WASILLA MAIN STREET

PROJECT NUMBER STP-0525(12) / 54302

TRAFFIC STUDY

Prepared for:

State of Alaska
Department of Transportation and Public Facilities
Central Region Design & Construction
Central Region, Highway Design

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LIST OF ACRONYMS

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
ADOT&PF	(Alaska) Department Of Transportation And Public Facilities
AM	Morning (Time)
APV	Accident Prediction Values
ARRC	Alaska Railroad Corporation
Ave or Ave.	Avenue
AWSC	All Way Stop Sign Control
CBD	Central Business District
CTWLTL	Center-Two-Way-Left-Turn-Lane
EB	Eastbound
EBLT or EBL	Eastbound Left Turn
EBRT or EBR	Eastbound Right Turn
EBT	Eastbound Through
ft. or ft	Feet or Foot
HCM2000	Highway Capacity Manual 2000
Hwy or Hwy.	Highway
HSIP	Highway Safety Improvement Program
LOS	Level of Service
LRTP	Long Range Transportation Plan (MSB)
MEV	Million Entering Vehicles
MPH	Miles Per Hour
MSB	Matanuska-Susitna Borough
NB	Northbound
NBLT or NBL	Northbound Left Turn
NBRT or NBR	Northbound Right Turn
NBT	Northbound Through
OWSC	One Way Stop Sign Control (Tee intersections)
PCM	Alaska Highway Preconstruction Manual
PGDHS	AASHTO Policy on Geometric Design of Highways and Streets
PM	Afternoon or Evening (Time)
QRS or QRSII	Quick Response System (Demand Forecasting Model is QRSII)
RR	Railroad
SB	Southbound
SBLT or SBL	Southbound Left Turn
SBRT or SBR	Southbound Right Turn
SBT	Southbound Through
sec or sec.	Seconds
St or St.	Street
TWSC	Two Way Stop Sign Control
UCL	Upper Control Limit
v/c	Volume To Capacity Ratio
veh or veh.	Vehicle(s)
Vph	Vehicles Per Hour
WB	Westbound
WBLT or WBL	Westbound Left Turn
WBRT or WBR	Westbound Right Turn
WBT	Westbound Through

EXECUTIVE SUMMARY

This report presents the purpose, activities, and results of the Wasilla Main Street Traffic Study.

Purpose: The purpose of the Main Street Traffic Study is to determine what improvements may be necessary for Main Street and the adjacent Wasilla core area to accommodate existing and future traffic while meeting several other objectives including.

- Accounting for other likely transportation system improvements to avoid over-building Main Street.
  - Increasing Alaska Railroad traffic
  - A potential alternative corridor for the Alaska Railroad and Parks Highway south of their current location.
- Maintaining a viable "Downtown" core area.

History: Wasilla-Fishhook Road and Main Street preliminary studies began in 1983. 1n 1993, an Environmental Assessment presented the preferred alternative; a two-way couplet consisting of:

- A 3-lane Main Street with at-grade crossings of the Parks Highway and the Alaska Railroad.
- A 3-lane Knik Street with a bridge over the Parks Highway and Alaska Railroad.

In 2001, the City of Wasilla raised concerns about impacts that the preferred alternative might have on the City. In response to this concern, the Alaska Department of Transportation and Public Facilities (ADOT&PF) prepared a traffic study. The outcome of the 2001 study was a City resolution supporting a 3-lane wide Main Street as an interim measure while additional study continued. This report is intended to complete the effort as intended in 2001.

Study Area: This study considers the Wasilla City limits westerly as far as Lucille Street and Lake Street and easterly as far as Peck Street and Roberts Street.

Assumptions:

- Unless noted otherwise, an Alternative Parks Highway and Alaska Railroad Corridor are assumed not to be in-place.
- It is assumed that the Alternatives will be constructed in phases. Costs for each phase of each alternative are separate.
  - The first phase would construct the basic form of each alternative, generally at-grade crossings of the Parks Highway and Alaska Railroad; except Alternative C, which would include a Knik St. bridge over the Parks Highway and railroad.
  - If necessary, the second phase would be constructed 10 – 20 years after the first phase and would create separated grade crossings of the roads and the railroad tracks. Under Alternative C, this would only add a single bridge to separate Main Street and the Alaska Railroad since the Knik Street Bridge would already be in place. Grade separation might not be necessary if the Parks Highway and Alaska Railroad construct an alternative corridor, or if railroad facilities are included on a future Knik-Arm bridge.

Current Traffic Conditions: Current traffic conditions were determined using published traffic volumes as well as traffic counts in selected locations. Currently, the intersection of Main Street and the Parks Highway operates at a LOS of "D". The Alaska Railroad provided current train schedules and crossing durations. At this time, train induced delays are less significant than vehicle induced delays.

Safety: Compliance with design standards, vehicle accident frequency, rail crossing accident prediction (Accident Prediction Values), and perceived safety issues were considered as part of this study.

The incomplete connectivity of pedestrian facilities, close proximity of the railroad and Parks Highway, Fire Department response delays by trains, and the sight distance at the southbound approach to the Parks Highway/ Main Street intersection are all perceived safety issues.

The existing conditions do not conform to all new construction design standards, although the deviations are not considered unusual for an urban facility without a recent upgrade, and the 25 MPH posted speed means that accidents tend to be low severity. Driveway landings, driveway corner clearance, pedestrian and bicycle route continuity, and clear zone encroachments where identified for improvement. Most or all of these can be corrected during the design of any of the build alternatives. The 10-year crash analysis found the Parks Highway / Main Street and Main Street / Swanson Avenue intersections to have accident rates that are considered significantly higher than the average rates for similar intersections. The Herning Avenue / Willow Street intersection was also found to have a significant accident frequency, although this intersection is not part of any of the Alternatives under study. The Accident Prediction Values computed for the existing conditions and the Alternatives do not suggest a safety based need to separate the roadway and rail traffic.

Twenty Year Forecast of Traffic Demand: A detailed model of the study area was prepared using the 2000 version of QRSII software. 2025 traffic demand at the perimeter of the detailed model was defined using the Matanuska-Susitna Borough model provided in 2005. Traffic demand within the detailed model was predicted based on existing land use, anticipated future land use consistent with the zoning, and special traffic generators such as schools, the Post Office, and Carr's Mall. The detailed model was calibrated to the most recent measured counts published by ADOT&PF at that time. The Alaska Railroad provided railroad traffic forecasts.

In general, the peak hour traffic demand on Main Street/KGB increases about 25% during the twenty year forecast. Increases on the Parks Highway at the Main Street intersection are more modest due to dispersion to alternative east-west routes such as Bogard and Seldon Roads. The Alaska Railroad forecasts a 250% increase in train traffic during peak vehicle traffic hours in next twenty years.

In 2006, the Matanuska-Susitna Borough issued a new draft 20-year traffic model, which differs from the previous model provided in 2005. The difference is most significant for the Parks Highway between Main Street and Crusey Street, where 20-year traffic demand increases from 33,000 ADT to 50,000 ADT in the 2006 version. The two Borough models are in close agreement regarding the 20-year traffic demand along Main Street and Knik-Goose Bay Road (they differ by only a few thousand vehicles per day).

The Department has determined that revising this study to account for differences between the 2005 and 2006 versions of the Mat-Su Borough models is not warranted for the following reasons.

- Revising the detailed model and subsequent work would not substantially change the footprint or performance of the alternatives studied.
- Revising the detailed model and subsequent work would delay the completion of this study by at least six months. During that time, other data used for this study might be updated.
- The alternatives have been evaluated using the same detailed model, which provides a common and sufficient basis for comparison and selection of a preferred alternative.
- The preferred alternative will undergo additional and more detailed analysis during design, using the most recent information available.

2025 Traffic Conditions: If no improvements are made to the north-south study area roads, then the Main Street level of service with be F. If no improvements are made, train induced delays will result in a level of service of E at the existing Parks Highway intersection, however the various build scenarios are more severely impacted by train traffic and generally produce a level of service of F at the Parks Highway. Therefore, the preferred alternative must address both vehicle congestion and train-induced delays.

Alternatives Studied: The study included the no-build and four build alternatives. Phase 1 construction is described below.

- Alternative A, 3-Lane Main Street. Estimated Cost = $5,500,000
- Alternative B, 5-Lane Main Street. Estimated Cost = $7,000,000
- Alternative C, Knik-Main Street Two-Way Couplet (1993 EA preferred alternative)
  - o Knik Street bridge over the Parks Highway and railroad.
  - o New connection from Nelson/Knik Street intersection north to Wasilla-Fishhook Road.
  - o Realign the Knik Street intersection with Park Avenue.
  - o Estimated Cost = $15,000,000
- Alternative D, Yenlo-Main One-Way Couplet. Estimated Cost = $12,500,000
  - o Extend and connect Yenlo and Talkeetna Streets to provide the northbound corridor.
  - o Change Main Street and a segment of Knik-Goose Bay Road into a southbound corridor.

  Alternative D, as originally conceived and modeled would have extended Yenlo Street north of Bogard Road to intersect Wasilla-Fishhook Road just south of Aspen Avenue. However, the impacts to the properties north of Bogard Road (school, church, residence, and undeveloped property) were found to outweigh the operational benefit of extending Yenlo Street north to Wasilla-Fishhook Road. Further study revealed that the levels of service would be approximately the same whether Yenlo terminated at Bogard Road or Wasilla-Fishhook Road. Consequently, Alternative D was modified to terminate at Bogard Road.

Comparison of Alternatives: The recommended alternative should provide the best combination of improved capacity, reduced delays due to train crossings, low impact to adjacent property, favor multiple travel modes, and be low cost. The recommended alternative should also be flexible to achieve these goals under a number of future scenarios. Future scenarios to reduce train induced delays include an alternative corridor for the Parks Highway and Alaska Railroad, raising the railroad tracks to pass over the roads, and raising the roads to pass over the railroad tracks.

Improved Capacity: Alternative A will not provide an intersection LOS D, (minimum acceptable level of service) under any future scenario and is therefore dropped from further discussion in the Executive Summary. Alternative B will provide LOS D only if an Alternative Corridor is constructed for the Parks Highway and Railroad. By the time an Alternative Corridor is constructed, it is likely that Alternative B will have already failed; consequently Alternative B is also dropped from further discussion in the Executive Summary. Only Alternatives C and D meet or exceed an intersection level of service D under any of the future build scenarios.

Impact to Adjacent Property: Alternative C has a higher level of impact to adjacent property than Alternative D. Therefore, the cost for Right-of-Way acquisition is expected to be about 70% higher for Alternative C than for Alternative D.

Multiple Travel Modes: Alternatives C and D accommodate multiple travel modes to a limited extent. Alternative D favors multiple travel modes because the one-way traffic decreases the number of possible conflicts. However, Alternative D does not provide a wide enough curb lane through the Yenlo Square Development to accommodate Type A bicyclists. Alternative C has the advantage of a bridge across the Parks Highway, but the two-way traffic increases the number of potential conflicts with other modes.

Future Scenarios for Separating Road and Railroad Traffic:

Future scenarios for reducing or eliminating train induced traffic congestion include:

- An alternative corridor for the Railroad and Parks Highway south of their existing location.
- Locating the Alaska Railroad on a future Knik-Arm bridge and bypassing Wasilla with the connecting line.
- Increasing the height of the rail to pass over the north-south collectors (rail over road).
- Increasing the height of the north-south collector roads to pass over the railroad (road over rail). Costs (where shown) indicate additional cost to grade separate 10-20 years after the initial (phase 1) construction.

Alternative Corridor and Knik-Arm Bridge Scenarios. The decision to construct an Alternative Corridor or add rail facilities to a future Knik-Arm bridge will not be driven by this study, and the cost for either of these scenarios will be substantially higher than any Alternatives included in this study. Consequently, costs for these scenarios are not provided.

If an alternative corridor were constructed, it would likely provide a limited access route for the Parks Highway, leaving the existing Parks Highway as a business loop. The primary route for the Alaska Railroad would shift into the new corridor, with the existing track carrying passengers from a new terminal located off Mack Drive and gravel trains from the QAP Construction quarry off Pittman Road.

In general, the lane requirements for Alternatives C and D are reduced if an alternative corridor is assumed, however an alternative corridor will not satisfy future demand for Main Street as it exists currently. See Appendix C for the lane requirements with and without an alternative corridor.

Under Alternative C, Main Street would remain at-grade and would require one fewer lane between Lakeview Avenue and Herning Avenue, while Knik Street would require one fewer lane from Knik-Goosebay Road to Susitna Avenue. The Swanson Avenue east approach to Main Street would require one fewer lane.

Under Alternative D, Yenlo, and Talkeetna Streets would require one less lane from Park Avenue to Swanson Avenue, and Main St. would require one less lane from the Parks Highway to Bogard Road with the Alternative Corridor. In general, these would be 2-lane roads instead of 3-lane roads. Swanson Avenue would also see some reduction in the number of approach lanes. The Main Street and Yenlo Street intersections with the existing Parks Highway would remain at-grade.

Alaska Railroad on Knik-Arm Bridge: The Alaska Railroad Corporation (ARRC) has stated that if a railroad were added to a future Knik-Arm bridge, then the link from the bridge would be routed west of Wasilla. Lane requirements and train traffic through Wasilla would be as described under the Alternative Corridor scenario.

Road Over Rail Scenario.

Under Alternative C, a Main Street bridge would be added across the Parks Highway and Alaska Railroad (the Knik Street bridge would already be in place). Additional Estimated Cost (in addition to phase 1) = $14,300,000.Under Alternative D, a Main Street and Talkeetna Street bridge would be added across the Parks Highway and Alaska Railroad. Estimated Cost (in addition to phase 1) = $20,700,000.

Rail Over Road Scenario.

Under Alternative C, a railroad overpass of KGB is not an option since it would be at nearly the same elevation as the Knik Street Bridge across the Parks Highway and Alaska Railroad.

Under Alternative D, the railroad embankment would be gradually raised from East of Crusey Street, and bridges would span Talkeetna Street and Knik-Goose Bay Road. The railroad embankment would then lower to meet the existing track just west of Lucille Street. Estimated Cost (in addition to phase 1) = $24,800,000.

Stakeholder Involvement:

The original public involvement plan for the traffic study included area landowners and residents, the Chamber of Commerce, Alaska Railroad Corporation (ARRC), and the City of Wasilla. This plan included a presentation to the Chamber of Commerce, a joint presentation to the ARRC and City of Wasilla, and a presentation to the public.

In July 2004, stakeholders received postcards announcing the study alternatives and requesting suggestions for other alternatives to study. Instead of the three public meetings originally planned, the project team made eight public appearances, including a public open house on June 14, 2006, a Planning Commission Public Hearing on June 27, 2006, and a City Council Public Hearing on July 10, 2006.

The Chamber of Commerce supported Alternative C, while the ARRC expressed a preference for Alternative D. Public opinion was mixed between those supporting Alternatives C, D, and do nothing. The Wasilla Planning Commission and City Council each passed resolutions supporting Alternative D. The City Council also requested that the final design address concerns raised by the Church North of Bogard Road, the Yenlo Square Developer, and residents of Centaur Avenue.

Recommended Alternative:

Alternative D, the Yenlo / Talkeetna – Main Street One-Way Couplet (modified to terminate at Bogard Road) is recommended to advance into design.

1 Introduction

1.1 Purpose and Need for Study

The City of Wasilla, Alaska has developed along the George Parks Highway and Alaska Railroad corridor, both east-west oriented facilities that serve as critical links between the interior of Alaska, and the communities of Matanuska-Susitna Borough (MSB), South-central, and the Kenai Peninsula. Although the railroad and Parks Highway are generally within a north-south corridor, facilities in this area bear east-west.

Most of the freight bound for the interior flows through Wasilla on these facilities. The Parks Highway is the more popular and more-used route for travelers between the interior and South-central Alaska (with the Glenn-Richardson being the alternative). In addition to freight, the railroad also provides passenger service for residents and tourists.

Both the Parks Highway and the railroad are functionally oriented to emphasize mobility. While having the Parks Highway and the Railroad in the center of the community promoted the early growth and success of Wasilla, they have become a limiting factor to access and circulation within the City's core area. In addition, the Parks Highway has to provide access to adjacent development, which conflicts with its mobility function. Local circulation and access are impacted because there is only one north-south crossing of the railroad tracks in the downtown area, at Main Street, approximately 100' south of the Parks Highway / Main Street / Knik-Goosebay Road intersection. Congestion at the intersection continues to grow, with queues spilling back within the downtown area and affecting circulation; and further compromising the high mobility function of the Parks Highway.

This is a local mobility study focused on Main Street improvements, but it will also take into account the potential for alternative corridors to the Parks Highway and the Alaska Railroad. By taking this background planning into account, this project determines the minimum traffic needs for improving Main Street to maintain a viable downtown road network, without overbuilding the corridor. This project examines the cost and effectiveness of Main Street alternatives and how they impact the existing Parks Highway and Alaska Railroad.

1.2 Study Description

1.2.1 Methods

The study included the following steps, which are briefly described below.

1.) Forecast the regional traffic demand surrounding Wasilla. This step extracts traffic volumes from the MSB LRTP model provided in 2005 at the perimeter of the study area. Step two incorporates these volumes into the "downtown" core traffic model.

In 2006, the Matanuska-Susitna Borough issued a new draft 20-year traffic model, which differs from the previous model provided in 2005. The difference is most significant for the Parks Highway between Main Street and Crusey Street, where 20-year traffic demand increases from 33,000 ADT to 50,000 ADT in the 2006 version. The two Borough models are in close agreement regarding the 20-year traffic demand along Main Street and Knik-Goose Bay Road (they differ by only a few thousand vehicles per day).

The Department has determined that revising this study to account for differences between the 2005 and 2006 versions of the Mat-Su Borough models is not warranted for the following reasons.

- Revising the detailed model and subsequent work would not substantially change the footprint or performance of the alternatives studied. This was verified by a screenline analysis using the 2006 Borough TransCad model volumes.
- Revising the detailed model and subsequent work would delay the completion of this study by at least six months. During that time, other data used in this study might be updated.
- The alternatives have been evaluated using the same detailed model, which provides a common and sufficient basis for comparison and selection of a preferred alternative.
- The preferred alternative will undergo additional and more detailed analysis during design, using the most recent information available.

2.) Update and anchor the "downtown" core traffic model. A separate QRSII detailed model was developed for the study area. The 2005 MSB Long Range Transportation Plan (LRTP) model was used to define the boundary conditions of the smaller area model.

3.) Evaluate existing daily capacity and thru lane deficiencies. This step was used to initially establish the number of north-south lanes that would be required within the study area, based upon model AADT forecasts.

4.) Summarize existing safety issues. Ten years of crash data was collected, from which crash rates and significance were computed. The study area was inventoried for compliance with current standards, and information was collected from expert users and the public.

5.) Evaluate alternatives to meet through lane demand. Five alternatives were developed (four build alternatives). Each alternative also considered an option with and without an alternative Parks Highway corridor.

6.) Evaluate design hour demand and performance. QRS II was used to generate peak hour turning movements, which were adjusted using judgment based on the observed traffic flows. Peak hour capacity was analyzed for the key intersections in each alternative.

7.) Compare Main Street alternatives. The benefits and disbenefits of each alternative were compared.

8.) Evaluate at-grade railroad crossing impacts on local road mobility under each alternative.

9.) Evaluate grade-separated railroad crossings under each alternative. Each alternative also considers rail over road and road over rail options.

10.) Initial findings, presentations, and recommendations. This step involves the assembly, presentation, public agency involvement, revision, and publication of the report.

1.2.2 Study Area

Figure 1, below, shows the Main Street Study Area.

1.2.3 Study Duration

The study duration is 20 years, with 2005 as the initial or "construction" year; and 2025 as the final year. Traffic volumes, system improvements, and other parameters will be developed for 2025 for each alternative considered.

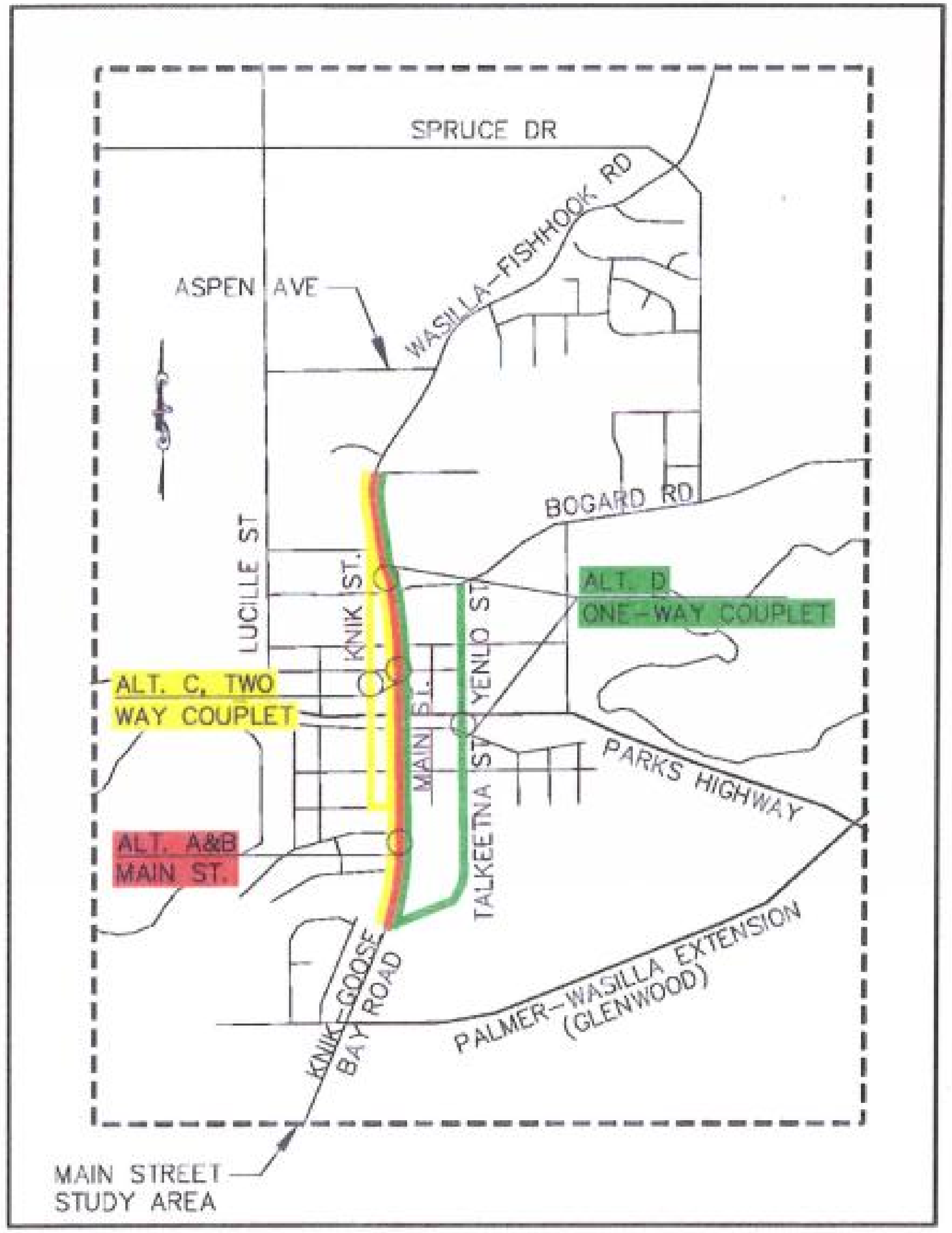


Figure 1- Main Street Study Area

1.3 References

- *Finding Meadow Lakes Draft Issues and Goals*, April 2004, Agnew and Beck.
- *Economic Projects for Alaska and the Southern Railbelt*, Institute of Social and Economic Research, November 2004, Scott Goldsmith.
- *Long Range Transportation Plan*, Matanuska-Susitna Borough Planning Department September 1997.
- *Matanuska-Susitna Borough Transportation Study 2005 and 2025 QRSII Model Draft Report*, Lounsbury and Associates, Inc.
- Various Population and Employment Statistics from State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, http://almis.labor.state.ak.us/
- State of Alaska, Department of Commerce, Community and Economic Development, Community Database Online, http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm .
- *Geometric Design of Streets and Highways*, 2001, (GDSH) American Association of State Highway and Transportation Officials (AASHTO).
- The *Alaska Preconstruction Manual* (PCM) published by the State of Alaska, Department of Transportation and Public Facilities (ADOT&PF).
- NCHRP Report 162, *Methods for Evaluating Highway Safety Improvements*, Laughland, et. al.
- *Alaska Traffic Accidents* published by State of Alaska, Department of Transportation and Public Facilities each year.
- *Highway Capacity Manual*, (HCM2000) TRB, 2000.
- *Manual of Traffic Signal Design*, Second Edition, by James H. Kell and Iris J. Fullerton Institute of Transportation Engineers (ITE).
- NCHRP Report 457, *Engineering Study Guide for Evaluating Intersection Improvements*, Bonneson and Fountaine, 2001.
- Manual on Uniform Traffic Control Devices Millennium Edition (MUTCD), FHWA.
- *Highway Capacity Software 2000* (HCS), McTrans
- Synchro and SimTraffic, Trafficware.
- *The Highway Safety Improvement Program* (HSIP) *Handbook* by ADOT&PF, January 2002; and annual crash rate updates.
- *Central Region Annual Traffic Volume Report* for the years between 1992 and 2001, published by ADOT&PF.
- *1998-2003 Average Daily Traffic*, Matanuska-Susitna Borough Planning Department.
- *Knik-Goose Bay Road Grade Separation Alternatives Analysis*, Alaska Railroad Corporation & HDR Alaska, Inc., January 2005.
- *Alaska Policy on Railroad/Highway Crossings*, ADOT&PF, ARRC, and FHWA, Revised September 1988.
- *Railroad-Highway Grade Crossing Handbook*, 2nd Edition FHWA-TS-86-215, September 1986.
- City of Wasilla Website; http://www.cityofwasilla.com/.

1.4 Alternatives Considered

This study considers four build alternatives, each with variations for an alternate Parks corridor, as well as other minor adjustments such as revised intersection control. These and the no-build option are described below.

- Existing Conditions, No-Build. This is presented in Figure 2, and would be the current conditions with new signals added to the CBD area.
- Alternative A Widening: Three-lane Main Street, Palmer-Wasilla Extension to Carpenter Circle. This option is depicted in Figure 3, and may include additional signalization at locations shown on the map. Future volumes for this option would be similar to the volumes under a no-build condition.
- Alternative B Widening: Five-lane Main Street, Palmer-Wasilla Extension to Carpenter Circle. This is depicted in Figure 3, and may include additional signalization.
- Alternative C Two-Way Couplet: Knik Street and Main Street, Park Avenue to Carpenter Circle. Each street would have 1 through lane northbound and southbound with additional turning lanes at intersections. Knik Street would pass over the Parks Highway and reconnect near to Knik Goose Bay Road near Park Avenue. This option is depicted in Figure 4.

- Alternative D One-Way Couplet: Main Street and Knik Goose Bay Road (southbound) with Yenlo Street and Talkeetna Street (northbound). Each street would have 3 lanes. This option is shown in Figure 5. During the original traffic modeling, Yenlo Street was extended north to Wasilla Fishhook Road south of Aspen Avenue. However, the modeling found that the design year performance was essentially the same if Yenlo Street was terminated at Bogard Road.

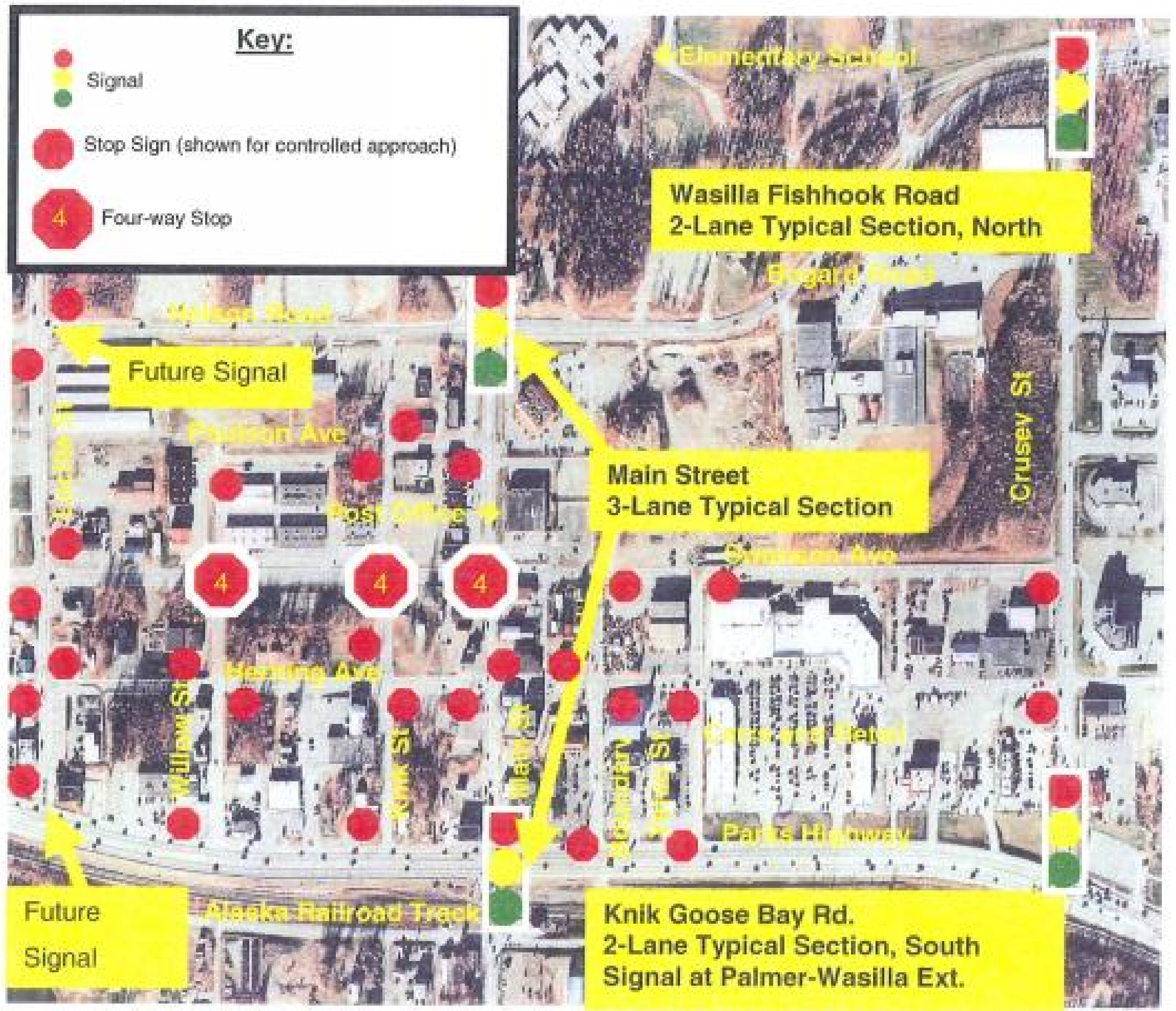


Figure 2- Study Area (CBD shown) Existing Conditions

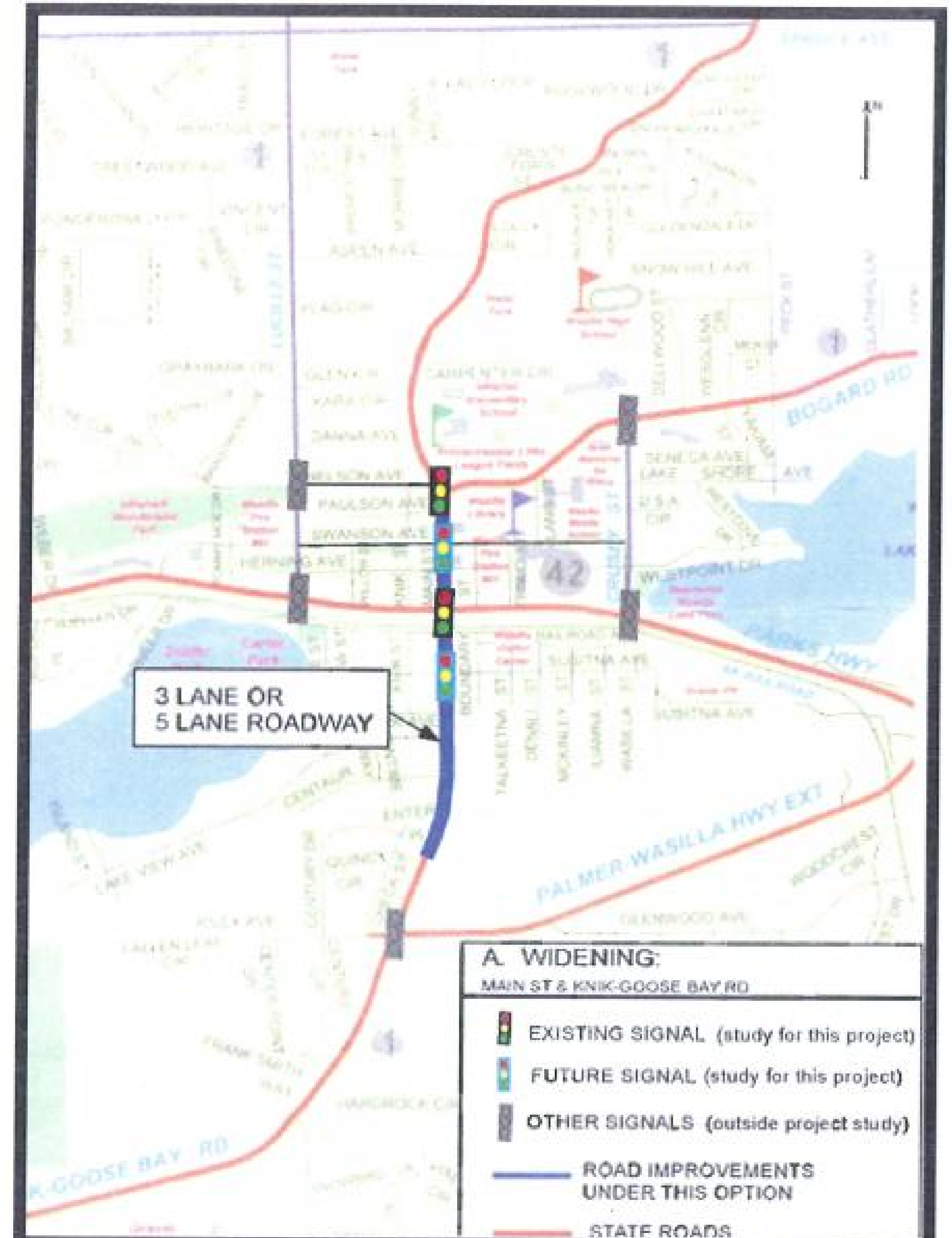


Figure 3- Alternative A (3-lane) and B (5-lane) Widening

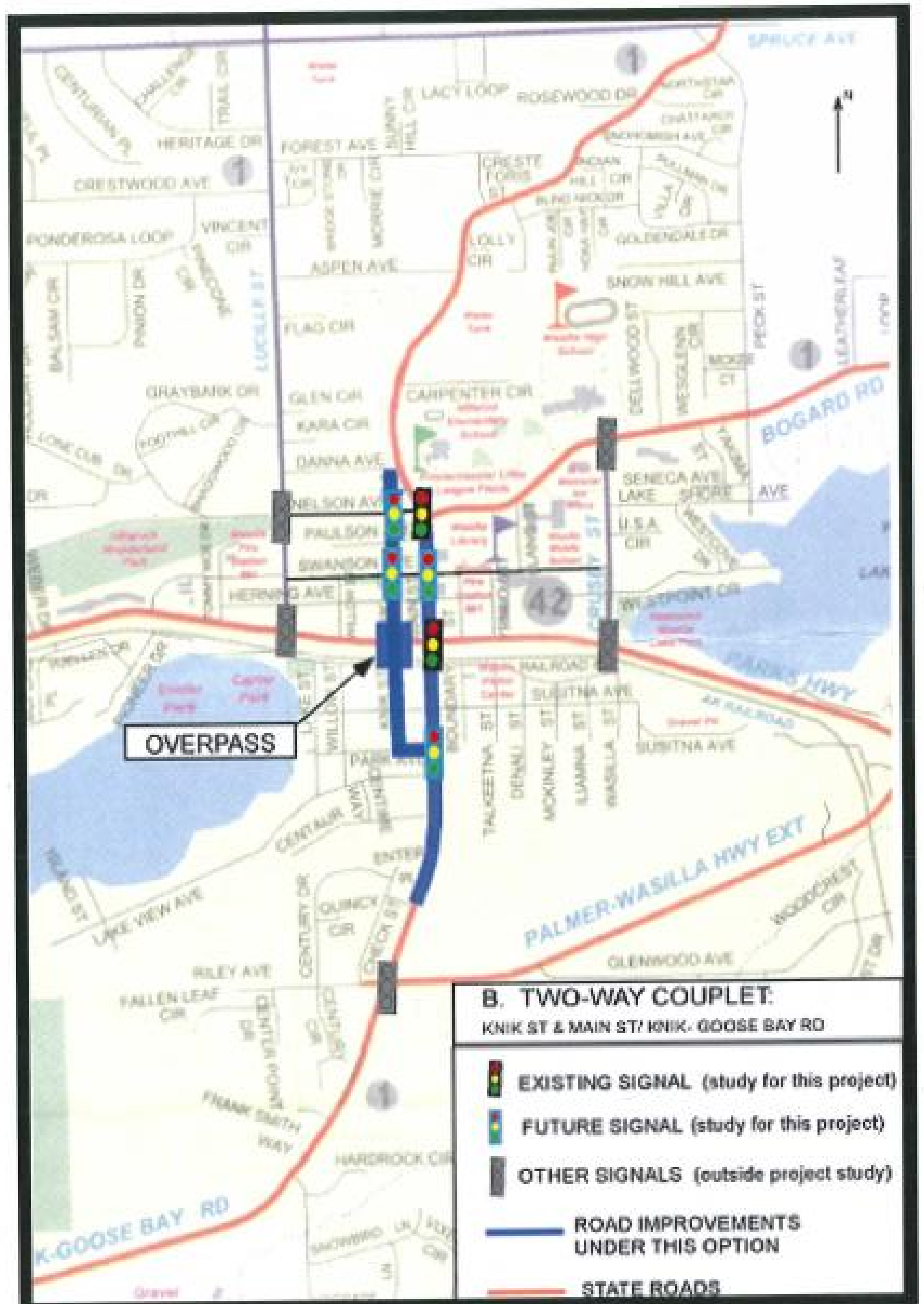


Figure 4- Alternative C, Two-Way Couplet

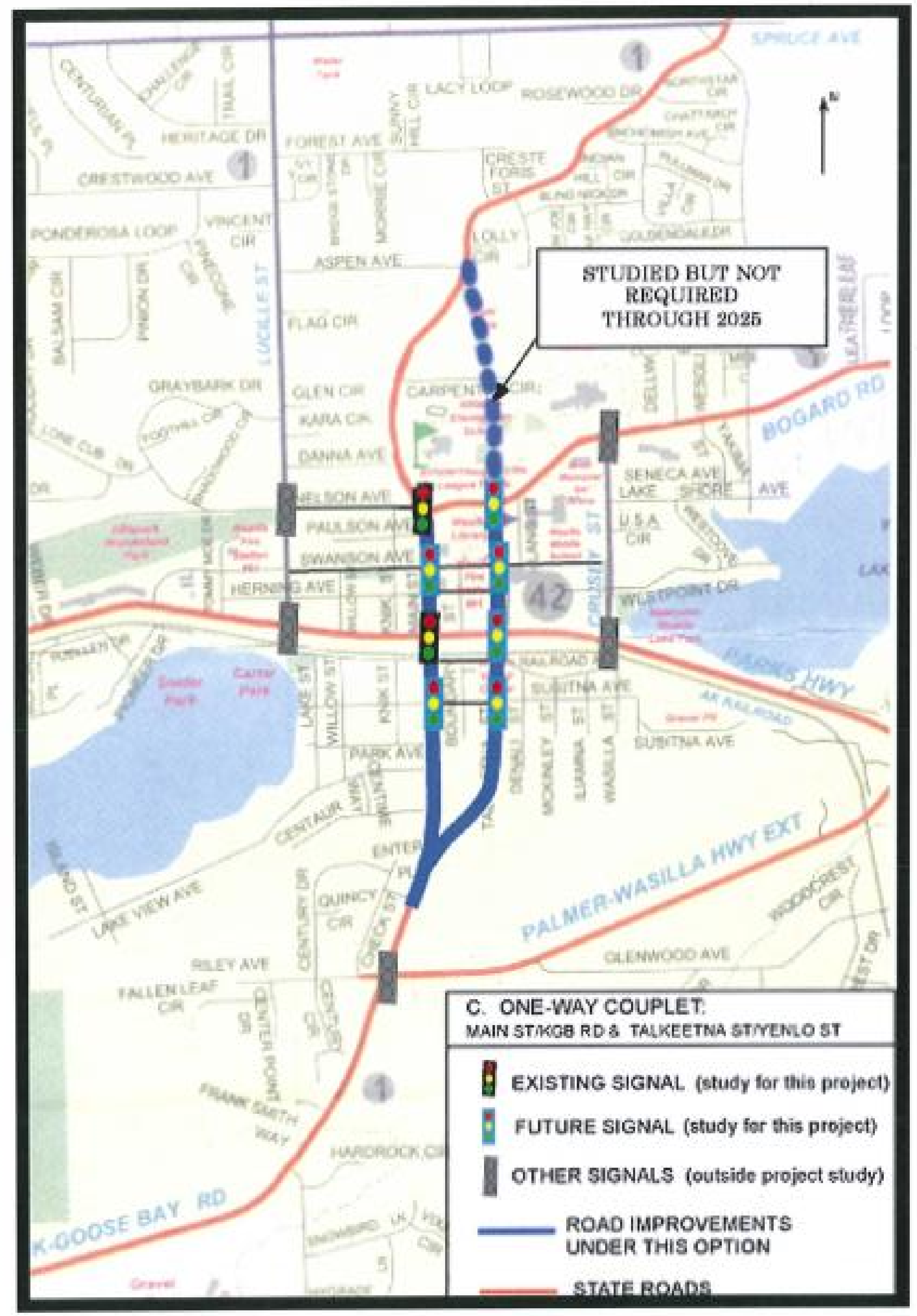


Figure 5- Alternative D, One-Way Couplet

2 Background for Planning

2.1 Community Description

The City of Wasilla is located between the Matanuska and Susitna Valleys, about 43 road miles north of Anchorage. The City core area, which is also the study area, is positioned between Wasilla and Lucille Lakes. Wasilla is located in the Palmer Recording District. There are about 11.7 sq. miles of land and 0.7 sq. miles of water within the city limits.

January temperatures range from -33°F to 33°F; July temperatures range from 42°F to 83°F. The average annual precipitation is 17 inches, with about 50 inches of snowfall.

2.2 Government

Wasilla is incorporated as a First Class City. It is within the Matanuska-Susitna Borough (MSB).

Wasilla uses a "Strong Mayor" form of government, and an elected city council. City Departments/Offices include the Mayor's Office, Economic Development, Planning, Finance, Police, Clerk's Office, Youth Court, Library, Public Works, and Museum (http://www.cityofwasilla.com/).

2.3 Past Population and Employment

The following table summarizes Wasilla and MSB population trends, taken from *Finding Meadow Lakes Draft Issues and Goals.*

Year	Wasilla	Matanuska-Susitna Borough	Municipality of Anchorage
1990	4,049	39,638	226,338
2000	5,469	59,322	260,283
2003	6,715	67,473	274,003
1990-2000 Average Annual Growth Rate (%/Year)	3.05%	4.11%	1.41%
2000 to 2003 Average Annual Growth Rate (%/Year)	7.08%	4.38%	1.73%

Table 1- Community and Region Population Trends

The 2004 population estimate for Wasilla is 6,109 (2004 State Demographer estimate from State of Alaska, Department of Commerce, Community and Economic Development, Community Database Online), which corresponds to a 2.6% annual growth rate between 2000 and 2004. MSB population estimate for 2004 is 69,400.

The 2000 census determined that the 2,443 of Wasilla residents were employed. According to the Community Database Online, about 30% of Wasilla's employed workforce commute to Anchorage, with the remainder working in Wasilla, MSB, or other locations in the state (e.g. mining and petroleum) or outside Alaska. As such, employment opportunities in Anchorage and the remainder of the MSB area are very important to Wasilla residents.

The 1990 to 2004 trends are summarized in the following table for MSB, the Municipality of Anchorage (MOA), and Wasilla.

Year	MOA- Total Employment [1]	MSB- Total Employment [1]	Wasilla- Residents Employed [2]
1990	111,400	7,200	1,939
1991	112,500	8,050	
1992	113,800	8,500	
1993	117,500	8,900	
1994	120,100	9,950	
1995	120,500	10,200	
1996	121,100	10,550	
1997	123,900	11,450	
1998	128,700	12,050	
1999	131,100	12,350	
2000	134,400	12,900	2,758
2001	138,200	13,350	
2002	140,800	14,450	
2003	142,300	15,600	
2004	144,400	16,300	
1990 to 2000 Average Annual Growth Rate	1.89%	6.00%	3.59%
2000 to 2004 Average Annual Growth Rate	1.81%	6.02%	-

[1] MOA and MSB Data from Alaska Department of Labor and Workforce Development http://almis.labor.state.ak.us/cgi/dataanalysis/?PAGEID=94&SUBID=228
[2] Wasilla 1990 and 2000 Census from:
http://www.labor.state.ak.us/research/cgin/cenmaps/cas/mat.htm

Table 2- Population and Employment Trends for Wasilla, Matanuska-Susitna Borough and the Municipality of Anchorage, 1990 to 2004

2.4 Population and Employment Forecasts

UAA's Institute of Social and Economic Research recently completed the *Economic Projections for Alaska and the Southern Railbelt*, part of which forecasted population and employment for the MSB and MOA to 2030, which is summarized in the following table.

	2030 MSB Employment	2030 MSB Population	2030 MOA Employment	2030 MOA Population
2030 Forecasts	39,100	156,300	181,100	373,300
2000 to 2030 Forecasted Average Annual Growth Rate (%/Year) for Employment and Population (*Computed from corresponding 2000 values in Tables 1 and 2)*	3.6%	3.3%	1.0%	1.2%

Table 3- Population and Employment Forecasts for Matanuska-Susitna Borough and the Municipality of Anchorage, 2030, from *Economic Projections for Alaska and the Southern Railbelt*

Forecasts for the City of Wasilla are unavailable. However, for purposes of planning modeling, the Wasilla population and employment trends are assumed to be the same as the MSB.

2.5 Economy

The following table summarizes key economic parameters for the Wasilla area.

Economic Parameter	2000 Census	1990 Census	Annual Change (%/Year)
Per Capita Income	$21,127	$15,764	3.0%
Median Household Income	$48,226	$37,619	2.5%
Median Family Income	$53,792	$40,685	2.8%
Total Housing Units	2,119	1,723	2.1%
Occupied Housing (Households)	1,979	1,410	3.4%
Vacancy (%)	6.6%	18.2%	-9.6%

Table 4- Key Economic Parameters

The City of Wasilla and the surrounding area experienced rapid economic growth with an influx of nationwide retail chains and independent small businesses. As such, the local economy is becoming more and more diversified, and people hold employment in a variety of government, retail, and professional service positions within the MSB and in Anchorage. Tourism is a major business segment and employer, and there are agriculture opportunities as well. Construction materials that are produced locally include wood, aggregate, and concrete. About 120 area residents hold commercial fishing permits. Wasilla is the home of the Iditarod Trail Committee and Iron Dog Race.

2.6 Land Use

Figure 6 portrays area zoning. This figure was downloaded from the City of Wasilla website http://www.cityofwasilla.com/planning/ .

2.7 Transportation Network (Maps)

Figure 7, shows the street system for the Wasilla Area. This figure was downloaded from the City of Wasilla website http://www.cityofwasilla.com/planning/ .

2.7.1 Current AADT

Figure 8, shows the 2003 Average Annual Daily Traffic (AADT) for the study area. The 2003 volumes were the most recent available at the time of the work was initiated. This figure was download from the State of Alaska Department of Transportation and Public Facilities website http://www.dot.state.ak.us/stwdplng/highwaydata/traffic.shtml#traffic_maps .

2.7.2 Turning Movement Volumes

Current turning movements for several key generators and intersections were performed by the project team, or collected from ADOT&PF to support modeling and analysis. These are attached under Appendix A.

2.7.3 Intersection Control

Figure 2 depicts the current intersection control for the CBD area.

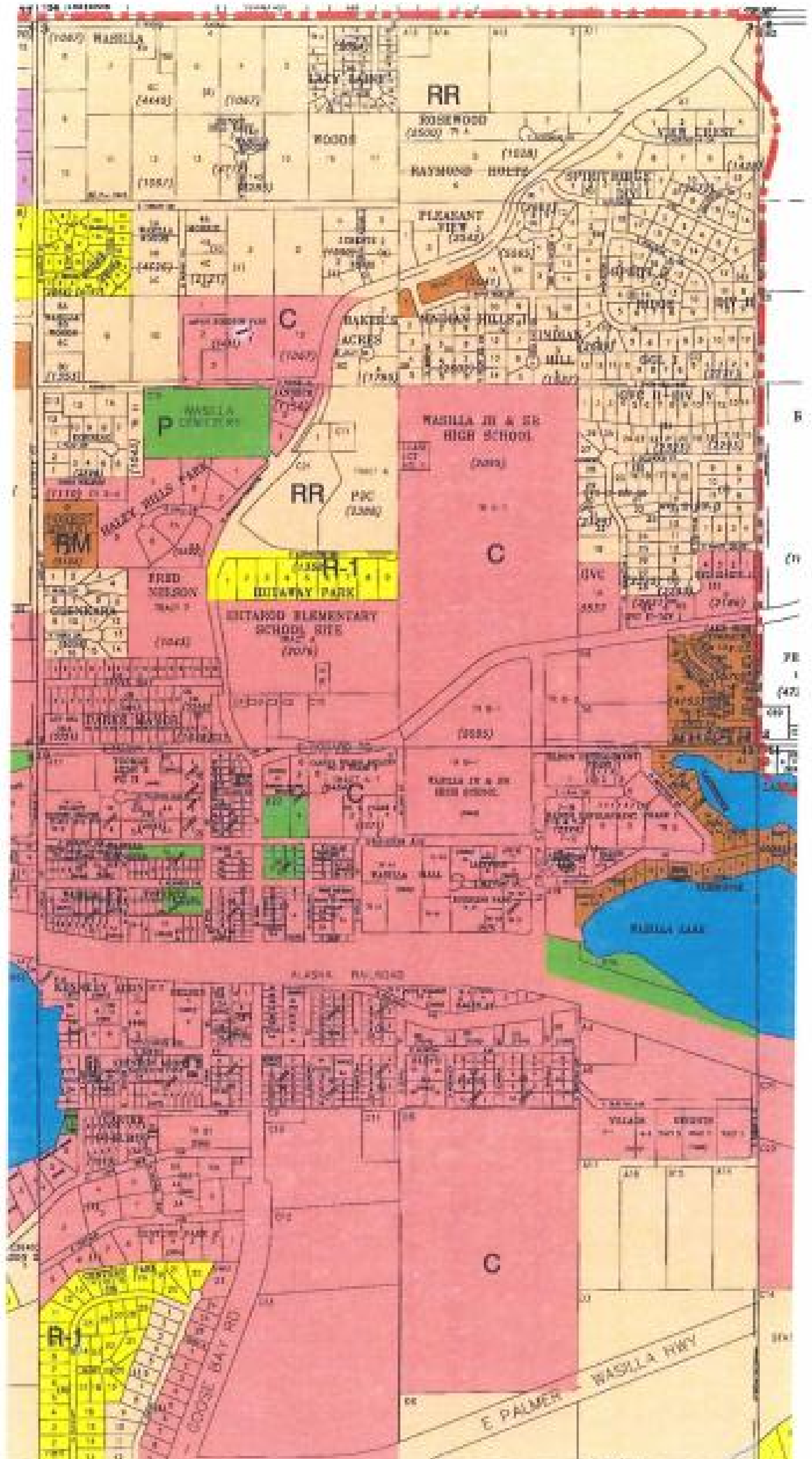


Figure 6- Main Street Study Area Zoning

Zoning Key

- RURAL RESIDENTIAL — RR
- COMMERCIAL — C
- RESIDENTIAL — R2
- MULTI-FAMILY RESIDENTIAL — RM
- PUBLIC — P
- INDUSTRIAL — I
- SINGLE-FAMILY RESIDENTIAL — R1

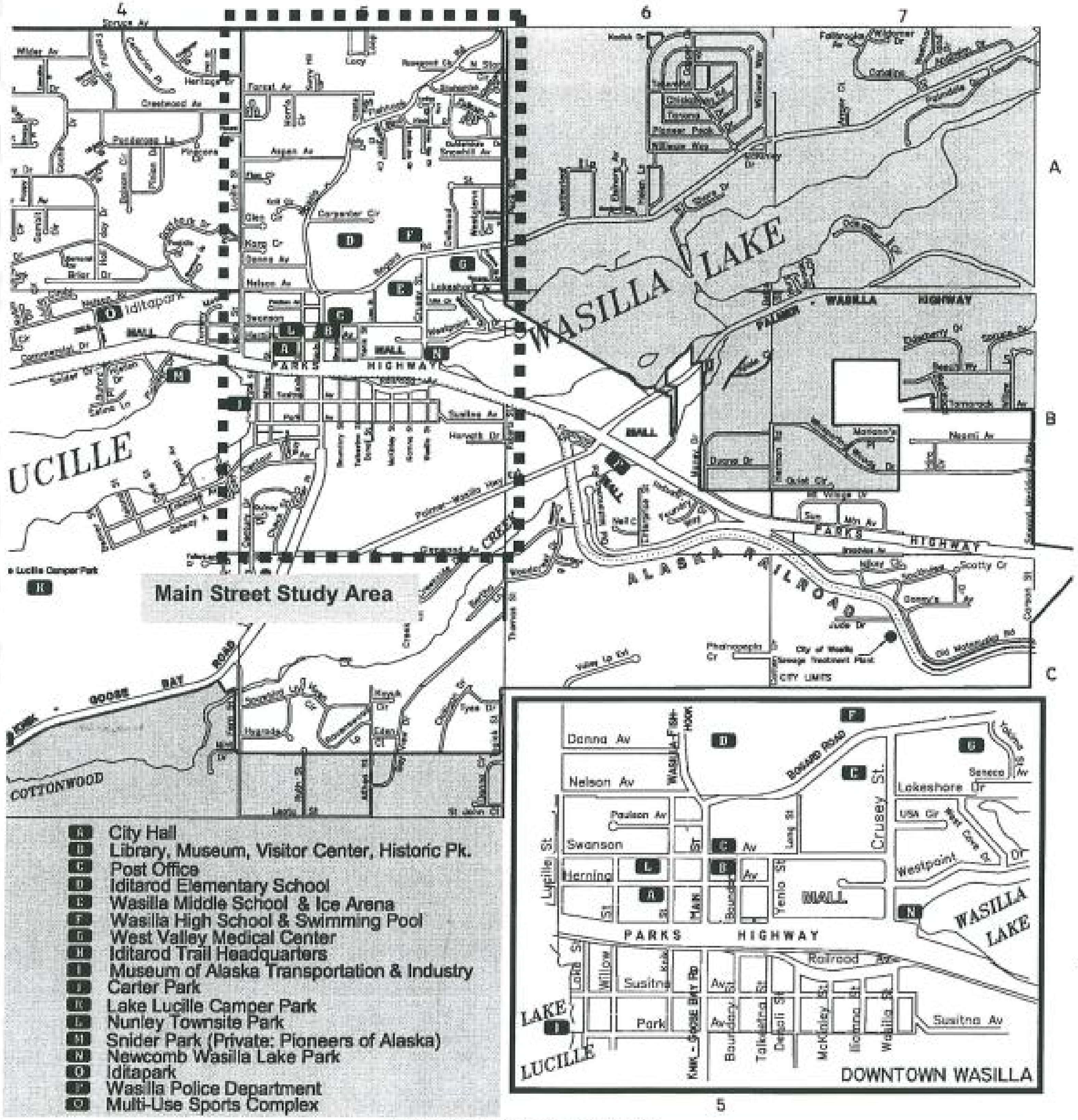


Figure 7- Wasilla Streets

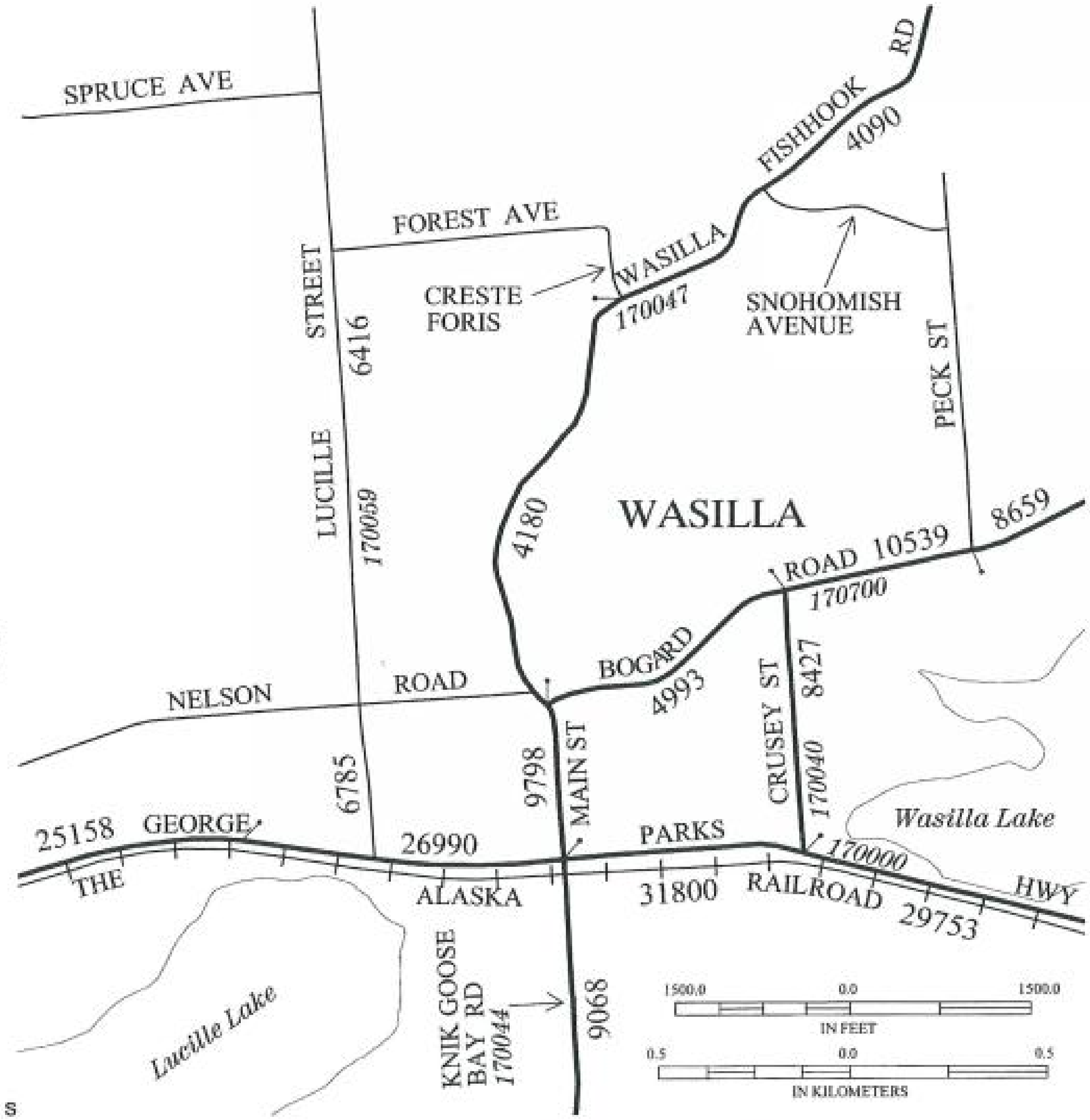


Figure 8- Main Street Study Area 2003 Average Annual Daily Traffic

2.7.4 *Functional Class*

The following table summarizes ADOT&PF owned roadways within the study area; and their corresponding functional classification (from the *Central Region Traffic Volume Report* and CDS log). Also, the *MSB Long Range Transportation Plan* has functional classifications for roads and streets in the borough boundaries. These classifications are shown in the table as well.

Street	ADOT&PF Functional Class	MSB LRTP Functional Classification
Parks Highway	Rural Interstate	Interstate
Palmer-Wasilla Highway	Rural Minor Arterial	Principal Arterial
Knik-Goose Bay Road	Rural Major Collector	Minor Arterial
Wasilla Fishhook Road	Rural Major Collector	Minor Arterial
Bogard Road	Rural Major Collector	Major Collector
Crusey Street	Rural Major Collector	Major Collector
Susitna Avenue	Rural Local Road	
Fred Nelson Road	Rural Local Road	Minor Collector
Knik Street	Rural Local Road	
Herning Avenue	Rural Local Road	
Lucille Street	Rural Minor Collector	Major Collector
Peck Street	Rural Local Road	Minor Collector

Table 5- Study Area Street Functional Classifications

2.8 Rail

The Alaska Railroad Corporation (ARRC) is a key part of the Alaskan multi-modal transportation system, linking ports and communities from the Gulf of Alaska to Fairbanks, see Figure 9. ARRC moves freight, passengers, gravel, and fuel that are important to the State economy.

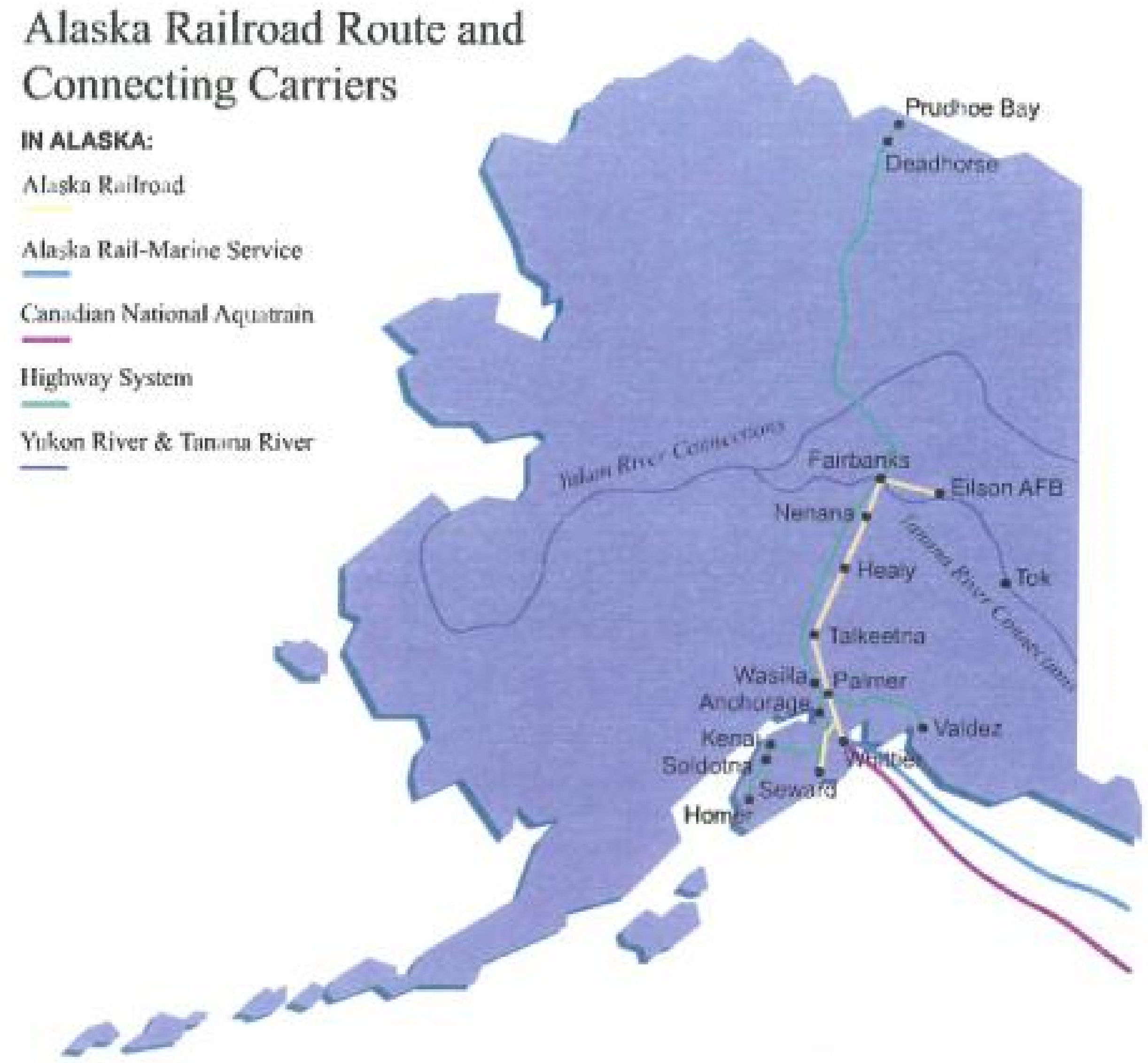


Figure 9- Alaska Railroad Routes and Connections

Currently, the railroad within the Wasilla core area consists of a single track. The railroad curve just east of the city center was re-aligned in 2005 to provide a higher allowable track speed. Previously the track speed was 30 mph for northbound trains and 49 mph for southbound trains. The allowable track speed is now 49 mph in both directions.

An average of 10 trains per day travel through Wasilla during the summer. These trains carry passengers, gravel, petro-chemicals, and freight. On a single day during the peak of the summer, more than 20 trains can pass through Wasilla. The trains are scheduled roughly 2 to 4 hours apart day and night. Passenger and gravel trains operate primarily during the summer months. During the winter, one passenger train travels round trip between Anchorage and Fairbanks, traveling northbound on Saturday, and southbound on Sunday.

During the past five years, freight revenue has increased at a 4.5% annual rate, with passenger revenue increasing at a 5.5% rate. Over the next 20 years, the rail traffic is expected to grow by approximately 5% annually, increasing the number of trains by 250%. It is anticipated that the number of gravel trains traveling through Wasilla will increase, due to the depletion of gravel pits in the Palmer area, and the development of additional gravel pits west of Wasilla. A new gravel train service for Quality Asphalt began in early summer 2004 and is adding more traffic through Wasilla. Coal trains do not currently operate between the Usibelli Coal Mine in Healy and Seward because there are no contracts to purchase coal, due to economic conditions. It is anticipated that up to one coal train per day may operate in the future, if and when a customer is identified.

The Alaska Railroad, in conjunction with Mat-Su Community Transit (MASCOT) is planning to develop a number of inter-modal stations in the Wasilla vicinity to facilitate commuter service between Wasilla and Anchorage. Proposed station locations include Mack Road, Knik-Goose Bay Road, Palmer-Wasilla Highway, and Seward Meridian Road.

2.9 Pedestrian and Bicycles

Several pedestrian and bicycle pathways have been constructed in the Wasilla area by the City of Wasilla and the ADOT&PF. See Figure 10 for locations of existing and planned pathways and transit routes.

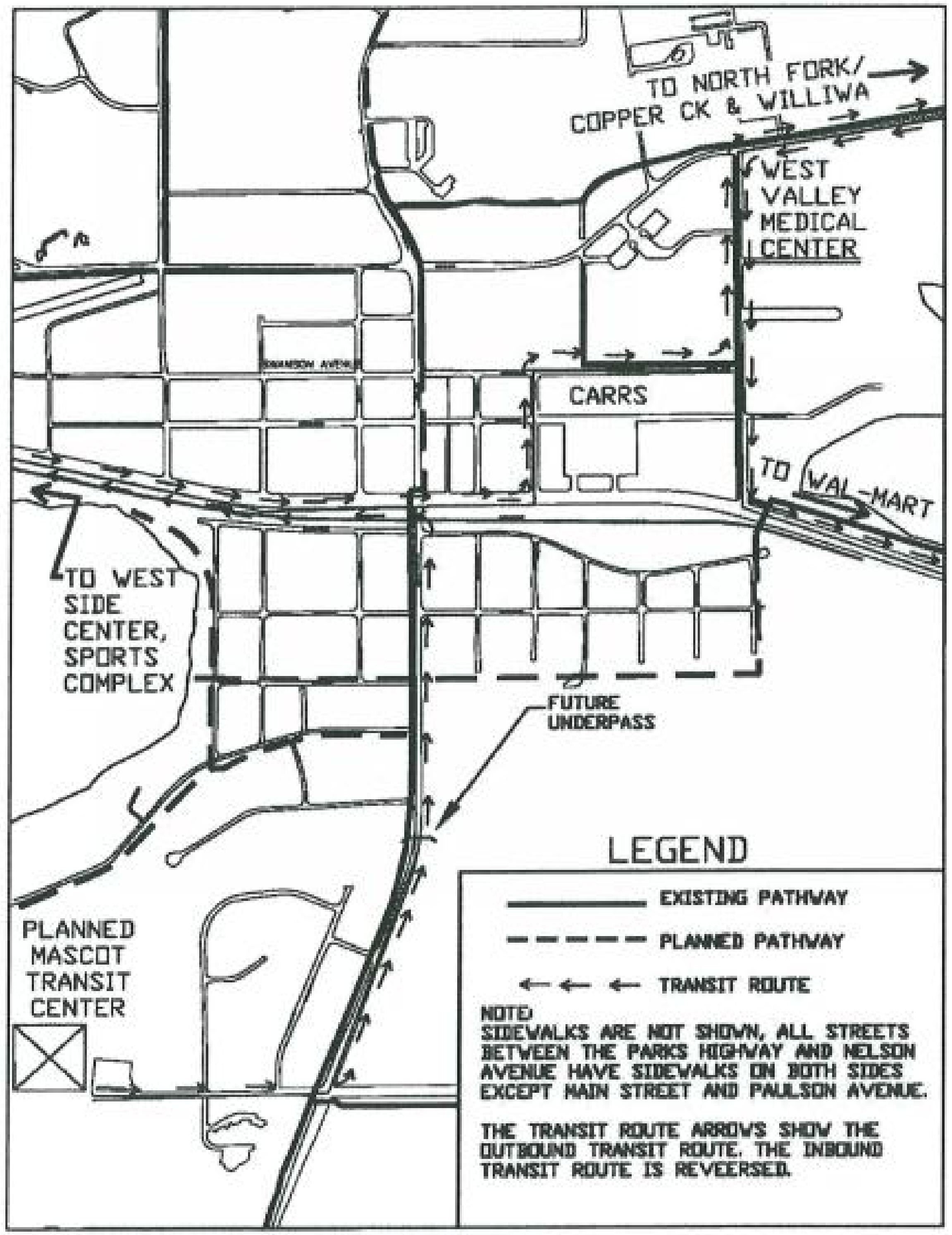


Figure 10- Pathway and Transit Routes

3 Transportation Demand Modeling

This section discusses demand modeling. Section 3.1 presents the results of the MSB demand model that is associated with the Long Range Transportation Plan. Section 3.2 focuses on the development and results of the city area model, which is a more detailed analysis than the MSB model. Section 3.3 reconciles differences between the more detailed City model and the larger and less detailed MSB model.

Since this modeling work was completed, the MSB abandoned their QRSII model (discussed below), and as a part of their update to the Long Range Transportation Plan, converted the MSB model to a Transcad Platform. The new MSB model used different centroid assumptions than the QRSII (quick Response System II by AJH and Associates) and consequently link volumes in the study area are different for some corridors. However, the MSB Transcad based Main Street corridor volumes agree reasonably well with the previous MSB QRSII based model. It was therefore decided to forego revisions to the Main Street model, recognizing that the boundary conditions do not reflect the latest Borough model, but they do provide for a sufficient relative evaluation of alternatives.

3.1 MSB Transportation Study Model

Figures 11, 12, and 13, show the 2025 AADT volumes with and without a Parks Highway alternative corridor that were forecast by the 2005 Mat-Su Borough traffic model. All assumed alternate corridors would be located south of the project area, and differ in their eastern terminus.

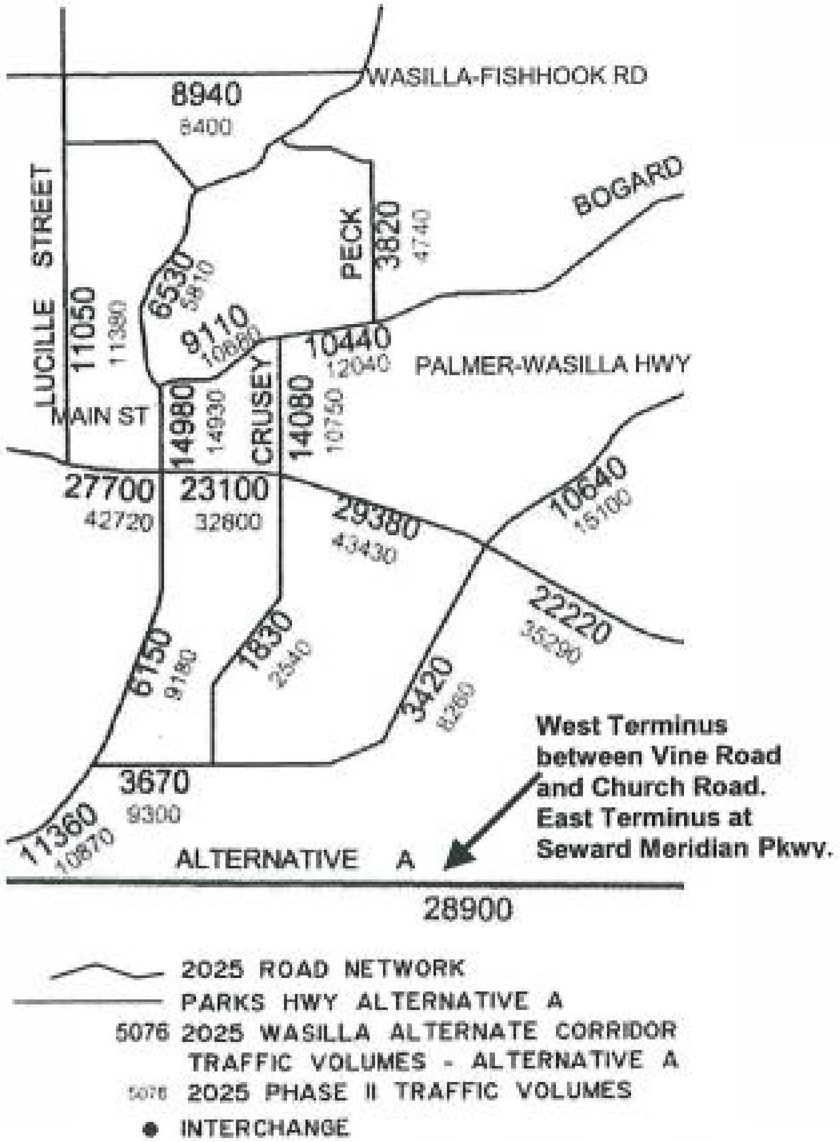


Figure 11- MSB Transportation Study, Alternative A Parks Highway Alternate Corridor

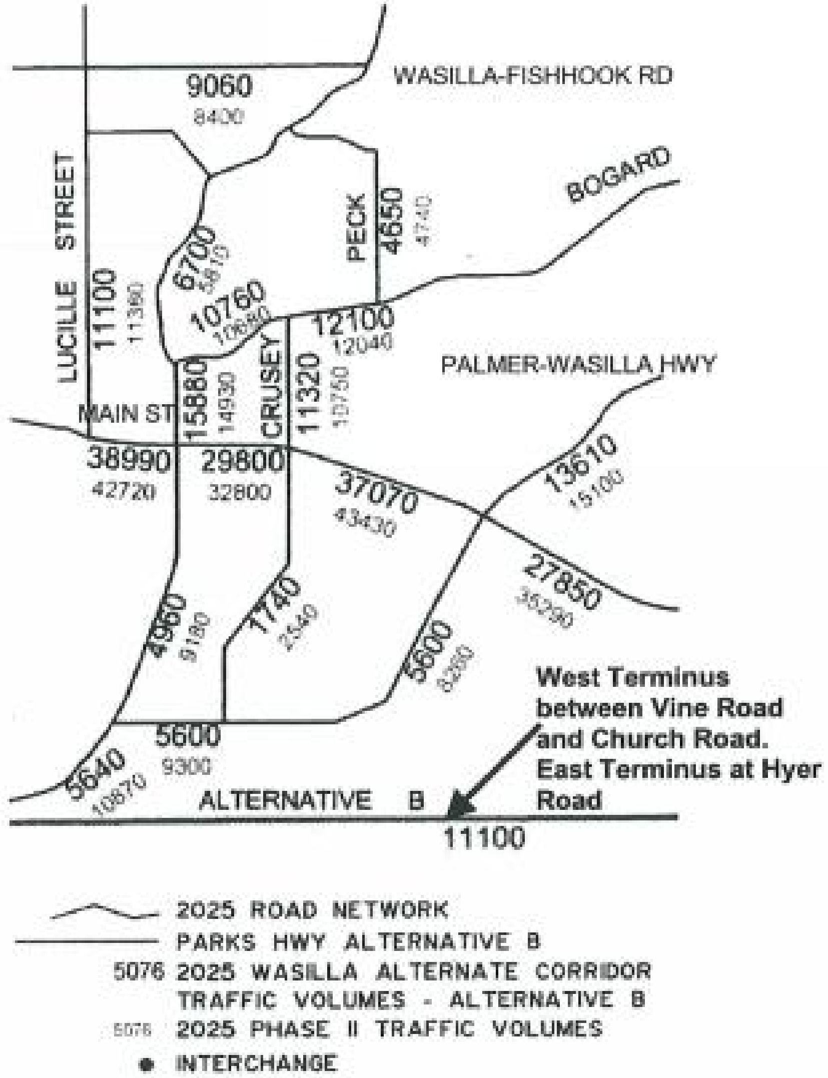


Figure 12- MSB Transportation Study, Alternative B Parks Highway Alternate Corridor

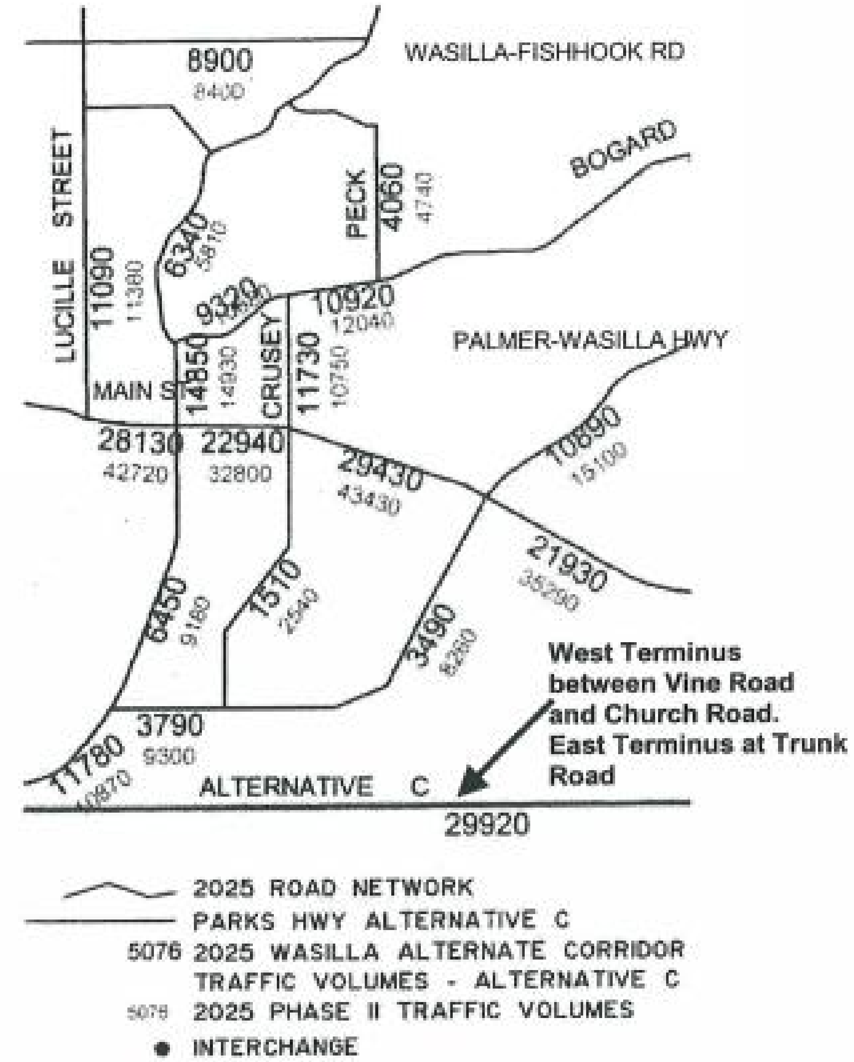


Figure 13- MSB Transportation Study, Alternative C Parks Highway Alternate Corridor

3.2 Detailed City Model - Study Area within Larger Regional Model

3.2.1.1 Methodology

The 2000 QRSII model developed for the 2000 ADOT&PF Wasilla-Fishhook Road Rehabilitation project was the basis for the current Main Street QRSII model. The 2000 WFR model was converted to a detailed schema, which allows more detail in defining intersection control. The current model inputs for housing and employees were updated with year 2000 census and economic data unavailable for the earlier study. The revised model was then recalibrated to ADOT&PF historic ADTs.

The current model accounts for three schools and the post office contained within the downtown area of Wasilla as special generators. Vehicle trips for the four special generators were calculated separately and assigned to a trip table to more closely represent the traffic generated by those sites. Inputs for the external stations, or boundaries of the Main Street model were taken from the ADOT&PF ADT link counts published in the ADOT&PF Central Regions Traffic Report. The external station volumes were reduced by the estimated 30% of trips to and from the Anchorage area, and those Anchorage trips were also assigned to the trip table. Trip tables were developed for both a 24-hour day and a pm peak hour.

3.2.1.2 2025 Committed Street Improvements

Committed street improvements for the 2025 model included an upgrade of Crusey Street to four lanes with a center two way left turn lane from the Parks Highway north to Bogard Road, addition of the Palmer-Wasilla Extension from KGB Road to the Parks Highway, addition of the Yenlo Square development; and signals at Lucille St. and the Parks Highway, Lucille and Nelson, and at Home Depot on the Palmer Wasilla Extension. Other committed street improvements for the MSB fall outside the Main Street model boundaries, but their effect is seen in the Borough model link volumes used for the Main Street model boundary inputs.

3.2.1.3 2025 Development

Housing and employment inputs for the 2025 Main Street model were developed by increasing the year 2000 housing and employment inputs using the economic forecast data (see Table 3), and then checked against the same inputs of the Borough model for 2025. Overall agreement was good between the Borough inputs and the smaller Main Street model inputs, when adjusted for the special generators. Some new centroids were added to represent new construction as reflected in issued building permits, such as the Home Depot, and some residential complexes. Trips for the special generators were kept the same except for the post office, where trips were increased 50% to reflect increased population. The special generator trips were again assigned in a trip table. External station volumes were taken from the 2025 Borough model, and 30% of those trips again assigned through the trip table.

3.2.1.4 Calibration

Calibration of the 2000 Main Street model consisted of adjusting the QRSII default trip production table and the splits between productions and attractions at the external stations until the model trips matched ADOT&PF counts within allowable deviation limits per roadway classification. The model link volumes for major roadways in the model were averaged and divided by the average of ADOT&PF counts for the same links. FHWA has recommended error limits based on functional classification as follows:

Freeways:	±7%;
Principal Arterials:	±10;
Minor Arterials:	±15%;
Collectors:	±25%; and
Frontage Roads:	±25%.

ADOT&PF counts are taken at single points on any given roadway, and therefore the average ADOT&PF volume for Main Street, for example, depends on a single count, whereas in reality, the volumes on Main Street may vary from block to block. In the Main Street model, the volumes on Main Street vary from link to link, due to centroids and side streets adding and subtracting traffic.

The average volume on Main Street is the sum of volumes on all seven links of Main Street, divided by the number of links. On a roadway like Main Street, with many generators including the post office, the calculated deviation between ADOT&PF volumes and model volumes may be greatly affected simply by the location of the ADOT&PF count.

Calibration results for major roadways in the 2000 model are listed in the following table, along with allowable % deviation. Except for Crusey and Main Street, model/ADOT deviations fall within acceptable tolerances. Total trip deviation from ADOT&PF counts for these selected roadways was 0.0% (calculated as a weighted average).

Street	Model Link ADT (Link Average)	Actual 2000 ADT *(Central Region Traffic Volume Report)*	Model Deviation	Recommended Deviation
Bogard Road	8641	7222	19.6%	±25%
Crusey Street	9124	7220	26.4%	±25%
Fishhook Road	4216	4102	2.8%	±15%
Goose Bay Road	10787	12590	-14.3%	±15%
Lucille Street	8213	7066	16.2%	±25%
Main Street	7158	8650	-17.2%	±15%
Palmer-Wasilla Hwy Extension	11866	11820	0.4%	±10%
Parks Hwy	22457	23490	-5.4%	±7%

Table 6-Year 2000 Selected Roadway Calibration Results

3.2.2 *Results*

3.2.2.1 2025 Existing and Committed Model Results, No Alternate Parks Highway Corridor

The following figure presents 2025 detailed city model without a Parks Highway alternate corridor for the Parks Highway. This model includes the existing and committed street network and no other system improvements. Consequently, the model is representative of the No-build Alternative and the Alternative A street network discussed under Section 1.4.

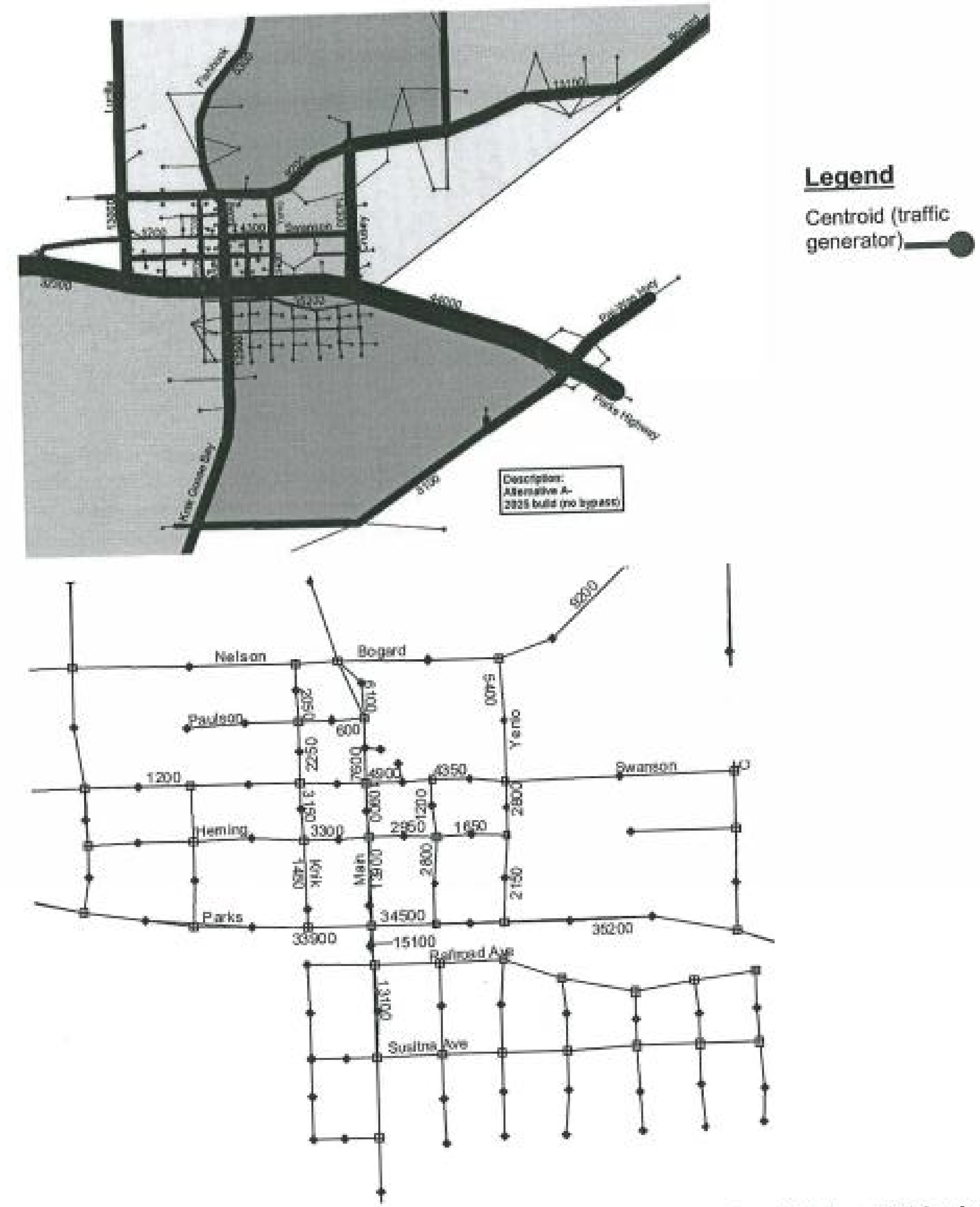
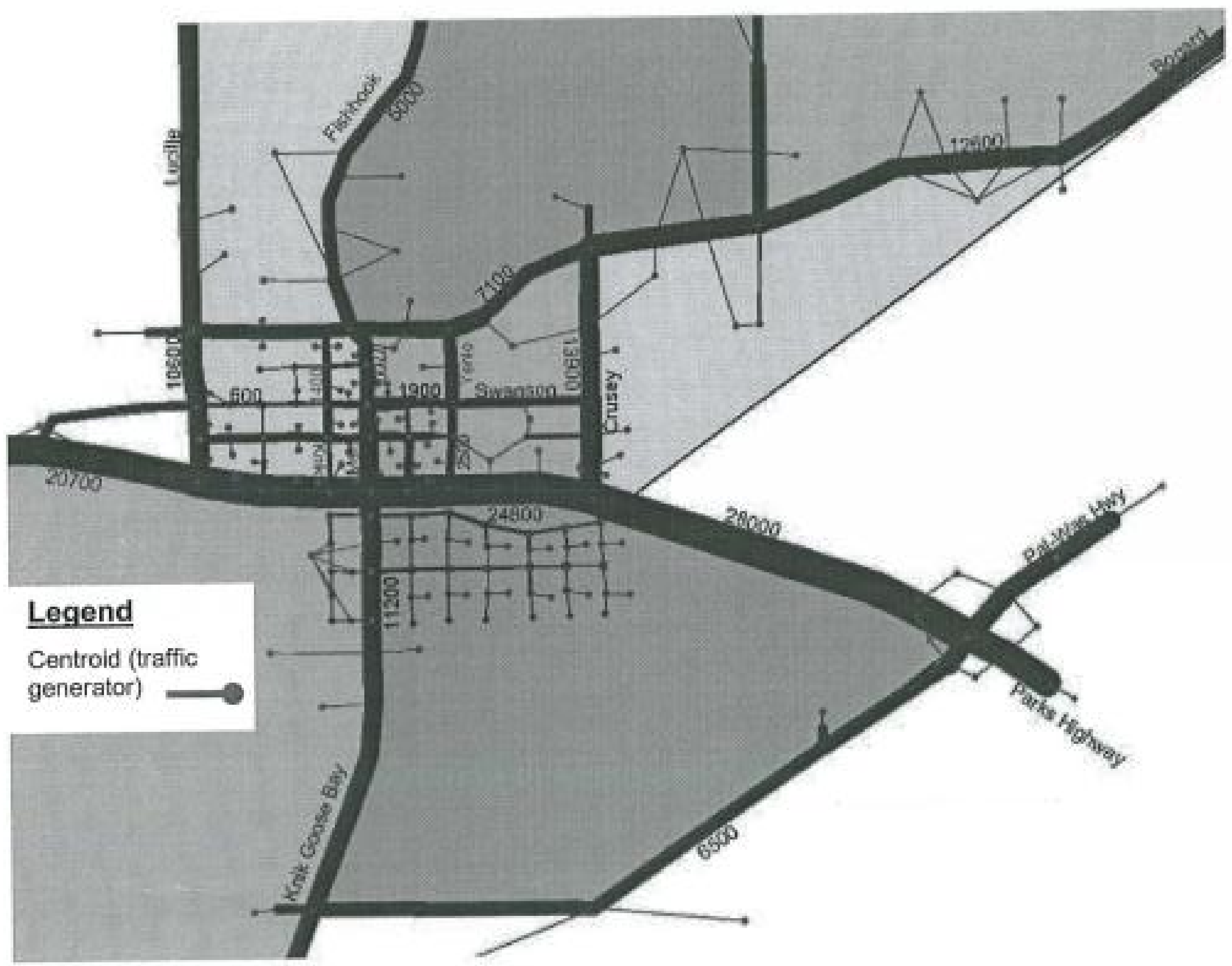


Figure 14- 2025 AADT for Existing No-Build and Alternative A 3-lane Widening, No Parks Highway Alternate Corridor (QRS II model output)

3.2.2.2 2025 Existing and Committed Model Results, Alternate Parks Highway Corridor

The following figure presents the 2025 detailed city model with the Parks Highway alternate corridor for the Parks Highway. This model includes the committed street network, the alternate corridor, but includes no other system improvements. The model is representative of the No-build and Alternative A street network discussed under Section 1.4 above, if the Parks Highway alternative corridor were in place.



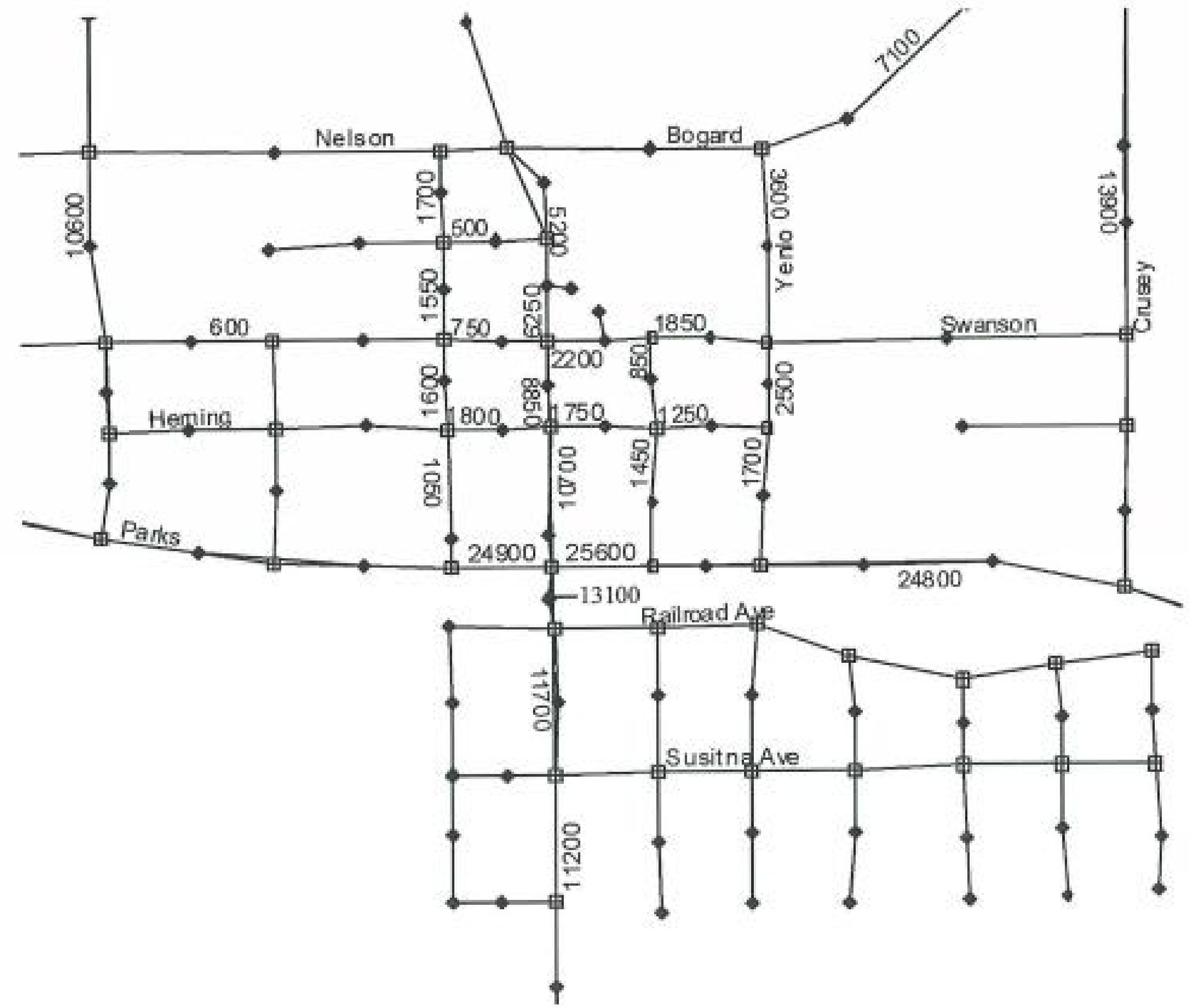


Figure 15- 2025 AADT for Existing No-Build and Alternative A 3-lane Widening, with Parks Highway Alternate Corridor (QRS II model output)

3.3 Comparison of the City Model to the MSB Model

The following table presents a link-by-link comparison of the city model and MSB model for the major streets within the study area.

Corridor Links				2025 Main St. Model		
Segment Begin	**Segment End**	**2003 AADT**	**2025 MSB Model**	**Average Link ADT**	**High Segment Value In Link**	**Low Segment Value In Link**
Parks Highway						
East of Crusey St.	Crusey St.	29,753	43,430	45,119		
Crusey St.	Knik Goose Bay - Main St	31,800	32,800	35,148	36,029	34,494
Knik Goose Bay - Main St	Lucille Street	26,900	42,720	33,956	34,240	32,441
Crusey St.						
Parks Highway	Bogard Road	8,427	10,750	14,313	17,060	11,438
Bogard Road-Nelson Road						
Peck St.	Crusey St.	10,539	12,044	16,237	17,226	15,342
Crusey St.	Main St.	4,993	10,680	9,260	10,333	8,575
Main St.	Lucille Street			7,658	8,009	7,378
Lucille Street						
Parks Highway	Forest Ave.	6,601	11,380	12,435	14,206	10,768
Knik Goose Bay Rd. - Main St. - Wasilla Fishhook Road						
South of Glenwood Ave.	Glenwood Ave.	12,933	10,870	9,827		
Glenwood Ave.	Parks Highway	9,068	9,180	12,551	15,022	10,790
Parks Highway	Bogard Road	9,798	14,930	9,577	14,614	5,556
Bogard Road	Creste Foris St.	4,180	5,810	5,411	6,880	4,883
Palmer-Wasilla Hwy Extension						
Parks Highway	Crusey St. (Extension)		8,260	8,941	12,433	5,570
Crusey St. (Extension)	Knik Goose Bay Road		9,300	5,459		
Sum of Link ADT Volumes			**222,154**	**225,894**		

Table 7- 2003 AADT and 2025 MSB and City Models

The table demonstrates some wide differences between the two models for some of the selected links, while others are within accepted tolerances. The explanation for these differences is believed to largely be due to the difference in the model scopes and uses. Consider the MSB network model in the study area, as shown in the following figure.

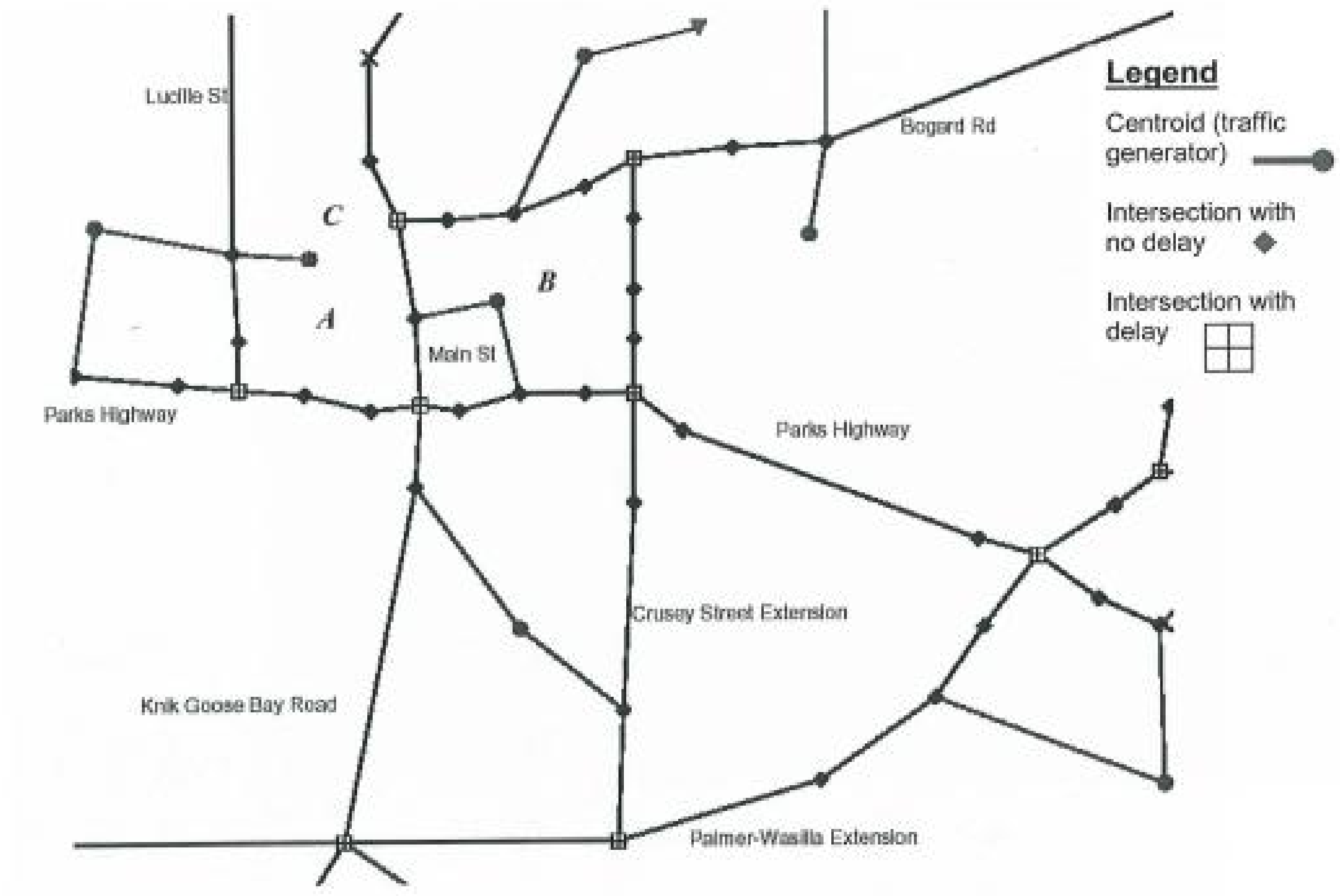


Figure 16- MSB Model in the Project Study Area

Comparing the MSB Model in Figure 16 to the city model shown in Figure 14, there are some differences. The MSB model only depicts the arterial and collector network, whereas the city model presents local streets as well as connection of unique special generators. Also, the MSB model includes an extension of Crusey Street to the south of the Parks Highway to connect with the Palmer-Wasilla Extension, although the MSB model forecasts a relatively low volume for this segment (about 2,500 ADT), and therefore may not be a significant contributing factor to the differences between the models.

There are other, more specific differences in the models, annotated in Figure 16 by the letters *A*, *B*, and *C*.

- *A*: This area in the MSB model is represented by one centroid that is connected to Lucille Street. In contrast, the city model has 24 centroids, connecting to the local streets in the area, which in turn connect to both Lucille and Main streets.
- *B*: One centroid in the MSB model is represented in the city model by 18 centroids. The MSB model directs all traffic to Main Street and Park Highway, whereas the development in the city model also connects to Bogard Road and Crusey Street either directly or through the local street network.
- *C*: The MSB model does not show the Fred Nelson Road link between Main and Lucille streets. The city model includes this link and forecasts about 7,400 to 8,000 ADT.

Notes for A and C may partially explain one of most significant model differences for Parks Highway segment between Main Street and Lucille Street (MSB: 42,700 vs. city: 34,000). The MSB model access to area A is practically limited to the Parks Highway, where the city model distributes the site-generated traffic to Main Street and Bogard Road as well. The Crusey Street difference (MSB: 10,700 vs. city: 14,300) may be explained by the city model connections to Crusey. Other differences may be explained on a case-by-case evaluation as demonstrated above.

The sum of link ADTs are shown in Table 7. The MSB model links total 222,000 vehicles daily, and the comparable city model links sum to 226,000, a difference of 1.8%, which is not a significant difference for a model forecast 20 years hence. As such, while there are significant link differences between the models because of the city model's ability to distribute traffic in an expanded network, the model aggregate volumes agree overall.

4 Safety Issues Within Main Street Corridor

4.1 Nominal-Compliance with Design Standards and Policy

Main Street and Knik-Goose Bay Road were analyzed as collectors, using 25 m.p.h. for the design speed between Bogard Road and the Parks Highway, 35 m.p.h. between the Parks Highway and E. Centaur Avenue, and 45 m.p.h. for the design speed between E. Centaur Avenue and the Palmer-Wasilla Highway. These design speeds are based upon current posted speeds, rather than speeds recommended in the PGDHS. Sight distances from the stop-controlled approaches of existing intersections along the corridor provide stopping sight distance, based on the posted speed of the adjacent uncontrolled approach although the sight distances at the Swanson Avenue and Herning Avenue intersections do not greatly exceed the stopping sight distance.

Existing pedestrian facilities are limited to a short section of sidewalk at the Main Street-Parks Highway intersection, and a section of pathway on the east side of Main Street between Swanson Avenue and Bogard Road. A pathway abutting the west shoulder of Knik-Goose Bay Road between Enter Way and Railroad Avenue was built in 2004.

The PCM does not contain specific guidance for the design of pedestrian facilities, but does reference the PGDHS. The PGDHS suggests that sidewalks should generally be provided on both sides of roads without a shoulder, or on high-speed facilities with a shoulder. Common design practice would provide sidewalks within the urban areas of the Main Street and KGB corridor and a pathway or shoulders in rural locations. The existing facilities do not provide pedestrian continuity, which would be a goal included in any Alternative selected for design. In addition to the lack of pedestrian continuity, there are no curb ramps at the Swanson Avenue intersection, and the sidewalks and curb ramps on the east side of the Parks Highway intersection are in disrepair and are not suitable for wheel chairs.

The PCM does contain guidance for the design of bicycle facilities. Bicycle facilities are not required, but should be considered for rehabilitation projects. For an existing facility, bicycle facilities are not required but they would likely be included in the preferred Alternative selected for design regardless of whether the project is classified as rehabilitation or new construction. As with the pedestrian facilities, the lack of continuity is the most notable existing shortcoming. The Alternatives under study provide for Group A bicyclists with an outside urban lane width of 14' to the lip of curb and shoulder in rural areas. An exception is Alternative D from Swanson Avenue to Bogard Road, where the Yenlo Square development is expected to constrain the improvements and narrow the curb lane widths.

Driveways that do not comply with the Driveway Standards section of the PCM are summarized in the following table:

Driveway Location	Driveway Non-Compliance
310' N. of Swanson Ave., east side. (Post office service driveway)	No landing.
60' N. of Swanson Ave., east side. (Post office driveway)	45' corner clearance, PCM section 1160 requires 150'. (Hourly volume between 100 and 200 vph)
15' N. of Herning Ave., east side	15' corner clearance, PCM section 1160 requires 50'.
50' S. of Railroad Ave., east side	30' corner clearance, PCM section 1160 requires 60'.

Table 8 – Non-complying Driveways

Current new construction standards require a 16 foot clear zone for Main Street and Knik-Goose Bay Road in the 25 and 35 mph segments, except where curb and gutter exists the clear zone is reduced to 1.5 feet beyond the face of curb. For urban collectors, the PGDHS recommends that where shoulders are provided, that they be 8 feet wide where traffic volumes exceed 2000 vehicles per day or greater. However, common design practice does not ordinarily provide shoulders this wide in urban areas. Features that do not comply with the current new construction standards along the Main Street corridor are summarized in the following table:

SEGMENT	FEATURE	DISTANCE FROM TRAVEL WAY	CURB PRESENT?	CLEAR ZONE	SHOULDER WIDTH
Paulson Ave. to Bogard Rd.	Short non traversable ditch, east side, 125' S. of Bogard Rd.	7'	N	16'	6'
Swanson Ave. to Paulson Ave.	Wood utility pole across from Paulson Ave., east side.	14.2'	N	16'	6'
	Wood utility pole, 50' N. of Swanson Ave., east side.	13.6'	N	16'	6'
Herning Ave. to Swanson Ave.	Wood utility pole, 120' N. of Herning Ave., east side.	12'	N	16'	6'
	Museum sign, 160' N. of Herning Ave., east side.	8'	N	16'	6' (1' in front of Museum)
Parks Hwy. to Herning Ave.	Wood utility pole, 30' S. of Herning Ave., east side.	10'	N	16'	6'
	Wood utility pole, 70' S. of Herning Ave., east side.	11'	N	16'	6'
	Wood utility pole, 250' N. of Parks Hwy., east side.	10'	N	16'	6'
Railroad Ave. to Parks Hwy.	Railroad gate vertical support, both sides.	5'	N	16	6'
Centaur Ave. to Park Ave.	No features in clear zone, shoulder width less than 8'.	N/A	N	16'	7' (East) 16' (West)

Table 9 – Existing Non-Complying Features

In addition to features listed above, there are luminaires within the Main Street clear zone near the Parks Highway, but these structures have frangible coupling bases and are therefore considered compliant with current design standards.

4.2 Substantive- 10 Year Crash Frequency and Rate Analysis

ADOT&PF provided ten years (1992 to 2001) of crash history for the intersections within the study area. Intersection crash rates were computed and compared to a population of similar intersections.

The following table summarizes the crash totals and intersection crash rates, crashes per million entering vehicles (Crash/MEV) for the project intersections during the study period. The table also indicates those intersections that have accident rates that exceed the average rates for similar intersections. The table lists the upper control limit (UCL) rate that is computed using the Rate Quality Control Method, expressing the degree of certainty that a location has a high accident rate. The 95% confidence level for the upper control limit is usually a threshold used to determine if an intersection has an accident rate that is truly higher than other similar intersections.

4.3 Perceived Safety Issues Raised by Government and Public

In 2004, the Wasilla City Engineer expressed a concern with pedestrians crossing the Parks Highway at Main Street, and in general, the need for pedestrians living south of the Parks Highway to walk to the retail areas on the north side of the Parks Highway. He noted that there would be a pathway built with the Knik-Goose Bay Road upgrades, but wants to see these pathways connect to similar facilities on the north side of the Parks Highway.

In 2005, an engineer with the Mat-Su School District transportation section was interviewed. He noted that the Knik-Goose Bay Road railroad crossing and the Parks Highway are too close together, although he mentioned no accidents resulting from this.

4.4 Safety Issues Raised by Emergency Responders

In 2004, the MSB Fire Chief expressed concerns about emergency response vehicles access to the Parks Highway and Knik-Goose Bay Road from the Fire Station at the corner of Lucille and Swanson. He raised concerns regarding sight distance and left turns onto the Parks Highway, as well as congestion at the Parks Highway intersection. The buildings at the northwest and northeast corners of the intersection limit the sight distance. They get about 1000 calls per year requiring emergency response vehicles to travel Knik-Goose Bay Road and 150-200 are fire calls. He mentioned that 5 to 10 times a year southbound emergency response vehicles traveling to Knik-Goose Bay Road are blocked by passing trains. He said that installing opticom systems on the traffic signals would help so that they could change the green lights and red lights as needed to help clear the intersections. He said the Parks-Main St intersection is where most of the injury accidents occur along the Main St. corridor. When asked about accidents that involve pedestrians, he said there is 'nothing that raises a red flag'.

In July 2006, the Mat-Su Fire Chief noted the following in an email, " ...The primary concern is to eliminate the at-grade railroad crossing which, in terms of public and community safety, is one of the most significant man-made target hazards in Wasilla...."

In 2005, a Wasilla Police Officer was interviewed. He noted the problems with congestion and driver frustration, but did not see any safety issues relating to engineering aspects of the existing road system. Because of the location of the Police Station near the intersection of the Palmer-Wasilla Highway and the Parks Highway, the Police do not have a material problem responding to calls.

Intersection	Crashes	Crash/MEV	Comparative Population	Above Average?	UCL @ 95.00% Confidence	Is Rate >UCL (Significant)?
Knik-Goose Bay Road and Glenwood Avenue	26	0.599	0.785	No	-	
Knik-Goose Bay Road and Enter Way	7	0.174	0.589	No	-	
Knik/Goose Bay Road and Centaur Street	3	0.074	0.589	No	-	
Knik-Goose Bay Road and Lakeview Drive	1	0.025	0.589	No	-	
Knik-Goose Bay Road and Park Avenue	2	0.050	0.785	No	-	
Knik-Goose Bay Road and Susitna Avenue	3	0.073	0.785	No	-	
Knik-Goose Bay Road and Railroad Avenue	26	0.645	0.785	No	-	
Knik-Goose Bay Road / Wasilla Fishhook Road / Parks Highway	228	2.015	1.604	Yes	1.80	Yes
Wasilla Fishhook Road and Herning Avenue	30	0.956	0.785	Yes	1.06	No
Wasilla Fishhook Road and Swanson Avenue	32	0.737	0.531	Yes	0.72	Yes
Wasilla Fishhook Road and Paulson Avenue	3	0.092	0.589	No	-	
Wasilla Fishhook Road and Bogard/Nelson Road	23	0.606	1.604	No	-	
Wasilla Fishhook Road and Danna Avenue	5	0.269	0.589	No	-	
Wasilla Fishhook Road and Iditarod Elementary	4	0.211	0.589	No	-	
Wasilla Fishhook Road and Carpenter Circle	3	0.168	0.589	No	-	
Secondary Intersections Affected By Planning						
Lucille Street and Herning Avenue	5	0.204	0.785	No	-	
Lucille Street and Swanson Avenue	8	0.221	0.785	No	-	
Lucille Street and Nelson Avenue	7	0.237	0.785	No	-	
Parks Highway and Willow Street	1	0.000	0.785	No	-	
Willow Street and Susitna Avenue	1	0.548	0.785	No	-	
Willow Street and Herning Avenue	13	3.562	0.785	Yes	1.68	Yes
Willow Street and Swanson Avenue	2	0.130	0.531	No	-	
Talkeetna Street and Railroad Avenue	1	0.274	0.589	No	-	
Boundary Street and Herning Avenue	14	1.128	0.785	Yes	1.24	No
Boundary Street and Swanson Avenue	3	0.211	0.589	No	-	
Yenlo Street and Herning Avenue	5	0.285	0.785	No	-	
Yenlo Street and Swanson Avenue	4	0.228	0.589	No	-	
Crusey Street and Swanson Avenue	8	0.274	0.589	No	-	
Parks Highway and Knik Street	7	0.100	0.589	No	-	
Knik Street and Herning Avenue	2	0.548	0.785	No	-	
Knik Street and Swanson Avenue	6	0.391	0.531	No	-	
Knik Street and Paulson Avenue	0	0.000	0.785	No	-	
Knik Street and Nelson Avenue	1	0.125	0.589	No	-	

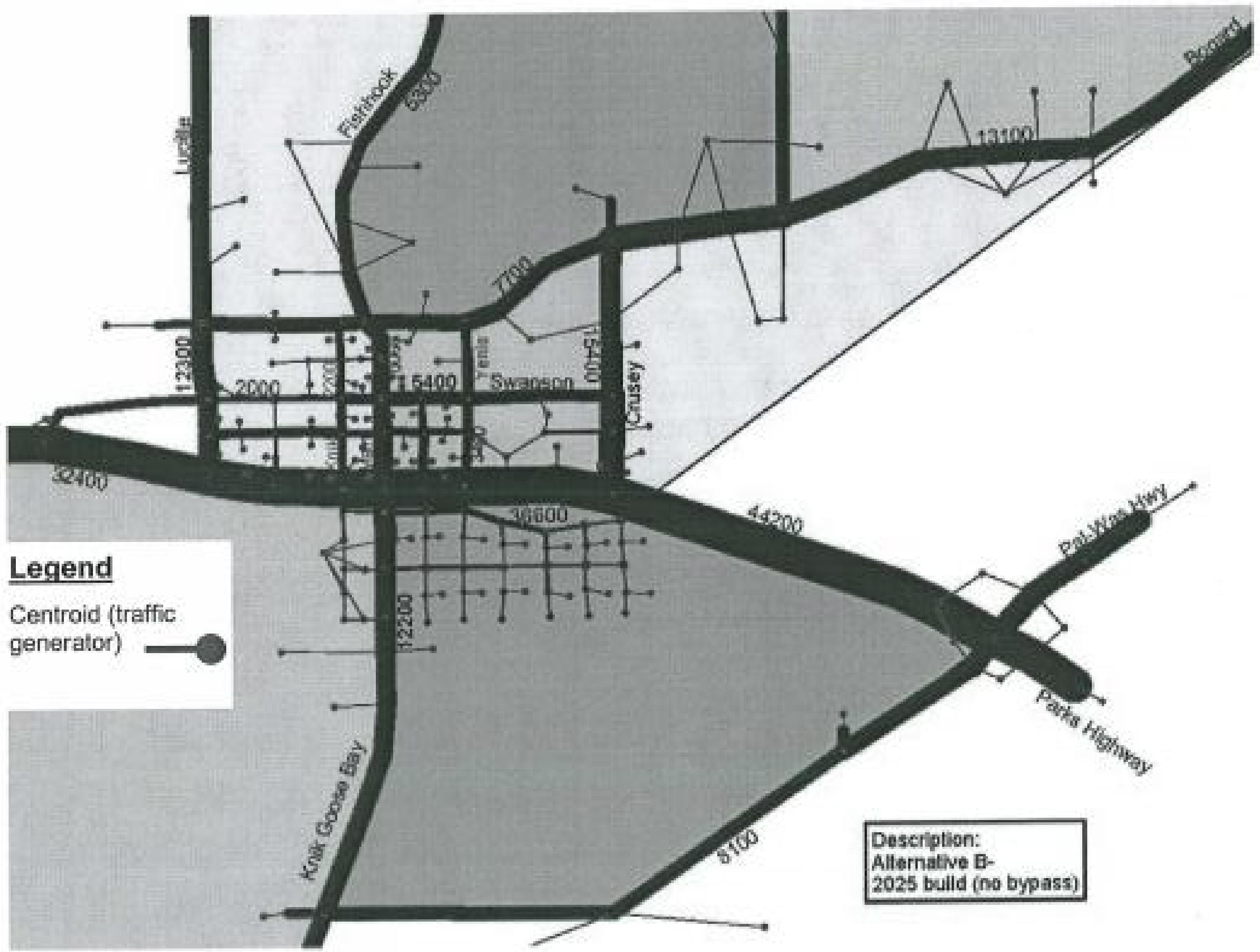
Table 10- Intersection Crash Rates

5 Transportation Modeling of Main Street Alternatives

Figures 14 and 15 present the transportation demand models for Alternative A, 3-lane widening; which is also representative of existing committed conditions in 2025. The remaining alternative demand models are presented below.

5.1 Alternative B: 5-Lane Widening Main Street and Knik-Goose Bay Road

The following two figures depict 2025 ADT for Alternative B, without and with the Parks Highway Alternate Corridor.



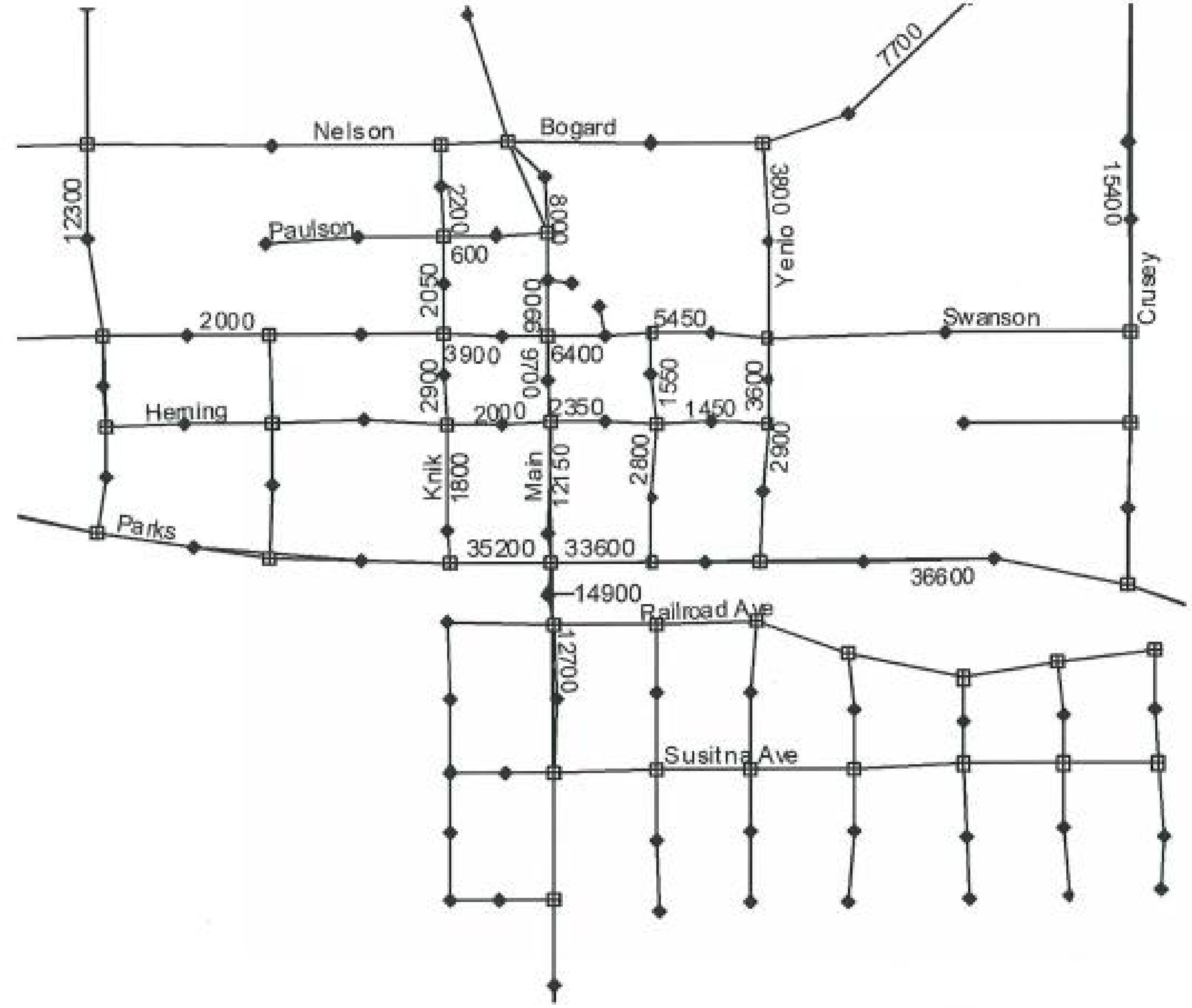


Figure 17- 2025 Alternative B, 5-Lane Widening, Without Parks Highway Alternate Corridor

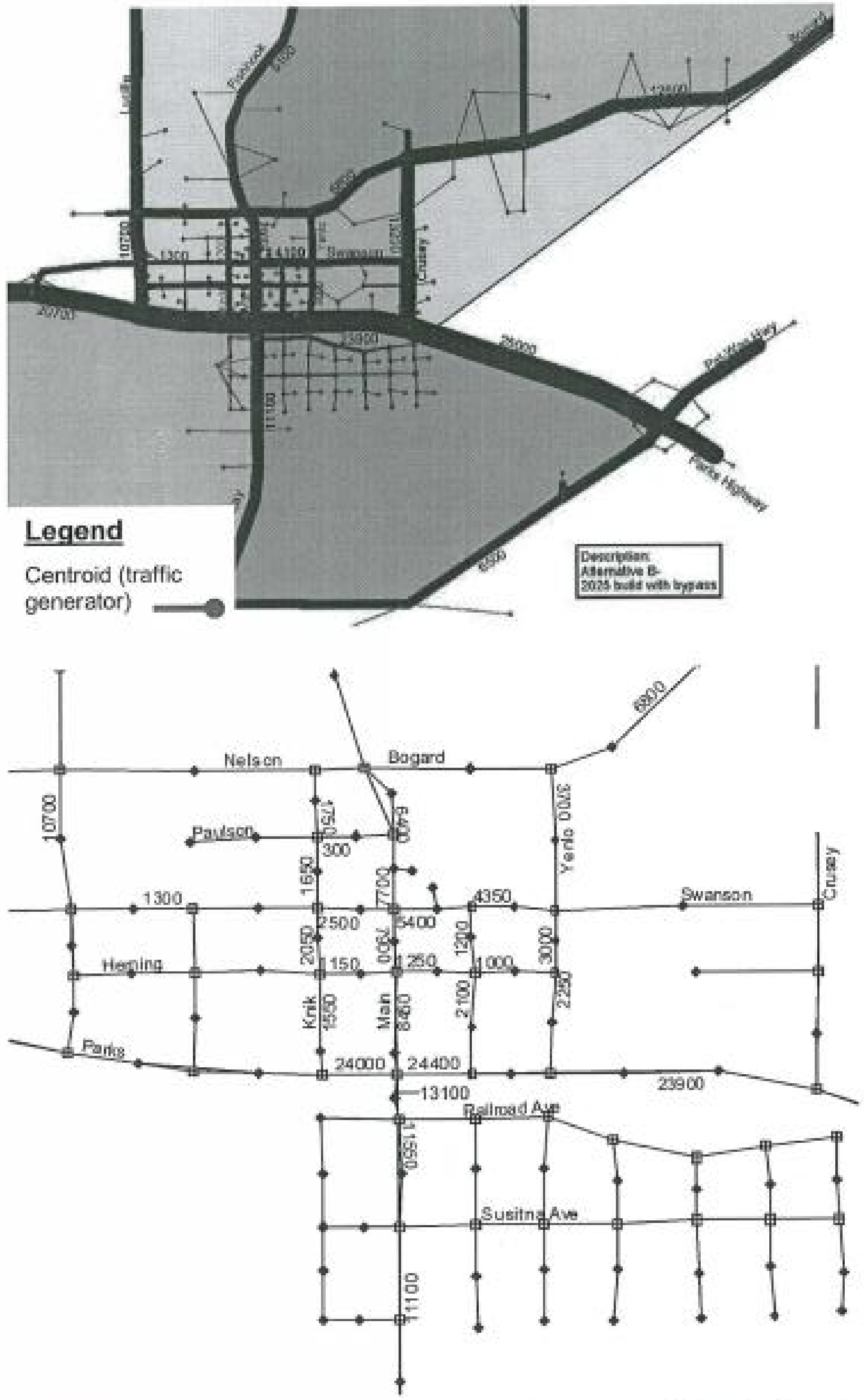


Figure 18- 2025 Alternative B, 5-Lane Widening, With Parks Highway Alternate Corridor

5.2 Alternative C: A Two-Way Couplet Using Knik Street and Main Street-Knik Goose Bay Road

The following two figures depict 2025 ADT for Alternative C, without and with the Parks Highway Alternate Corridor.

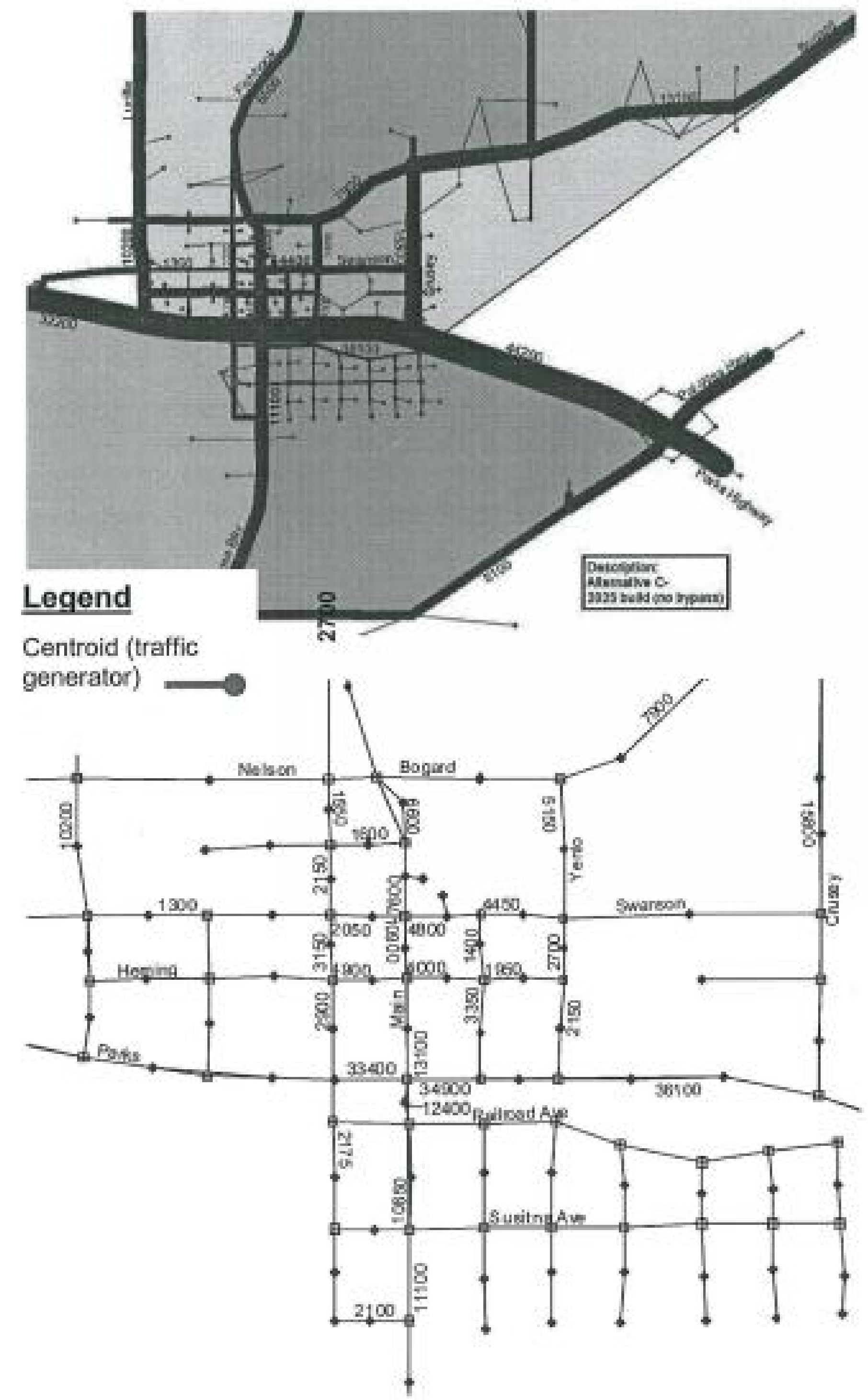


Figure 19- 2025 Alternative C, Knik Street and Main Street-Knik Goose Bay Road Two-Way Couplet, Without Parks Highway Alternate Corridor

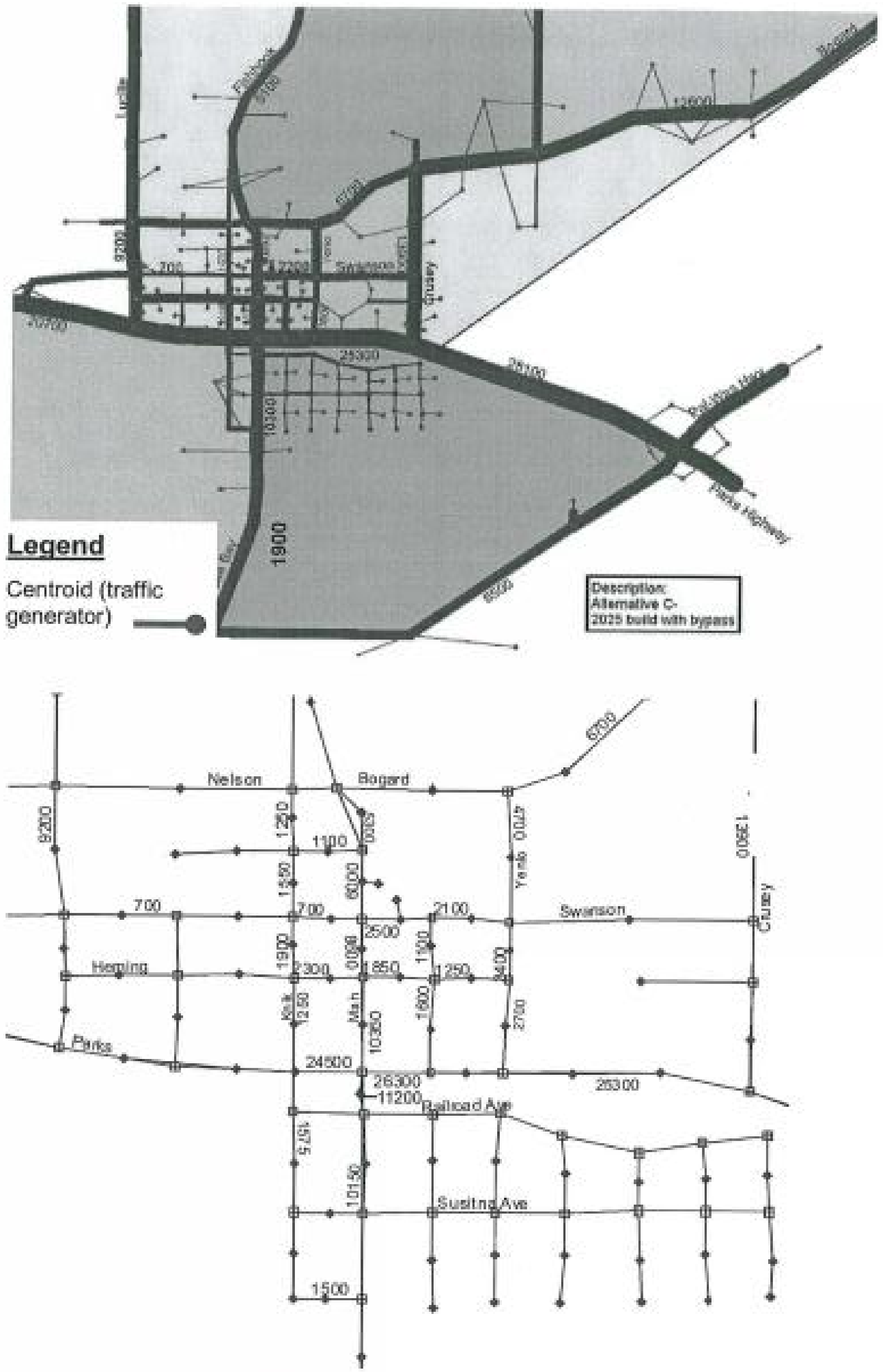


Figure 20- 2025 Alternative C, Knik Street and Main Street-Knik Goose Bay Road Two-Way Couplet, With Parks Highway Alternate Corridor

5.3 <u>Alternative D: A One-Way Couplet Using Main Street/Knik-Goose Bay Road And Talkeetna Street/Yenlo Street.</u>

The following two figures depict 2025 ADT for Alternative D, without and with the Parks Highway Alternate Corridor.

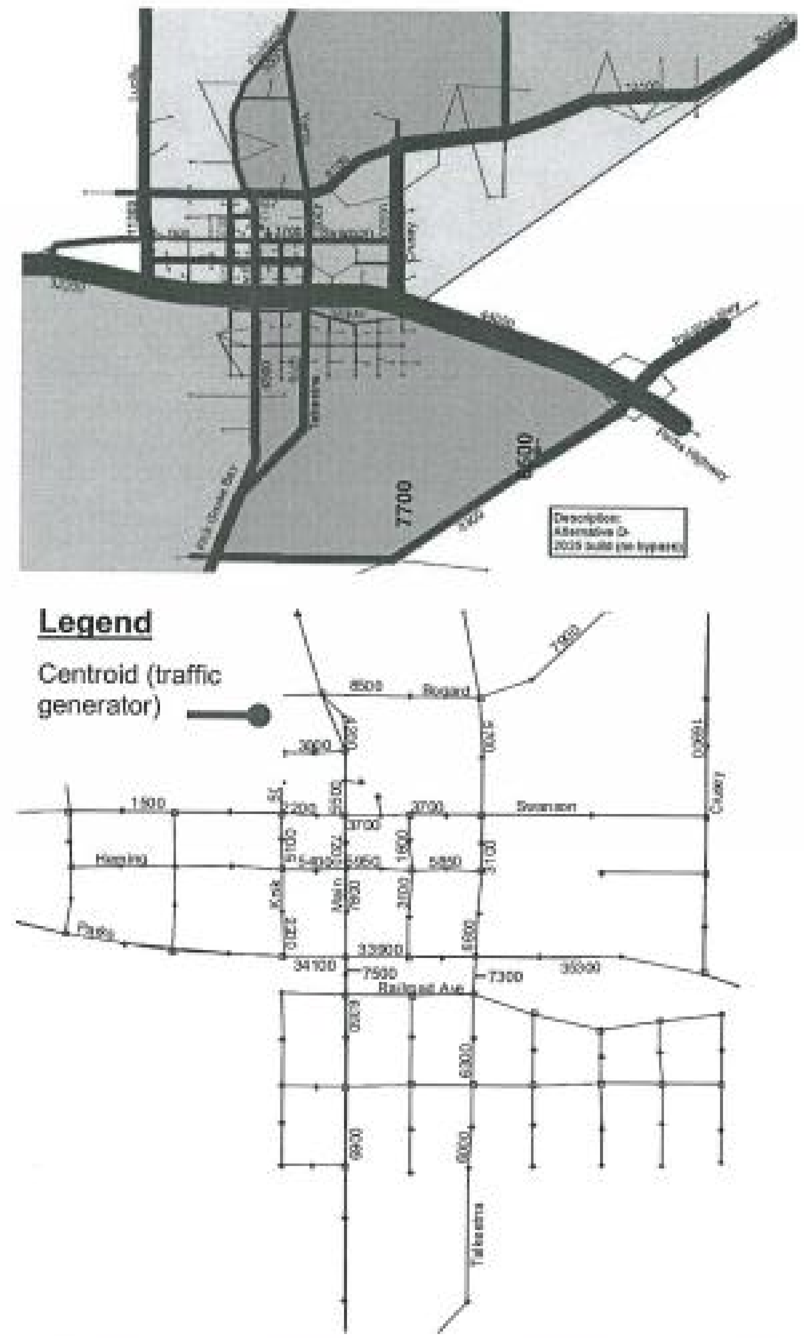


Figure 21- Alternative D, Main Street/Knik-Goose Bay Road And Talkeetna Street/Yenlo Street One-Way Couplet, Without Parks Highway Alternate Corridor

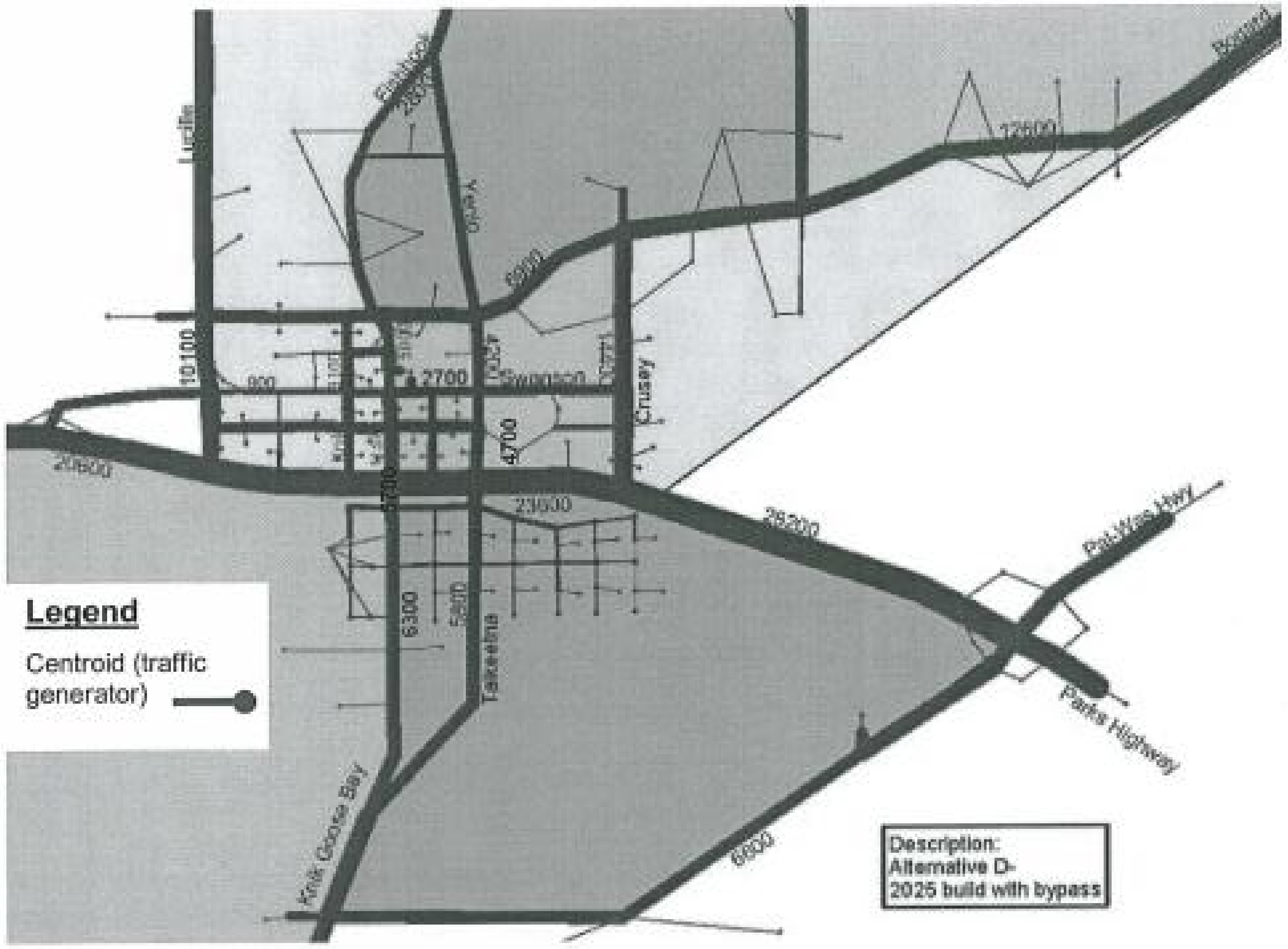


Figure 22- Alternative D, Main Street/Knik-Goose Bay Road And Talkeetna Street/Yenlo Street One-Way Couplet, With Parks Highway Alternate Corridor

6 Alternative Design Volumes

6.1 Methodology To Determine 2005 and 2025 Design Hour Volumes

Section 5 discusses the alternatives' demand model ADT results. In order for alternatives to be meaningfully evaluated, volumes must be reduced to design hour levels. Systems are typically designed to accommodate future hourly volumes, which for this project is 2025. This section presents an overview of the methodology used to develop 2005 and 2025 volumes for each of the Main Street alternatives.

In addition to providing ADT volumes (as shown in Figures 14, 15, and 17 – 22 above), QRSII provided design hour segment and turning movement volumes. The demand model hourly movement outputs, as well as existing turning movement volumes for streets and key generators (Appendix A) were used as a basis to form design hour volumes. However, the alternatives required further modifications and adjustments because of unusual or complex patterns that are not well modeled; and to calibrate the models to match expected travel patterns.

The remainder of Section 6 describes development of the alternative volumes.

6.2 Overview of Universal Adjustments

Several issues occurred and were common in each model. Section 6.2 presents these issues and the way these were addressed.

6.2.1 Post Office Circulation

The Post Office is a major generator and impacts existing and future operations of the Main Street alternatives. The circulation has been under study because ingress and egress circulation patterns have internal queues caused by parking turnovers or mailbox drop-off that spill out of the site and block Main Street traffic flow. As such, it is likely that circulation will be revised to mitigate this condition and to respond to the external circulation flows that are unique to each alternative.

As a special generator, QRSII will not model the directional split well. All models included adjustment of the Post Office evening peak hour volumes. Volumes generated in the QRS-II model were redistributed to an inbound and outbound split of 48.7% and 51.3%, respectively, based on the existing distribution provided by the traffic counts. It is assumed that future traffic will follow this pattern, regardless of the alternative.

As an initial step, all QRS-II modeling for all alternatives was based on the existing Post Office circulation pattern shown in the figure below. The model provided the basis on which all final turning movements were derived at the Main Street access and Main Street/Swanson intersection for each study scenario. The figure illustrates a one-way ingress from Main Street and two-way ingress/egress at Swanson Street.

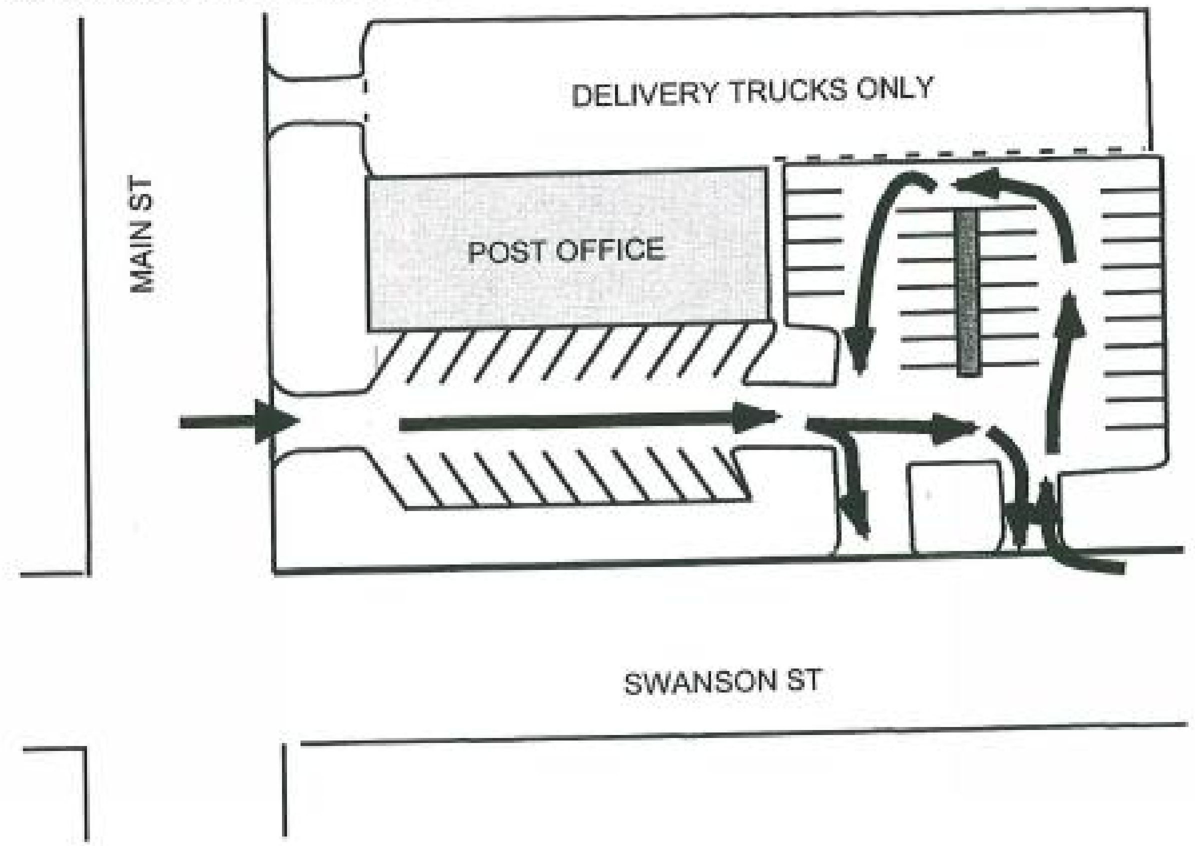


Figure 23- Post Office Circulation, 2005 Existing Configuration, and 2005 and 2025 Alternative D.

The circulation in the figure above was used as a final circulation for the 2005 existing configuration and also for Alternative D Yenlo-Main One-Way Couplet (2005 and 2025). For the 2005 existing and D (2005/2025) alternatives, the Post Office traffic is modeled to egress one-way onto southbound Swanson Avenue; for Alternative D and 2005 existing configurations, providing for egress with full movements onto Main Street would otherwise cause circulation and safety issues associated with the functional area of the Swanson/Main intersection.

For all other 2005 and 2025 alternatives, the model turning volumes were manually adjusted for the Post Office circulation shown in the figure below. The Post Office traffic will egress one-way onto Main Street as a right turn only and will be two-way at the Swanson Avenue driveway. Note that the number or location of the accesses may be adjusted to address internal circulation requirements and only illustrates the circulation interaction with the adjacent street for purposes of the alternatives model.

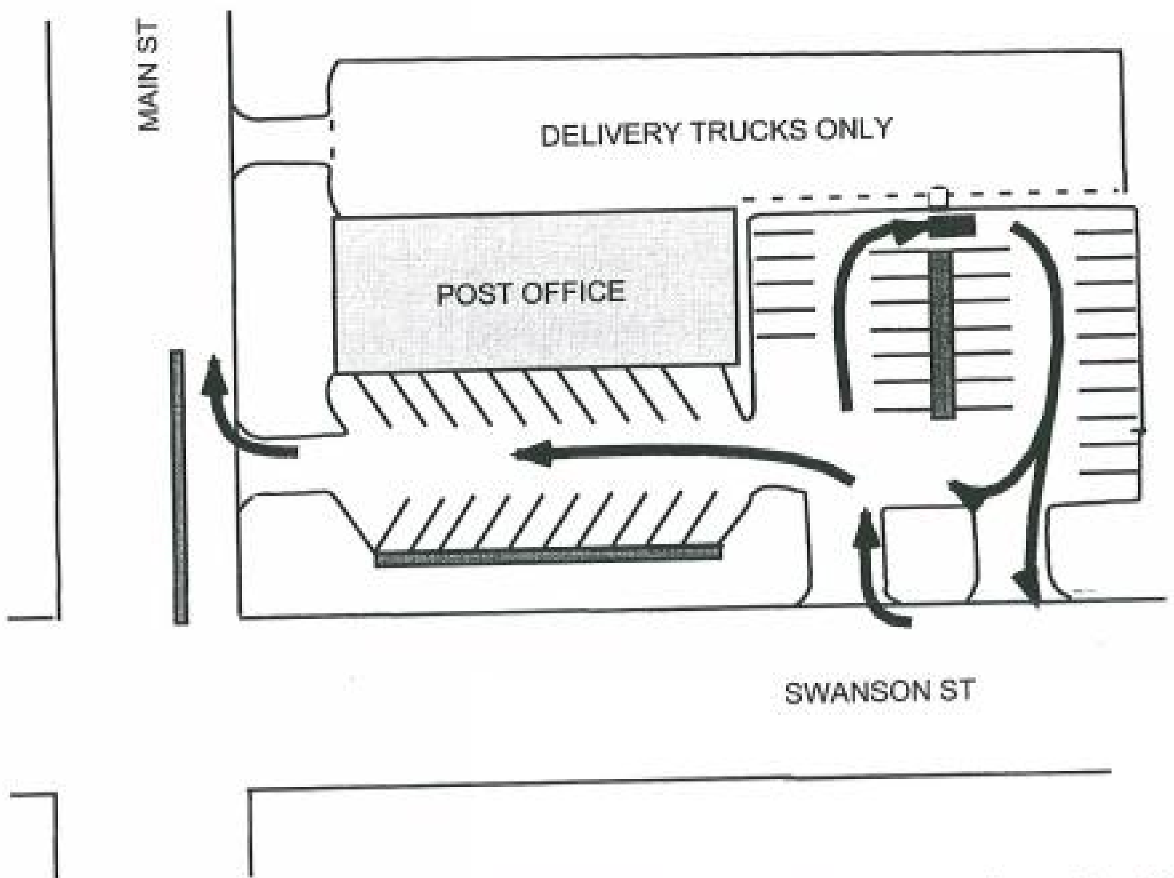


Figure 24- Post Office Circulation for 2025 Existing Configuration, 2005 and 2025 Alternatives A, B and C Alternatives

Entering 2005 hourly volumes from the QRS-II model were factored to resemble field counts in locations deemed necessary. Entering hourly volumes from the QRS-II model were factored according to adjusted hourly segment volumes derived for east-west Parks Highway; turning movements were balanced to the extent possible using balancing algorithms.

6.2.2 Railroad Avenue/Main Street Intersection Hourly Volumes

Entering and exiting hourly traffic volumes for the Railroad Avenue approaches were provided by the QRS-II demand model for all scenarios, including the 2005 existing configuration. Based on the interaction with northbound queues extending from Parks Highway on Knik-Goose Bay Road and the proximity to the railroad crossing just north of the intersection, it was assumed that most or all of the turning movements at the intersection of Knik-Goose Bay Road and Railroad Avenue intersection would be right turns with few or no east-west through movements. It is likely that a raised median would be installed to prevent all left turns and east-west through movements at the intersection because of the expected queues for each alternative during the peak hours and interaction with the trains.

Entering volumes from the QRSII model were factored according to hourly volumes derived for east-west Parks Highway and balanced with turning movement balancing algorithms.

6.2.3 2025 Parks Highway Hourly Volumes

East-west 2025 hourly segment volumes for intersections on the Parks Highway were derived from applying a K_{30} factor, the percent of ADT representing the 30^{th} highest hourly volume of a year, and a directional distribution to ADTs provided by the QRSII transportation model. With this procedure, the final 2025 alternatives show roughly a 3% per year increase in hourly volume, which is generally consistent with previous work from Kinney Engineering on the Parks Highway west of the study area. The following table summarizes the factors used in determining approaching and departing east-west traffic at Parks Highway intersections.

Factor	Final Value Used for Parks Highway Segment Design Hourly Volumes	AASHTO Recommended Values
K_{30} (Percent of ADT)	9.22%	8% to 12% (urban areas)
Directional Split*	60% (westbound) 40% (eastbound)	55% to 70% - peak direction (rural highways)

* **Based on PM Peak Hour Counts**

Table 11 – Factors Used to Estimate Existing and Future East-West Hourly Volumes on the Parks Highway for All Scenarios Except 2005 Existing Traffic Conditions

Referring to the above table, the K_{30} value was derived based on the average of the 6 years (1999 to 2003 with consideration for construction) of PTR data on the Parks Highway provided by the Department and comparison of AASHTO recommendations. The Directional Distribution is based on the current east-west distribution provided by 2005 turning movement counts and comparison of AASHTO typical values.

The final directional distribution is based upon engineering judgment as opposed to values provided by the QRS-II transportation model. The model had a tendency to heavily favor traffic distribution in the westbound direction and reduce future traffic in the eastbound direction. One would expect that directional distribution would become more equally distributed on the Parks Highway as more development occurs in Wasilla and more employment opportunities are available in MSB (see Table 3 for future employment trends).

Turning movement-balancing algorithms were used to determine final turning movements at Parks Highway intersections. The final turning movements were weighted in the algorithm using existing hourly turning movements and hourly turning movements provided by the transportation model.

6.2.4 General-Hourly Volume Adjustments

Turning movement-balancing algorithms provided in *NCHRP Report 255* were used for the various alternatives where applicable; the method allows to check or "smooth" turning movement counts from the QRSII model against 2005 turning movement volumes without significant adjustments to the initial model road segment volumes. The iterative method maintains accuracy during any adjustments to always ensure turning movement counts sum as practical as possible to the corresponding entering and departing segment volumes provided from the QRS-II model. Essentially, the method allows verification against existing turning movement counts so that no significant volume reductions (or increases) occur for entering and exiting segment volumes. This is an essential measure to ensure intersection design is not underestimated or overestimated.

The prevailing turning movement counts were then balanced, or redistributed, based available intersection capacity in each of the models and the ability to redistribute based on availability of connecting streets. The NCHRP method described above ensures the turning movements sum as close as practical to any redistributed directional traffic on a road segment and a procedure for tracking redistributed volumes through a network. The end product is the final adjusted turning movement volumes for each alternative.

6.3 Existing Conditions and Main Street Alternatives Turning Movement Volumes

The following subsections provide an overview of the volume development for each alternative with and without the Parks Highway Alternative Corridor option. The network volumes are presented for each alternative under Appendix B.

6.3.1 2005 Existing Network, Existing Conditions Without Parks Highway Alternate Corridor

The turning movements provided for this scenario where based upon recent turning movement counts. Turning movement counts were conducting in May and June 2005 for the following intersections:

- Bogard Road/Nelson Avenue and Main Street
- Main Street and Swanson Avenue
- Parks Highway and Main Street
- Palmer-Wasilla Highway and Knik-Goose Bay Road
- Knik Street and Swanson Avenue
- Main Street and Paulson Avenue (minor movements only)
- Main Street and Post Office (minor movements only)
- Knik-Goose Bay Road and Susitna Avenue (minor movements only)
- Knik-Goose Bay Road and Park Avenue (minor movements only)
- Knik Street and Nelson Road (minor movements only)
- Main Street and Herning Avenue (minor movements only)

Through north-south movements were estimated from adjacent upstream and downstream intersection counts for those intersections that had minor movement counts only. A final factor of 1.054 was applied to these counts in order to resolve the data collected to the 30th highest volumes for the year. The factor is based on analyzing 1999 to 2003 data provided at the permanent traffic recorder (PTR) locations on the Parks Highway (Nye) and the Palmer-Wasilla Highway East of Trunk Road.

Traffic counts for the Post Office were taken in April 2004 by Tryck Nyman Hayes, Inc. and resolved to 2005 30[th] highest hourly volumes using a factor of 1.24 (from the PTR). The following table summarizes the adjusted volumes for the 2005 existing condition.

Main Street Access				Swanson Avenue Access			
Entering		Exiting		Entering		Exiting	
NBRT	SBLT	WBLT	WBRT	EBLT	WBRT	SBLT	SBRT
126	58	-	-	15	96	117	194

Table 12 –Post Office Peak Hour Circulation Flows, 2005 Existing Conditions

6.3.2 2005 Alternative B, C, and D Without Parks Highway Alternate Corridor

The alternatives covered in this section are:

- Alternative B, 2005 5-Lane (widening)
- Alternative C, 2005 Knik-Main two-way couplet
- Alternative D, 2005 Main-Yenlo one-way couplet

The QRSII model provided a basis on which all 2005 turning movements were determined for the alternative volumes.

The Post Office QRSII derived volumes were distributed at each Main Street and Swanson Avenue access based on (1) proportion of adjacent street traffic flows and (2) a 2004 traffic count ingress-egress distribution at the Post Office. The NCHRP turning movement algorithm was applied to the Main Street access to balance entering and exiting flows.

Slight variation in 2005 Post Office circulation volumes between alternatives can be accounted for by differences in adjacent street flows and the turning movement balancing algorithm. The following table summarizes the Post Office circulation flows.

Alternative	Main Street Access				Swanson Avenue Access			
	Entering		Exiting		Entering		Exiting	
	NBRT	SBLT	WBLT	WBRT	EBLT	WBRT	SBLT	SBRT
Alternative B	-	-	-	185	322	154	188	127
Alternative C	-	-	-	185	322	154	188	127
Alternative D	-	256	-	-	8	220	111	389

Table 13- Post Office Hourly Circulation Flows 2005 B, C, and D Alternatives

When compared to the adjusted 2005 entering and exiting flows for existing conditions, the QRSII estimation of Post Office traffic appears to be higher for the 2005 alternatives. The QRSII generated traffic for the Post Office should be considered when reviewing the 2005 capacity analysis results for the 2005 alternatives. The final 2025 estimated QRS-II Post Office traffic has been reduced to an expected level based on Parks Highway volumes.

6.3.3 2025 Alternative B, C, and D Without Parks Highway Alternate Corridor

The alternatives covered in this section are:

- 2025 Existing Configuration (No-build)
- Alternative A, 2025 3-Lane (widening), without Parks Highway Alternate Corridor
- Alternative B, 2025 5-Lane (widening), without Parks Highway Alternate Corridor
- Alternative C, 2025 Knik-Main two-way couplet, without Parks Highway Alternate Corridor
- Alternative D, 2025 Main-Yenlo one-way couplet, without Parks Highway Alternate Corridor

The QRSII model provided a basis for 2025 turning movements, with the adjustments discussed in Section 6.2. In addition, QRSII 2025 hourly volumes were comparing to the product of the QRSII ADT volumes with the K_{30} factor, a method of converting ADT to design hours. QRSII hourly volumes were higher, and as such were believed to be overestimated in some areas. As a result of the comparison, the hourly volumes were reduced by about 10 to 30% of their original model volume depending on the alternative and location in the network.

With the exception of all Yenlo-Main couplet alternatives (utilizes existing Post Office circulation), all post office volumes from the QRS-II model were revised for the proposed reversed circulation. All entering and exiting Post Office flows in the QRS-II model output were adjusted based on the distribution provided by existing traffic counts. The distributions at each access to Main Street and Swanson Avenue were derived based on the (1) proportion of adjacent street traffic flows and (2) a 2004 traffic count ingress-egress distribution at the Post Office. The *NCHRP Report 255* turning movement algorithm was applied to the Main Street access to balance entering and exiting flows.

Variation in 2025 Post Office circulation volumes between alternatives are caused by differences in circulation patterns, adjacent street flows and network applied factors based on the Parks Highway. The following table summarizes the Post Office circulation flows.

Alternative	Main Street Access				Swanson Avenue Access			
	Entering		Exiting		Entering		Exiting	
	NBRT	SBLT	WBLT	WBRT	EBLT	WBRT	SBLT	SBRT
Existing and Alternative A	-	-	-	140	378	181	221	223
Alternative B	-	-	-	188	433	207	221	253
Alternative C	-	-	-	156	381	182	223	214
Alternative D	-	259	-	-	53	220	197	394

Table 14- Post Office Hourly Circulation Flows, 2025 Alternatives Without Parks Highway Alternative Corridor

6.3.4 2025 Alternative A, B, C, and D With Parks Highway Alternate Corridor

The alternatives covered in this section are:

- Alternative A, 2025 3-Lane (widening), with Parks Highway Alternate Corridor
- Alternative B, 2025 5-Lane (widening), with Parks Highway Alternate Corridor
- Alternative C, 2025 Knik-Main two-way couplet, with Parks Highway Alternate Corridor
- Alternative D, 2025 Main-Yenlo one-way couplet, with Parks Highway Alternate Corridor

The same methodologies described above were used to determine the Parks Alternate Corridor options for each Alternative. Post Office volumes for these options are summarized in the following table.

Alternative	Main Street Access				Swanson Avenue Access			
	Entering		Exiting		Entering		Exiting	
	NBRT	SBLT	WBLT	WBRT	EBLT	WBRT	SBLT	SBRT
Existing and Alternative A	-	-	-	141	375	179	219	215
Alternative B	-	-	-	158	361	172	210	175
Alternative C	-	-	-	189	358	171	209	159
Alternative D	-	267	-	-	28	145	105	423

Table 15- Post Office Hourly Circulation Flows, 2025 Alternatives With Parks Highway Alternative Corridor

7 Alternative Design Hour Evaluations

Alternatives have been evaluated with HCM2000 and micro simulation analysis tools for peak hour volumes (developed under Section 6) for 2004 and 2025 traffic. Section 7 of this report does not account for the impact of railroad operations and estimates performance based only on traffic operations and normal traffic signal timing. However, the track parallels the Parks Highway and any north-south crossing (Knik-Goose Bay/Main or Yenlo/Talkeetna) would be impacted by trains. Section 8 evaluates these same intersections and segments with preemption timing plans that would occur with trains.

7.1 Capacity Analysis and Performance Methods

All-way and minor-street stop control were performed in accordance with the procedures outlined in the Transportation Research Board Highway Capacity Manual 2000 (HCM) using Synchro, Version 6, distributed by Trafficware. These methods are macroscopic in nature and can only evaluate a single intersection.

The performance measures for minor-street stop control only and all-way-stop control include control delay, level of service (LOS) and volume to capacity ratio (v/c) for the movements of the intersection, which include the street approaches under sign control, or major movements that must yield to oncoming traffic, such as left-turning traffic. The operational performance measures used for signalized intersection analysis are levels of service, control delay (seconds delay per vehicle), and volume to capacity ratio (v/c), values reported for the entire intersection.

The level of service for urban arterials is based upon average travel speeds, varying per arterial classification (Type I-IV). These performance measures are further discussed under Appendix D.

Microscopic simulation (SimTraffic by Trafficware) is also used to evaluate operational overlapping impacts of the intersections and average travel speeds. The simulation results are included to better illustrate how performance relates to the interaction of queues, overlapping functional areas of closely spaced intersections, and approaches with high v/c ratios.

Where simulation performance measures are reported in tables for comparison to HCM measures, an average of at least 5 simulations are used to determine performance measures.

7.2 Design Level of Service

AASHTO's GDHS Exhibit 2-32 presents design year levels of service (LOS) guidelines for facilities within this study.

- Arterial Roads (intersections included) - Rural arterials should have LOS B or better in level terrain conditions and urban arterials should have a minimum LOS of C. Since the Parks Highway becomes urbanized within the study area, the minimum desirable LOS is C.
- Collector Roads (intersections included) - AASHTO states that rural collectors should have a LOS C or better in level terrain conditions. This guideline also recommends LOS D for urban collectors in urban and suburban settings, which will apply to this project as this area becomes more urbanized.
- Local Roads (intersections included) - The minimum LOS for these local roads may be D for all rural and urban roadways.

The minimum desirable level of service established for this study is LOS C for 2025. However, LOS D is acceptable in urban areas, and may be acceptable as Wasilla continues to become more urbanized. Alternatives that do not provide LOS D are considered not viable.

7.3 Models

Synchro and SimTraffic were used for this analysis. The following parameters were used for these model inputs.

7.3.1 Intersection Control and Lane Configurations

Alternative A and B have fixed Main Street through-lanes (defined by the alternative description); but auxiliary lanes were added as required to improve performance measures. North-south through and auxiliary lanes for alternatives C and D were determined iteratively to optimize performance.

In general, the Parks Highway and the minor east-west streets through lanes in the study areas were not changed in the alternatives, but auxiliary lanes were added as required.
The analyses determined that Paulson Avenue and Railroad Avenue should have the following median closures to prevent crossing flows and impact the adjacent signal operations.

	North-South Raised Median on Main Street/Knik-Goose Bay Road			
	Normal Operation		Railroad Preemption Considerations	
2025 Alternative	Paulson Ave	Railroad Ave	Paulson Ave	Railroad Ave
A - 3-Lane	Required	Required	Required	Required
B - 5-Lane	Not Required	Required	Not Required	Required
C - Knik-Main Two-Way Couplet	Not Required	Not Required	Not Required	Required
D - Yenlo-Main One-Way Couplet	Not Required	Not Required	Not Required	Not Required

Table 16- Median Closures for Paulson Avenue and Railroad by Alternatives

Detailed intersection control and lane configurations are presented with the Alternative plans under Appendix C.

7.3.2 Basis of Timing

The following assumptions were made or observed for signalized intersection capacity and micro simulation analyses where applicable.

- Pedestrian and vehicle clearances were based on ITE standards when applicable. For existing conditions, the calculated clearances were based on as-built plans, aerial photos, or existing timing plans when available. For scenarios other than existing conditions and when clearances were critical in the analysis, estimates were made based on the number of approach lanes and estimated speeds.
- Other timing parameters were based on current practices used by the Municipality of Anchorage for both high speed/high volume dilemma zone detection operation and volume-density operation (for Parks Highway through traffic) and also presence detection (for minor street approaches and left turns off of the Parks Highway). The ADOT&PF Central Region standard detection layout was used for the simulation.
- For existing conditions, cycle lengths were based on actual controller setting when available. Where controller settings are not available, typical practices used by the Municipality of Anchorage, general field observation and typical maximum green times were used. The maximum greens for each movement account for a combination of balancing degree of saturation and delays of the critical movements and also conservative measures for incident management.

Signalized systems were optimized to the extent possible to reduce congestion and delays. Minimal cycle lengths were used at signalized locations in the downtown area to minimize the effects of queuing.

7.3.3 2005 Existing Conditions Model Calibration and Validation

Calibration and validation compares the predicted or computed results of an existing conditions model to actual observable performance measures in the field. If validated, the parameters used in the existing conditions models can be transferred to alternative models, with a reasonable expectation that the alternative predictions will be representative of future observable performance.

Part of the calibration process is to construct the models using specific real attributes instead of default values. Lanes were entered as they are in the field, and actual operational timing, phasing, and detection was used. The base saturation flow rate for the project is 1,850 vehicles (similar to Municipality of Anchorage's models). Current counts were entered into the model with an estimate of heavy vehicles and pedestrians.

Queue prediction was used to validate the 2005 existing conditions model. The field data was observed on Tuesday, August 22, 2005 between 5pm and 6:30pm at the Parks Highway/Main Street intersection. Observed queues were expected to be slightly worse than queues under normal conditions because of adjacent construction (closure of SBLT lane and one EB lane at the Crusey Street/Parks Highway intersection).

Northbound or southbound queues, including those caused by train preemption, that were nearly, but not completely, served in one cycle. There were no cycle failures on these approaches in the subsequent cycle. Also, there were no observable queuing problems for any movements on the westbound and eastbound approaches.

The table below summarizes queues for various methods for 2005 existing conditions. Only the first of two preemptions is included in the summary.

Method	Movement	Maximum Queue (veh)	Maximum Queue (feet)	Average 15-minute Queue (veh)	Average 15-minute Queue (ft)
Field Data	WB	24	600	16	396 *
HCM		-	686	-	422
SimTraffic		-	517	-	324
Field Data	NB/NBL	21	525	12	297 *
HCM		-	414 **	-	175 **
SimTraffic		-	533	-	233
Field Data	SB/SBL	21	525	15	372 *
HCM		-	603 **	-	283 **
SimTraffic		-	449	-	266

* Reported average 15-minute field data queues may be higher than actual since field data did not include some cycles with less demand

** Estimated based on 1/2 of HCM queues for turn bays plus through queues

Table 17-Queue Comparisons Among Field Data and Traffic Models for 2005 Existing Conditions

Based on the maximum queues, current field conditions calibrate reasonably well to the HCM and simulation model delays. It seems reasonable to say that the HCM delay model would not underestimate the existing intersection level of service at Parks Highway/Main Street given the non-normal conditions (construction) that occurred during the observations.

7.4 Alternative Comparisons

Appendix E provides summaries for 2005 and 2025 alternative operations. 2025 operations also include the option of a Parks Highway Alternate Corridor. These intersection evaluations only address traffic, see Section 8 for railroad-influenced operations.

The performance of key intersections under the 2005 and 2025 no-build alternative is summarized in the subsequent table.

Based on simulation and HCM results for the 2025 no-build alternative, average travel speeds along Main Street are expected to be 2 to 3 miles per hour in the southbound direction and 3 to 7 miles per hour in the northbound direction. Both directions will operate at Level of service F. In addition, southbound vehicle queues are expected to extend from Parks Highway to approximately 200 feet north of Bogard Road.

Intersection	Measure of Effectiveness	2005 Existing Configuration			2025 No-Build		
		Value	Critical Move-ment	Control	Value	Critical Move-ment	Control
Nelson Avenue and Wasilla Fishhook Road	V/C	0.48	All	Signal	0.66	All	Optimized Signal
	HCM Delay (S)	25	All		19	All	
	HCM LOS	C	All		B	All	
	Simulation Delay (S)	26	All		28	All	
	Simulation LOS	C	All		C	All	
Swanson Avenue and Main Street	V/C	0.85	NBT	AWSC	>1.5	WB	AWSC
	HCM Delay (S)	16	NBT		>50	WB	
	HCM LOS	C	NBT		F	WB	
	Simulation Delay (S)	29	NBT		>50	EB & WB	
	Simulation LOS	D	NBT		F	EB & WB	
Parks Highway and Main Street	V/C	0.74	All	Signal	1.28	All	Optimized Signal
	HCM Delay (S)	37	All		169	All	
	HCM LOS	D	All		F	All	
	Simulation Delay (S)	37	All		63	All	
	Simulation LOS	D	All		E	All	
Railroad Avenue and Knik-Goose Bay Road	V/C	0.01	EB	TWSC	0.02	EB	TWSC
	HCM Delay (S)	15	EB		18	EB	
	HCM LOS	B	EB		C	EB	
	Simulation Delay (S)	16	NBT		56	EBL	
	Simulation LOS	C	NBT		F	EBL	
Susitna Avenue and Knik-Goose Bay Road	V/C	0.17	EB	TWSC	>1.5	EB	TWSC
	HCM Delay (S)	36	EB		>50	EB	
	HCM LOS	E	EB		F	EB	
	Simulation Delay (S)	27	WBL		>50	EBL, EBR	
	Simulation LOS	D	WBL		F	EBL, EBR	

(S) Seconds; TWSC Two-Way (Minor Street) Stop Control; AWSC All-Way Stop Control
Simulation results are averages of at least 5 runs.

Table 18-Intersection Performance Measures Existing and Committed Network (No Build)

7.4.1 Comparative Alternative Intersection Performance

The following table provides general HCM2000 performance measures for 2025 alternatives, without the Parks Highway Alternate Corridor options. Comparative rank is based on average vehicle delay for signalized intersections and for the critical movement delay for unsignalized intersections.

Intersection	Alternative A, 3-lane			Alternative B, 5-lane			Alternative C, Two-Way Couplet			Alternative D, One-Way Couplet		
	Delay (sec/veh)	LOS	Comparative Rank	Delay (sec/veh)	LOS	Comparative Rank	Delay (sec/veh)	LOS	Comparative Rank	Delay (sec/veh)	LOS	Comparative Rank
Nelson Avenue and Wasilla Fishhook Road (Signal)	29	C	3	44	D	4	23	C	2	22	C	1
Paulson Avenue and Main Street (Unsignalized)	14	C	1	>50	F	3	>50	F	3	26	D	2
Post Office and Main Street (Unsignalized)	18	C	3	16	C	2	11	B	1	--	--	--
Swanson Avenue and Main Street (Signal)	28	C	2	24	C	1	30	C	4	29	C	3
Herning Avenue and Main Street (Unsignalized)	>50	F	4	>50	F	4	>50	F	4	>50	F	4
Parks Highway and Main Street	141	F	4	135	F	3	53	D	2	36	D	1
Railroad Avenue and Knik-Goose Bay Road (Unsignalized)	18	C	3	25	C	4	14	B	2	13	B	1
Susitna Avenue and Knik-Goose Bay Road (Signal)	35	C	4	10	A	2			1	13	B	3
Park Avenue and Knik-Goose Bay Road (Signal)	--	--	--	--	--	--	17	B	--	--	--	--
Nelson Avenue and Knik Street (Signal)	--	--	--	--	--	--	22	C	--	--	--	--
Paulson Avenue and Knik Street (Unsignalized)	--	--	--	--	--	--	18	C	--	--	--	--
Swanson Avenue and Knik Street (Signal)	--	--	--	--	--	--	20	B	--	--	--	--
Herning Avenue and Knik Street (Unsignalized)	--	--	--	--	--	--	20	C	--	--	--	--
Bogard Road and Yenlo Street (Signal)	--	--	--	--	--	--	--	--	--	17	B	--
Swanson Avenue and Yenlo Street (Signal)	--	--	--	--	--	--	--	--	--	31	C	--
Herning Avenue and Yenlo Street (Unsignalized)	--	--	--	--	--	--	--	--	--	>50	F	--
Parks Highway and Yenlo Street (Signal)	--	--	--	--	--	--	--	--	--	47	D	--
Railroad Avenue and Talkeetna Street (Unsignalized)	--	--	--	--	--	--	--	--	--	15	C	--
Susitna Avenue and Talkeetna Street (Signal	--	--	--	--	--	--	--	--	--	5	A	--

Table 19- Comparative Alternative HCM2000 Performance Measures, 2025 Traffic without Parks Highway Alternate Corridor

The performance measures presented in the table are for individual intersection operations, and because of the deterministic approach, largely do not represent conditions that occur when there is queue interaction or metering caused by adjacent intersections. These conditions are better modeled by micro simulation analyses. The following table list intersections where the micro simulated delay performance measure (average of 5 or more runs) were significantly different (20% or more) from the HCM2000 results; and where micro simulation and deterministic levels of service are more than one level of service apart. The simulation results consider system impacts and interaction.

Intersection	HCM Performance	Micro Simulation Performance
Alternative A: 2025 3-Lane		
Nelson Avenue and Wasilla Fishhook Road	HCM2000 delay=29 seconds, HCM2000 LOS=C	Simulation delay=61 seconds, simulation LOS=E
Paulson Avenue and Main Street	HCM2000 delay=14 seconds, HCM2000 LOS=B/C	Simulation delay=50 seconds, simulation LOS=F
Swanson Avenue and Main Street	HCM2000 delay=28 seconds, HCM2000 LOS=C	Simulation delay=80 seconds, simulation LOS=F
Railroad Avenue and Knik-Goose Bay Road	HCM2000 delay=18 seconds, HCM2000 LOS=C	Simulation delay=50 seconds, simulation LOS=F
Susitna Avenue and Knik-Goose Bay Road	HCM2000 delay=35 seconds, HCM2000 LOS=C	Simulation delay=80 seconds, simulation LOS=F
Alternative B: 2025 5-Lane Widening		
Swanson Avenue and Main Street	HCM2000 delay=13.1 seconds, HCM2000 LOS=B	Simulation delay=127.9 seconds, simulation LOS=F
Alternative C: 2025 Knik-Main Two-Way Couplet		
Paulson Avenue and Main Street	HCM2000 delay>50 seconds, HCM2000 LOS=F	Simulation delay=35 seconds, simulation LOS=D
Post Office and Main Street	HCM2000 delay=11 seconds, HCM2000 LOS=B	Simulation delay=94 seconds, simulation LOS=F
Park Avenue and Knik-Goose Bay Road	HCM2000 delay=17 seconds, HCM2000 LOS=B	Simulation delay=57 seconds, simulation LOS=E
Alternative D: 2025 Main-Yenlo One-Way Couplet		
Post Office and Main Street	HCM2000 delay=0 seconds, HCM2000 LOS=A	Simulation delay=50 seconds, simulation LOS=F
Parks Highway and Yenlo Street	HCM2000 delay=47 seconds, HCM2000 LOS=D	Simulation delay=106 seconds, simulation LOS=F
Railroad Avenue and Talkeetna Street	HCM2000 delay=15 seconds, HCM2000 LOS=C	Simulation delay=171 seconds, simulation LOS=F
Susitna Avenue and Talkeetna Street	HCM2000 delay=5 seconds, HCM2000 LOS=A	Simulation delay=30 seconds, simulation LOS=C

Table 20- Intersections where HCM2000 and Micro Simulation Results Disagree, 2025 Traffic without Parks Highway Alternative Corridor

7.4.2 Comparative System Evaluation

The following table presents system performance measures in average travel speed. These travel speeds are the averages of 5 or more micro simulation model runs.

Street	Direction	Average Speed (MPH)	LOS
Alternative A: 3-Lane Main Street Widening			
Main Street- Knik Goose Bay Road	SB	4	F
	NB	8	E
Parks Highway	EB	25	D/C
	WB	14	F
Alternative B: 5-Lane Main Street Widening			
Main Street- Knik Goose Bay Road	SB	8	E
	NB	7	E
Parks Highway	EB	11	F
	WB	7	F
Alternative C: Knik Street and Main Street, Knik Goose Bay Road Two-Way Couplet			
Main Street/Knik-Goose Bay Road	SB	7	F
	NB	8	E
Knik Street	SB	11	D
	NB	8	E
Parks Highway	EB	25	C
	WB	12	F
Alternative D: Main Street/Knik-Goose Bay Road and Yenlo Street/Talkeetna Street One-Way Couplet			
Main Street/Knik-Goose Bay Road	SB	4	F
Yenlo Street/Talkeetna Street	NB	6	F
Parks Highway	EB	19	D/E
	WB	5	F

Table 21- Average Travel Speeds, System Performance 2025, Without Parks Highway Alternate Corridor

Based on the above table, all options show less than desirable levels of service for the westbound traffic on the Parks Highway. In general, westbound Parks traffic operates close to capacity for both couplet alternatives. Likewise, the couplet alternatives without the Parks Alternative corridor provide for the most desirable HCM2000 measures for north-south travel, assuming through travel is the most attractive measure of system performance.

Note that the HCM results show more desirable average speeds on the Parks Highway for the 2025 3-Lane alternative than for the 5-Lane Widening alternative. The 3-Lane option is based on an existing and longer cycle length for the Parks Highway/Main Street intersection and thus gives proportional more effective green time in the cycle to the Parks Highway traffic and the effective green time has the greatest affect on delay during periods of over-saturation such as in this case. The longer cycle length severely penalizes traffic on Main Street and Knik-Goose Bay Road and appears to account for differences in system operation along Main Street/Knik-Goose Bay Road. Furthermore, the overall intersection performance measures for Parks Highway intersections reported above and in Appendix E are likely better indications of system performance for the Parks Highway traffic. It is also informative in comparing system performances for the north-south through traffic routes (Main, Knik and Yenlo Streets). Detailed Parks Highway intersection information is summarized in the table below.

	2025 3-Lane Widening	2025 5-Lane Widening	2025 Knik-Main Couplet	2025 Yenlo-Main Couplet	
	Parks Highway & Main Street	Parks Highway & Main Street	Parks Highway & Main Street	Parks Highway & Main Street	Parks Highway & Yenlo Street
Volume to Capacity ratio	1.29	1.11	0.92	0.96	0.95
Delay, Seconds per Vehicle	141 (210)	135 (107)	53 (63)	36 (30)	47 (106)
LOS	F (F)	F (F)	D (E)	D (C)	D (F)

Table 22 – Parks Highway Intersection Performance Measures – 2025 No-Bypass Alternatives HCM2000 and Micro Simulation (Results in Parentheses)

As seen in the previous table, the two couplet alternatives offer the best performance at the Parks Highway intersections, which are likely to serve more traffic than the other alternatives.

7.4.3 Other Considerations

The following table addresses, qualitatively, additional impacts that might be considered for system wide performance other than the performance measures previously discussed. These impacts were determined through review and interpretation of simulation runs.

	2025 3-Lane Widening	2025 5-Lane Widening	2025 Knik-Main Couplet	2025 Yenlo-Main Couplet
Paulson Avenue Impacts?	Yes – NB queues on Main St. extend through Paulson from Bogard	Yes – Northbound queues extend through Paulson from Bogard	Yes – Northbound queue interference on Main Street and Knik Street	Some – prohibited turns in opposition to one-way flow; east-west through traffic allowed
Post Office (P.O.) - Swanson Access Impacts?	Yes – Heavy westbound congestion from Swanson/Main	Some – WBLT queue > 200' at Swanson/Main will have some negative affect on both Post Office Accesses to Swanson Ave	Some – WBLT queue > 200' at Swanson/Main will have some negative affect on both Post Office Access to Swanson Ave	Some – WB queue > 300' at Swanson/Main adversely impacts Post Office exiting traffic; P.O./ Main St. access helps
Pedestrian Impacts Negative?	Yes – Heavy congestion throughout entire network.	Yes – Wider Crossings on Main Street & KGB Road with two-way traffic; South crossing eliminated at Swanson/Main; benefit from new signals	Some – Some wider crossings (one lane) on Main Street & KGB Rd; South crossing eliminated at Swanson/Main; benefit from new signals	Some – One- way traffic is appealing; balance of some wider/some narrower crossings on Main-Yenlo; South crossing eliminated at Swanson/Main; benefit from new signals; Potential of only one Parks Hwy crossing per signal
Railroad Avenue Access Impacts?	Yes- Congestion from Parks Hwy	Yes – Median Closure on KGB Road	Some – Queuing from Parks Highway through Railroad Ave; some potential for future median closure on KGB Road	Some – prohibited turns in opposition to one-way flow; east-west through traffic allowed; queuing from Parks Hwy through Railroad Ave

Table 23 – Alternative Qualitative Observations for 2025 Without Parks Highway Alternate Corridor

7.4.4 Effects of the Parks Highway Alternate Corridor

Appendix E has detailed intersection and system performance measures for the Parks Highway Alternative Corridor. In general, the Parks Highway traffic is reduced 30 to 35% by the alternative corridor. As a result, intersection levels of service are generally one grade or more better than would occur without the alternative corridor. However, even with the Parks Highway Alternate

Corridor in place, the existing Main Street intersection approaches at the Parks Highway and Swanson Avenue show signs of undesirable operating levels prior to 2015.

Based on operational performance, the following alternatives are considered feasible in 2025 along with the Parks Highway Alternate Corridor:

-
- Knik-Main Couplet
- Yenlo-Main Couplet

The presence of Parks Highway Alternate Corridor does effect of the number of lanes required for each different alternatives. Refer to Appendix C for the differences in the lane requirements with and without the alternate corridor.

7.4.5 *Alternative D, Alternate North Connection*

The final north connection terminates Yenlo Street at Bogard Road. This was evaluated under Alternative D to minimize right-of-way impacts. A diagram showing the final connection has been provided in Appendix C and the turning movement volumes have been provided in Appendix B. Several alternatives have been suggested for the Bogard Road/Main Street intersection. Each design has its own advantages and disadvantages that can be addressed appropriately in the design stage. The final design should:

- appropriately align the Yenlo Street left turn lanes to westbound lanes on Bogard so as to minimize weaving on Bogard Road. The alignment of the northbound left turn lanes on Yenlo Street to westbound Bogard will impact the operation of the Bogard /Main and Bogard/Yenlo intersections.
- minimize westbound queues between Main Street and Yenlo Street,
- minimize pedestrian crossings to no longer than the width of 4-lanes (with allowances for center raised medians which may provide refuges for a two-stage crossing,
- consider providing for advance overhead signing on Yenlo Street to help the unfamiliar driver match the lane to the desired destination on westbound Bogard Road.

Figure 25 illustrates the minimum lanes that would meet the minimum level of service requirements, minimize weaving for vehicles on Bogard Road, and minimize westbound vehicle queues between Main Street and Yenlo Street.

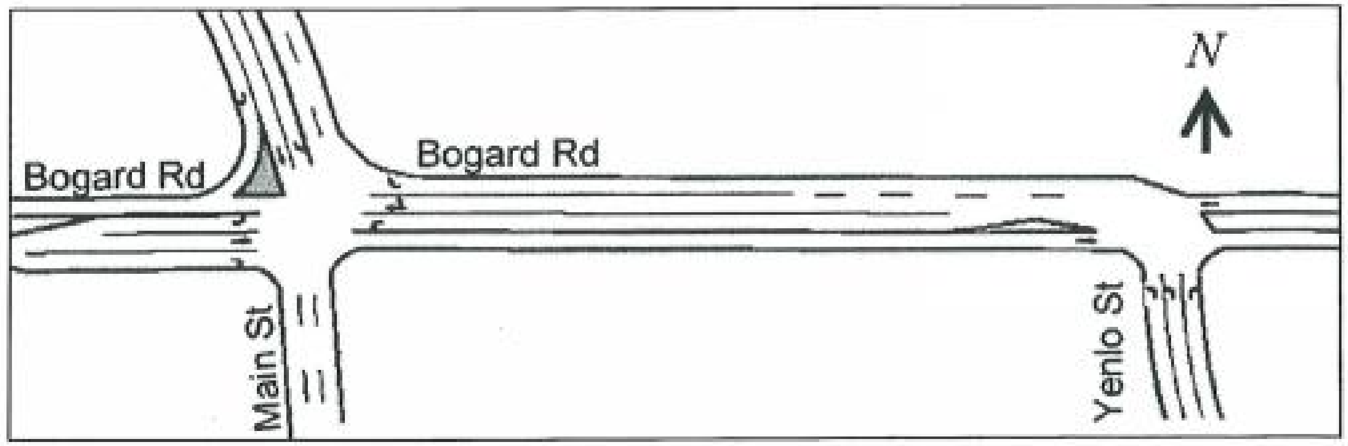


Figure 25- Alternative D, Final North End Connection, Minimum Lane Requirements

The alternate north connection will cause slightly greater travel delay to both northbound and southbound traffic within the area when compared to the option of extending Yenlo Street north of Bogard. However, the performance measures in the following table show that the intersections will operate at desirable levels in 2025. Performance measures from two separate methods are shown for comparison for the intersections displayed in Figure 25.

Intersection	Method	Cycle (seconds)	Volume-to-Capacity Ratio	Delay (seconds per vehicle)	Level of Service
Bogard Rd & Main St	Synchro	80	0.72	25	C
	SimTraffic	80	-	23	C
Bogard Rd & Yenlo St	Synchro	80	0.85	15	B
	SimTraffic	80	-	18	B

Table 24- Performance Measures for Alternative D-Final North Connection

Queue lengths are given below for two methods for comparison. The longest queue length should be utilized in determining storage requirements for turn bays.

Intersection	Method	95th Percentile Queue (feet)											
		EB			WB			SB			NB		
		Left	Thru	Right	Left	Thru/ Right	Right	Left	Thru	Right	Left	Thru	Right
Bogard Rd & Main St	Synchro	33	190	20	254m	228m	147	83	157	59	-	-	-
	SimTraffic	118	270	74	311	311	227	150	464	158	-	-	-
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Bogard Rd & Yenlo St	Synchro	-	278	-	-	241	-	-	-	-	650*	-	57m
	SimTraffic	-	244	-	-	241	-	-	-	-	489	-	343

m- Metered by upstream signal, *- moving queue

Table 25 - 2025 Vehicle Queue Lengths for Alternative D-Final North Connection

The DOT&PF *Preconstruction Manual* states that facilities with intersection approach speeds of 35 mph should facilitate vehicle storage in the turn bays, whereas approaches of 40 mph or above should account for both deceleration and vehicle storage. The westbound left turn lane storage bay shown in Figure 25 should be made as long as possible, however would not provide for desirable deceleration during peak traffic conditions due to intersection spacing.

Existing posted speed limits are provided below to assist in determining turn bay lengths. The November, 2005 *Mat-Su Borough Long Range Transportation Plan (LRTP) Draft Report* identifies Bogard Road east of Main Street (to Seldon Rd.) as a Minor 2-lane arterial for the 2025 base condition and as an "identified improvement" to a 2-lane Major Arterial with speeds between 25-50 mph. Also in the draft report, Bogard Road from Lucille Rd to the Glenn Highway is identified as a collector and Minor Arterial for 2025 base conditions and as a" identified improvement" to a Minor Arterial.

Intersection	Posted Approach Speeds			
	East Leg	West Leg	North Leg	South Leg
Bogard Rd & Main St	40 mph	25 mph	35 mph	25 mph
Bogard Rd & Yenlo St	40 mph	40 mph	Does not Exist	Does not exist

Table 26- Existing Posted Speeds near the Alternative D-Final North Connection

The Bogard Road westbound exclusive right turn lane must be continuous from Main Street to Yenlo Street in order to provide for the dual northbound left turn movement from Yenlo Street. All turn lanes on the Yenlo Street northbound approach must be continuous from Swanson Avenue to maintain the 3-lane continuity north of Parks Highway, unless the Parks Highway Alternate Corridor is constructed. All other turn bays for the two intersections should provide for vehicle storage (full bay width length plus ½ of bay taper distance) at least equal to the 95th percentile queue lengths unless their approach speeds are expected to be increased to above 35mph.

Consideration should be made to increase minimum storage bay lengths at the Bogard/Main intersection where possible since the queues are based on an 80 second cycle. Turn bays designed at an 80 second cycle have the potential to limit longer cycles during off-peak hours.

On occasion during the busiest times, westbound queues could negatively impact operations at the Yenlo Street intersection with the minimal design. This is not desirable because of the long queues expected on Yenlo Street that would approach Swanson Avenue even if operation is not impacted by traffic on Bogard Road.

A design shown in Figure 26 would minimize the likelihood of westbound queuing from Main Street and therefore allow for greater weaving distance after making a left turn from Yenlo Street. The design would address concerns with backups related to school schedules and would provide for some of the deceleration distance for auxiliary lanes that cannot be achieved with the minimum number of lanes. Triangular islands provide pedestrian refuge and reduce the lengths of the crosswalks. This design provides for vehicle storage that would likely be necessary only a few years beyond the design year.

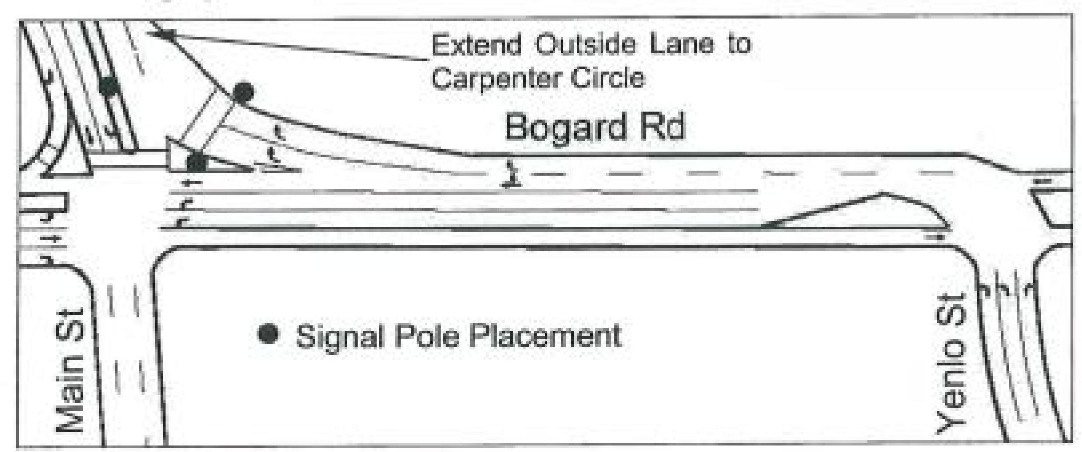


Figure 26- Alternative D, Final North End Connection, Optional Design

8 Railroad Considerations For Main Street

8.1 Crossing Descriptions

8.1.1 The following figure depicts the railroad crossing that was recently constructed as part of the Parks Highway MP 39-42 project. The gates and track were reconstructed to a width that would accommodate the widest roadway anticipated during this study period. However, additional modular concrete panels and new cantilever sign supports will be required if this crossing is widened.

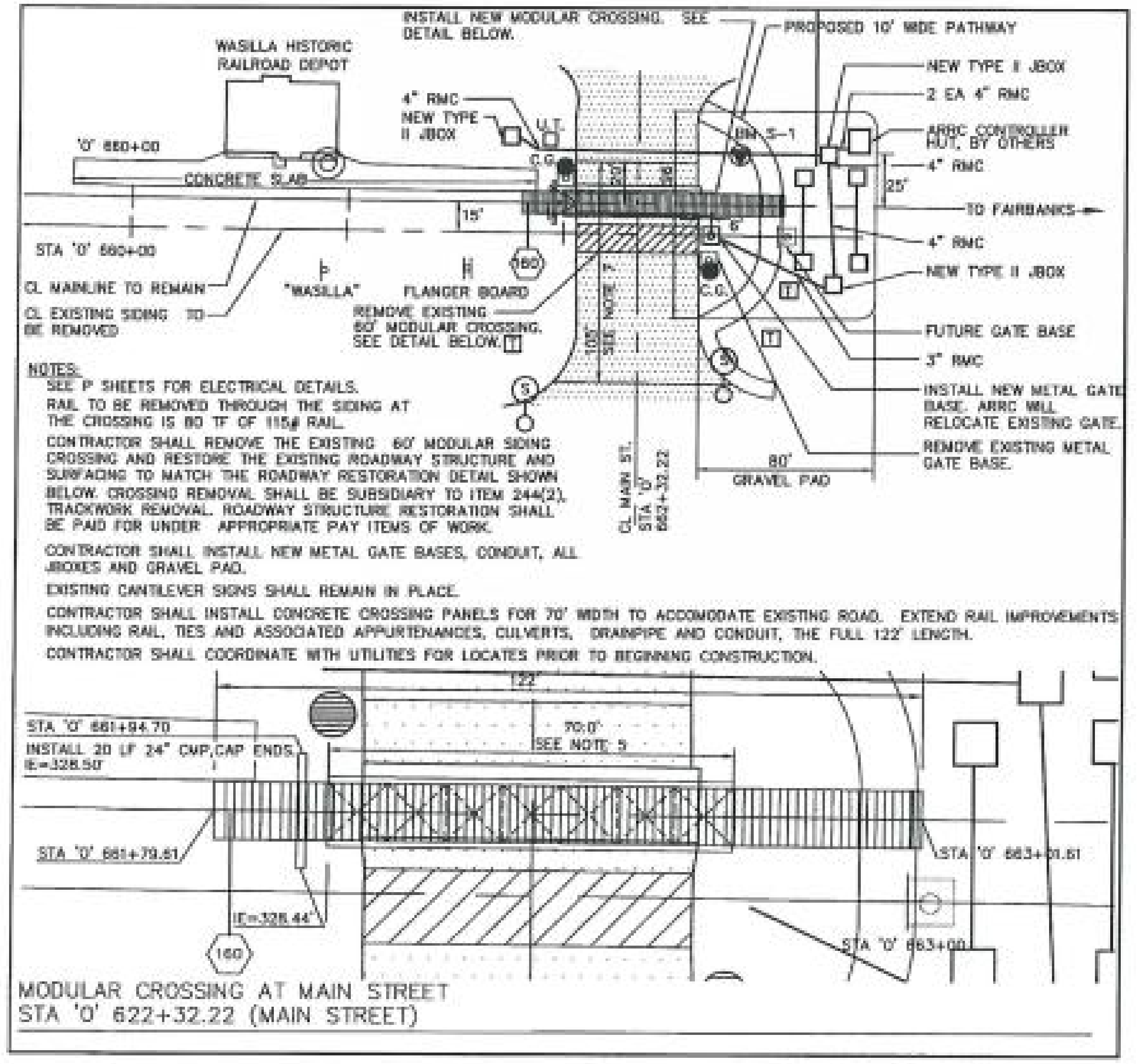


Figure 27-Railroad Crossing

8.2 Detailed Current Schedules

Typical Spring, Summer, and Fall train schedules are presented below in tables 27 through 29.

Typical Fall Train Schedule at Knik Goose Bay Road

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Midnight	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL
1:00 AM							
2:00 AM			FREIGHT	FREIGHT	FREIGHT		
3:00 AM	GRAVEL, PETRO	PET, GRA, FRE	GRAVEL, PETRO	GRAVEL, PETRO	GRAVEL, PETRO	PETRO, GRAVEL	PETRO, GRAVEL
4:00 AM	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO
5:00 AM							
6:00 AM							
7:00 AM							
8:00 AM							
9:00 AM					PASSENGER		PASSENGER
10:00 AM							
11:00 AM							
Noon	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL
1:00 PM							
2:00 PM							
3:00 PM	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL
4:00 PM					PASSENGER		
5:00 PM	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO
6:00 PM	PASSENGER						
7:00 PM							PETRO
8:00 PM	FEIGHT, PETRO	FEIGHT, PETRO	FEIGHT, PETRO	FEIGHT, PETRO	PETRO	PETRO	
9:00 PM							
10:00 PM							
11:00 PM							

Alaska Railroad Line Seward - Fairbanks
Year 2005

Typical Train Length	
TYPE	LENGTH (feet)
FREIGHT	3000
GRAVEL	4400
PASSENGER	1700
PETROLEUM	3000
Information Provided by Dave Kocher 265-2642	

Table 27-Typical Fall Train Schedule

Typical Spring Train Schedule at Knik Goose Bay Road

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Midnight							
1:00 AM						PETRO	
2:00 AM			PETRO	PETRO	PETRO		
3:00 AM	PETRO	PETRO					PETRO
4:00 AM	PETRO	PETRO	PETRO	PETRO	PETRO, FREIGHT	PETRO, FREIGHT	PETRO
5:00 AM			FREIGHT	FREIGHT			
6:00 AM							
7:00 AM		GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	
8:00 AM							
9:00 AM	PASSENGER	PASSENGER	PASSENGER	PASSENGER	PASSENGER	PASSENGER	PASSENGER
10:00 AM		GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL	
11:00 AM		PASSENGER					PASSENGER
Noon		PASSENGER					PASSENGER
1:00 PM		PASSENGER					PASSENGER
2:00 PM							PASSENGER
3:00 PM		PASSENGER					
4:00 PM							
5:00 PM	PETRO	PETRO, PETRO	PETRO	PETRO, PETRO	PETRO	PETRO	PETRO
6:00 PM	PASSENGER	PASSENGER	PETRO, PASS	PASSENGER	PASS, PETRO	PASSENGER	PASSENGER
7:00 PM							
8:00 PM	FREIGHT	FREIGHT	FREIGHT	FREIGHT			
9:00 PM							
10:00 PM	PETRO						PETRO
11:00 PM						PETRO	

Alaska Railroad Line Seward - Fairbanks
Year 2005

Typical Train Length	
TYPE	LENGTH (feet)
FREIGHT	3000
GRAVEL	4400
PASSENGER	1700
PETROLEUM	3000
Information Provided by Dave Kocher 265-2642	

Table 28-Typical Spring Train Schedule

Typical Summer Train Schedule at Knik Goose Bay Road

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Midnight	PETRO	PETRO					
1:00 AM							
2:00 AM			PETRO	PETRO	PETRO		
3:00 AM		PETRO					
4:00 AM	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO, FREIGHT	PETRO
5:00 AM			FREIGHT	FREIGHT	FREIGHT		
6:00 AM							
7:00 AM	PETRO	GRAVEL	GRAVEL	GRAVEL	GRAVEL	GRAVEL, PETRO	PETRO
8:00 AM							
9:00 AM			PASSENGER	PASSENGER	PASSENGER		
10:00 AM	PASSENGER	PASSENGER	GRAVEL	GRAVEL	GRAVEL	PASS,GRAVEL	PASSENGER
11:00 AM		PASSENGER					PASSENGER
Noon		PASSENGER					PASSENGER
1:00 PM							PASSENGER
2:00 PM		PASSENGER					PASSENGER
3:00 PM		PASSENGER					
4:00 PM							
5:00 PM	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO	PETRO
6:00 PM	PASSENGER	PASSENGER	PASSENGER	PASSENGER	PASSENGER	PASSENGER	PASSENGER
7:00 PM							
8:00 PM	FREIGHT		FREIGHT,PETRO	FREIGHT,PETRO	PETRO		
9:00 PM		PETRO					PETRO
10:00 PM							
11:00 PM						PETRO	

Alaska Railroad Line Seward - Fairbanks
Year 2005

Typical Train Length	
TYPE	LENGTH (feet)
FREIGHT	5000
GRAVEL	[illegible]
PASSENGER	1700
PETROLEUM	5000
Information Provided by Dave Kocher [illegible]	

Table 29-Typical Fall Train Schedule

8.3 Rail Traffic Forecasts

8.3.1 Accident Prediction Value Forecasts

Accident Prediction Values (APV) require daily estimates of daytime and nighttime train crossings. The following table from the *Knik-Goose Bay Road Grade Separation Alternatives Analysis* summarizes peak (summer) daily train traffic.

The *Knik-Goose Bay Road Grade Separation Alternatives Analysis* also summarizes winter train traffic. Seven trains cross the road on Sunday, four cross on Friday, and the remainder of the winter weekdays each have five train crossings.

APV computations by ADOT&PF use peaking train schedules. As such, the forecasted peak summer train is used for future APV alternative computations.

Train Type	2004 Peak Daily Train Traffic			2025 Future Peak Daily Train Traffic		
	Day	Night	Total	Day	Night	Total
Base						
Passenger (through Wasilla)	2	0	2	6	0	6
Passenger (Commuter)	-	-	-	16	0	16
Freight	2	4	6	4	6	10
Gravel	2	2	4	4	4	8
Coal	1	1	2	1	1	2
Total Base	**7**	**7**	**14**	**31**	**11**	**42**
Occasional						
Passenger Charter	2	0	2	4	0	4
Company Work	4	0	4	4	0	4
Total Base + Occasional (Peak)	**13**	**7**	**20**	**39**	**11**	**50**

Table 30- Peak Daily Trains for the Knik-Goose Bay Road Crossing, 2004 and 2025

8.3.2 Operation Impact Analyses Forecasts

Operational impacts are determined through forecasting the number of train crossings that will occur during a traffic peak hour, in this case the evening peak hour.

The table below lists the total estimated number of trains expected to preempt the signal during the one hour evening peak traffic period in the future years 2015 and 2025. The 2025 estimate is based on August 2005 discussions with ARRC Strategic Planning and ARRC Engineering, and the 2015 estimate is interpolated from current conditions and the 2025 estimate.

Train Type	Train Length (Source ARRC)	Stop at Wasilla Depot?	Assumed 2015 Preempts	Assumed 2025 Preempts
Petroleum	5000 feet	No	1-NB -	1-NB 1-SB
Gravel	5000 feet	No	- 1-SB	1-NB 1-SB
Passenger	1800 feet	Yes	- 1-SB	1-NB 1-SB
Commuter	270 feet	Yes	1-NB 1-SB	2-NB 2-SB
Totals			**2-NB** **3-SB**	**5-NB** **5-SB**

Table 31- Peak Hour Train Crossing Forecasts

8.4 Alternative Sight Triangles.

The sight triangles at the railroad crossings were evaluated using the Alaska Policy on Railroad/Highway Crossings. The minimum required crossing sight distances are presented in the Appendix D graphics and in the table below:

Vehicle Speed (mph)	Distance Along	Case I	Case II
50, Train 25, Vehicle	Rail	495'	1200'
50, Train 25, Vehicle	Road	175'	25'
50, Train 35, Vehicle	Rail	500'	1200'
50, Train 25, Vehicle	Road	275'	25'

Note: Case I = Distance required for moving vehicle to safely avoid a moving train;
Case II = Distance required for a stopped vehicle to safely accelerate across the tracks in front of an oncoming train.

Table 32-Minimum Railroad Crossing Sight Distance

8.4.1 Existing Sight Triangles at the Knik-Goose Bay Railroad Crossing.

Knik-Goose Bay Road is currently a four-lane roadway consisting of one southbound through lane, one northbound through lane, a northbound right turn lane, and a northbound left turn lane at the rail crossing. Cantilevered flashing lights and automated gates provide active protection for both north and south bound traffic. There are no storage lanes for CMV/buses outside the main traffic flow. The existing vehicle speed limits are 25 mph south bound and 35 mph northbound. The railroad timetable speed is 49 mph, therefore 50 mph was used to evaluate the sight triangles.

The existing roadway does not provide Case I sight distance at the southwest and southeast quadrants of the Knik-Goose Bay / Railroad intersection. There are several existing buildings that block the western sight line and the eastern sight line is blocked by fencing and the Chamber of Commerce building.

Case II sight distance is currently provided at all quadrants of the rail intersection but the southeast quadrant, which only provides 472 feet of sight distance to the east. The existing Chamber of Commerce building at the southeast quadrant is within the sight distance triangle. This building is the original Wasilla Railroad Depot and is considered a historic structure.

8.4.2 Potential Future Sight Triangles at Future At-Grade Crossings of Alternatives A Through D.

The sight triangles for the Alternative at-grade crossings have assumed a future posted speed of 25 mph for the north-bound approach. This speed is consistent with the existing posted speed on Main Street and the alignment of a new development proposed for Yenlo Street between Swanson Avenue and Bogard Road. In addition, a 35 mph design speed would require a longer bridge for the Knik Street overpass (Alternative C). Future sight triangles for Options A through D that do not meet the values within Table 32 for 25 mph are discussed below.

Option A has the same sight distance issues as the existing roadway. Both of the southern Case I sight lines are blocked and the southeast quadrant Case II sight line is blocked by the Chamber of Commerce building.

Option B shares the same Case I sight restrictions as the existing conditions. Although, because Knik-Goose Bay Road is widened, the southeast Case II sight line is reduced to 430 feet to the east.

Option C shares the Case I existing restrictions and because Knik-Goose Bay Road is widened, the southeast Case II sight line is reduced to 417 feet to the east. Option C will also require that the piers for Knik Street Bridge be kept out of the Case II sight line for the northwest quadrant of the Knik-Goose Bay / Railroad intersection.

Option D provides increased Case I sight lines because the one way traffic on Knik-Goose Bay Road and Yenlo Street only encounter restrictions at the edge of the southeast Yenlo sight line. The small building within the southeast quadrant of the Yenlo / Rail intersection also restricts the Case II sight line to 869 feet.

8.4.3 Review Whether Sight Triangles Are Consistent With Train Speeds, Traffic Speeds, And Traffic Control Devices.

Due to the rail and traffic volumes, it is assumed that automated gates will be replaced or installed at all of the future at grade crossings. This will reduce the need for Case I sight lines. Case II sight lines are still typically required for automated crossings and the diagnostic team should evaluate how the building obstructions within all of the southeast Case II sight lines should be addressed. At this time, it appears likely that the Depot function for this building will be relocated off of Mack Drive into a new structure. This would allow the existing Depot building to be repositioned so it does not encroach on the Case 2 sight triangle.

8.5 Existing Signal Preemption Timing And Traffic Control Devices Related To The Adjacent Signal On The Parks Highway.

Controller signal timing parameters were provided by Alaska Central Region ADOT&PF Traffic Section and can be found in Appendix F for the Parks Highway/Main Street intersection. The following phase diagram is based on Central Region design criteria for an intersection with a major east-west highway and would apply to the Parks Highway and Main Street intersection. The diagram is to be used in conjunction with the table below that summarizes signal controller settings for preemption.

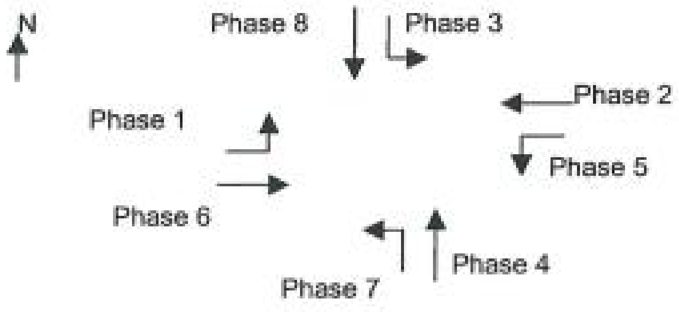


Figure 28-Traffic Signal Phasing, East-West Major Street

The following table summarizes existing railroad preemption timing and phasing parameters that are currently used in the Main Street/Park Highway signal controller.

Traconex® Controller Variable	Definition	Program Values
	Terminating Active Vehicle and Pedestrian Phases	
TPC	Pedestrian clearance interval used for active pedestrian phases in order to next serve the required phases to clear the railroad tracks	7 sec
TY1	Amber vehicle clearance interval used for active phases in order to next serve the required phases to clear the railroad tracks	4.5 sec
TR1	Red vehicle clearance interval used for active phases in order to next serve the required phases to clear the railroad tracks	1.5 sec
	Clearing Queued Highway Vehicles from Track/Highway Crossing	
CGR	Phases that define the signalized vehicle movements required to clear vehicles off of the track during an initiated preemption.	Phases 7 & 4
TM1	Minimum Green interval used for phases required to clear the railroad tracks	15 sec
TY2	Amber vehicle clearance interval used for phases required to clear the railroad tracks	4.0 sec
TR2	Red vehicle clearance interval used for phases required to clear the railroad tracks	1.5 sec
	Servicing Phases After Vehicles Clear from Track (Train has Nearly Approached and Continues to Cross Highway)	
TGR	Phases, sequentially following CGR phases, that are allowed to be served while the train continues to cross track.	Phases 1 & 6
TVO	Phases, that are not allowed to be served and cycled after TGR phases have terminated while train continues to cross track.	Phases 8,7,5 & 4
TPM	Minimum Green interval used for phases (see TGR and TVO) that follow the phases required to clear the track. The oncoming train is near or crossing the highway when TPM starts.	3 sec
TY4	Yellow Interval used to clear all phases after train has left the tracks and signal controller desires to return to normal operation	4.5 sec
TR4	Yellow Interval used to clear all phases after train has left the tracks and signal controller desires to return to normal operation	1.5 sec
TPG	The allowable amount of time in which a continuous electrical signal to the controller, supplied by train detection, is not received before the preemption sequence starts to terminate.	1.0 sec
	Phases Served After Preemption Terminates	
TRG	Phases that are served, under normal signal operation, after train has just left the tracks and preemption has terminated.	Phases 1 & 6
	Other Timing Parameters	
PRR	Amount of time after the entire initial preemption sequence occurs, that the next preemption sequence can occur	5.0 sec

Table 33- Existing Signal Controller Timing Intervals for Railroad Preemption, Parks Highway/Main Street Intersection

8.6 Accident Prediction Values (APV) Review

8.6.1 Description of APV

The US Department of Transportation provides a formula for APV in FHWA-TS-86-215. The APV is an accident prediction value based upon traffic, railroad, roadway, and control characteristics and is computed using a two-step formula process.

a = (K)(EI)(MT)(DT)(HP)(MS)(HT)(HL)

Where:

a= Initial accident prediction, accidents per year at the crossing

K= Formula constant

EI= Factor for exposure index based on product of highway and train traffic

MT=Factor for number of main tracks.

DT= Factor for number of through trains per day during day-light

HP Factor for highway paved (yes or no)

MS= Factor for maximum timetable speed

HT= Factor for highway type

HL= Factor for number of highway lanes.

FHWA TS-86-215 provides factors or computations to determine factors.

The final APV is computed with the second formula:

$$A = \frac{T_o}{T_o + T} \times a + \frac{T_o}{T_o + T} \times \frac{N}{T}$$

A= Final accident prediction

N/T= Accident history prediction, accidents per year, where N is the number of observed accidents in T years at the crossing

T_o= Formula weighting factor, 1/(0.5+a)

ADOT&PF maintains a database of all crossings in the State. Furthermore, this database is also a spreadsheet model which computes DOT APVs as well as other risk models. The APV outputs rank crossings in the State providing decision makers for ADOT&PF and ARRC with a good understanding of relative risk of each crossing compared to the overall population.

The *Alaska Policy on Railroad/Highway Crossings* provides guidance on changing crossing treatments, given the current protection level and computed APV. This allows the ADOT&PF and ARRC to re-evaluate treatments on an annual basis.

8.6.2 Summary of ADOT&PF and ARRC Practices

ARRC permits ADOT&PF roadway crossings of railroad (RR) tracks. The 1988 *Alaska Policy on Railroad/Highway Crossings* provides a framework in which new and existing crossings are evaluated for treatments.

New ADOT&PF road/RR crossings are reviewed by diagnostic teams whose members consist of ARRC, ADOT&PF, and members from local and borough governments; and may also include FHWA, school district, or law enforcement resources as well. In general, crossing treatments are recommended and permitted based upon design objectives for sight distance, alignment, and the treatment levels consistent with the forecasted APV values shown in the 1988 policy. However, there are several institutional exceptions to this procedure. One is that gates are always included with crossing signals, even for locations in which the APV would indicate that signals by themselves are satisfactory. Another exception is that new or improved crossing of National Highway System facilities are grade separated. The diagnostic team will sometimes exercise judgment and experience to recommend higher levels at crossings than would be required by the APV. For example, railroad/highway grade crossing signals are sometimes used for treatment at a crossing that does not meet that APV threshold based upon the teams experience and judgment.

Existing crossings are reviewed by a convened diagnostic team only upon request by an affected interest. One trigger may include the changes in the annual calculation of APV by the ADOT&PF. However, as crossing treatments have improved over the years, there has been a marked decline in Central Region train-vehicle accidents from a high of 13 in 1985, to levels ranging between 0 and 3 in the last 10 years. As such, the calculated APV levels are generally stable without much year-to-year fluctuations, and the need to convene a diagnostic team for APV changes has declined.

ARRC and ADOT&PF have a goal of eliminating train-vehicle crashes entirely. However, a "zero" accident objective is very difficult to attain given the ADOT&PF responsibility to cost-effectively balance mobility, access, and safety. It would not be a wise use of public resources to grade-separate all crossings even if it were to remove all risk of train-vehicle collisions. Nonetheless, the crash reduction that has occurred since the State has acquired ARRC is highly significant, and provides good evidence that the program and policies of ADOT&PF and ARRC are working well.

8.6.3 *Current APV Computations and Analysis*

ADOT&PF Central Region HSIP staff prepares annual APV for crossings in the State, which have a two to three year lag time. The Knik Goose-Bay Road crossing has a 2002 APV of 0.3586 accidents per year, based upon an AADT of 10,060, 1 train-vehicle collision, 6 vehicle-vehicle collision, 25 mph track speed, and 18 daily trains (11 day, 7 night).

The APV rank for this crossing is 4th in the State. The APV value indicated that the crossing treatment would not require changes (Appendix B of the 1998 *Policy*).

8.6.4 *Alternative APV Results*

Alternatives A through D were evaluated for 2025 vehicle traffic and train traffic. 2025 AADT traffic volume forecasts are from the demand models discussed under Section 5. Daily train volumes forecasts are discussed under Section 8.3.1. Future crash profiles are difficult to predict, but for comparison purposes it is assumed that the same 6 vehicle-vehicle and 1 train-vehicle collisions per 5 years would occur in the future.

Lane configurations were obtained from capacity models and input into the APV model. Since the RR parallels the Parks Highway without much separation, auxiliary lanes are included in the highway lane variable.

The *Knik-Goose Bay Road Grade Separation Alternatives Analysis* prepared by HDR Alaska, Inc. indicates that the northbound and southbound train speeds are 25 mph and 49 mph, respectively, and these speeds are assumed to hold in the future. For this analysis, a 25 mph train speed is used (APV is relatively insensitive to increase in train speed).

The following table summarizes the Alternative's APV. These alternatives do not include the Parks Highway Alternate Corridor.

Alternative	Street	AADT (Model Output)	5- Year Collisions	Computed APV
Alternative A -3 Lane Widening	Knik-Goose Bay Road/Main Street	15,022	6 vehicle-vehicle, 1 train-vehicle	0.4435
Alternative B -5 Lane Widening	Knik-Goose Bay Road/Main Street	14,836	6 vehicle-vehicle, 1 train-vehicle	0.4596
Alternative C –Main Street/Knik-Goose Bay Road and Knik Street 2-Way Couplet	Knik-Goose Bay Road (Knik Street Grade Separated)	11,172	6 vehicle-vehicle, 1 train-vehicle	0.4453
Alternative D - Main Street/Knik-Goose Bay Road and Yenlo Street/Talkeetna Street 1-way Couplet	Knik-Goose Bay Road/Main Street (Southbound)	7,423	3 vehicle-vehicle, 1/2 train-vehicle	0.2153
	Yenlo Street/Talkeetna Street (Northbound)	7,253	3 vehicle-vehicle, 1/2 train-vehicle	0.2240

Table 34-Alternative APV Forecasts

Based on these forecasted APV, Appendix B of the 1988 Policy indicates that no change in treatment levels (upgrade to grade separation) would be required.

8.6.5 Contrast the Level of At-Grade Traffic Control Devices with Similar Locations in the State

There are 11 major collector rail crossings in the State of Alaska with AADT in the range of 5,000 to 22,000. Six of these crossings have flashing signals and five of these crossings have flashing signals and gates. These are presented in the following figure. The yellow box represents the region of the Main Street Alternative 2025 APVs, bounded by high and low AADT (approximate) and by high and low APVs stated in the above table.

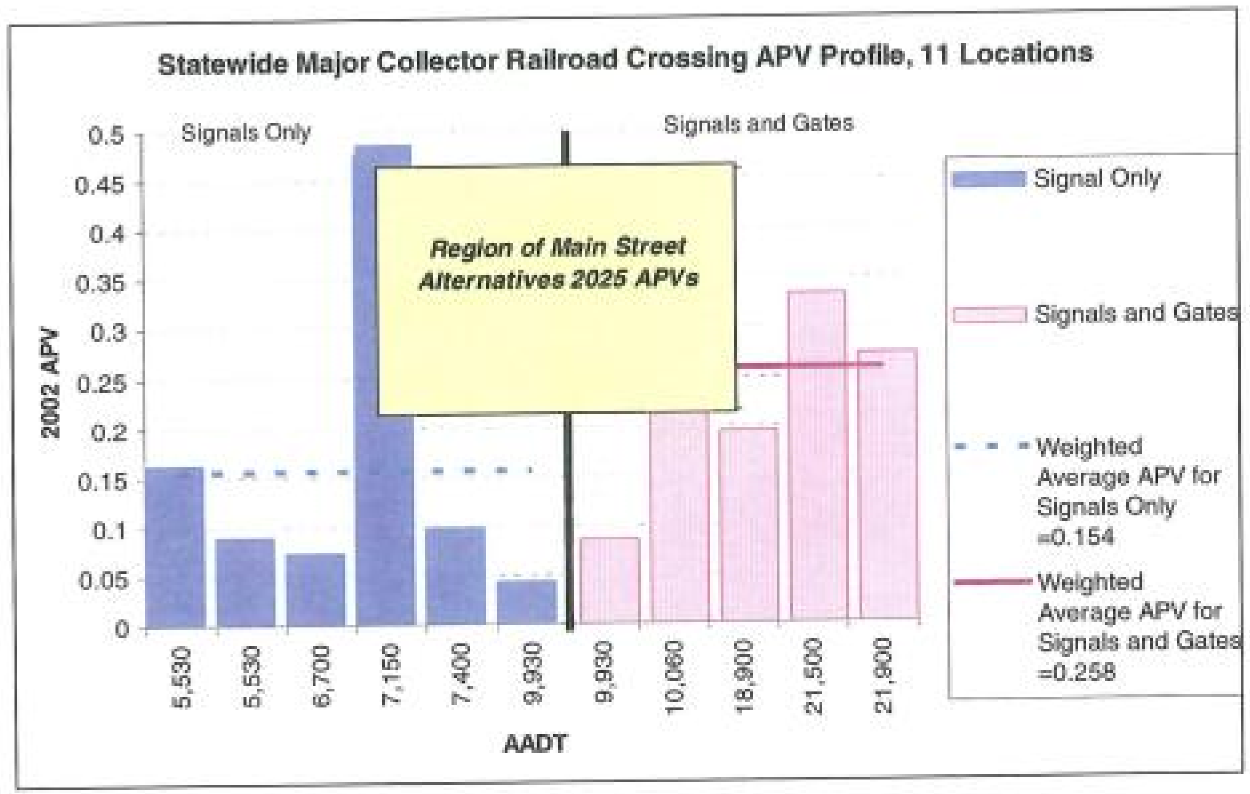


Figure 29-Statewide Major Collector 2002 APV Profile

This graph demonstrates that the Main Street 2025 APVs ranges are not excessive when compared to current APV on similar function class and AADT streets.

8.7 Summary of future RR Preemption Impacts

The purpose of the preemption analysis is to demonstrate future railroad impacts to the study area in the year 2025 and to determine whether or not an alternative form of treatment is required. Alternative treatments may include grade separations, or may support the Parks Highway Alternate Corridor.

Micro simulation models are used to determine the performance of each Alternative. Micro simulation is superior to deterministic analysis tools because of the high interdependence of intersections, railroad, and segment performances; which are not well modeled deterministically.

SimTraffic software was used for this analysis. Since this is vehicle software, train crossings were modeled as special case single vehicles with timings that would approximate pre-emption conditions, which in some cases are approximations of actual timing sequences. However, this analysis provides a good comparison of the relative performance for each alternative.

8.7.1 Preemption Parameters

In this analysis, total warning time includes RR equipment delay after a train is detected, initiation of the RR signal display, descending of RR gates, and a buffer time to ensure the track is cleared prior to train arrival. The actual warning time, or initiation of the RR signal display, at the Knik-Goose Bay Road crossing is displayed for approximately 35 seconds (does not include equipment delay) prior to the train reaching the crossing.

The total time that the traffic is stopped at the crossing includes the warning time, time spent crossing the tracks, time spent stopped on the tracks (northbound and southbound passenger trains) and time for the gate to ascend (approximately 12 seconds) after train has left the tracks.

It is estimated that there is approximately 10 seconds between start of the flashing RR Signal and the start of northbound track clearing phases at the Parks Highway/Main Street intersection. The estimate is based on 21 seconds (green, yellow and red) needed to clear the track prior to the train arrival (note that the exact railroad and signal equipment delays are unknown). Essentially, this would allow for the minimum of 4 seconds of separation time specified in the Manual on Uniform Traffic Control Devices (MUTCD) after the track clearance sequence prior to the train arrival.

The following table lists the total number of trains expected to preempt the signal during the one hour evening peak traffic period in the future years as determined from ARRC Strategic Planning. With exception of the Passenger Trains (preemption time estimated from field data), the estimated time of preemption sequence time is consistent with the estimated time of blockage by the train reported in the *Knik-Goose Bay Road Grade Separation Alternatives Analysis* prepared by HDR Alaska, Inc and the current warning time (35 seconds). The existing maximum northbound and southbound train speeds are 25 mph and 49 mph, respectively, and these speeds are assumed to hold in the future.

Train Type	Train Length (Source ARRC)	Stop at Wasilla Depot?	2015 Preempts	2015 Preempt Order	2025 Preempts	2025 Preempt Order	Estimated Time of Preemption Sequence (per occurrence) *
Petroleum	5000 feet	No	1-NB -	1 -	1-NB 1-SB	1 5	180 seconds 105 seconds
Gravel	5000 feet	No	- 1-SB	- 3	1-NB 1-SB	6 4	180 seconds 105 seconds
Passenger	1800 feet	Yes	- 1-SB	- 4	1-NB 1-SB	2 6	180 seconds ** 180 seconds **
Commuter	270 feet	Yes	1-NB 1-SB	2 5	2-NB 2-SB	3, 8 5,10	50 seconds *** 50 seconds ***
Total			**2-NB** **3-SB**		**5-NB** **5-SB**		**230 seconds** **335 seconds**

* Includes 25 second portion of the 35 second warning time (21 seconds of track clearance and 4 seconds of separation time prior to train arrival), crossing time, time spent on tracks (passenger trains only) and gate ascending time. Preemption sequence for the traffic signal controller includes northbound track clearance phases and subsequent phases that are allowed to dwell and cycle during preemption.

** Actual amount of time will vary depending on length of stop at the depot (southbound and northbound), and when the preemption sequencing will go into effect/technological advances in both RR signal and traffic signal in the future (unknown for northbound) and variability in acceleration for northbound. The time is based on field data obtained for an existing weekday southbound train measured at approximately three minutes.

*** Estimated from a recommendation of one minute by ARRC Planning Department and calculations.

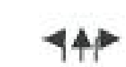
Table 35-Train Type and Associated Preemption Times Used for Simulation During 2015 and 2025 PM Peak Hour Traffic

The preemption sequence times for each train must coincide with the length of the phases that occur during preemption because of software protocol. As such, it is assumed that the passenger trains and the northbound gravel/petroleum trains have the same relative time which is reasonable since their actual estimated time differences are negligible. In reality, all the times provided in the table provide very good estimates for both trains and phases.

Simulation models include the following assumptions.

- All preemption phase sequences start at the end of eastbound/westbound Parks Highway traffic phases in order to ensure the controller returns to the correct phases when exiting the preemption; this is a software limitation but also represents a worse case situation for traffic on Main Street/Knik-Goose Bay Road.
- Sequences are pre-timed because of software limitations. The sequences are based on the estimated maximum splits and are very likely to represent actual field conditions because of the heavy traffic demand in the PM rush hour.
- Sequences are mutually exclusive for each train and multiple trains cannot utilize or extend the same preemption and at least one normal cycle is assumed to be permitted between trains.

Alternative preemption sequences are presented in the following tables.

	Track Clear Phase	Dwell Phase Sequence		Extended (Optional) Phase Sequence	
Parks Highway and Main Street					
Timing	21 Seconds	29 Seconds	55 Seconds	20 Seconds	55 Seconds
	50 Second Train		(Not Used)		
	105 Second Train			(Not Used)	
	180 Second Train				

Northbound is in the up direction. Permissive movements are indicated by dashed arrows.

* Assumes EBLT protected phase is skipped (reasonable assumption since longer times are allocated in dwell phase for EBLT).

Table 36–Preemption Signal Phase Sequence for 2015 & 2025 Alternative A 3-Lane, Alternative B 5-Lane and Alternative C Knik-Main Couplet

	Track Clear Phase	Dwell Phase Sequence		Extended (Optional) Phase Sequence	
Parks Highway and Yenlo Street					
Parks Highway and Main Street	**				
Timing	25 Seconds	25 Seconds	55 Seconds	25 Seconds	50 Seconds
	50 Second Train			(Not Used)	
	105 Second Train			(Not Used)	
	180 Second Train				

Northbound is in the up direction. Permissive movements are indicated by dashed arrows.
* * Additional westbound preempt sequence of 45 seconds is needed to move westbound queue at Main Street prior to "track clear phase". This is not shown but is accounted for since the phases prior to the "track clear phase" are eastbound and westbound at both intersections. The 45-seconds phase is not required, but the need for it will require some engineering judgment in the future depending on the length of the westbound queue and degree of coordination between the two signals.

Table 37-Preemption Signal Phase Sequence for 2015 & 2025 Alternative D Yenlo-Main Street Couplet

The tables below summarize the phase sequence for normal signal operation used for each alternative. Permitted movements that must yield either to other vehicular or pedestrian movements are indicated by the dashed arrows. The Parks Highway intersections at Main Street and Yenlo Street were modeled with the same controller in order to coincide proper timing and sequences during preemption and to ensure platoon progression for Parks Highway traffic during normal operation. Because of this, all Parks Highway intersections for all alternatives did not necessarily achieve coordination with signals to the north and south of the Parks Highway. Time allocated to each movement (split) within the cycle was optimized for the entire PM hour based on delays incurred by the preemption.

Intersection	Northbound and Southbound Phases		Eastbound and Westbound Phases	
Parks Hwy and Main St.		*		

Northbound is in the up direction. Permissive movements are indicated by dashed arrows.
* Permissive left turn movement is not allowed for 2025 5-lane alternative

Table 35-Normal Signal Phase Sequence for 2025 Alternative A 3-Lane, Alternative B 5-Lane and Alternative C Knik-Main Couplet

	Northbound and Southbound Phases	Eastbound and Westbound Phases	
Parks Hwy and Yenlo St.			
Parks Hwy and Main St.			

Northbound is in the up direction. Permissive movements are indicated by dashed arrows.

Table 38- Normal Signal Phase Sequence for 2025 Alternative D Yenlo-Main Couplet

Pedestrian actuations are not shown in the above table, but were allowed during normal cycle operation and some of the preemption sequences.

8.7.2 Performance Measures

Performance measures for RR preemption within the PM peak hour are based on a full hour simulation of constant (50th percentile) traffic demand in order to control predetermined train arrival periods in the simulation.

Multiple simulation periods were conducted using t-statistic criteria to obtain 95% confidence that the mean system delay was within 10% of the actual mean delay. Mean system delays for each 1-hour simulation were statistically screened for extreme values or *outliers*. Simulations that showed visual problems and reported *outlying* delays were discarded and the mean delays for the alternatives in question were recomputed. This ensured a fair comparison of simulated performance measures among alternatives.

8.7.2.1 Intersection Performance-2015 Railroad Preemption

Intersection delay (reported by micro simulation) is reported in the tables for 2015 for all intersections along north-south critical routes. The alternatives did not include the Parks Highway Alternate Corridor option, and therefore are a worst case. Micro simulation provides the best measure of performance for each 2015 alternative because queues created from overcapacity movements and preemptions tend to back through and interact with upstream intersections. Bogard Avenue intersection results were not reported since most of the delay is due to the signal control only at this intersection.

The information provided below is based on lane configurations utilized for 2025 scenarios (discussed in previous sections) with additional northbound storage improvements for the couplet alternatives on the approaches to the Parks Highway. The additional storage for the couplets take into account additional improvements needed as a result of recovery from preemptions.

		2015 Existing (3-Lane)			2015 5-Lane			2015 Knik-Main Couplet			2015 Yenlo-Main Couplet		
Intersection	**Major Street**	**Con-trol**	**Delay (sec)**	**LOS**	**Con-trol**	**Delay (sec)**	**LOS**	**Con-trol**	**Delay (sec)**	**LOS**	**Con-trol**	**Delay (sec)**	**LOS**
Paulson Avenue	**Main Street**	TW	207	F	TW	3	A	TW	39	E	TW	1	A
	Knik Street	-	-	-	-	-	-	TW	3	A	-	-	-
Post Office driveway	**Main Street**	TW	74	E	TW	3	A	TW	16	B	None	4	-
Swanson Avenue	**Main Street**	AW	216	F	Sig	29	C	Sig	40	D	Sig	23	C
	Knik Street	-	-	-	-	-	-	Sig	28	C	-	-	-
	Yenlo Street	-	-	-	-	-	-	-	-	-	Sig	21	C
Herning Avenue	**Main Street**	TW	48	D	TW	32	D	TW	16	C	TW	29	D
	Knik Street	-	-	-	-	-	-	TW	24	C	-	-	-
	Yenlo Street	-	-	-	-	-	-	-	-	-	TW	19	C
Parks Highway	**Main Street**	Sig	78	E/F	Sig	198	F	Sig	121	F	Sig	31	C
	Yenlo Street	-	-	-	-	-	-	-	-	-	Sig	140	F
Railroad Track	**KGB Road**	RR	7	-	RR	8	-	RR	9	-	RR	3	-
	Talkeetna St	-	-	-	-	-	-	-	-	-	RR	17	-
Railroad Avenue	**KGB Road**	TW	75	E	TW	55	F	TW	39	E	TW	1	A
	Talkeetna St	-	-	-	-	-	-	-	-	-	TW	62	F
Susitna Avenue	**KGB Road**		366	F	Sig	60	E	-	-	-	TW	2	A
	Talkeetna St	-	-	-	-	-	-	-	-	-	Sig	66	E
Park Avenue	**KGB Road**	TW	729	F	-	-	-	Sig	20	B	-	-	-

TW – Minor Street Stop Control; AW – All-Way Stop Control; Sig-Traffic Signal; RR-RR Signal

Table 39-Intersection Performance Measures - 2015 No-Bypass Alternatives – Railroad Preemption

For 2015, the figure below gives a visual average comparison among alternatives as to what a typical driver might experience in delays at each location north or south of the Parks Highway during the evening peak traffic hour when railroad preemptions occur. This may also indicate how well the alternative systems recover from the preemptions during the evening peak traffic hour and what locations are most impacted by preemption.

Figure 30 shows the average of the delays for all critical intersection locations north and south of the Parks Highway. The reported delay for the Yenlo-Main Couplet alternative is an average of the intersection delays at Yenlo Street and Main Street while the delays for the Knik-Main Couplet are an average of the intersections delays at Knik Street and Main Street.

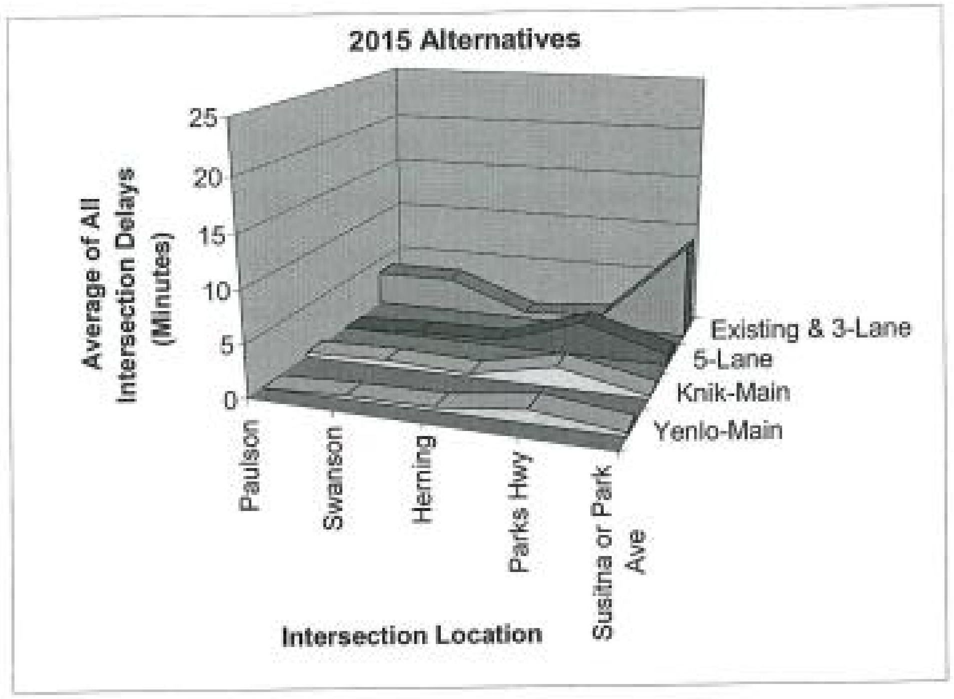


Figure 30-Intersection Railroad Preemption Average Delay, 2015, By Alternatives

In the figure for 2015, the existing/3-Lane alternative is influenced well north and south of the Parks Highway and will have very long delays indicating long or unlikely recovery periods between trains.

For the Yenlo-Main Couplet, the signalized Susitna Avenue intersection's high delays are very much influenced by the railroad preempts, as can be seen by the reported delay in the southerly direction of the figure above. Less negative impacts can be expected with the signal located at Park Avenue/Main Street for the Knik-Main Couplet alternative when compared with the signal location at Susitna/Main for the Knik-Main Couplet. Overall, the total typical impacts for each of the couplet alternatives north and south of the Parks Highway are somewhat similar.

The influence of the preemptions for the 5-lane alternative is more significant when compared to the couplet alternatives. The amount of time required for north-south traffic to dissipate north-south queues has a significant impact on Parks Highway traffic as can be seen by the spike in delay in the figure and is cause for concern. Intersections are expected to be affected just south of Park Avenue.

8.7.3 *Intersection Performance-2025 Railroad Preemption*

Intersection delay is reported in the table below for all intersections along Main Street and Knik-Goose Bay Road and probably provides the best measure of performance for each 2025 alternative (without Park Alternative Corridor option). Queues caused by overcapacity movements and preemptions tend to back through and interact with upstream intersections. Bogard Road intersection results were not reported since most of the delay is due to the signal control at this intersection.

		2025 Existing And 3-Lane *			2025 5-Lane			2025 Knik-Main Couplet			2025 Yenlo-Main Couplet		
Intersection	**Major Street**	**Control**	**Delay (sec)**	**LOS**	**Control**	**Delay (sec)**	**LOS**	**Control**	**Delay (sec)**	**LOS**	**Control**	**Delay (sec)**	**LOS**
Paulson Avenue	**Main Street**	TW	420	F	TW	3	A	TW	39	E	TW	8	A
	Knik Street	-	-	-	-	-	-	TW	2	A	-	-	-
Post Office driveway	**Main Street**	TW	190	F	TW -	4	A	TW	18	C	None	59(SB)	-
Swanson Avenue	**Main Street**	AW	1400	F	Sig	143	F	Sig	43	D	Sig	61	E
	Knik Street	-	-	-	-	-	-	Sig	28	C	-	-	-
	Yenlo Street	-	-	-	-	-	-	-	-	-	Sig	89	E/F
Herning Avenue	**Main Street**	TW	78	E	TW	37	E	TW	17	C	TW	13	B
	Knik Street	-	-	-	-	-	-	TW	28	D	-	-	-
	Yenlo Street	-	-	-	-	-	-	-	-	-	TW	35	D
Parks Highway	**Main Street**	Sig	150	E	Sig	314	F	Sig	230	F	Sig	74	E
	Yenlo Street	-	-	-	-	-	-	-	-	-	Sig	469	F
Railroad Track	**KGB Road**	RR	10	-	RR	11	-	RR	10	-	RR	4	-
	Talkeetna St	-	-	-	-	-	-	-	-	-	RR	14	-
Railroad Avenue	**KGB Road**	TW	150	F	TW	109	F	TW	49	E	TW	1	A
	Talkeetna St	-	-	-	-	-	-	-	-	-	TW	85	F
Susitna Avenue	**KGB Road**		750	F	Sig	772	F	-	-	-	TW	2	A
	Talkeetna St	-	-	-	-	-	-	-	-	-	Sig	109	F
Park Avenue	**KGB Road**	TW	2300	F	-	-	-	Sig	24	C	-	-	-

TW – Minor Street Stop Control; AW – All-Way Stop Control; Sig-Traffic Signal; RR-RR Signal

* Based on 2005 Signal Timing Parameters

Table 40-Intersection Performance Measures - 2025 No-Bypass Alternatives – Railroad Preemption

The delays for the intersections upstream from the Parks Highway are an indication of the impact of the train preemptions in the year 2025. Both couplet alternatives appear to out-perform the existing/3-lane and 5-lane alternatives; however, no alternative performs to desirable levels in 2025 when trains cross at-grade.

The Knik-Main Couplet has similar but slightly better overall performance north of the Parks Highway when compared with the Yenlo-Main alternative. Due to preemptions, traffic queues from the Main/Swanson intersection start to cause congestion at the Yenlo/Swanson intersection and present a cause for concern for northbound traffic on Yenlo Street queuing to the Parks Highway.

The intersections south of the RR track (excluding Railroad Avenue) will perform better with the Knik-Main Couplet if additional storage length is provided for auxiliary lanes on the northbound Main Street approach, and this was incorporated into the model for 2025. In the 2025 model and 2015 model, the results shown include a longer northbound left-turn lane than would be required if the RR was not there. Also, the performance of the Knik-Main Couplet may be better than shown since more traffic is likely to divert to Knik Street during preemptions and since the train prohibits southbound movement (allows essentially a free flow northbound left turn at Susitna/KGB Road during preempt).

In both 2025 couplet cases, northbound storage improvements have been provided south of the tracks in the models, to augment intersection geometry recommendations necessary for capacity objectives. These improvements include:

- 2025 Yenlo-Main Alternative (without Parks Alternate Corridor) would include increased Talkeetna Avenue northbound approach to Susitna Avenue to a 3-lane approach for the Yenlo-Main Alternative from the recommended 2-lane approach. This provides needed capacity for northbound traffic at the Parks Highway/Yenlo Street signal for recovery from a preemption and it also allows residential traffic to get onto Talkeetna Street at the Susitna Avenue signal during preemptions and preemption recovery periods (preemptions cause queues to back thru Susitna Avenue from the Parks Highway).
- 2025 Knik-Main Alternative (without Parks Alternate Corridor) would include increased northbound auxiliary lane lengths at the Parks Highway intersection from the recommended existing configuration on KGB Road (no additional lanes). This increases northbound capacity at the Parks Highway signal, which is needed most after preemptions and it, prevents traffic from backing into the signal to be located at Park Avenue.

As indicated in the above table, the preemption analysis justifies a need for additional treatment in 2025 in addition to the recommended configurations of the alternatives listed.

The following figure presents 2025 intersection delay in graphical form. The reported delay for the Yenlo-Main Couplet alternative is an average of the intersection delays at Yenlo Street and Main Street while the delays for the Knik-Main Couplet are an average of the intersections delays at Knik Street and Main Street.

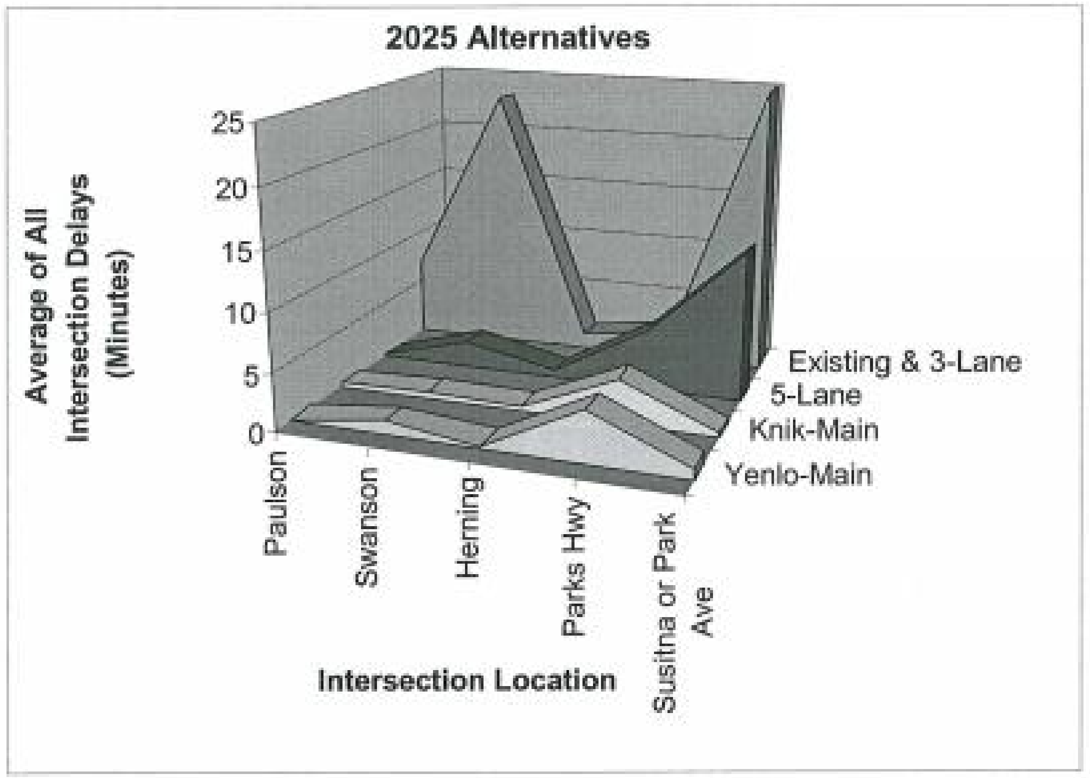


Figure 31-Intersection Railroad Preemption Delay, 2025, By Alternatives

In the figure for 2025, the existing and 5-lane alternatives are influenced well north and south of the Parks Highway and are unlikely to recover between trains.

For the Yenlo-Main couplet in 2025, the signalized Susitna Avenue intersection's high delays are worsened by the railroad preempts and the influence of the railroad preemptions extend south of Susitna Avenue. With the signal located at Park Avenue/Main Street for the Knik-Main Couplet alternative, a signal is less impacted when compared with the signal at Susitna/Main for the Yenlo-Main Couplet. Overall, the total typical delays for each of the couplet alternatives north and south of the Parks Highway appear to be somewhat similar.

8.7.4 System Performance-Railroad Preemption

The following figures report expected system performance based on railroad preemption at the Knik-Goose Bay Crossing. The results include all intersections and approaches for each 2025 and 2015 alternative (without the Parks Alternate corridor) that are affected by railroad preemptions. South to north limits include approximately 1000-feet south of Park Avenue to Bogard Road/Nelson Avenue, respectively. None of the reported delays include the intersection delays at Bogard Road or Nelson Avenue.

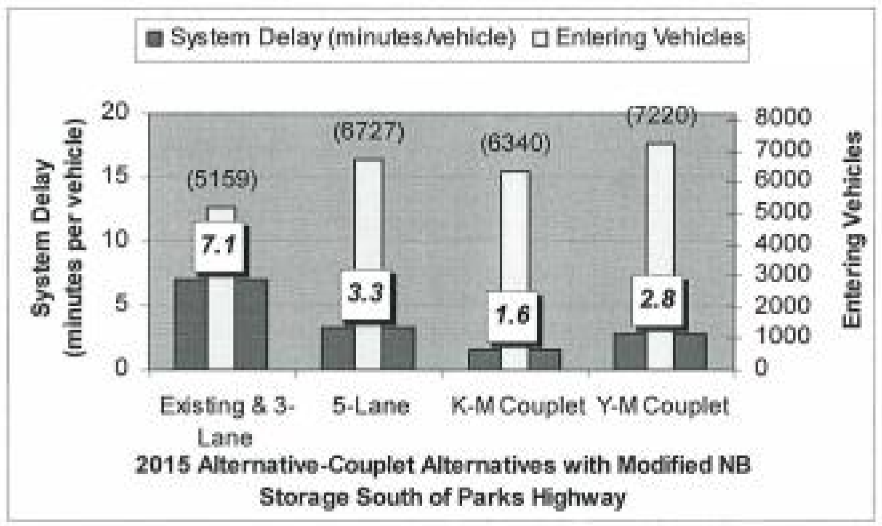


Figure 32 – 2015 System Performance Measures (Includes Railroad Preemption at Knik-Goose Bay Road Crossing)

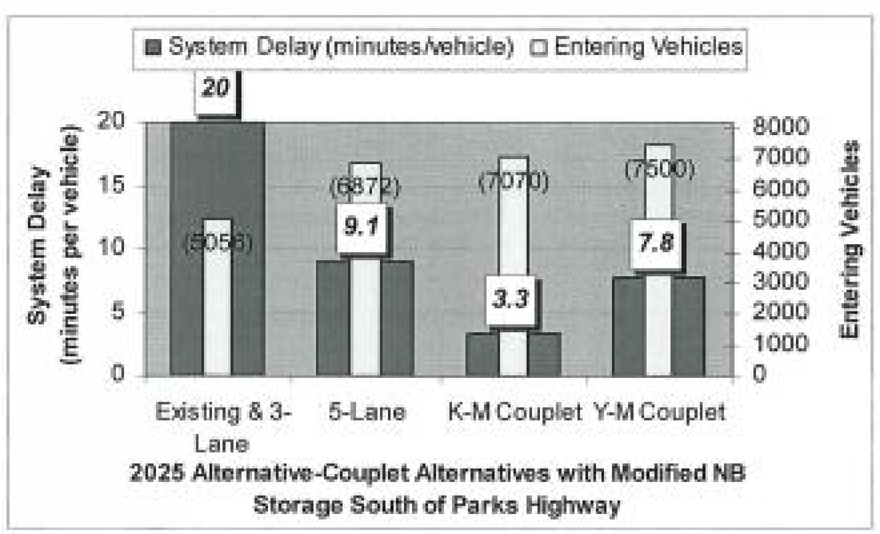


Figure 33– 2025 System Performance Measures (Includes Railroad Preemption at Knik-Goose Bay Road Crossing)

Vehicles entering the system are noted in the above figures since congestion is indicated by a low number of vehicles entering with a high delay.

The two couplet alternatives respond the best to the impedance created by railroad preemption. Since level of service is not associated with system performance, we can only generalize in stating that the system delay is lowest and vehicles served is highest for the Knik-Main Couplet; furthermore, the Knik-Main couplet may have a slight advantage for traffic desiring to get across the Parks Highway without having to travel near Main Street.

8.7.5 Preemption-Operational Summary

Based on the results, it is expected that the Knik-Main Couplet may see undesirable impacts by the preemptions in the year 2015 even though a small portion of the traffic would be expected to divert to Knik Street during the times of preemption. In additional to the original recommendations for intersection operation without RR influence, extending two northbound lanes on Main Street from Railroad Avenue would improve recovery periods to desirable levels for a few years beyond 2015 but would likely pose impacts to adjacent property.

The Yenlo-Main couplet will likely see undesirable recovery periods sometime between 2015 and 2025. Providing an additional northbound approach through lane (for a total of three NB through lanes) south of the railroad crossing to the Susitna/Talkeetna Street intersection would improve recovery periods on the northbound approach and would assist the needed recovery on both northbound and westbound approaches. However, because the queues on westbound Parks Highway approach would have difficulty in recovering, it is likely additional improvements (in addition to the northbound improvements) such as a separated grade railroad crossing would be needed between 2020 and 2025.

8.8 Results of a Diagnostic Team Review

Future item, to be addressed during design.

9 Summary Analysis of Alternatives

9.1 General considerations.

Currently, the intersection at Main Street and the Parks Highway operate at a LOS of "D", but based on an average southbound Main Street travel speed of 8 mph, the LOS is E. Congestion will continue to increase as the Matanuska-Susitna Borough population grows. In 2025, the Parks Highway intersection LOS will fall to F and the average southbound Main Street travel speed will be 2-3 mph with queues extending north of the Bogard intersection. This condition is not altered by a potential Alternative Corridor for the Parks Highway and ARRC.

In addition, traffic operations will be increasingly impacted by train traffic. Within the next ten to twenty years, train delay will dominate vehicular delay. Eventually the Main Street alternatives will all have a failing level of service due to delays caused by trains crossing the Knik-Goose Bay Road.

The Department of Transportation and Public Facilities and the Alaska Railroad Corporation (ARRC) are jointly studying an alternative corridor south of the current location, for the Parks Highway and the ARRC track. If an alternative corridor is constructed, then frequent and long duration train-induced delays will be effectively eliminated within the study area by relocating all but passenger trains to the alternative corridor. In addition, much of the Parks Highway traffic will be diverted around the study area, favorably impacting the level of service within the study area. However the Main Street / Parks Highway intersection is still expected to be operating at an undesirable level of service of E to F, so other core area improvements will also be necessary.

9.2 Basic (at-grade) Alternatives

In general, the assumed urban cross sections include 11' wide through lanes, 12' wide turn lanes, 4' wide raised medians where necessary to channelize traffic, 14' wide outside lanes to allow bicycle use, and 5' wide sidewalks on both sides of all reconstructed roads. In locations where Right-of-Way is sufficiently wide, sidewalks are set back 6' from the road to provide snow storage. Where Right-of-Way does not permit wide outside lanes, bicycles will be required to occupy the lane as a vehicle. Side slopes are assumed to be 2H:1V, and the roads are assumed to match the existing profile. The analysis of all basic alternatives includes approach road upgrades.

9.2.1 *Alternative A-3 lane Main Street.*

The name of this alternative is somewhat misleading, as intersection lane requirements cause most of this alternative to have more than three lanes. The typical section is shown in the following figure with three lanes.

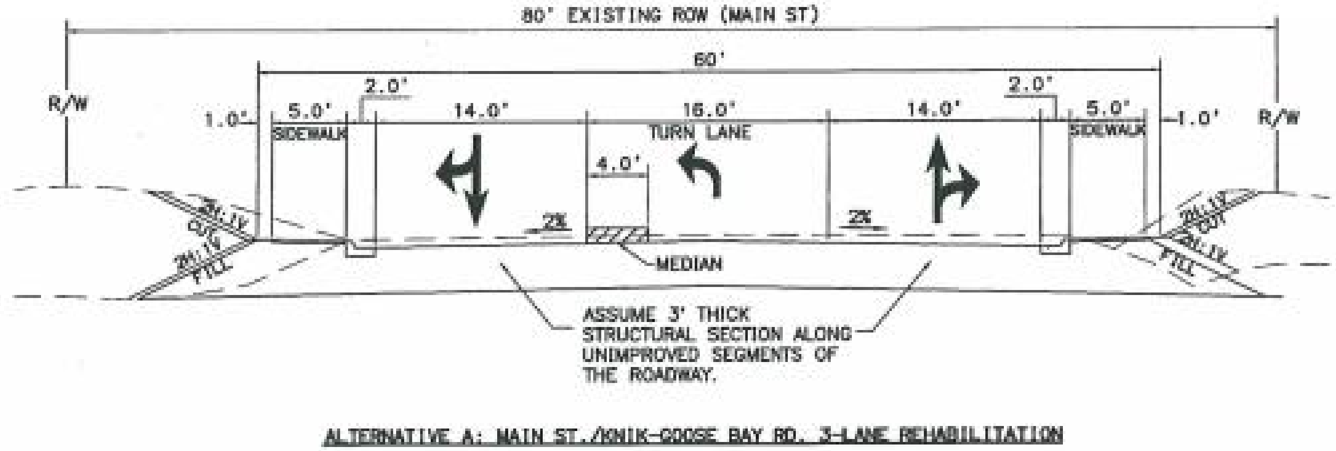


Figure 34 Alternative A Typical Section

This alternative is the least disruptive and least costly of any alternative. However, it will still require some narrow right of way takes along Nelson, Swanson, and Knik-Goose Bay Road. The railroad crossing of Knik-Goose Bay Road will remain the only crossing within the study area.

However, this alternative provides the lowest capacity of any alternative. Congestion will hamper access to adjacent businesses for vehicles and pedestrians. Except for breaks at roadway intersections, raised medians will be installed continuously from Railroad Avenue to Bogard Road to prevent left turns across the Main Street left turn lanes. Raised medians are included in front of Paulson Avenue and Railroad Avenue to prevent left turns at those intersections. Sidewalk buffers for snow storage have not been included because of Right-of-Way constraints.

9.2.2 Alternative B – 5 lane Main Street.

Similar to Alternative A, this alternative also is wider than typical from Herning Avenue to Susitna Avenue. The typical section is shown in the following figure with five lanes.

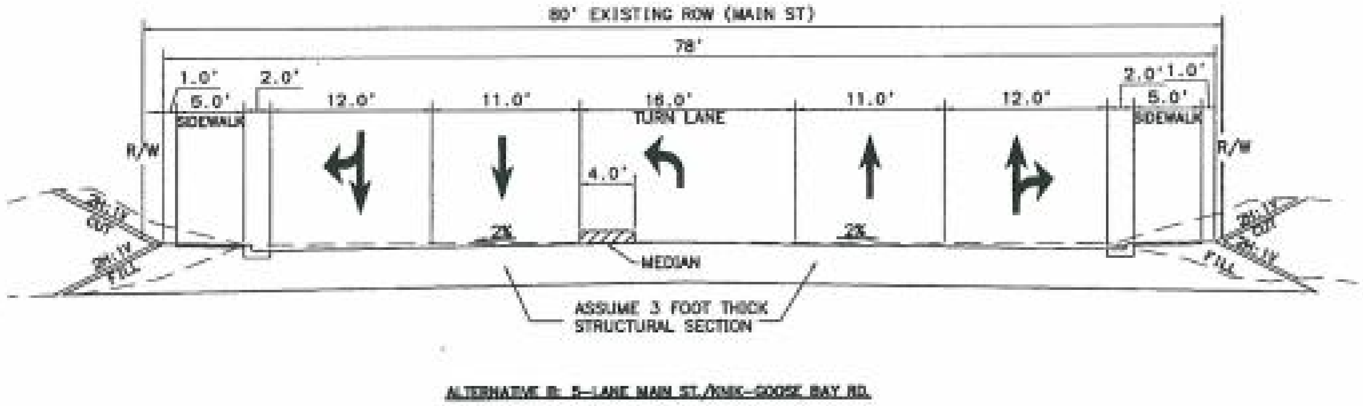


Figure 35-Alternative B Typical Section

This alternative offers slightly improved levels of service compared to Alternative A and does not require a new railroad crossing, however the impacts to adjacent property will be almost continuous. The eastern frontage of Main Street and Knik-Goose Bay Road from Susitna Avenue to Bogard Road will either require partial right-of-way takes or retaining structures. The property on the west side of Main Street and Knik-Goose Bay Road from Susitna Avenue to Herning Avenue will be impacted, including three buildings. The improvements along the west side of Main Street will occupy all of the existing right-of-way, thereby eliminating any unauthorized parking within the existing right-of-way.

Except for breaks at roadway intersections, raised medians will be installed continuously from Railroad Avenue to Bogard Road to prevent left turns across the Main Street turn lanes. A raised median is included in front of Railroad Avenue to prevent left turns at that intersection. Sidewalk buffers for snow storage and wide outside lanes for bicyclists have not been included because of Right-of-Way constraints. The wide roadway, congestion, and extensive medians will make obstacles to vehicular and pedestrian access.

9.2.3 Alternative C- Knik-Main Street Two-Way Couplet

In terms of Main Street and KGB, this alternative is very similar to Alternative A. Main Street and Knik-Goose Bay Road remain 3-lane facilities, except where they are near the Parks Highway where additional lanes are necessary. However, Knik Street would be elevated to cross the Parks Highway and the Alaska Railroad with a bridge. The typical sections are shown in the following figure.

This alternative offers one of the best levels of service of the alternatives studied. Vehicle and pedestrian access will be enhanced by the relatively narrow roads, low congestion, and multiple travel routes. Emergency vehicles access across the Parks Highway and Railroad corridor will be enhanced, although the model shows that primary access to the Parks Highway will continue to be from Main Street.

Impacts to property adjacent to Main Street is minor, similar to Alternative A. However, the impact to property adjacent to Knik Street will be significant. The approaches to the bridge will be elevated above the adjacent property and eliminate access to Knik Street. The entire tier of lots on the east side of Knik Street and north of the Parks Highway are considered full-takes, as is most of the property between the Parks Highway and Susitna Avenue.

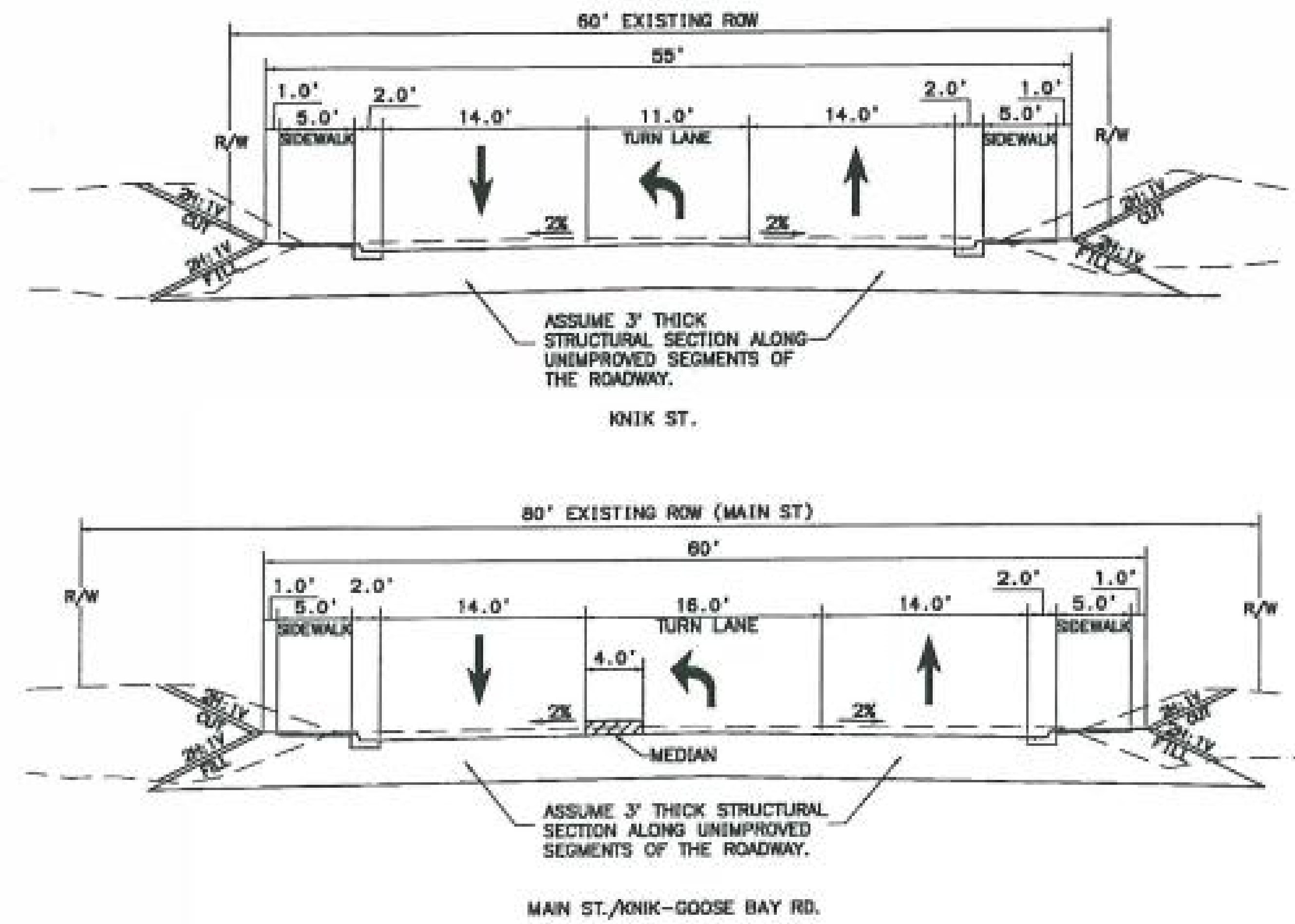


Figure 36-Alternative C Typical Sections

Except for breaks at roadway intersections, raised medians will be installed continuously from Susitna Ave. to Bogard Road to prevent turns across the Main Street turn lanes. A raised median is included in front of Railroad Avenue to prevent left turns at that intersection. Raised medians are not included for Knik Street. Sidewalk buffers for snow storage have not been included because of Right-of-Way constraints. The wide roadway, congestion, and extensive medians will make obstacles to vehicular and pedestrian access.

Alternative C has a higher level of impact to adjacent property than Alternative D. Therefore, the cost for Right-of-Way acquisition is expected to be about 70% higher for Alternative C than for Alternative D.

This will be the most costly alternative to construct. This alternative will prohibit left-turn access to Railroad Avenue. Most importantly, if selected, this alternative will forever prohibit a rail over road method of separating the roadway and rail traffic between the Palmer-Wasilla Highway and Lake Lucille. The Knik Street Bridge will occupy the same space as a railroad bridge across Knik-Goose Bay Road.

9.2.4 Alternative D – Yenlo-Main One-Way Couplet

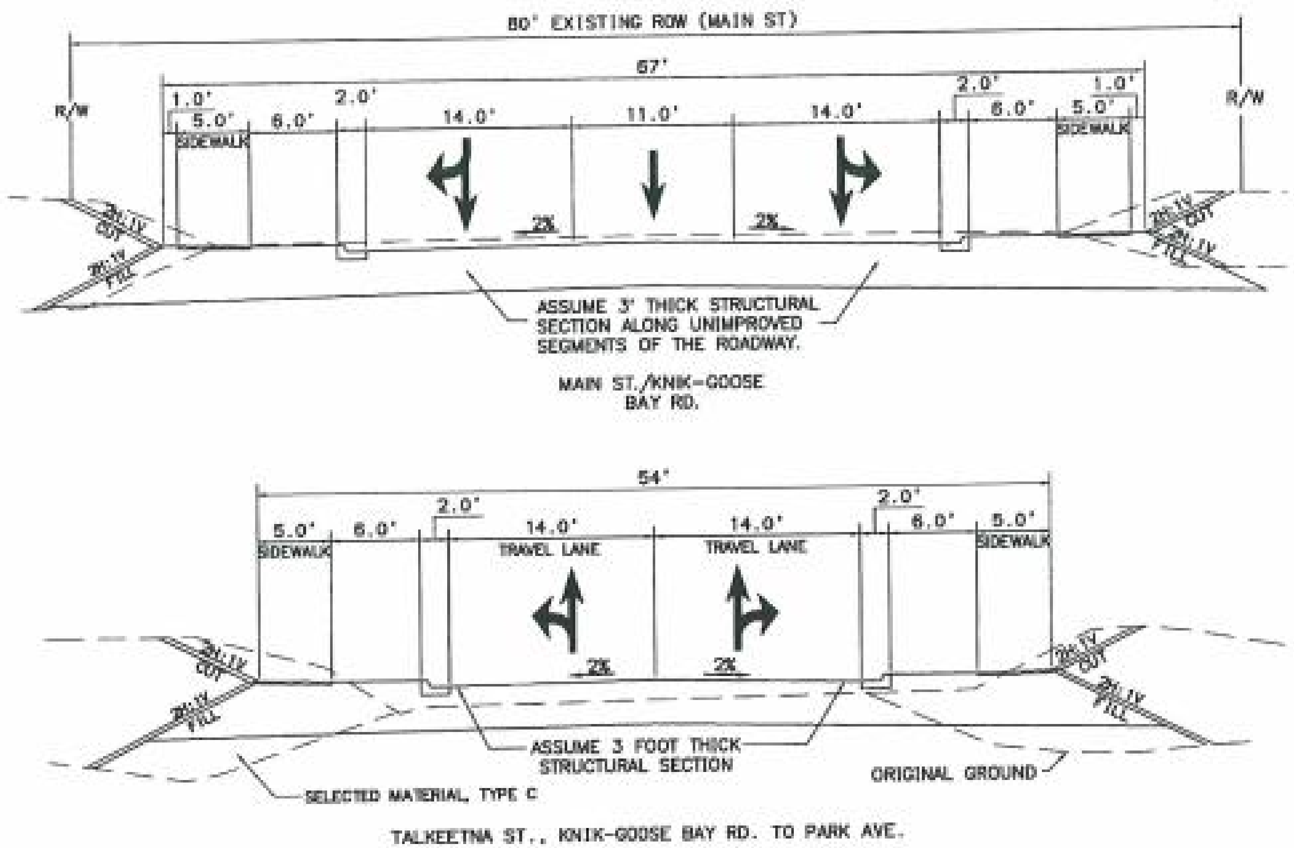
This alternative would create a one-way couplet, similar to 5th and 6th Avenue in Anchorage. Yenlo and Talkeetna Streets would function as a one-way northbound leg of the couplet. Main Street and Knik-Goose Bay Road would function as a one-way southbound leg of the couplet. The typical sections are shown in the following figure.

This alternative would extend Talkeetna Street south from Park Avenue to Knik-Goose Bay Road near Centaur Avenue, and Yenlo Street would be extended north from Swanson Drive to Bogard Road. As originally conceived and modeled, this alternative would have extended Yenlo Street north to Wasilla-Fishhook Road south of Aspen Avenue. However, as the study progressed it became apparent that Yenlo Street could terminate at Bogard Road and avoid impacts to a nearby church, school ball fields, residences, and undeveloped private property; while still providing a high level of service. Consequently, Alternative D was redefined to terminate Yenlo Street at Bogard Road.

Yenlo and Talkeetna Streets would have sidewalks with buffers, except for the segment from the Parks Highway to Swanson Ave where the right-of-way to provide the buffers would be too costly. The segment between Swanson Avenue and Bogard Road will not have provide wide outside lanes suitable for type A bicyclists because the right-of-way necessary for wide curb lanes would be incompatible with the planned Yenlo Square Development. Main Street and KGB have a wider right-of-way, so wide curb lanes and sidewalk buffers will be continuous.

This alternative will provide a relatively high level of service, comparable to Alternative C. Vehicle and pedestrian access to adjacent property will be very good because of narrow roads, one-way traffic, relatively low congestion, and no medians. One-way traffic facilitates signalized pedestrian crossings and reduces vehicle conflicts at the signals. This alternative would expand the existing road network and increase connectivity. The cost of this option is lower than alternative C, although it performs at a similar level. This option does not limit or prohibit any other alternatives, particularly grade separation.

The right-of-way requirement for this alternative will be primarily unimproved land. Property adjacent to Main Street and Knik-Goose Bay Road would be minimally impacted, since there would be three traffic lanes as there is today. However, Yenlo and Talkeetna Streets would see impacts to the adjacent property for several reasons.



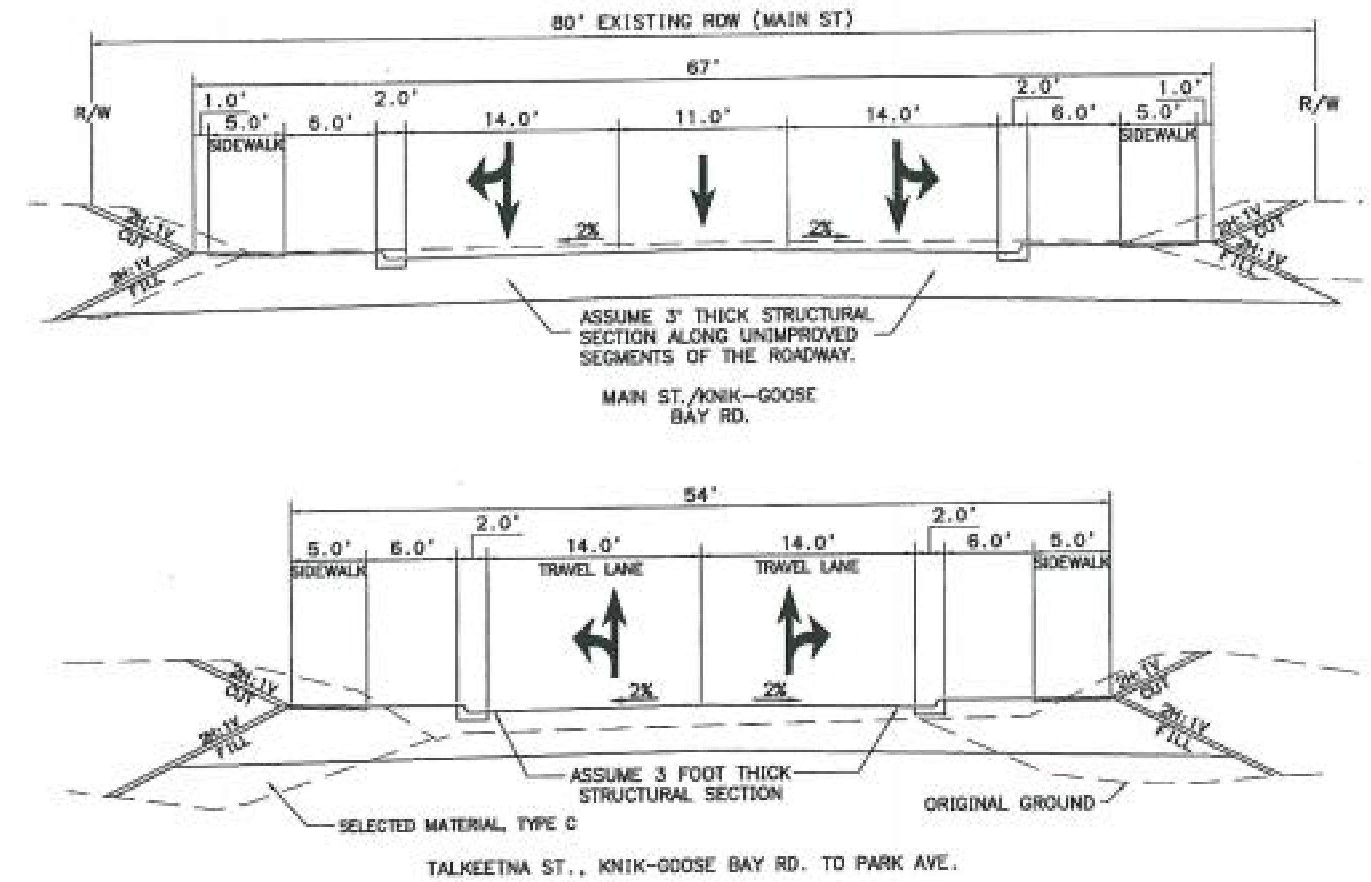


Figure 37-Alternative D Typical Sections

- The existing right-of-way width for Yenlo and Talkeetna Streets is only 60 feet wide, compared with 80 feet on Main/Knik-Goose Bay. The proposed cross-section would require narrow takes on both sides of the narrow right-of-way. Alternatively, the existing cross-section could be retained where possible to minimize the impact, although some impacts would still exist. In any case, no full-takes are anticipated in the business district.
- A right of way corridor does not exist south of Park Avenue or north of Bogard Road.
- Yenlo and Talkeetna Street approaches to the Parks Highway and Bogard Road will require four traffic lanes.

The largest right-of-way constraint for Alternative D is the segment from Swanson Avenue to Bogard Road, which will traverse the Yenlo Square Development. The Yenlo Square Developer has agreed to provide a 65' right-of-way corridor, but also plans to locate the buildings directly on the right-of-way line. The proposed typical section through this development will just barely fit within the right-of-way, requiring retaining structures and substantial coordination between the road design and site design. Sequencing the construction will also be crucial. Construction of Yenlo Square, Phase One is scheduled for the summer of 2006. Coordinating with the City and developer will be essential for this alternative.

This alternative would require an additional crossing of the Alaska Railroad, although it splits the same flow of traffic into separate directions, which has distinct safety advantages. The existing gates for two-way traffic do not gate the downstream side of the railroad tracks so that a vehicle can not become trapped behind a gate. With one-way traffic flow, trapped vehicles are not a concern so the gates may extend across the entire roadway. This prevents vehicles from sneaking around the gates as they can now.

9.3 Future Scenarios for Separating Road and Railroad Traffic

9.3.1 *General.*

If the Parks Highway and ARRC corridors remain where they are and the railroad crossings remain at-grade, then vehicular delays caused by train traffic will become substantial in the next 10 to 20 years. Increasing train traffic will cause all of the alternatives to fail unless some other measure is taken during the next 10 to 20 years.

Future scenarios for reducing or eliminating train induced traffic congestion include:

- An alternative corridor for the Railroad and Parks Highway south of their existing location.
- Locating the Alaska Railroad on a future Knik-Arm bridge and bypassing Wasilla with the connecting line.
- Increasing the height of the north-south collector roads to pass over the railroad (road over rail). Costs (where shown) indicate additional cost to grade separate 10-20 years after the initial (phase 1) construction.
- Increasing the height of the rail to pass over the north-south collectors (rail over road).

9.3.2 *Alternative Corridor south of study area.*

The decision to construct an Alternative Corridor will not be driven by this study and the cost for an Alternative Corridor will be substantially higher than any Alternatives included in this study. Consequently, costs for this scenario are not provided.

If an alternative corridor is constructed, it would likely provide a limited access route for the Parks Highway, leaving the existing Parks Highway as a business loop. The primary route for the Alaska Railroad would shift into the new corridor, with the existing track carrying passengers from a new terminal located off Mack Drive and gravel trains from the QAP Construction quarry off Pittman Road. By diverting most rail traffic from the core area, train induced delays would not materially impact the roadway LOS.

In general, the lane requirements for Alternatives C and D are reduced if an alternative corridor is assumed, however an alternative corridor will not satisfy future demand for Main Street as it exists currently. See Appendix C for the lane requirements with and without an alternative corridor.

Under Alternative C, Main Street would remain at-grade and would require one fewer lane between Lakeview Avenue and Herning Avenue, while Knik Street would require one fewer lane from Knik-Goosebay Road to Susitna Avenue. The Swanson Avenue east approach to Main Street would require one fewer lane.

Under Alternative D, Yenlo, and Talkeetna Streets would require one less lane from Park Avenue to Swanson Avenue, and Main St. would require one less lane from the Parks Highway to Bogard Road with the Alternative Corridor. In general, these would be 2-lane roads instead of 3-lane roads. Swanson Avenue would also see some reduction in the number of approach lanes. The Main Street and Yenlo Street intersections with the existing Parks Highway would remain at-grade.

9.3.3 *Alaska Railroad on Knik-Arm Bridge*

The Alaska Railroad Corporation (ARRC) has stated that if a railroad were added to a future Knik-Arm bridge, then the link from the bridge would be routed west of Wasilla. Lane requirements and train traffic through Wasilla would be as described under the Alternative Corridor scenario.

9.3.4 Rail Over Road

In its January 2005, "Knik-Goose Bay Road Grade Separation Alternatives Analysis," ARRC identified a rail over road alternative as their preferred alternative for grade-separating vehicle and train traffic within the study area. The photograph below is taken at the Ted Stevens International Airport where a similar elevated railroad embankment was constructed in 2000.

As conceived by the ARRC, this alternative would begin raising the railroad track at Crusey Street, reach full height for a separated-grade crossing of Knik-Goose Bay Road, then grade down to match the existing track elevation just west of Lucille Street. Construction of this alternative would require the construction of a shoofly to maintain railroad traffic while the embankment is being constructed. The shoofly will generally occupy the area where Railroad Avenue is located.

Railroad Avenue would be relocated south onto private property from Talkeetna Street to Knik-Goose Bay Road, and Railroad Avenue would be closed west of Knik-Goose Bay Road. Following construction, the shoofly would be converted to a corridor for an overhead guy line.

The alternative will impact access to some businesses along Railroad Avenue west of Knik-Goose Bay Road. The alternative does not make provisions for vehicles to turn around at the ends of Lake Street and Willow Street where they currently connect to Railroad Avenue. Lake Street and Willow Street could be connected by a new road paralleling the railroad, or they could be provided with cul-de-sacs. The route and time for emergency response to this area is likely to be increased. Because an elevated railroad embankment would be located immediately south of the Parks Highway, it would cast a sizable shadow across the Parks Highway.

Figure 38- Rail Over Road at the Anchorage International Airport

The Rail over Road alternative for a separated-grade crossing of Knik-Goose Bay Road is not compatible with Alternative C (the Knik / Main Street two-way couplet), since the railroad and the Knik Street overpass would be at about the same elevation. These two alternatives are mutually exclusive.

The preliminary design that ARRC has prepared would accommodate Alternatives A & B (both Main Street alternatives), and if it were modified by adding a railroad bridge at Talkeetna Street and extending the railroad grade raise about 750 feet east of the current design, then it could accommodate Alternative D (the Yenlo-Talkeetna / Main Street one-way couplet). Under Alternative D, the estimated Cost (in addition to phase 1) is $24,800,000.

9.3.4 Road over Rail

A schematic Road over Rail design and cost estimate has been prepared for each Alternative, A-D. In general, these grade-separated alternatives will not only eliminate conflicts with train traffic, they will also eliminate many vehicle conflicts at the Parks Highway. As such, the vehicle level of service at the intersections with the Parks Highway will be enhanced under each Road over Rail alternative, an advantage not present in the Rail over Road alternative.

The Road over Rail alternatives have several significant disadvantages compared to the Rail over Road alternative. Ramps connecting the Parks Highway to the bridges over the Parks Highway will need to be on the order of two city blocks long. Most of these ramps will be elevated well above the adjacent ground surface and hence will eliminate at least one approach road intersection and perhaps two. Most driveway access to the Parks Highway would also be eliminated within the length of each ramp. Since ramps would be needed for both directions of the Parks Highway, the total impacted length would be on the order of four city blocks total. The impact to business access and local circulation is deemed unacceptable and these ramps have been eliminated from consideration by inspection.

However, ramps can be added on the south side of the Parks Highway (adjacent to the railroad tracks), since road and driveway access on that side of the Parks Highway is already constrained by the adjacent railroad tracks. These ramps would serve eastbound Parks Highway traffic. Because the ramps would be located on the south side of the Parks Highway, they would cast a sizable shadow during the winter months.

Westbound traffic would be required to use the local street network north of the Parks Highway, instead of ramps. This would cause a significant increase in traffic on the internal street network, which would not be desirable. For this reason, all of the Road over Rail alternatives include a $3 million line item for upgrades to the local road network.

Because only a single Parks Highway on and off ramp is included in each Road over Rail alternative, very few vehicle conflicts will occur at the Parks Highway intersection. The number of turn lanes recommended in the corresponding at-grade alternatives will be greatly reduced for both the Parks Highway and the elevated north-south roads. For the purpose of estimating costs, bridge widths have been assumed to match the at-grade roadway width one-block north and south of the Parks Highway.

In estimating the cost of the Road over Rail alternatives, no traffic modeling has been conducted to determine the exact lane requirements for the bridges, ramp intersections, or local road improvements. However, the cost estimates are considered sufficient to recommend an alternative while also considering its viability to be converted to a separated-grade facility in 10 to 20 years. See the Comparison of Alternatives Section on the next page.

9.4 Comparison of Alternatives

Criteria	Alternative A: 3-lane Main St.	Alternative B: 5-lane Main St.	Alternative C: Knik-Main St. Two-way Couplet	Alternative D: Main – Yenlo / Talkeetna St. One-way Couplet
Level of Service Ranking	Worse than today	Better	Best	**Best**
Business Access	Poor	Poor	Good	**Best**
Increase Route Options?	No	No	Better	**Best**
Pedestrian/ Bicycle Friendliness	-No S/W buffer -Congested -Wide outside lane for bikes.	-No S/W buffer -Congested -Narrow outside lanes. -Wide road, long pedestrian crossing	**Tie** -No S/W buffer -Less Congested -Wide outside lane for bikes. -Peds may cross Parks Hwy. on bridge.	**Tie** -No Yenlo S/W buffer -Less Congested -Wide outside lane for bikes missing from Swanson to Bogard. -One-way traffic makes larger gaps-easier to see. -Facilitates crossing Parks Highway
At-grade RR Crossing Considerations	No Change	No Change	Adds Separated Crossing for Knik	**Best** Adds crossing at Talkeetna St., but no change in number of vehicle crossings. Positive Gating
ROW Impacts	Numerous Partial Takes, Three Full Take.	Numerous Partial Takes, Three Full Take.	Numerous Full Takes. Few Partial Takes	**Best** Few Partial Takes Close coordination with Yenlo Square Developer needed.
Maintenance	Minimal Snow Storage No Sidewalk Buffer	No Snow Storage No Sidewalk Buffer	Minimal Snow Storage No Sidewalk Buffer	**Best** Best Snow Storage, Most with Sidewalk Buffer Snow storage through Yenlo Square will be minimal.

Medians	From Railroad Avenue to Bogard Road and in front of Paulson Ave. and Railroad Ave.	From Railroad Avenue to Bogard Road and in front of Railroad Ave..	From Susitna Ave. to Bogard Road and in front of Railroad Avenue. Raised medians are not included for Knik Street. Prohibits Rail over Road upgrade	No medians
Estimated Cost ($ million)	5.0	6.5	13.9	11.5
Additional Cost to Upgrade to Road over Rail ($ million)	14.3	15.4	14.3	20.7
Other Road over Rail Considerations	Maintaining traffic during construction would be difficult.	Maintaining traffic during construction would be difficult.	Knik St. separated crossing would help with traffic during construction.	Dual corridors would provide flexibility for traffic during construction.
Additional Cost to Upgrade to Rail over Road ($ million)	21.0	21.0	Not possible	24.8
Other Rail over Road Considerations				Would extend track raise beyond Crusey St., making grade separation there more challenging.

Table 41- Comparison of Alternatives

9.5 Stakeholder Involvement

The original public involvement plan for the traffic study included area landowners and residents, the Chamber of Commerce, Alaska Railroad Corporation (ARRC), and the City of Wasilla. This plan included a presentation to the Chamber of Commerce, a joint presentation to the ARRC and City of Wasilla, and a presentation to the public.

In July 2004, stakeholders received postcards announcing the study alternatives and requesting suggestions for other alternatives to study. Instead of three public meetings originally planned, the project team made eight public appearances, including a public open house on June 14, 2006, and Planning Commission Public Hearing on June 27, 2006, and a City Council Public Hearing on July 10, 2006.

The Alaska Railroad has stated their preference for Alternative D, because it does not preclude the rail over road scenario sometime in the future. The Chamber of Commerce supported Alternative C. Public opinion was mixed between those supporting Alternatives C, D, and "do nothing". The Wasilla Planning Commission and City Council each passed resolutions supporting Alternative D (see Appendix H).

9.6 Conclusions

The recommended alternative should ideally provide the best level of service, the most flexibility for upgrading to separated-grade railroad crossings, minimize impacts to businesses, maximize pedestrian opportunities, increase vehicle route options within the study area, and minimize cost.

The choice between Road over Rail and Rail over Road alternatives does not need to be made now. The railroad induced traffic delays are expected to cause a failing level of service in ten to twenty years. During that time, many events could influence the decision or even the need for grade separation. It is imperative therefore, to select an at-grade alternative and plan to upgrade it later if necessary to separate the roadway and railroad. Alternative C, the Knik-Main two-way couplet will not allow a future Rail over Road alternative, a far-reaching decision that does not need to be taken now. The Road over Rail alternatives also have disadvantages, primarily the ramp limitations that would require routing traffic through the local road network north of the Parks Highway. The Parks Highway and ARRC alternative corridor has numerous advantages, but it will be expensive and failing levels of service may be reached before that project is completed. At this time the plans for the Knik-Arm Bridge do not include rail facilities, so it is questionable whether that scenario will route trains around Wasilla.

Alternatives A & B, the 3-lane and 5-lane Main Street alternatives rate poorly in most criteria and are considered non-viable due to their poor levels of service.

Alternative C, the Knik-Main St. Two-way Couplet has numerous desirable features such as good levels of service, pedestrian and bicycle friendly, enhanced emergency service access, route alternatives, good business access. However, the cost is high, Right-of-Way requirements are high, and this alternative is incompatible with a Rail over Road grade separation upgrade.

Alternative D, the Main St. –Yenlo Street / Talkeetna Street One-way Couplet alternative is not hampered most of the disadvantages that seriously diminish the value of the other alternatives. This alternative immediately would add increased route options and good traffic circulation within the core area. This should allow the core area to remain an attractive destination as the City grows around it. Further, as the core area grows, this alternative can be scaled-up by adding additional one-way roads. This alternative does not prohibit any options for separating road and rail traffic in the future.

Alternative D has the best overall performance, and the support of the City of Wasilla and Alaska Railroad Corporation. As such, Alternative D is recommended for design. Items that the preliminary design will need to address include:

- A convenient means of routing traffic from Park Avenue, Lakeview Avenue, Centaur Avenue, and southbound Main Street to northbound Talkeetna St. Possibilities include a roundabout, extending Centaur Avenue east of Main Street to connect with Talkeetna Street, and adding a southbound u-turn lane on Main Street and subsequent northbound acceleration lane on Talkeetna Street.
- Coordination with the developer of Yenlo Square. The existing right of way corridor is just large enough to contain the roadway cross section if fill slopes are retained. It will also be important to coordinate the roadway profile with the developer's building thresholds. Consider ways to maximize the pedestrian facilities along and across Yenlo Street, which might include a pedestrian undercrossing, pedestrian signal, or even an unsignalized mid-block crosswalk.