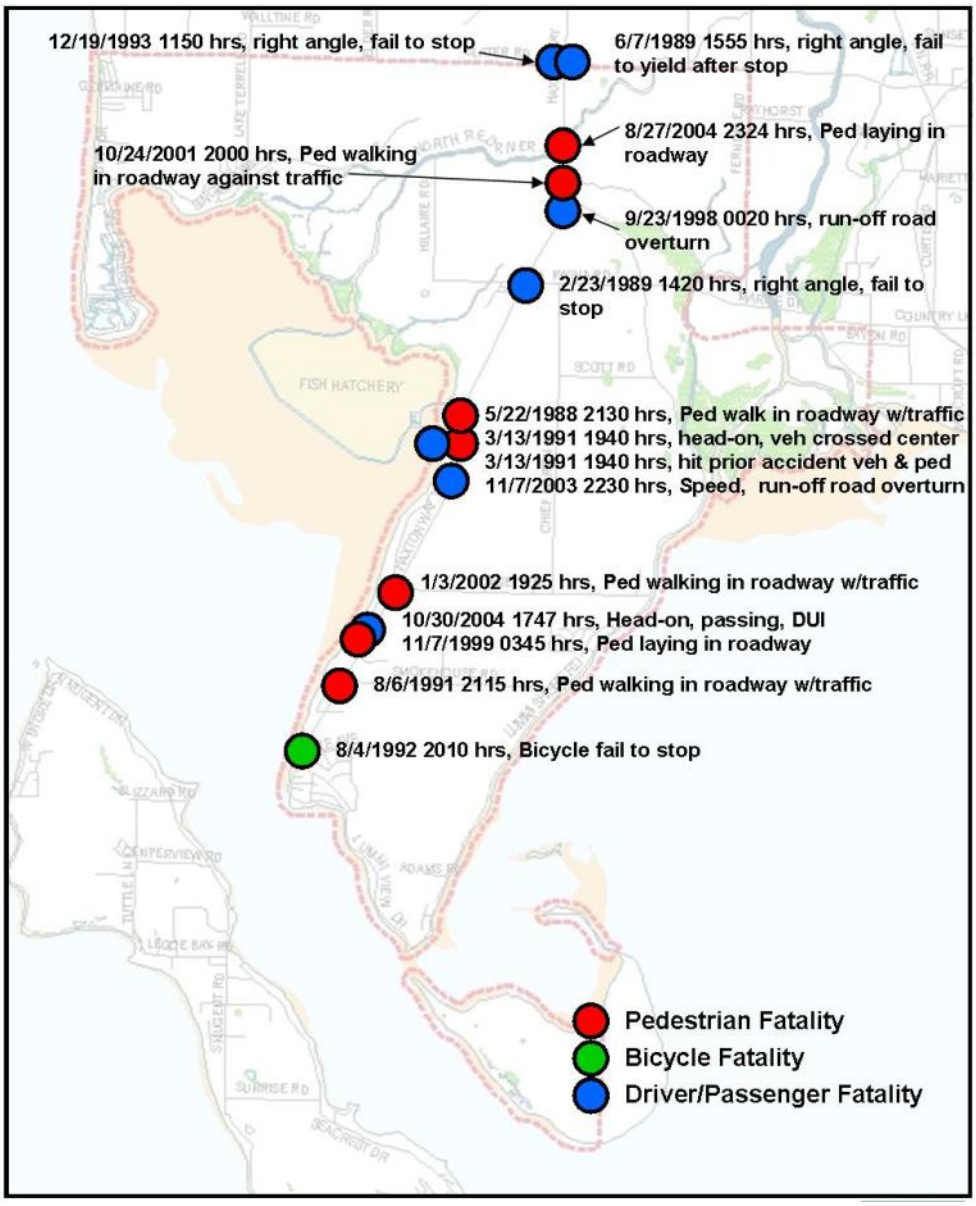


Figure 3-5, Haxton Way Fatal Accident Locations

Table 3-1, Contributing Factors

Type of Fatality	Number of Events	Contributing Factors
Bicyclist	1	Bicycle operator failed to stop at sign
Pedestrian	2	Pedestrian laying in roadway, dark
	3	Pedestrian walking in roadway with traffic, dark
	1	Pedestrian walking in roadway against traffic, dark
	1	Pedestrian on shoulder, dark
Driver/Passenger	3	Fail to stop/yield at stop sign, daylight
	2	Head on collision while passing, dusk
	2	Run off road, speed, dark

The number of pedestrian fatal accidents is a concern. The study area is classified as rural under the provisions of the Growth Management Act (GMA) that Whatcom County (County) must comply with. Sidewalks are generally considered to be an urban amenity, so are not included in rural roadway improvements. All of the pedestrian fatalities occurred in dark conditions and dark clothing was generally indicated. This combination, especially in rainy weather, makes pedestrians very difficult to see.

Speed Analysis

Existing Speed Limits

Speed limits on the County Roads are set by the Whatcom County Council. The codification of speed limits in contained in Whatcom County Code, Chapter 10.04. The general speed for roads in unincorporated Whatcom County is 35 MPH (WCC 10.04.050). Any change from 35 MPH is done by ordinance and amends the appropriate section of code. **Table 3-2** lists the exceptions to the 35 mile per hour standard.

Table 3-2, 35 MPH Speed Limit Exceptions

Posted Speed	Road Name	Extents
50 MPH	Slater Road	BNSF RR Tracks to Elder Road
	Haxton Way	1000 Feet south of Slater Road to Smokehouse Road
45 MPH	Slater Road	Elder Road to Lake Terrell Road
40 MPH	Ferndale Road	Marine Drive to Slater Road

Posted Speed	Road Name	Extents
25 MPH	Haxton Way	Lummi View Dr to McKenzie Road
	Lummi Shore Road	Lummi View Dr north 0.75 miles
25 MPH	Lummi Shore Road	Kwina Road to Haxton Way
	North Red River Road	Lake Terrell Road to Haxton Way

Speeds on roadways under Tribal control are set by the Lummi Indian Business Council (LIBC). Those roads are not part of this study.

Prevailing Speeds

A traditional method of determining speed limits is to measure the prevailing speed of drivers and calculate the 85th Percentile value. The 85th Percentile is then used as a basis for recommending speed limits. This assumes that 15% of drivers are operating their vehicles at a speed that is higher than reasonable for the conditions.

The County records for driver speeds were used to determine the 85th Percentile value for most of the study area roadway segments. All of the 85th Percentile values exceeded the posted speed limit. Roads with a posted limit of 50 MPH have an 85th Percentile speed of 5 to 8 miles over the posted limit. As the posted speed decreases, the difference between the posted and observed speeds typically increases. Most of the 35 MPH zones are actually running at about 45 MPH, with the 25 MPH zones only a few miles per hour less. **Figure 3-6** illustrates the posted speeds by color and the measured 85th Percentile value as a boxed call-out.

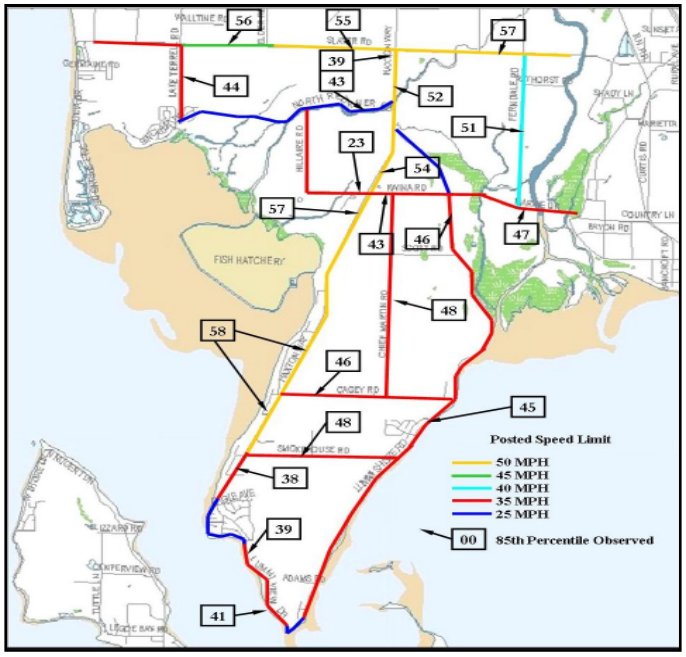


Figure 3-6, Speed Limits & 85th Percentile Speeds

The magnitude of the prevailing speed over the posted speed is a concern. An immediate reaction is that the posted speeds are not reasonable and the opposite is that the typical driver is not operating their vehicle in a reasonable manner. Given the typically narrow roadways with marginal to non-existent shoulders, the current posted speeds are not unreasonable.

Recommendations

- Evaluate the installation of a protected left turn phase at the Haxton Way/Slater Road signal.
- Partner with Lummi Nation to enhance the pedestrian education program with emphasis on wearing light colored clothing or reflective arm or leg bands to increase nighttime visibility.
- Partner with Lummi Nation to develop agreements and funding programs that will provide pedestrian facilities where appropriate.
- Consider moving the Haxton Way speed change from 50 to 35 MPH to a location north of the Smokehouse Road intersection to reduce speed at the intersection.
- Continue and enhance the law enforcement "impaired driver" zero tolerance program. This could include roaming field sobriety stations using officer teams from Whatcom County Sheriff and Lummi Police.
- Develop a comprehensive joint agency program to reduce speed on the roads.

Chapter 4 – Lummi Island Ferry

(Revised 10/22/2009)

Task Description

Whatcom County (County) operates a small vehicle and passenger ferry that provides scheduled service between Gooseberry Point on the Lummi Nation and Lummi Island. The County has identified a need at some point to replace the aging ferry, named Whatcom Chief, and major modifications to the existing slip may be necessary for the new vessel. The current landing does not have sufficient accommodations for ferry traffic holding areas and ferry-bound vehicles often interfere with the Lummi Fisherman's Cove facilities adjacent to the ferry landing.

The major work elements involved in this task are as follows.

- Conduct an origin-destination interview of weekday vehicles using the ferry in both directions for the entire operating day.
- Conduct a limited origin-destination interview of weekend vehicles using the ferry in both directions between 8:00 AM and 6:00 PM.
- Analyze the data obtained to determine travel desires.
- Assist the County in traffic impact evaluation of a proposed relocation of the ferry landing.

Origin-Destination Study

Objective

The origin-destination study was designed to obtain a general understanding of the mainland destinations or points of travel origin for the patrons of the ferry. Due to the limited time available to interview most travelers, the response options were limited to five broadly defined locations.

- **Bellingham** was used for trips with an origin or destination within the greater Bellingham area. This also included areas to the east, such as Sudden Valley.
- **Lummi Nation** was used to describe trips that were between Lummi Island and the study area.
- **Refineries** described the industrial area north and west of the study area, generally known as Cherry Point.
- **Ferndale** was used to describe the greater Ferndale area and the general North Whatcom County area that would typically find travel to the north, through Ferndale, before using or crossing the freeway.

- **Other** was used to generally describe trip ends that were outside Whatcom County, thus very likely to be using the I-5 corridor for travel.

Study Process

RH2 Engineering, Inc. (RH2) employees were located on both the Gooseberry Point and the Lummi Island Ferry landings. They attempted to quickly interview every vehicle and most pedestrians and cyclists as the patrons queued for the ferry trip. Most of the patrons, estimated at 95%, cooperated with the interviewers although there were a few who chose to not respond or were last minute boarders who drove directly on the ferry.

A separate log sheet was used for each ferry trip to allow for a more detailed evaluation if desired in the future. A copy of the log sheets are included in **Appendix D**.

The patrons on the Lummi Island approach were asked what their next destination was. They response was logged to the appropriate destination. In addition, those interviewed were asked how frequently they made the particular trip during the summer and winter seasons. The frequency information was provided to the County for use by the IBI Group who is working on other aspects of ferry use for the County.

Weekday Study

The weekday study was performed on Thursday, August 8, 2005. The study period was the entire operating day for the ferry. The trip pattern for the ferry was as expected for a weekday. The morning hours are predominantly towards the mainland, midday and afternoon are nearly balanced and the evening travel is primarily toward the island. **Figure 4-1** represents the travel direction by time of day.

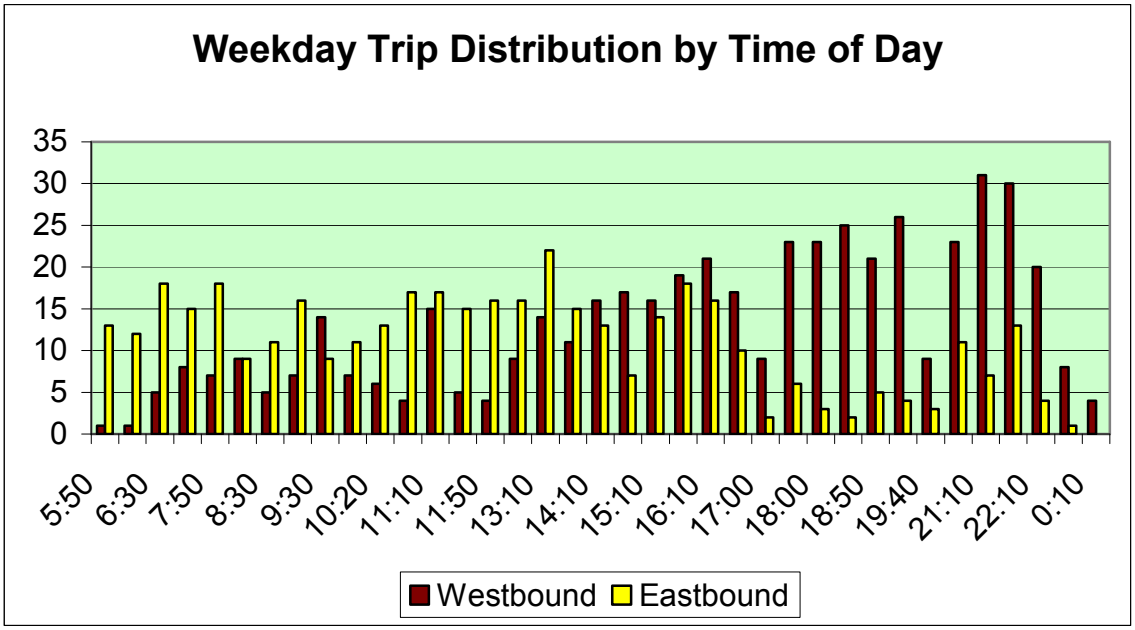


Figure 4-1, Weekday Trip Distribution

A total of 892 ferry patrons responded to the study. The tabular summary of their response is contained in **Table 4-1**. The data summary is in **Appendix D**.

Table 4-1 Weekday Destination Survey Results

Weekday	*Bellingham*	*Lummi Nation*	*Refineries*	*Ferndale*	*Other*	*Total*
Westbound	305	21	2	31	131	490
Eastbound	269	18	0	34	81	402
Chart Color						

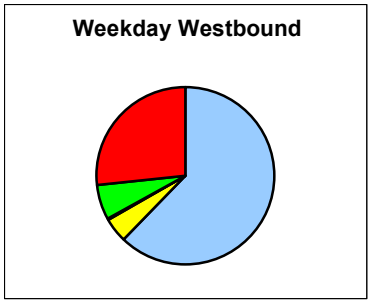


Figure 4-2

As could be expected for weekday travel, the overall relationship between eastbound and westbound travel is nearly balanced. This indicates a commuter type of trip.

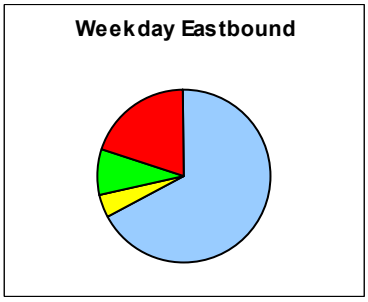


Figure 4-3

Figures 4-2 and **4-3** illustrate the similarities between westbound origins and eastbound destinations. The low to non-existent trips to the Cherry Point area reflect the incompatibility between the shift schedules and response time requirements of the major employers and the ferry operating schedule.

Weekend

The weekday study was performed on Saturday, August 27, 2005. The study period was the 8:00 AM to 6:00 PM. The morning hours are closely balanced, and the afternoon and evening travel is primarily toward the island. This study, taken near the end of the summer season, is more representative of the summer travel characteristics. Lummi Island is the site of many festivals and special events during the summer. These activities would tend to increase travel toward the island during the day, with an evening return to the mainland. A more balanced travel pattern, such as illustrated for the mid-morning time period is likely to prevail during non-tourist times of the year. **Figure 4-4** represents the travel direction by time of day.

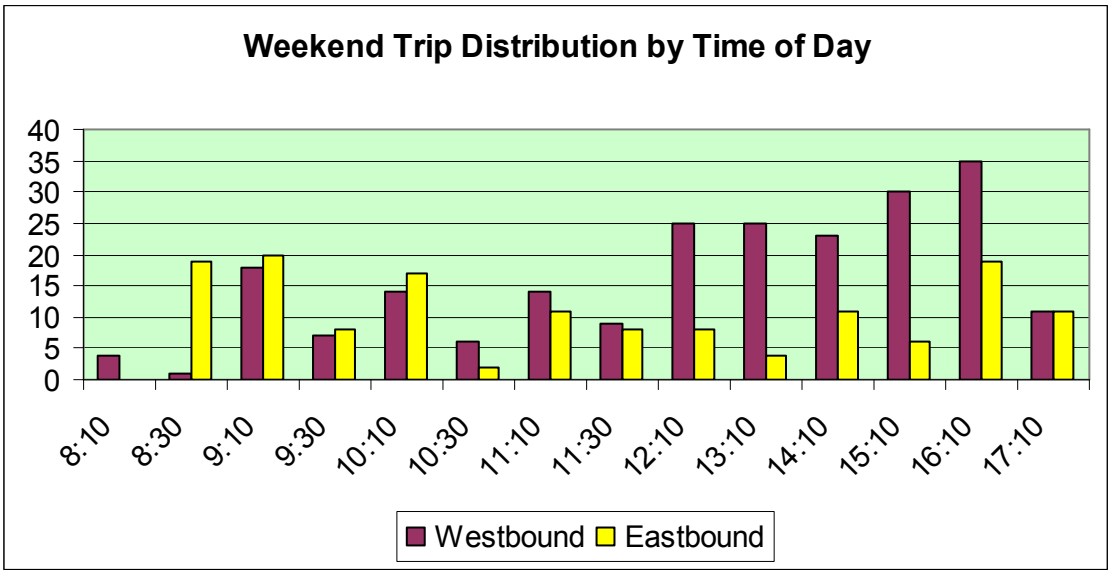


Figure 4-4, Weekend Trip Distribution

A total of 320 ferry patrons responded to the study. The tabular summary of their response is contained in **Table 4-2**. The data summary is in **Appendix D**.

Table 4-2, Weekend Destination Survey Results

Weekend	*Bellingham*	*Lummi Nation*	*Refineries*	*Ferndale*	*Other*	*Total*
Westbound	69	8	0	10	89	176
Eastbound	64	5	0	11	64	144
Chart Color						

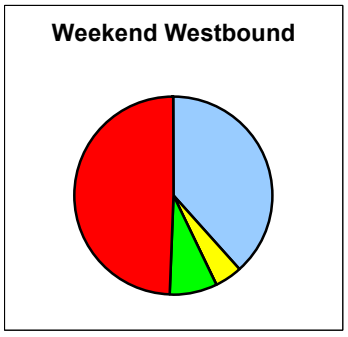


Figure 4-4

The overall relationship between eastbound and westbound travel is still Bellingham oriented, but a higher percentage of the travel is from outside Whatcom County. This indicates a recreational destination type of trip. **Figures 4-4** and **4-5** illustrate the relationship between westbound origins and eastbound destinations.

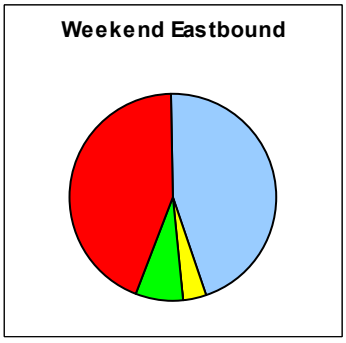


Figure 4-5

Conclusions

The objective of this study was to document the travel desires of the patrons using the Lummi Island Ferry. The data strongly suggests that the greater Bellingham area is the predominant trip end. This reflects the

current standing of Bellingham as the primary employment, retail and service center for the region. As indicated by the current traffic flow patterns, most of this traffic uses the Haxton Way and Slater Road route to access I-5 and Bellingham. Observation of northbound traffic flow on Haxton Way accurately identifies ferry landings with streams of vehicles. There is some travel that uses Marine Drive, but roadway geometrics do not make this route attractive or time effective for most commuters.

Roadway improvements that accommodate the Bellingham destination should be included as part of the overall improvement program.

Ferry Landing Relocation

Whatcom County Public Works recently completed the Gooseberry Point Ferry Dock Relocation Feasibility Study in December, 2009. This study identified a number of potential alternative dock locations and assessed each of them according to the following criteria.

- Consistency with the Lummi Nation's vision.
- Consistency with the Whatcom County vision.
- Safety of Ferry Service.
- Reliability of Ferry Service.
- Foster the development of a multi-modal transportation center.
- Avoid or mitigate impacts from ferry-related traffic on the Lummi Reservation.
- Avoid or mitigate significant environmental impacts.
- Avoid or mitigate impacts to treat reserved usual and accustomed fishing, hunting and harvesting areas.
- Avoid significant impacts on archaeological and historic resources in the project area.
- Geotechnical feasibility.
- Permit-related risks.
- Capital costs.
- Real estate costs.
- Operations and maintenance costs.

A total of 14 sites were initially examined and five of those sites were identified for further analysis. Those five sites are as follows.

- The existing dock.
- A new dock west of the existing dock.
- Hilton Harbor.
- Whatcom Waterway (two sites – East and West).
- Mt. Baker Plywood.

None of the alternative sites were found to have fatal flaws; that is, a new ferry dock could be built at any of these sites provided the necessary permits can be obtained and adverse impacts avoided or satisfactorily mitigated. Note that the site west of the existing dock is likely limited by the presence of known Tribal cultural resource sites which may as a practical matter preclude this site from further consideration.

The report identified planning level cost estimates for docks at the various locations. Costs ranged from a low of $36,000,000 for a 20-year period to a high of $137 million for the same 20-year period.

At the present time, the County has not identified a funding source that would enable them to proceed with the additional work necessary to further assess any of the potential alternative ferry dock sites. With that in mind, the focus of this Traffic Safety Study update should shift to a determination of how the County and the Lummi Nation can work together to identify and minimize the ferry traffic-related disruptions of traffic on the Lummi Reservation and to minimize the incidents of vehicle and pedestrian accidents and injuries on the Reservation as they relate to ferry traffic.

Chapter 3 of the Traffic Safety Study addressed accidents on the Lummi Reservation. The data shows that while the ferry certainly accounts for a significant amount of traffic and congestion both on the roads and in the waiting-line area, there is no clear evidence that the vehicles involved in the crashes were predominantly bound for or coming from the ferry. Several of the accidents occurred late at night or in the early morning after the ferry had stopped its operations for the day.

The recommendations in **Chapter 3** are as follows.

- Evaluate the installation of a protected left turn phase at the Haxton Way/Slater Road signal.
- Partner with Lummi Nation to enhance the pedestrian education program with emphasis on wearing light colored clothing or reflective are or leg bands to increase nighttime visibility.
- Partner with Lummi Nation to develop agreements and funding programs that will provide pedestrian facilities where appropriate.
- Consider moving the Haxton Way speed change from 50 to 35 MPH to a location north of the Smokehouse Road intersection to reduce speed at the intersection.
- Continue and enhance the law enforcement "impaired driver" zero tolerance program. This could include roaming field sobriety stations using officer teams from Whatcom County Sheriff and Lummi Police.
- Develop a comprehensive joint agency program to reduce speed on the roads.

In addition to the recommendations above, the Lummi Nation, as part of their comments on the Gooseberry Point Ferry Dock Relocation Feasibility Study, has suggested that the following recommendations also be added to the Traffic Safety Study.

- Perform a FHWA compliant Safety Audit of Haxton Way with special emphasis throughout the Gooseberry Point area.
- Provide sidewalks in and around the Ferry Terminal to facilitate pedestrian and Transit access.

- Convert the Kwina Rd. Haxton Way intersection and the Smokehouse Rd. Haxton Way intersection to roundabouts to reduce speed on Haxton Way and improve pedestrian safety.
- Study the use of off-site queuing of ferry traffic.

As Whatcom County develops its future transportation and capital improvement plans, the County will involve representatives of the Lummi Nation in evaluating these recommendations and developing the County's prioritized project lists.

The focus would appear to be most appropriately placed on efforts to reduce traffic speed, especially on Haxton Way, as it is a major route from Slater Road to the ferry. Additional benefits may be gained by efforts to reduce traffic congestion during peak periods and by identifying steps to minimize the congestion and disruption caused by traffic waiting in the vicinity of the terminal.

Chapter 5 - Lummi Nation Growth and Development

Task Description

General growth and development within the Lummi Nation will increase traffic within the Nation and also affect the external roads that provide access to the reservation. This task is intended to quantify the traffic generation potential of the build-out scenario of the land area using the adopted Lummi Indian Business Council (LIBC) land use plan with major emphasis on the internal roadway network.

The major work elements involved in this task are as follows.

- Use planned development potential provided by Lummi Planning and the LIBC adopted Land Use Plan to generate future trip potential for parcels regulated by the Lummi Land Use Plan.
- Use data provided by Whatcom County (County) to generate future trip potential for parcels regulated by the Whatcom County Land Use Plan (Fee Land).
- Generate future trip potential using appropriate Institute of Transportation Engineers (ITE) Trip Generation values for the identified land uses.
- Identify and quantify the internal and external trip potential for the build-out condition.
- Estimate the future level of service (LOS) for the study area arterial network. Identify deficiencies and possible solutions.

Existing Conditions

The Lummi Nation Reservation is a peninsula that separates Bellingham Bay from Hale Passage. The land is generally rolling and forested or used for active agriculture. The northern portion of the land area is subject to seasonal flooding from the Nooksack River.

Housing Areas

The housing centers tend to be the southern tip, known as Gooseberry Point, and the western portion that includes Sandy Point. Both of these areas have salt water view potential, which makes the lots attractive for housing. There is also a housing concentration near Kwina Road and Haxton Way. The remainder of the study area has a distribution of homes in a more rural setting of various size parcels.

The Lummi Nation has built an Assisted Living complex in the Gooseberry Point area to provide housing for the Elders.

Retail/Commercial Areas

There are currently no significant retail centers within the study area. There is a Mini-Mart at Haxton Way and Slater Road, near the Silver Reef Casino Complex. Residents wanting most goods and services need to go to Ferndale or Bellingham to satisfy their shopping and entertainment needs.

Government and Social Service Area

Most of the Lummi Nation Government offices are located on Kwina Road. The two centers are near Lummi Shore Drive and near Haxton Way. The government offices are a major employment center within the study area.

Most of the social services, such as Community Centers, Medical Centers and Child Care are located near the Lummi Shore Drive segment of the Tribal Offices.

Education Centers

Secondary

The Lummi School System has developed a combined school campus area near Gooseberry Point.

Post-Secondary

The current Northwest Indian College Campus is located at Kwina Road and Lummi Shore Drive.

Transportation System

Roadway

The majority of the 51-mile roadway network is under the jurisdiction of the County. **Figure 5-1** illustrates that roadway network with the Federal Functional Class designation. There are approximately 3.5 miles of roadway that are catalogued under the Indian Reservation Roads Inventory. Those roadways are generally within the developed housing areas and function as local access roads. County Roads comprise the backbone of the circulation system.

Figure 5-1, Federal Functional Roadway Classification

As illustrated in **Figure 5-1**, primary access to the study area from the population and retail centers of Bellingham and Ferndale are provided by Slater Road, and to a lesser degree, Marine Drive. Study area circulation needs are primarily provided by the perimeter loop of Haxton Way and Lummi Shore Drive.

The County has an ongoing traffic counting program that is very complete. The county staff also provided additional traffic counts during the turning movement counts to supplement historical data. The existing traffic flow on the arterial system is illustrated in **Figure 5-2**.

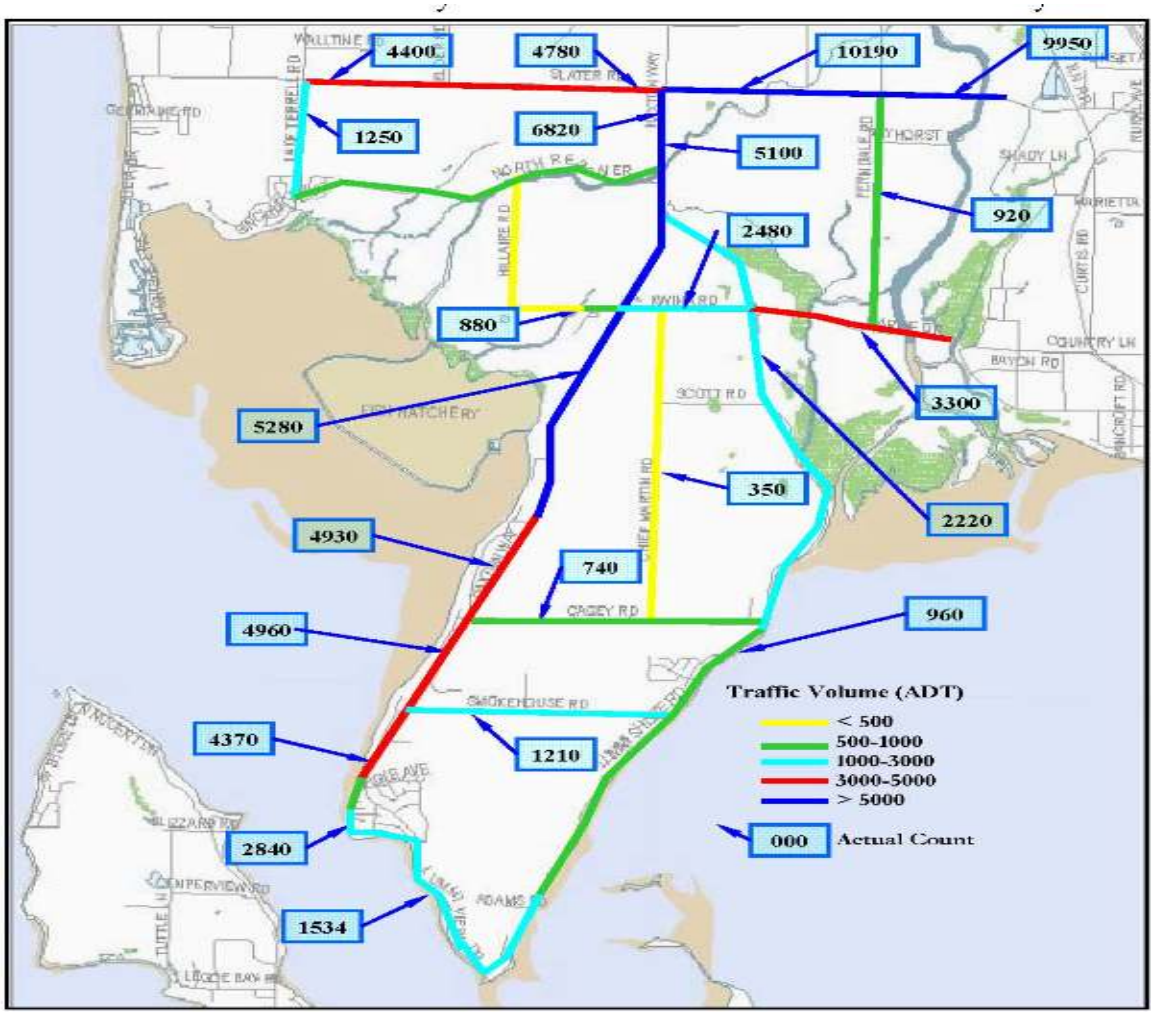


Figure 5-2, Existing Traffic Flow

Pedestrian and Bicycle

There is a limited formal pedestrian and bicycle network within the study area. Kwina Road adjacent to the Tribal offices has a sidewalk on the south side. Haxton Way from Gooseberry Point to Kwina Road has a paved shoulder on both sides that is used by pedestrian and bicycles, although not specifically designated as such. A similar condition exists on the portions of Lummi Shore Drive that have recently been reconstructed. The remainder of the roadways within the study area is generally a rural cross section, without shoulders and with drainage ditches in close proximity to the pavement.

Transit

A portion of the study area is served by Route 50, operated by the Whatcom Transit Authority (WTA). **Figure 5-3** illustrates the fixed route service. The current weekday schedule is operated with 80 minute headways from 6 AM to about 7 PM, thus providing no evening service. Weekend service is the same headway, but operates only from 8:40 AM to 5:45 PM.[1]

LIBC is currently operating a shuttle van that supplements the WTA service schedule. The van is operated on a double loop route that includes the Casino Complex, Kwina Road governmental and social center and the Gooseberry Point/Lummi Shore Drive area. The service is coordinated with the WTA fixed route operation at the Kwina Road location.

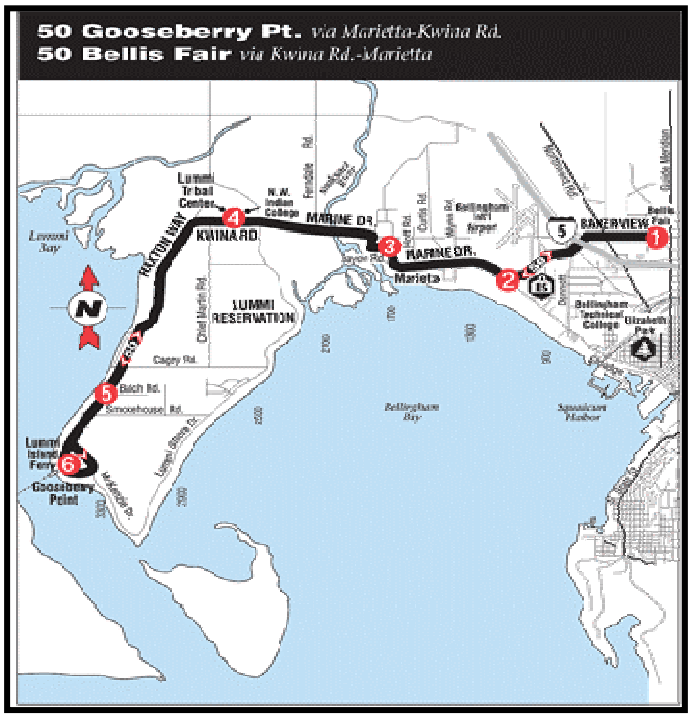


Figure 5-3, Whatcom Transit Authority, Route 50

[1]WTA Website, Schedule for Route 50, obtained October 28, 2005

Study Process

Background

Transportation plans and networks are the result of land use designations. Land use designations generally infer a type of development that is desired by the land use planning authority. The overall land use plan for a community should reflect the policy goals and objectives of the community and serves as a basis for planning other elements of community infrastructure, such as transportation and utility needs. Changes in the land use designation should be carefully considered and evaluated with consideration of the impact potential on subordinate systems.

The study area consists of land falling under the planning jurisdiction of two different governments. The County provides the planning for the parcels owned Fee-Simple. The remainder of the land is under the LIBC land use plan.

The scenario selected for this study is the "Build-Out" of the area to the current adopted Zoning. This selection represents a significant time for implementation, but is suitable for determining the traffic and transportation potential for the study area. Significant changes in land use designation have the potential to change the results of this study.

Information Sources

Whatcom County

Whatcom County Public Works provided information on the additional growth possible on the fee simple parcels. The data was originally developed as part of a process that looked at the additional development possible on land ownership controlled by the County. Under the Growth Management Act (GMA) regulations, the County has mostly designated the study area as Rural, Suburban Enclave, Agricultural and Forestry with a small area of commercial development. The Whatcom County Land Use is shown in **Figure 5-4**.

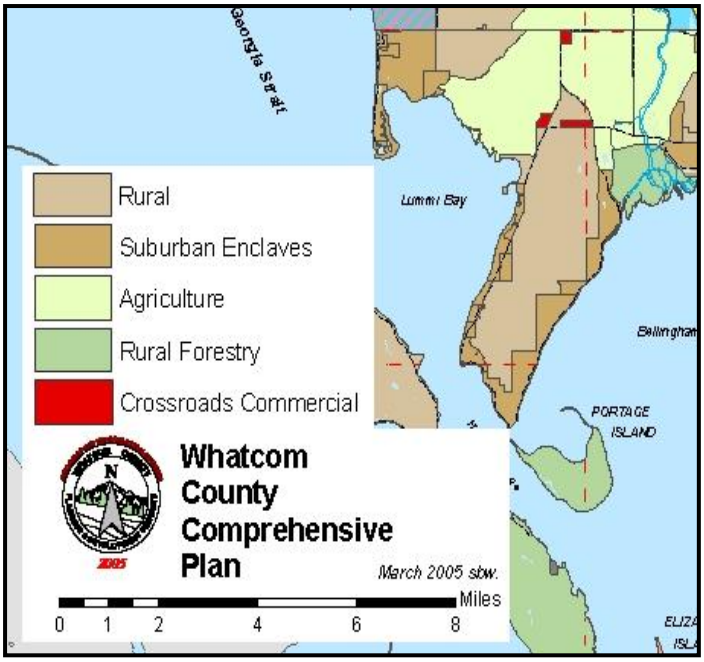


Figure 5-4, Whatcom County Land Use

There are two components to the data provided – existing parcels and potential parcels if land is subdivided to the currently allowed density. There are approximately 581 current parcels that are not developed. An additional 297 lots can be created under the current allowable density, for a total of an additional 878 residential lots within the study area.

Lummi Nation

The LIBC is charged with regulation of land use for Tribal and Trust lands within the reservation boundary. The Lummi Planning Department prepared a master zoning map for the study area that was adopted by the LIBC on August 24, 2004. **Figure 5-5** is the Official Lummi Nation Zoning Map. Since the LIBC is not under the restrictions of the Washington State Growth Management Act, it can plan for the overall benefit of the Reservation, which includes a mixture of all land uses that comprise a community.

That map was used by Lummi Planning to determine the future development potential of Tribal and Trust lands. The goal of the Lummi Nation is to develop lands and resources that will enhance the economy and viability of the community.

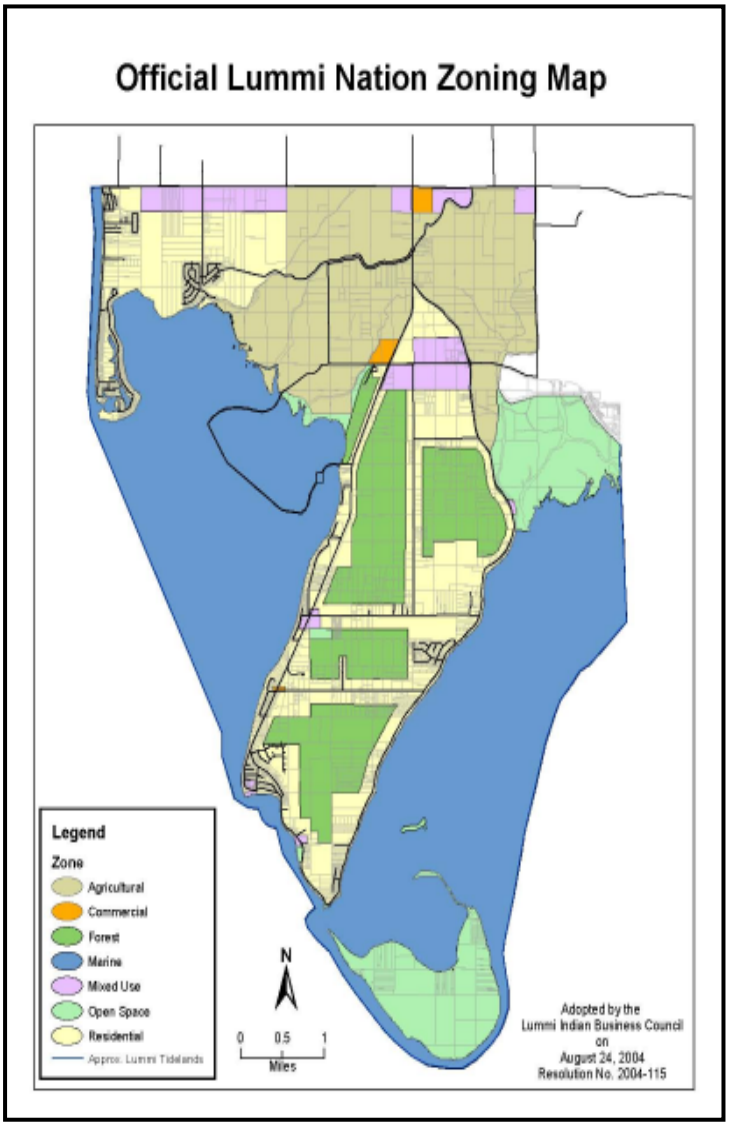


Figure 5-5, Lummi Zoning Map

The Lummi Nation has several major projects currently under construction or in planning. The Silver Reef Casino is expanding the casino and will include hotel accommodations. The Northwest Indian College, currently located at the intersection of Kwina Road and Lummi Shore Drive, has begun construction of a new campus across Kwina Road from the current campus.

Guiding Principles

A typical traffic distribution for a planning area relies heavily on historical patterns. The build-out condition for the study area, using the LIBC Zoning, is anticipated to create different travel patterns than currently exist. The current traffic pattern is what is typically expected of a residential area with most employment opportunities being located external to the area. The current typical travel pattern is from the study to the employment centers in the morning with a return in the evening. There is also an underlying internal circulation of Tribal members and employees between government and social services and their offices and residences.

As the study area is developed and LIBC continues to purchase fee lands for conversion to trust lands, the internal circulation is expected to become the prevailing condition. This will happen fairly slowly, and the major impact to the transportation system will be the need for coordinated internal circulation in concert with the external travel needs now prevailing.

The following principles have been used for guidance in the analysis and projection of future travel patterns within the study area.

- New development will be focused on providing housing, goods, services and employment for Tribal members.
- New single family housing will be concentrated in the northwest and southern portions of the study area.
- The growth in Tribal Governmental offices will continue to be located along Kwina Road.
- Centralized social services will continue to be located along Kwina Road.
- Parks and community centers will be located near the residential population centers to encourage non-vehicular access.
- The Northwest Indian College Campus will be located south of Kwina Road near Lummi Shore Drive. It will be a complete campus with housing and food services for students.
- Future secondary schools will be developed near the existing school complex in the Gooseberry Point area
- Future senior housing and assisted living facilities will be located near the existing Elder Housing near Gooseberry Point.
- Development near the existing Casino will be largely affiliated with a Casino Resort and associated support services.
- The mixed use area along Slater Road near Sandy Point will emphasis support of the Industrial area to the north (Cherry Point).
- The Marina will be in the vicinity of the existing Lummi Island Ferry dock and will serve a mix of recreational and commercial vessels.
- There will be an increase in services available within the study area, such as grocery, pharmacy, dry goods and other retail endeavors. Those will be located in the mixed use areas along Slater Road, Kwina Road at Haxton Way and a neighborhood center at Haxton Way and Cagey Road.
- WTA will continue to provide scheduled service to the inter-modal transfer at the Lummi Island Ferry and at least a transfer station service location along Kwina Road. The current LIBC shuttle will be expanded as needs demand to provide internal circulation and service to the WTA transfer station.

Future Trip Generation and Distribution

Trip Generation Potential

The potential trip generation value for the study area was calculated using information provided by the County and Lummi Planning, as previously discussed. The land use type was matched to an Institute of Transportation Engineers (ITE) trip generation code for calculation of the expected trip generation potential for that land use and area. **Table 5-1** summarizes the land use types, area or quantity of the land use and the trip generation potential for the study area. As currently zoned, there is the potential for almost 70,000 additional vehicle trips at build-out.

Table 5-1, Land Use Types & Trip Generation

ITE Code	Description	Units	Quantity	Generation Rate	Weekday Trips
For Tribal Controlled Land					
110	Light Industrial	acre	175	7.51	1314
170	Utility	acre	10	2.49	25
210	Single Family Residential	each	4410	9.57	42204
220	Apartment/Multi-family Residential	unit	250	6.72	1680
252	Senior Housing	unit	300	3.48	1044
254	Assisted Care	bed	120	2.74	329
310	Hotel	room	105	8.92	937
330	Resort Hotel	room	20	0.37	7
420	Marina	berth	120	2.96	355
473	Casino	1000 GSF	125	13.43	1679
495	Recreation/Community Center	1000 GSF	60	22.88	1373
520	Elementary School	student	650	1.29	839
522	Middle School	student	500	1.62	810
540	College	student	400	1.2	480
733	Government Office Complex	1000 GSF	120	27.92	3350
770	Business Park	acre	25	12.92	323
820	Shopping Center	1000 GSF	90	42.94	3865

460	Regional Event/Fairgrounds	acre	6	33.33	200
430	Sports Complex (Golf, Baseball)	acre	80	5.04	403
For Fee Ownership Land					
210	SFR (Existing Platted Lots)	each	581	9.57	5560
210	SFR (Existing County Zoning w/GMA)	each	297	9.57	2842
Projected Daily Trip Generation at Build-Out					69619

As shown, the trip generation potential for the build-out condition is almost 70,000 new vehicle trips per day.

Future Trip Distribution

The future trip distribution for the study area does not use a traditional approach. With the current split land use authority, the fee land areas are expected to develop using traffic patterns similar to the present. The trust and tribal lands are planned to develop more as a self sufficient community, with fewer external trips.

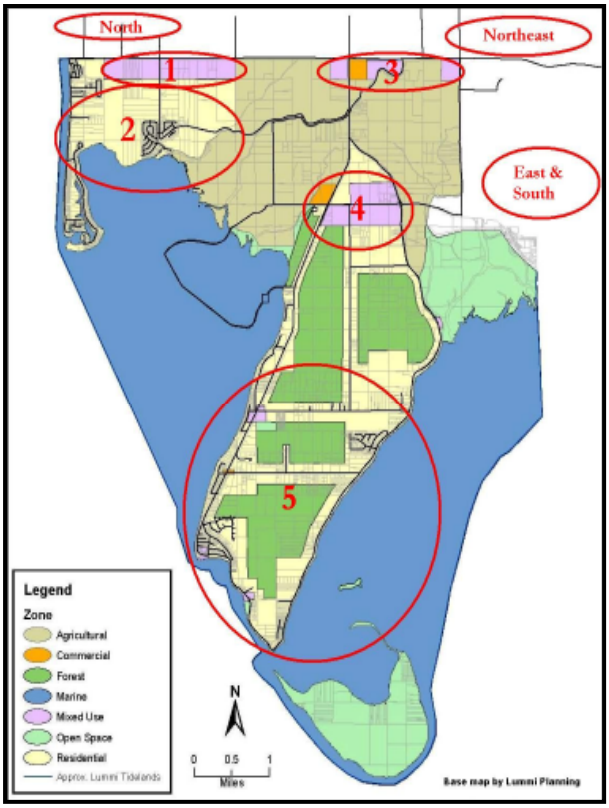


Figure 5-6, Vehicle Trip Analysis Study Areas

The study area was evaluated for geographic areas where the proposed development was likely, using the existing LIBC Zoning and knowledge of existing development. Five general traffic generation areas were created within the study area and three external areas. Only new trips generated within the study area were distributed to the areas, so the analysis does not include trips generated outside the study area.

The area external to the study area were selected to represent the existing employment and services centers in the County. The northern area generally represents the Cherry Point industrial area containing the refineries and ALCOA Intalco Works facilities. The northeast

area contains Ferndale and generally the portion of the County north of Slater Road. The area to the east and south is Bellingham and points south. These have been selected to represent general travel desires, and not a specific destination.

Using the adopted LIBC Land Use Plan and knowledge of existing developments, the study area was assigned five general areas for vehicle trip analysis. **Figure 5-6** illustrates the study areas.

- **Area 1** is typically the mixed use land along Slater Road near Lake Terrill Road. It is anticipated to be commercial and industrial, with a limited amount grocery, restaurant and local service type development. The emphasis of the commercial industrial is expected to be in support of the Cherry Point Industrial. The other services will support the commercial and industrial uses and the immediate residential need for local service.
- **Area 2** is typically the area zoned for residential development in the western portion of the study area. The expectation is that this area will be primarily single-family homes developed as necessary for housing as the study area employment base expands. This area is not expected to develop to provide significant housing for demand external to the study area due to limited availability of water and sewer service for non-tribal purposes.
- **Area 3** encompasses the current Mini-Mart and Casino complex at Slater Road and Haxton Way. The area extends east to include a potential mixed use area at Ferndale Road. This area is projected to continue development as a destination resort and include the amenities such as restaurants, shopping and other activities generally associated with resort development. This will become one of the major employment centers for study area residents.
- **Area 4**, located along Kwina Road, is expected to develop as the major governmental, social/community service and regional commercial area. Most of the future Tribal offices are expected to be located in this area, along with the community social and support services, such as Head Start and a medical complex. The Northwest Indian College Campus is currently being developed along the south side of Kwina Road near Lummi Shore Drive. As this area is near the center of the study area, it is also expected to develop as a retail and commercial core for the region.
- **Area 5** encompasses the southern portions of the study area. Although the zoning is typically either residential or forest, it is a large area with a potentially complex development potential. The current Lummi Island Ferry landing is at Gooseberry Point, and is projected to remain in that area. There are plans for a commercial and private marina. The existing secondary school complex is projected to be enlarged as necessary for additional school buildings and support facilities. Additional Elder support and housing is anticipated to be located in the vicinity of the existing Elder Housing. This area is also expected to be the primary location for additional residential development due to the availability of water and sewer facilities and the highly desirable water views from much of the land. Additional recreational services, such as the current Stommish Grounds, ball parks and other active sports facilities and community centers are expected to be located within this area.

A potential trip generation number was determined for each zone using the zoning designation, projected development type and size as provided by Lummi Planning and number of trips generated. The process reflects the trip potential using the underlying goal of self-sufficiency for the study area and the evolution of a new traffic pattern as that goal is achieved. The sum of the planning zone trips does not equal the total study area trips to allow for some increase in the areas not included in the defined trip areas. **Table 5-2** summarizes the future trip estimate for each area.

Table 5-2, Future Trip Estimates

Area	New Trips
Area 1	5000
Area 2	18000
Area 3	10000
Area 4	8000
Area 5	25000

Trip Assignment

The next step in the process of analyzing the distribution of trips is to project the intra- and inter-area trip assignment. This process was performed using the same principles as used for the trip generation phase. For ease of evaluation, a percentage value was used to assign trips. **Table 5-3** summarizes the distribution. Intra-area trips are shown in the shaded cells and represent the trips that do not exit the area in which they originate. Inter-area trips (non-shaded) are the projection of trips between the areas with the exception that the external areas reflect only those trips generated by development of the study area.

Table 5-3 Distribution of New Trips

From - To	Area 1	Area 2	Area 3	Area 4	Area 5	North	Northeast	East & South
Area 1	10%	15%	5%	5%	5%	20%	20%	20%
Area 2	5%	10%	25%	25%	10%	5%	5%	15%
Area 3	5%	10%	5%	15%	10%	5%	10%	40%
Area 4	5%	15%	5%	10%	30%	5%	5%	25%
Area 5	5%	10%	20%	25%	5%	5%	5%	25%

Future Vehicle Trips

Applying the distribution ratios from **Table 5-3** to the number of trips generated by each area provides an estimate of the number of new trips to and from each study area. That calculation is shown in **Table 4** and illustrated by **Figure 5-7**. This methodology provide for the distribution of 66,000 of the projected 70,000 new trips. The difference in the number of trips is assumed to be representative of the development of the remaining study area. As in the previous table, the shaded area reflects trips that are internal to each area.

Table 5-4 Calculation of New Trips

From - To	Area 1	Area 2	Area 3	Area 4	Area 5	North	Northeast	East & South
Area 1	500	750	250	250	250	1,000	1,000	1,000
Area 2	900	1,800	4,500	4,500	1,800	900	900	2,700
Area 3	500	1,000	500	1,500	1,000	500	1,000	4,000
Area 4	400	1,200	400	800	2,400	400	400	2,000
Area 5	1,250	2,500	5,000	6,250	1,250	1,250	1,250	6,250

As the final step in determining the travel demand volume for the study area a compilation of the inter-area travel is necessary. **Table 5-5** is a simplification of **Table 5-4** and excludes the intra-area trips. This allows for easier understanding of the magnitude of traffic volume that can be expected.

Table 5-5 Travel between Areas

	Area 1	Area 2	Area 3	Area 4	Area 5	North	Northeast	East & South
Area 1		1,650	750	650	1,500	1,000	1,000	1,000
Area 2			5,500	5,700	4,300	900	900	2,700
Area 3				1,900	6,000	500	1,000	4,000
Area 4					8,650	400	400	2,000
Area 5						1,250	1,250	6,250

As expected, there is a significant travel demand between residential areas and areas containing employment and services. **Figure 5-7** is a geographic depiction of the projected volumes.

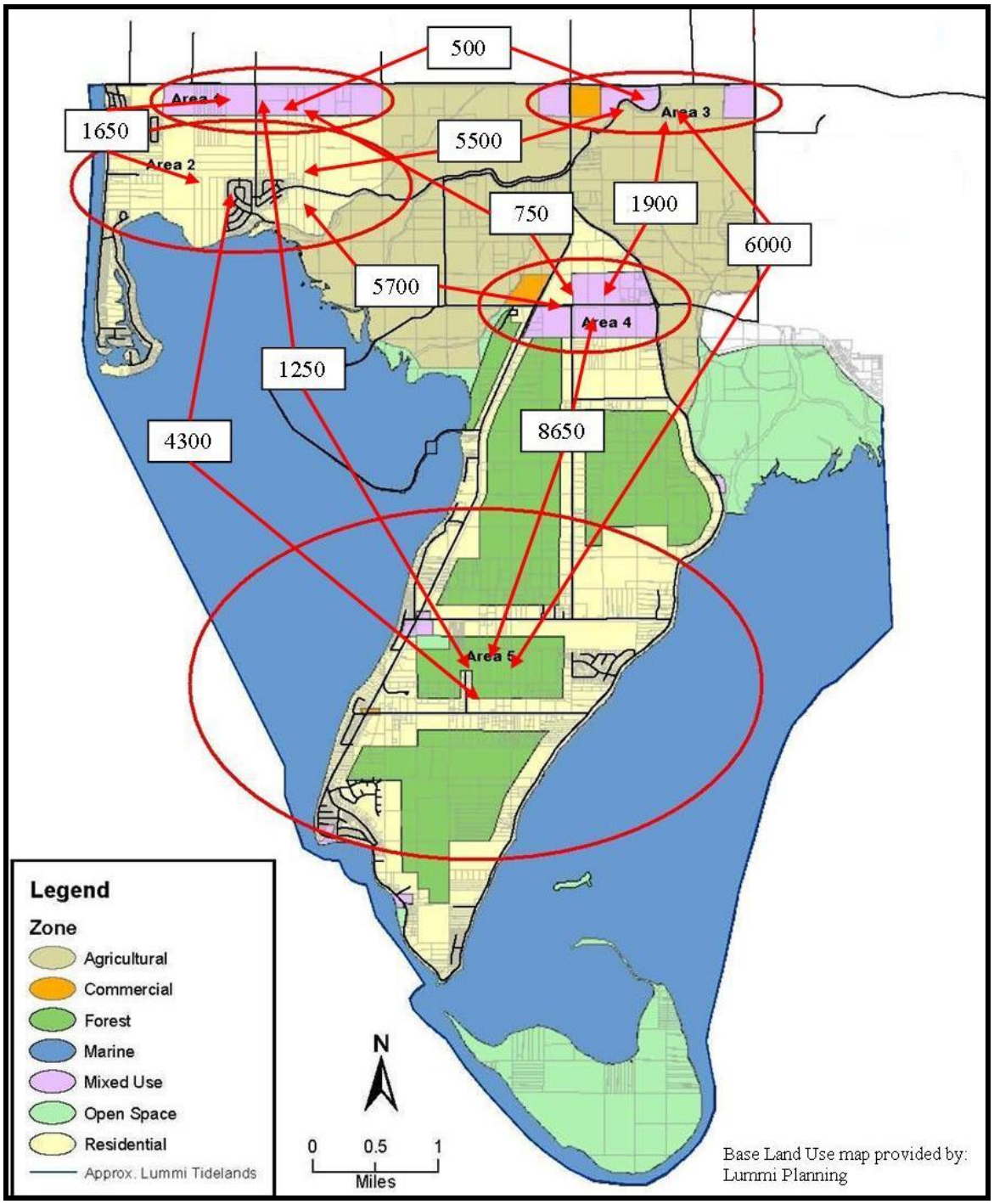


Figure 5-7, Projected Traffic Volumes

Lummi Island Impacts

Lummi Island, which is not part of the study area, has the potential for additional development and resulting traffic. As documented in the **Chapter 4** of this report, the majority of the vehicles using the ferry wish to travel to Bellingham. Even with the proposed replacement ferry vessel, the physical ability of the ferry to transport vehicles will be restricted. As a result, the percentage of traffic in the study area that is Lummi Island related

will decrease as the LIBC vision of the study area evolves. The ferry traffic should be adequately served by a roadway network that provides for the travel movement within the study area and to outside points with no specific provisions other than a rational connection between the desired travel route and the ferry landing.

Additional Transportation Modes

Pedestrian

Pedestrian demand projections are difficult, especially in a rural environment. Pedestrians were observed along most of the roadways at some time during this study. The concentrations were heavier near the denser residential areas and the social services center. Although the volumes will be less than for vehicles, the pedestrian traffic desires within the study area should not be significantly different in pattern.

Bicycle

The generally flat terrain of the study area encourages the use of bicycles. Recreational and commuter use of bicycles were observed throughout the study area. Although the volumes will be less than for vehicles, the bicycle traffic desires within the study area should not be significantly different in pattern.

Transit

Regional

The WTA has traditionally been very responsive to changes in demand for service within its service area. WTA will evaluate the current regional service as the bus is utilized more and will likely provide more frequent service as demand grows.

Internal Circulator

Part of the agreement for the circulator bus contains a rider threshold that must be met for continuation of the contract with WTA for the vehicle. The circulator provides an important service within the study area as well as connections to the regional public transportation service.

Future Network Level of Service (LOS)

The proposed overall roadway network is expected to operate at a LOS "E" or better. The projected traffic volumes are generally within the capacity of the proposed roadways. There may be the need for additional lanes at a few significant locations or traffic signals. This means that during the peak traffic times, there will be moderate congestion. The peak travel time varies from location to location within the study area and is expected to remain similar as the study area develops as planned. Most of the day, traffic will be able to move with little hindrance from congestion. The construction of roadways to provide a higher, or less congested, LOS will result in significant construction and maintenance costs for facilities that are not needed for most of the day.

The generally rural nature of the study area and the typically straight roads tend to encourage higher speeds, so dedicated off road pedestrian and bicycle paths are encouraged along major routes.

Specific transit stops should be incorporated into the design of any new roads or road improvements.

Recommendation

Limiting Conditions

The master land use planning for the study area is complicated by there being two governmental entities, the County and the Lummi Nation, with some authority to regulate land use and development. The vision for the study area by the two entities is somewhat different.

The Lummi Nation is a sovereign government with authority to guide and direct the trust and tribal lands within the study are. The Lummi Nation envisions a significant growth and increase in density, likely to urban density in some areas. This growth will take place over time as the vision of the study area becoming a homeland for the Lummi people with self sufficient residential, employment, cultural, social and educational centers.

The County, being an entity of the state, must operate within the laws, rules and regulations of the State of Washington. One of the major planning regulations is the GMA, which is intended to limit urban sprawl. The study area is currently outside the allowable extent of the urban growth area. This has the significant impact of not allowing the County to adopt the intensity of land use envisioned by the LIBC adopted land use plan.

A significant issue will be the future construction of portions of the planned roadways. The County will be limited by State regulation and funding sources to a rural design standard. Lummi Nation will likely desire a more urban streetscape in some areas.

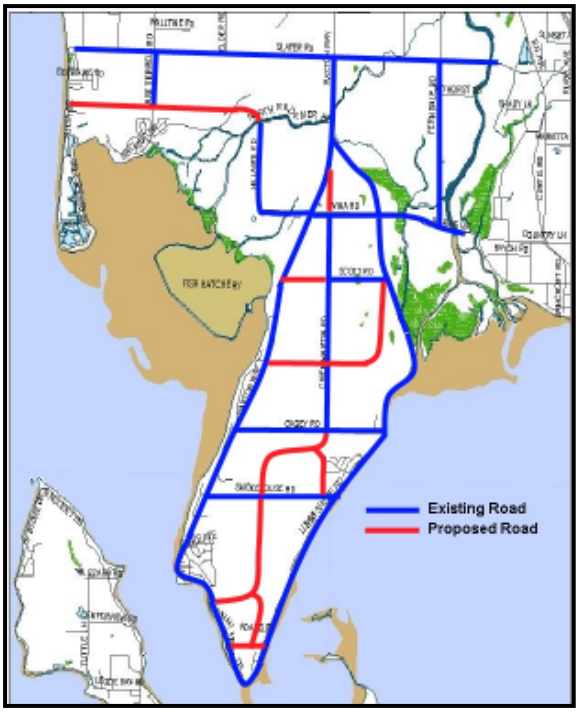


Figure 5-8, Proposed Road Network

Vision

The vision of the future transportation system for the Lummi Nation is of a central core route that provides reasonably direct connections to the various intensive land use designations while minimizing impact to existing homes. This core, or transportation spine, will be developed as a safe and efficient transportation for all modes of travel. As the Lummi Nation becomes more of a full service government and population growth occurs, there will be

more of an urban travel characteristic with significant travel between residential areas and the service, governmental and employment centers.

The implementation of the LIBC adopted vision will is anticipated to create the opportunity for creation of residential neighborhoods with a common theme and the desire to provide urban streetscapes and amenities.

The design standard varies along a route. A denser development, whether residential or commercial, would entail an urban streetscape, where a roadway through a less dense, rural environment would be a rural roadway.

Illustrations of roadway cross sections proposed for consideration are in **Appendix E.** The proposed sections with the "urban" designation contain design elements generally not allowed by funding sources typically used by Whatcom County. Construction to those standards will require resolution of funding conflicts and joint cooperation between the two Governments to achieve.

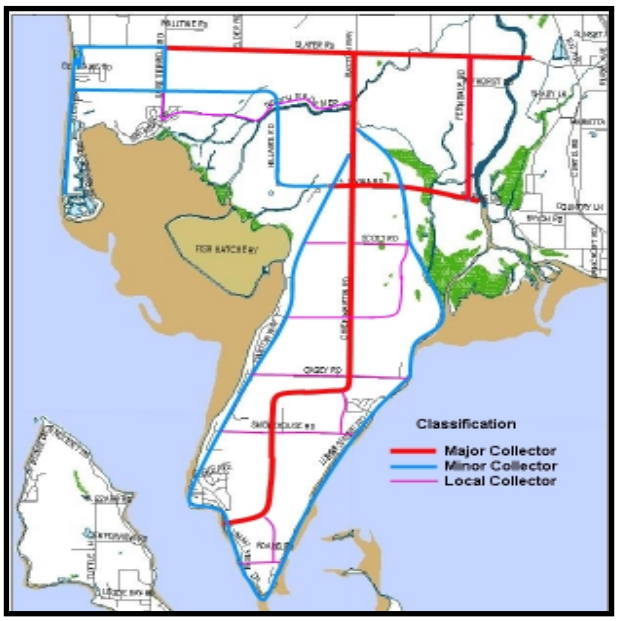


Figure 5-9 - Proposed Network Classification

Routes

The transportation network proposed for the study area is illustrated in **Figure 5-8**, **Proposed Road Network**. In addition to the existing network presented in **Figure 2-1, Study Area Road Classification**, there are new roadways proposed. Most of the new roadway proposals are similar to those presented in the 2000 Lummi Nation Transportation Plan Update. The proposed classification of the new roads is shown in **Figure 5-9**.

The North-South Connector proposed in that plan has been modified to provide a more direct connection to the Lummi Island Ferry and connect into Chief Martin Road as part of the major transportation corridor serving the Lummi Nation. There is also a small segment missing between Kwina Road north to Haxton Way. Similarly, the proposed Lake Terrell-Sucia connector from that plan has been extended to the east and connected into Hillaire Road at the existing bridge over the Red (Lummi) River. Both of the modifications reflect the desire to provide an efficient and effective transportation framework.

Route Classification

A roadway classification is an indicator of the importance that road has to the community and its function within the larger transportation system. The roadway classification also determines the design standards for future improvements and opens the door to compete for various Federal and State funding programs for improvements.

A major realignment of the existing route classification is proposed. To better reflect the significance of the proposed backbone roadway, it is proposed to become the Major Collector, thus moving most of Haxton Way to Minor Collector status. In addition, the connector between Sucia and Kwina Road will serve the function purposes for a Minor Collector and is proposed to be classified as such.

Design standards

General Condition

Under the provisions of the GMA, all of the study area is considered to be Rural and roadway construction standards for rural roads apply. In general, urban amenities like street lights and sidewalks are not considered appropriate in a rural setting. The County must use appropriate design standards, such as those in the Local Agency Guidelines, for roadway improvements.

Policy Considerations

Land Use and Government Relations

- The County and Lummi Nation should enter into Inter-Governmental agreements that define the planning responsibility and establish a process for resolution of land use conflicts.
- The County and Lummi Nation should enter into Inter-Governmental agreements that outline which standards and conditions apply to the development of land within the reservation.
- The County and Lummi Nation should enter into Inter-Governmental negotiations and ultimately agreement that resolve the road construction and maintenance funding that is reduced as Lummi Nation purchases fee land and places it into Trust. The County Road Tax is not levied on Trust Lands, which reduce funds available for construction and maintenance of County Roads.

Direct access to Major Collectors

- Routes designated as Major Collectors are intended to function as major transportation corridors, and as such, access points should be controlled.
- Land development along Major Collectors shall be encouraged to provide on-site traffic circulation.
- To the extent possible, there shall be no access to a Major Collector within 500 feet of an intersection that is signalized, channelized or a traffic circle. If closer access is necessary due to property ownerships, it shall be "right-in/right-out" if possible. Left turns onto or off of Major Collectors in the vicinity of such an intersection are not desirable.

Parking

- Vehicle parking along arterial roadways should be discouraged, preferable prohibited. This will allow the use of the paved area external to the travel lanes by pedestrians and bicycles.

Pedestrian and Bicycle Transportation

- Provisions for safe pedestrian circulation should be part of the overall design standards for the area. Areas with urban characteristics should have sidewalks. The more rural areas should have joint facilities along major travel corridors.
- Shoulders of roadways should be built and maintained for use by bicycles. It may be desirable to designate some as bikeways.
- Lummi Nation and the County should jointly pursue the construction of a pedestrian and non-motorized vehicle project to connect the Kwina Road governmental complex and the Haxton Way and Slater Road growing employment center.

Appendices

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E