Technical Working Paper #2

Future Deficiencies Analysis

AMATS 2040 Metropolitan Transportation Plan

Prepared for: AMATS

Prepared by: HDR

Approved by AMATS PC
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MTP 2040

LINK - CONNECT - MOVE

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1   Introduction

The purpose of transportation system deficiency analysis is to understand current transportation system performance and project future transportation needs based upon adopted land-use forecasts in the Anchorage region. The bulk of this analysis was conducted using the Anchorage Metropolitan Area Transportation Solutions (AMATS) travel demand model[1] and land-use forecasts[2] previously developed for AMATS by RSG.

The travel demand model used for this analysis is a completely new model system, and was calibrated to match observed travel patterns from recently-collected household and transit travel survey data, Bluetooth data, Census data, and other sources. The AMATS model is a traditional trip-based travel model that represents average weekday conditions, and covers the entire AMATS area (Anchorage Bowl and Chugiak\Eagle River) as well as the part of the Matanuska-Susitna Borough (MSB). It includes travel models for residents, overnight visitors, airport ground-access, commercial vehicle travel and internal-external and through travel. The model includes a number of enhancements over previous versions of AMATS travel models which are fully described in the model development report. It considers auto, transit, and non-motorized (walk and bike) modes of transport. It was fully calibrated to match travel patterns revealed in local travel survey data, and validated against 2013 traffic count and transit boarding data and meets or exceeds federal guidelines for goodness-of-fit.

The AMATS 2040 Metropolitan Transportation Plan (MTP) project team was directed to use the AMATS Travel Demand Model updated in 2016 for preparation of the MTP by the AMATS Policy Committee (PC) in a resolution dated October 27, 2016.

Land-use forecasts are an essential part of the travel forecasts and the primary driver of travel patterns and forecasted congestion in the region. This chapter briefly summarizes the previously-developed land-use forecasts adopted for use in the 2040 Metropolitan Transportation Plan (MTP), and the updates that were made to those forecasts based upon land-use projections that were recently adopted by the Municipality of Anchorage (MOA) and the MSB.

In order to understand future transportation system performance, a set of future baseline networks must be created. These networks reflect current conditions plus all projects with dedicated funding that are currently under construction or will be built in the near future. This chapter describes the projects that were coded in the 2013 base-year networks to created 2030 and 2040 baseline, e.g. 'Existing Plus Committed', networks.

Finally, this chapter describes future system performance, based on model runs using future year land-use and future baseline (existing plus committed) networks as inputs. A number of model outputs are presented including forecasted road network level-of-service, travel time and cost expenditures, and mode shares.

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[1] Travel Model Development Report, Prepared for Anchorage Metropolitan Area Transportation Solutions by RSG et al, April 2016 (https://www.muni.org/Departments/OCPD/Planning/AMATS/Travel%20Demand%20Model/2016/2016_Travel_Demand_Model%20_Development_Report.pdf)

[2] Socioeconomic Projections And Land Use Allocation Report, Prepared for Anchorage Metropolitan Area Transportation Solutions by RSG et al, April 2015 (https://www.muni.org/Departments/OCPD/Planning/AMATS/Travel%20Demand%20Model/2016/2016_Socioeconomic_Projectio ns.pdf)

2   Land-Use Forecasts

The land-use forecasts for the 2040 MTP Update are based on land-use forecasts developed as part of AMATS travel demand update project, completed in 2016. The future-year 2040 land-use for the modeling region are based on the Alaska Department of Labor and Workforce Development's (ADOLWD) Alaska Population Projections issued in 2014. The ADOLWD projections include population by age cohort and gender for the MOA and MSB in five-year increments. These projections are based on a population cohort methodology with past observed population and migration as key inputs. The development of land-use forecasts for the model development project are described fully in "Socioeconomic Projections And Land Use Allocation Report" by RSG with Jon Spring and the McDowell Group, dated April 2016.

As part of the model development project, intermediate year household and employment forecasts were developed for 2028 based on the 2013 existing household and employment estimates and 2040 forecasts. In order to develop 2030 household and employment data, a linear growth rate was assumed between 2028 and 2040 and the incremental change for two years (2,942 households and 4,316 jobs in total) was added to the 2028 forecast to create 2030 households and employment.

Two other key aspects of land-use were updated from the 2016 estimates developed as part of the model development project. First, household forecasts in the Municipality of Anchorage were updated in key locations to be consistent with a recently-updated MOA Planning Department Buildable Lands Inventory and Housing Capacity Analysis. Second, land-use forecasts for the Matanuska-Susitna (Mat-Su) Borough were updated which do not include construction of the Knik Arm Crossing project, as that project is no longer a "committed" project. This modified household and employment distribution in the MSB is based on a land-use forecast developed for the Mat-Su Borough's transportation plan update project. Each update is described in more detail below.

2.1   MOA Capacity Analysis Update

The MOA Planning Department recently completed a buildable lands inventory and housing capacity analysis for the Anchorage Bowl that was not available when the model development project 2028 and 2040 forecasts were created. The capacity analysis data by 2010 Census Block for the MOA was aggregated to Transportation Analysis Zones (TAZs) and compared to the forecasted change in households between 2013 and 2040 in the model development project forecasts (Figure 1). The figure shows that the model development project 2040 household estimate is within 100 households of the capacity analysis estimate for most TAZs. However, there were 24 TAZs where the model development project forecasts an increase of 100 households or more than the planning capacity analysis (shown in bright red), and 19 TAZs (shown in bright green) where the planning department forecasts an increase of 100 households or more than the model development project forecast.

Figure 1: Differences between Planning Capacity and Model Development Project household changes from 2013 to 2040
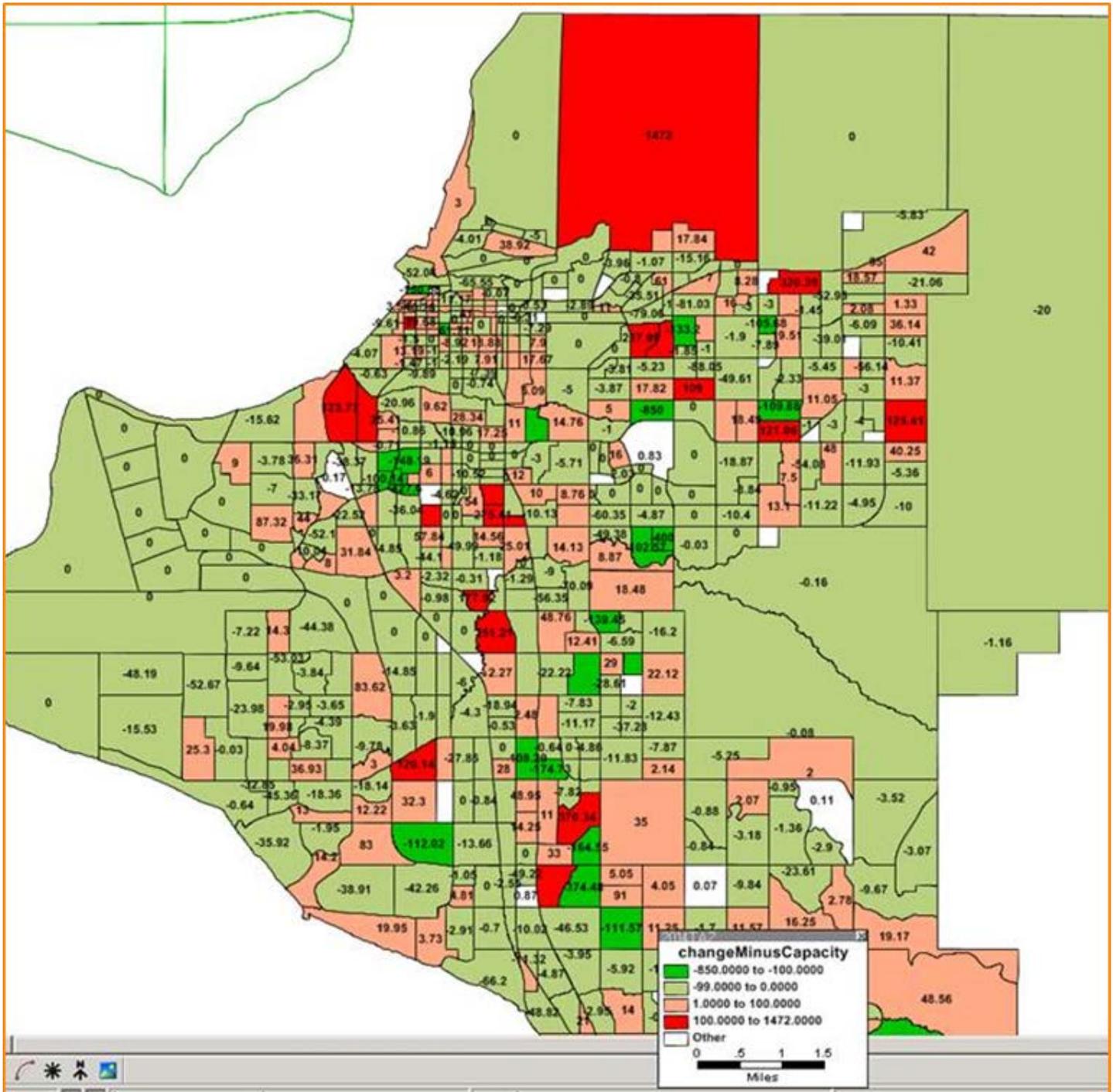
In order to update the land-use forecasts for the travel model to be consistent with the capacity analysis forecasts of household change between 2013 and 2040 predicted by the Planning Department, those TAZs with a difference of 100 or more households in growth were adjusted to be consistent. For these zones, the planning department capacity analysis growth in households was adopted. Since the total difference in red and green zones (over-estimates and under-estimates)

was approximately the same, this did not materially affect the overall growth forecast for MOA. However, after these zones were adjusted, households for the entire MOA forecast were adjusted slightly to respect the initial household growth forecast. The 2030 household estimate for the modified zones was prepared by interpolating between the 2013 base year household estimate and the revised 2040 forecast.

Chugiak-Eagle River was not included buildable lands inventory and housing capacity analysis so no changes were made to the Chugiak-Eagle River area.

2.2 Matanuska-Susitna Borough "No Knik Arm Crossing" Land-use Forecast

The 2028 and 2040 land-use forecasts prepared for the model development project in 2016 within the Mat-Su Borough were allocated to TAZs based on the share of households and employment in each TAZ in accord with the Matanuska-Susitna Borough (MSB) land-use files prepared for the MSB long range transportation plan (LRTP) update. Plots of forecasts of household and employment growth (Figure 2 and Figure 3) show the distribution assuming that the Knik Arm Crossing (KAC) would be in place—they clearly demonstrate significant growth in the Point Mackenzie part of the Borough.

Figure 2: Change in households 2013 to 2040, Mat-Su Borough (Assuming KAC)
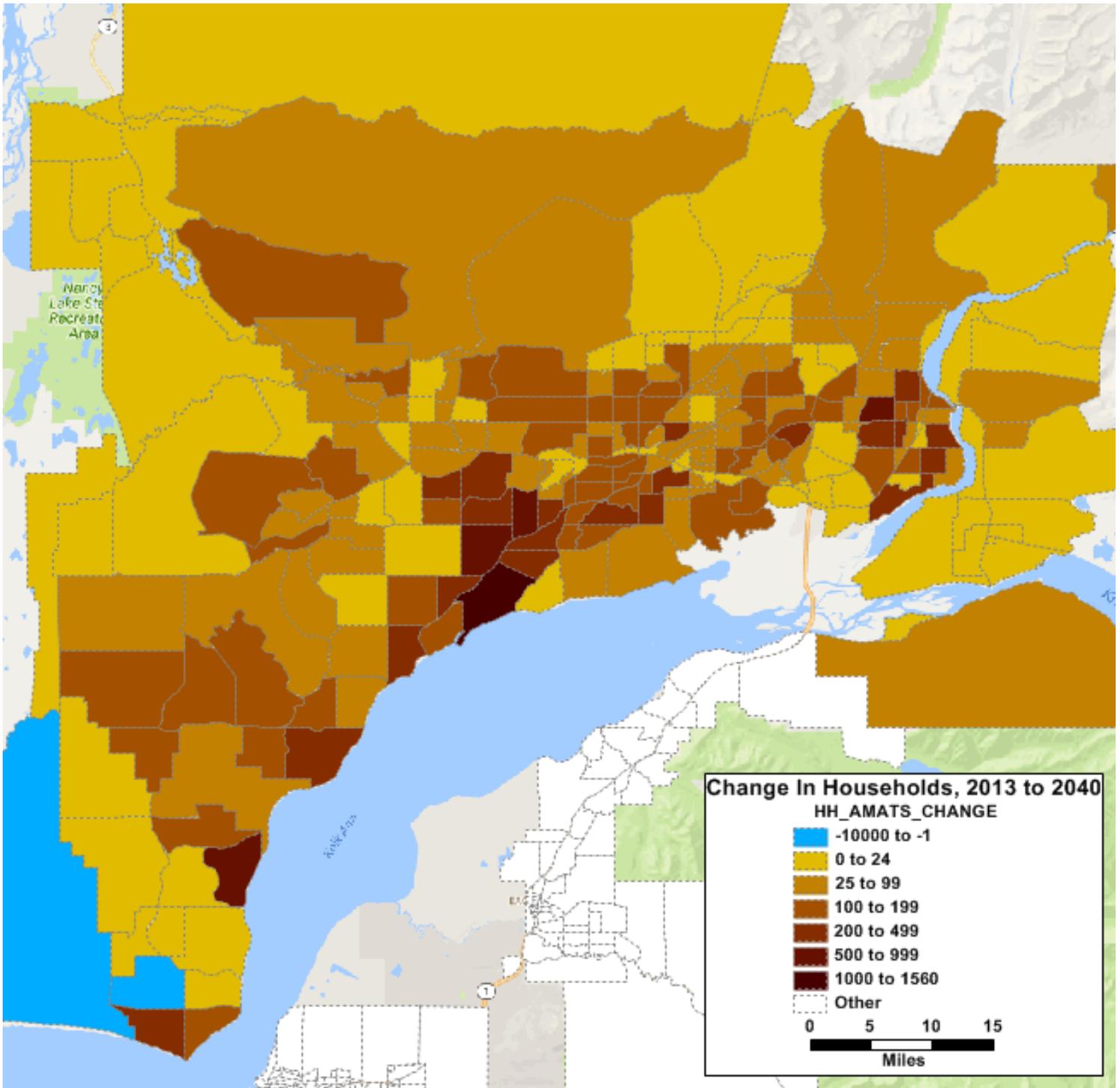
Figure 3: Change in Employment, 2013 to 2040, Mat-Su Borough (Assuming KAC)

Change In Employment, 2013 to 2040
EMP_AMATS_DIFF

■ (blue)	-700 to -1
■ (gold)	0 to 9
■	10 to 49
■	50 to 99
■	100 to 199
■	200 to 2300
⬚	Other

0   5   10   15
Miles
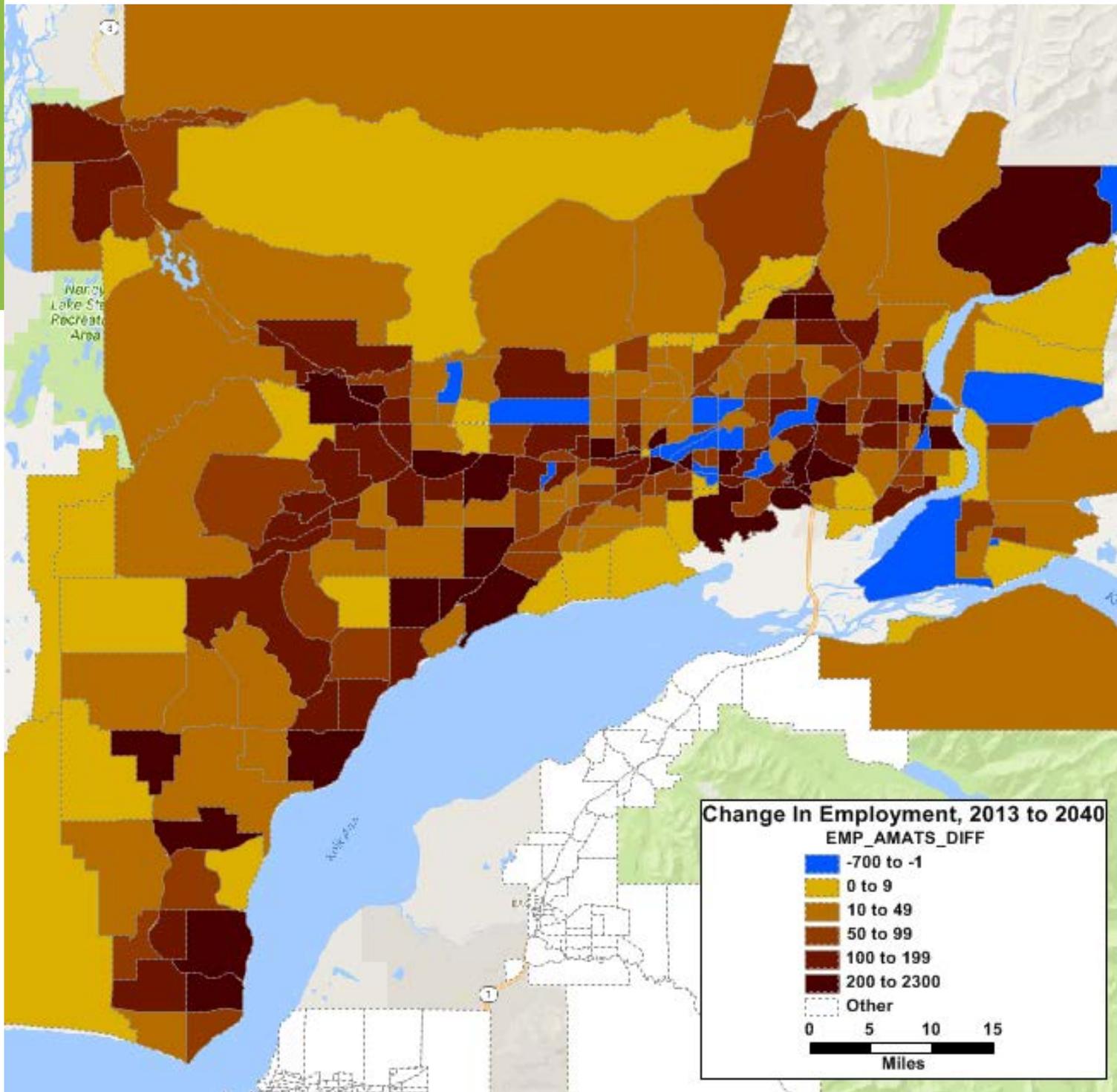
As part of the MSB LRTP update, the MSB adopted an alternative 2035 land-use forecast that reflects a household and employment distribution assuming that the KAC would not be built by 2035. This land-use forecast was acquired by AMATS from the MSB and used to re-allocate the growth projected within the MSB in order to create a 'non-KAC' land-use forecast for use in the AMATS model, where total households and employment in MSB are consistent with the ADOWDL land-use forecasts adopted by AMATS.

Figure 4 shows the change in households from 2013 in the "No KAC" 2040 land-use forecast. The figure shows much less growth in the Point McKenzie area compared to the initial forecasts prepared for the AMATS model development project. Figure 5 similarly shows less employment growth in the Point McKenzie area compared to the model development project forecasts. 2030 land-use forecasts were developed by first allocating the Mat-Su Borough non KAC household and employment growth from 2013 to 2028 using the same proportions by TAZ, and then growing the 2028 forecasts to 2030 using linear interpolation.

These land-use forecasts were used in the 2030 and 2040 system deficiency (existing plus committed) network analysis, and all future model runs that do not contain the KAC project. If any alternatives containing the KAC project are modeled as part of the MTP 2040 plan development, they will use the previously-developed with KAC forecasts for the MSB, as well as the re-allocated land-use for the MOA according the capacity analysis described above.

Figure 4: Change in Households 2013 to 2040, Mat-Su Borough (NO KAC)
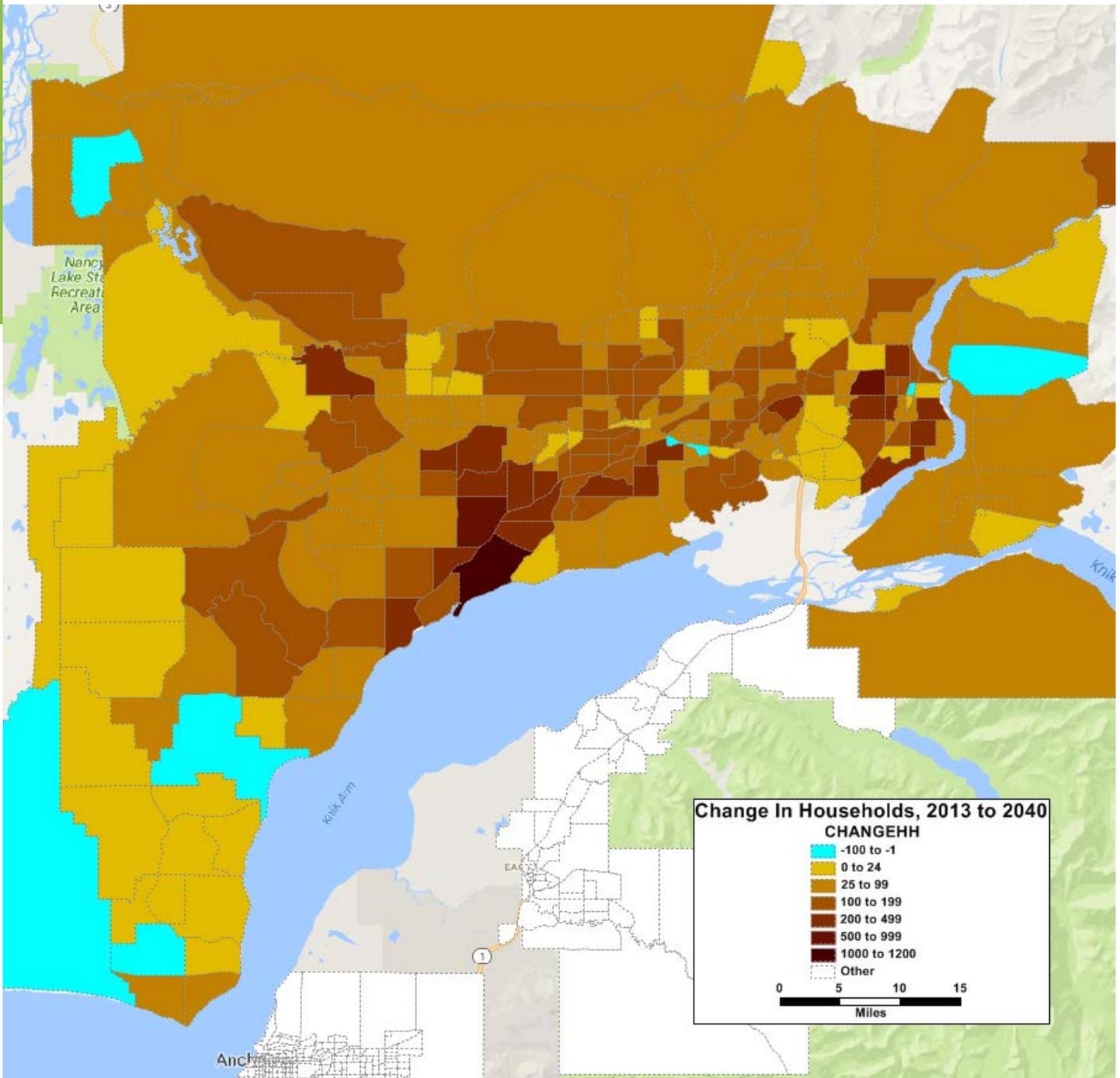
Figure 5: Change in Employment 2013 to 2040, Mat-Su Borough (NO KAC)
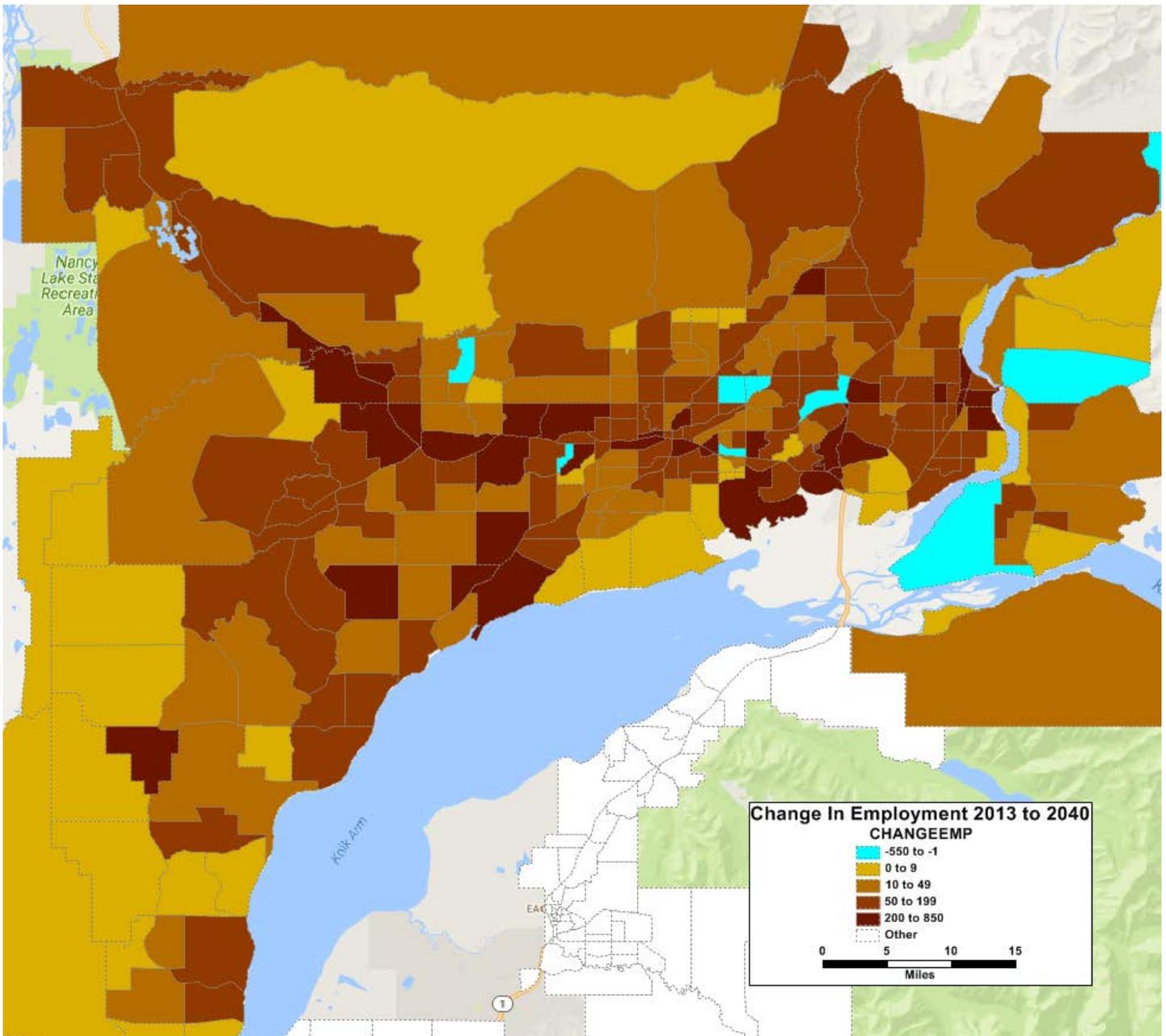
In order to check that the land-use forecasts prepared for the 2040 MTP Update are consistent with the original forecasts developed as part of the AMATS model development project, household and employment totals were compared by area as shown in Figure 6.

Table 1Table 1 shows total households by area (district) and year, with and without the KAC. Table 2 shows total employment by area and year, with and without the KAC. The total households and employment in Anchorage Bowl and Chugiak\Eagle River districts are exactly the same by year in both the with and without KAC land-use files. This is because, land use planning and forecasting completed for the land use plan map update by the Planning Department, does not predict any major distribution differences of households or employment within the MOA with or without the KAC. The other MOA land-use changes made to be consistent with the land use plan map only reallocated

households between a total of 43 TAZs in the Anchorage Bowl, with no change to total households or employment between any of the districts.

However, the tables show that the MSB reallocation in the 'Without KAC' land-use alternative shifts households and employment out of the MSB-West district into the MBS Central and MSB East districts, as a result of the reallocation which does not assume that the KAC project will be built within the 2040 MTP planning horizon. However, the total households and employment across the Mat-Su Borough stays constant, with the exception of a few households and jobs due to rounding.

Table 1: Total Households by Area and Year, with and without KAC

District Name	2013	With KAC		Without KAC	
		2030	2040	2030	2040
Anchorage Bowl	95,867	110,451	116,246	110,451	116,246
Chugiak\Eagle River	12,474	16,804	18,837	16,804	18,837
East MSB	13,525	18,052	20,597	18,574	21,364
West MSB	5,330	10,080	12,714	9,045	11,098
Central MSB	14,095	19,764	22,949	20,263	23,675
Total	141,291	175,151	191,343	175,137	191,220

Table 2: Total Employment by Area and Year, with and without KAC

`	2013	With KAC		Without KAC	
		2030	2040	2030	2040
Anchorage Bowl	192,958	218,753	232,866	218,753	232,866
Chugiak\Eagle River	5,100	6,256	6,598	6,256	6,598
East MSB	14,005	18,737	22,059	19,035	22,474
West MSB	1,516	6,720	10,116	3,961	5,619
Central MSB	16,200	19,437	21,650	21,707	25,185
Total	229,779	269,903	293,289	269,712	292,742

Figure 6: AMATS Model Districts

District
- Anchorage Bowl
- Chugiak\Eagle River
- East Mat-Su Borough
- West Mat-Su Borough
- Central Mat-Su Borough

0 5 10 15
Miles
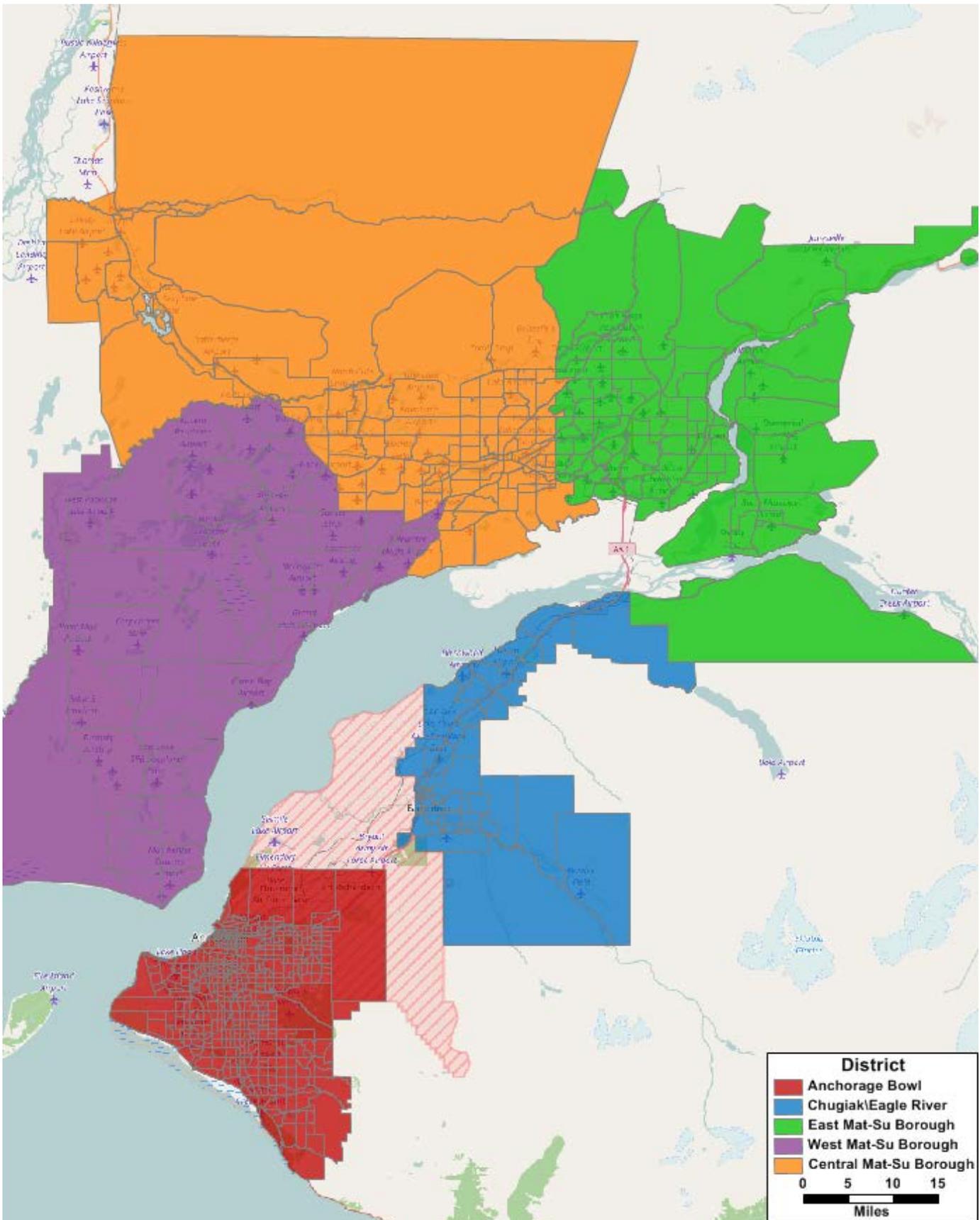
Figure 7 and Figure 8 show total households and total employment, respectively, in 2013, 2030, and 2040. Although the Anchorage Bowl area is projected to increase by over 20,000 households from 2013 to 2040, households are expected to increase by 51% in Chugiak\Eagle River and 70% in Mat-Su Borough over the same period. Employment is expected to grow by nearly 40,000 jobs in the Anchorage Bowl area from 2013 to 2040, which is consistent in percentage terms with the growth in households in Anchorage Bowl. Employment in the Mat-Su Borough is expected to increase by 21,500 jobs, or 68%, which is also roughly consistent in percentage terms with the growth in households in Mat-Su Borough. However, the Chugiak\Eagle River area is expected to increase by approximately 1,500 jobs, or 29%, between 2013 and 2040, which is lower than the percentage increase in households forecasted for Chugiak\Eagle River. The continued imbalance in jobs versus housing in this area will contribute to more congested peak period conditions on the Glenn Highway as Chugiak\Eagle River residents travel to jobs, shopping, and other activities in the Anchorage Bowl.

Figure 7: Total Households, 2013-2040
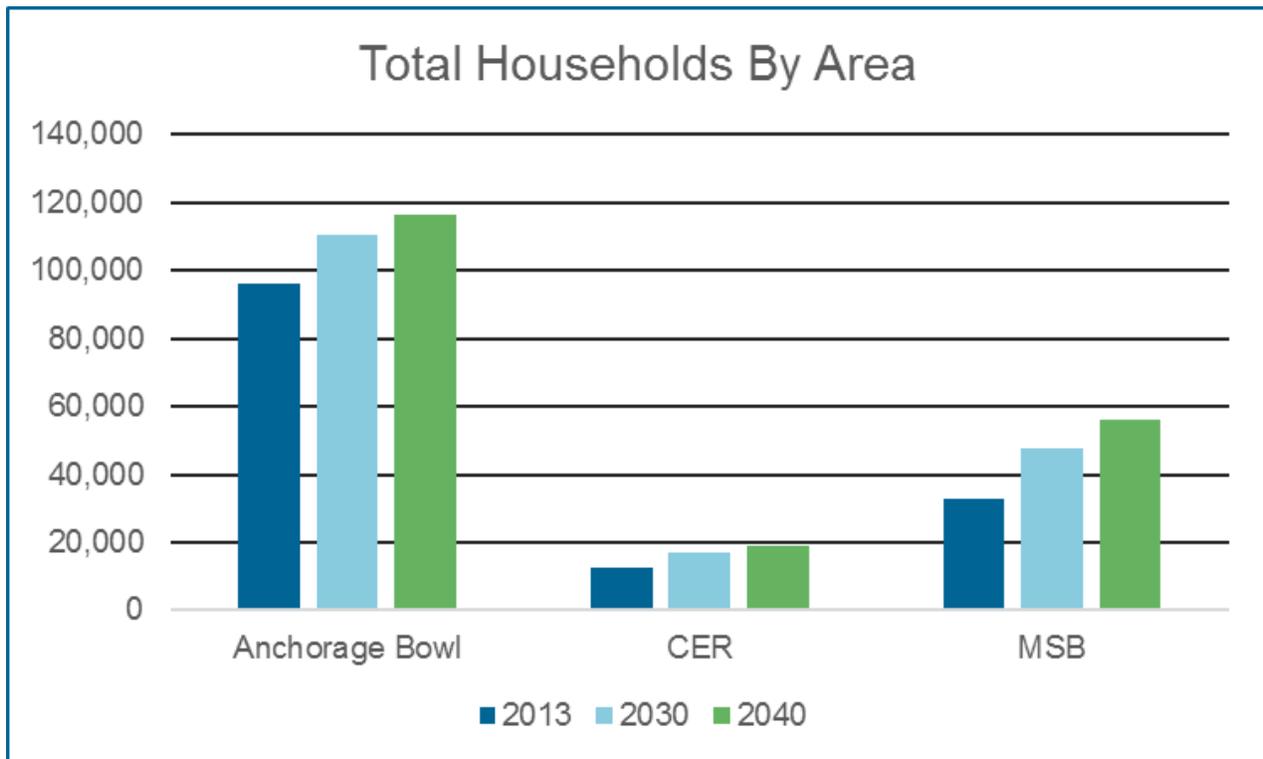
Figure 8: Total Employment, 2013-2040
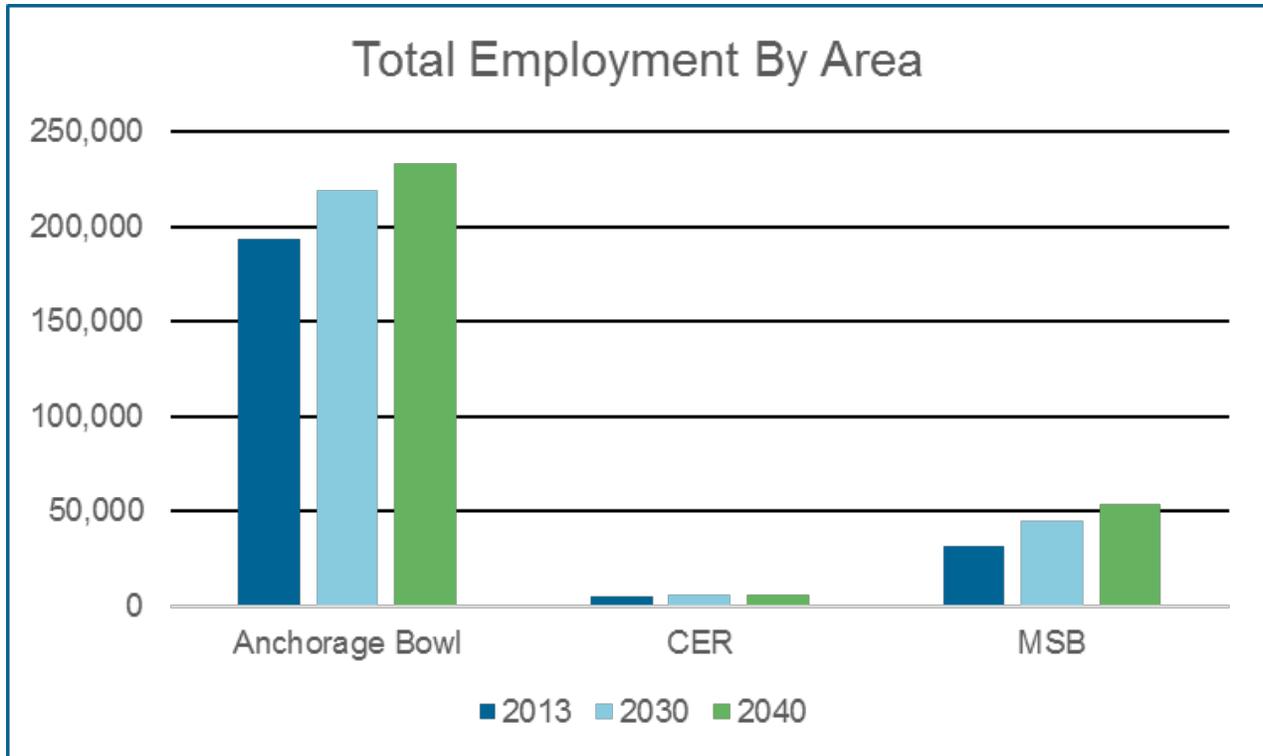
3 Future Baseline Transportation Networks

This section describes the base year and the future networks used in the system deficiency analysis. The model base year network is explained in Section 1.1 which is followed by future networks in Section 1.2.

3.1 Model Base Year (2013) Network

The model base year is 2013 and a corresponding 2013 roadway network is used as a base in the model. This network includes all projects constructed by 2013 as well as the 2013 transit network. The base year means that the model was calibrated to this year, and it is able to predict travel (roadway volumes and transit ridership) for that year meeting federally accepted accuracy parameters.

Figure 9 shows the 2013 transit system in the Anchorage Bowl with AM peak period headways (average time between bus arrivals). Note that the lowest frequency of service in the 2013 AM period is 30 minutes. Figure 10 shows the transit system in Chugiak/Eagle River with AM peak period headways. The transit fare is $2 per one-way trip for all routes except the Valley Mover route which provides service between Anchorage and Wasilla, where the one-way fare is $7. Although the

per-trip fare is lower for monthly pass-holders and some other travelers, trip-based models do not usually account for these options and use the full cash fare for consistency.

Figure 9: 2013 Transit Routes with AM Peak Period Headway, Anchorage Bowl
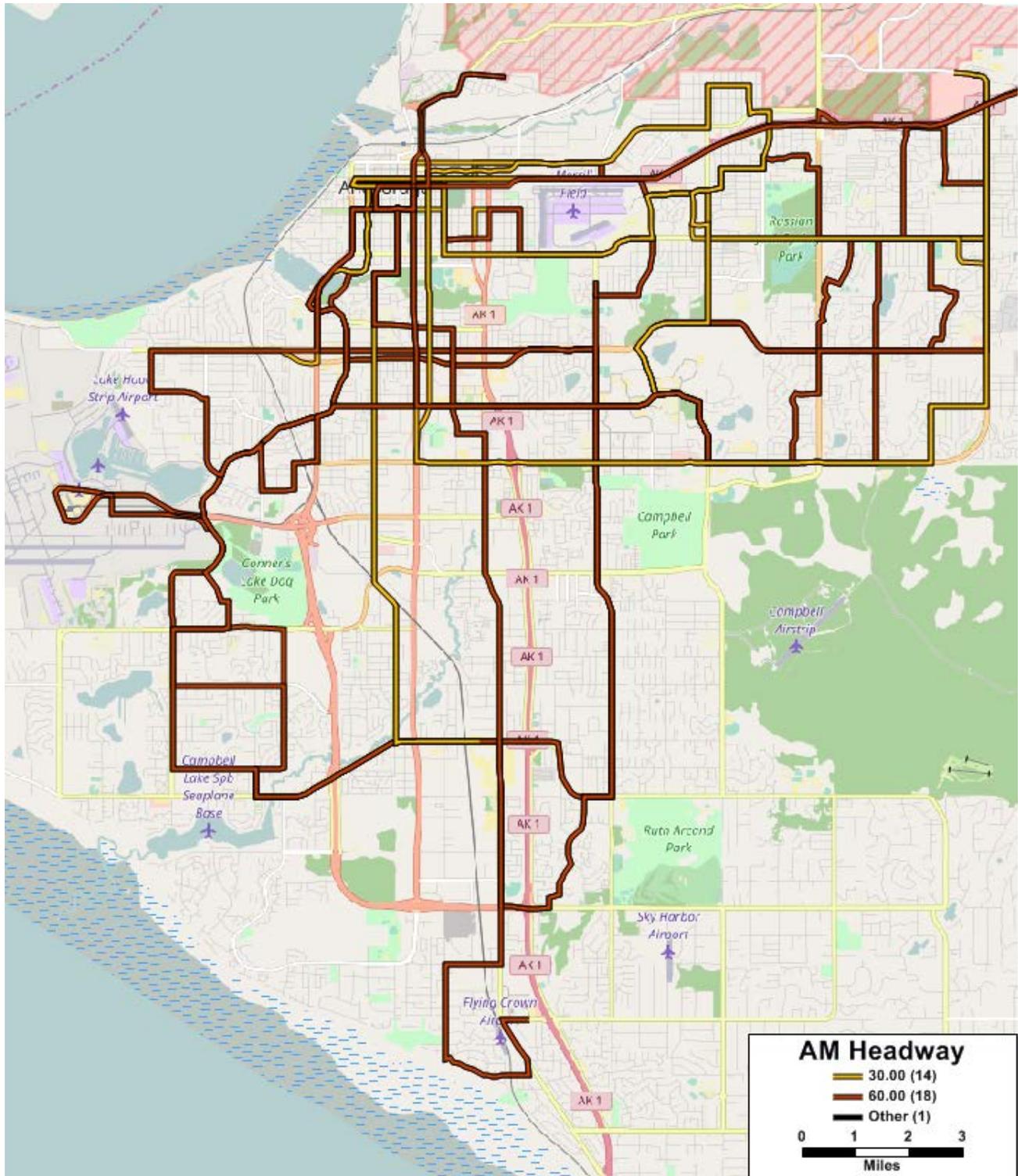
Note: The AM Peak Period is 7AM to 9AM and headways refers to the average time between bus arrivals.

Figure 10: 2013 Transit Routes with AM Peak Period Headway, Chugiak Eagle River

Note: The AM Peak Period is 7AM to 9AM and headways refers to the average time between bus arrivals.
Note: Transit headways out to the Matanuska-Susitna Borough reflect Valley Mover service.

3.2　2030 and 2040 Baseline Network Alternatives

Baseline alternatives predict future travel assuming land use growth occurs as planned, and also presupposes that we only build or implement those projects and improvements that are already committed. These baseline model runs identify future problem areas predicted to occur if we do not implement any new projects or solutions. The maps and metrics will be used for comparison against future "build" alternative scenarios during the alternatives development phase of the plan.

A set of future (2030 and 2040) year networks (roadway and transit) were developed by coding all 'Existing plus Committed' projects on the 2013 network. Existing plus commited (E+C) projects include projects constructed since 2013 and projects programmed in the construction pipeline with commited construction funding. The list of E+C projects (Table 3 and Table 4) was developed in close coordination with Municipality of Anchorage, Matanuska-Susitna Borough, and Alaska Department of Transportation & Public Facilities staff. Note that the model does not consider safety projects and minor road alignment projects as those do not materially affect travel demand. Capacity-enhancing road projects are included and the transit network was updated to reflect the planned transit system changes recently adopted and programmed to be implemented in October 2017.

Table 3 presents the list of projects for the MOA, and Table 4 shows funded projects in the MSB. Figure 11 and Figure 12 illustrates the committed transit system with routes colored according to AM peak headway. Note that the proposed transit system has less coverage than the 2013 system, but with more frequent service.

Table 3 List of Committed and Funded Projects (MOA)

Project Name	From	To	Description	Status
Dowling Road Extension	Minnesota Drive	Old Seward Highway	2 lanes in each direction	Complete
Glenn Highway - Northbound Lanes	Hiland Rd	Artillery Rd	Adding 1 lane to the northbound direction	Complete
92nd Avenue	Seward Hwy	Old Seward Highway	1 lane in each direction Auxiliary lane from Diamond Blvd to 92nd Ave Auxiliary lane from 92nd Ave to O'Malley Rd	Complete
Arctic Boulevard Reconstruction	36th Ave	Tudor Ave	1 lane each direction plus center turn lane	Complete
36th Ave - Arctic Boulevard to C Street 5 Lane Conversion	Arctic Boulevard	C Street	2 lanes in each direction	Complete
O'Malley Road Reconstruction	Seward Highway	Lake Otis Parkway	2 lanes in each direction	Complete
Seward Highway	Dimond Blvd	Dowling Road	3 lanes in each direction	Complete

100th Avenue Extension	Minnesota	C Street	1 lane in each direction w/center turn lane	Complete
Glenn Hwy/Muldoon Road Interchange			A diverging diamond interchange with 2 lanes in each direction	Scheduled for completion in 2018
Jewel Lake Road	88th Ave	Strawberry	1 lane in each direction w/center turn lane	Complete
Abbott Road Rehabilitation Phase I	Lake Otis Parkway	Jupiter Drive	1 lane in each direction w/center turn lane	Scheduled for completion in 2018
Abbott Road Rehabilitation Phase II	Jupiter Drive	Birch Road	1 lane in each direction w/center turn lane	Scheduled for completion by 2030
Glenn Highway	Hiland Rd	Artillery Rd	Adding 1 lane to the Southbound direction	Scheduled for completion by 2030
Klatt Road/Johns Road Roundabout			Roundabout	Complete

Table 4 List of Committed and Funded Projects (MSB)

Project Name	From	To	Description	Status
Bogard Road East Extension	N. 49 Ave	Arabian Street	1 lane in each direction	Complete
Fern Street Connection to Edlund	Fern	Edlund Rd	1 lane in each direction	Complete
Seldon Road/Lucille Street roundabout			Roundabout	Complete
Seldon Road	Church Rd	Beverly Lake Rd	1 lane in each direction	Complete
Trunk Road Improvements	George Parks Hwy	Bogard Rd	2 lanes in each direction	Complete
Trunk Road Extension South (part of above)	George Parks Hwy	Nelson Rd	1 lane in each direction	Complete
Glenn Highway MP 34-42 Reconstruction	George Parks Hwy	Arctic Street	2 lanes in each direction	Scheduled for completion by 2019
Knik-Goose Bay Road	Centaur Rd	Vine Rd	2 lanes in each direction	Scheduled for completion by 2019
Knik-Goose Bay Road Widening	Vine Rd	Settlers Bay	2 lanes in each direction	Scheduled for completion by 2019
Parks Highway MP 43.5-48.3 - Church	Church Rd	Pittman Rd	2 lanes in each direction	Scheduled for completion by 2019

Road to Pittman Road				
Seward Meridian Parkway	Palmer-Wasilla Highway	Bogard Rd	2 lanes in each direction	Scheduled for completion by 2019
Seward Meridian Parkway	Bogard Rd	Seldon Rd	1 lane in each direction	
Hermon Road Reconstruction and Extension	George Parks Hwy	Palmer-Wasilla Highway	2 lanes in each direction	Scheduled for completion by 2019
Nelson Road Extension: extend to Fairview loop	Nelson Rd	Fairview Loop	1 lane in each direction	Scheduled for completion by 2019
Engstrom Road Congestion Relief (to the east, route unknown)	Engstrom	Palmer-Fishhook Rd	1 lane in each direction	Scheduled for completion by 2019
Engstrom North Extension	Engstrom	Tex Al	1 lane in each direction	Scheduled for completion by 2019
Tex Al Road Upgrade and Extension	Wasilla-Fishhook Rd	Palmer-Fishhook Rd	1 lane in each direction	Scheduled for completion by 2019

Figure 11: 2030 and 2040 Baseline Transit Routes with AM Peak Period Headway, Anchorage Bowl
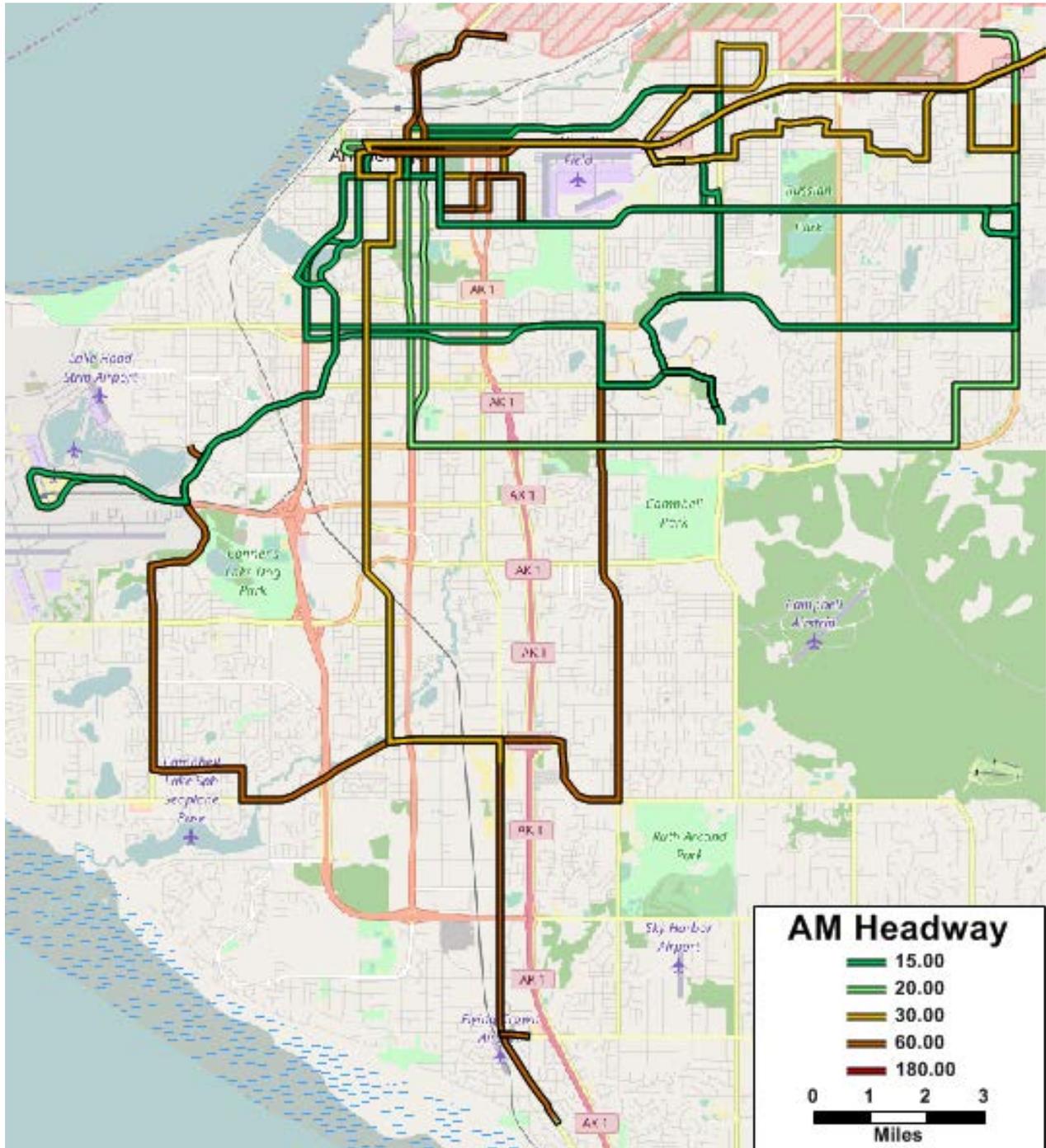
Note: The AM Peak Period is 7AM to 9AM and headways refers to the average time between bus arrivals.

Figure 12: 2030 and 2040 Baseline Transit Routes with AM Peak Period Headway, Chugiak Eagle River
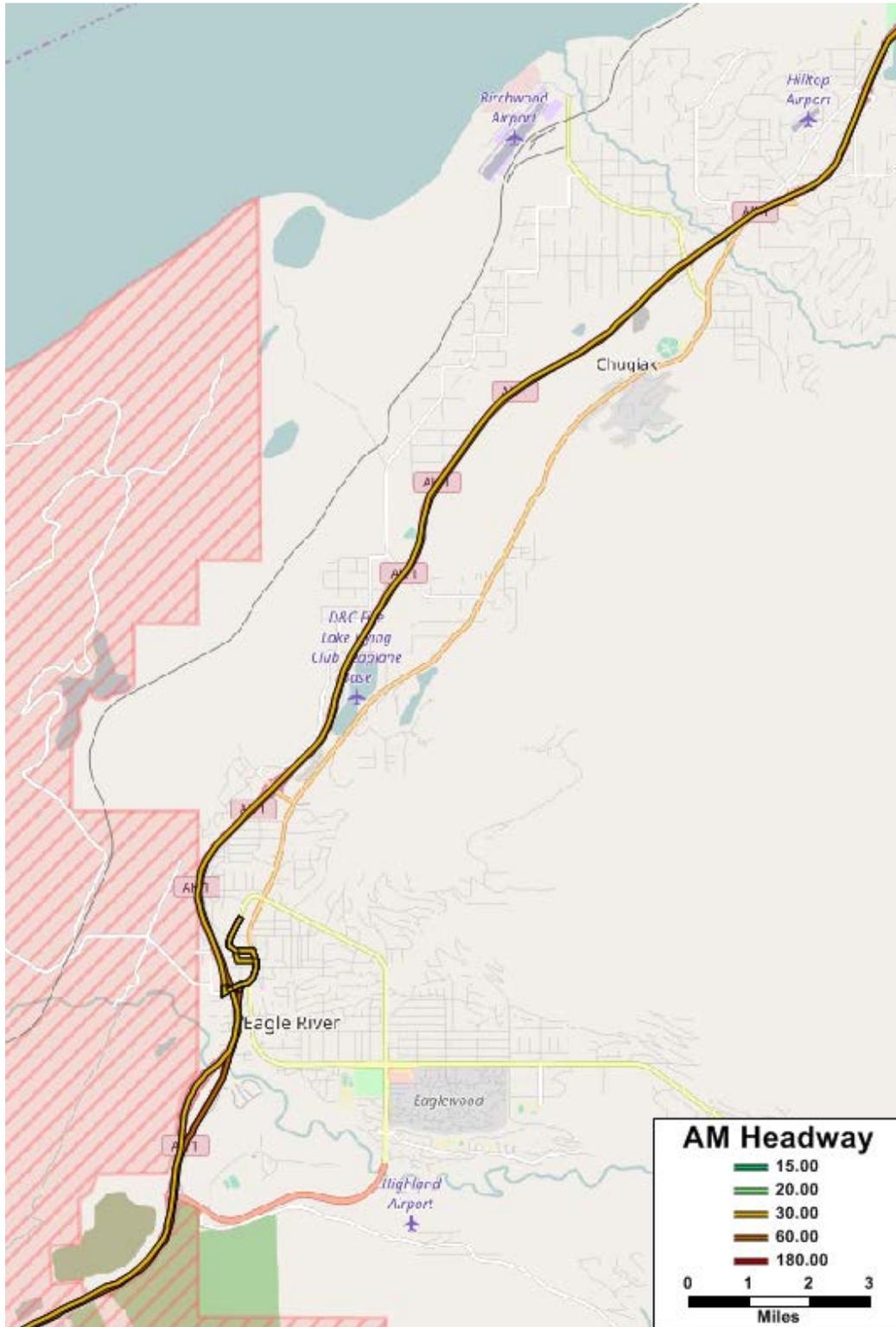
Note: The AM Peak Period is 7AM to 9AM and headways refers to the average time between bus arrivals.

Note: Transit headways out to the Matanuska-Susitna Borough reflect Valley Mover service.

4   Travel Model System Deficiency Analysis

This section presents AMATS travel demand model results for the base year (2013) and future baseline (E+C) year scenarios (2030 and 2040). The following metrics are presented in this section. Additional metrics can be found in Appendix A.

1. Total and average travel time and cost by income group

2. Trips by mode and purpose

3. Level of service by road for 2013, 2030, and 2040

4. Total and Per Capita Vehicle Miles Traveled (VMT)[3], Vehicle Hours Traveled (VHT)[4], and Vehicle Hours of Delay (VHD)[5]

5. VMT, VHT, VHD, and miles by level of service

6. Total transit boarding

7. Household and employment within 0.5 mile of transit by frequency

4.1   Travel Time and Cost

Average travel time per trip and cost per person trip was calculated for 2013, 2030 baseline, and 2040 baseline scenarios. The calculations are restricted to trips with at least one end in the AMATS area. Average travel time per trip is calculated by dividing the total travel for all person trips with at least one end in AMATS, according to the mode of travel (auto, walk, bike, or transit) by total person trips with at least one end in Anchorage. Average cost per person trip is calculated similarly, but out-of-pocket cost is used instead of travel time. Out-of-pocket cost includes the cost of gasoline, maintenance, and parking (for auto trips) and transit fare (for transit trips). Results are presented for low income[6] households separately from all households, in order to explore the equity impacts of changes in travel patterns.

Figure 13 presents the average trip travel time for low income households and all households in the base year and future scenarios. The purpose of these figures is to provide an understanding of base-year and future-year baseline trends with respect to travel time and out-of-pocket cost. Specific summaries are shown for low-income travelers as a point of comparison for a specific community of concern. Figure 14 shows the average home-based work trip travel time for low income households and all households in the base year and future scenarios. Figure 15 shows average out-of-pocket cost for low income and all households for the same scenarios. According to Figure 13, Figure 14 and Figure 15, the average travel time, home-based work travel time, and out-of-pocket cost does

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[3] VMT is the sum of vehicles on each road network segment multiplied by the segment length. It measures total distance by all vehicles on an average weekday.

[4] VHT is the sum of all vehicles on each road network segment multiplied by the segment time. It measures total travel time for all vehicles on an average weekday.

[5] VHD is the sum of all vehicles on each road network segment multiplied by delay. Delay is measured by subtracting free-flow travel time from estimated travel time which takes into account congestion (if any). It measures the total delay incurred by vehicles traveling in congested conditions.

[6] The definition of a low-income household is based on 2013 household income of less than $25k.

not change significantly for low income households (approximately 7.2 minutes per trip for all scenarios), while a slight increase is observed for all households in future years (from 8.9 minutes in 2013 to 9.4 minutes per trip in 2040), due to slightly longer trip lengths and increasing congestion. In addition, Figure 13 and Figure 15 indicate that trips made by members of low income households are 19 percent shorter in terms of travel time, and 34 percent less expensive in terms of out-of-pocket cost, than all households. Overall, one can conclude that while there is a slight increase in travel time and cost predicted overall, low income households will spend about the same time and cost traveling under future baseline conditions as they are in 2013. This may be because low income households tend to travel shorter distances than medium and high income households on average, and therefore will not experience the same amount or increase in congestion as other households in future baseline scenarios.

Figure 13: Average Travel time in 2013 and Future Baseline Scenarios
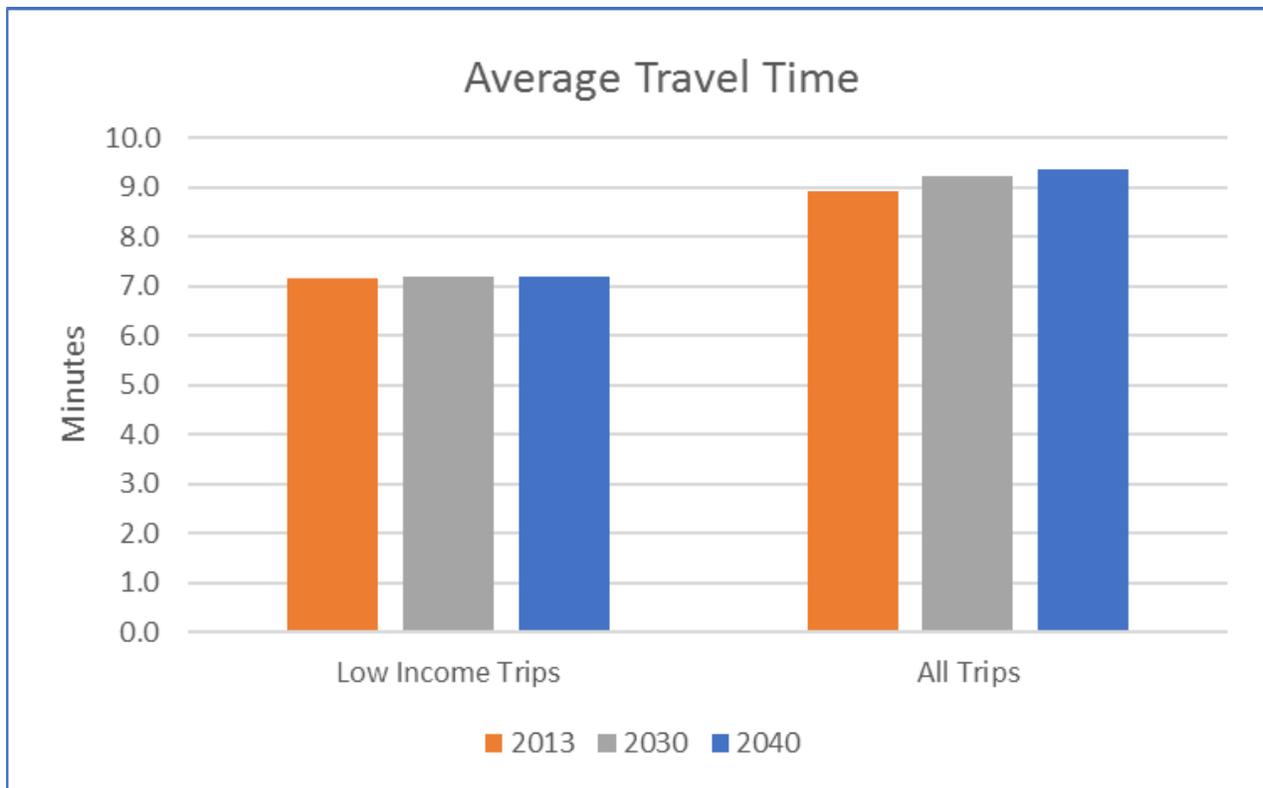
Figure 14: Average Home-Based Work Travel Time in 2013 and Future Baseline Scenarios

Home-Based Work Trip Average Travel Time
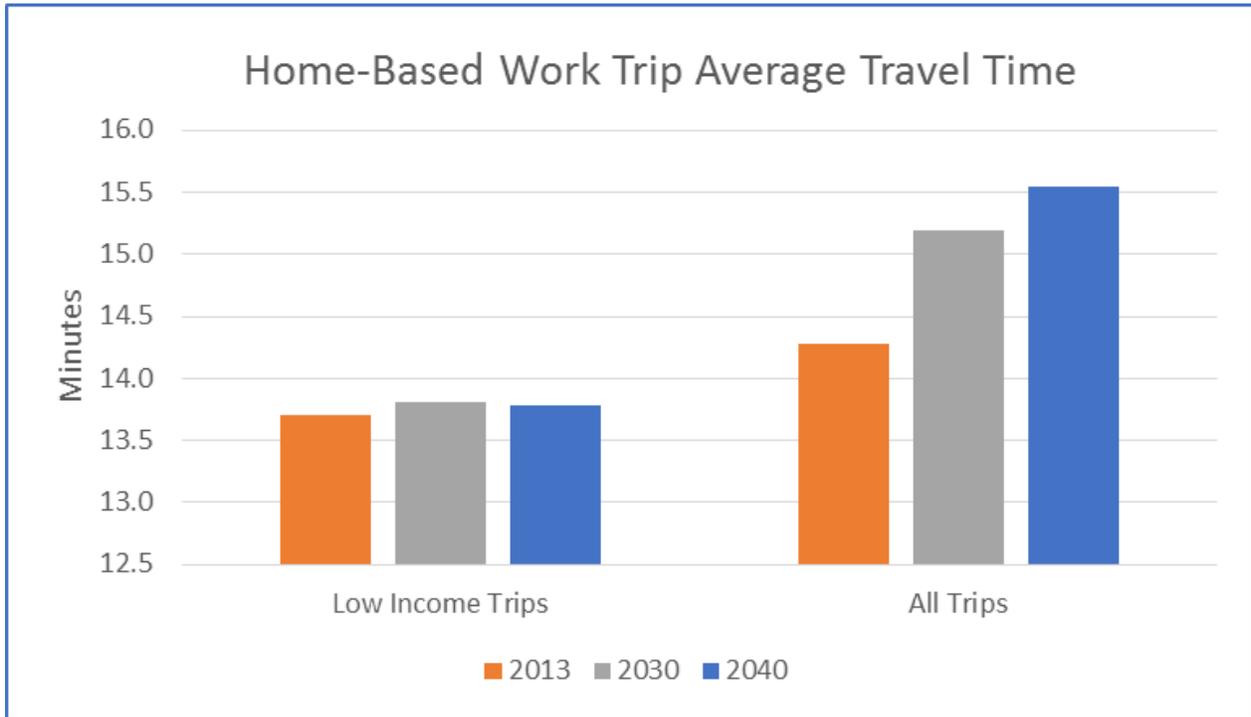
Figure 15: Average out-of-pocket cost in 2013 and Future Baseline Scenarios

Average Out-of-Pocket Cost
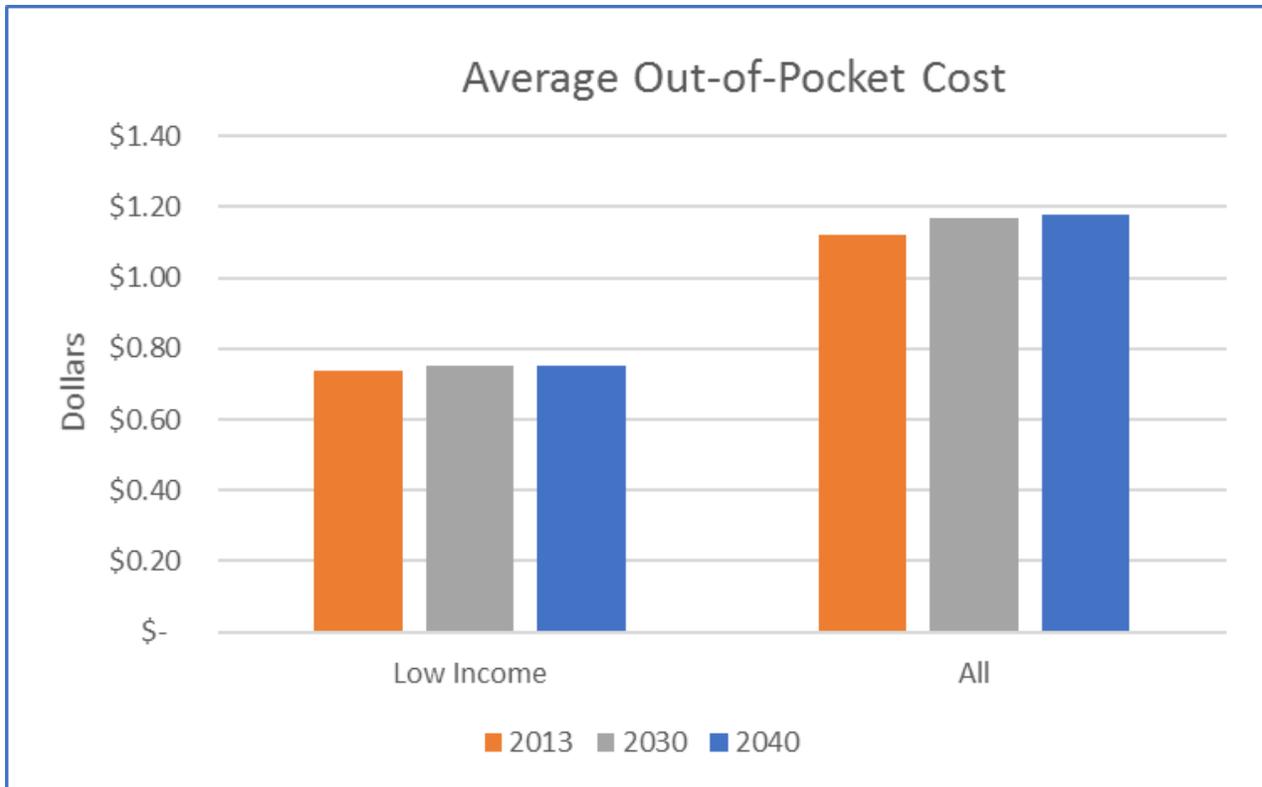
4.2   Mode Share

This section explores the share of trips by mode of travel in 2013 compared to 2030 and 2040 Existing plus Committed scenarios. All of the modes considered by the travel model are shown, including auto trips by occupancy (drive alone, shared-ride with two occupants, and shared-ride with three or more occupants), walking, biking, transit by mode of access (walk, drive and park, drive with drop-off or pickup), and school bus. These summaries are included to provide an understanding of overall demand by mode and how predicted changes in land-use, and projects included in the Existing plus Committed project list, might change future mode shares. Figure 16 illustrates the mode shares in the base year (2013), for trips with at least one end in the Municipality of Anchorage. According to Figure 16, 88 percent of trips are made by auto (drive alone and share rides). Approximately 9% of trips are made by walking, 2% by bicycle and approximately 1% by transit[7]. It is clear from this figure that biking and transit are currently the least utilized modes for trips in Anchorage. Figure 17 presents the mode share change from 2013 to 2030 and 2040 future baseline scenarios. Note that the y-axis of this chart is a fairly small scale, indicating relatively little change in future mode shares. That said, transit and non-motorized mode shares increase slightly in future existing plus committed scenarios (0.8% and 1.7% increases from 2013 to 2040 respectively) while there is a slight decrease in auto trips. In other words, the changes in land-use predicted between 2030 and 2040 are not expected to affect the utilization of modes significantly, though transit use has the highest percent increase across all modes. This may be due to a combination of factors including more frequent transit service and predicted increases in land-use density along key transit corridors.

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[7] The number of trips by mode can be found in Appendix A.

Figure 16: Trip Mode Shares in 2013

2013 Mode Share

- Walk 9%
- Bike 2%
- Transit 1%
- Drive Alone 46%
- Shared 3+ 21%
- Shared 2 21%
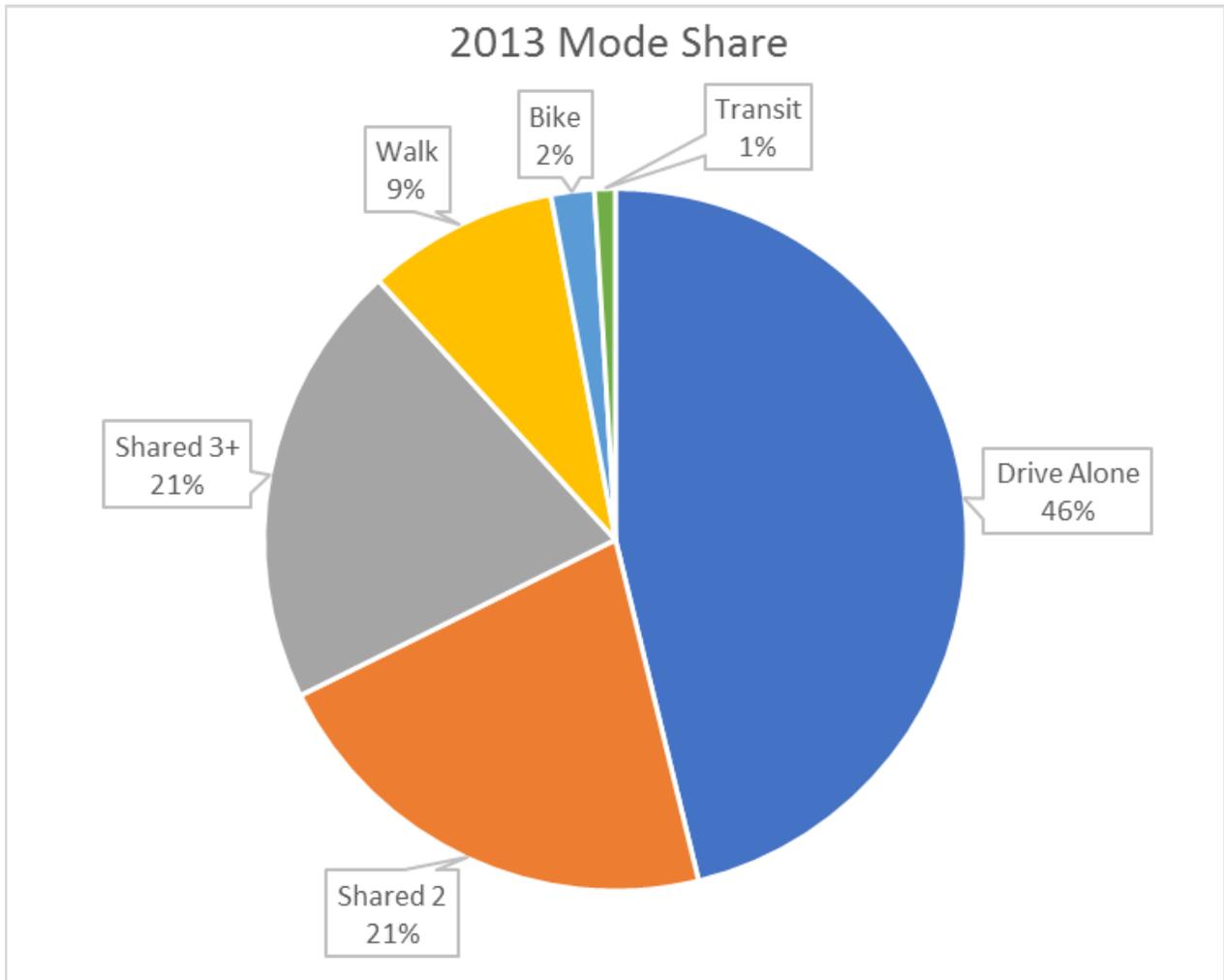
Figure 17: Change in Mode Share from 2013 to 2030 and 2040 Future Baseline
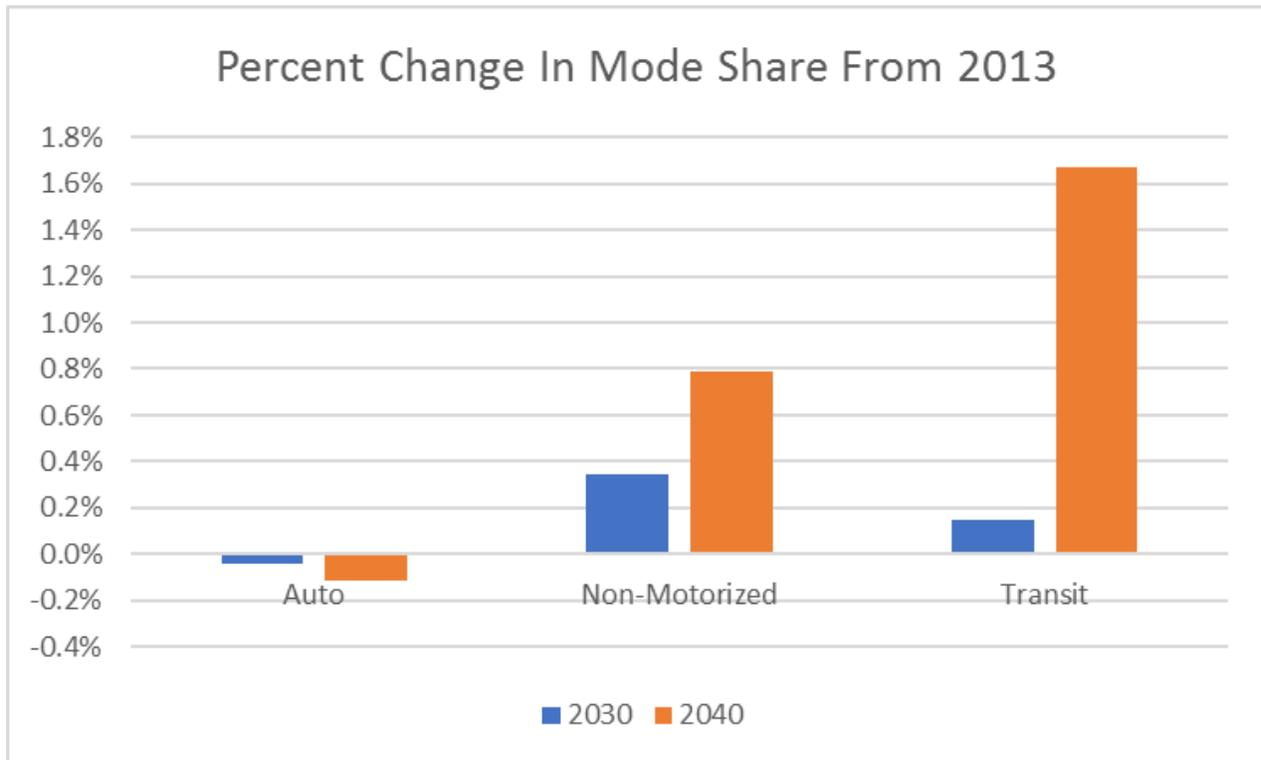
4.3   Road Network Level-of-Service

Understanding likely levels and locations of future congestion is a key aspect of system deficiency analysis. Figure 19 to Figure 21 show peak period[8] 'level-of-service' on roads in the Anchorage Bowl in 2013, 2030 baseline, and 2040 baseline scenarios, respectively. Similarly, Figure 22 to Figure 24 illustrate the same maps for the Chugiak\Eagle River area.

Level-of-service (LOS) is calculated by dividing the capacity of the road segment by the volume forecast for that roadway segment by the model. In the AMATS model, capacity is represented based on number of lanes for road segments without signalized intersections, and a combination of number of lanes and intersection characteristics for signalized intersections. The results of the LOS calculations in the figures below use the intersection capacity for roads with signalized intersections, which tends to be lower than the mid-link capacity due to signal timing. Level-of-service is coded into six letter categories A through F according to ranges of the volume to capacity ratio as shown in Table 5. Level-of-service categories D through F indicate congested conditions. Examples of a facility with D, E, and F level of service are shown in Figure 18.

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[8] There are three travel model periods; AM Peak (7 A.M. to 9 A.M.), PM Peak (3:00 P.M. to 6:00 P.M.) and Off-Peak (the rest of the day). The peak period is defined as either the AM Peak or PM Peak for each directional link in the road network based on which period has the higher per hour volume for the purpose of calculating peak level-of-service.

Table 5: Road Level of Service Definitions

Level-of-Service	Volume To Capacity Ratio	Description
A	< 0.6	Free-flow
B	0.6-0.7	Near free-flow
C	0.7-0.8	Stable
D	0.8-0.9	Approaching Unstable Flow
E	0.9-1.0	Unstable Flow
F	1.0 +	Forced or Breakdown Capacity

Figure 18: Examples of LOS D, E, and F Conditions

Source: 2000 Highway Capacity Manual

Figure 19: 2013 Peak Period Road Level of Service in Anchorage Bowl

Peak Period Level of Service
- LOS A & B
- LOS C
- LOS D
- LOS E
- LOS F

0   2   4   6
Miles
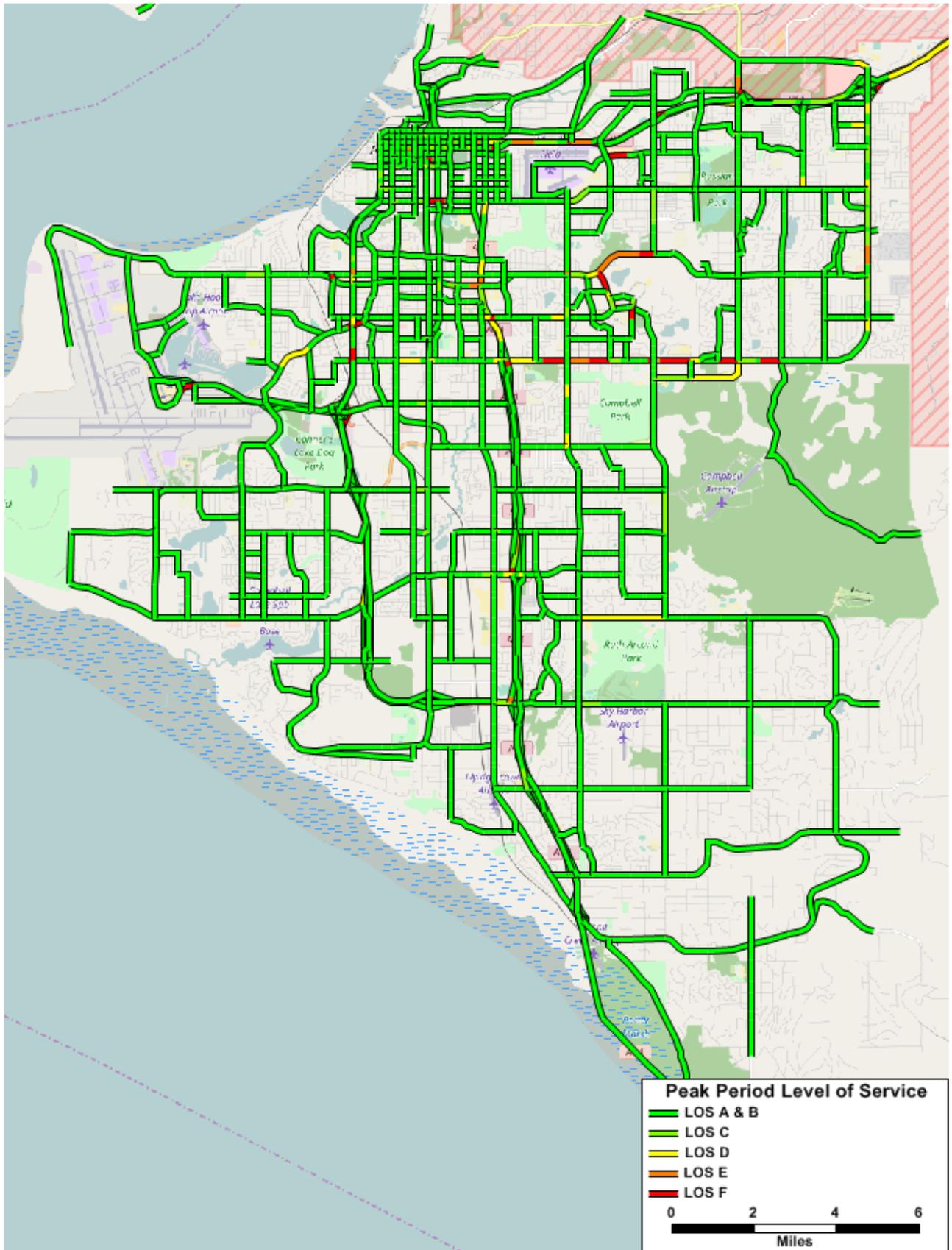
Figure 20: 2030 Baseline Peak Period Road Level of Service in Anchorage Bowl

Peak Period Level of Service
LOS A & B
LOS C
LOS D
LOS E
LOS F

0   1.5   3   4.5
Miles
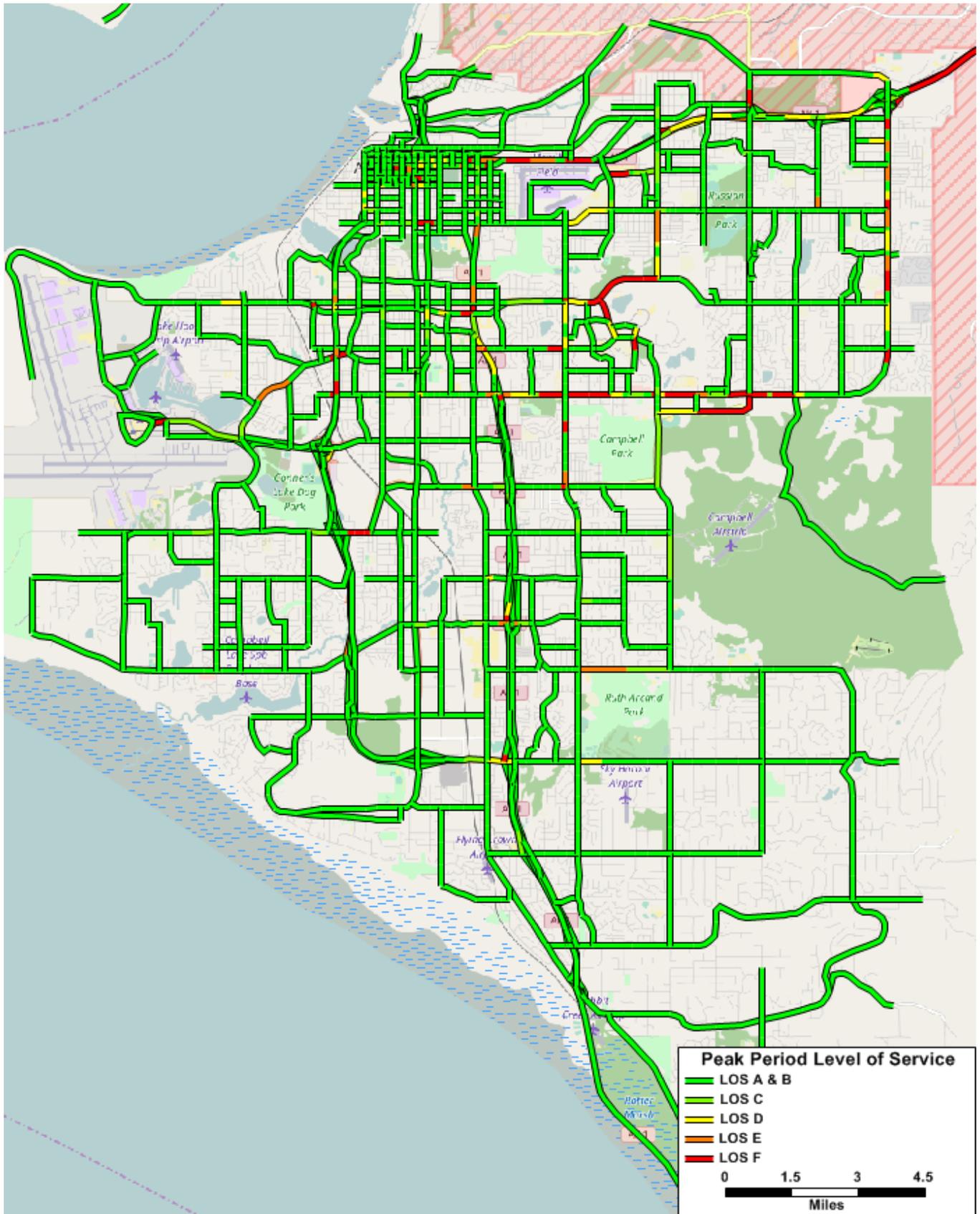
Figure 21: 2040 Baseline Peak Period Road Level of Service in Anchorage Bowl
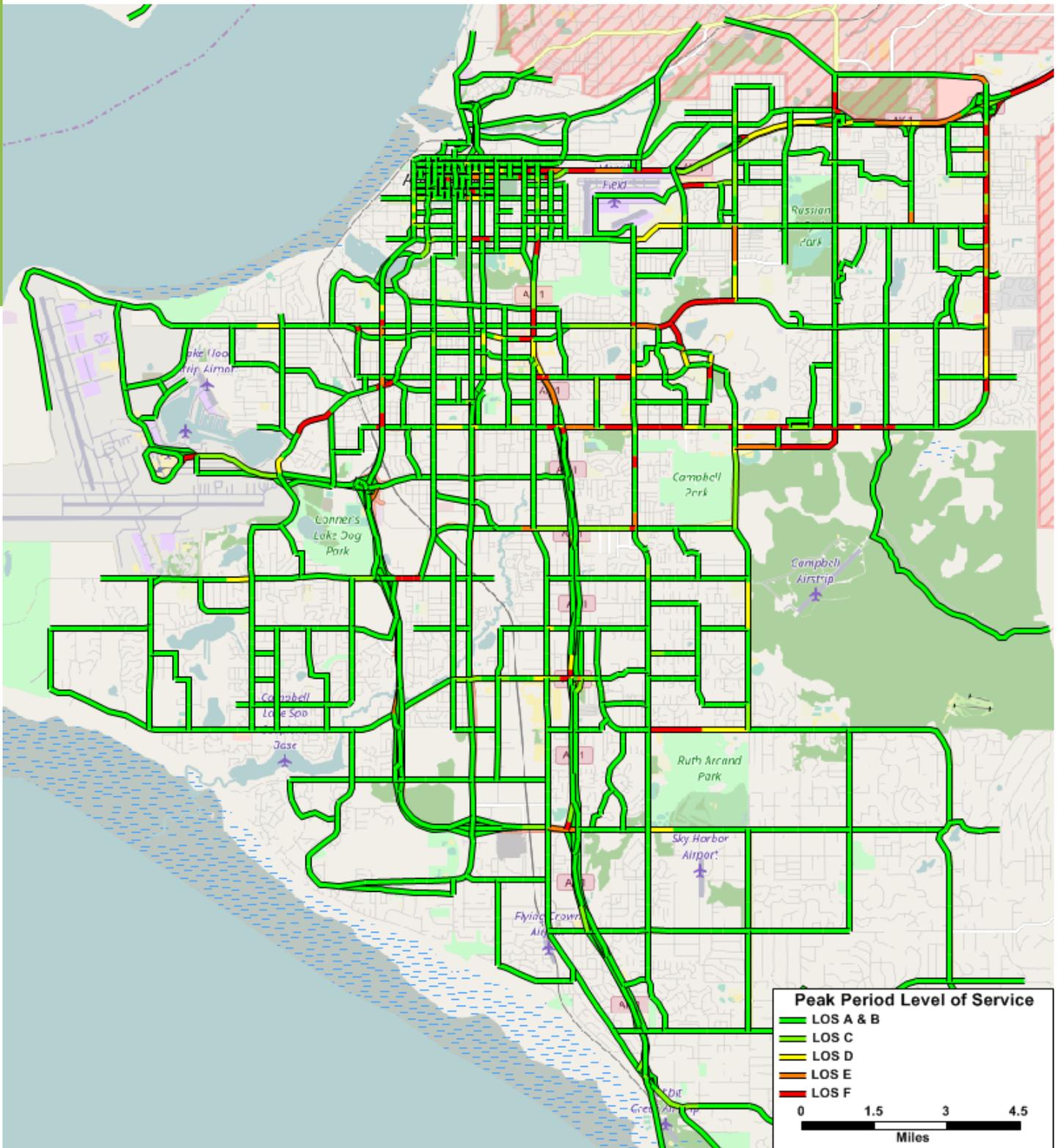
Figure 22: 2013 Peak Period Road Level of Service in Chugiak\Eagle River

Peak Period Level of Service
- LOS A & B
- LOS C
- LOS D
- LOS E
- LOS F

0   2.5   5   7.5
Miles
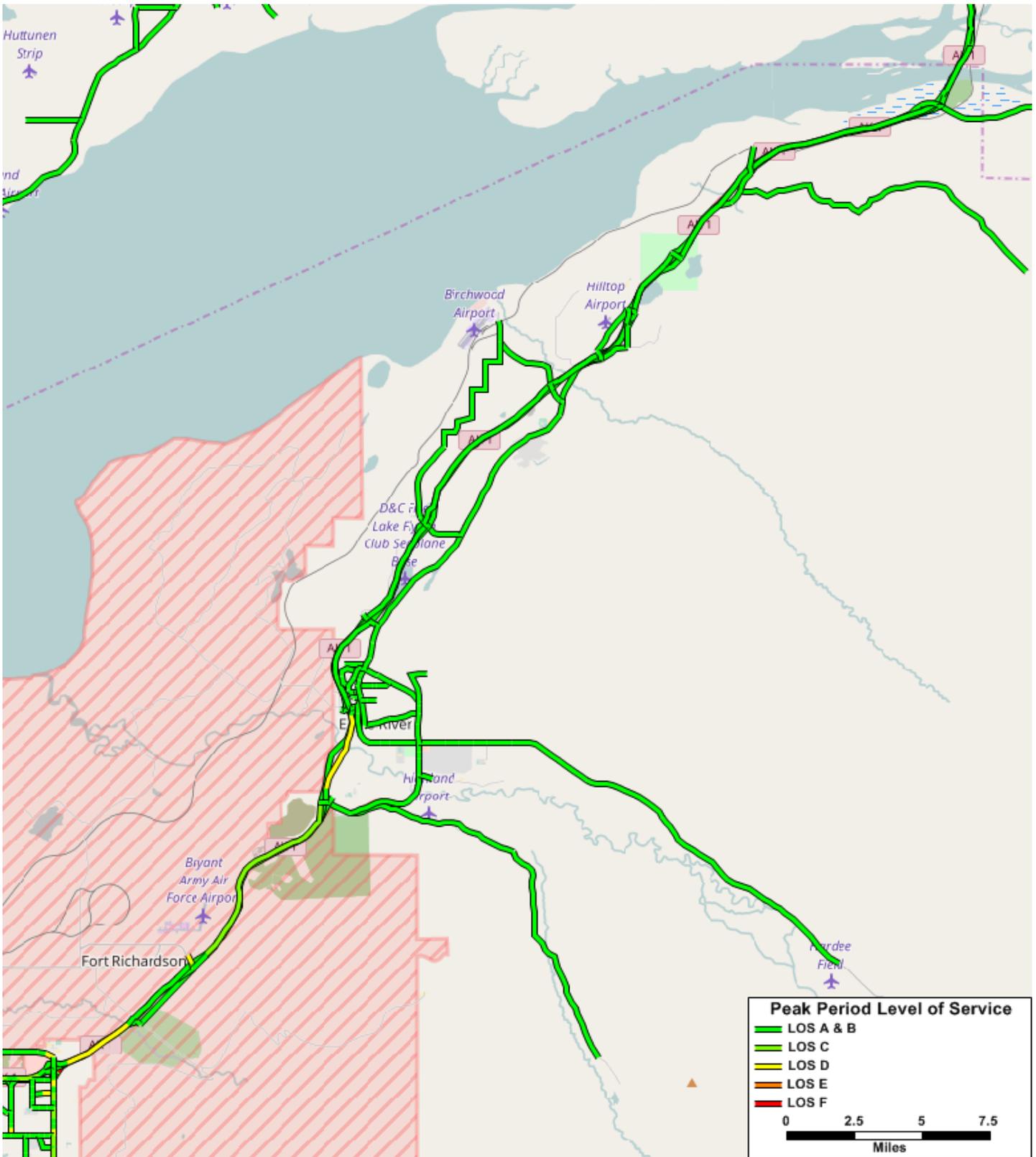
Figure 23: 2030 Baseline Peak Period Road Level of Service in Chugiak\Eagle River

Peak Period Level of Service

- LOS A & B
- LOS C
- LOS D
- LOS E
- LOS F

0   2.5   5   7.5

Miles
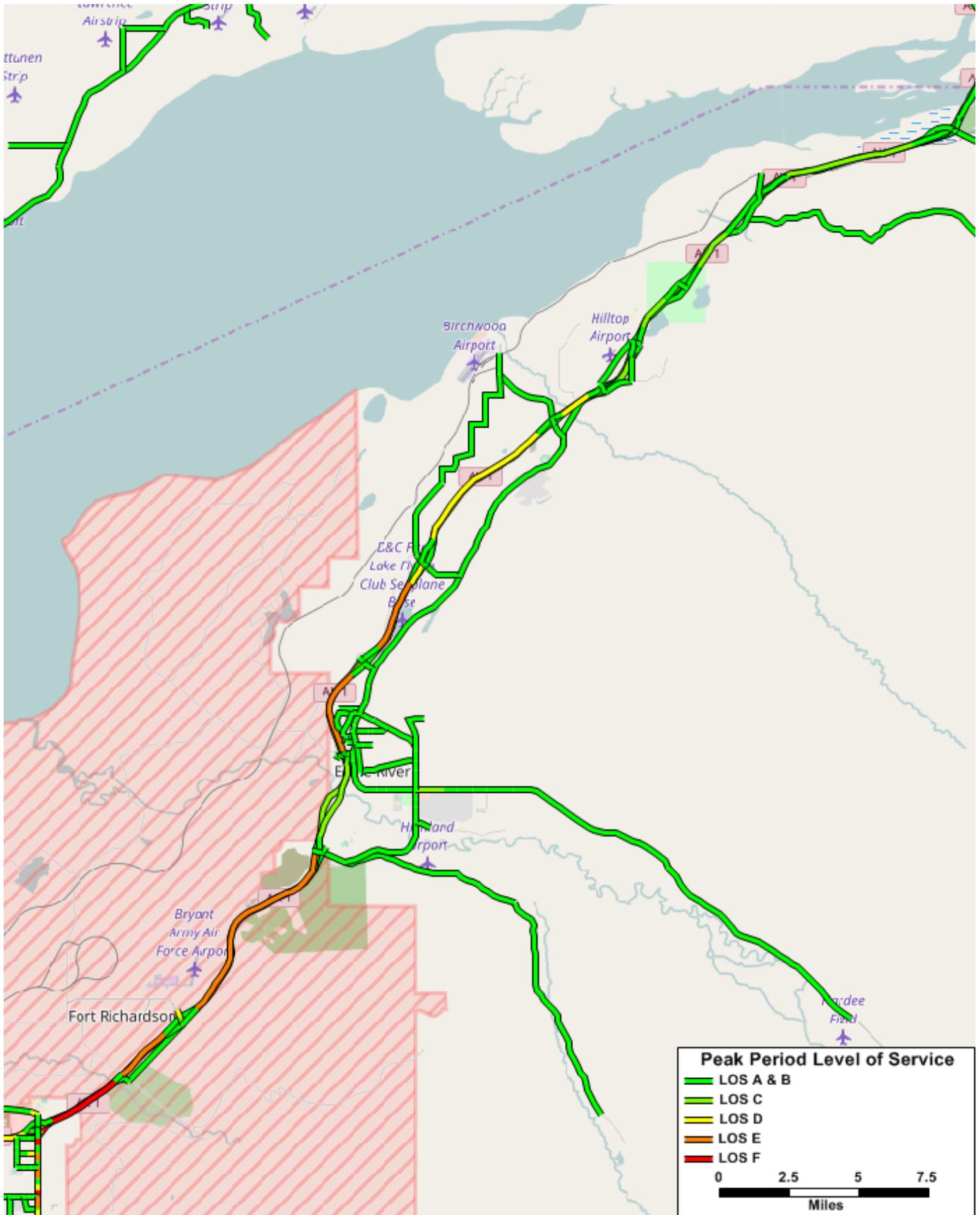
Figure 24: 2040 Baseline Peak Period Road Level of Service in Chugiak\Eagle River
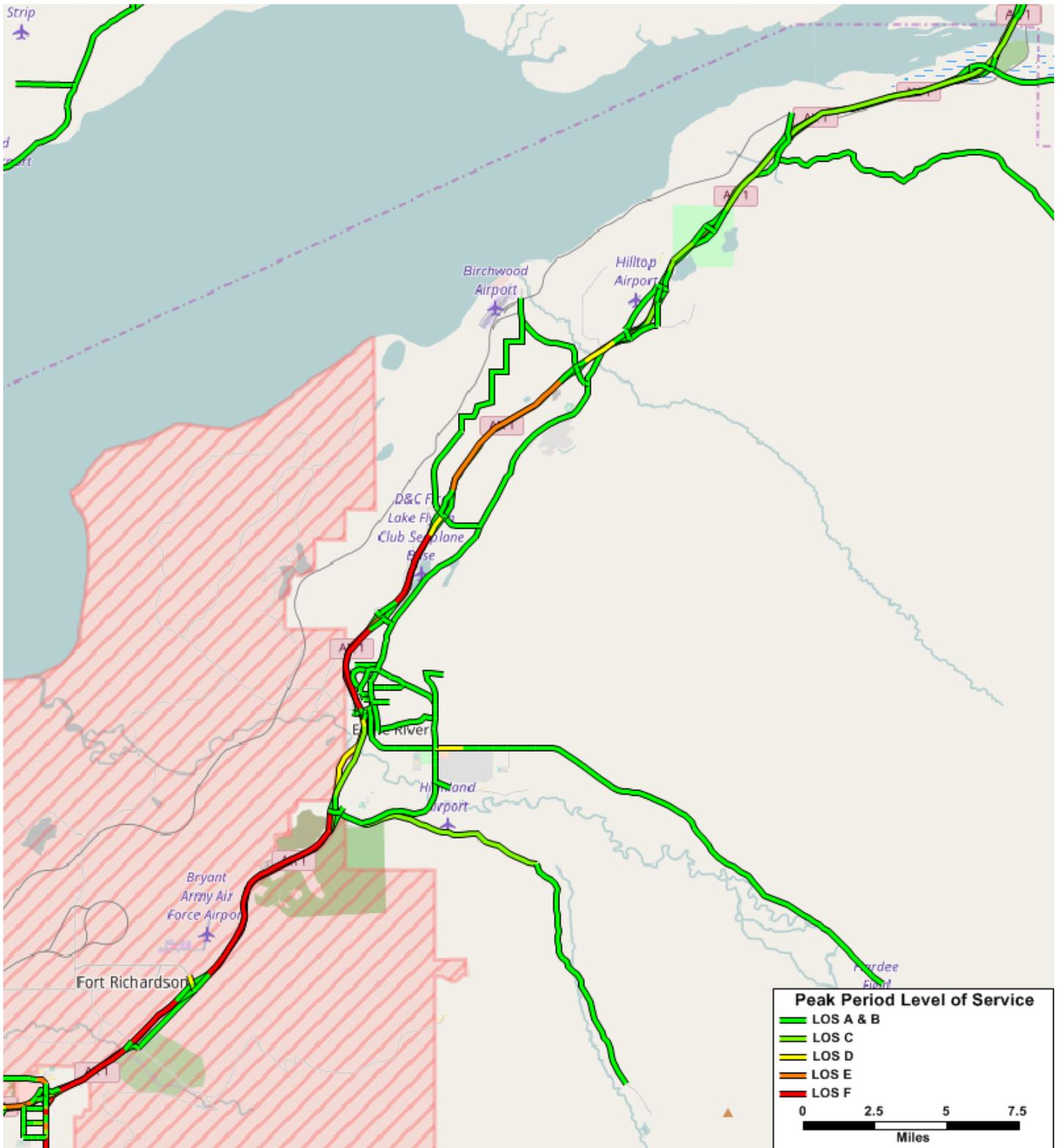
As shown in Figure 22 through Figure 24, peak period level-of-service is relatively good on most of the facilities in 2013 in the Anchorage Bowl. Key congested facilities during the peak period include: Tudor Road\Muldoon Road, East Northern Lights Boulevard near the University of Alaska Anchorage, sections of Seward Highway north of Tudor to downtown Anchorage, Minnesota Drive between Tudor and Northern Lights Boulevard, West 15th Street between A Street and C Street in downtown, 5th Avenue east of downtown to Glenn Highway, and Glenn Highway east of Muldoon Road.

As expected by 2040, congestion worsens on many of these facilities. Level of service deteriorates on the Glenn Highway east of downtown Anchorage, Tudor Road\Muldoon Road, and Northern Lights Boulevard; many locations that were LOS C or D in 2013 show up as LOS D, E, and F in 2040. Congestion can also be observed on Bragaw Street between Northern Lights Boulevard and Debarr Road and sections of the Glenn Highway.

As shown in Figure 22 through Figure 24, LOS C and D conditions in the peak periods are observed on the Glenn Highway in 2013 between Anchorage Bowl and Eagle River. By 2040, the Glenn Highway becomes LOS F in this section, and becomes LOS F north of Eagle River to Birchwood Loop Road in Chugiak. LOS D and E conditions are observed on Glenn Highway north to Voyles Road.

4.4   Road Network Performance

This section of the report describes overall system level of performance for roads in the Municipality of Anchorage. It includes miles of road by LOS, as well as summaries of system-wide vehicle miles traveled (VMT)[9], vehicle hours traveled (VHT)[10], and vehicle hours of delay (VHD)[11] analysis for the 2013 base-year, and 2030, and 2040 baseline model scenarios.

Figure 25 summarizes road centerline[12] miles by level of service in the 3 scenario runs. Note that this summary is for all three time periods in the model (AM Peak, PM Peak, and Off-Peak); therefore each road segment is counted three times in the graphs, though the off-peak period tends to be uncongested for most road segments.

Figure 25 shows that LOS D conditions increase by approximately 50% from 2013 to 2040, LOS E conditions increase by almost 480% from 2013 to 2040, and LOS F conditions increase by 340% for roads in the AMATS area.

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[9] Vehicle miles of travel is the sum of estimated (assigned) vehicles * distance (in miles) across all time periods and links in Anchorage Bowl and Chugiak\Eagle River

[10] Vehicle hours traveled is the sum of estimated (assigned) vehicles * time (in hours) across all time periods and links in Anchorage Bowl and Chugiak\Eagle River

[11] Vehicle hours of delay is the sum of estimated (assigned) vehicles * (Congested time – free-flow time) across all time periods and links in Anchorage Bowl and Chugiak\Eagle River

[12] Centerline miles refer to miles of roadway regardless of the number of lanes.

Figure 25: Centerline Miles by Level of Service in 2013, 2030 Baseline, and 2040 Baseline Scenarios
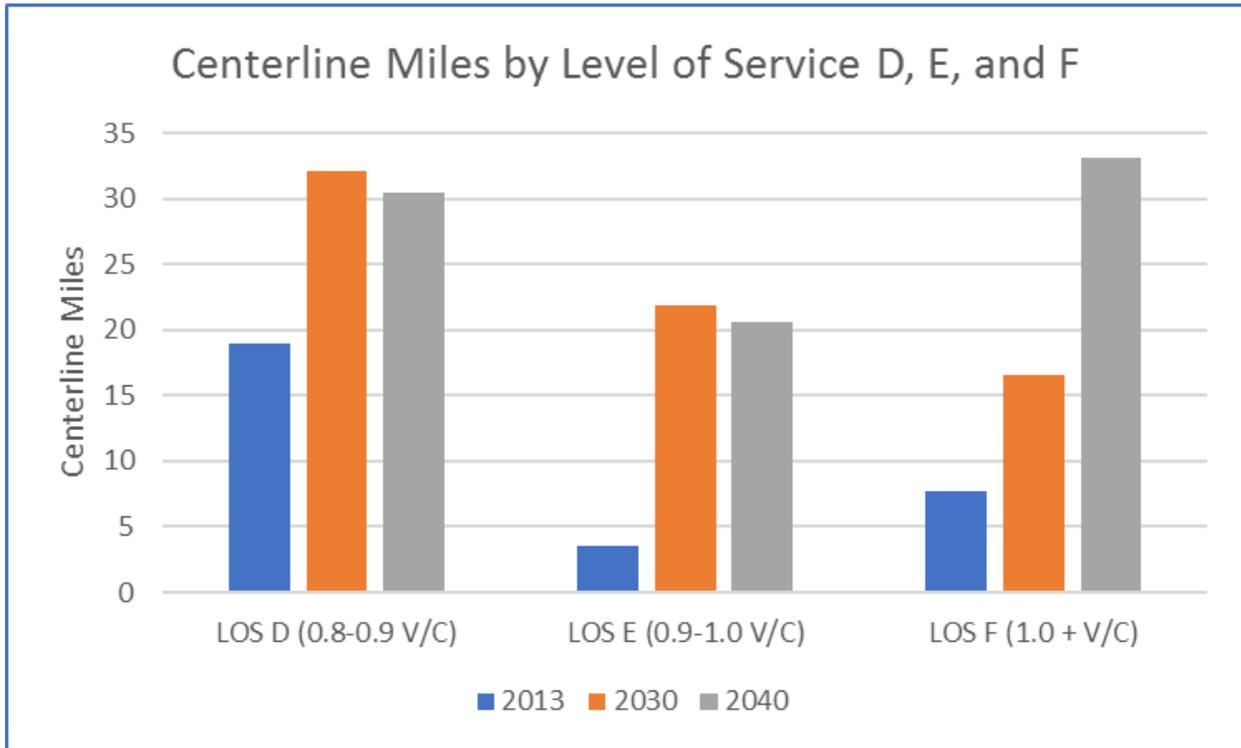
Figure 26 presents total vehicle miles traveled (VMT) and vehicle hours traveled in 2013, 2030 baseline, and 2040 baseline scenarios predicted by the model. These are useful metrics to understand the predicted increase in the number of vehicles using the road network and the effects of those vehicles on congestion. If no future improvements are implemented, then VMT and VHT are predicted to increase by 19 percent in 2030 and 27 percent in 2040 compared to 2013 conditions. VMT and VHT are predicted to increase primarily because of predicted population and employment growth in the region between 2013 and 2040, which is predicted to grow by 17.5 and 24.7 percent respectively between 2013 and 2040 within the Municipality of Anchorage. The increased number of trips made by future residents will add to the traffic on the road network.

Figure 27 indicates that the per capita VMT and VHT will increase by 3.5 percent and 5 percent in 2030 and 2040 compared to 2013 conditions, respectively. Note that per capita calculations exclude the population of Mat-Su Borough in order to be consistent with the rest of the plots and graphics in this chapter. The slight increase in per capita VMT and VHT is likely due to future predicted land-use development outside the Anchorage Bowl, exacerbating the jobs\housing imbalance in the region.

Figure 26: VMT and VHT in 2013, 2030 Baseline, and 2040 Baseline Scenarios

Vehicle Miles of Travel

Vehicle Hours of Travel
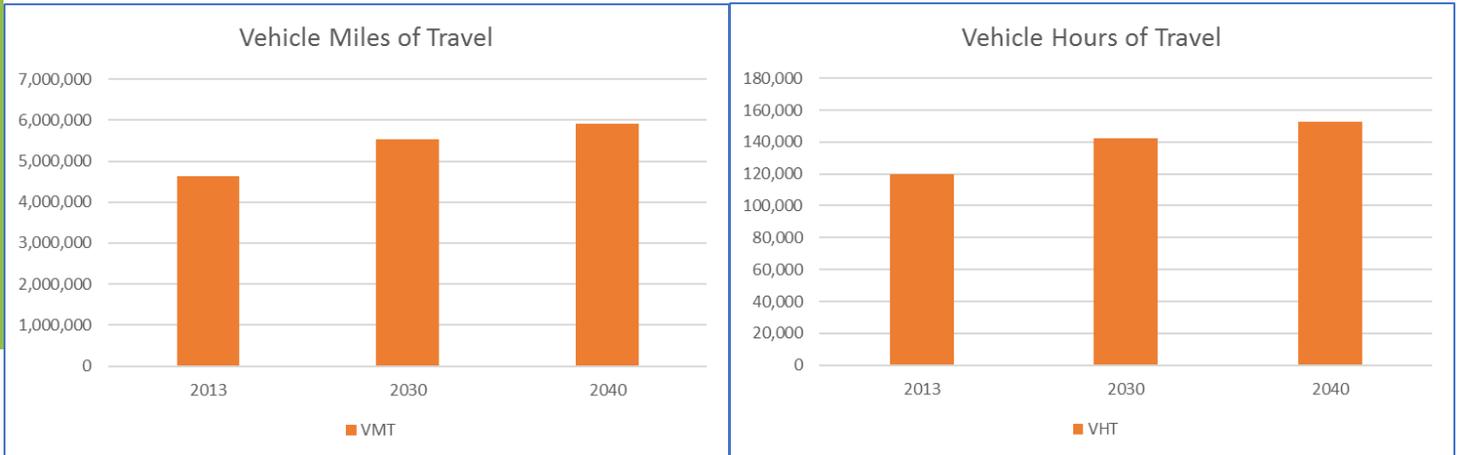
Figure 27: Per Capita VMT and VHT in 2013, 2030 Baseline, and 2040 Baseline Scenarios

Per Capita Vehicle Miles of Travel

Per Capita Vehicle Hours of Travel

Figure 28 illustrates that total vehicle hours of delay (VHD) will double in 2030 and triple in 2040 compared to 2013.

Figure 28: Vehicle Hours of Delay in 2013, 2030 Baseline, and 2040 Baseline Scenarios
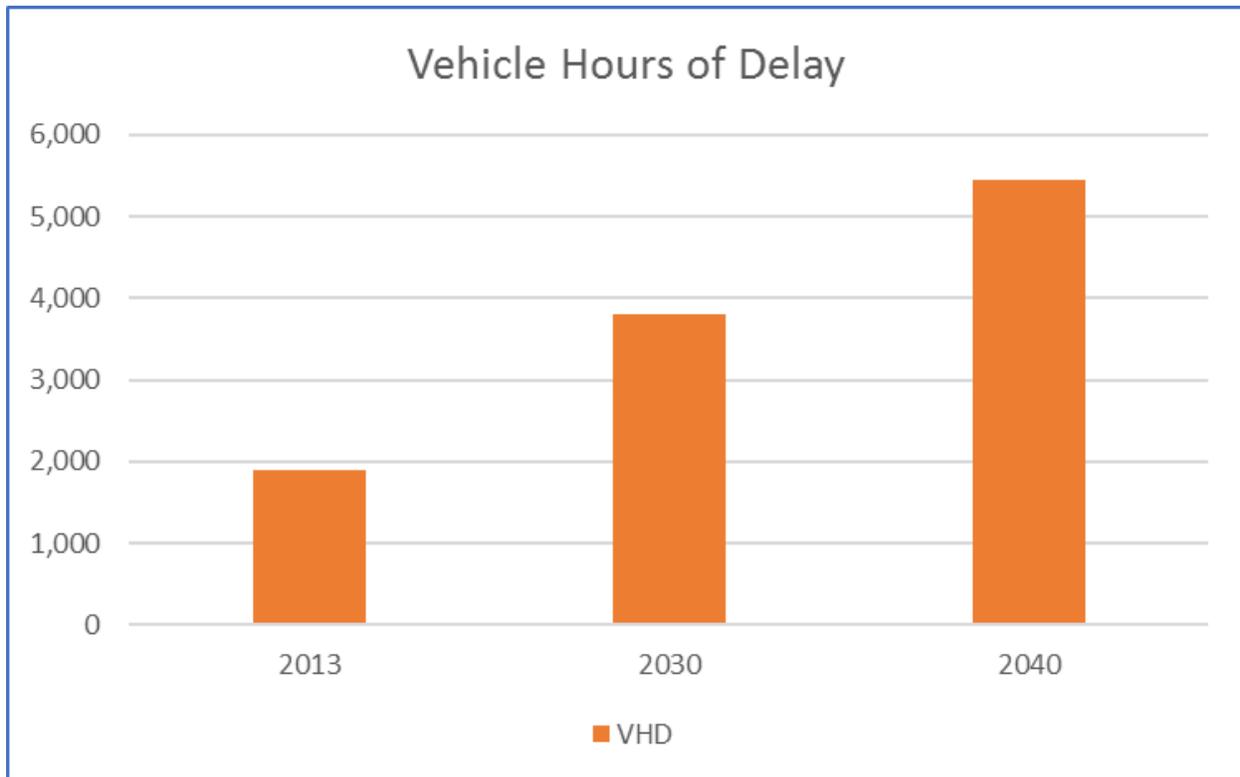
Table 6 presents VHD for key roadways in 2013, 2030 baseline, and 2040 baseline scenarios. The table shows that delay will increase on most of the facilities by 2040 except Seward Highway (due to the Seward Highway widening project currently being constructed).Table 6: VHD for Key Roadways in 2013, 2030 Baseline and 2040 Baseline Scenarios

Facility	Scenario			Increase (%)	
	2013	**2030**	**2040**	**2013 to 2030**	**2013 to 2040**
Tudor	217	268	332	23.5	53.0
Dimond-Abbott	50	61	73	22.0	46.0
Muldoon	41	69	91	68.3	122.0
*Seward SB**	49	30	41	-38.8	-16.3
*Seward NB**	70	57	75	-18.6	7.1
O'Malley	10	16	21	60.0	110.0
Minnesota Dr SB	2	2	3	0.0	50.0
Minnesota Dr NB	4	5	6	25.0	50.0

*The reduction in VHD is largely due to roadway improvement projects that are under construction.

4.5 Transit Ridership

This section describes transit accessibility[13] and transit ridership in the 2013, 2030, and 2040 baseline scenarios.

Figure 29 and Figure 30 show the percentage of low income and total households within ½ mile of transit by frequency of transit service. Note that in the 2013 base year, none of the households had access to high frequency transit service (1-15 minute headways). However, People Mover's committed service changes, going into effect in October 2017, will dramatically change accessibility to frequent service. As shown in these graphs, household transit accessibility to routes with headways over 15 minutes will decrease, while approximately 40% of low income households and 25% of total households will have access to high frequency transit service in 2030 and 2040. This demonstrates that low income households are benefiting from the planned transit system changes and a significant number of households will have access to high frequency transit service after the changes take effect in October 2017. Figure 31 shows transit accessibility for employment; approximately 45% of all jobs in the region will have access to high frequency transit service in the 2030 and 2040 baseline scenarios.

Figure 29: Percent of Low Income Households by Transit Accessibility in 2013, 2030 Baseline, and 2040 Baseline Scenarios

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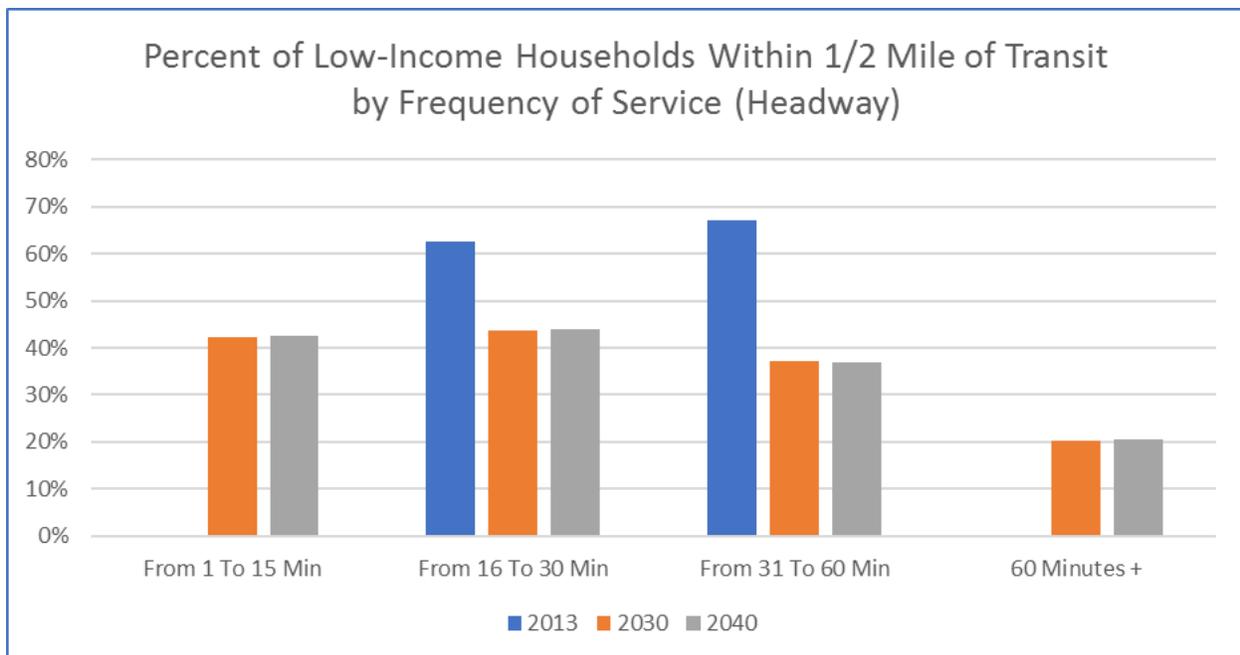
[13] Transit accessibility sums up all households or employment within ½ mile of a transit stop by buffering around the transit stops according to the frequency of service of buses that serve those stops, and adding all of the households or employment across all of the TAZs within the ½ mile buffer

Figure 30: Percent of Total Households by Transit Accessibility in 2013, 2030 Baseline, and 2040 Baseline Scenarios

Percent of Total Households Within 1/2 Mile of Transit by Frequency of Service (Headway)
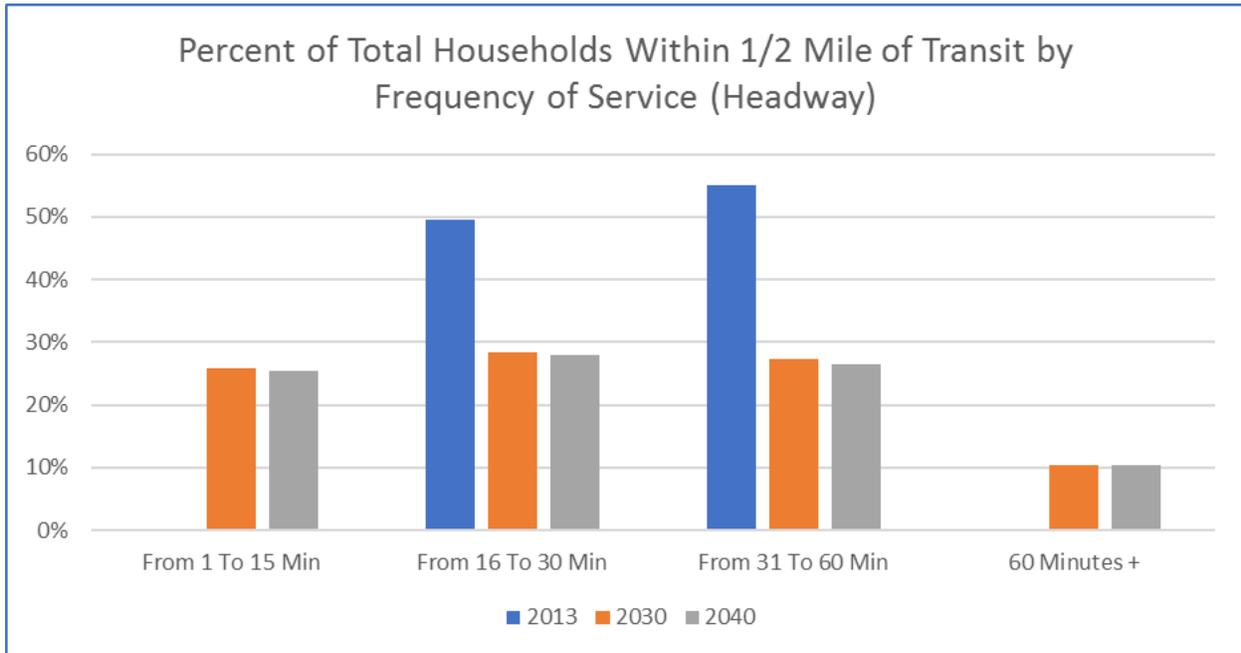
Figure 31: Percent of Total Employment by Transit Accessibility in 2013, 2030 Baseline, and 2040 Baseline Scenarios

Percent of Total Employment Within 1/2 Mile of Transit by Frequency of Service (Headway)
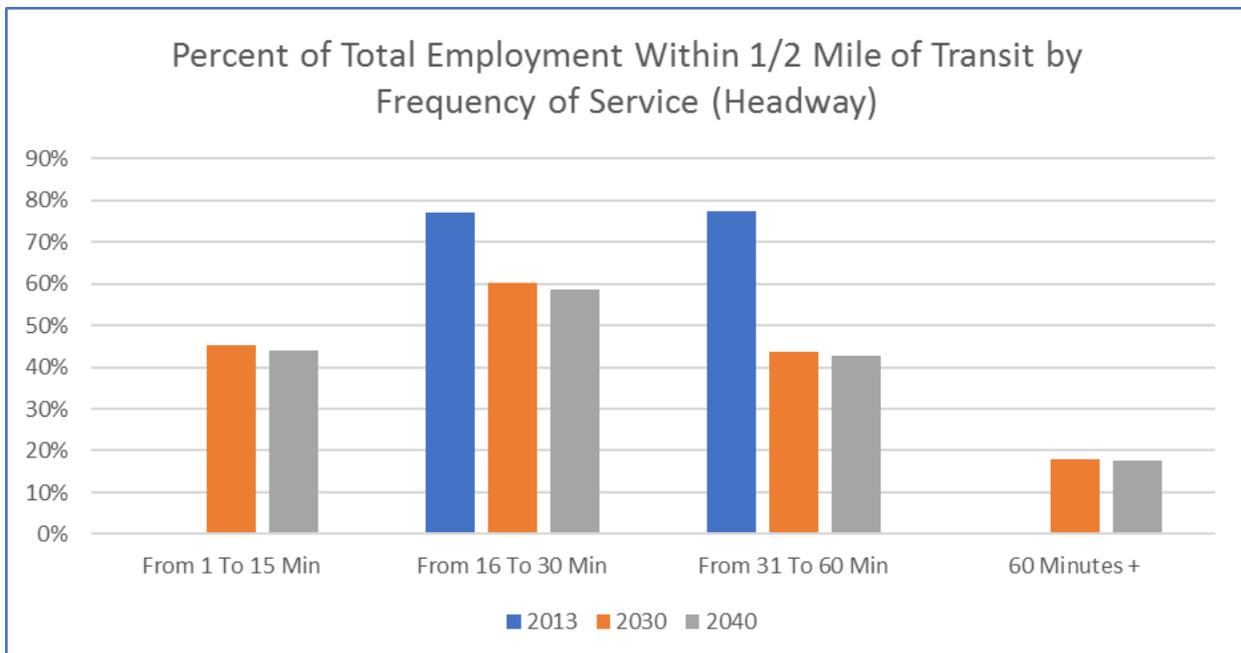
Forecasted transit boardings slightly outpace population growth, likely due to the increased frequencies of service being implemented on key transit corridors in October 2017. Figure 32 and Figure 33 present total and per capita transit boardings for the base year and future baseline scenarios. According to these figures, total boardings grow by 27 percent in 2030 and 36 percent in 2040. Per capita boardings are predicted to increase by 11 percent and 12.5 percent in 2030 and 2040, respectively, even without additional service improvements.

Figure 32: Daily Transit Boardings in 2013, 2030 Baseline, and 2040 Baseline Scenarios

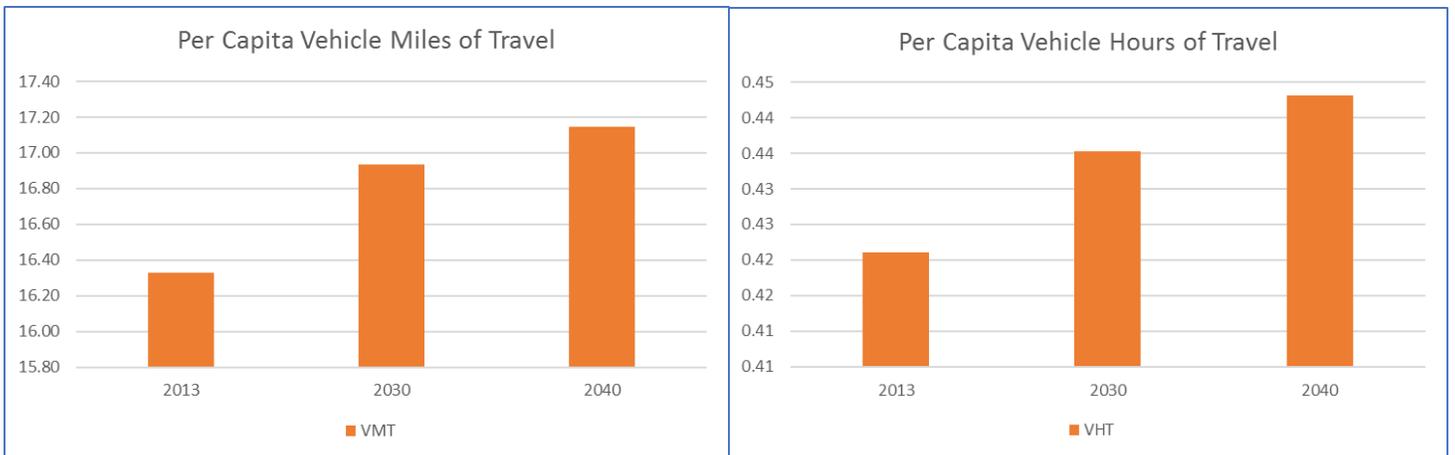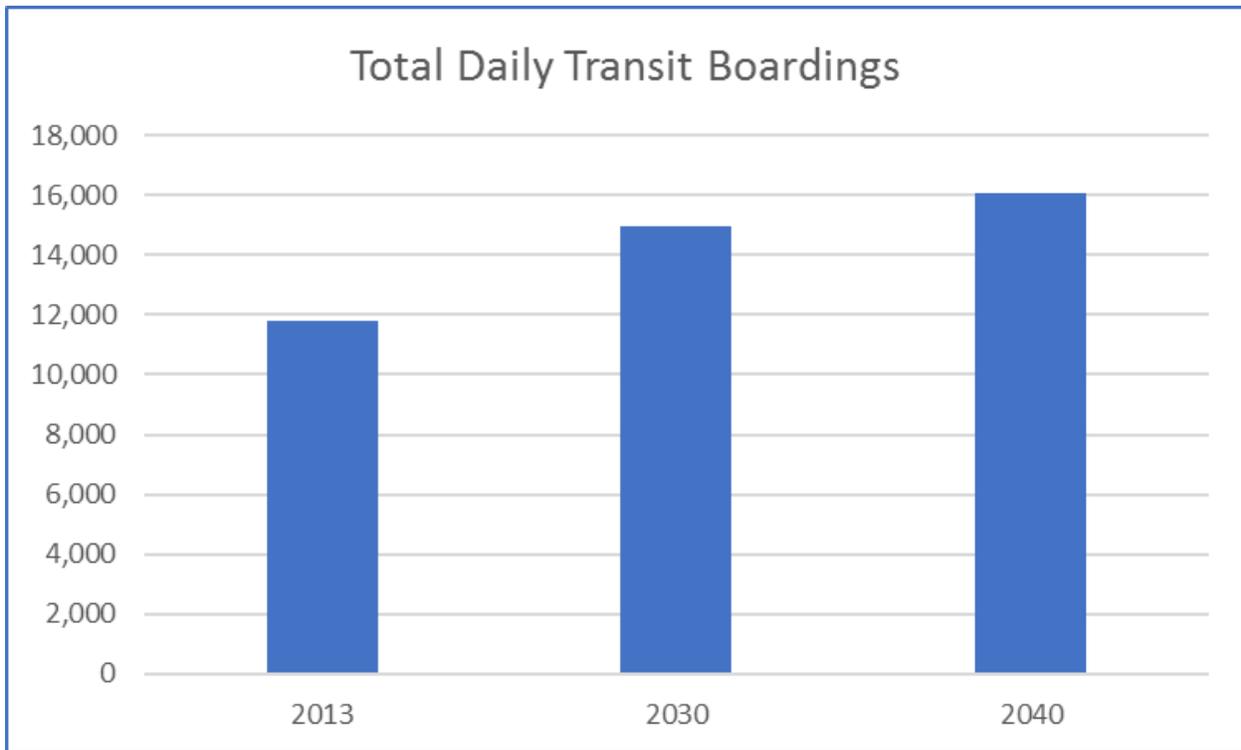**Figure 33: Per Capita Transit Boardings in 2013, 2030 Baseline, and 2040 Baseline Scenarios**
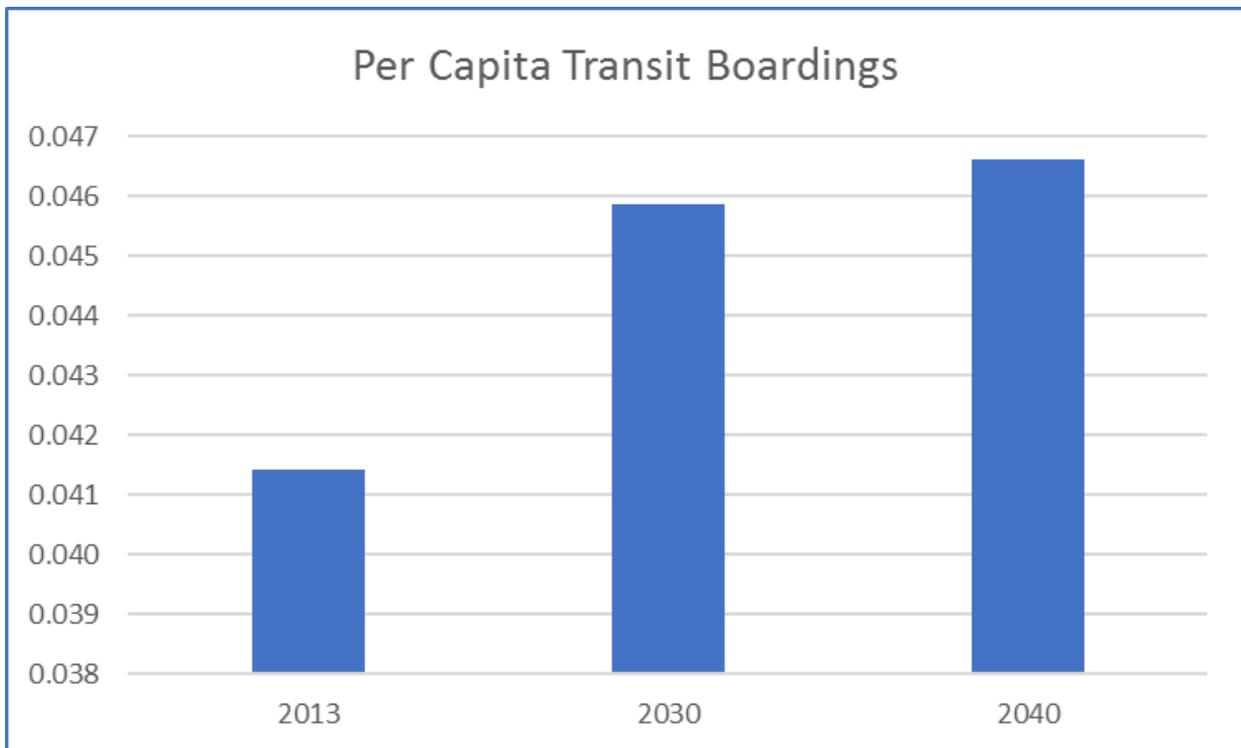
5 Other Deficiencies Analysis

This section presents information regarding identified deficiencies in the transportation system except roads. This data and any subsequent analysis is not intended to supplant the detailed studies and recommendations of the MOA or DOT&PF. The purpose of this MTP deficiency analysis is to summarize the needs and deficiencies base on a review of existing plans.

5.1 Bridges

Bridges are an important part of our transportation system. FHWA maintains a database, the National Bridge Inventory (NBI), with data collected by the State Transportation Agencies, on all public bridges in the United States that are greater than 20 feet in length. Using National Bridge Inspection Standards, State inspectors visually assess and record up to 116 standards for the NBI. The database contains condition ratings for the primary bridge components—the deck, substructure, and superstructure—that provide an overall characterization of the bridge's general condition. The condition ratings, along with a structural assessment of the clearances, approach roadway alignment, deck geometry, and load carrying capacity are used to determine the sufficiency of a bridge.

An insufficient bridge is categorized in one of two ways:

- Structurally Deficient – A bridge is considered structurally deficient if the deck, substructure, superstructure, or culvert is rated at or below "poor" condition (0 to 4 on the NBI Rating Scale). A bridge can also be structurally deficient if load-carrying capacity is significantly below current design standards, or the adequacy of the waterway opening provided is determined to be very insufficient to the point of causing intolerable roadway traffic interruptions. A bridge that is classified under the Federal definition of "structurally deficient" does not necessarily mean the bridge is unsafe. A structurally deficient bridge, when left open to traffic, typically needs major maintenance and repair to remain in service and will eventually need to be rehabilitated or replaced to address deficiencies. The designation attracts continued monitoring and makes the bridge eligible for federal and/or state repair or replacement funding if its sufficiency rating meets a certain threshold.

- Functionally Obsolete – A bridge is functionally obsolete if the roadway geometry no longer meets current minimum design standards for width or vertical clearance classifications. A functionally obsolete classification does not mean that a bridge is unsafe. If a bridge meets the criteria for both structural deficiency and functional obsolescence, it is only identified as structurally deficient, because structural deficiencies are considered more critical.

The final MTP may identify structurally deficient or functionally obsolete bridges in the problem statements of the roadways that are selected for improvements, but the final MTP will not have a separate section with future bridge improvements identified.

5.2   Pedestrian

The pedestrian system in Anchorage and Chugiak\Eagle River consists largely of sidewalks, separated pathways, and greenbelt trails.

The following deficiencies have been identified in the pedestrian system:

- Gaps in network - the sidewalk system in the AMATS area is incomplete as many areas have sidewalks that are discontinuous or missing entirely. Older neighborhoods such as Downtown, South Addition, and Airport Heights tend to have more complete sidewalk coverage than newer neighborhoods. The 2007 Anchorage Pedestrian Plan states that the existing sidewalk system coverage (excluding separated multi-purpose trails) "represents roughly 13 percent of the total miles of roads in the Anchorage Bowl".
- Fail to meet ADA requirements – Many of the sidewalks and curbs fail to meet Americans with Disabilities Act (ADA) requirements for accessibility for the elderly and individuals with disabilities.
- Facilities are too narrow/encroachment – Many existing sidewalks are narrower than current guidelines. Other items such as utility poles, mailboxes, trash containers, etc., are often located on or near sidewalks which reduces the available width. In areas with rolled curbs, vehicles sometime park in a way that blocks the sidewalk.
- Facilities are used for snow storage – During the winter, sidewalks are sometimes used for snow storage resulting in people walking in the streets. While snow storage is meant to be temporary, the amount of time the sidewalk is unavailable can vary depending on the amount of snow fall.
- Lack of winter maintenance –Many sidewalks are not the responsibility of the MOA or DOT. In many areas of Anchorage including Downtown[14] and parts of Midtown, property owners or tenants are responsible for snow removal from sidewalks. Not all sidewalks get cleared in a timely manner. In areas where the MOA or DOT is responsible for sidewalk clearance, limited financial resources may restrict the amount snow clearing activity.
- Safety – crashes between pedestrians and motor vehicles is a concern because the injuries associated with these are typically more severe than other types of crashes.
- Development pattern does not support walking – Overall, our historical development pattern does not support walking as a transportation option for many trips. Different land uses are spread apart making it difficult to travel between locations without an automobile. For example, the highest concentrations of employment are found in Downtown, Midtown, and U-Med but there is relatively little housing in these areas making it difficult for people to be able to walk to work.
- Separated pathways –Separated pathways can be an issue because the pathway is used by several different user groups. Pedestrians and cyclists sometimes conflict because of the different travel speeds. Pedestrians can feel unsafe when being passed by bicyclists.

For additional information, please see the Anchorage Pedestrian Plan.

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[14] In Downtown, the Anchorage Downtown Partnership provides supplemental snow and ice removal services in the Downtown Improvement District.

5.3   Bicycle

The existing Anchorage bicycle network relies primarily on a system of pathways and greenbelt trails with very limited on-street bicycle facilities. The bicycle network includes on-street facilities in Anchorage; which consist of bicycle lanes, on-street bicycle routes, and paved roadway shoulders. On-street bicycle infrastructure such as bike lanes is fairly rare in the Anchorage Bowl and nonexistent in Chugiak\Eagle River. Ideally, the bicycle network should form a grid system with connections every half mile to provide direct and continuous routes.

The following deficiencies have been identified in the bicycle system:
- Mixing Bicyclists and Pedestrians on the Same Facility – There are many areas in Anchorage where bicyclists find themselves mixing with pedestrians on the sidewalk or through intersections, as identified under Section 5.2 Pedestrian.
- Separated pathways –Separated pathways can be problematic when they are located on one side of the road. This leads to conflicts with turning vehicles because a driver preparing for a right turn is typically looking left/ahead for on-coming traffic, not right for bicyclists who may be approaching the intersection or in a crosswalk. This is commonly referred to as a "right hook." As a result, bicycles going both directions have to share the same pathway. Another issue is that when the path ends, the bicyclist going against traffic often ends up traveling on the road in the opposite direction of traffic flow. Other challenges associated with separated pathways include signage not visible in both directions, bicycles are often expected to stop or yield at cross streets and driveways, and vehicles on side streets or driveways may block pathway. Even when a pathway exists, some bicyclists may ride on the road because they consider the road to be safer, more convenient, and better maintained. The 2010 Anchorage Bicycle plan states that "For years facility design has relied on separated multi-use trails for bicycle travel; however such bikeways have been found to increase conflicts. A study by International Transportation Engineers shows twice the crash risk for bicyclist on separated pathways then riding on the road."
- Winter Conditions – Pathways, especially those located near the curb, are sometimes used for temporary snow storage. The length of time the pathway is blocked, or difficult to traverse, can vary depending on the amount of snow. Having snow on the bicycle network also limits the ability to use this infrastructure during the winter.
- Safety – Similar to pedestrians, crashes between bicyclists and motor vehicles is a concern because the injuries associated with these are typically more severe than other types of crashes.
- Gaps in network – While improving, there are still gaps in the bicycle network of separated pathways, trails, and on-street facilities. Bicyclists, like other travelers, typically want a direct route to their destination. The greenbelt trails follow major creeks in Anchorage which provides few direct connections to many destinations. The Hillside and Chugiak\Eagle River areas tend to have more gaps than other areas.
- Do not meet existing standards/good practice for bicycle use – Many of the older bicycle facilities don't meet the existing standards or good practice for bicycle use. For example, standard bike lanes with no physical separation from road facilities are not welcoming for most of Anchorage's riding population. These facilities need to be updated.
- Lack of proper signage – Many bicycle facilities lack proper signage and some existing signage needs to be relocated to reflect better routes.
- Insufficient maintenance – Cracks in pathways, heaving from tree roots, grit, glass, and other debris all create poor conditions for bicyclists and can limit bicycle use.

For additional information, please see the [Anchorage Bicycle Plan](#)

5.4   Transit

The *Anchorage Talks Transit Report* identified the following problems and needs:

- Limited funding requires trade-off between ridership and coverage – Ridership and coverage goals often conflict with each other. Transit can provide more service in areas with higher transit usage or it can provide coverage to all parts of the MOA. However, it can't do both without increasing the cost to operate the transit system.
- Low frequency of service – Having a low frequency of service, such as buses only once an hour is problematic because it means buses are not there when people want to travel.
- Short span of service – Span of service refers to the hours when transit service is scheduled to operate. By having reduced hours at night and on weekends, transit is often not operating when people need it.
- Development not conducive to transit service – Areas with higher densities are spread throughout the city and are often not located on main roads. This makes it harder to provide efficient transit service.
- Circuitous routes – Many routes are circuitous which can provide more transit coverage but it increases travel time.
- Radial system – The transit system is focused on downtown meaning many transit users have to go downtown to transfer buses regardless of what their destination is.
- Duplication of service – As the number of ways to access the downtown area are limited, transit service is often duplicated on the roads leading downtown.
- Disconnected streets – Areas with few through streets present a challenge to providing transit service because it limits efficient routing, adds travel time, and can mean fewer people may be within walking distance to a transit stop.
- Intersections that don't support frequent transfers/unwelcome pedestrian environment – Many intersections, such a C Street and Tudor Road, have many traffic lanes, long walking distance between bus stops, and higher speed traffic making it uncomfortable and time consuming for some people to cross the intersection to transfer buses.
- Sidewalk maintenance – Transit riders use the sidewalk to access transit stops. When sidewalks are unusable or covered with snow (or nonexistent), people's ability to access transit stops is reduced.

Please note that many of these deficiencies are being addressed with the new transit system being implemented on October 23, 2017.

5.5   Freight

The following deficiencies have been identified in the freight system as part of the 2017 AMATS Freight Mobility Study:
- Roadway/intersection geometry issues – Several roads and intersections are not designed to accommodate 53 foot trailers. Other locations have issues such as insufficient turning radii, poor visibility, roadway medians limiting turning ability, etc. Areas of concern include the C Street/Ocean Dock Road intersection, Whitney Road, 3rd Avenue, the C Street/International Airport Road intersection, and the Tudor Road/Minnesota Drive intersection (see Figure 34).

Figure 34 AMATS Freight Movement Problem Areas
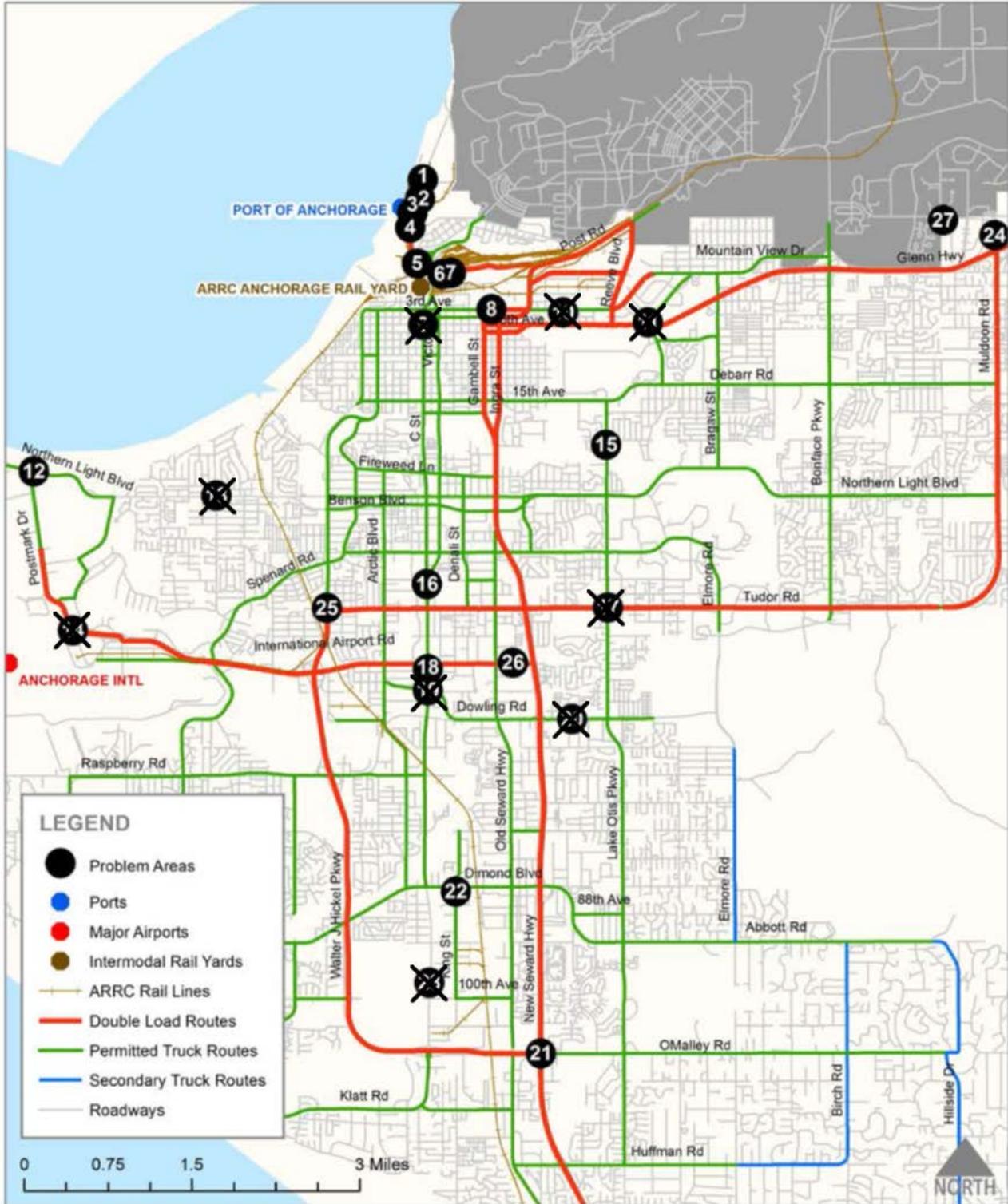
Freight Movement Problem Areas

Data: Shapefiles from Municipality of Anchorage/National Transportation Atlas Database

Note: Problem areas with an X over the number indicate the problem is resolved since 2009.

- Aging Port of Anchorage – The Port is 55 years old and needs to be updated and modernized to current maritime commerce standards, provide seismic resilience, and ensure a capability to parallel the region's expected population growth.
- Truck/Rail conflicts – Trucks going to/from the Port of Anchorage must cross the Alaska Railroad yard creating the potential for conflicts creating congestion and safety concerns.
- Need improved connections – The connections between the Ted Stevens Anchorage International Airport (TSAIA), Port of Anchorage (POA), and Alaska Railroad (ARRC) yard could be improved to support the safe and efficient movement of freight in the area.
- Dispersed freight generating land uses/land use compatibility – Commercial and industrial land is located throughout the region. These freight oriented land uses are not always located near TSAIA, POA, or ARRC which can increase the distance freight is transported in the region.
- Lack of redundancy – With their being limited access points to the Ted Stevens Anchorage International Airport, Port of Anchorage, Alaska Railroad yard, and between Anchorage and communities to the north and south, there is a lack on redundancy in the system that may cause significant delays if a route is unavailable for any length of time.

For additional information, please see the AMATS Freight Plan

Appendix A: Model Metrics

This appendix contains additional model metrics produced by the Anchorage Travel Model and the 2013, 2030 Baseline, and 2040 Baseline scenarios.

		Scenario		Change from 2013	
Households and Employment	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Entire Region					
Total HH	141,291	175,137	191,220	24.0%	35.3%
Total Population	374,081	456,065	496,012	21.9%	32.6%
Total Employment	229,779	269,712	292,742	17.4%	27.4%
MOA					
Total HH	108,341	127,255	135,083	17.5%	24.7%
Total Population	284,161	326,481	344,770	14.9%	21.3%
Total Employment	198,058	225,009	239,464	13.6%	20.9%

		Scenario		Change from 2013	
Auto Statistics	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
VMT	4,639,283	5,528,667	5,911,834	19.2%	27.4%
VHT	119,635	142,085	152,734	18.8%	27.7%
VHD	1,897	3,807	5,449	100.7%	187.2%
VHD (as percent of VHT)	1.59	2.68	3.57	69.0%	125.0%

		Scenario		Change from 2013	
Auto Statistics (per capita)	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
VMT	16.33	16.93	17.15	3.7%	5.0%
VHT	0.42	0.44	0.44	3.4%	5.2%
VHD	0.01	0.01	0.02	74.7%	136.7%
VMD	0.40	0.70	0.95	74.7%	136.7%

Total Centerline miles	1,378	1,386	1,386	0.6%	0.6%

		Scenario		Change from 2013	
VMT of LOS E by Facility Type	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Freeway\Expressway	0	157,268	100,019		
Major Arterial	25,760	52,928	75,780	105.5%	194.2%
Minor Arterial	1,004	6,591	18,000	556.5%	1692.8%
Other	408	3,654	6,127	795.6%	1401.7%

		Scenario		Change from 2013	
VMT of LOS F by Facility Type	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Freeway\Expressway	4,313	79,123	245,417	1734.5%	5590.2%

	2013	2030_EC	2040_EC	2030_EC	2040_EC
Major Arterial	20,672	50,657	75,760	145.1%	266.5%
Minor Arterial	8,894	13,732	17,718	54.4%	99.2%
Other	9,614	10,721	14,430	11.5%	50.1%

		Scenario		Change from 2013	
VHT of LOS E by Facility Type	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Freeway\Expressway	0	3,135	2,504		
Major Arterial	1,223	2,308	3,171	88.7%	159.3%
Minor Arterial	82	388	627	373.2%	664.6%
Other	57	151	232	164.9%	307.0%

		Scenario		Change from 2013	
VHT of LOS F by Facility Type	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Freeway\Expressway	147	1,980	5,889	1246.9%	3906.1%
Major Arterial	985	2,476	3,713	151.4%	277.0%
Minor Arterial	529	779	1,086	47.3%	105.3%
Other	833	1,016	1,231	22.0%	47.8%

		Scenario		Change from 2013	
VDT of LOS E by Facility Type	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Freeway\Expressway	0	553	313		
Major Arterial	93	166	234	78.5%	151.6%
Minor Arterial	7	34	37	385.7%	428.6%
Other	6	12	21	100.0%	250.0%

		Scenario		Change from 2013	
VDT of LOS F by Facility Type	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Freeway\Expressway	14	457	1,790	3164.3%	12685.7%
Major Arterial	100	276	420	176.0%	320.0%
Minor Arterial	49	84	121	71.4%	146.9%
Other	205	283	346	38.0%	68.8%

		Scenario		Change from 2013	
VMT by LOS	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
LOS A	3,828,191	4,189,905	4,117,038	9.4%	7.5%
LOS B	328,382	443,255	637,111	35.0%	94.0%
LOS C	261,692	241,969	349,898	-7.5%	33.7%
LOS D	150,353	278,865	254,536	85.5%	69.3%
LOS E	27,173	220,441	199,926	711.3%	635.8%
LOS F	43,493	154,233	353,325	254.6%	712.4%

		Scenario		Change from 2013	

Centerline Miles by LOS	2013	2030_EC	2040_EC	2030_EC	2040_EC
LOS A	1,272	1,230	1,198	-3.3%	-5.8%
LOS B	46	53	57	13.1%	22.8%
LOS C	30	33	48	11.8%	60.3%
LOS D (0.8-0.9 V/C)	19	32	30	67.4%	55.3%
LOS E (0.9-1.0 V/C)	4	22	20	525.7%	477.1%
LOS F (1.0 + V/C)	8	17	34	114.3%	339.0%
	1,378	1,386	1,386		

		Scenario		Change from 2013	
VHD for Key Facilities	2013	2030_EC	2040_EC	2030_EC	2040_EC
Tudor	217	270	337	24.4%	55.3%
Dimond_Abbott	50	60	72	20.0%	44.0%
Muldoon	41	70	93	70.7%	126.8%
Seward SB	49	32	45	-34.7%	-8.2%
Seward NB	70	57	76	-18.6%	8.6%
OMalley	10	15	20	50.0%	100.0%
MinnesotaDr SB	2	2	3	0.0%	50.0%
MinnesotaDr NB	4	5	6	25.0%	50.0%
Total					

		Scenario		Change from 2013	
Average time by Income	2013	2030_EC	2040_EC	2030_EC	2040_EC
Low Income Trips	7.2	7.2	7.2	0.1%	0.4%
All Trips	8.9	9.2	9.4	3.6%	5.1%

		Scenario		Change from 2013	
Average cost by Income	2013	2030_EC	2040_EC	2030_EC	2040_EC
Low Income	$0.74	$0.75	$0.75	1.4%	1.4%
All	$1.12	$1.17	$1.18	4.5%	5.4%

		Scenario		Change from 2013	
	2013	2030_EC	2040_EC	2030_EC	2040_EC
Total Transit Boardings	11,775	14,970	16,066	27.1%	36.4%
Total Transit Boarding per Capita	0.041	0.046	0.047	10.7%	12.5%

		Scenario		Change from 2013	
Transit Access	2013	2030_EC	2040_EC	2030_EC	2040_EC
Low Income HHs					
From 1 To 15 Min	0%	44%	43%		
From 16 To 30 Min	63%	37%	44%	-40.4%	-30.0%
From 31 To 60 Min	67%	20%	37%	-69.7%	-45.0%

60 Minutes +	0%	0%	20%		
All HHS					
From 1 To 15 Min	0%	28%	26%		
From 16 To 30 Min	50%	27%	28%	-45.1%	-43.8%
From 31 To 60 Min	55%	10%	27%	-81.1%	-51.8%
60 Minutes +	0%	0%	10%		
Employment					
From 1 To 15 Min	0%	60%	44%		
From 16 To 30 Min	77%	44%	59%	-43.5%	-23.7%
From 31 To 60 Min	77%	18%	43%	-76.6%	-44.7%
60 Minutes +	0%	0%	18%		

		Scenario		Change from 2013	
Trips By Mode (Region)	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
DRIVE ALONE	642937	788314	855731	22.6%	33.1%
SHARED-RIDE 2	309949	378869	409749	22.2%	32.2%
SHARED-RIDE 3+	277080	339194	366258	22.4%	32.2%
WALK	114764	139137	150895	21.2%	31.5%
BIKE	26804	31858	34145	18.9%	27.4%
WLKTRN	10482	12070	12995	15.1%	24.0%
PNRTRN	53	65	68	22.6%	28.3%
KNRTRN	370	432	455	16.8%	23.0%
SCHBUS	24036	28788	30654	19.8%	27.5%
TOTAL	1406475	1718727	1860950	22.2%	32.3%

		Scenario		Change from 2013	
Mode Shares (Region)	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
DRIVE ALONE	46%	46%	46%	0.3%	0.6%
SHARED-RIDE 2	22%	22%	22%	0.0%	-0.1%
SHARED-RIDE 3+	20%	20%	20%	0.2%	-0.1%
WALK	8%	8%	8%	-0.8%	-0.6%
BIKE	2%	2%	2%	-2.7%	-3.7%
WLKTRN	1%	1%	1%	-5.8%	-6.3%
PNRTRN	0%	0%	0%	0.4%	-3.0%
KNRTRN	0%	0%	0%	-4.5%	-7.1%
SCHBUS	2%	2%	2%	-2.0%	-3.6%
TOTAL	100%	100%	100%	0.0%	0.0%

		Scenario		Change from 2013	
Mode Shares (Region, Aggregate)	**2013**	**2030_EC**	**2040_EC**	**2030_EC**	**2040_EC**
Auto	89.2%	89.3%	89.3%	0.2%	0.2%
Non-Motorized	10.1%	9.9%	9.9%	-1.2%	-1.2%

Transit	0.8%	0.7%	0.7%	-5.7%	-6.3%

Trips By Mode (MOA)	2013	Scenario 2030_EC	2040_EC	Change from 2013 2030_EC	2040_EC
DRIVE ALONE	514607	597967	633752	16.2%	23.2%
SHARED-RIDE 2	239389	275356	291161	15.0%	21.6%
SHARED-RIDE 3+	210618	242290	256080	15.0%	21.6%
WALK	98295	114781	122461	16.8%	24.6%
BIKE	22160	24978	26243	12.7%	18.4%
WLKTRN	10246	11854	12760	15.7%	24.5%
PNRTRN	52	65	68	25.0%	30.8%
KNRTRN	368	432	454	17.4%	23.4%
SCHBUS	18252	20468	21622	12.1%	18.5%
TOTAL	1113987	1288191	1364601	15.6%	22.5%

Mode Shares (MOA)	2013	Scenario 2030_EC	2040_EC	Change from 2013 2030_EC	2040_EC
DRIVE ALONE	46%	46%	46%	0.5%	0.5%
SHARED-RIDE 2	21%	21%	21%	-0.5%	-0.7%
SHARED-RIDE 3+	19%	19%	19%	-0.5%	-0.7%
WALK	9%	9%	9%	1.0%	1.7%
BIKE	2%	2%	2%	-2.5%	-3.3%
WLKTRN	1%	1%	1%	0.0%	1.7%
PNRTRN	0%	0%	0%	8.1%	6.8%
KNRTRN	0%	0%	0%	1.5%	0.7%
SCHBUS	2%	2%	2%	-3.0%	-3.3%
TOTAL	100%	100%	100%	0.0%	0.0%

Mode Shares (MOA, Aggregate)	2013	Scenario 2030_EC	2040_EC	Change from 2013 2030_EC	2040_EC
Auto	88.2%	88.2%	88.1%	0.0%	-0.1%
Non-Motorized	10.8%	10.8%	10.9%	0.3%	0.8%
Transit	1.0%	1.0%	1.0%	0.1%	1.7%

Mode Shares (MOA, Aggregate 2)	2013	Scenario 2030_EC	2040_EC	Change from 2013 2030_EC	2040_EC
Drive Alone	46%	46%	46%	0.5%	0.5%
Shared 2	21%	21%	21%	-0.5%	-0.7%
Shared 3+	21%	20%	20%	-0.7%	-0.9%
Walk	9%	9%	9%	1.0%	1.7%
Bike	2%	2%	2%	-2.5%	-3.3%
Transit	1%	1%	1%	0.1%	1.7%