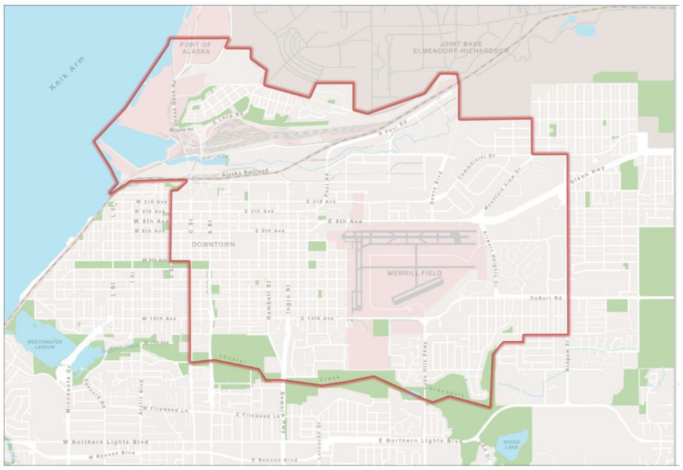

AMATS: Seward Highway to Glenn Highway Connection Planning & Environmental Linkage Study

State Project No.: CFHWY00550
Federal Project No.: 0001653

Draft Travel Demand Modeling Report

October 10, 2022

This planning document may be adopted in a subsequent environmental review process in accordance with 23 USC 168 Integration of Planning and Environmental Review and 23 CFR 450 Planning Assistance and Standards.

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by DOT&PF pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated November 3, 2017, and executed by FHWA and DOT&PF.

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1.0 Introduction and Model Overview

This document outlines the steps taken for the travel demand forecasting sub-task of the Seward Highway to Glenn Highway Connection Planning & Environmental Linkage Study project (SG PEL or “the project”). It also documents the findings from the 2019 baseyear and 2050 Nobuild scenario analyses.

RSG started with a version of the Anchorage Metropolitan Area Transportation Study (AMATS) Travel Demand Model used for the AMATS *2040 MTP* that had a 2013 base year. For the SG PEL study RSG updated and enhanced what is now the “SG PEL model” in the following ways:

- Updated the base year to 2019 using new socioeconomic, land-use, and network data for the entire modeled region. The land-use data originated from the planning and permitting departments of the Municipality of Anchorage (MOA) which includes the Chugiak-Eagle River (CER) area and the Matanuska-Susitna Borough (MSB or MatSu) and is thus consistent with those agencies’ adopted land use plans.
- Updated the model network to incorporate the actual intersection configuration (number of turn lanes by direction) for all model nodes (intersections) in the project area.
- Performed a passive location-based services (LBS) Origin-Destination Study and used it to calibrate the 2019 base-year model’s trip distribution and trip generation components.
- Developed future 2030, 2040, and 2050 socioeconomic projections (future population and employment) based on Alaska Department of Labor and Workforce Development (ADOL&WD) projections.
- Developed future-year "Existing plus Committed" (E+C) transportation networks to be used as the Nobuild baseline for comparison to build alternatives. These networks were derived from information in the AMATS *2040 MTP*.

As of this version of the document RSG completed estimating 2019 baseyear conditions and 2050 horizon year conditions in a “Nobuild” scenario based on the E+C network. A later version of this document will include discussion of forecasts for the various SG PEL alternatives analyzed.

This document describes the travel model and its limitations, the data used in updating it, the updates applied, and the forecasts findings.

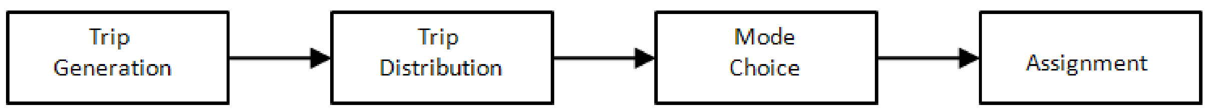
1.1 SG PEL Model Overview

The *2040 MTP* model upon which the SG Pel model is based was completed in 2016 and used a 2013 baseyear. That model was built on observed travel patterns from a household survey, transit on-board survey, and a Bluetooth origin-destination survey collected in a 2014 time frame. The *2040 MTP* model included (among many items) some features that make it particularly useful as the basis for the SG PEL model:

- Replacement of a 'gravity' trip distribution module with destination choice models to better reflect sensitivity of various travel modes to trip length and to better differentiate travel patterns for residents of the Anchorage Bowl versus residents of outlying areas of the region.
- A set of commercial vehicle models including a goods-movement (freight) model derived from location-based data for trucks plus a state-of-the-practice non-goods movement commercial vehicle model.

RSG updated the *2040 MTP* model as described in Chapter 2 to produce the SG PEL model. The rest of this chapter summarizes the SG PEL model structure and features. It is based on a four-step framework that includes trip generation, trip distribution, mode choice and vehicle assignment as shown in Figure 1.

FIGURE 1: SG PEL MODEL 4-STEP WORKFLOW

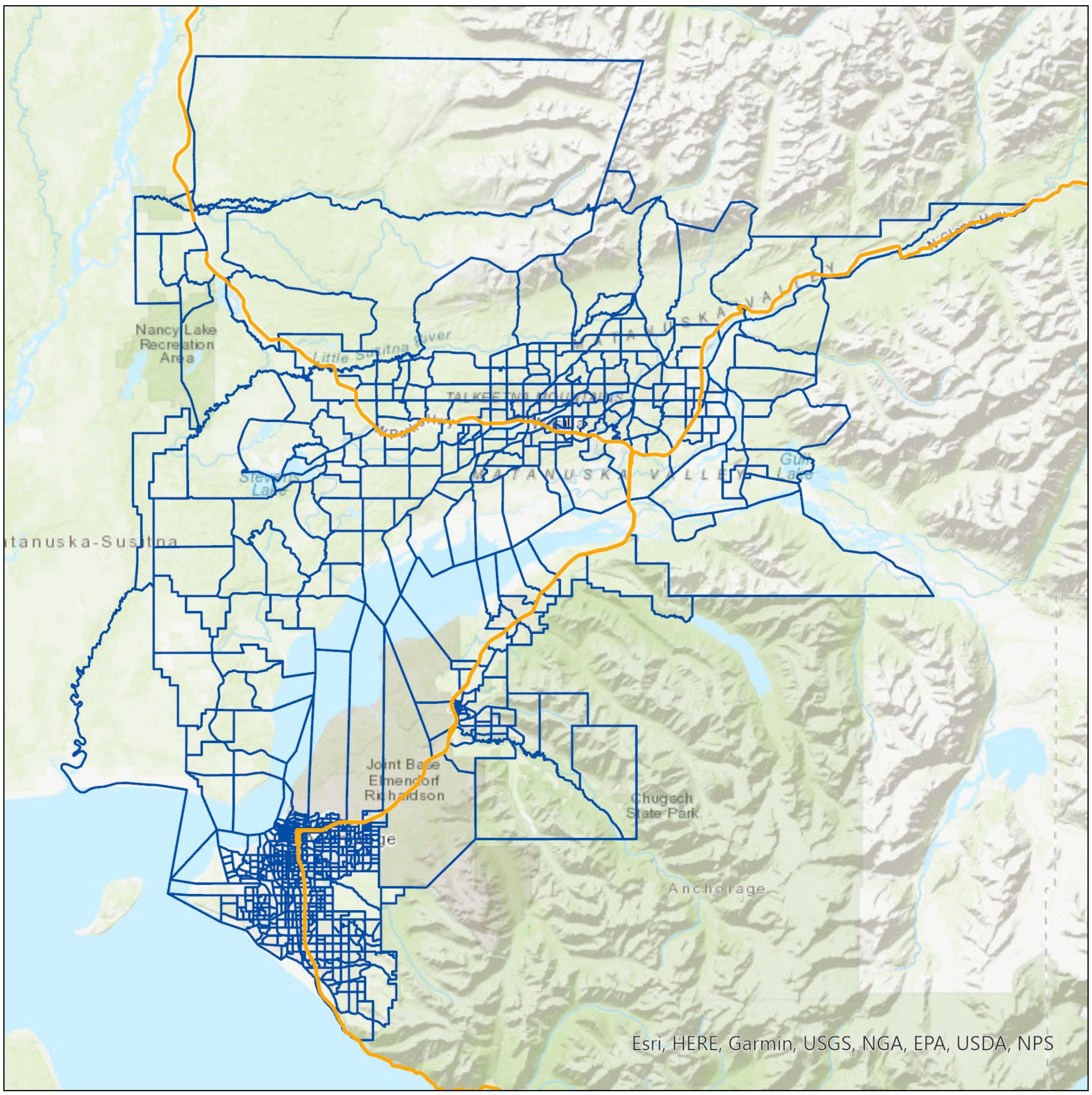


1.2 Model Geography

As shown in *Figure 2*, the SG PEL model currently encompasses the Anchorage Bowl, CER, and most of the MSB using Traffic Analysis Zones (TAZs, shown in blue in the figure) as the unit of geographic analysis. Three “external stations” handle travel in, out, or through the modeled region:

- Seward Highway south of Anchorage
- Glenn Highway to the northeast of the TAZ-enclosed area
- Parks Highway at the northwest corner of the TAZ-enclosed area

FIGURE 2: THE SG PEL MODEL REGION SHOWING TAZ BOUNDARIES



TRIP GENERATION

The trip generation step predicts the number of total daily home-based trip productions for each TAZ in the region. It also computes non-home-based trip productions by an innovative non-home-based travel submodel. Home-based productions use a cross-classification method that multiplies the number of households categorized by socio-economic variables by the trip rate for each household segment and trip purpose. Trip generation produces quantities of productions and attractions by purpose and by TAZ.

TRIP DISTRIBUTION

The trip distribution step predicts the destination choice of the trips estimated by the trip generation step. The SG PEL model computes the relative ease of travel across all modes combined with trip distance to create a holistic accessibility measure that informs destination choice for home-based trips. Non-home based (NHB) trips use a similar computation geographically based on the non-home trip end relative to all possible destinations. The general outcome is that potential destination TAZs with more modal options and closer to the trip origin will be more attractive, other things (e.g. attractions such as the number of jobs at the possible destinations) being equal.

The trip distribution step produces matrices of trips by purpose from origin TAZs to destination TAZs by time of day.

MODE CHOICE

The mode choice step predicts the mode for each trip based upon trip purpose, traveler characteristics, travel times and costs by mode, and land-use characteristics of the destination. The mode choice sub-model considers the following modes:

- Drive-alone
- Carpool transporting 2 persons (“Shared 2”)
- Carpool transporting 3 or more persons (“Shared 3+”)
- Walk
- Bike
- Walk-Transit (Walk access transit)
- PNR-Transit (Park and Ride access transit)
- KNR-Transit (Kiss and Ride or drop-off access transit)
- School bus (Home-Based School trips only)

The mode choice step produces matrices of trips by mode from origin to destination TAZ.

VEHICLE ASSIGNMENT

The assignment step turns the mode choice matrices into vehicle origin-destination matrices (the model does not assign walk and bike trips). For example, each drive-alone trip becomes one vehicle while the carpool trips require fewer vehicles. Transit trips are assigned based on the transit routes coded in the model while school buses are assigned based on the aggregate number and location of school enrollees in each TAZ. The model generates truck trips in a separate truck submodel. The truck submodel uses employment by category to generate truck trips and choose their destinations, then creates trip tables for both light (service vehicles) and heavy (goods-carrying) trucks. Assignment then simulates transportation system performance by placing all these vehicles in the transportation network. Finally, the four steps illustrated in Figure 1: SG PEL Model 4-Step Workflow iterate to ensure that the model finds a solution as optimal as possible for each traveler, given congestion in the system and other effects of the scenario under analysis.

The SG PEL model assigns trip tables by income for each mode type as shown in Table 1. The model estimates travel in three "typical weekday" time periods:

- AM Peak – 7 AM to 9 AM
- PM Peak – 3 PM to 6 PM
- Off-Peak – 6 PM to 7 AM plus 9 AM to 3 PM

Assignment uses generalized cost impedances accounting for both time and direct costs of travel to enable sensitivity to road pricing. The value-of-time (VOT) used for each person-based mode assumes a wage rate at one-half of the mid-point of each modeled income range; for trucks the VOTs are based on a national literature review performed for Oregon Department of Transportation (ODOT).[1] The data in the ODOT truck VOT review are based on more than a decade of publicly available national data and provide a reasonable basis for choosing truck VOT in cases where a local study is not available. Direct costs account for vehicle occupancy at 1/1.8 for *Shared 2* vehicles and 1/2.3 for *Shared 3+* vehicles.

[1] Commercial Travel (CT) section of the Oregon Transportation Land Use Modeling Integration Program. Oregon Department of Transportation. https://github.com/tlumip/tlumip/wiki/CT Accessed 6/30/21.

TABLE 1: MODE, VEHICLE CLASSES, VALUE OF TIME (VOT) INFORMING TRIP TABLES USED IN FORECASTS

Vehicle Class	VOT Bin	Link Exclusions	VOT ($/hour)
Drive-alone	Low VOT (income < $25k)	HOV2 and HOV3+ lanes	$ 3.11
Drive-alone	Medium-low VOT ($25k< income <$50k)	HOV2 and HOV3+ lanes	$ 7.88
Drive-alone	Medium-high VOT ($50k< income <$100k)	HOV2 and HOV3+ lanes	$ 15.38
Drive-alone	High VOT ($100k+)	HOV2 and HOV3+ lanes	$ 35.34
Shared 2	Low VOT (income < $25k)	HOV 3+ lanes	$ 3.11
Shared 2	Medium-low VOT ($25k< income <$50k)	HOV 3+ lanes	$ 7.88
Shared 2	Medium-high VOT ($50k< income <$100k)	HOV 3+ lanes	$ 15.38
Shared 2	High VOT ($100k+)	HOV 3+ lanes	$ 35.34
Shared 3+	Low VOT (income < $25k)	None	$ 3.11
Shared 3+	Medium-low VOT ($25k< income <$50k)	None	$ 7.88
Shared 3+	Medium-high VOT ($50k< income <$100k)	None	$ 15.38
Shared 3+	High VOT ($100k+)	None	$ 35.34
Light trucks	All (note: Light trucks are non-freight commercial vehicles regardless of size)	None	$ 25.00
Heavy trucks	All (note: Heavy trucks are freight-moving commercial vehicles regardless of size)	None	$ 36.00

The final output of the assignment step is a database of network link volumes by time period and by vehicle class for all network links. The assignments can be visualized using the spatial representation of the network in the model software itself or other geospatial software.

1.3 Model Limitations

Project stakeholders should be aware that the SG PEL model has certain limitations.

The traffic assignment model uses aggregate, static methods meaning that it assigns all flows simultaneously within each time period. The model thus does not explicitly represent vehicle queuing and spillbacks. While the model was carefully validated as described below in Chapter 3.0, caution should be used in interpreting any individual link (road segment) or node (intersection) data since the SG PEL travel forecast model is a regional demand model without fine network detail, unlike a microsimulation model. Individual data points should be thought of as a probable estimate within a range of uncertainty.

The current version of the model can impute (infer) intersection characteristics (number of turn lanes by direction) and signal timing (cycle length and green-time-per-cycle ratio by approach) from facility type and number of lanes at each intersection. This eliminates the need to manually update the model with intersection detail. In addition to mid-block capacity, the model can explicitly represent intersection control type and the presence of turn lanes. For the SG PEL forecasts, RSG explicitly coded intersection data for links and nodes within the project area so the model will be sensitive to intersection signal type and turn lane presence in the project alternatives. The RSG team retained intersection characteristic imputation for the geography outside the project area. Stakeholders should also note that even with this additional sensitivity to intersection design features, the model is not micro-simulating the alternatives so care should be taken in evaluating detailed model findings.

The model does not consider Transportation Network Companies (TNC) or mobility as a service (MaaS) such as Uber, Lyft, bicycle sharing, scooter sharing, and so forth. The 2019 base year recalibration ensured that overall volume and flow estimates will be robust, but any project treatment of TNC and MaaS effects will need to be done outside the model.

The model does not forecast pollutant emissions. It also does not represent safety improvements, sidewalks, bicycle lanes, pedestrian crossings, and non-capacity enhancements or policies. Impacts of such improvements will need to be assessed with tools other than the model, although model outputs such as vehicle volumes can be helpful to such assessments.

Finally, the model does not currently explicitly estimate what portion of workers will telework on a given day. However, if stakeholders wish to know the potential effects of increasing telework, the SG PEL study could choose to take a scenario planning approach during the alternatives development step of the process by asserting and testing different levels of work-from-home.

1.4 How to Read this Report

Each model forecast estimates the transport system performance for one alternative (scenario) for one forecast year. The SG PEL travel model creates a wealth of data packaged in standard reports summarizing results for each forecast and in many detailed output files containing the raw data. In addition to the 2019 baseyear forecast, given the expected scope of the planning process the SG PEL study will likely produce several 2050 forecasts (including Nobuild, preliminary alternatives, and final alternatives). The preferred alternative will also include forecasts for years 2030 and 2040. Given the immense amount of resulting data, the project team worked to select model outputs most relevant to the study:

- System performance summary statistics in the Anchorage Bowl area of Vehicle Miles Traveled (VMT), Vehicle Hours Traveled (VHT), Vehicle Hours of Delay (VHD) in general and for selected key roads, plus selected map representations of these data.
- Roadway Volume-over-Capacity (VOC) categorized by Level-of-Service (LOS) summary statistics and maps for the Anchorage Bowl and project area.
- Vehicle volume summaries by screenline, and selected maps of vehicle volumes by road segment.

Chapters 4.0 and 5.0 describe these findings for the 2019 baseyear and the 2050 Nobuild alternative.

2.0 Data Collection & Model Preparation

The consultant team, with help from Alaska Department of Transportation and Public Facilities (ADOT&PF), MOA, MSB, and ADOL&WD, updated the travel model base year and future year assumptions. This chapter describes those data-driven updates.

2.1 Traffic and Transit Data

RSG updated the base year to 2019 for this project to avoid the need to make any adjustments regarding COVID-19 impacts.

RSG contacted all relevant jurisdictions, including ADOT&PF, MOA, and MSB for available traffic counts in 2019 and prior years, corresponding geographic files with count station coordinates within the region, and adjustment factors.

RSG obtained 2019 ridership data from the MOA Public Transportation Department.

2.2 Origin-Destination Study

RSG used ‘big data’ based techniques via the firm’s rMerge product line to perform an Origin-Destination Study (ODS) to illustrate baseyear travel patterns in support of the study. The ODS is based on fall 2019 observed location data purchased from a third-party vendor. The origin-destination matrices from the ODS directly informed calibration and validation of the model’s trip generation, trip distribution, and trip length distribution elements. See the *Seward Highway to Glenn Highway Connection Planning & Environmental Linkage Study Origin-Destination Survey Report* for more detail on the ODS.

2.3 Socioeconomic Data

Updating the travel model to 2019 required updating socio-economic input data (“SE data”) including households, population, and employment for 2019 to correspond with the updated traffic counts. This process required reviewing and adjusting existing future-year SE data for forecast years 2030 and 2040, and extrapolating 2050 SE data from those existing projections. The 2019, 2030, 2040, and 2050 SE Data are stored as attributes in the model’s TAZ database and in separate files.

Census and ADOL&WD data was clipped to the model geography (the area enclosed by TAZs does not encompass the entire MSB and excludes the Girdwood part of the MOA) and used to establish regional and borough level control totals. American Community Survey (ACS) 5-year (2014-2019) census estimates at the block group level for MOA and MSB were used to create households and household population control totals for 2019. ADOL&WD projections were used to create households and household population control totals for 2030 and 2040. ADOL&WD 2020 through 2024 projections were used to linearly extrapolate the control totals for 2050. Figure 3 and Figure 4 show the household and household population control totals across the base and future forecast years. Note that the region also contains population housed in group quarters; see further below for information on total population.

FIGURE 3: REGIONAL AND BOROUGH-LEVEL HOUSEHOLDS CONTROL DATA

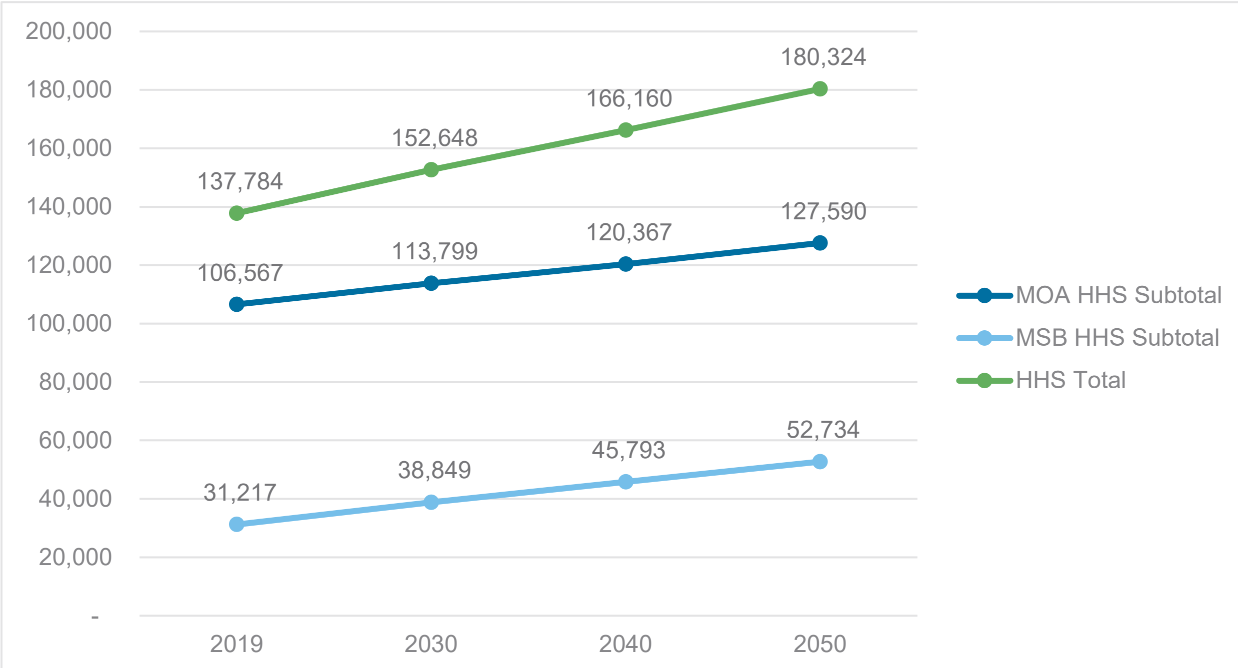
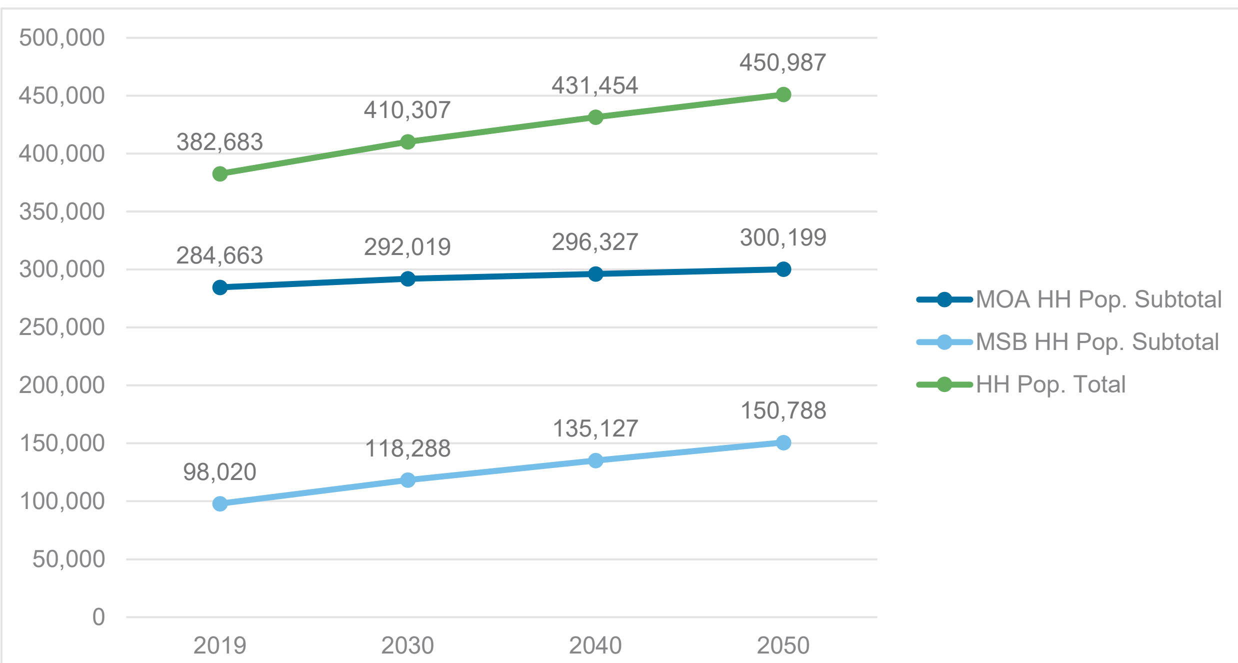


FIGURE 4: REGIONAL AND BOROUGH-LEVEL HOUSEHOLD POPULATION CONTROL DATA



HOUSEHOLD AND POPULATION ESTIMATES AND GEOGRAPHIC ALLOCATION

To estimate the number of households added from 2014 to 2019, MOA building permit data and MSB assessor data was used. The data was sub-setted to only include residential permits issued between 2014 and 2019. The permit data were summarized by parcel ID to get the total number of new units for each parcel. The parcels were then tagged with the underlying TAZ ID and aggregated at the TAZ level to estimate the total number of new residential buildings built within each TAZ. The new households were added to the 2013 household numbers to create the 2019 estimated number of households. The same process was applied to the MSB assessor data then combined with the MOA data. The permit or assessor parcel locations were used to spatially locate the new households in appropriate TAZs. Using the permit data to locate the new households reflects the provisions of the *Anchorage 2040 Land Use Plan* by inference under the assumption that all permits issued were compliant with that plan.

The 2019 estimated number of households were distributed by household size (1 person HHS, 2 person HHS, 3 person HHS and 4+ person HHS) using the ACS 2019 household size percentage bins (ACS HHS 1-7). Household population was estimated by multiplying the number of households in each size bin by the number of persons then added together. An iterative household rebalancing algorithm was applied to the household size bins to move households from the larger size bins into the smaller size bins to balance the distribution of households so that the resulting population was within 2.5% of the 2019 Alaska Department of Labor and Workforce Development (ADOL&WD) population control totals (after the latter were filtered to the TAZ geography).

In summary, the 2019 baseyear households started with the 2013 model household data, added new households later than 2013, which were identified and located using building permit and assessor data, and then distributed them into size bins using ADOL&WD 2019 population estimates as a control total.[2]

The travel model also takes group quarters (GQ) populations (e.g. those living in assisted care facilities) into account. The 2019 GQ population was estimated by using the 2013 spatial distribution by TAZ of GQ population to allocate the 2019 GQ control totals from ADOL&WD[3] then netting out prison inmates from the region's various correctional centers.

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[2] Alaska Department of Labor and Workforce Development-- Research and Analysis Section. *Alaska Population Projections: 2019 to 2045*. Published April 2020.

[3] Ibid.

FUTURE HOUSEHOLD AND POPULATION ESTIMATES

RSG estimated household and household population forecasts for model future years 2030, 2040 and 2050 using historical Census data for years 2000-2019 and ADOL&WD population projections filtered to the area enclosed by the model's TAZs.[4] Block group level household data were summarized by ACS household size bins (1 to 7 person households) for each year and growth rates were calculated for each size bin based on the historic ADOL&WD population estimates. The growth rates were applied to 2019 households to grow them from 2019 to 2030, 2019 to 2040 and 2019 to 2050 at the TAZ level. Since the model uses only four household size categories, after growing households in the ACS size bins an aggregate four-plus person growth rate was calculated. Table 2 shows the final growth rates.

TABLE 2: CENSUS-DERIVED HOUSEHOLD COUNT GROWTH RATES BY HOUSEHOLD SIZE

	Growth Rates	
Period 2000-2019	**MOA**	**MSB**
Total HHS	0.62%	2.22%
HHS 1	1.25%	2.84%
HHS 2	0.82%	2.91%
HHS 3	0.33%	1.52%
HHS 4	*0.53%*	*2.04%*
HHS 5	*0.31%*	*3.25%*
HHS 6	*0.15%*	*3.82%*
HHS 7	*1.81%*	*5.47%*
HHS 4 and more	0.07%	1.35%

Household population was balanced in each forecast year by multiplying total households by household size bin, then applying an iterative household rebalancing algorithm to move households from household size bins 3-4 to 1-2 to adjust household population and align the resulting household population estimates as tightly as possible to the ADOL&WD population control totals. An exact match is impossible to achieve since the household distribution and population projections come from different sources, but a very good fit was obtained--within 0.3% on regional population and within 1.5% on regional total households, with slightly higher control-to-estimated differences by borough as shown in the figures below.

Since the ADOL&WD projections only go out to 2045, the 2050 results are a linear extrapolation of the ADOL&WD 2019-to-2045 projections.

[4] Ibid

FIGURE 5: FINAL FORECASTED HOUSEHOLDS VS. GROWTH-RATE-BASED HOUSEHOLD CONTROL TOTALS BY BOROUGH

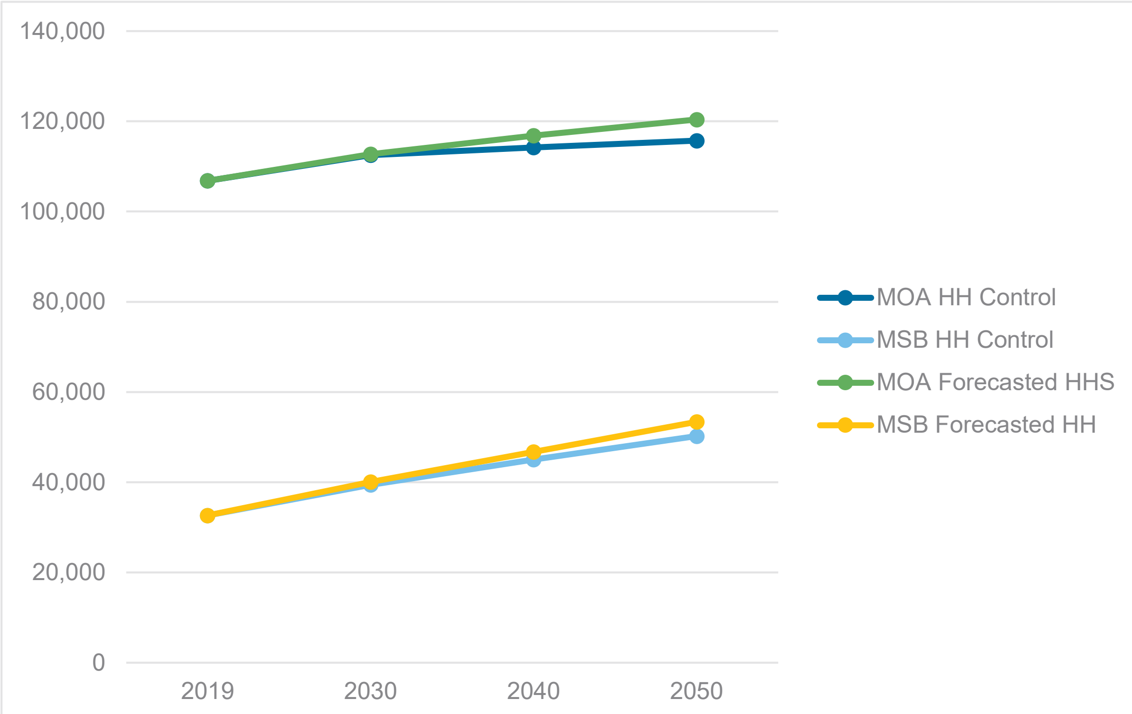
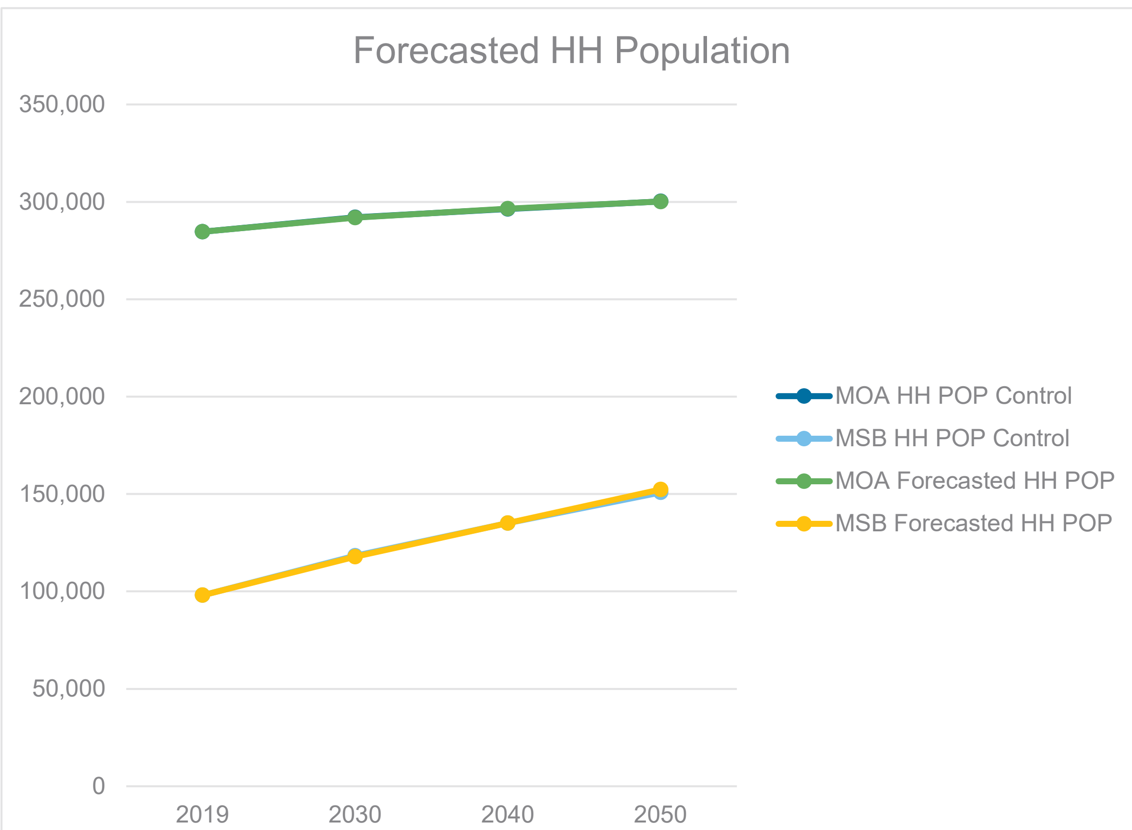


FIGURE 6: FINAL FORECASTED POPULATION VS. ADOL&WD CONTROL TOTALS BY BOROUGH



EMPLOYMENT ESTIMATES

For the 2013 model, the development of 2013 employment data by TAZ used detailed information regarding the location, number of employees, and employment category of each employee in the Anchorage Bowl and CER. For detailed information on this process see the *Socio-economic Projections and Land Use Allocation Report*[5] created for the previous model update.

For the SG PEL update to a 2019 base year, RSG used building permit and assessor data to spatially allocate new, post-2013 jobs to appropriate zones, plus ADOL&WD estimates based on employment data supplemented with Bureau of Economic Analysis (BEA) data to understand the number of self-employed persons who do not appear in the ADOL&WD estimates. Similar to the population data, in summary the ADOL&WD estimates (with the addition of self-employment from BEA data) set the amount of 2019 employment while the permit and assessor data provided location information for where new job locations appeared in the region.

To update the 2019 base year employment at the TAZ level, Computer Assisted Mass Appraisal (CAMA) data for MOA and assessor data for MSB was used. Filters were applied to the source data file, keeping only records where year built was between 2014-2019 and keeping only records where the building area was greater than zero. Next any commercial records with residential related land uses were dropped for example, "Apartment - Garden 1-3 Levels", "Apartment - High Rise 4+ Levels", "Condominium. The permit data was then tagged to a parcel ID.

Next the building permit use type was matched to the model employment categories. Since the assessor and permit data did not consistently include new square footage, commercial building square footage was estimated from assessed value using $100/sqft for retail space, $165/sqft for office space, and $200/sqft for restaurant/hospitality space.[6] The new building value was divided by that figure to estimate the total building square footage, which was then multiplied by the appropriate employment factor in Table 3 to estimate the number of new jobs (the factors were the same as used in the *2040 MTP* model). The parcels were then tagged with the TAZ ID of the zone in which the parcel fell and total new employment was aggregated to the TAZ level.

[5] Ibid.
[6] eSub: Commercial Construction Costs Per Square Foot 2019. 2019. Accessed 11/15/21 at: Commercial Construction Costs Per Square Foot 2019 || eSUB

TABLE 3: EMPLOYMENT CATEGORY EMPLOYMENT FACTOR

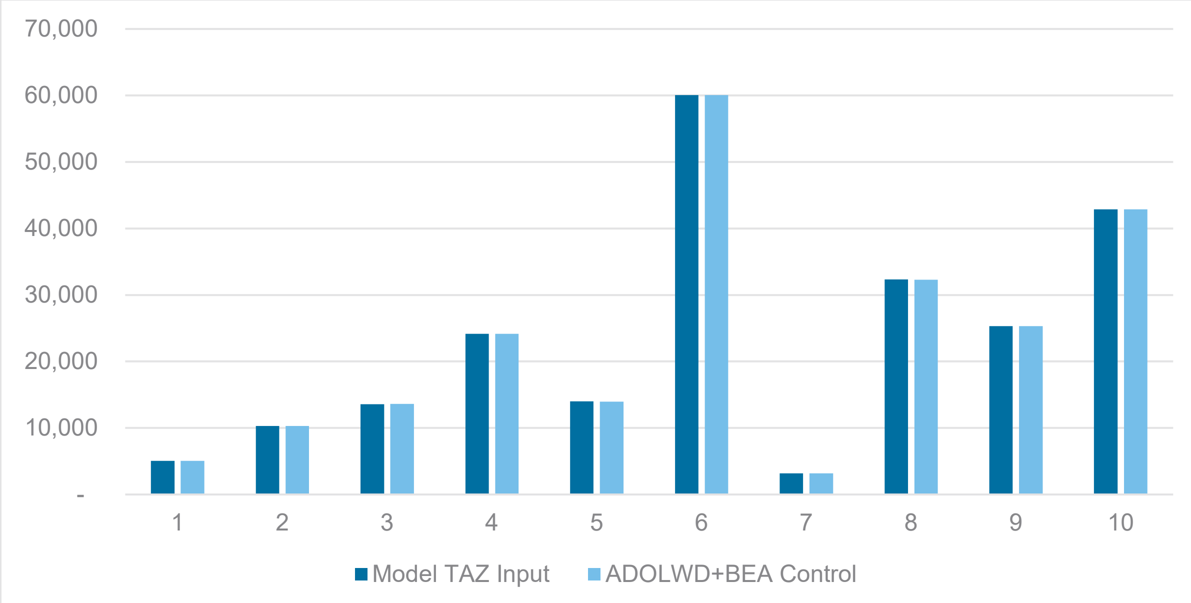
Emp_Cat	Emp_Factor	Model Category
1	1	Cat 1
2	2	Cat 2
3	1	Cat 3
4	1.8	Cat 4
5	1	Cat 5
6	3.4	Cat 6
7	3.3	Cat 7
8	4.8	Cat 8
9	7.5	Cat 9
10	3.3	Cat 10

Finally, self-employed and sole proprietor jobs were derived from the BEA data[7] using the difference between total BEA employment and total ADOL&WD employment as the target, allocated to categories using the BEA proportions by category, and spatially allocated to each TAZ proportionally to the allocation of the covered employment by TAZ. This required some final rebalancing to account for the fact that only whole jobs are allocated. At the conclusion of the balancing process subtotal employment by sector in the TAZ data matched the ADOL&WD- and BEA-derived control totals within plus or minus 0.1% as shown by the chart in Figure 7, which also illustrates the proportion of employment within the model geography by the following ten model employment categories:

- Cat 1: Natural Resources Employment (NAICS 11 & 21)
- Cat 2: Wholesale Trade, Manufacturing and Utilities Employment (NAICS 22,31,32,33,42)
- Cat 3: Construction Employment (NAICS 23)
- Cat 4: Retail Trade Employment (NAICS 44 & 45)
- Cat 5: Transportation & Warehousing Employment (NAICS 48 & 49)
- Cat 6: FIRE, Professional Services and Other Employment (NAICS 51-56 & 81)
- Cat 7: Educational Services Employment (NAICS 61)
- Cat 8: Health Care & Social Assistance Employment (NAICS 62)
- Cat 9: Accommodation, Food Services, & Entertainment Employment (NAICS 71 & 72)
- Cat 10: Government Employment (NAICS 92)

[7] Bureau of Economic Analysis Data Table CAEMP25N: Total Full-Time and Part-Time Employment by NAICS Industry (accessed for years 2013-2019).

FIGURE 7: 2019 BASEYEAR EMPLOYMENT INPUTS VS. CONTROL TOTALS



EMPLOYMENT FORECAST ESTIMATES

To forecast future employment, RSG used ADOL&WD ten-year employment projections as the starting point.[8] The labor categories in the ADOL&WD data (in the North American Industrial Classification system or NAICS) were allocated to the ten travel model categories described above and summarized by category. Annual growth rates were derived from the ADOL&WD projections and applied to the 2019 base year employment by category to produce 2030, 2040, and 2050 future employment projections for the SG PEL travel forecasting. Since the ADOL&WD projections are for the entire Anchorage Metropolitan Statistical Area, the derived growth rates were applied evenly across the entire model geography including MSB. Finally, the subtotal controls by future year were allocated to TAZs using the 2019 baseyear proportions by category. In essence, then, the SG PEL 2030, 2040, and 2050 employment inputs are linear extrapolations by each of the ten model employment categories of the ADOL&WD 2018-to-2028 projections.

SPECIAL GENERATOR ESTIMATES AND PROJECTIONS

The SG PEL travel model takes explicit inputs of K-12 public school enrollment (SENROLL), college and university student enrollment (COLLENROLL), K-12 private school enrollment (PSENROLL), and commercial aviation passengers enplaning and deplaning at the Ted Stevens airport (DENPLANEMENTS) given the unique travel characteristics of these market segments. Baseyear data were obtained for the public K-12 from the Alaska Department of Education and Early Development[9], from specific colleges where available and from publicly

[8] Official publication: *10-year industry projections (2018-2028)*. Alaska Department of Labor and Workforce Development, Research and Analytics branch. Data available at https://live.laborstats.alaska.gov/indfcst/index.html as an Excel download, accessed 12/8/2021.
[9] Alaska Department of Education and Early Development. *School Enrollment by Grade as of October 1, 2019*. https://education.alaska.gov/data-center. Accessed 8/12/21

available summary college sources where needed.[10] Baseyear air passenger data came from the Federal Aviation Administration's Air Carrier Activity Information System (ACAIS).[11]

Baseyear data were projected to 2030, 2040, and 2050 using population growth by borough (different rates for MOA and MSB) to establish growth rates for school enrollment and regionwide population growth for air passenger change.

SE DATA SUMMARY AND HISTORICAL CONTEXT

The final SE data encoded in the TAZ inputs to the SG PEL model estimates a total of 173,806 households in 2050 within the modeled geography, a regionwide 25% increase from 139,478 in 2019 (consistent with the population increase of about 18% given the long-term trend of declining household size). Total employment was estimated to be almost 273,000 in 2050, up from 230,861 in 2019 for an 18% increase. It is important to look at the MOA details in the bottom part of Table 4 and Figure 8, though: estimated MOA households are predicted to grow by only 13% from 2019 to 2050 given Anchorage's different land use characteristics from the faster-growing MSB. Indeed, the relative balance of growth in Anchorage Bowl is important for SG PEL stakeholders to understand given the future-year forecast findings in Chapter 5 below. The relative location of the forecast household growth appears as percentage change by TAZ from 2019 to 2050 in Figure 9, illustrating quite clearly in geographic terms the high relative growth in MSB vs MOA quantified in the growth trajectories documented in Table 4 and Figure 8.

[10] National Center for Education Statistics. https://nces.ed.gov/

[11] Federal Aviation Administration. *Commercial Service Airports (Rank Order) based on Calendar Year 2019—Final.* Accessed at https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/ on 8/16/2021

TABLE 4: TAZ INPUT SOCIO-ECONOMIC DATA SUMMARY (REGIONAL TOTALS AND MOA ONLY)

Modeled Region	2019	2030	2040	2050	2050-2019
TOTPOP	390,372	418,303	440,455	461,677	18%
GQPOP	7,689	8,582	8,860	9,164	19%
HHPOP	382,683	409,721	431,595	452,513	18.2%
TOTALHH	139,478	152,760	163,510	173,806	25%
AVHHS-Region	2.74	2.68	2.64	2.60	-5%
AVINC					
SENROLL	65,388	70,054	71,497	72,974	12%
COLLENROLL	22,069	23,358	23,844	24,333	10%
Cat 1	5,046	5,691	6,352	7,091	41%
Cat 2	10,300	10,926	11,529	12,165	18%
Cat 3	13,595	14,650	15,683	16,790	23%
Cat 4	24,155	25,063	25,919	26,804	11%
Cat 5	13,995	14,473	14,923	15,387	10%
Cat 6	60,076	65,040	69,925	75,177	25%
Cat 7	3,158	3,154	3,150	3,146	0%
Cat 8	32,328	36,123	39,978	44,244	37%
Cat 9	25,327	27,785	30,236	32,904	30%
Cat 10	42,881	41,546	40,370	39,227	-9%
TOTEMP	230,861	244,449	258,065	272,934	18.2%
PSENROLL	3,493	3,691	3,767	3,844	10%
DENPLANEMENTS	6,572	6,996	7,406	7,840	19%
MOA Only					
TOTPOP	291,750	299,739	304,587	308,366	6%
GQPOP-MOA	7,087	7,866	8,027	8,192	16%
MOA-HHPOP	284,663	291,873	296,560	300,174	5%
TOTALHH	106,821	112,725	116,805	120,410	13%
AVHHS-MOA	2.66	2.59	2.54	2.49	-6%
AVINC					
SENROLL-MOA	45,758	46,799	47,762	48,749	7%
COLLENROLL-MOA	17,200	17,590	17,957	18,324	7%
Cat 1	4,632	5,224	5,831	6,509	41%
Cat 2	9,457	10,031	10,585	11,170	18%
Cat 3	10,460	11,272	12,067	12,918	23%
Cat 4	19,821	20,566	21,268	21,995	11%
Cat 5	12,858	13,297	13,711	14,136	10%
Cat 6	54,242	58,724	63,135	67,877	25%
Cat 7	2,479	2,476	2,473	2,470	0%
Cat 8	27,509	30,738	34,019	37,649	37%
Cat 9	21,307	23,375	25,437	27,681	30%
Cat 10	36,304	35,174	34,178	33,210	-9%
TOTEMP	199,069	210,876	222,703	235,615	18%
PSENROLL-MOA	2763	2826	2884	2944	7%
DENPLANEMENTS	6572	6996	7406	7840	19%

FIGURE 8: TAZ SOCIO-ECONOMIC DATA BY FORECAST YEAR

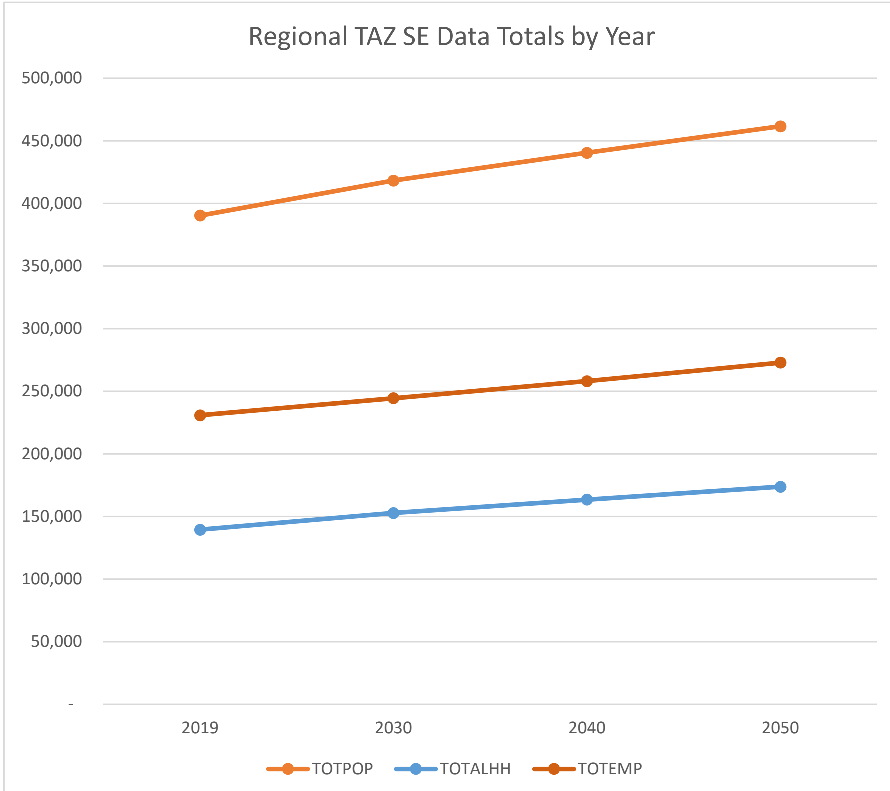
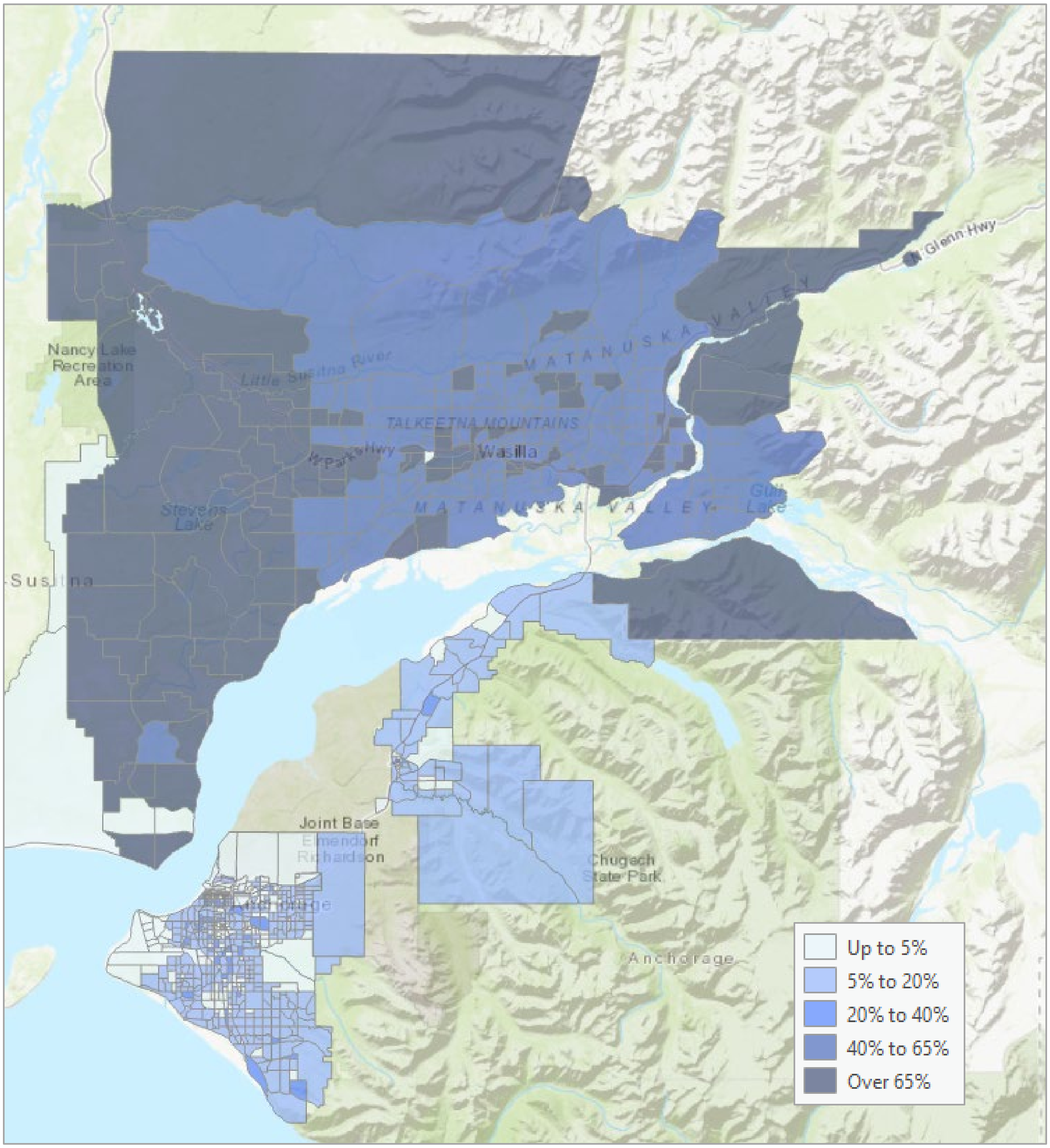
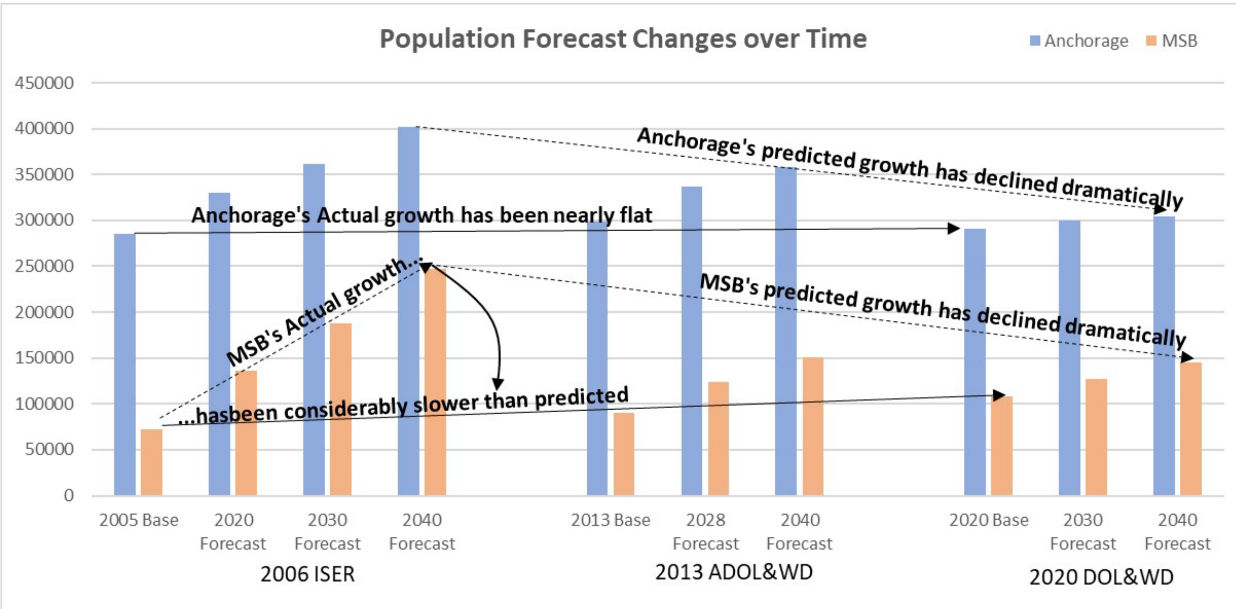


FIGURE 9: PROJECTED POPULATION GROWTH IN PERCENT BY TAZ FROM 2019 TO 2050



Before readers proceed to the portions of this report describing forecast findings it is very important to note how the socio-economic projections described above compare to historic forecasts used in AMATS planning and other transportation studies in the Anchorage region. Figure 10 illustrates the marked decrease in future-year population as the forecasters changed their projections over time. The figure compares a forecast made in 2006 by the Institute for Socio-Economic Research (ISER) and a forecast prepared in 2013 by ADOL&WD to the 2020 forecast by ADOL&WD used as the basis for the SG PEL travel model socio-economic projections. Compared to previous studies readers should expect very different future transport system performance findings given the dramatically lower population forecasts since system utilization is highly correlated with population. Note especially the relatively flat population growth in Anchorage, a phenomenon also visible in Figure 6 above.

FIGURE 10: POPULATION FORECAST USED FOR SG PEL COMPARED TO PREVIOUS POPULATION FORECASTS



2.4 Update Model Networks

BASE YEAR NETWORK UPDATES

RSG used the AMATS 2013 Base network as a starting point along with aerial imagery in updating the SG PEL network to 2019 conditions. RSG referred to the AMATS MTP 2040 documentation to add the existing plus committed projects by 2018 (Table 5-4 List of Existing Plus Committed Projects).[12] This list of projects includes those constructed since 2013 per consultation with AMATS staff and the *2040 MTP*. During the coding process, RSG used aerial imagery to verify that each of these projects existed by or before 2019. Each project found in the table below was coded into the SG PEL base network.

[12] Anchorage Metropolitan Area Transportation Study. *MTP 2040*. Available at https://www.muni.org/Departments/OCPD/Planning/AMATS/Pages/1_MTP.aspx. Accessed 9/22/21.

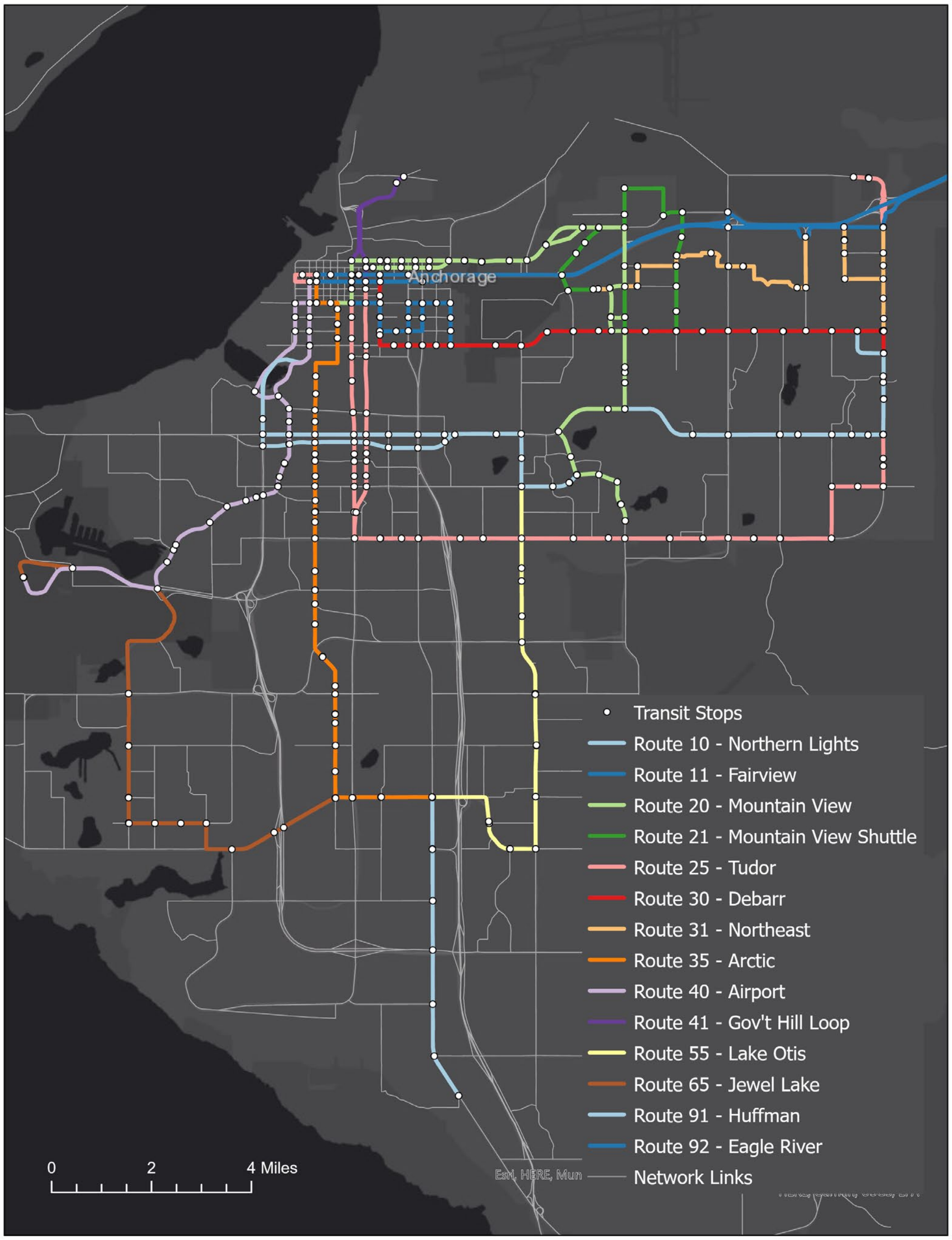
TABLE 5: 2019 BASE NETWORK UPDATES BASED ON 2040 MTP E+C

Project Name	From	To	Description
Dowling Road Extension	Minnesota Drive	Old Seward Highway	No changes made, already existed in 2013 network.
Glenn Highway - NB Lane	Hiland Road	Artillery Road	Added 1 lane to the NB direction, 3 total.
92nd Avenue	Seward Highway	Old Seward Highway	No changes made, already existed in 2013 network.
Arctic Boulevard Reconstruction	36th Avenue	Tudor Avenue	No changes made, already existed in 2013 network.
36th Avenue - Arctic Boulevard to C Street 5-lane conversion	Arctic Boulevard	C Street	No changes made, already existed in 2013 network.
O'Malley Road Reconstruction	Seward Highway	Lake Otis Parkway	No changes made, already existed in 2013 network.
Seward Highway	Dimond Boulevard	Dowling Road	Added 1 lane in each direction, total 3 lanes each direction.
100th Avenue Extension	Minnesota Drive	C Street	Update model links to 1 lane in each direction and added center turn lane.
Glenn Highway & Muldoon Road Interchange			Realigned from half-clover to diverging diamond
Jewel Lake Road	88th Avenue	Strawberry Road	Added center left turn lane.
Abbott Road	Lake Otis Parkway	Jupiter Drive	Added center left turn lane.

Abbott Road	Jupiter Drive	Birch Road	Added center left turn lane.
Glenn Highway - SB Lane	Hiland Road	Artillery Road	Added 1 lane to the SB direction, 3 total.
Klatt Road & Johns			Coded network node as roundabout.
Bogard Road East Extension	49th Avenue	Arabian Street	Added new links to network, coded with 1 lane in each direction.
Fern Street Connection to Edlund	Fern Street	Edlund Road	Added new links to network, coded with 1 lane in each direction.
Seldon Road & Lucille Street Roundabout			Coded network node as roundabout.
Seldon Road	Church Road	Beverly Lake Road	Added new links to network, coded with 1 lane in each direction.
Trunk Road Improvements	George Parks Highway	Bogard Road	Added 1 lane in each direction, total 2 lanes each direction.
Trunk Road Extension South	George Parks Highway	Nelson Road	Added new links to network, coded with 2 lanes in each direction.
Glenn Highway MP 34-42 Reconstruction	George Parks Highway	Arctic Street	Added 1 lane in each direction, total 2 lanes each direction.
Knik-Goose Bay Road	Vine Road	Settlers Bay	Outside of model network. Nothing done.
Parks Highway MP 43.5-48.3	Church Road	Pittman Road	Added 1 lane in each direction, total 2 lanes each direction.

In addition to updating the network links and network nodes, the transit routes were also updated for 2019. To update the transit route system for the model, the Municipality of Anchorage website was used to access the People Mover transit system routes and stops information. Each route was coded separately as inbound and outbound to run on top of the model link network. Stops were added to each route and coded by route number. The overall transit route system coded in the model can be found in Figure 11.

FIGURE 11: 2019 TRANSIT ROUTE SYSTEM



The SG PEL model is a regional demand model and its final roadway network includes the most important road facilities but not every road in the area, as shown in Figure 12 and Figure 13 of the project area and the Anchorage Bowl respectively.

FIGURE 12: PROJECT AREA (RED) AND EXISTING MODEL NETWORK (BLUE)

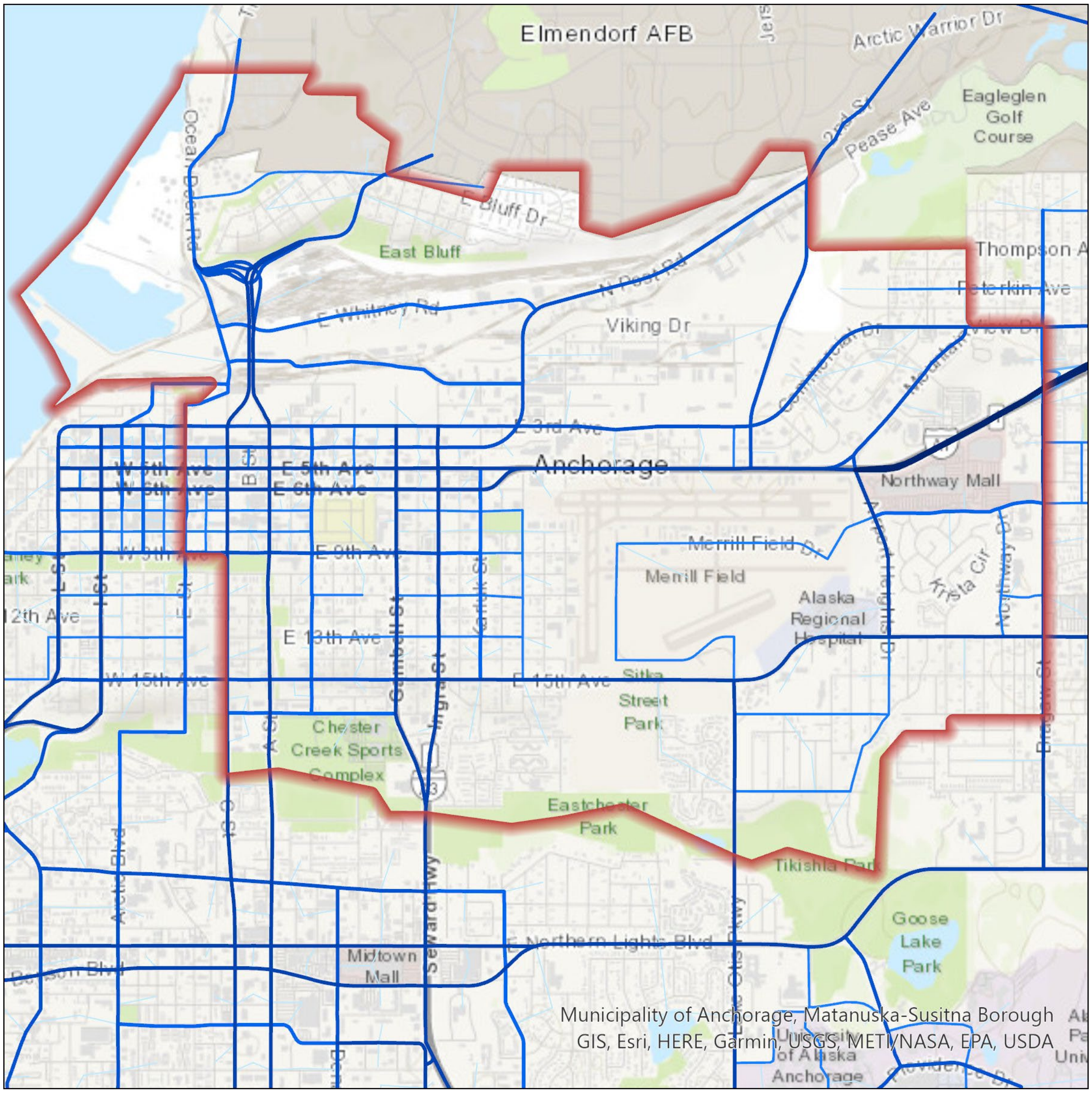
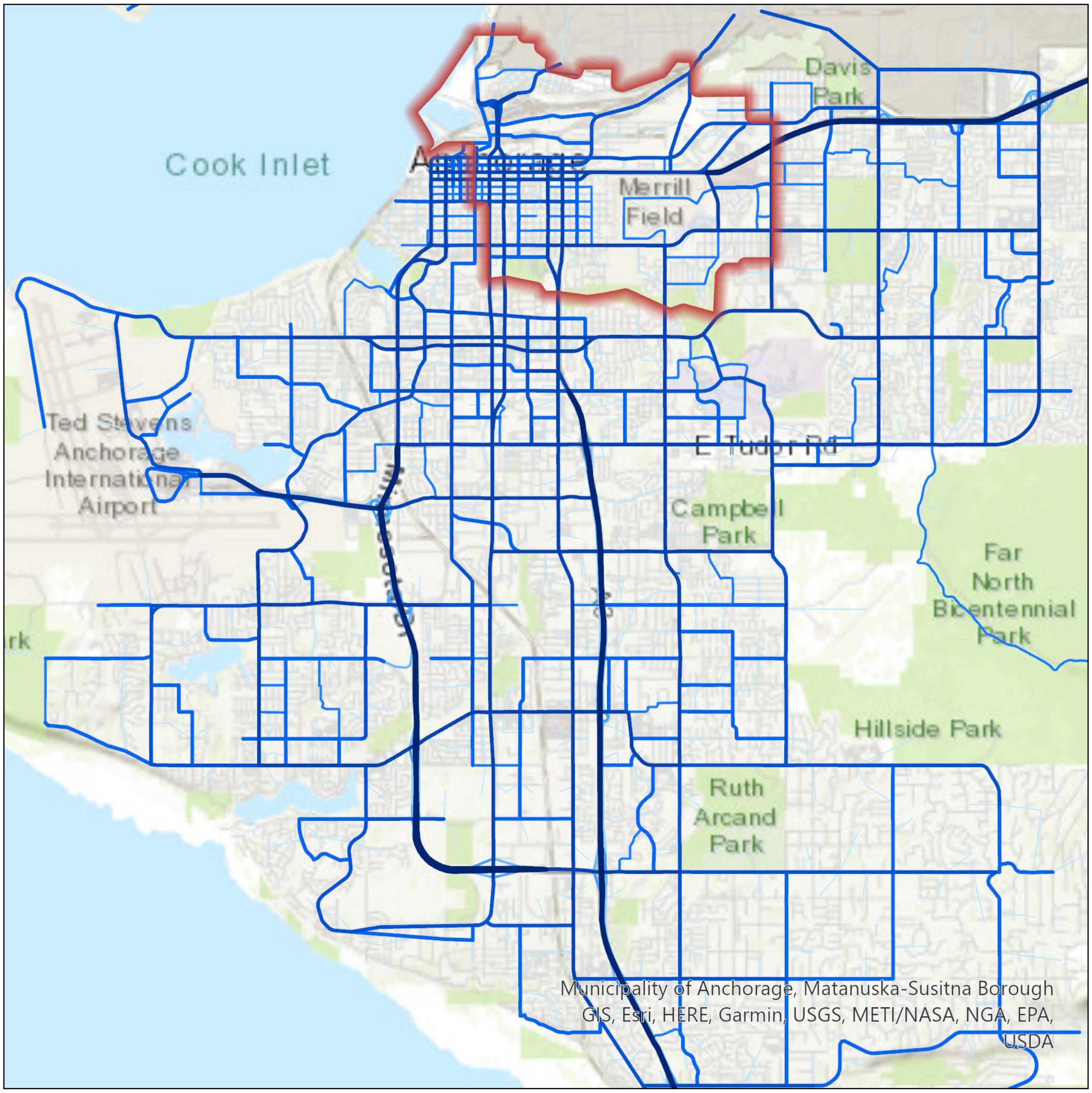


FIGURE 13: MODEL NETWORK (BLUE) ACROSS ANCHORAGE BOWL (PROJECT AREA IN RED)



3.0 Model Calibration and Validation

Calibrating the model involves adjusting various parameters in each model component (e.g. trip generation rates, destination choice attraction parameters, mode choice constants, and signal progression factors) to tune base year model performance to observed conditions (in this case 2019). Validating the model assesses key model outputs relative to observed system performance (generally forecast vehicle volumes) in the context of some desired error tolerance. Validation can lead to re-calibration to ensure that the model is performing within the desired tolerances, so the two processes are described together in the following section.

3.1 Model Calibration and Validation

The model was validated using two data sources: district to district flows from expanded passive O-D data and traffic count data. Expanded passive O-D data was used to validate the destination choice model by comparing aggregate district to district movements of residents after subtracting intrazonal trips from the model to ensure that model outputs and expanded data were directly comparable to each other. The primary method to validate the travel demand model was direct comparison to traffic counts. Three sets of validation statistics were generated separating traffic counts into statistics by volume grouping, functional classification, and screen lines. RSG adopted the Florida DOT Florida State Urban Transportation Model System (FSUTMS) validation guidelines[13] for corridor-level forecasting to assist in the determination of a properly validated model. The FSUTMS guidelines have two levels of maximum acceptable error: “acceptable” and “preferred.” The travel model was validated at the regional level, but considerable effort was made to ensure that the travel model was producing reasonable flows along the Seward-Glenn highway corridor.

The project team balanced the desire to achieve validated corridor level link flows with having a properly specified travel model at the regional level. The two main re-calibration adjustments utilized were the destination choice parameters and the intersection signal progression factors. The results of the validation statistics appear below.

Table 6 below presents the final validation statistics for the SG PEL model by volume grouping compared to the FSUTMS validation targets. Overall the model calibrates very well to the traffic counts despite the fact that the majority of traffic counts in the region are below 5,000 vehicles per day (small volume roadways are harder to calibrate given their higher variability relative to high volume roads). The volume group validation achieved “preferred” validation results in all volume groups by a wide margin. The SG PEL model thus exceeds the FSUTMS validation standards in the volume group sense.

TABLE 6 SG PEL MODEL VALIDATION STATISTICS

VolumeRange	Percent Error	Acceptable Error	Preferred Error	Validation Level
0-5,000	-11.2%	+/- 50%	+/- 25%	Preferred
5,000-10,000	-1.7%	+/- 50%	+/- 25%	Preferred
10,000-15,000	-1.4%	+/- 30%	+/- 20%	Preferred
15,000-20,000	-2.7%	+/- 30%	+/- 20%	Preferred
20,000-25,000	-1.8%	+/- 30%	+/- 20%	Preferred
25,000-50,000	1.1%	+/- 20%	+/- 10%	Preferred
Total	-3.4%			

Validation statistics were also generated based on model functional classification groupings, and compared to applicable groupings from the FSUTMS standards. Functional classification groups are subject to more variability in their statistics because of lower sample size when compared to volume grouping statistics. SG PEL functional classification groups performed well for the arterial and freeway groups (the groups most relevant to the project area), achieving

[13] Florida Department of Transportation and Cambridge Systematics. *FSUTMS-Cube Framework Phase II--Model Calibration and Validation Standards—Final Report*. 2008.

preferable and acceptable standards respectively when compared to FSUTMS. Only two classifications, Expressway and Collectors, exceeded “acceptable” error levels and then only by a few percentage points. Otherwise most classifications are “preferable.” The collector facilities fared the worst when compared to the FSUTMS standards, however, it should be noted that this facility type was the most subject to fluctuations when attempting to balance corridor link flows validation and the regional validation statistics. Table 7 shows SG PEL functional class validation statistics compared to the FSUTMS guidance.

TABLE 7 SG PEL FUNCTIONAL CLASSIFICATION VALIDATION STATISTICS

SG PEL Type	FSUTMS Standard Applied	Percent Error	Acceptable Error	Preferred Error	Validation Level
Freeway	Freeway	6.7%	+/- 6%	+/- 5%	Acceptable
Expressway	Divided Arterial	-14.1%	+/- 10%	+/- 7%	-
Major Arterial	Divided Arterial	-1.8%	+/- 10%	+/- 7%	Preferred
Minor Arterial	Undivided Arterial	-6.6%	+/- 10%	+/- 7%	Preferred
Collector	Collector	-18.1%	+/- 15%	+/- 10%	-
Local	Collector	-1.5%	+/- 15%	+/- 10%	Preferred
On-Ramp	One way/Frontage	-10.3%	+/- 20%	+/- 15%	Preferred
Off-Ramp	One way/Frontage	-0.9%	+/- 20%	+/- 15%	Preferred
Frontage Road	One way/Frontage	-17.4%	+/- 20%	+/- 15%	Acceptable
Total		-3.4%			

Another key set of statistics against which the model was validated are screenline volumes. Total daily screenline volumes were validated to the FSUTMS standards as shown below in Table 8. Figure 14 maps the screenlines in the general vicinity of the project area. All screenlines most relevant to the project area (those highlighted gray in the table) were well within or very close to the error bands set by the FSUTMS guidance, and overall all screenlines were within or very close to the desired tolerances.

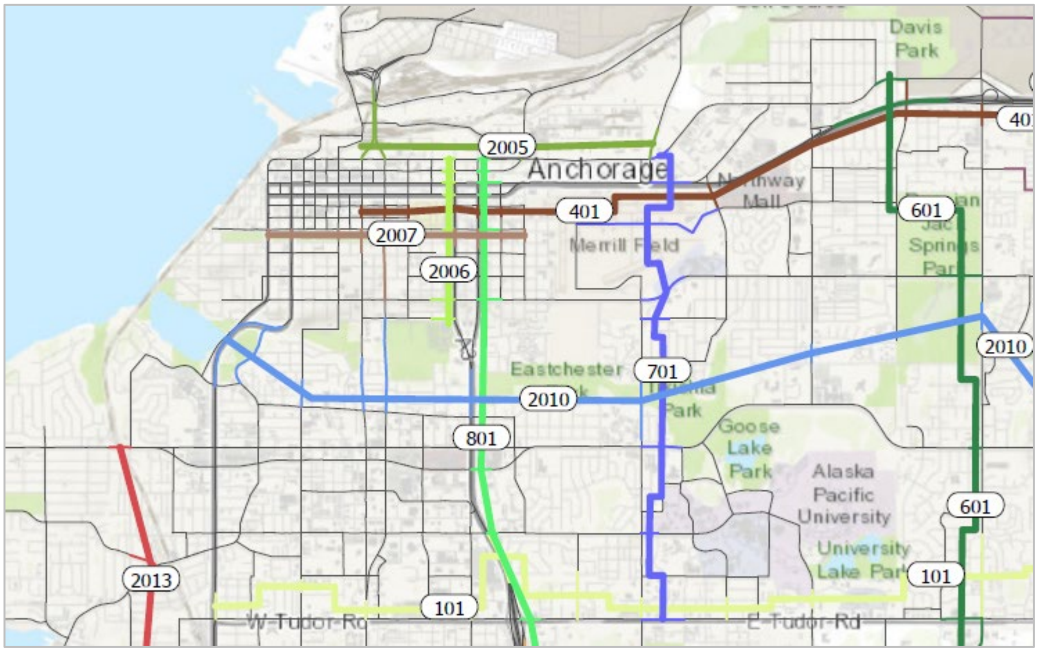
TABLE 8 SG PEL SCREENLINE VALIDATION STATISTICS

Screenlines most important to the project area highlighted gray

Screenline	FSUTMS Standard Applied *	Percent Error	Acceptable Error	Validation Level
101_Tudor	Screenlines 35,000 to 70,000 AADT	-9.0%	+/- 10%	Meet
201_Dimond_Abbott_N	Screenlines 35,000 to 70,000 AADT	-10.7%	+/- 10%	Within 2%
301_OMalley	Screenlines < 35,000 AADT	-7.8%	+/- 15%	Meet
401_5thAve_GlennHwy	Screenlines 35,000 to 70,000 AADT	-1.3%	+/- 10%	Meet
501_Muldoon	Screenlines 35,000 to 70,000 AADT	-4.6%	+/- 10%	Meet
601_Boniface	Screenlines 35,000 to 70,000 AADT	5.2%	+/- 10%	Meet
602_Parallel_Seward	Screenlines < 35,000 AADT	-16.4%	+/- 15%	Within 2%
701_LakeOtis	Screenlines 35,000 to 70,000 AADT	12.3%	+/- 10%	Within 2%
702_LakeOtis	Screenlines 35,000 to 70,000 AADT	-8.8%	+/- 10%	Meet
801_Seward	Screenlines < 35,000 AADT	2.9%	+/- 15%	Meet
802_Seward_S	Screenlines 35,000 to 70,000 AADT	-3.9%	+/- 10%	Meet
803_Seward_N	Screenlines 35,000 to 70,000 AADT	6.3%	+/- 10%	Meet
901_AirportRd	Screenlines 35,000 to 70,000 AADT	-4.4%	+/- 10%	Meet
1001_Dimond_Abbott_S	Screenlines 35,000 to 70,000 AADT	-6.5%	+/- 10%	Meet
2001_Glenn_Kink	Screenlines < 35,000 AADT	-4.1%	+/- 15%	Meet
2002_Glenn_Birchwood	Screenlines < 35,000 AADT	10.8%	+/- 15%	Meet
2003_Glenn_Eagle	Screenlines < 35,000 AADT	11.6%	+/- 15%	Meet
2005_3rdAve	Screenlines < 35,000 AADT	10.6%	+/- 15%	Meet
2006_Gambell	Screenlines < 35,000 AADT	-5.3%	+/- 15%	Meet
2007_9thAve	Screenlines 35,000 to 70,000 AADT	9.5%	+/- 10%	Meet
2010_15th_Fireweed	Screenlines 35,000 to 70,000 AADT	1.0%	+/- 10%	Meet
2013_Hickel_Airport	Screenlines < 35,000 AADT	-15.2%	+/- 15%	Within 2%
2016_Hickel	Screenlines < 35,000 AADT	-7.5%	+/- 15%	Meet
2020_NewSewardHwy	Screenlines < 35,000 AADT	-5.1%	+/- 15%	Meet

** Based on the largest volume road crossing the screenline*

FIGURE 14: MODEL SCREENLINES IN THE GENERAL SG PEL PROJECT AREA



Finally, the team validated total daily transit boardings against observed 2019 daily ridership. The model estimates 11,033 daily boardings in 2019 against an observed total of 11,382, a difference of about 3% for a very good fit.

Based on all the above findings, the SG PEL model is valid for application to a corridor level study.

3.2 Future Forecast Preparation

FUTURE NOBUILD NETWORK

The state of the system in the planning horizon year (2050) absent any future changes other than those known to be funded is an important reference point, known as the "Nobuild" alternative or the "Existing plus Committed" alternative. In this case, the *MTP 2040* identified no committed and funded projects beyond those already incorporated in the baseyear, so the 2050 Nobuild model networks are identical to the 2019 networks.

BUILD ALTERNATIVE NETWORKS WILL BE DEVELOPED

The SG PEL process will soon segue to discussing a variety of future build alternatives, at which point the consultant team will code networks relevant to each alternative and prepare horizon year forecasts for alternative evaluation. This report will be updated with those materials and re-released.

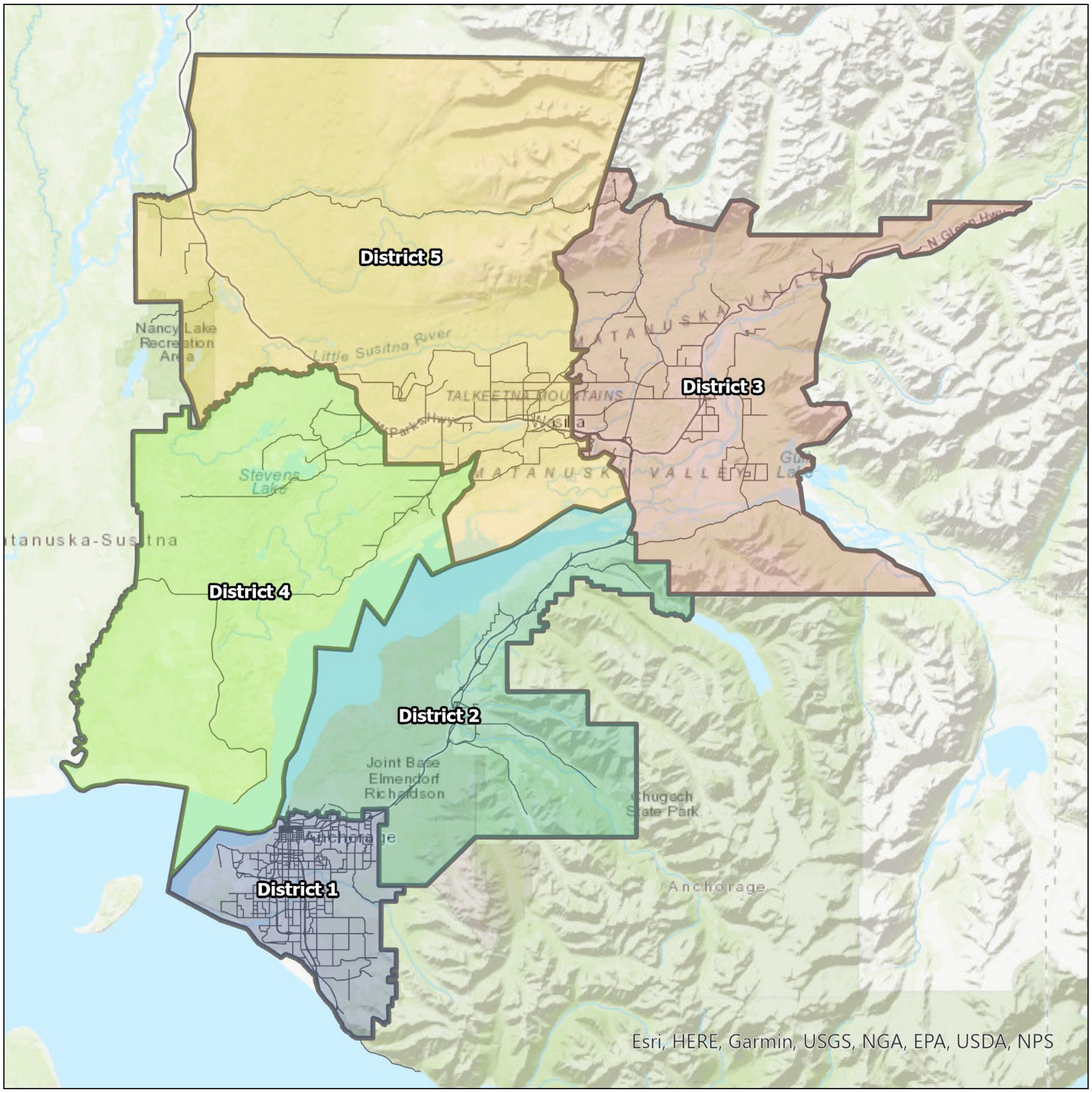
4.0 Modeled 2019 Existing Conditions

After validating the 2019 baseyear model RSG extracted metrics from the final 2019 model run to describe baseyear existing conditions. Baseyear conditions can be thought of as what travelers experienced when moving around Anchorage and the project area in 2019. Key findings and descriptions of the forecast metrics appear below.

4.1 2019 Baseyear Aggregate Findings

Output summaries from the Anchorage Bowl area, which the model labels “District 1,” are a useful basis for understanding transport system performance relevant to the project area. The reference map in Figure 15 illustrates the boundaries of District 1 relative to the entire model geography of all districts taken together. Studying travel in the Anchorage Bowl is helpful to understanding transport system performance in the project area since much of the travel flows to and from the project area originate in the Bowl, as shown by the Origin-Destination Study performed by the SG PEL project. Beyond the Anchorage Bowl itself, the Origin-Destination study also shows that the CER and MSB contribute noticeable travel movements to the Seward-Glenn connection. The Ted Stevens Anchorage International Airport and the many amenities in downtown Anchorage are key destinations for CER and MSB residents.

FIGURE 15: REFERENCE MAP SHOWING MODEL DISTRICTS



To understand the meaning of the forecast findings, some context is useful. Table 9, Figure 16, and Figure 17 show 2019 system physical and performance summary statistics. These show that 71% of the modeled 989 roadway centerline miles in the Anchorage Bowl consist of Major Arterials, Minor Arterials, and Collectors. The map in Figure 17 illustrates the layout of these roadways by type. The types used in the model correspond to the urban classes in the Federal Highway Administration (FHWA) roadway functional classification system[14] (note that the model uses “Freeway” for the FHWA class “Interstates”).

[14]https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section03.cfm

TABLE 9: ANCHORAGE BOWL (DISTRICT 1) 2019 ESTIMATED DAILY VMT, VHT, AND VHD

Facility Type	Vehicle Miles of Travel	Vehicle Hours of Travel	Vehicle Hours of Delay	VHD as % of VHT	Centerline Miles	Share of VMT	Share of VHD
Freeway	742,581	13,627	112	0.8%	103	22.8%	8.1%
Expressway	50,389	1,414	32	2.3%	5	1.5%	2.3%
Major Arterial	1,718,791	52,015	796	1.5%	269	52.7%	57.6%
Minor Arterial	435,058	13,583	160	1.2%	179	13.3%	11.6%
Collector	182,902	6,946	84	1.2%	254	5.6%	6.1%
Local	45,375	2,045	26	1.3%	98	1.4%	1.9%
On-Ramp	33,884	784	3	0.4%	29	1.0%	0.2%
Off-Ramp	39,333	1,420	102	7.2%	23	1.2%	7.4%
Frontage Road	13,862	437	68	15.6%	29	0.4%	4.9%
Total	3,262,175	92,269	1,383	1.5%	989	100.0%	100.0%

FIGURE 16: ANCHORAGE BOWL 2019 MODELED ROAD CENTERLINE MILES BY FACILITY TYPE

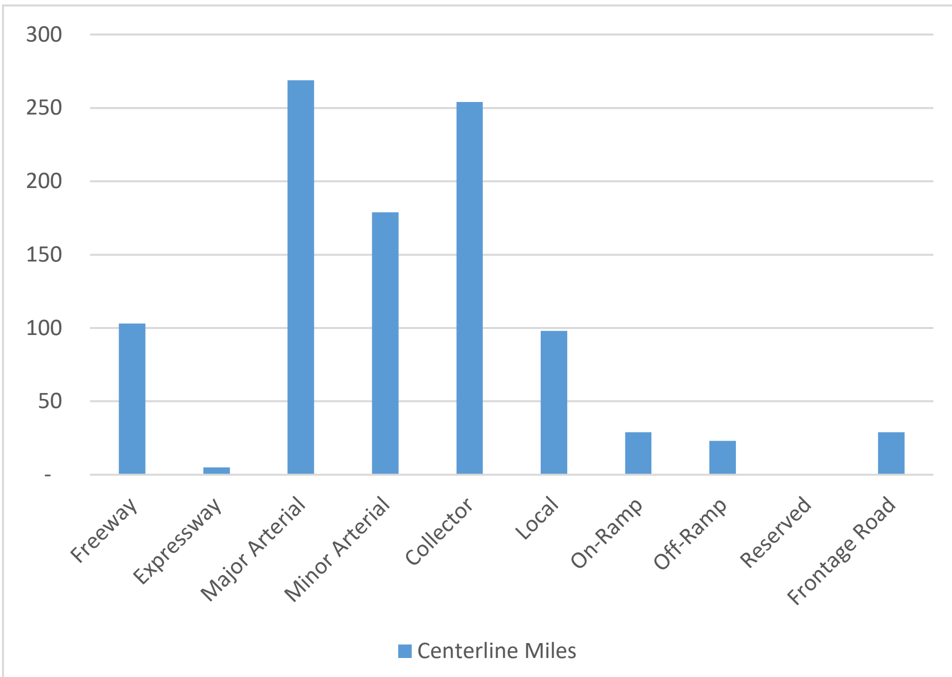
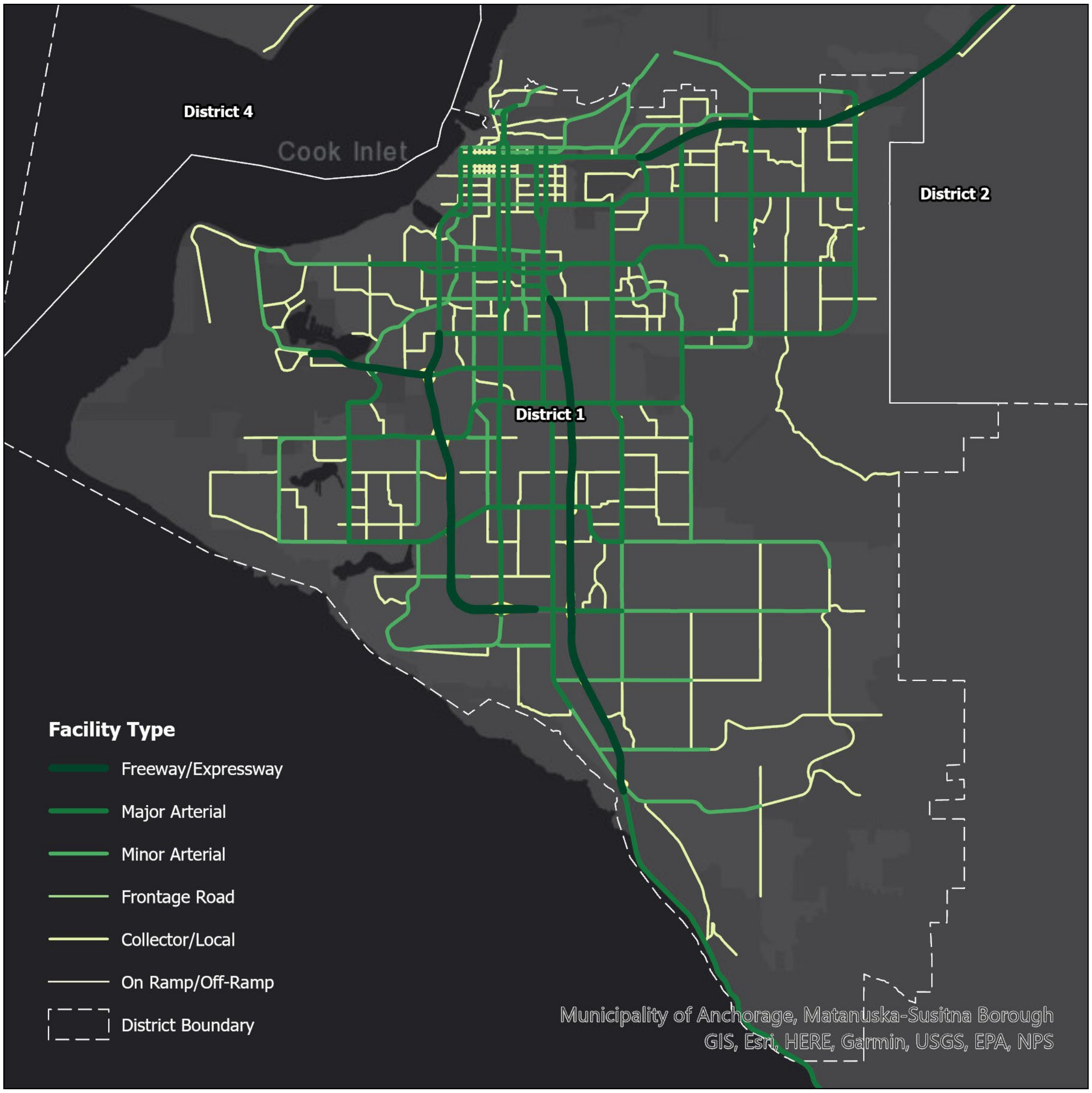


FIGURE 17: MAP SHOWING MODELED 2019 ROADS BY FACILITY TYPE

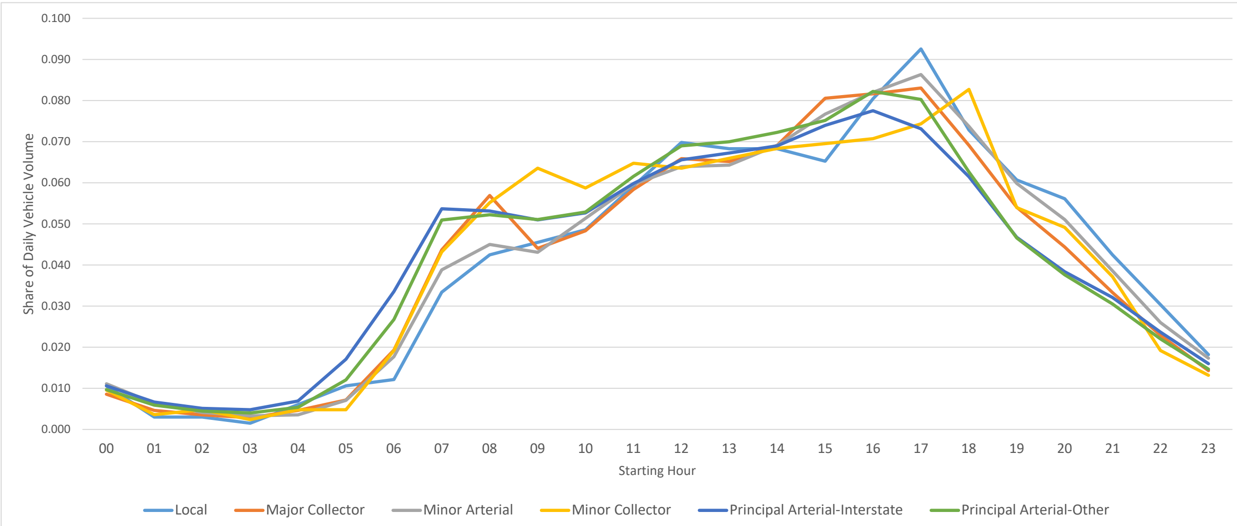


In the Anchorage Bowl, the model estimates there were over 3.2 million daily Vehicle-Miles-Traveled (VMT) on a typical 2019 autumn weekday and travelers needed over 92 thousand Vehicle-Hours-Traveled (VHT) to make those trips (Table 9). The baseyear model estimates relatively little congestion in the Anchorage Bowl district when measured over an entire day—of those 92 thousand VHT only about 1,380 VHT or 1.5% were spent in delayed conditions (vehicle-hours of delay or VHD). In interpreting these findings it is important to note that the model assigns vehicles to the road network across multi-hour time periods (see Section 1.1) thus it is possible that individual travelers, at specific moments of the day, experienced noticeable congestion in 2019. For this reason, the project team used 2019 traffic count data to factor the forecast PM period performance to represent peak hour conditions in addition to the model's standard multi-hour conditions.

In the Anchorage region the highest vehicle volumes generally fall into the afternoon (PM) period of 3pm to 6pm, with the 5pm to 6pm hour containing the highest flows on the arterials.

Figure 18 below, a chart based on an hourly analysis of Anchorage-region traffic counts by ADOT&PF staff, illustrates the peak effects.

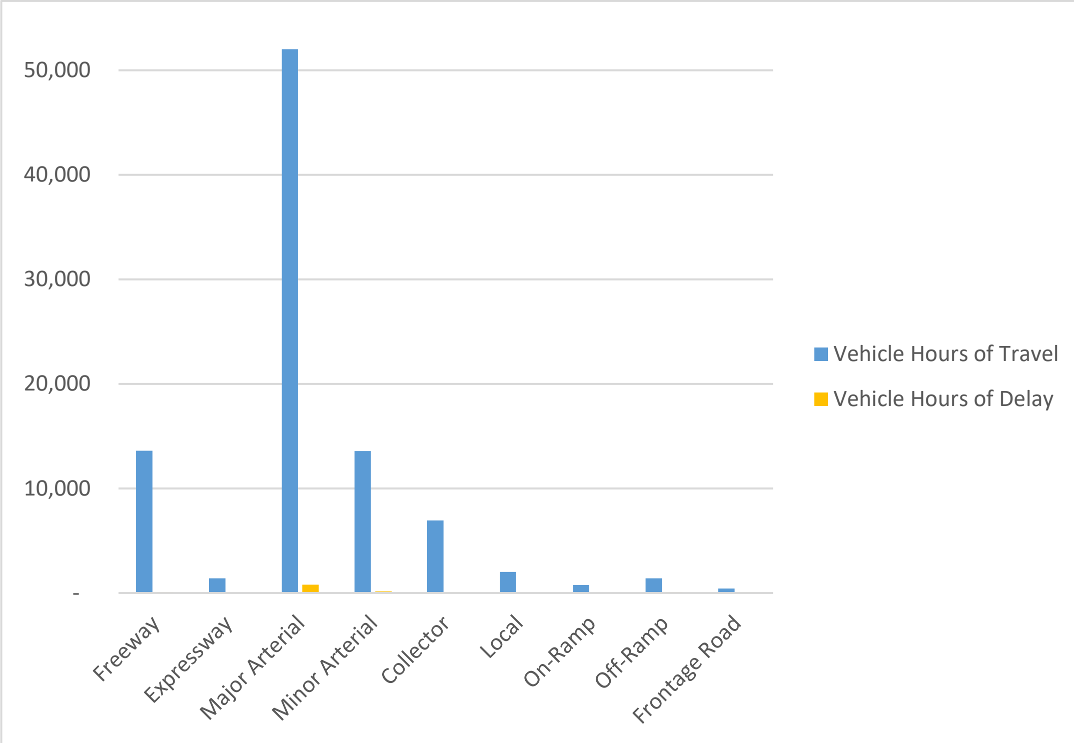
FIGURE 18: AVERAGE OBSERVED URBAN HOURLY TRAFFIC VOLUMES IN 2019 IN THE MODELED GEOGRAPHY BY FACILITY TYPE



Source: Alaska Department of Transportation and Public Facilities Traffic Count Program

Figure 19 charts the VHT and VHD columns of Table 9 to highlight the relative utilization of the different road types and VHD as a proportion of VHT, illustrating that the Major Arterials in the Anchorage Bowl are where travelers spend most of their in-vehicle time and experience the most delay. The table also shows that the Minor Arterials and Freeways are the next-most-congested facilities in general after the Major Arterials, as measured by their proportional shares of VHD. Note that the majority of the Expressway miles in District 1 are on International Airport Drive and Minnesota Drive. These details provide some nuance to the overall finding of relatively little congestion in the baseyear.

FIGURE 19: ANCHORAGE BOWL ESTIMATED 2019 VHT AND VHD BY FACILITY TYPE



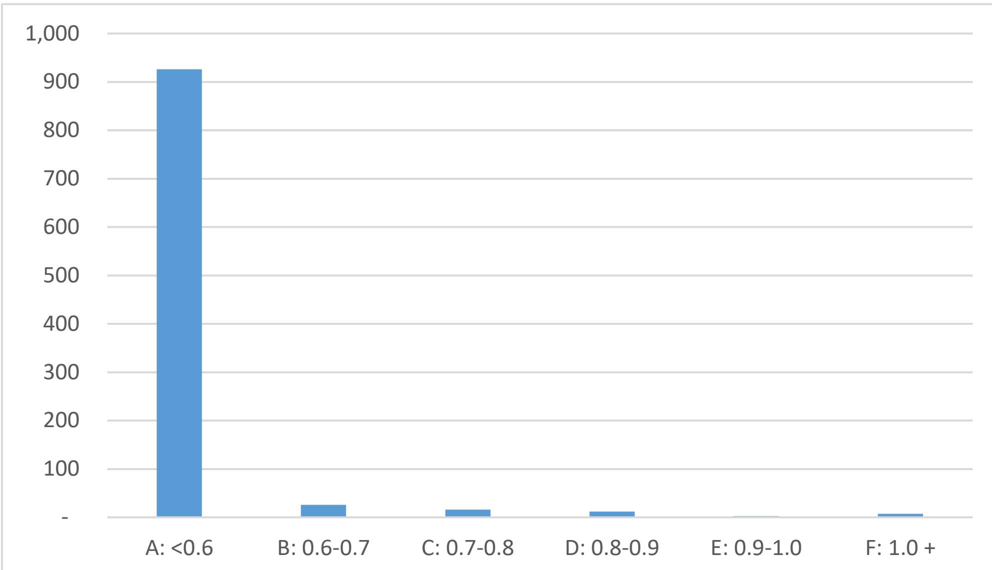
4.2 Level of Service as Measured by Volume-over-Capacity

The SG PEL model categorizes roadway facilities by volume-over-capacity ratio (VOC) bins that roughly correspond to level-of-service (LOS) grades. The model computes VOC by dividing forecast vehicle volumes in a given time period by roadway capacities for that period for each model link. The VOC summary for the 2019 Anchorage Bowl forecast illustrates the relatively low amount of congestion estimated in the baseyear. As shown in Table 10, the model estimates that on a daily basis almost 94% of roadway links (by centerline mile) function at VOC greater than or equal to 0.6 (roughly equivalent to LOS A). Less than 1% (about 7 centerline miles) of the roads in the Bowl performed at LOS F at any time across a typical weekday. Taken in total, only 1.5% of all hours spent traveling in vehicles experienced delayed conditions. These findings indicate that for the most part, the Anchorage Bowl is not greatly congested in the baseyear across the model's multi-hour time periods, although individual travelers may have experienced local congestion over shorter time periods. The maps below illustrate the 2019 baseyear afternoon (PM) peak-hour (5pm to 6pm) volume and delay findings to provide added detail.

TABLE 10: 2019 ANCHORAGE BOWL (DISTRICT 1) DAILY VMT, VHT, AND VHD BY LOS

Volume/ Capacity	Vehicle Miles of Travel	Vehicle Hours of Travel	Vehicle Hours of Delay	VHD as % of VHT	Centerline Miles by LOS	% of Centerline Miles by LOS
A: <0.6	2,832,399	75,773	424	0.6%	926	93.6%
B: 0.6-0.7	163,478	6,102	184	3.0%	26	2.6%
C: 0.7-0.8	106,842	3,627	159	4.4%	16	1.6%
D: 0.8-0.9	91,552	3,233	155	4.8%	12	1.2%
E: 0.9-1.0	19,847	891	65	7.3%	3	0.3%
F: 1.0 +	48,057	2,643	396	15.0%	7	0.7%
Total	3,262,175	92,269	1,383	1.5%	989	100.0%

FIGURE 20: 2019 ANCHORAGE BOWL DAILY CENTERLINE MILES OF ROAD BY LOS BIN



Noting that the SG PEL model is a regional model and not a local microsimulation model, its 2019 system performance estimates in the PM peak hour (see Figure 21 and Figure 22) illustrate several congestion effects. First, 6th Avenue, 5th Avenue, and the Glenn Highway perform at much slower than free-flow conditions during the peak. On the southern end of the project area 15th Avenue, Debarr, and the southern part of Ingra all experienced noticeable congestion and performance degradation.

FIGURE 21: 2019 PM PEAK HOUR (5PM TO 6PM) ESTIMATED VOC IN NORTH PART OF THE PROJECT AREA BY LOS

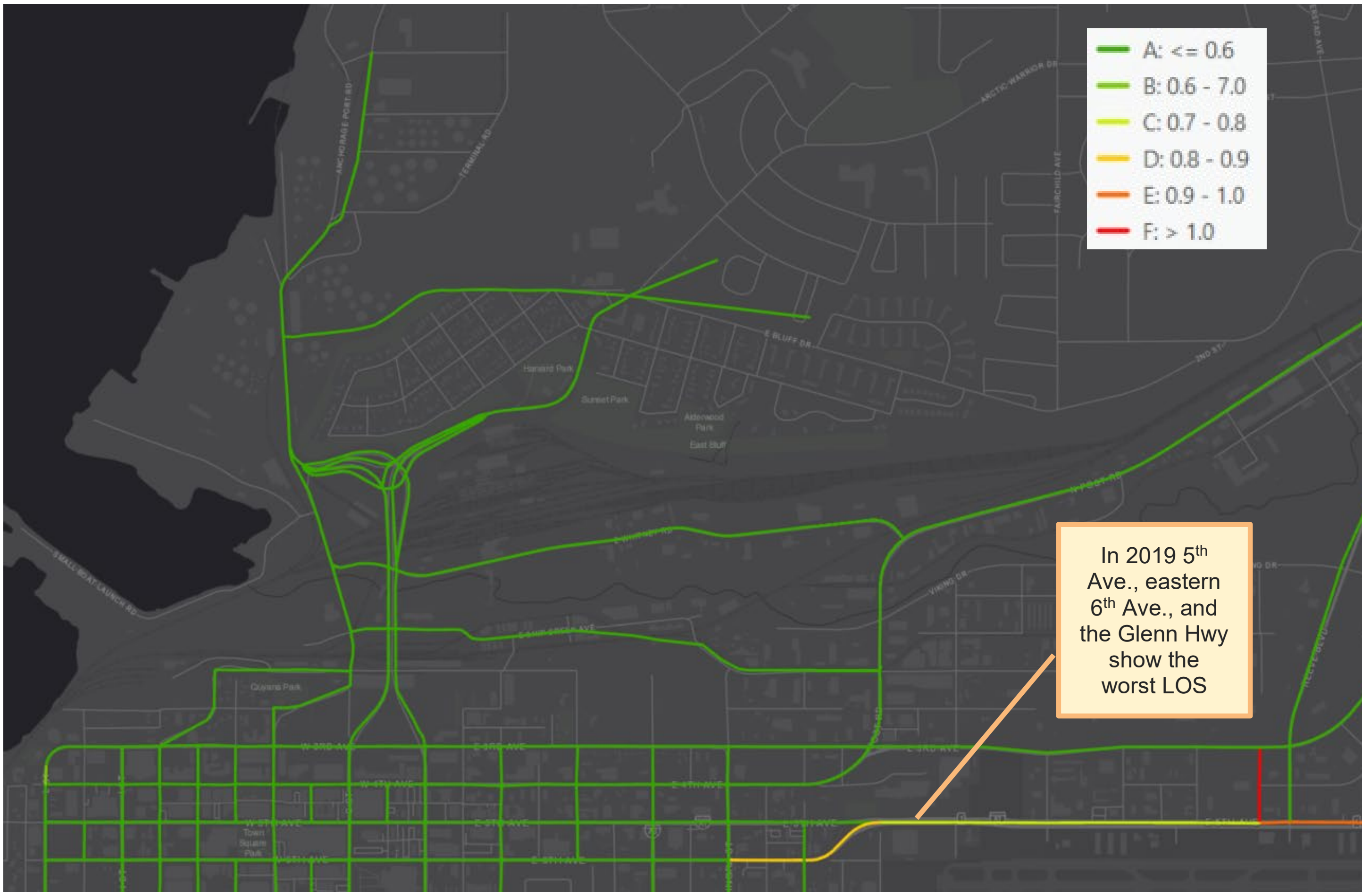
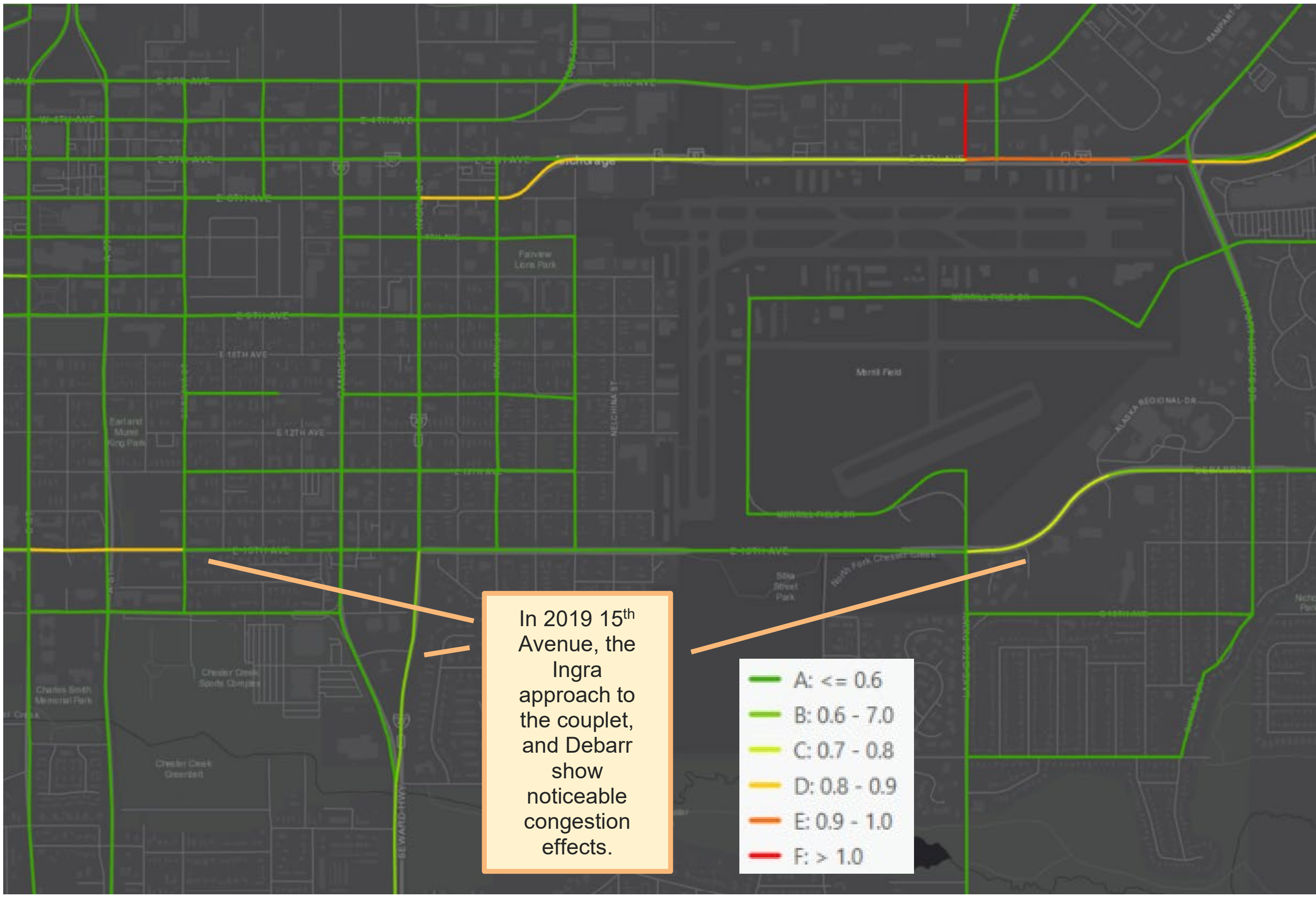


FIGURE 22: 2019 PM PEAK HOUR (5PM TO 6PM) ESTIMATED VOC IN SOUTH PART OF THE PROJECT AREA BY LOS



4.3 Performance Summary for Selected Road Facilities and Screenlines

The project team selected several individual road segments to serve as indicators for the SG PEL study. The segments are of similar lengths—most are from 0.6 to 0.8 miles except for the selected segment of Northern Lights Boulevard at 0.4 miles. The map in Figure 24 illustrates these selected roads. The Glenn and Seward Highways together with the Ingra-Gambell couplet and 5th Avenue form the existing Seward-Glenn system. A and C streets on the west side of the project area form a parallel couplet to Ingra-Gambell that is a key alternate north-south route through downtown Anchorage while 15th Avenue south of Merrill Field offers an alternate east-west movement to 5th Avenue. The selected Northern Lights Boulevard, Muldoon, and Tudor segments represent important alternate routes to the Seward-Glenn system so being aware of their performance in the alternatives analysis will be helpful even though they are outside the project area. The 2019 estimated VMT, VHT, and VHD for these selected roads form a useful comparison point for understanding future forecasts for the Nobuild and Build scenarios. These statistics for the key roads appear in Table 11. This drill-down to specific roads shows nuances of the overall performance picture summarized above, specifically that in 2019 the Seward and Glenn highways plus Ingra experience roughly a third of their daily utilization in delayed conditions. Gambell, A and C Streets, Tudor, and Muldoon are delayed about one fifth of the day.

Figure 23 plots daily VHD as a proportion of VHT for these selected segments to illustrate these points. Changes in these indicators in the future scenario analysis will help judge the relative merits of potential alternative treatments of the Seward-Glenn connection.

TABLE 11: 2019 DAILY VMT, VHT, AND VHD ON SELECTED ROAD SEGMENTS

Facility	2019 VMT	2019 VHT	2019 VHD	2019 Delay % of VHT
GlennHwy	33,347	860	253	29.5%
NewSewardHwy	31,353	1,069	409	38.2%
GambellSt	11,714	451	113	25.0%
IngraSt	18,592	840	318	37.9%
5thAve	30,740	900	90	10.0%
3rdAve	8,280	228	19	8.4%
15thAve	15,472	478	37	7.7%
ASt	9,976	439	107	24.3%
CSt	8,478	347	97	27.9%
TudorRd	33,912	969	215	22.2%
MuldoonRd	16,368	455	91	20.0%
NorthernLightsBlvd	11,973	331	46	14.0%

Grade-separated facilities combined—note that Ingra, Gambell, A, and C are one-way

FIGURE 23: 2019 ESTIMATED VHT AND VHD FOR SELECTED ROAD SEGMENTS

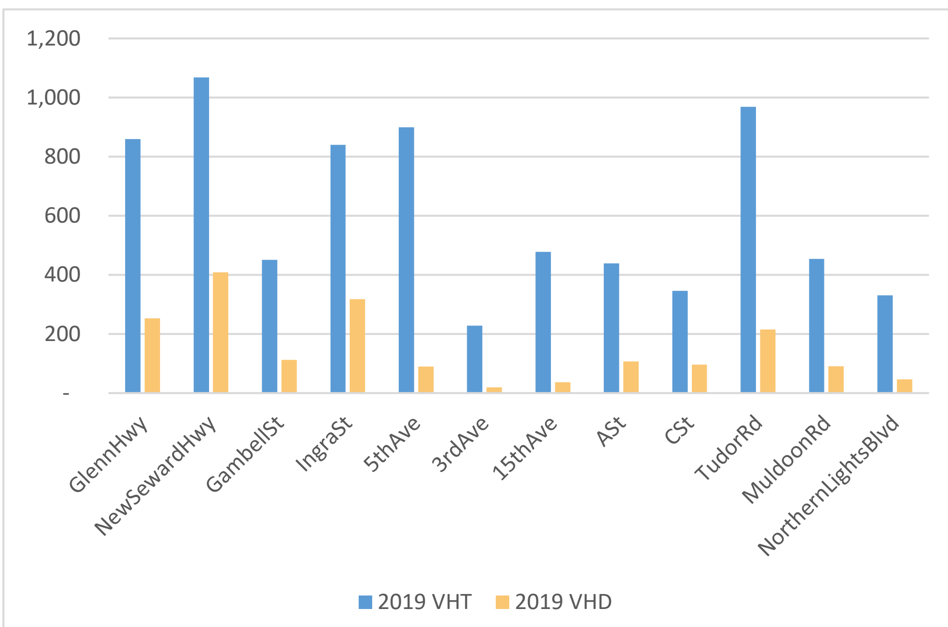
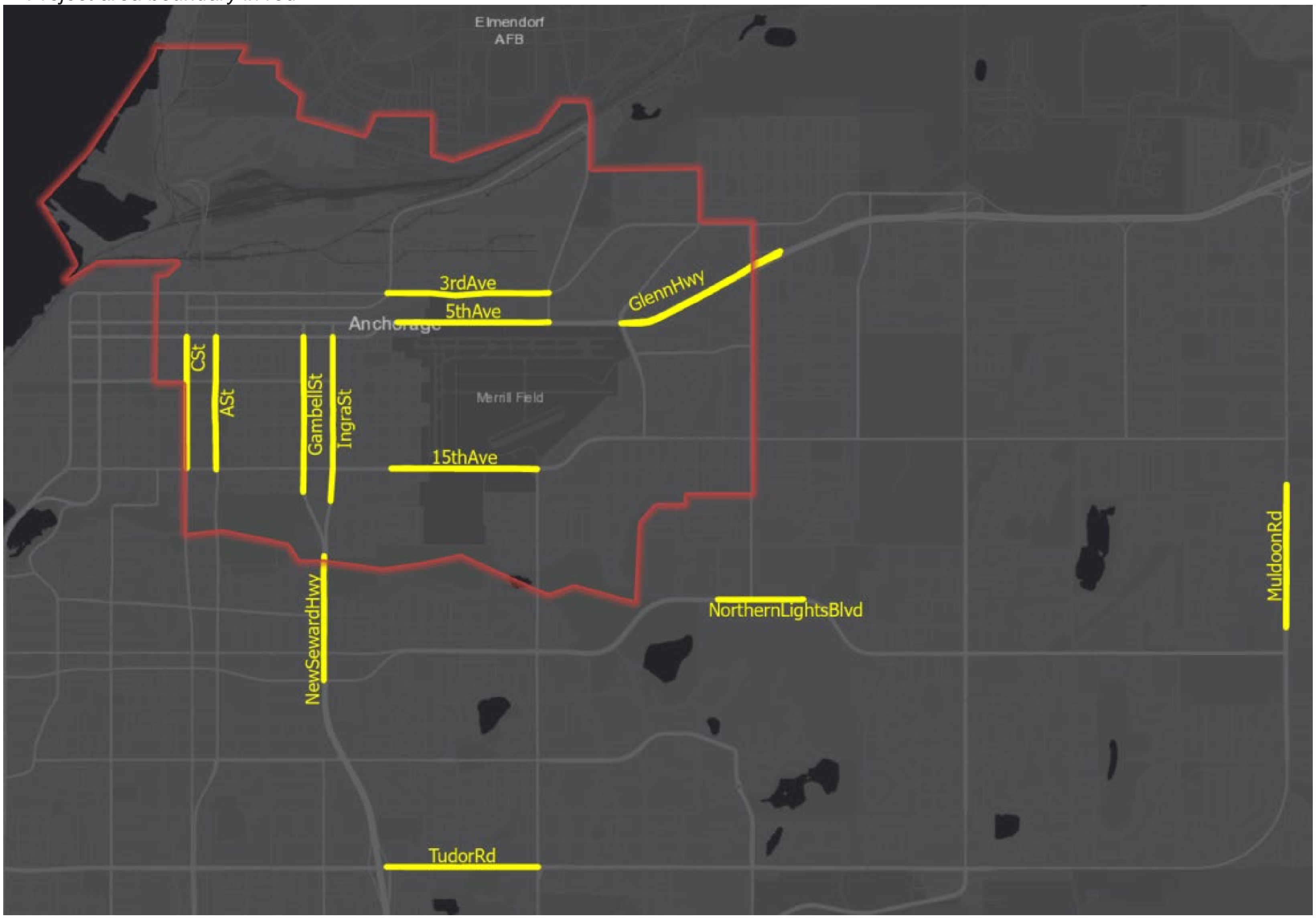


FIGURE 24: MAP OF SELECTED ROADWAYS IN OR AFFECTING THE PROJECT AREA

Project area boundary in red



In addition to individual roads the model delineates a series of screenlines that summarize total vehicle flows into and out of key geographic subareas. Screenlines are analytic methods that measure the total volume of all roadways they cut across. Baseyear estimated total daily vehicle volumes for the model screenlines appear in Table 12. The screenlines are data constructs designed to summarize the total vehicle flows across imaginary lines bordering key subareas of the modeled geography. Figure 25 illustrates the primary screenlines of interest for the Anchorage Bowl. Note that screenline #802 in the table represents half of screenline #801 from Dowling Road south while screenline #803 represents the other half of screenline #801 from Dowling Road north (with Dowling Road volumes split between #802 and #803 proportional to observed turn movements at the Dowling Road/Seward Highway interchange). Since the screenlines themselves vary in physical length and the number of roads summarized, the primary use of this table is as a reference point for future volume estimates across the various project alternatives.

FIGURE 25: SG PEL TRAVEL MODEL SCREENLINES IN THE ANCHORAGE BOWL

(project area in black at upper left)

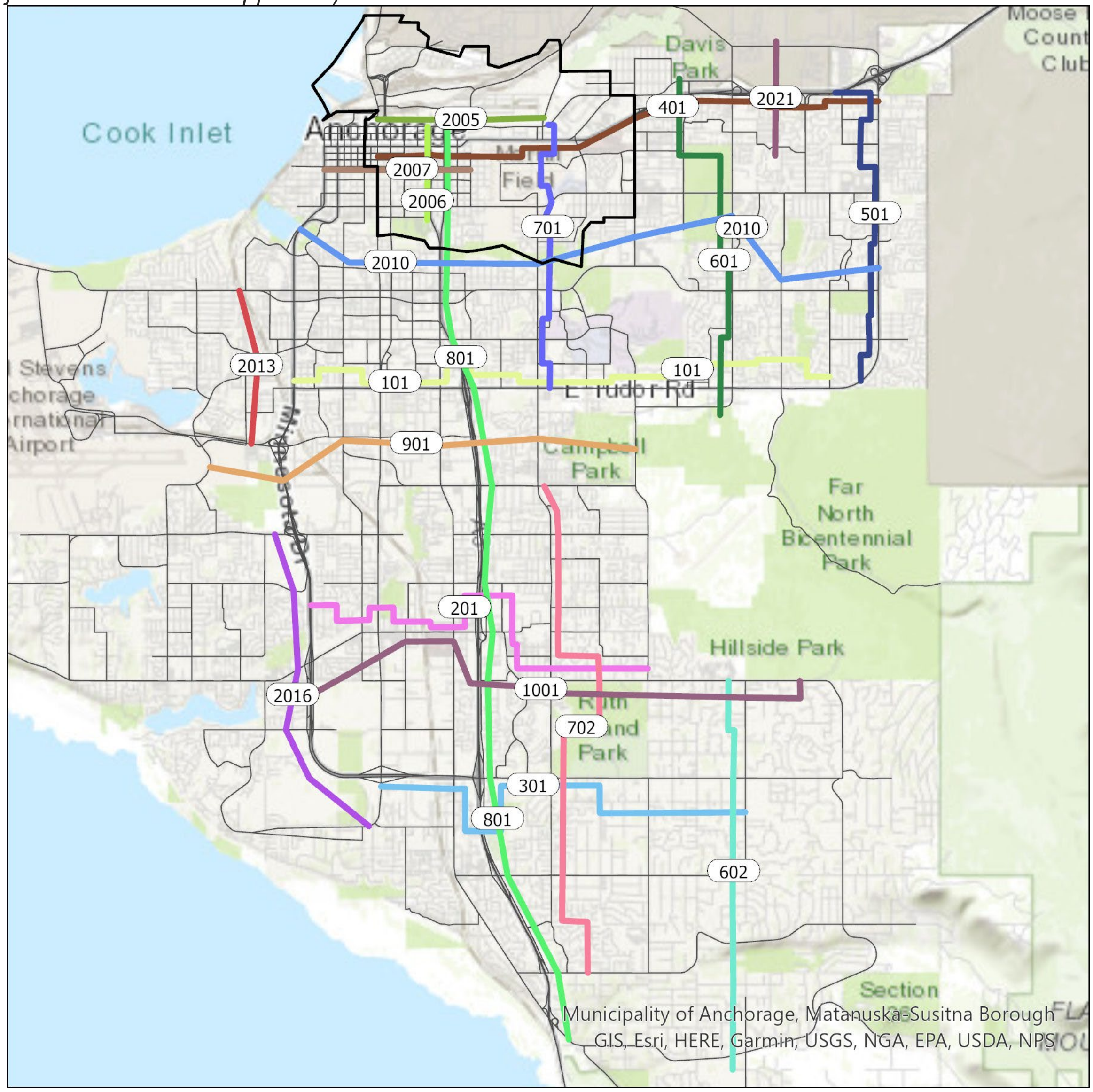


TABLE 12: 2019 ESTIMATED DAILY VOLUMES CROSSING MODEL SCREENLINES

Screenlines most important to the project area highlighted gray—803 is 801 north of Dowling

Screenline	Estimated Vehicles
101_Tudor	186,397
201_Dimond_Abbott_N	146,963
301_OMalley	55,211
401_5thAve_GlennHwy	158,541
501_Muldoon	106,666
601_Boniface	132,771
602_Parallel_Seward	22,530
701_LakeOtis	195,466
702_LakeOtis	60,271
801_Seward	305,155
802_Seward_S	94,141
803_Seward_N	211,015
901_AirportRd	153,386
1001_Dimond_Abbott_S	112,510
2001_Glenn_Kink	17,015
2002_Glenn_Birchwood	44,861
2003_Glenn_Eagle	58,212
2005_3rdAve	28,800
2006_Gambell	65,993
2007_9thAve	121,360
2010_15th_Fireweed	220,723
2013_Hickel_Airport	54,609
2016_Hickel	76,145
2020_NewSewardHwy	7,954
2021_AcrossGlennHwy	78,382

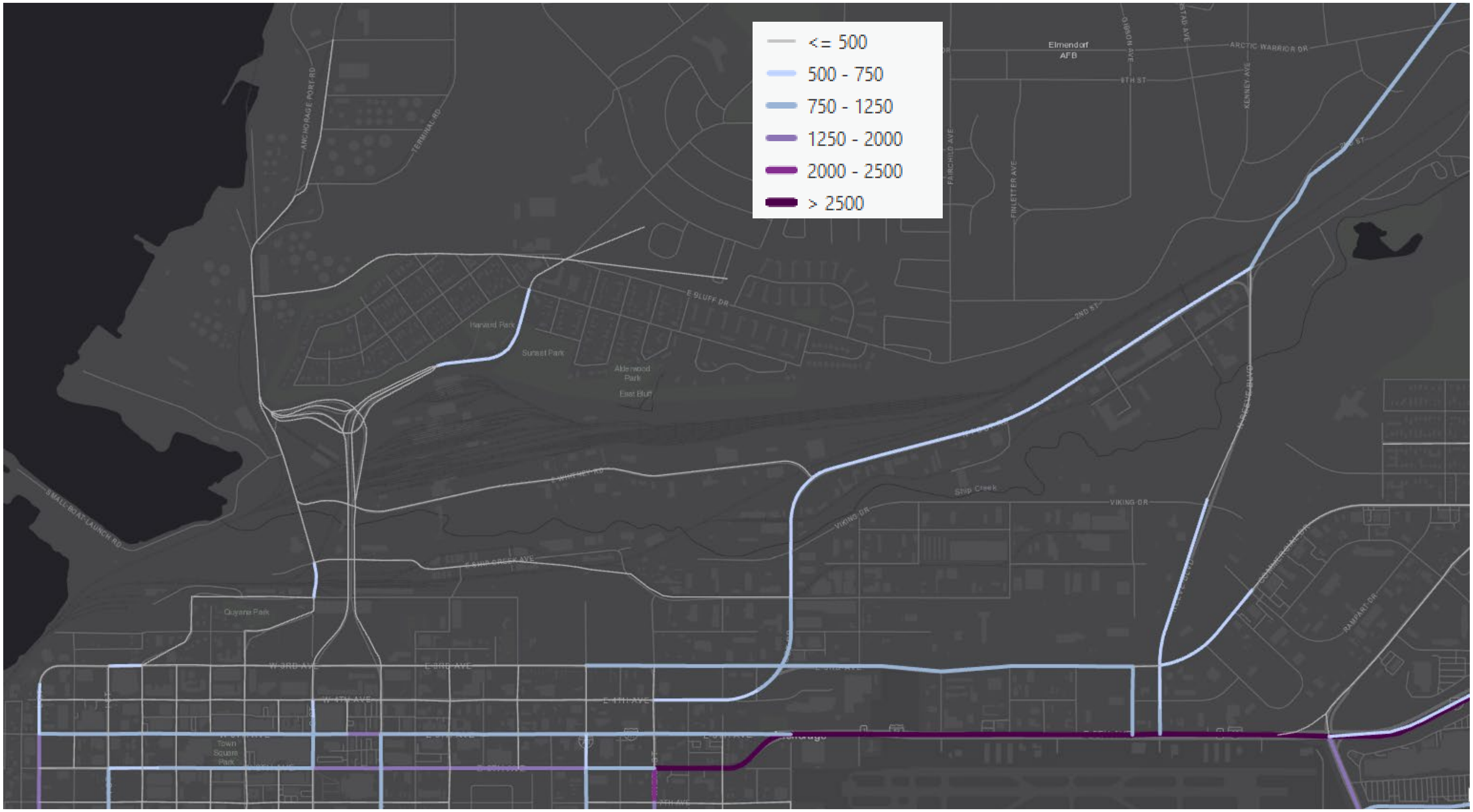
4.4 Estimated roadway vehicle volumes and delay

The SG PEL travel forecast model estimates vehicle volumes at the individual link (road segment) level. The following maps illustrate link-level daily estimated 2019 vehicle volumes and VHD in the Anchorage Bowl district. This level of analysis narrows the temporal focus from the daily level used in the screenline findings above to the daily peak hour. This provides more detail and frames findings in a “design hour” context.

The volume maps in Figure 26 and Figure 27 show the high level of demand for the selected facilities: 5th Avenue, Seward, Glenn, the A/C couplet, and the 15th Avenue-Debarr axis. Other roads that carry heavy volumes include 6th Avenue, Airport Heights Drive, and Bragaw. The volume map also illustrates the role of Debar/15th Avenue as an important east-west parallel route to Glenn/15th Avenue.

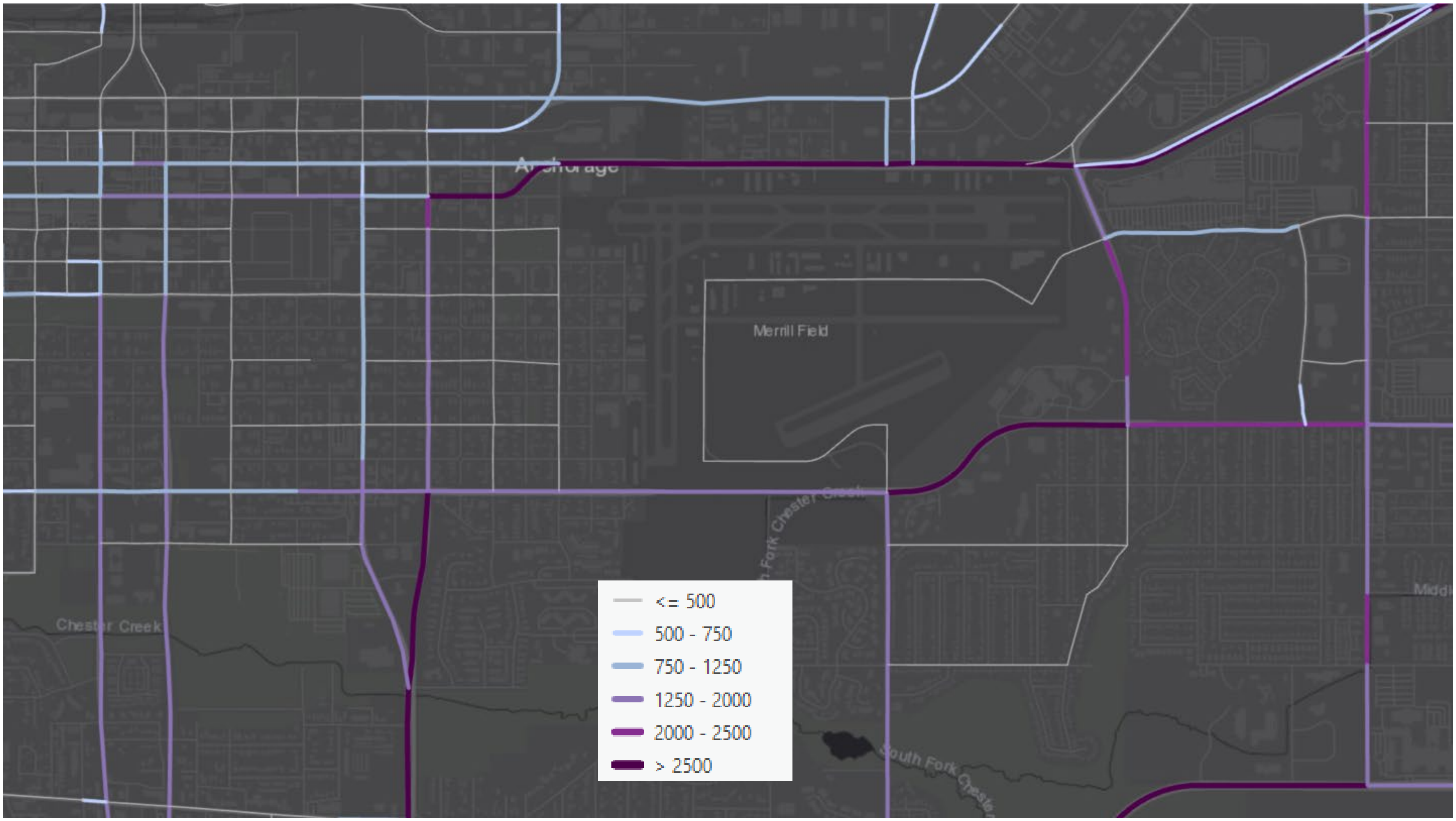
The VHD maps in Figure 28 and Figure 29 show nuances that complement the VOC/LOS maps above. In addition to roads already called out as having less-than-A LOS in 2019, Gambell and Ingra in the main part of the couplet show noticeable delay as do A St. and C St. The east-west street grid between 5th Ave. and 8th Avenue in the west part of the project area also experience delay in the baseyear. Access to the Port appears to be relatively uncongested.

FIGURE 26: 2019 PM PEAK HOUR (5PM TO 6PM) ESTIMATED ROAD VOLUMES (ALL VEHICLES) IN NORTH PART OF PROJECT AREA



Grade-separated facilities mapped separately

FIGURE 27: 2019 PM PEAK HOUR (5PM TO 6PM) ESTIMATED ROADWAY VOLUMES (ALL VEHICLES) IN SOUTH PART OF PROJECT AREA

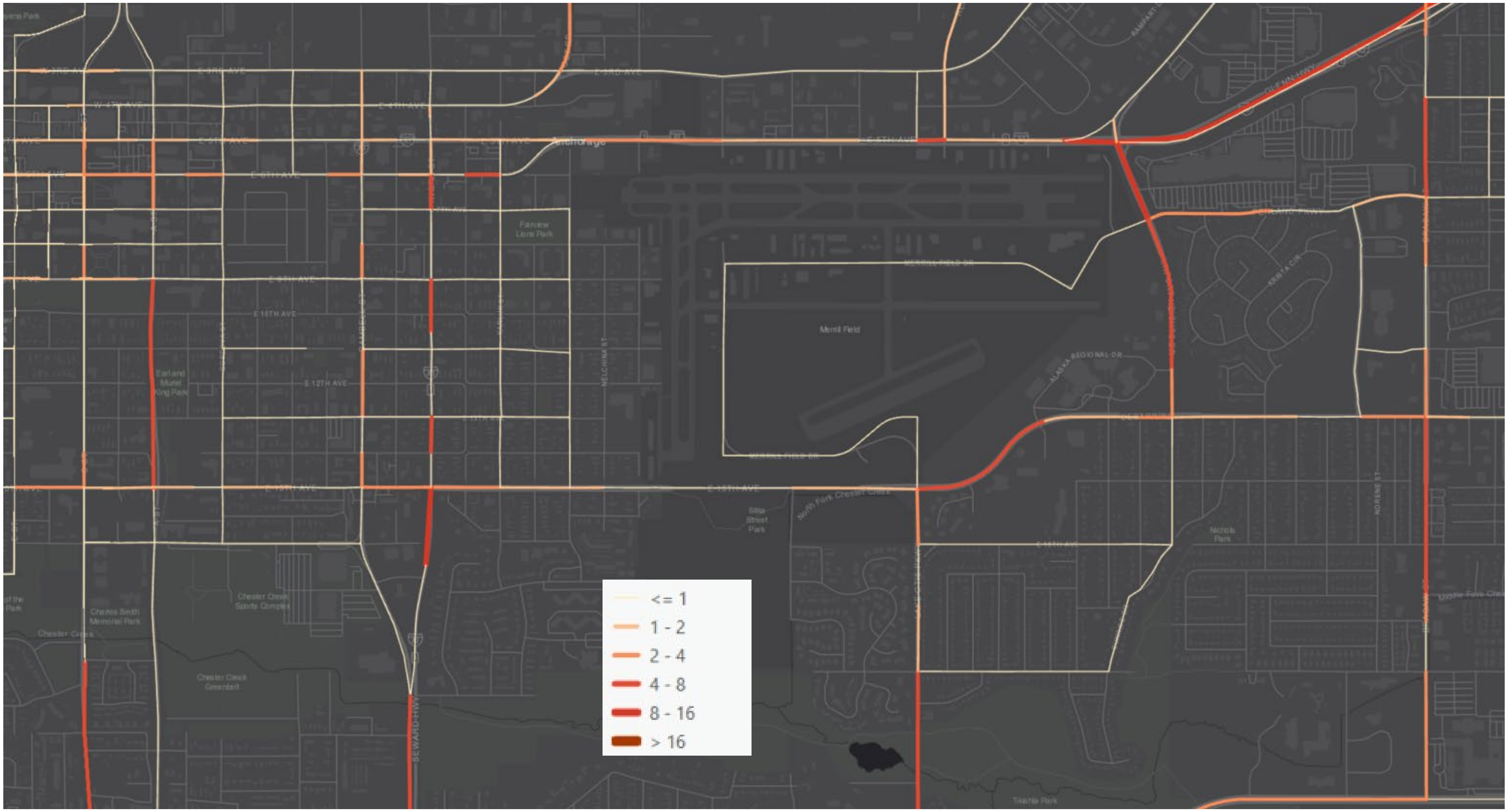


Grade-separated facilities mapped separately

FIGURE 28: 2019 PM PEAK HOUR (5PM TO 6PM) VEHICLE HOURS OF DELAY (VHD) IN NORTH PART OF THE PROJECT AREA

Grade-separated facilities mapped separately

FIGURE 29: 2019 PM PEAK HOUR (5PM TO 6PM) VEHICLE HOURS OF DELAY (VHD) IN SOUTH PART OF THE PROJECT AREA



Grade-separated facilities mapped separately

4.5 Transit Performance

The 2019 baseyear analysis estimates 11,037 daily transit boardings for all modeled transit routes. As mentioned in the *Model Calibration and Validation* chapter, RSG validated the SG PEL model to total daily transit boardings, so the primary use of this number is as a comparison point for future scenario forecasts.

5.0 Forecast Future System Performance

5.1 2050 Nobuild Scenario

2050 NOBUILD AGGREGATE FINDINGS

The particular value of the future Nobuild scenario is that it shows what future system performance is likely to be absent any additional investments beyond those now funded. In the Anchorage Bowl, the SG PEL 2050 Nobuild forecast estimates over 3.7 million daily VMT in a typical autumn weekday accrued via over 106 thousand VHT (see Table 13). This represents about a 15% increase in both VMT and VHT from the 2019 baseyear, and is consistent with the MOA household growth of 13% and employment growth of 18%. As shown in Table 13 congestion, measured by overall VHD as a proportion of VHT, would increase from 1.5% of VHT to 2.4% of VHT from 2019 to 2050 in a Nobuild scenario. Relative to other urban regions of the U.S.A. of all sizes this is not a large amount of congestion.[15]

TABLE 13: ANCHORAGE BOWL 2050 NOBUILD FORECAST DAILY VMT, VHT, AND VHD COMPARED TO 2019 BASEYEAR ESTIMATES

Facility Type	2019 VMT	2050 VMT	2019 VHT	2050 VHT	2019 VHD	2050 VHD	2019 VHD as % of VHT	2050 VHD as % of VHT
Freeway	742,581	875,140	13,627	16,584	112	656	0.8%	4.0%
Expressway	50,389	58,284	1,414	1,646	32	51	2.3%	3.1%
Major Arterial	1,718,791	1,961,521	52,015	59,598	796	1,231	1.5%	2.1%
Minor Arterial	435,058	486,604	13,583	15,243	160	229	1.2%	1.5%
Collector	182,902	207,383	6,946	7,949	84	141	1.2%	1.8%
Local	45,375	48,861	2,045	2,225	26	48	1.3%	2.2%
On-Ramp	33,884	38,420	784	892	3	6	0.4%	0.7%
Off-Ramp	39,333	44,402	1,420	1,633	102	146	7.2%	8.9%
Frontage Road	13,862	15,401	437	488	68	80	15.6%	16.4%
Total	3,262,175	3,736,016	92,271	106,258	1,383	2,588	1.5%	2.4%
2050/2019 PctDiff		14.5%		15.2%		87.1%		

[15] In the Texas Transportation Institute (TTI) *2021 Urban Mobility Report* Anchorage is grouped in the "Small Average" set of cities along with Pensacola FL, Little Rock AR, and Eugene OR. In 2019 TTI reported that the overall grouping had an average per-commuter annual delay of 38 person-hours and a maximum of 48 person-hours. Pensacola, Little Rock, Anchorage, and Eugene had per-commuter delay statistics of 48, 46, 43, and 38 person-hours respectively. The next largest TTI city category is Medium Average with an average of 45 person-hours of commuting delay annually and a maximum of 68. TTI thus estimates that Anchorage is somewhat above average delay in the "Small" class and somewhat below the average in the "Medium" class. Texas Transportation Institute. *2021 Urban Mobility Report*. 2021. Accessed at https://static.tti.tamu.edu/tti.tamu.edu/documents/mobility-report-2021.pdf

Table 13 also compares forecast 2050 Nobuild performance relative to the 2019 baseyear estimates for the Anchorage Bowl. As in the 2019 baseyear the Major Arterials in the Anchorage Bowl would carry the bulk of the VMT. In 2050 the Major Arterials also show the greatest increase in VMT, growing by over 240 thousand daily VMT. The Major Arterials in 2050 experience a 50% increase in delay as measured by VHD, as illustrated in Figure 30. That said, 2050 Major Arterial delay remains a smaller proportion of Major Arterial VHT than Freeways in the Bowl in 2050. Future freeway delay is likely to more than quintuple, from over 110 VHD in 2019 to over 650 VHD in 2050. This would increase the proportion of travel time on freeways experiencing delay to 4%. Other than off-ramps and frontage roads, no other facility type shows as much delay as a share of travel time in 2050 (see Figure 31). Since the Glenn and Seward contribute a good part of the freeway centerline miles in the Anchorage Bowl this finding is significant for SG PEL. Although it occurs atop a relatively small 2019 starting number (1.5% of daily VHT spent in delay conditions), another noteworthy change is a likely 87% overall increase in total delay (VHD) in the Anchorage Bowl in a 2050 Nobuild future from about 1,400 hours to about 2,600 hours.

FIGURE 30: ANCHORAGE BOWL FORECAST 2050 DAILY VHD COMPARED TO 2019 BASEYEAR

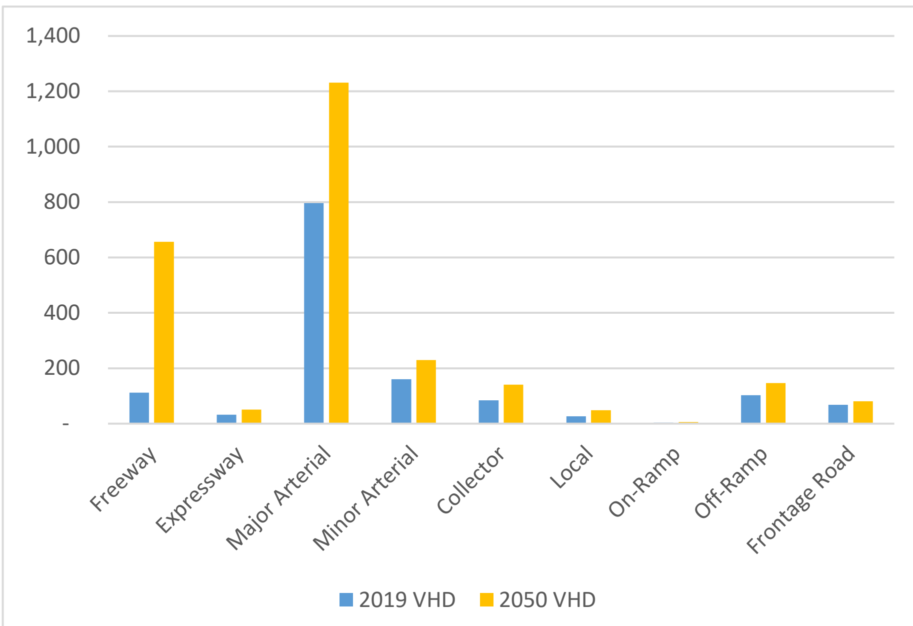
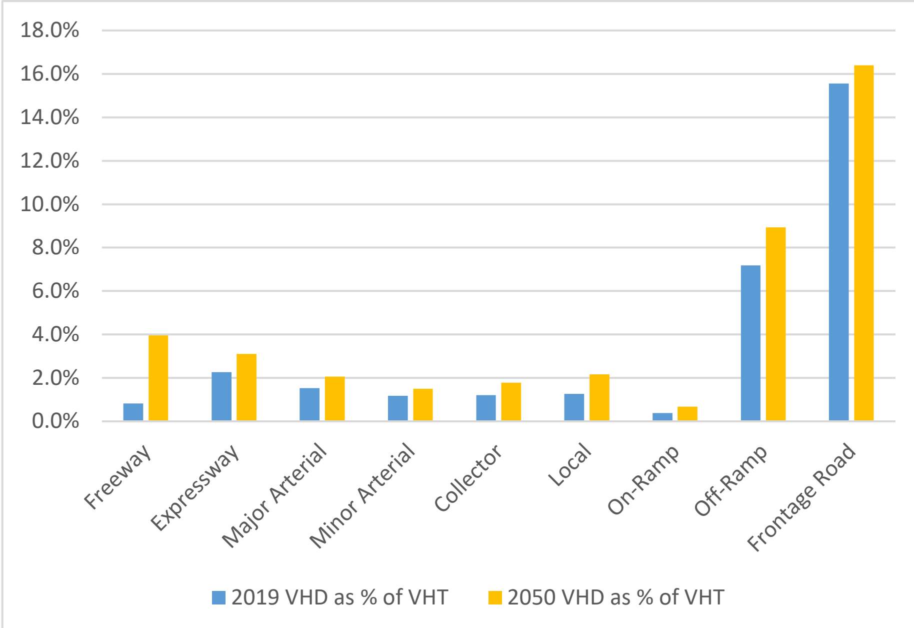


FIGURE 31: ANCHORAGE BOWL FORECAST 2050 DAILY NOBUILD VHD SHARE OF VHT COMPARED TO 2019 BASEYEAR



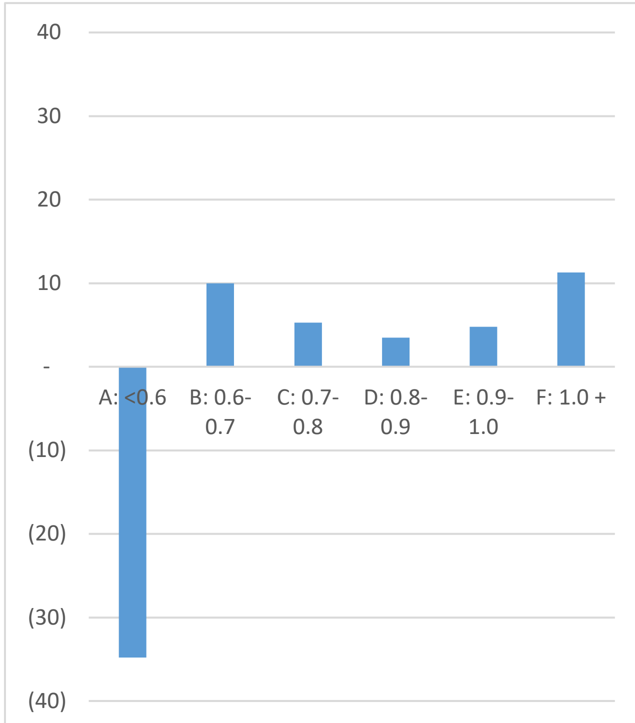
2050 NOBUILD LEVEL OF SERVICE AS MEASURED BY VOC

The forecast 2050 Nobuild LOS summary within the Anchorage Bowl shows another view of the overall change in congestion. As shown in Table 14 the Bowl's 926 centerline miles of roads enjoying estimated LOS A (almost 94% in 2019) decline to 888 miles (just over 90%) in a 2050 Nobuild future. Of the 38 centerline miles of roadway slipping from LOS A into other categories, about 11 fall into LOS F. Figure 32 graphically illustrates the shift in LOS from the 2019 base to the future Nobuild. Figure 33 and Figure 34 below provide maps of forecast LOS for the roadways in the project area in a 2050 Nobuild future in the PM peak hour. A good part of the shift into LOS F is on the Glenn Highway in the northeastern corner of the Anchorage Bowl and along the Glenn Highway and 5th Avenue within the project area.

TABLE 14: ANCHORAGE BOWL FORECAST DAILY 2050 NOBUILD ROAD CENTERLINE MILES BY VOC/LOS CATEGORY COMPARED TO 2019 BASEYEAR

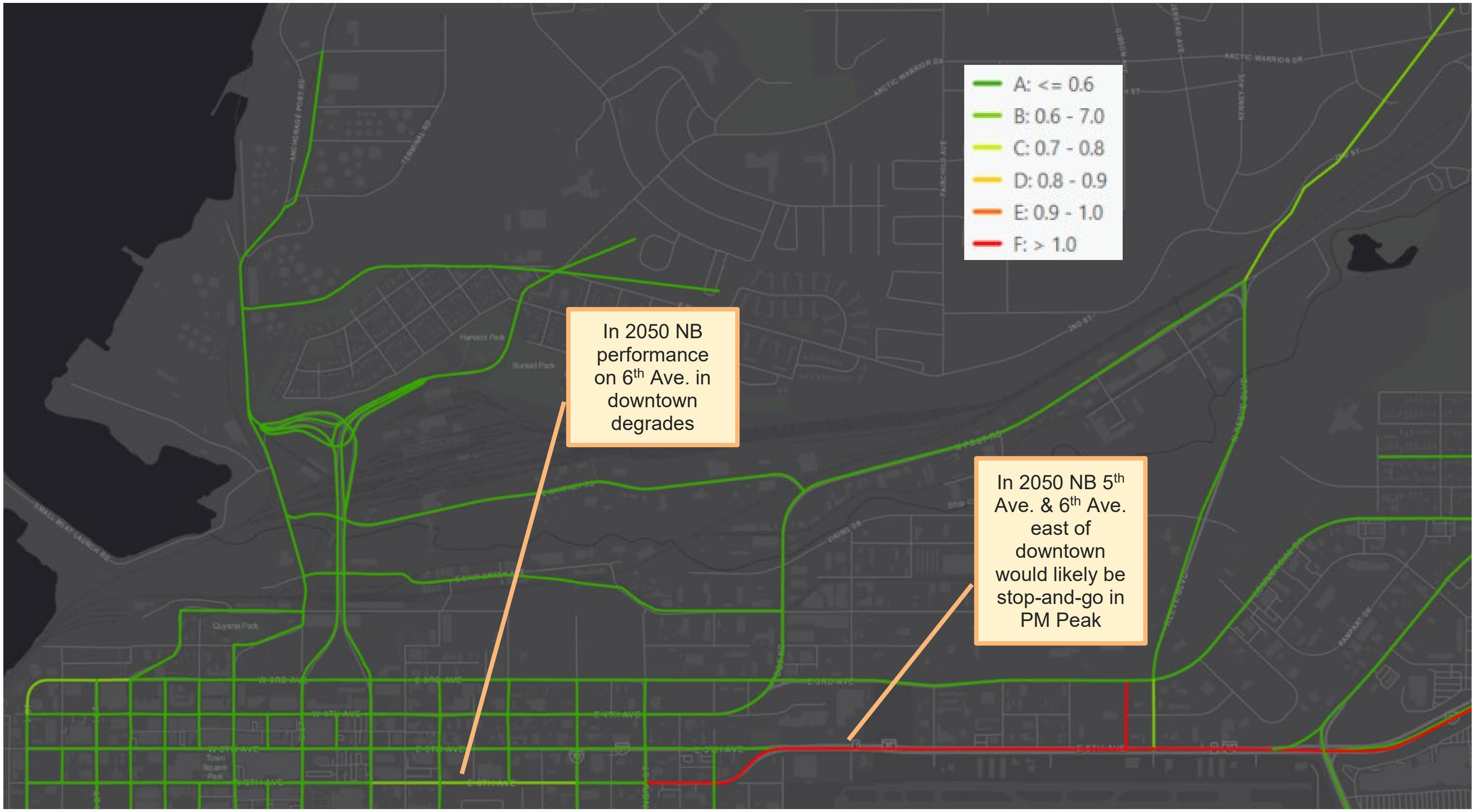
VOC Bin with LOS Category	2019 Centerline Miles at LOS	2050 Centerline Miles at LOS	2050-2019 Change in Centerline Miles
A: <0.6	926	888	(38)
B: 0.6-0.7	26	38	12
C: 0.7-0.8	16	21	6
D: 0.8-0.9	12	16	4
E: 0.9-1.0	3	8	6
F: 1.0 +	7	18	11
Total	989	989	-

FIGURE 32: ANCHORAGE BOWL FORECAST DAILY 2050 NOBUILD CHANGE FROM 2019 CENTERLINE MILES BY VOC/LOS CATEGORY



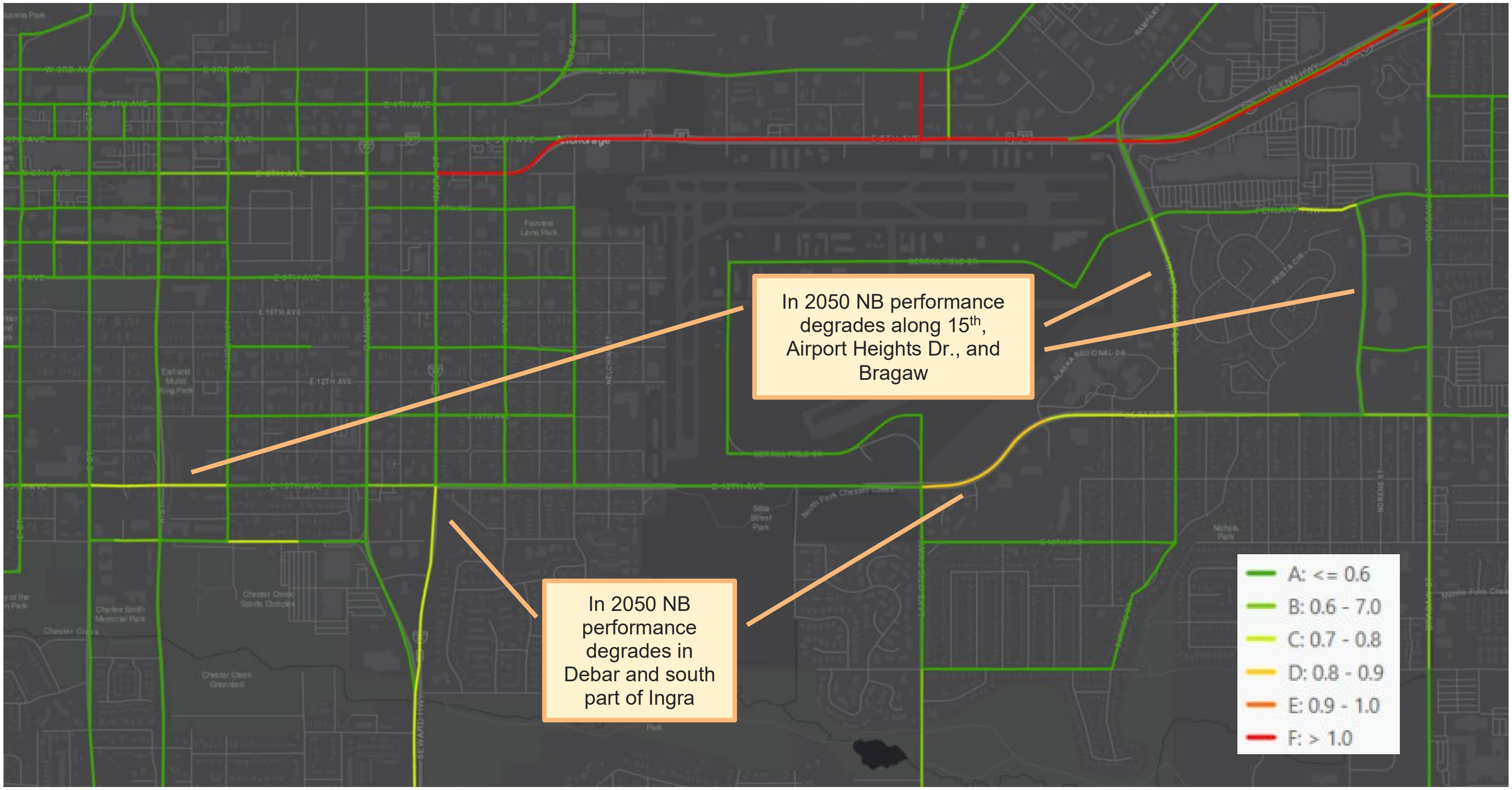
Other 2050 congestion changes in the project area itself include more congestion on 6th Avenue as it approaches the north end of the Ingra-Gambell couplet, poorer performance on 15th Avenue at the southwest part of the project area, and decreasing LOS on the south part of Ingra approaching the couplet. East of the Seward-Glenn, performance is likely to degrade on Airport Heights Drive and Bragaw. Debarr south of Merrill field also shows noticeable LOS degradation.

FIGURE 33: 2050 NOBUILD PM PEAK HOUR (5PM TO 6PM) ESTIMATED VOC IN NORTH PART OF THE PROJECT AREA BY LOS



Grade-separated facilities mapped separately

FIGURE 34: 2050 PM PEAK HOUR (5PM TO 6PM) FORECAST VOC IN SOUTH PART OF THE PROJECT AREA BY LOS



Grade-separated facilities mapped separately

2050 NOBUILD PERFORMANCE SUMMARY FOR SELECTED ROAD FACILITIES AND SCREENLINES

Drilling further into 2050 Nobuild at the facility level reveals more detail about likely change from 2019. Table 15, Figure 35, and Figure 36 illustrate the forecast 2050 daily VMT, VHT, and VHD and change from 2019 in a Nobuild future. Of note is the heavy future demand for both 5th Avenue and the Glenn shown in the VMT findings. The Glenn, Seward Highway, and Ingra all are forecast to experience the most significant increases in delay amidst an expectable across-the board increase in delay.

The selected segments of 5th Avenue, Gambell, A and C streets, Tudor, and Muldoon show the next-largest increase in delay in 2050. This highlights the importance of 5th Avenue as a part of the highway-to-highway connection, that the A/C corridor is a key parallel route to the Seward-Glenn connection, and that the Tudor/Muldoon corridor is an alternate route.

TABLE 15: 2050 NOBUILD ANCHORAGE BOWL FORECAST DAILY VOLUMES, VMT, VHT, AND VHD BY SELECTED ROADS, COMPARED TO 2019

Facility	2019 VMT	2050 VMT	2019 VHT	2050 VHT	2019 VHD	2050 VHD	2019 Delay % of VHT	2050 Delay % of VHT
GlennHwy	33,347	43,729	860	1,183	253	387	29.5%	32.8%
NewSewardHwy	31,353	35,585	1,069	1,231	409	482	38.2%	39.1%
GambellSt	11,714	13,906	451	538	113	136	25.0%	25.3%
IngraSt	18,592	21,230	840	968	318	372	37.9%	38.5%
5thAve	30,740	38,004	900	1,123	90	121	10.0%	10.8%
3rdAve	8,280	10,067	228	276	19	23	8.4%	8.2%
15thAve	15,472	17,913	478	555	37	44	7.7%	7.9%
ASt	9,976	11,434	439	506	107	124	24.3%	24.6%
CSt	8,478	9,326	347	383	97	108	27.9%	28.1%
TudorRd	33,912	36,383	969	1,047	215	238	22.2%	22.8%
MuldoonRd	16,368	21,093	455	591	91	122	20.0%	20.7%
NorthernLightsBlvd	11,973	13,009	331	362	46	52	14.0%	14.4%

FIGURE 35: 2050 NOBUILD DAILY VMT ON SELECTED ROADS, COMPARED TO 2019

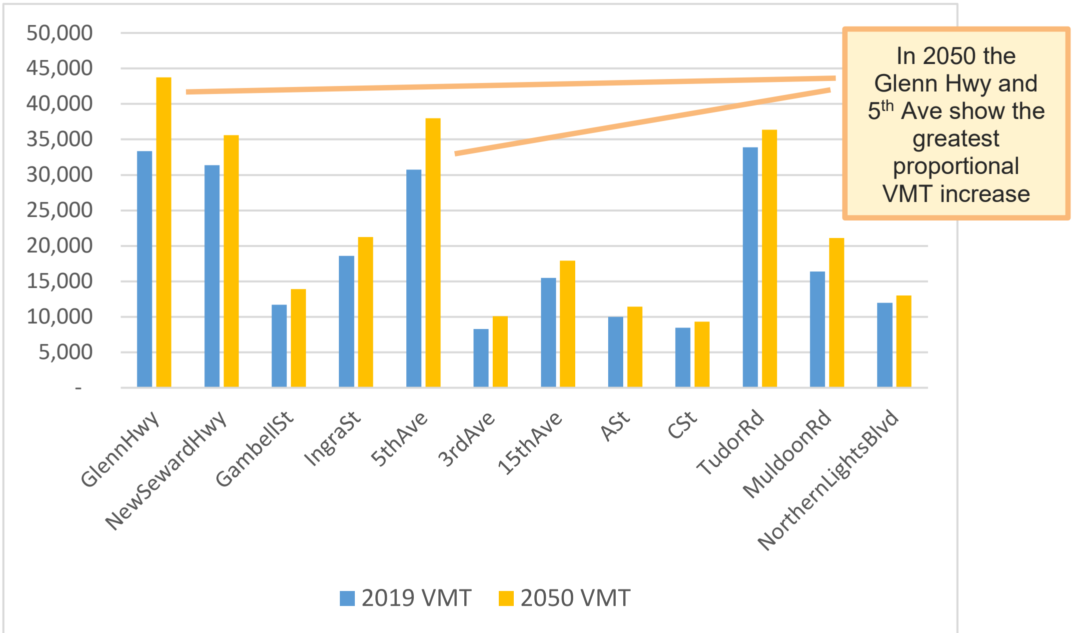
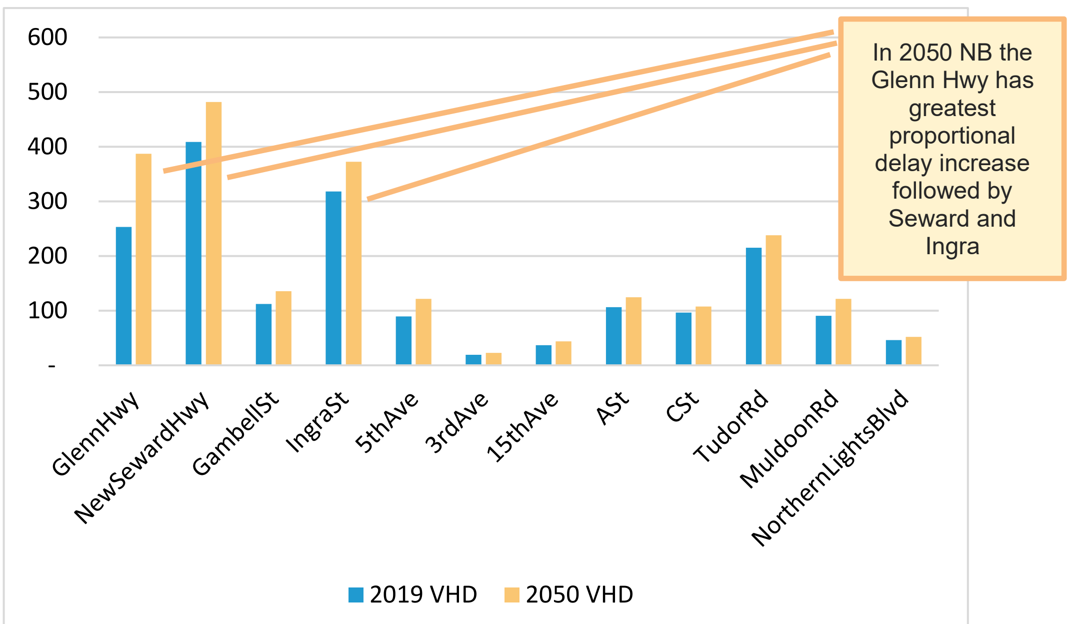
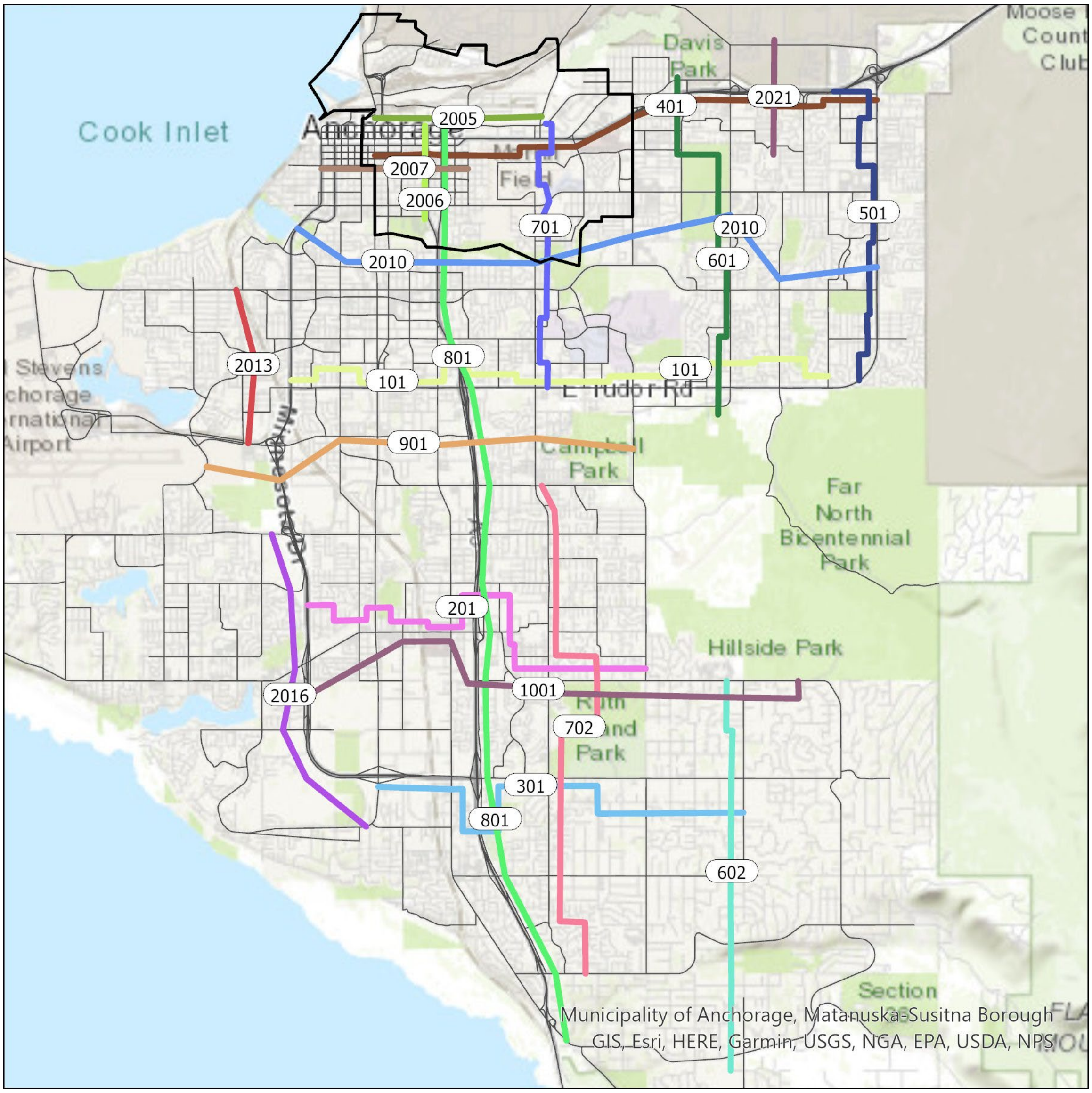


FIGURE 36: 2050 NOBUILD DAILY VHD ON SELECTED ROADS, COMPARED TO 2019



Forecast 2050 Nobuild volumes by screenline offer another window into future conditions in a Nobuild scenario. Figure 37 repeats the Anchorage Bowl screenline reference map for ease of use with Table 16 which shows the estimated 2019 screenline volumes, 2050 Nobuild forecast volumes, and screenline volume change from 2019 to 2050 side by side. See also Appendix B which shows a larger-scale view of the screenline map.

FIGURE 37: SG PEL TRAVEL MODEL SCREENLINES IN THE ANCHORAGE BOWL



Noting that screenlines measure the total volume of all roadways they cut across, the 2050 Nobuild forecast screenline volumes tend to confirm findings suggested by the facility-level analysis documented above.

First, percentage increases in 2050 daily volumes over 2019 are larger than the average VMT increase of about 15% on screenline #601 (which measures east-west flows on the Glenn Highway and parallel facilities east of downtown Anchorage) which shows a 18% increase. Likewise, screenline #501 (which captures all east-west flows coming into the Bowl from the Glenn highway regardless of how they work their way through the area bounded by Muldoon and Tudor) would have a 25% increase . The screenline #501 change plus the 16% increase on #401 (measuring north-south flows crossing the 5th Avenue/Glenn axis) support the hypothesis that a significant part of potential Seward-Glenn future volumes come from travel along the Glenn and that the Muldoon-Tudor corridor is an alternate route for some of those movements.

Second, the screenline performance described above contrasts with the corresponding changes on the #2010 screenline (which measures north-south flows on the Seward Highway and parallel facilities south of the Ingra-Gambell couplet), the #901 screenline (measuring north-south flows further south), and the #2013 screenline measuring east-west flows just east of the airport. Those three screenlines show 2050 increases over 2019 ranging from 12% to just over 15%.

Taken together (and factoring in the findings from the Origin-Destination Study and the socio-economic growth patterns previously described) the forecasts show that the larger drivers of future traffic demand for the Seward-Glenn corridor will be the northeastern part of the Anchorage Bowl, CER, and MSB. Existing travel patterns discussed in the Origin-Destination Study will remain but more of the growth in demand will be from parts northeast.

TABLE 16: ANCHORAGE BOWL FORECAST 2050 NOBUILD VOLUMES BY SCREENLINE

Screenlines most important to the project area highlighted gray—803 is 801 north of Dowling

Screenline	TotalEst 2050	TotalEst 2019	Difference	PercDiff
101_Tudor	203,120	186,397	16,723	9%
201_Dimond_Abbott_N	163,126	146,963	16,163	11%
301_OMalley	61,593	55,211	6,382	12%
401_5thAve_GlennHwy	183,357	158,541	24,816	16%
501_Muldoon	133,100	106,666	26,434	25%
601_Boniface	156,395	132,771	23,624	18%
602_Parallel_Seward	24,516	22,530	1,986	9%
701_LakeOtis	220,175	195,466	24,709	13%
702_LakeOtis	70,078	60,271	9,807	16%
801_Seward	345,712	305,155	40,557	13%
802_Seward_S	106,580	94,141	12,439	13%
803_Seward_N	239,132	211,015	28,117	13%
901_AirportRd	171,868	153,386	18,482	12%
1001_Dimond_Abbott_S	124,962	112,510	12,452	11%
2001_Glenn_Kink	28,214	17,015	11,199	66%
2002_Glenn_Birchwood	69,468	44,861	24,607	55%
2003_Glenn_Eagle	82,647	58,212	24,435	42%
2005_3rdAve	31,363	28,800	2,563	9%
2006_Gambell	77,172	65,993	11,179	17%
2007_9thAve	138,360	121,360	17,000	14%
2010_15th_Fireweed	252,870	220,723	32,147	15%
2013_Hickel_Airport	62,161	54,609	7,552	14%
2016_Hickel	83,686	76,145	7,541	10%
2020_NewSewardHwy	9,389	7,954	1,435	18%

2050 NOBUILD ESTIMATED ROADWAY VEHICLE VOLUMES AND DELAY

Figure 38, Figure 39, Figure 40, and Figure 41 show forecast 2050 roadway volumes and VHD in the project area. These maps reinforce findings mentioned above and add additional nuances.

First, the volumes in Figure 38 and Figure 39 vividly illustrate the amount of flow likely to be demanded of key facilities in the future, the heaviest-used of which would be 6th Avenue in the north part of downtown Anchorage, 5th Avenue and the Glenn Highway east of the Ingra-Gambell couplet, the Ingra-Gambell couplet (Ingra especially), the Seward approach to the couplet, and the Muldoon-Tudor corridor. The 15th Avenue/Debarr east-west route will also be in high demand as will the north-south axes of Lake Otis Parkway, Airport Heights Drive, and Bragaw further to the east.

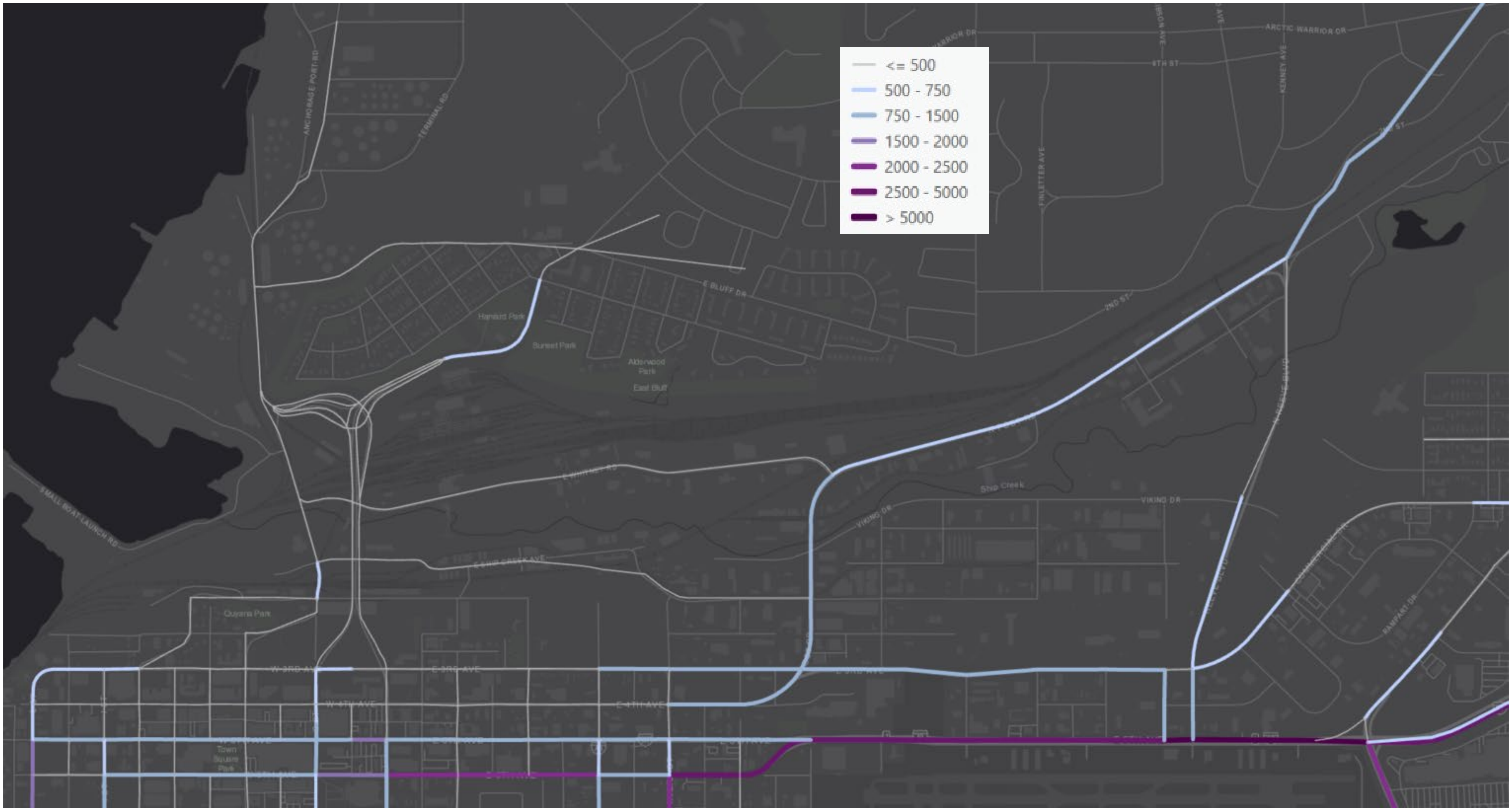
Second, the VHD maps in Figure 40 and Figure 41 show that likely delay in a 2050 Nobuild scenario would be significant on 5th Avenue, Ingra, the Seward as it approaches the couplet northbound, and the Glenn Highway just northeast of Merrill Field and further to the northeast. The C Street/A Street couplet in the western part of downtown will see more delay in 2050 (note that trips to and from the airport are likely affecting the C/A couplet). The east-west street grid (e.g. 5th and 6th Avenues) in the northwest part of the project area (see Figure 41) also shows noticeable delay increases. Note that the VHD categories in the map key use a geometric scale (each successive bin doubles the upper limit of the previous bin) to capture the full range of future delay while retaining comparability to the 2019 figures.

It is suggestive that Ingra, the northbound leg of the couplet, appears to suffer more delay and performance decline than Gambell, the southbound leg. The figures in *Appendix B: Excerpts from the Origin-Destination Study*[16] offer a likely explanation: most of the demand for the Seward-Glenn corridor using its 5th Avenue segment operates on a southwest-to-northeast diagonal axis from the Northeast District, CER, and MSB to areas including downtown, neighborhoods southwest of downtown, the airport, and places south of the airport. This movement also has the C/A couplet and the L/I couplet west of the project area as logical alternative routes to the Ingra/Gambell couplet. In contrast, in 2019 there was relatively little demand from places east of the Seward/Glenn for using the 5th Avenue facility (see Figure B2 and B3 in Appendix B). Flows using the Seward south of Ingra/Gambell in 2019 demonstrated more of a north-south axis, with northbound origins straddling the Seward/Glenn line and destinations also straddling that line (see Figure B4 and Figure B5 in Appendix B). In summary, the downtown Anchorage street grid, L/I couplet, and C/A couplet seem to provide a resilient system for the overall demand using 5th Avenue since that demand has origins and destinations west of Seward/Glenn and southwest of downtown Anchorage. The system east of Seward/Glenn appears to depend more on the Ingra/Gambell couplet, especially Ingra, for demand originating south of the couplet and east of the Seward/Glenn line. This is borne out by

[16] *SG PEL Origin-Destination Study Report*. 2022. By RSG and HDR for Alaska Department of Transportation and Public Facilities.

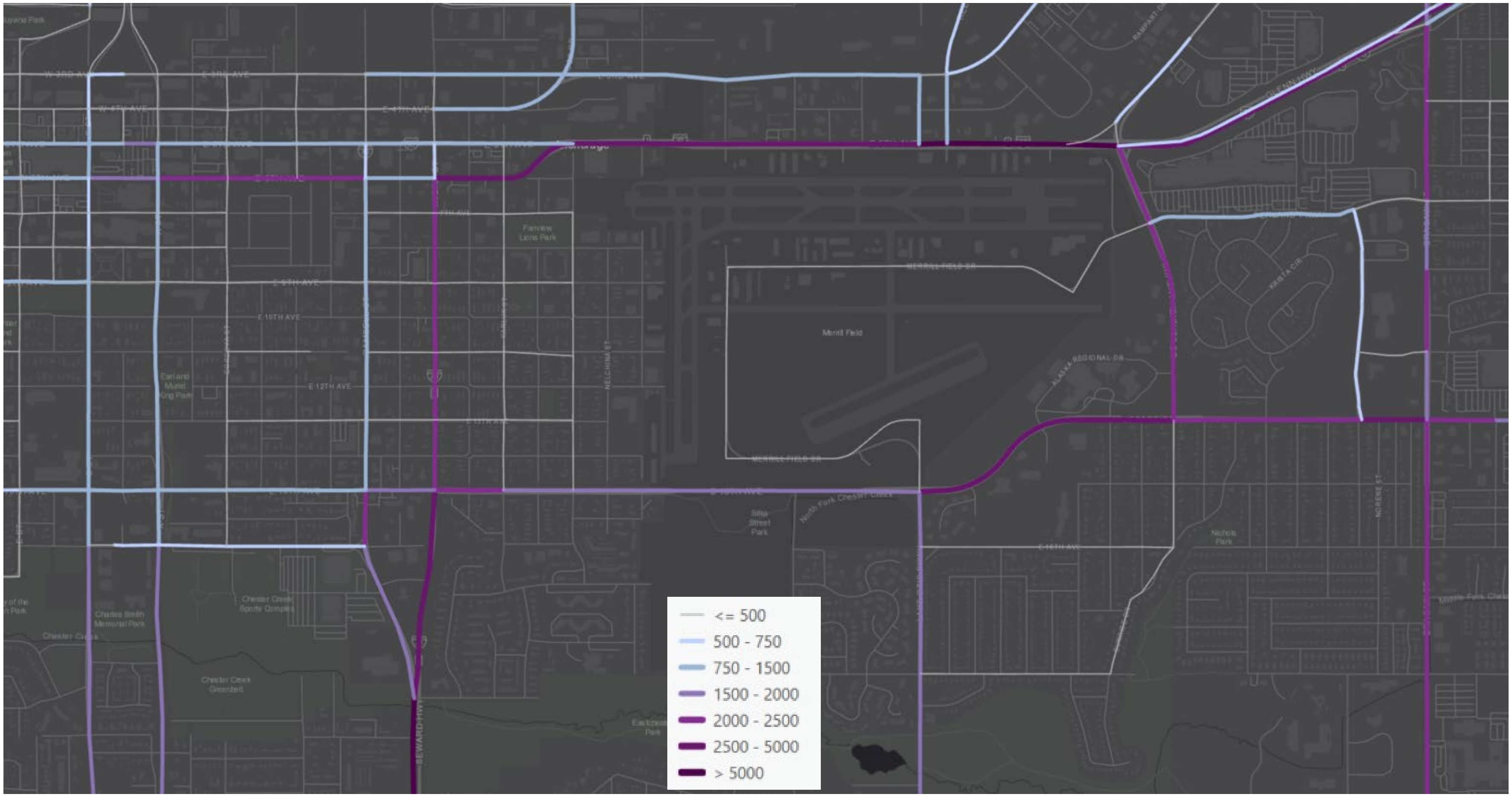
the heavy 2050 forecast demand and increased delay on East Northern Lights Boulevard, Debarr Road, and the Lake Otis Parkway.

FIGURE 38: 2050 NOBUILD FORECAST PM PEAK HOUR (5PM TO 6PM) VEHICLE VOLUMES IN THE NORTH PART OF THE PROJECT AREA



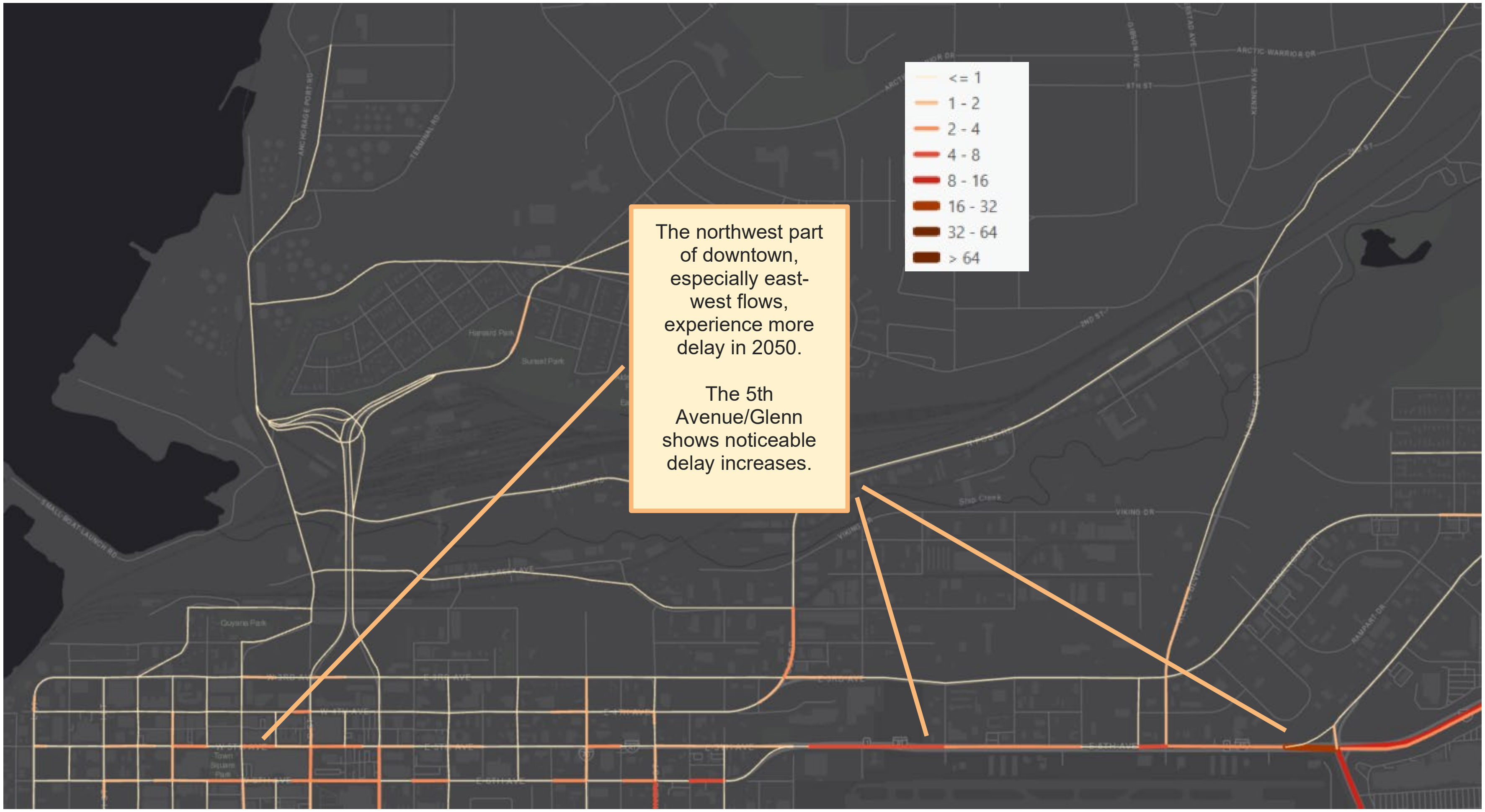
Grade-separated facilities mapped separately

FIGURE 39: 2050 NOBUILD FORECAST PM PEAK HOUR (5PM TO 6PM) VEHICLE VOLUMES IN THE SOUTH PART OF THE PROJECT AREA



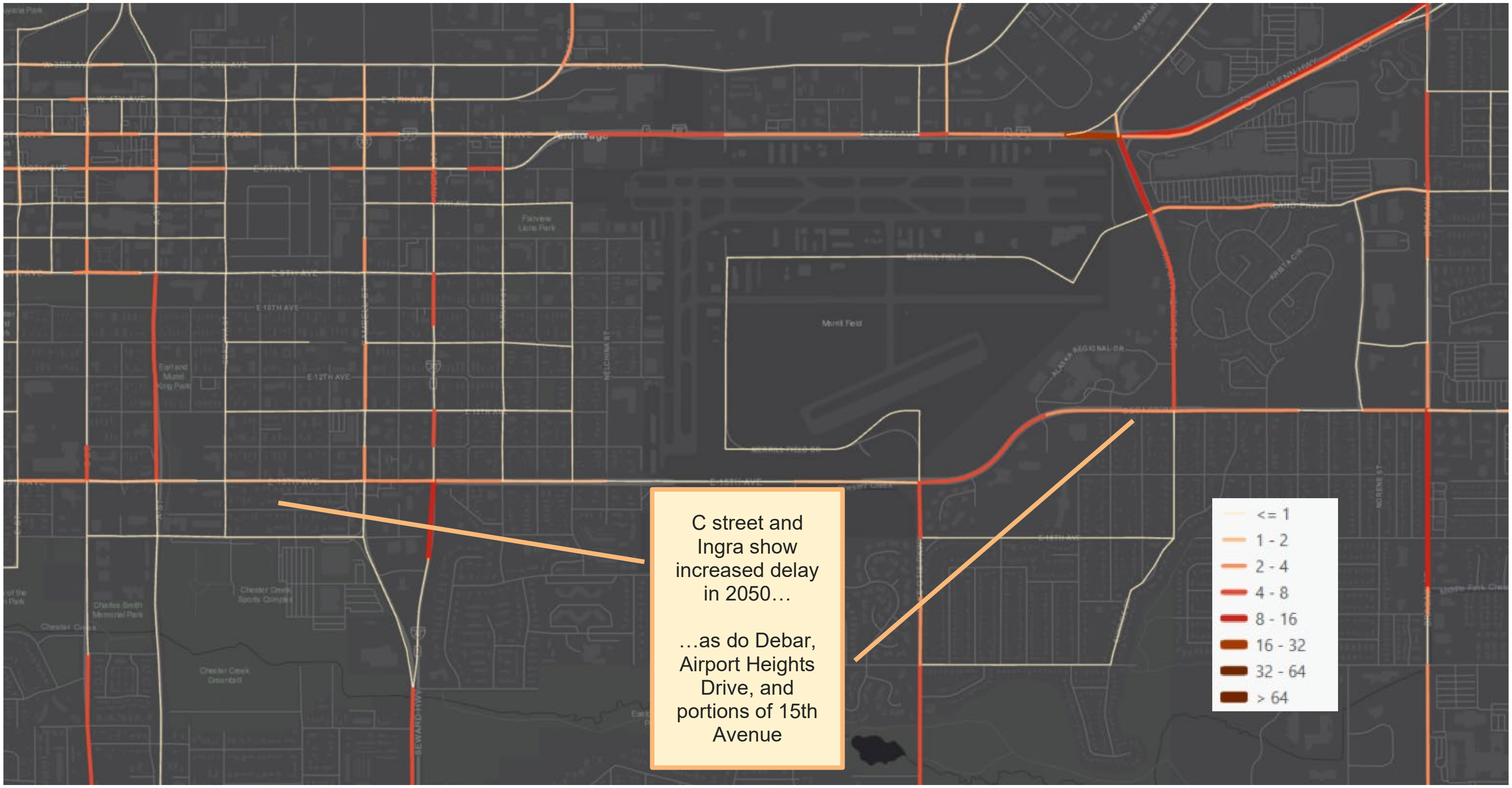
Grade-separated facilities mapped separately

FIGURE 40: 2050 NOBUILD FORECAST PM PEAK HOUR (5PM TO 6PM) VHD IN THE NORTH PART OF THE PROJECT AREA



Grade-separated facilities mapped separately

FIGURE 41: 2050 NOBUILD FORECAST PM PEAK HOUR (5PM TO 6PM) VHD IN THE SOUTH PART OF THE PROJECT AREA



Grade-separated facilities mapped separately

2050 NOBUILD TRANSIT PERFORMANCE

The 2050 Nobuild forecast indicates increased transit ridership of 12,018 total regional daily weekday boardings or an increase of 981 (8.9%) boardings over the 2019 estimate of 11,037 daily boardings.

2050 NOBUILD CONCLUSIONS

In summary, combining the forecast data cited above, the Origin-Destination Study (portions of which are reproduced in *Appendix B: Excerpts from the Origin-Destination Study* below for easy reference) and the various maps in this report, several over-arching observations can be drawn:

- Congestion will increase in the Anchorage Bowl overall in a 2050 Nobuild future but would still be relatively low compared to other regions (2.4% of daily vehicle hours traveled spent in delay conditions). This is consistent with the modest 6% forecast population growth from 2019 to 2050 in the Municipality of Anchorage (which includes the Anchorage Bowl and Chugiak-Eagle River).
- 5th Avenue and Glenn Highway east of the Ingra/Gambell couplet will likely become more of a chokepoint in a 2050 Nobuild future. This is consistent with the stronger population growth in the Matanuska-Susitna Borough (which provides a good part of the overall modeled region 18% forecast population growth to 2050) and the Origin-Destination Study findings showing that in 2019 13% to 20% of the flows east/west along 5th Avenue come from or go to the MSB.
- The south part of Ingra Street and the Seward Highway immediately south of the couplet are also likely to become more congested in a 2050 Nobuild scenario but would not likely experience as much performance degradation as the Glenn and 5th Avenue.
- There is and will likely continue to be strong demand on a diagonal axis from the southwest portion of the Anchorage Bowl to and from the northeast (and parts beyond) that utilizes the combined system of Ingra/Gambell and A/C streets. The combination of those facilities and the Anchorage downtown street grid appear to be relatively resilient but will start to become more taxed in a 2050 Nobuild future.
- Flows to and from the airport will grow, adding delay to the Airport Drive/Minnesota corridor and likely contributing to the increased congestion in the Ingra-Gambell, L/I, and A/C combined system.
- In a Nobuild future, demand from neighborhoods south of the Ingra-Gambell couplet straddling Seward/Glenn and accessing Downtown, Midtown, the Northeast District, and areas out the Glenn to the northeast will contribute to more delay on Ingra and more impact on the Glenn Highway. Lake Otis Parkway should be considered a key parallel facility to Seward/Glenn itself.
- The SG PEL alternatives design process may wish to consider the performance of the L/I, A/C, and Lake Otis Parkway facilities as part of any overall plan to improve

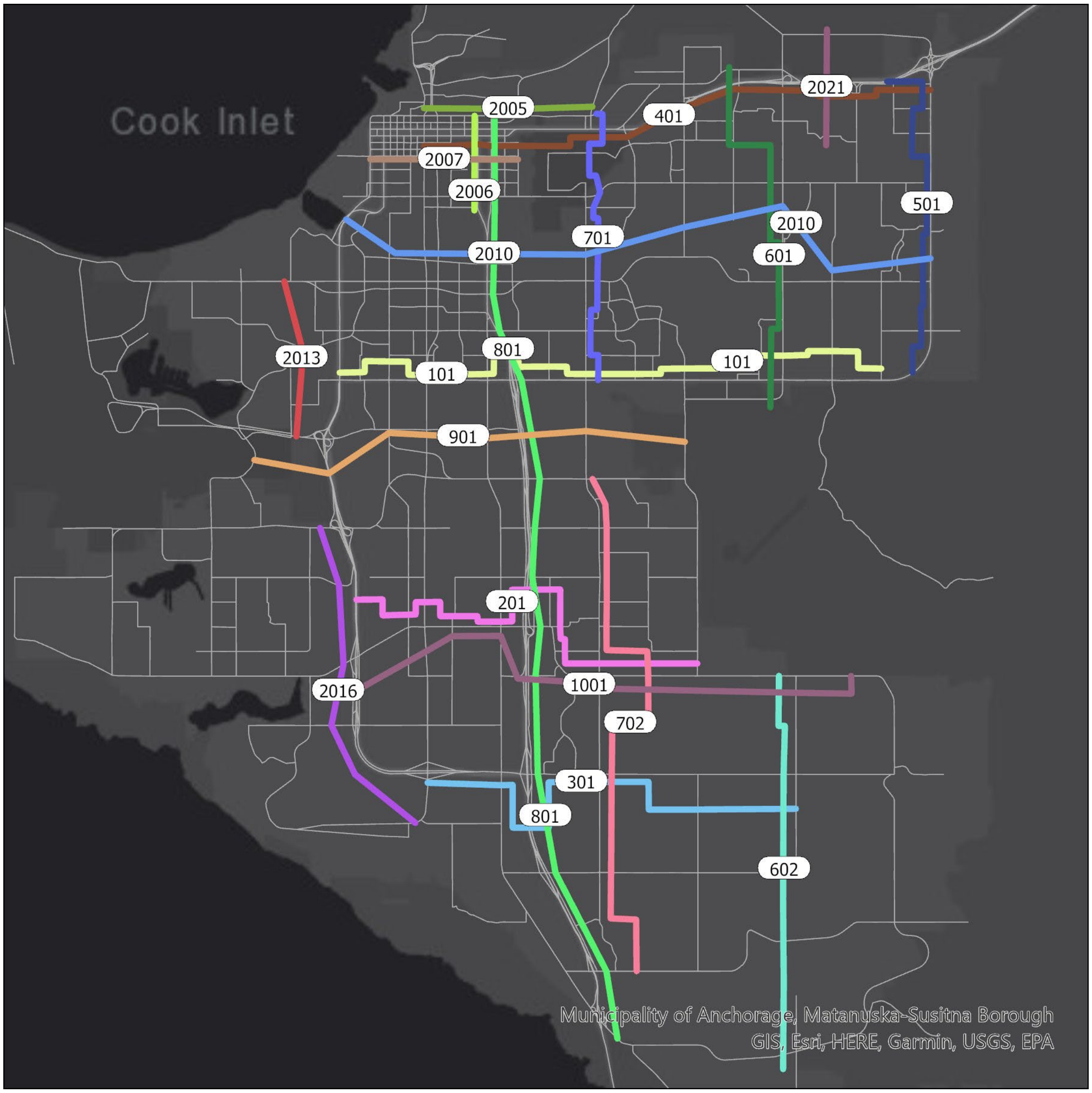
performance of the specific Seward/Glenn and Ingra/Gambell facilities, balanced with community concerns and land use policies along those corridors.

5.2 Build Scenarios

This section of the document will be populated later with the findings from the various study build alternatives.

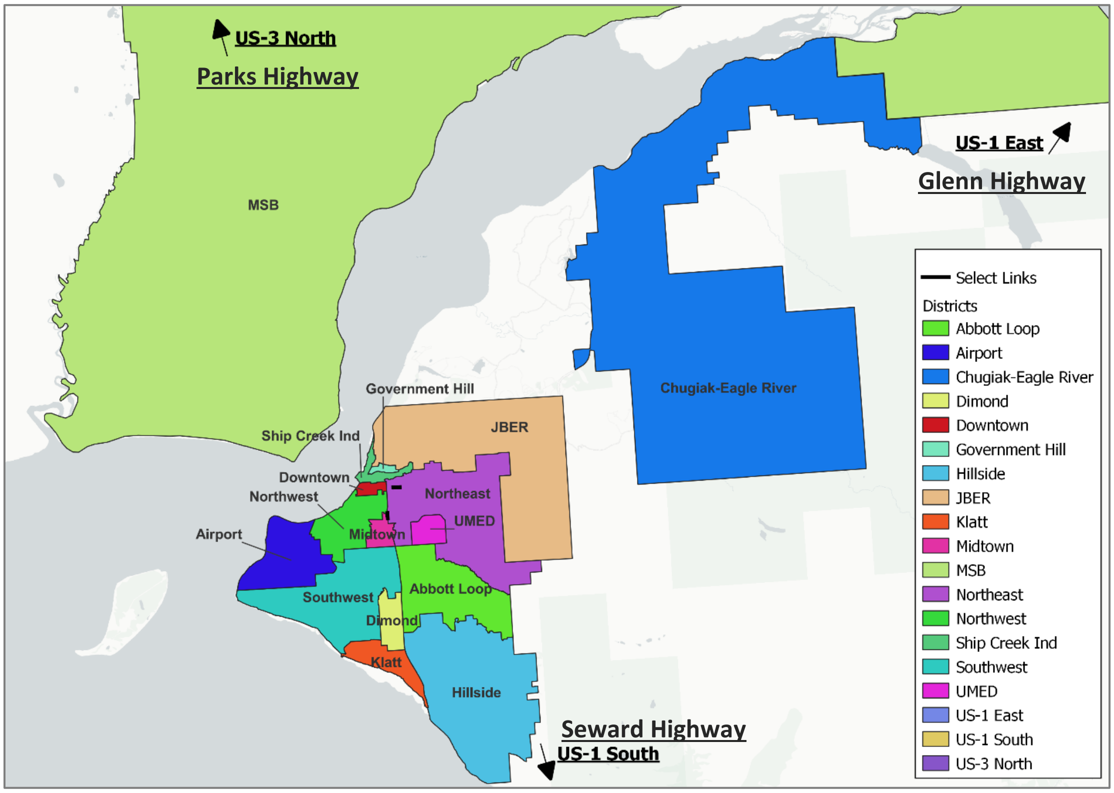
Appendix A: Screenline Map

FIGURE A1: SCREENLINE MAP SHOWING ALL OF ANCHORAGE BOWL (DISTRICT 1)



Appendix B: Excerpts from the Origin-Destination Study

FIGURE B1: ANALYSIS DISTRICTS USED IN THE ORIGIN-DESTINATION STUDY



Zoomed view of central Anchorage below

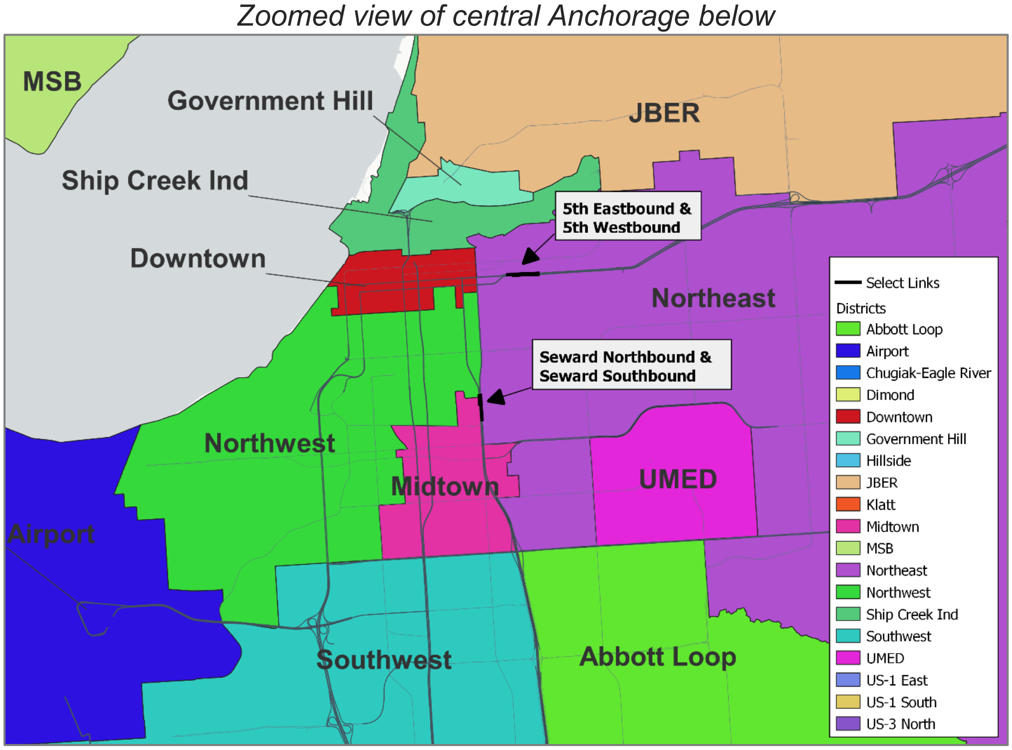


TABLE B1: ORIGIN AND DESTINATION DISTRICTS OF VEHICLE FLOWS USING 5TH AVENUE EASTBOUND (ITALICS INDICATE TRIP ENDS EXTERNAL TO THE MODEL GEOGRAPHY)

	AM		Midday		PM		Off-Peak		Daily	
	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations
Parks Highway	0%	2%	0%	2%	0%	1%	0%	2%	0%	2%
MSB	1%	15%	1%	17%	1%	19%	1%	14%	1%	16%
Glenn Highway	0%	1%	0%	0%	0%	0%	0%	1%	0%	1%
Chugiak-Eagle River	2%	15%	1%	16%	1%	20%	1%	13%	1%	16%
JBER	2%	12%	3%	6%	2%	4%	2%	7%	2%	6%
Northeast	8%	48%	8%	53%	7%	52%	7%	59%	8%	54%
Government Hill	2%	0%	1%	0%	1%	0%	1%	0%	1%	0%
Ship Creek Ind	1%	1%	2%	0%	2%	0%	1%	0%	2%	0%
Downtown	13%	1%	20%	1%	25%	0%	19%	1%	20%	1%
Northwest	19%	1%	16%	1%	14%	1%	19%	1%	17%	1%
UMED	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Midtown	6%	0%	11%	1%	15%	0%	9%	0%	11%	1%
Abbott Loop	4%	0%	4%	1%	4%	0%	5%	0%	4%	0%
Southwest	18%	1%	14%	1%	12%	1%	16%	1%	15%	1%
Airport	4%	0%	5%	0%	6%	0%	6%	0%	6%	0%
Dimond	4%	0%	5%	0%	5%	0%	5%	0%	5%	0%
Hillside	7%	1%	3%	0%	2%	0%	2%	0%	3%	0%
Klatt	2%	0%	2%	0%	2%	0%	2%	0%	2%	0%
Seward Highway	4%	1%	3%	0%	1%	0%	2%	0%	2%	0%

TABLE B2: ORIGIN AND DESTINATION DISTRICTS OF VEHICLE FLOWS USING 5TH AVENUE WESTBOUND (ITALICS INDICATE TRIP ENDS EXTERNAL TO THE MODEL GEOGRAPHY)

	AM		Midday		PM		Off-Peak		Daily	
	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations
Parks Highway	1%	0%	2%	0%	1%	0%	2%	0%	2%	0%
MSB	15%	1%	14%	1%	13%	1%	20%	1%	17%	1%
Glenn Highway	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Chugiak-Eagle River	25%	1%	16%	1%	13%	1%	18%	1%	18%	1%
JBER	4%	1%	7%	1%	10%	1%	4%	1%	6%	1%
Northeast	51%	6%	54%	6%	57%	7%	51%	6%	53%	6%
Government Hill	0%	1%	0%	1%	0%	2%	0%	2%	0%	2%
Ship Creek Ind	0%	2%	1%	1%	1%	1%	0%	2%	1%	2%
Downtown	0%	22%	1%	16%	1%	15%	0%	16%	0%	17%
Northwest	0%	15%	1%	16%	1%	17%	1%	17%	1%	16%
UMED	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%
Midtown	0%	17%	1%	16%	1%	16%	0%	14%	0%	15%
Abbott Loop	0%	3%	0%	3%	0%	4%	0%	4%	0%	4%
Southwest	1%	12%	1%	14%	1%	14%	1%	15%	1%	14%
Airport	0%	5%	0%	5%	0%	3%	0%	6%	0%	5%
Dimond	0%	10%	0%	9%	0%	7%	0%	8%	0%	9%
Hillside	1%	2%	0%	3%	0%	4%	0%	2%	0%	3%
Klatt	0%	1%	0%	3%	0%	4%	0%	3%	0%	3%
Seward Highway	0%	2%	0%	3%	0%	2%	0%	2%	0%	2%

TABLE B3: ORIGIN AND DESTINATION DISTRICTS OF VEHICLE FLOWS USING THE SEWARD NORTHBOUND SELECT LINK (ITALICS INDICATE TRIP ENDS EXTERNAL TO THE MODEL GEOGRAPHY)

	AM		Midday		PM		Off-Peak		Daily	
	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations
Parks Highway	0%	1%	0%	1%	0%	0%	0%	1%	0%	1%
MSB	1%	4%	0%	7%	0%	10%	1%	6%	0%	7%
Glenn Highway	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Chugiak-Eagle River	1%	4%	1%	7%	0%	9%	0%	5%	1%	6%
JBER	0%	7%	0%	4%	0%	3%	0%	5%	0%	4%
Northeast	10%	28%	10%	38%	9%	42%	9%	38%	9%	38%
Government Hill	0%	2%	0%	3%	0%	3%	0%	3%	0%	3%
Ship Creek Ind	0%	4%	0%	2%	0%	1%	0%	3%	0%	3%
Downtown	0%	24%	1%	16%	1%	12%	0%	18%	0%	17%
Northwest	5%	18%	6%	16%	7%	14%	5%	16%	6%	16%
UMED	3%	0%	7%	0%	7%	0%	4%	0%	6%	0%
Midtown	9%	2%	19%	2%	27%	1%	16%	2%	18%	2%
Abbott Loop	24%	0%	16%	1%	13%	1%	18%	1%	17%	1%
Southwest	12%	1%	10%	1%	12%	2%	12%	1%	11%	1%
Airport	0%	0%	1%	0%	1%	0%	2%	0%	1%	0%
Dimond	6%	1%	9%	1%	10%	0%	8%	0%	9%	0%
Hillside	19%	1%	9%	0%	6%	1%	13%	0%	11%	0%
Klatt	5%	0%	4%	0%	4%	0%	5%	0%	5%	0%
Seward Highway	5%	1%	5%	0%	3%	0%	6%	0%	5%	0%

TABLE B4: ORIGIN AND DESTINATION DISTRICTS OF VEHICLE FLOWS USING THE SEWARD SOUTHBOUND SELECT LINK (ITALICS INDICATE TRIP ENDS EXTERNAL TO THE MODEL GEOGRAPHY)

	AM		Midday		PM		Off-Peak		Daily	
	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations	Origins	Destinations
Parks Highway	1%	0%	1%	0%	1%	0%	1%	0%	1%	0%
MSB	9%	0%	7%	0%	6%	0%	11%	0%	8%	0%
Glenn Highway	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Chugiak-Eagle River	17%	0%	9%	1%	5%	0%	12%	0%	10%	0%
JBER	5%	0%	8%	0%	10%	0%	5%	0%	7%	0%
Northeast	29%	7%	29%	8%	27%	9%	27%	8%	28%	8%
Government Hill	3%	0%	1%	0%	1%	0%	3%	0%	2%	0%
Ship Creek Ind	2%	0%	3%	0%	3%	0%	1%	0%	2%	0%
Downtown	12%	0%	20%	0%	24%	0%	18%	0%	19%	0%
Northwest	17%	4%	17%	4%	18%	3%	17%	2%	17%	3%
UMED	0%	7%	0%	4%	0%	2%	0%	4%	0%	4%
Midtown	1%	32%	1%	25%	1%	22%	1%	23%	1%	25%
Abbott Loop	1%	10%	1%	15%	1%	19%	1%	16%	1%	16%
Southwest	1%	8%	1%	9%	1%	9%	1%	12%	1%	10%
Airport	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dimond	0%	18%	0%	14%	1%	11%	0%	14%	0%	14%
Hillside	1%	6%	1%	9%	0%	13%	0%	9%	1%	10%
Klatt	0%	3%	0%	6%	0%	6%	0%	7%	0%	6%
Seward Highway	0%	3%	0%	3%	0%	3%	1%	3%	1%	3%

FIGURE B2: 2019 DAILY OBSERVED ORIGINS AND VEHICLE FLOWS USING THE 5TH AVENUE SELECT-LINK LOCATION (IN RED) EASTBOUND

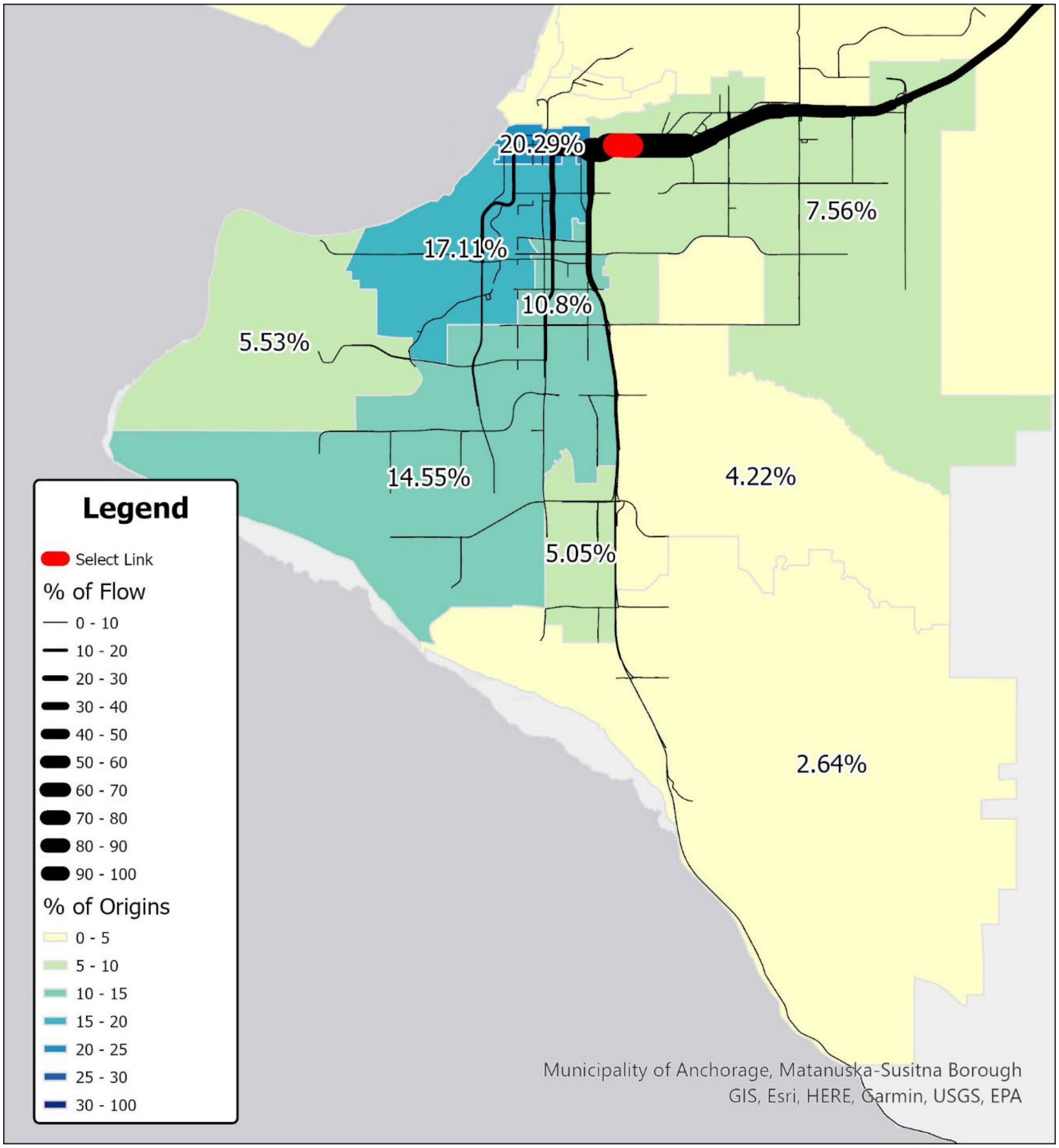


FIGURE B3: 2019 DAILY OBSERVED DESTINATIONS AND VEHICLE FLOWS USING THE 5TH AVENUE SELECT-LINK LOCATION (IN RED) EASTBOUND

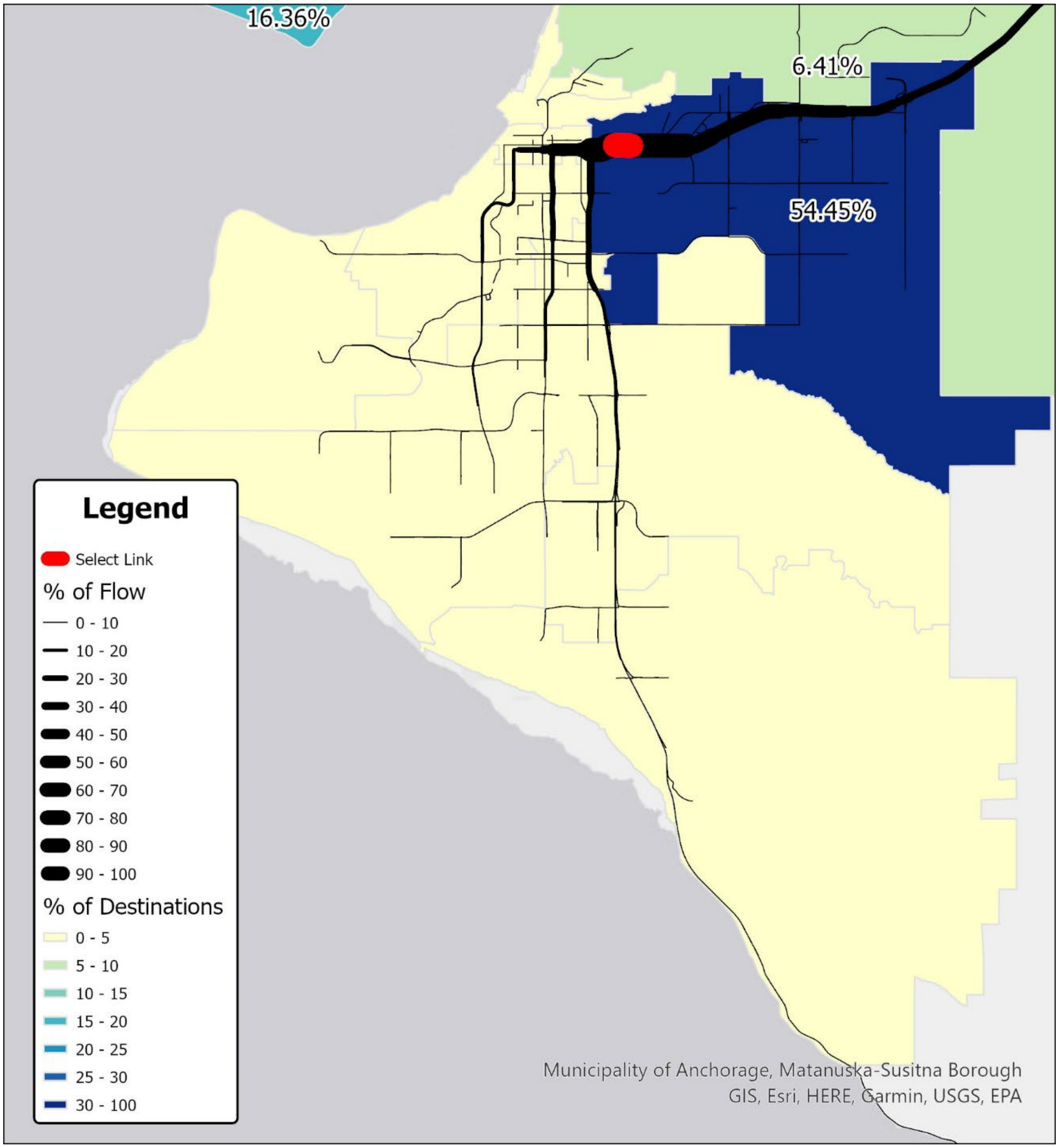


FIGURE 42: 2019 DAILY OBSERVED ORIGINS AND VEHICLE FLOWS USING THE SEWARD SELECT-LINK LOCATION NORTHBOUND

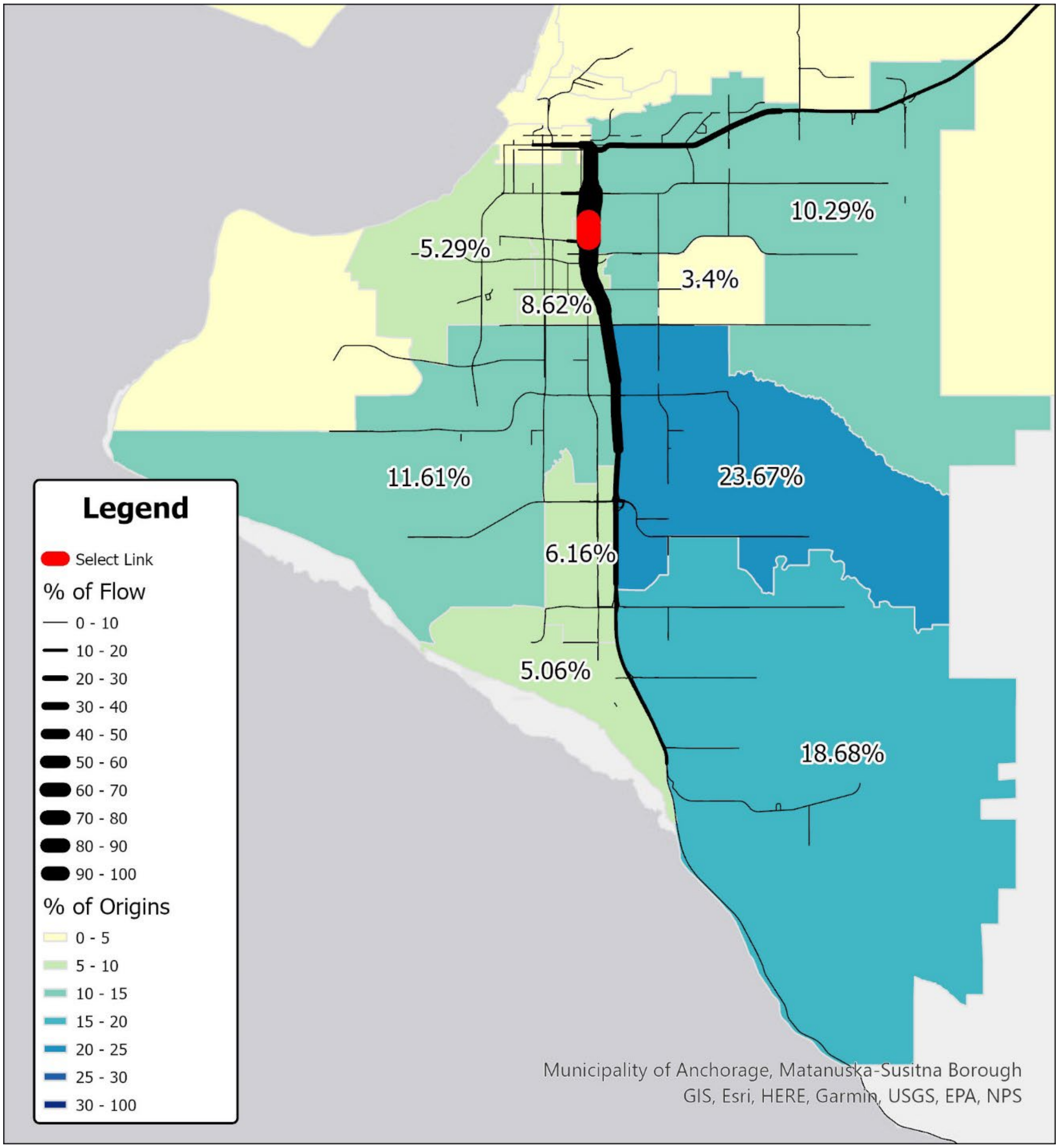


FIGURE B5:2019 DAILY OBSERVED DESTINATIONS AND VEHICLE FLOWS USING THE SEWARD SELECT-LINK LOCATION NORTHBOUND