WHAT'S NEW? - VERSION 9.0.0

WFRC / MAG

August 1, 2023

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1 Documentation

Documentation of the Wasatch Front Travel Demand Model (WF TDM) has been separated into three documents:

- What's New Report – describes the changes made to the WF TDM since the last model release
- Validation Report – provides the base year validation of the current version of the WF TDM, as well as a reasonableness check of the model as a forecasting tool
- Model Process Report – provides an overview of the model, a summary of the model's input data sets, and an outline of the model's primary steps and logic

These reports will be available as PDF documents in the "_Notes" folder in the WF TDM's root directory. However, it is expected that the primary means of accessing the model's documentation will be online at the following links:

- What's New
- Validation Report
- Model Process Report (in progress)
- Previous Versions (in progress)

2 General Parameters

Changes made to the `0_GeneralParameters.block` file are discussed in this section.

2.1 Zone Parameters

The TAZ and highway node schema was changed as a result of the version 9 TAZ splits. The following parameters were updated to reflect these changes.

2.1.1 TAZ

Table 2.1: Renumbered TAZ Ranges

Parameter	v9 Value	v8 Value	Notes
UsedZones	3629	2881	Highest TAZ number used by model
BoxElderRange	1-153	1-140	Box Elder County Range
WeberRange	154-581	141-423	Weber County Range
DavisRange	582-905	424-654	Davis County Range
SLRange	906-2216	655-1788	Salt Lake County Range
UtahRange	2217-3546	1789-2881	Utah County Range
Dummyzones	3547-3600	2882-3400	Placeholder for future TAZ splits
Externalzones	3601-3629	136-140, 421-423, 1782-1788, 2874-2881	External zones
NorthBC	3604-3606	138, 139, 140	North Brigham City external zones

The following TAZ parameters ranges were removed from the general parameters file as they were not being used in the WF TDM:

- RegionRange
- WFRCRange
- MAGRange

2.1.2 Highway Nodes

Table 2.2: Renumbered Highway Nodes

Parameter	v9 Value	v8 Value	Notes
HwyNodes	10000-99999	3401-999999	Highway and transit node range

2.1.3 College Zones

Where noted, several colleges were effectively discontinued, meaning references to these schools are still in the code base, but enrollment was set to zero.

Table 2.3: Renumbered College Zones

Area	Parameter	v9 Value	v8 Value	Notes
WFRC Colleges	Ensign (was LDSBC)	1029	950	Ensign College
	Westmin	1263	1150	Westminster College
	UOFU_Main	1051	1075	University of Utah - Main
	UOFU_Med	1007	1076	University of Utah - Medical (removed)
	WSU_Main (was WSU_OGDEN)	437	383	Weber State University - Main
	WSU_Davis	693	525	Weber State University - Davis
	WSU_West	521	290	Weber State University - West (removed)
	SLCC_Main (was SLCC_TL)	1580	897	Salt Lake Community College - Main
	SLCC_SC	1231	1126	Salt Lake Community College - South City
	SLCC_JD	1776	1493	Salt Lake Community College - Jordan
	SLCC_Mead		1206	Salt Lake Community College - Meadbrook (removed)
	SLCC_ML	1886	1516	Salt Lake Community College - Miller
	SLCC_LB	1085	989	Salt Lake Community College - Library (removed)
	SLCC_HL	1525	1294	Salt Lake Community College - Highland (removed)
	SLCC_Airp	979	746	Salt Lake Community College - Airport (removed)
	SLCC_West	959	745	Salt Lake Community College - Westpointe (removed)
	SLCC_HM	2031	1607	Salt Lake Community College - Herriman (removed)
MAG Colleges	BYU	2939	2384	Brigham Young University - Main
	UVU_Main	2848	2326	Utah Valley University - Main
	UVU_Geneva	2882	2280	Utah Valley University - Geneva (removed)
	UVU_Lehi (was UVU_THANKP)	2606	2099	Utah Valley University - Lehi

Area	Parameter	v9 Value	v8 Value	Notes
	UVU_Vine	2809	2259	Utah Valley University - Vineyard
	UVU_Payson	3336	2690	Utah Valley University - Payson

Table 2.4: Renumbered College Zones (continued)

Parameter	v9 Value	v8 Value
colleges	437, 521, 693, 959, 979, 1007, 1029, 1051, 1085, 1231, 1263, 1491, 1525, 1580, 1776, 1886, 2031, 2606, 2809, 2848, 2882, 2939, 3336	290, 383, 525, 897, 950, 989, 1075, 1076, 1126, 1150, 1294, 1493, 1516, 1607, 2099, 2259, 2280, 2326, 2384, 2690

2.1.4 Zones with Off-line Trip Tables

Table 2.5: Renumbered Off-line Trip Table Zones

Parameter	v9 Value	v8 Value
Lagoon	781	562
Airport	965	742

2.1.5 Special Generator Zones

Table 2.6: Renumbered Special Generator Zones

Parameter	v9 Value	v8 Value
TempleSquare	1035	966
SLC_Library	1147	1015

2.2 Exogenous Trip Table Parameters

Income break points for the airport exogenous trip table generation were updated to reflect 2019 base year income.

Table 2.7: Income Break Points for Airport Exogenous Trip Table Generation

Parameter	v9 Value	v8 Value	Notes
Income_Lo	$45,000	$35,000	breakpoint between Inc1 & Inc2
Income_Md	$75,000	$70,000	breakpoint between Inc2 & Inc3
Income_Hi	$125,000	$100,000	breakpoint between Inc3 & Inc4

2.3 Household Disaggregation Parameters

The regional median income was updated using 2019 5-year ACS data and kept in 2019 dollars to reflect 2019 base year. Note, the version 8 value was estimated from 2015 ACS data and deflated to 2010 dollars.

Table 2.8: Household Disaggregation Parameter Income Update

Parameter	v9 Value	v8 Value
Reg_Median_Inc	$74,946	$58,793

2.4 Distribution, Mode Choice, and Assignment Parameters

2.4.1 K-Factors

K-factor variables were expanded by trip purpose to allow for more flexibility in calibrating the distribution model. However, no K-factors were needed for calibration. All K-factors were reset to 1.

Table 2.9: Reset K-Factors

Area	v9 Parameter	v9 Value	v8 Parameter	v8 Value
between Salt Lake and Utah counties	SL_UT_KFAC_Wrk	1	SL_UT_KFAC	0.85
	SL_UT_KFAC_Oth	1		
	SL_UT_KFAC_Trk	1		
	SL_UT_KFAC_Ext	1		
between Salt Lake and Davis counties	SL_DA_KFAC_Wrk	1	SL_DA_KFAC	0.95
	SL_DA_KFAC_Oth	1		
	SL_DA_KFAC_Trk	1		
	SL_DA_KFAC_Ext	1		
between Box Elder and Weber counties	WE_BE_KFAC_Wrk	1	WE_BE_KFAC	1.00
	WE_BE_KFAC_Oth	1		
	WE_BE_KFAC_Trk	1		
	WE_BE_KFAC_Ext	1		

2.4.2 Auto Occupancy

Auto or vehicle occupancy variables were expanded to include additional trips purposes. New auto-occupancy rates were calculated based on the reprocessed 2012 Household Travel Survey. Values represent average persons per vehicle for just the Wasatch Front model space. External auto-occupancy rates represent the average of internal-external and external-internal trips.

Table 2.10: Vehicle Occupancy Rates

v9 Parameter	v9 Value	v8 Parameter	v8 Value	Notes
VehOcc_HBW	1.1	VEH_OCCUPANCY_HBW	1.1	Home-Based Work
VehOcc_HBShp	1.63	VEH_OCCUPANCY_HBSHP	1.58	Home-Based Shopping
VehOcc_HBOth	1.68	VEH_OCCUPANCY_HBOTH	1.66	Home-Based Other
VehOcc_HBSch	1.76	VEH_OCCUPANCY_HBSCH	2.14	Home-Based School
VehOcc_HBC	1.12	VEH_OCCUPANCY_HBC	1.26	Home-Based College
VehOcc_NHBW	1.21	VEH_OCCUPANCY_NHBW	1.2	Non-Home-Based Work
VehOcc_NHBNW	1.76	VEH_OCCUPANCY_NHBNW	1.7	Non-Home-Based Non-Work
VehOcc_Rec	1.68	(Uses HBO)	1.64	Recreation
VehOcc_HBO	1.67	VEH_OCCUPANCY_HBO	1.64	Home-Based Other (HBShp+HBOth)
VehOcc_NHB	1.54	VEH_OCCUPANCY_NHB	1.48	Non-Home-Based (NHBW+NHBNW)
VehOcc_ExtWrk	1.16	(Uses HBW)	1.1	External Work
VehOcc_ExtHBO	1.82	(Uses HBO)	1.64	External Home-Based Other
VehOcc_ExtNHB	1.73	(Uses NHB)	1.48	Non-Home-Based
VehOcc_ExtRec	1.73	(Uses HBO)	1.64	External Recreation

Table 2.11: Vehicle Occupancy 3+ Rates

v9 Parameter	v9 Value	v8 Parameter	v8 Value	Notes
VehOcc_3p_HBW	3.53	VEH_OCC_3P_HBW	3.4	3+ Person Home-Based Work
VehOcc_3p_HBShp	3.49	(Uses HBO)	3.55	3+ Person Home-Based Shopping
VehOcc_3p_HBOth	3.73	(Uses HBO)	3.55	3+ Person Home-Based Other
VehOcc_3p_HBSch	3.88	(Uses HBO)	3.55	3+ Person Home-Based School
VehOcc_3p_HBC	3.24	VEH_OCC_3P_HBC	3.53	3+ Person Home-Based College

v9 Parameter	v9 Value	v8 Parameter	v8 Value	Notes
VehOcc_3p_NHBW	3.71	(Uses NHB)	3.51	3+ Person Non-Home-Based Work
VehOcc_3p_NHBNW	3.71	(Uses NHB)	3.51	3+ Person Non-Home-Based Non-Work
VehOcc_3p_Rec	3.73	(Uses HBO)	3.55	3+ Person Recreation
VehOcc_3p_HBO	3.68	VEH_OCC_3P_HBO	3.55	3+ Person Home-Based Other (HBShp+HBOth)
VehOcc_3p_NHB	3.71	VEH_OCC_3P_NHB	3.51	3+ Person Non-Home-Based (NHBW+NHBNW)

2.4.3 Value of Time

Value of time parameters were updated using 2019 5-year ACS data and previous model assumptions and are in 2019 dollars. Version 8 parameters were calibrated to 2015 ACS data and deflated to 2010 dollars. Values of time are in cents/minute.

Table 2.12: Value of Time Rates

v9 Parameter	v9 Value	v8 Parameter	v8 Value	Notes
VOT_Auto_Wrk	22	VOT_Auto_Wrk	18	work trips (HBW)
VOT_Auto_Per	17	VOT_Auto_Per	14	non-work trips
VOT_Auto_Ext	20	VOT_Auto_Ext	16	external
VOT_LT	37	VOT_LT	30	light truck
VOT_MD	50	VOT_MD	40	medium truck
VOT_HV	63	VOT_HV	50	heavy truck
VOT_Toll	63	VOT_Toll	50	all vehicles on tollway
VOT_HOT_DA	63	VOT_HOT_DA	50	drive alone on HOT
VOT_Auto_Wrk_Lo	9			work trips - low income (added)
VOT_Auto_Wrk_Hi	24			work trips - high income (added)
VOT_Auto_Per_Lo	7			non-work trips - loc income (added)
VOT_Auto_Per_Hi	19			non-work trips - high income (added)

2.4.4 Auto Operating Costs

Auto operating costs were updated to reflect 2019 fuel cost, average fuel economy, and cost of vehicle maintenance and are in 2019 dollars. Version 8 parameters were calibrated to 2015 data and deflated to 2010 dollars. Costs are in cents/mile.

Table 2.13: Auto Operating Cost Rates

Parameter	v9 Value	v8 Value	Notes
AOC_Auto	21.7	18.3	auto
AOC_LT	27.3	24.6	light truck
AOC_MD	55.5	47.8	medium truck
AOC_HV	74.3	63.7	heavy truck

2.4.5 Managed Lane Costs

Tolls for tollways (FT=40) were updated to reflect approximately a $5.00 toll for work trips and a $3.00 toll for non-work trips. Tolls for HOT (FT=38) and reliability lanes were updated to reflect approximately a $3.50 toll for work trips and $2.20 for non-work trips. Distances of 10.25 miles (length of average work trip) and 6.5 miles (average length of all trips) were used to determine the work/non-work toll costs in cents per mile. Version 9 tolls are in 2019 dollars. Toll costs for version 8 are in 2010 dollars.

Table 2.14: Managed Lane Cost Rates

Parameter	v9 Value	v8 Value	Notes
Cost_Toll_Pk	48	24	Tollways (FT 40) cost - Peak
Cost_Toll_Ok	48	24	Tollways (FT 40) cost - Off-peak
Cost_HOT_Pk	34	10	HOT (FT 38) cost - Peak
Cost_HOT_Ok	17	5	HOT (FT 38) cost - Off-peak
Cost_REL_Pk	34	10	Reliability lane cost - Peak
Cost_REL_Ok	17	5	Reliability lane cost - Off-peak

2.4.6 Core Bus Constant Multiplier

The parameter used to set the Core Bus constant was renamed and updated.

Table 2.15: Core Bus Constant Multiplier

v9 Parameter	v9 Value	v8 Parameter	v8 Value	Notes
RAIL2COR_MULTIPLIER	0.33	RAIL2BRT_MULTIPLIER	0.4	factor to set Core Route constant relative to LRT constant

2.4.7 CRT Adjustment Factors

The following parameters were added to adjust CRT ridership for Davis and Utah Counties. The parameters are applied in the mode choice utility calculation and represent a penalty/incentive in equivalent minutes.

- ADJ_CONST_UT = 0 ;place holder
- ADJ_CONST_CRT_UT = -5 ;encourge CRT in UT County
- ADJ_CONST_CRT_DA = 5 ;discourage CRT in Davis County
- ADJ_CONST_BRT = 0 ;place holder

2.4.8 Transit Fare Discount Factor

Transit fares (in the transit Input folder) were updated in version 9 to represent standard fares. In previous model versions, fares were coded as effective fares, which included discounts for transit passes and other discounts. Effective fares were estimated to be approximately 54% of the standard fare. A transit fare discounting parameter was added in version 9 to adjust standard transit fares back to effective transit fares. Transit fares are in version 9 are in 2019 dollars.

- FARE_DISCOUNT = 0.54

2.5 Removed Parameters

The following parameters were removed from the 0_GeneralParameters.block file.

2.5.1 County Identification Parameters

The following county identification parameters are no longer used in version 9 and were removed:

- CountyRange = '1-5'
- CountyName1 = 'Weber'
- CountyName2 = 'Davis'
- CountyName3 = 'SaltLake'
- CountyName4 = 'Utah'
- CountyName5 = 'BoxElder'
- CO_Name1 = 'WE'
- CO_Name2 = 'DA'
- CO_Name3 = 'SL'
- CO_Name4 = 'UT'
- CO_Name5 = 'BE'

2.5.2 Air Quality Conformity Report Parameters

The following air quality conformity reporting parameters are no longer used in version 9 and were removed:

- RE_ID = 0 ;Entire region
- WE_ID = 1 ;Weber
- DA_ID = 2 ;Davis
- SL_ID = 3 ;Salt Lake
- UT_ID = 4 ;Utah

- BE_ID = 5 ;BoxElder
- OC_ID = 55980 ;Ogden
- SC_ID = 67000 ;Salt Lake City
- PC_ID = 62470 ;Provo

2.5.3 Bus Speed Ratios

Bus speed ratio parameters in version 9 are read in via an input file (see section 3.1 of this report for more information). As such, the following bus speed ratio parameters were removed from the `0_GeneralParameters.block` file:

- ratio_fway = 0.95 ;bus speed to auto speed - freeways
- ratio_ramp = 0.75 ;bus speed to auto speed - freeway ramps
- ratio_part = 0.60 ;bus speed to auto speed - principal arterials
- ratio_mart_urbcbd = 0.55 ;bus speed to auto speed - minor arterials, urban/cbd
- ratio_mart_subrur = 0.65 ;bus speed to auto speed - minor arterials, suburban/rural
- ratio_collector = 0.60 ;bus speed to auto speed - collectors
- minimum_bus_speed = 10.0 ;mph

2.5.4 Prefixes for Transit Skims

Prefixes to identify transit skim output files are coded directly into the scripts in version 9. The following transit skim prefix parameters were removed from the `0_GeneralParameters.block` file:

- W_LCL_skims = 'skm_w4' ;walk-to-local skims
- D_LCL_skims = 'skm_d4' ;drive-to-local skims
- W_BRT_skims = 'skm_w5' ;walk-to-BRT skims
- D_BRT_skims = 'skm_d5' ;drive-to-BRT skims
- W_EXP_skims = 'skm_w6' ;walk-to-express bus skims
- D_EXP_skims = 'skm_d6' ;drive-to-express bus skims
- W_LRT_skims = 'skm_w7' ;walk-to-light rail skims
- D_LRT_skims = 'skm_d7' ;drive-to-light rail skims
- W_CRT_skims = 'skm_w8' ;walk-to-commuter rail skims
- D_CRT_skims = 'skm_d8' ;drive-to-commuter rail skims
- W_mode9_skims = 'skm_w9'
- D_mode9_skims = 'skm_d9'

2.5.5 Diurnal Factors

DDiurnal factor parameters in version 9 are read in via an input file (see section 3.1 of this report for more information). As such, the following diurnal factor parameters were removed from the `0_GeneralParameters.block` file:

% of trips in period

- HBW_AM_Pct = 0.3254
- HBW_MD_Pct = 0.1831
- HBW_PM_Pct = 0.3074

- HBW_EV_Pct = 0.1841
- HBC_AM_Pct = 0.2592
- HBC_MD_Pct = 0.3374
- HBC_PM_Pct = 0.1853
- HBC_EV_Pct = 0.2181
- HBSch_AM_Pct = 0.3784
- HBSch_MD_Pct = 0.2931
- HBSch_PM_Pct = 0.2941
- HBSch_EV_Pct = 0.0344
- HBShp_AM_Pct = 0.0192
- HBShp_MD_Pct = 0.4391
- HBShp_PM_Pct = 0.2496
- HBShp_EV_Pct = 0.2921
- HBOth_AM_Pct = 0.0997
- HBOth_MD_Pct = 0.3129
- HBOth_PM_Pct = 0.2367
- HBOth_EV_Pct = 0.3507
- NHBW_AM_Pct = 0.0697
- NHBW_MD_Pct = 0.5582
- NHBW_PM_Pct = 0.2597
- NHBW_EV_Pct = 0.1124
- NHBNW_AM_Pct = 0.0498
- NHBNW_MD_Pct = 0.4752
- NHBNW_PM_Pct = 0.2426
- NHBNW_EV_Pct = 0.2324
- IX_AM_Pct = 0.1786
- IX_MD_Pct = 0.3291
- IX_PM_Pct = 0.2604
- IX_EV_Pct = 0.2319
- XI_AM_Pct = 0.1786
- XI_MD_Pct = 0.3291
- XI_PM_Pct = 0.2604
- XI_EV_Pct = 0.2319
- XX_AM_Pct = 0.1786
- XX_MD_Pct = 0.3291
- XX_PM_Pct = 0.2604
- XX_EV_Pct = 0.2319
- TR_AM_Pct = 0.1590
- TR_MD_Pct = 0.3522
- TR_PM_Pct = 0.2274
- TR_EV_Pct = 0.2614

- HBO_AM_Pct = 0.0840
- HBO_MD_Pct = 0.3383
- HBO_PM_Pct = 0.2401
- HBO_EV_Pct = 0.3376
- NHB_AM_Pct = 0.0563
- NHB_MD_Pct = 0.5024
- NHB_PM_Pct = 0.2482
- NHB_EV_Pct = 0.1931

% of trips in PA direction

- HBW_AM_PA = 0.9706
- HBW_MD_PA = 0.5690
- HBW_PM_PA = 0.0871
- HBW_EV_PA = 0.2891
- HBC_AM_PA = 0.9828
- HBC_MD_PA = 0.5259
- HBC_PM_PA = 0.2420
- HBC_EV_PA = 0.1057
- HBSch_AM_PA = 0.7899
- HBSch_MD_PA = 0.4306
- HBSch_PM_PA = 0.2268
- HBSch_EV_PA = 0.2391
- HBShp_AM_PA = 0.7826
- HBShp_MD_PA = 0.5615
- HBShp_PM_PA = 0.4604
- HBShp_EV_PA = 0.4228
- HBOth_AM_PA = 0.7147
- HBOth_MD_PA = 0.5517
- HBOth_PM_PA = 0.5181
- HBOth_EV_PA = 0.3806
- NHBW_AM_PA = 0.5000
- NHBW_MD_PA = 0.5000
- NHBW_PM_PA = 0.5000
- NHBW_EV_PA = 0.5000
- NHBNW_AM_PA = 0.5000
- NHBNW_MD_PA = 0.5000
- NHBNW_PM_PA = 0.5000
- NHBNW_EV_PA = 0.5000
- IX_AM_PA = 0.8563
- IX_MD_PA = 0.5627
- IX_PM_PA = 0.3288
- IX_EV_PA = 0.3290
- XI_AM_PA = 0.8563
- XI_MD_PA = 0.5627
- XI_PM_PA = 0.3288
- XI_EV_PA = 0.3290
- XX_AM_PA = 0.8563
- XX_MD_PA = 0.5627
- XX_PM_PA = 0.3288
- XX_EV_PA = 0.3290
- TR_AM_PA = 0.5000
- TR_MD_PA = 0.5000
- TR_PM_PA = 0.5000
- TR_EV_PA = 0.5000
- HBO_AM_PA = 0.7283
- HBO_MD_PA = 0.5495
- HBO_PM_PA = 0.5050
- HBo_EV_PA = 0.3901

- NHB_AM_PA = 0.5000
- NHB_MD_PA = 0.5000
- NHB_PM_PA = 0.5000
- NHB_EV_PA = 0.5000

2.5.6 Assignment Type Flag

The assignment type parameter is no longer used in version 9 and was removed:

- AssignType = 'managed'

3 Input Data

Changes made to the `1_Inputs` folder are discussed in this section.

3.1 Global Data

This section includes the changes made within the `0_GlobalData` subfolder.

3.1.1 Trip Tables

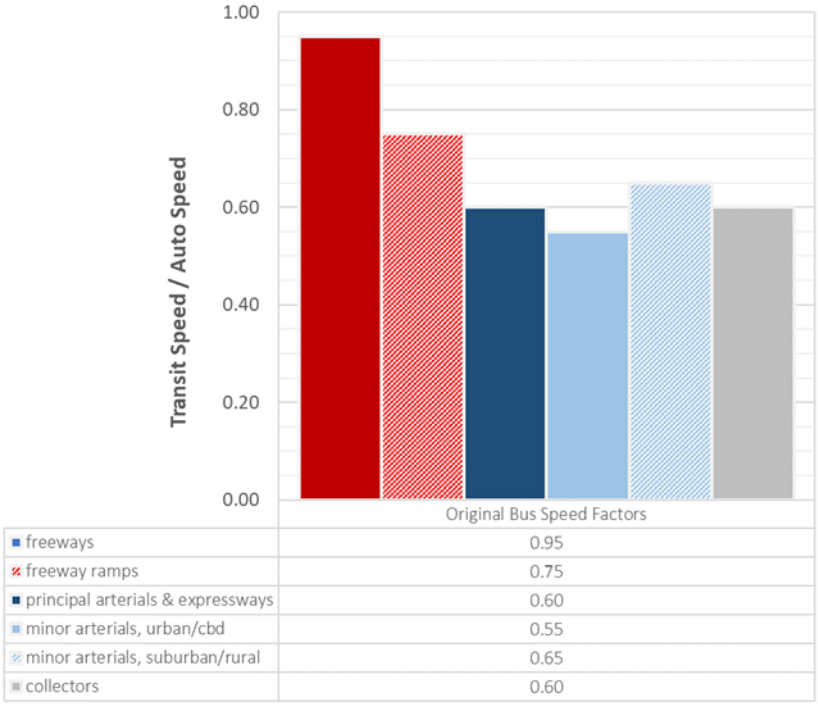
The college base distribution file `BaseDistribution.csv` that contains the household locations of students in the base year was updated using new enrollment data sources. Dormitory populations were assigned to TAZs based on group quarter data from the census. The remaining enrollment was distributed using StreetLight origin-destination and USHE enrollment data.

3.1.2 Household Disaggregation and Auto Ownership

The age percent lookup file `Lookup - BYTAZAgePct - AllCo.csv` used in household disaggregation was replaced with the updated statewide file. The statewide file was updated based on 2020 Census block data, 2020 ACS block group data, and 2019 ACS population by age group data.

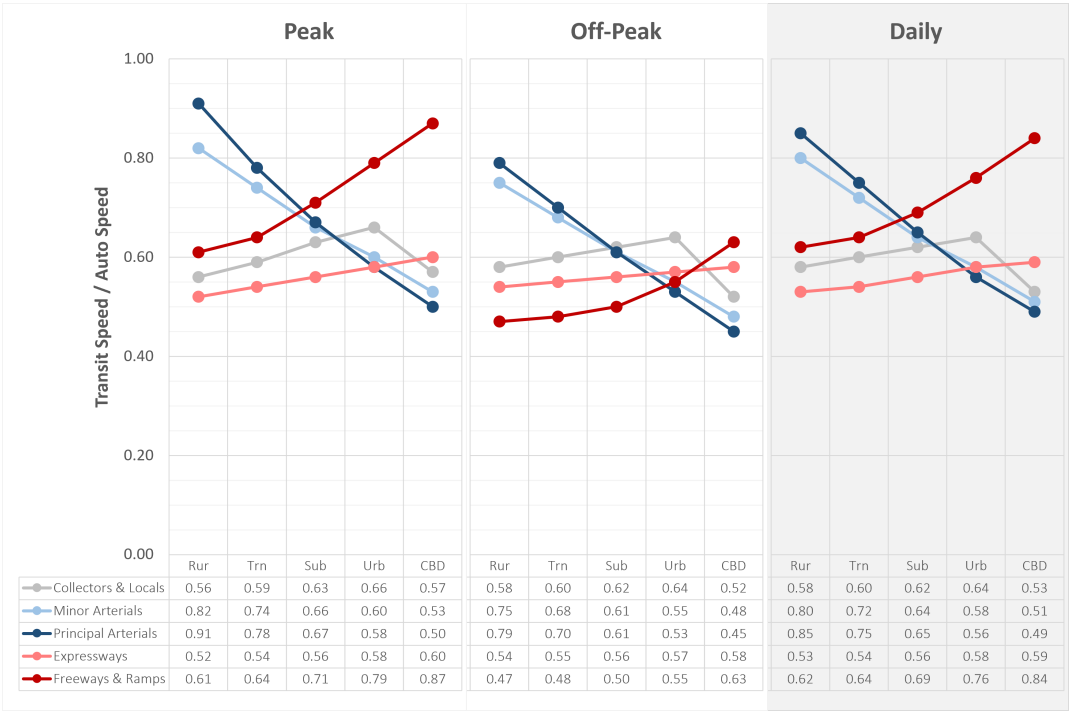
3.1.3 Mode Choice

The bus speed ratios in the model were further categorized and refined using actual bus speed data. The resulting bus speeds ratios were removed from the model scripts, as detailed in the *General Parameters* section, and included in a new bus speed ratios file `bus_speed_ratios.csv`. The ratios were estimated based on 2019 General Transit Feed Specification (GTFS) data, which includes scheduled time and stop locations for all bus routes. Figure 3.1 shows the old bus speed ratios and Figure 3.2 shows the updated bus speed ratios.



	Original Bus Speed Factors
freeways	0.95
freeway ramps	0.75
principal arterials & expressways	0.60
minor arterials, urban/cbd	0.55
minor arterials, suburban/rural	0.65
collectors	0.60

Figure 3.1: Bus Speeds Plot - Version 8.3.2



	Peak					Off-Peak					Daily				
	Rur	Trn	Sub	Urb	CBD	Rur	Trn	Sub	Urb	CBD	Rur	Trn	Sub	Urb	CBD
Collectors & Locals	0.56	0.59	0.63	0.66	0.57	0.58	0.60	0.62	0.64	0.52	0.58	0.60	0.62	0.64	0.53
Minor Arterials	0.82	0.74	0.66	0.60	0.53	0.75	0.68	0.61	0.55	0.48	0.80	0.72	0.64	0.58	0.51
Principal Arterials	0.91	0.78	0.67	0.58	0.50	0.79	0.70	0.61	0.53	0.45	0.85	0.75	0.65	0.56	0.49
Expressways	0.52	0.54	0.56	0.58	0.60	0.54	0.55	0.56	0.57	0.58	0.53	0.54	0.56	0.58	0.59
Freeways & Ramps	0.61	0.64	0.71	0.79	0.87	0.47	0.48	0.50	0.55	0.63	0.62	0.64	0.69	0.76	0.84

Figure 3.2: Bus Speeds Plot - Version 9.0.0.

3.1.4 Assignment

As described in the *General Parameters* section, diurnal and production/attraction factors were moved out of the `0_GeneralParameters.block` file to an input file. The factors are now found in the `Diurnal & PA factors.csv` file.

3.2 Traffic Analysis Zones (TAZ)

3.2.1 Taz Geometry & Geographic Changes

TAZ geometry was updated and corrected. These updates include:

- Fixed the TAZ UTM NAD83 projection to use the standard for Utah rather than the ArcGIS default.
- All TAZ boundaries align to county boundaries from the most current version on AGRC's website.
- All internal TAZ topology was checked and corrected so there are no slivers, gaps, overlaps.

Internal zones were split to increase the model's geographic resolution. Some zone boundaries were also modified without being split to better align with underlying land uses and planning boundaries.

The geographic coverage area of the internal zones was also expanded to encompass the entire county. The notable exceptions to this are the portions of Box Elder County and Weber County that are not in the WFRC planning domain. While not expanded to county boundaries, the geographic coverage area of these counties was still changed to encompass the canyon/mountain areas that are part of the Wasatch Front travel shed.

External zones were revised to reflect the changes of the expanded internal zone area. This included an update to the number and location of the external zones. However, external zones are no longer represented in the TAZ shapefile. The arbitrary polygons representing the external zones in previous version of the TAZ shapefile have been removed. External zones are still represented in other parts of the model, such as in the highway network, general parameters block file.

The expanded area and reconfigured TAZs resulted in the addition of 688 internal zones and 6 external zones. A comparison of zone counts is found in Table 3.1.

Table 3.1: TAZ Count Comparisons

(a) Internal

County	v9	v832	Change
Box Elder	153	135	18
Weber	428	280	148
Davix	324	231	93
Salt Lake	1311	1127	184
Utah	1330	1085	245
Total	3546	2858	688

(b) External

County	v9	v832	Change
Box Elder	6	5	1
Weber	3	3	0
Davix	0	0	0
Salt Lake	6	7	-1
Utah	14	8	6
Total	29	23	6

The maps in Figure 3.3, Figure 3.4, Figure 3.5, and Figure 3.6 show the difference in version 9 and version 8 TAZs.

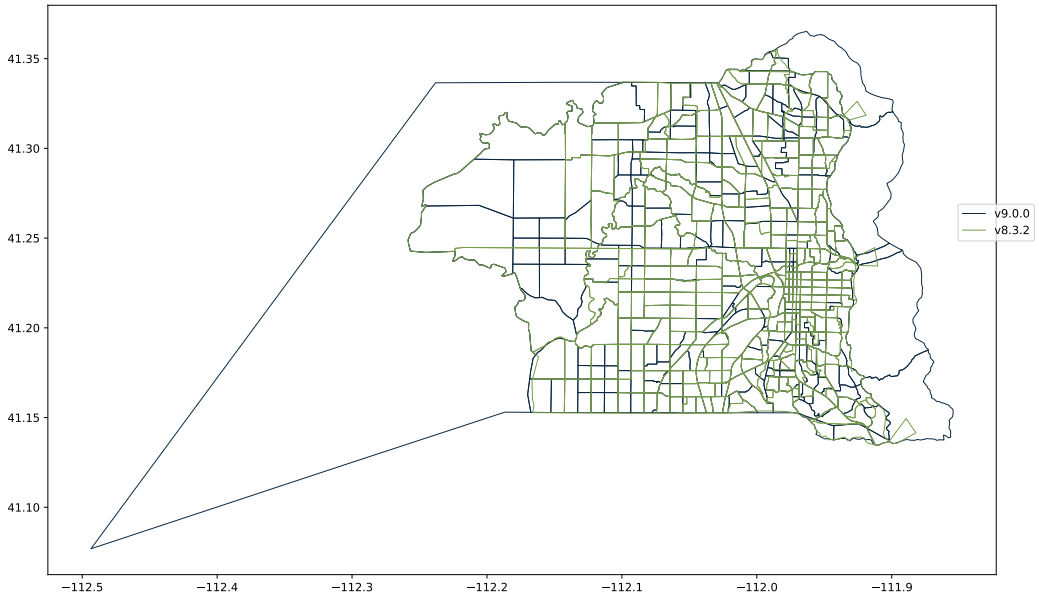


Figure 3.3: TAZ Geography Comparison Map – Weber County

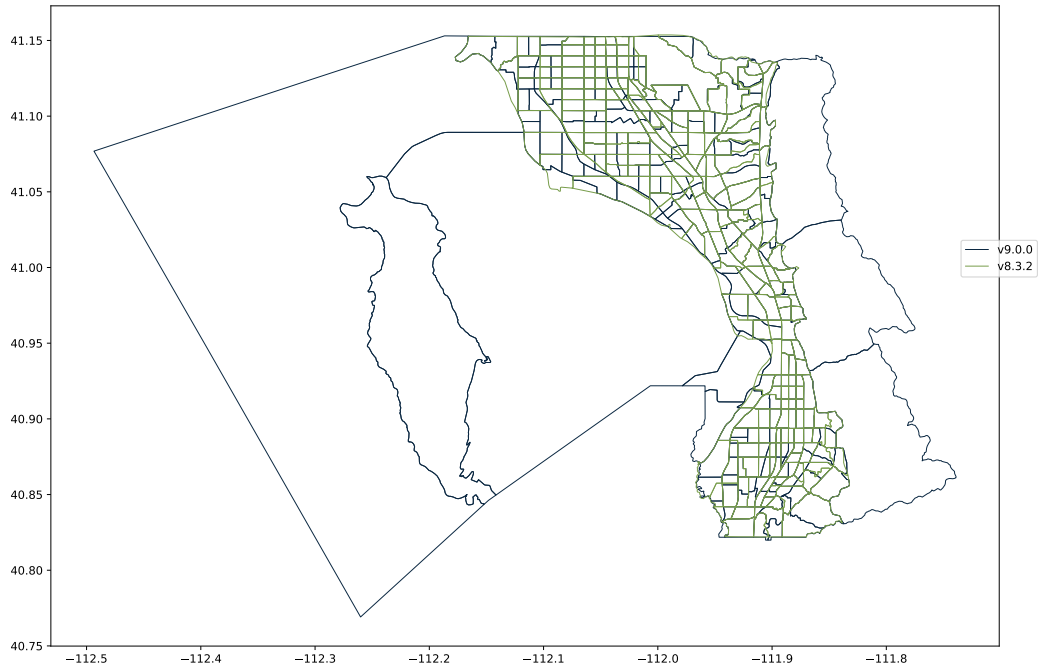


Figure 3.4: TAZ Geography Comparison Map – Davis County

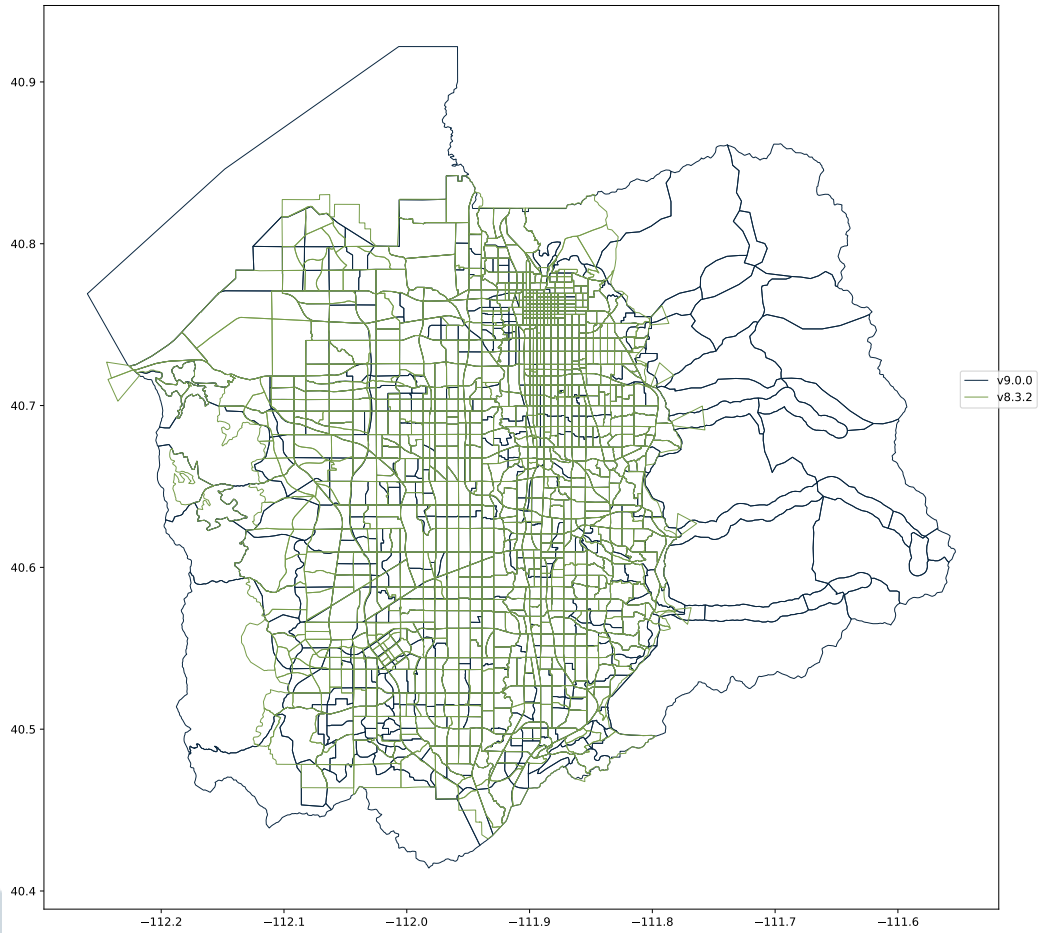


Figure 3.5: TAZ Geography Comparison Map – Salt Lake County

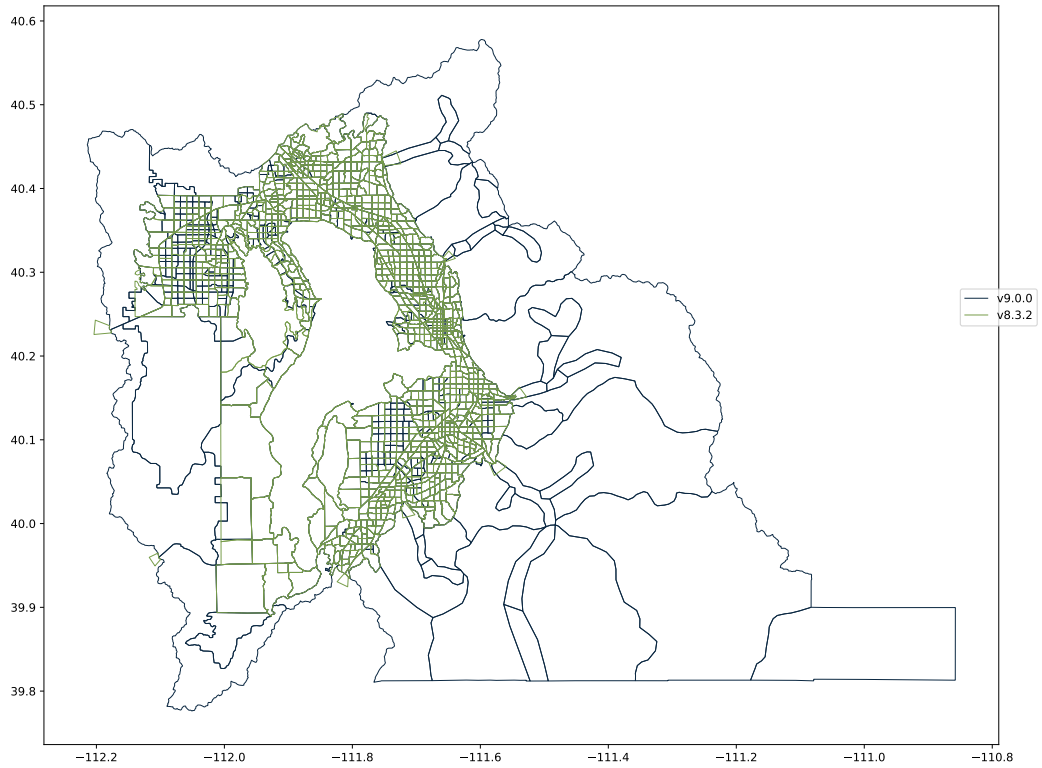


Figure 3.6: TAZ Geography Comparison Map – Utah County

The TAZ numbering was updated to reflect the changes made to the TAZ geometry, as depicted in Table 3.2.

Table 3.2: TAZ Ranges

County	v9.0.0 Internal	v9.0.0 External	v8.3.2 Internal	v8.3.2 External
Box Elder County	1-153	3601-3606	1-135	136-140
Weber County	154-581	3607-3609	141-420	421-423
Davis County	582-905	N/A	424-654	N/A
Salt Lake County	906-2216	3610-3615	655-1781	1782-1788
Utah County	2217-3546	3616-3629	1789-2873	2874-2881

3.2.2 TAZ Attribute Changes

This section describes the changes made to the attributes of the TAZ shapefile.

3.2.2.1. REMM Space

To indicate which TAZs are included in the Real Estate Market Model (REMM) space, the `REMM` field was added with a value of `1` indicating that it is part of REMM and `0` indicating it is not part of REMM, as shown in Figure 3.7.

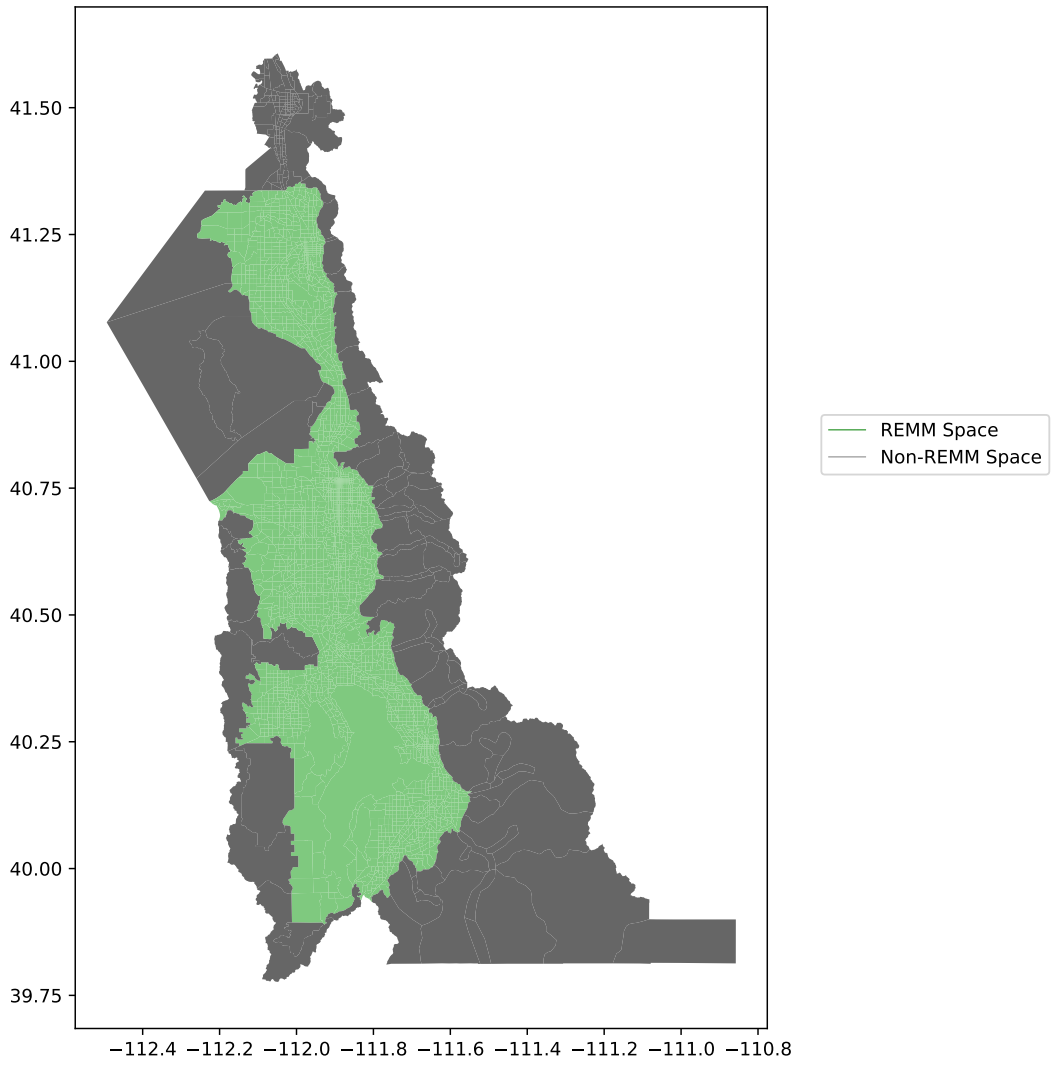


Figure 3.7: TAZ REMM Space

3.2.2.2. Parking Costs

Parking costs were updated based on 2022 parking rates obtained from Salt Lake City, web searches, and field visits. A new methodology for calculating parking cost was envisioned but not implemented for v9. Accordingly, updates to parking data were done in a way to facilitate the change to the new methodology in the future. These updates include a new polygon source file for downtown and university areas. However, since the envisioned methodology removes the use of parking cost fields for Lagoon and Salt Lake City International Airport, they were not included in this new shapefile.

3.2.2.2.1 Downtown and University Areas Parking costs were developed for downtown areas for Ogden, Salt Lake City, and Provo, as well as major university areas along the Wasatch Front. A new source polygon shapefile was developed to hold rates for Home-Based Work (HBW), Home-Based College (HBC), Home-Based Other (HBO), and Non-Home-Based (NHB) trip purposes. While rates are included for these four purposes,

the v9.0.0 model only utilizes HBW for permanent parking and HBO for temporary parking. The future methodology will incorporate all four purposes.

3.2.2.2.2 Lagoon and Salt Lake City International Airport The Airport & Lagoon parking costs were updated based on current parking rate information and the assumptions described in this section.

The cost of permanent parking for the Lagoon TAZ was set to $0 based on the assumption that workers at Lagoon do not pay for parking. The temporary parking was set to $6 as calculated by dividing the 2022 advertised parking rate of $18 per day by an assumed average occupancy of 3 people per vehicle. The cost of temporary parking in previous models was $5 in 2010 dollars. The resulting $1 increase in 2019 dollars (20%) over 9 years seems reasonable.

The cost of permanent parking at the Salt Lake City International Airport was set to *$0* based on the assumption that workers at the airport do not pay for parking. The cost of temporary parking was set to $1.25 based on a weighted average of short-term premium and economy rates and drop offs and a assumed average vehicle occupancy rate.

The 2022 the cost for the short-term premium parking in the garage is $5.00 per hour. Short-term economy rate is $2.00 per hour. And for drop-offs there is no charge for parking. The assumed occupancy rate of 2 people per vehicle would result in per-person rates of $2.50, $1.00, and $0.00, respectively. The average of the three per-person rates is $1.75. Given the unknown distribution of travelers, but assuming more drop-offs than parking, a lower value than $1.75 should be expected. The 2019 cost was chosen to be $1.25.

Compared to the previous temporary parking values of $1 in 2010 dollars, the chosen cost represents a 25 cent increase in 2019 dollars (25%) over 9 years. This growth seems reasonable, especially given the recent improvements to the airport. Additional justification for the chosen increase is the CPI adjustment, which for the 2010 value of $1.00 in results in a 2019 value of $1.18.

3.2.3 Small Districts

There are now 129 total small districts sequentially numbered from northwest to southeast in each medium district. The small district name field `DSML_NAME` includes a prefix of Medium District index followed by a colon and then the sequential small district count (e.g. 15:1). Districts are shown in Figure 3.8. Two additional polygon shapefiles were added to the Districts subfolder to represent the Wasatch Front sub area and the REMM area.

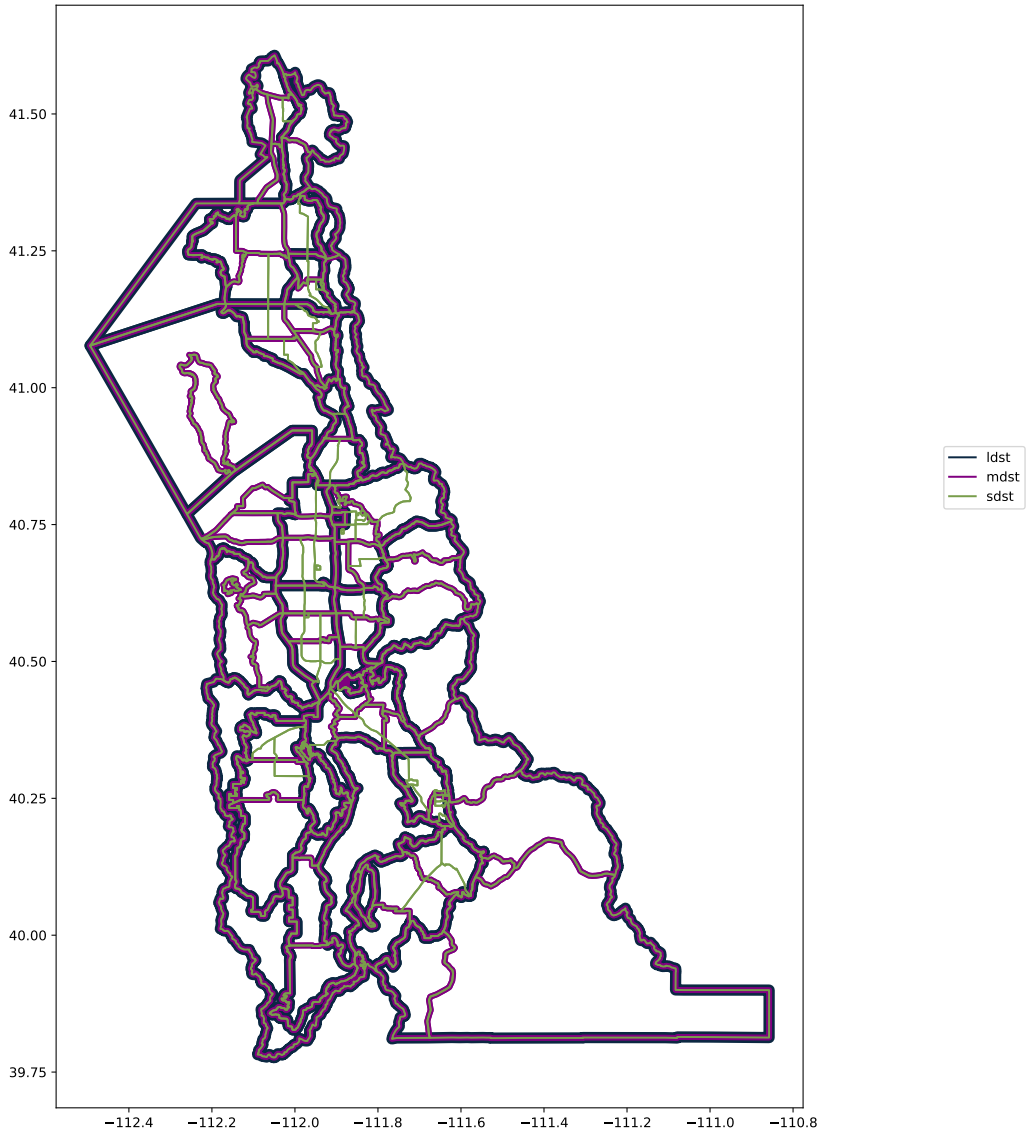


Figure 3.8: Districts

3.2.4 Source

The `_Source` subfolder was added and includes the following shapefile data sets: Cities, Counties, Districts, and Environmental Constraints. Additionally, a ArcGIS Pro project & mapping files can be found in the `__ViewTAZDistricts` subfolder.

3.3 Socioeconomic Data

Forecasts and control totals were updated based on new census data, updated base year parcel data, and the results of the REMM Model.

3.3.1 Forecasts

The SE forecasts were updated for the WFRC areas. Box Elder updates were taken from the UDOT SE Forecasts from June 8, 2022. The updated SE forecasts can be found using the Household and Job Forecasts Web App. This map only contains the latest forecast and not any iterative step, such as the SE datasets in the model folder. Click on the *View Advanced Version* link in the header to enable the "Changes" option where you can see the change in forecasts between v8.3.2 and v9.0.0.

3.3.2 Control Totals

Updates to the county control totals were made based on projections from the Gardner Policy Institute.

3.3.3 School Enrollment

The Kindergarten through 12th grade (K-12) enrollment data was updated using the 2019 statewide school enrollment database. This was done at the state-wide level and then applied to the Wasatch Front.

3.3.4 Median Income

Median income & value-of-time (VOT) inputs for the model were updated with 2019 data and used to update the TAZ Median Income in the TAZ file.

3.4 Highway Network

The highway network was expanded to incorporate the new model areas. See TAZ Geographies. The 2023 RTP fields have been updated to reflect the adopted 2023 RTP.

3.4.1 Highway Node Numbering Schema

Updates to the highway node numbering schema are shown in Table 3.3. An additional reference file called `_Node Definition - v832 & v9.xlsx` is found in the `3_Highway` folder.

Table 3.3: Master Network Node Numbering Schema

MPO	Transit Nodes	Highway Nodes	v9 Expansion Areas
WFRC	10,000 - 19,999	20,000 - 49,999	90,000 - 94,999
MAG	50,000 - 59,999	60,000 - 89,999	95,000 - 99,999

The highway network updates include the following:

- Updated Commuter-Rail Transit (CRT) Fare Zone
  - Vineyard & Orem stations were modified to have the same fare zone (similar to North Temple & Central)
  - Updated and fixed fare zone definitions in WFRC area
- Fixed small network error in Box Elder where a local road was drawn to the centroid of v8.3.2 TAZ 53
- A few edits to WFRC draft RTP project list
- Updated segment ids
  - Made consistent with the latest segment shapefile
  - Updated segments to account for recent network changes & add segment definitions to account for rail transit
- Added `SEGEX_RTP` & `SEGEX_NEED` as text fields (to be populated later when script/processing updated). These are segment ID exception fields where the future SEGIDs are different than existing SEGIDs.
- Phase change for Managed Motorways in WFRC area
- A couple of phasing updates from the WFRC RTP project list
- Cleaned up `GIS23_32` and `GIS23_42` fields
- Differentiated what projects will be built by 2028 from what will be built by 2023
- Rail `SEGID` additions were made to allow for easier transit result visualization.

Additionally, a `MergedMasterNet – 2022-09-19a` folder was added to serve as a workspace for editing and updating Merged Master Network and for exporting to v8.3.2 & v9 master networks.

3.5 Transit

The transit line files and CUBE Public Transport (PT) files were updated to correspond with the 2023 RTP:

- 2019 was thoroughly vetted to represent Aug 2019 change day
- 2023: updated route alignment, headways & stops based on August 2022 change day (WFRC & MAG)
- 2028: updated route alignment, headways & stops based on UTA 5-Year Service Plan (WFRC & MAG)
- RTP 2032, 2042 & 2050: rolled 2028 changes forward into plan phased years & updated based on 2023 draft plan
- Needs 2032, 2042 & 2050: rolled 2028 changes forward into plan phased years & updated based on 2023 draft plan

Route S902 was updated so route no longer go to the I-80 Parleys Canyon external node.

3.5.1 Public Transport (PT) Parameters

The fare files were updated with 2019 fare data. The fares were updated to match the actual advertised fares, whereas the v8.3.2 model contained a 46% adjustment fares. This reduction accounts for monthly pass, education, fare-pay, senior, employer paid, and other discounts. This adjustment is now explicitly defined, as was discussed in the *General Parameters* section.

3.5.2 General Hand-Coded Support Links

`General_hand_coded_walk_links.NTL` files were reviewed and updated.

3.5.3 Transit Route Tester

A route tester script was added in the `_chk Transit Compile on Net` folder. The script checks to see if transit line files for the respective scenario compile on the scenario highway network. This can be used for reviewing transit line edits outside of the model stream.

3.6 Externals

External locations and forecasts were updated. The locations of the former and updated location of externals is shown in Figure 3.9. Forecasts through 2060 were generated for the updated external locations using historical data through 2019.

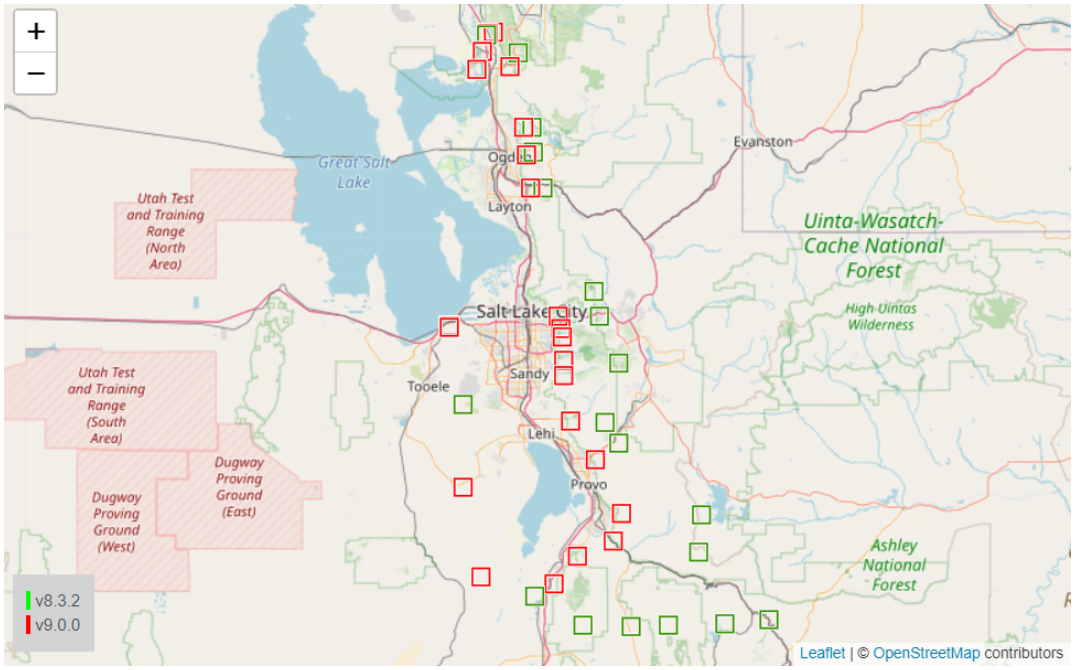


Figure 3.9: v9 External Description.

The updated numbering scheme can be found in Figure 3.10, Figure 3.11, and Figure 3.12.

County	v9	Location
Box Elder	3601	FAR-1082 Bird Refuge
	3602	SR-13/83 to Corinne
	3603	FAR-1112 to Bear River
	3604	I-15 to Tremonton
	3605	SR-38 to Riverside
	3606	SR-91 to Logan
Weber	3607	FAR-3462 N Ogden Pass
	3608	SR-39 Ogden Canyon
	3609	I-84 to Summit
Salt Lake	3610	FAR-2688 Butterfield Cyn to Tooele
	3611	SR-201 to Tooele
	3612	I-80 to Tooele
	3613	SR-65 Mountain Dell Canyon
	3614	I-80 East Parley's
	3615	SR-190 Guardsman Pass
Utah	3616	FAR-1828 Goshen Canyon
	3617	US-6 Eureka
	3618	SR-73 Rush Valley
	3619	FAR-3108 Cascade Springs
	3620	SR-189 Provo Canyon
	3621	FAR-2865 Sixth Water / Horse Creek
	3622	FAR-2863 Sheep Creek
	3623	US-6 Price Canyon
	3624	SR-96 Scofield
	3625	FAR-2495 Skyline Dr
	3626	US-89 Thistle
	3627	FAR-1822 Nebo Loop
	3628	I-15 to Juab
	3629	FAR-1826 South Ridge Farms

Figure 3.10: v9 External Description.

County	v832	Location
Box Elder	136	FAR-1082 Bird Refuge
	137	SR-13/83 to Corinne
	138	I-15 to Tremonton
	139	SR-38 to Riverside
	140	SR-89 to Logan
Weber	421	FAR-3462 N Ogden Pass
	422	SR-39 Ogden Canyon
	423	I-84 to Summit
Salt Lake	1782	I-80 to Tooele
	1783	SR-201 to Tooele
	1784	FAR-2292 Emigration Canyon
	1785	I-80 East Parley's
	1786	FAR-2192 Millcreek Canyon
	1787	SR-190 Big Cottonwood
	1788	SR-210 Little Cottonwood
Utah	2874	SR-92 AF Canyon
	2875	SR-189 Provo Canyon
	2876	FAR-2865 Hobble Ck. Can (Springville)
	2877	US-6 SF Canyon
	2878	FAR-2822 Payson Canyon
	2879	I-15 to Juab
	2880	US-6 Goshen
	2881	SR-73 to Tooele (Cedar Fort)

Figure 3.11: v8.3.2 External Description.

County	v9	v832	Location	Notes
Box Elder	3601	136	FAR-1082 Bird Refuge	
	3602	137	SR-13/83 to Corinne	
	3603	NA	FAR-1112 to Bear River	*New External*
	3604	138	I-15 to Tremonton	
	3605	139	SR-38 to Riverside	
	3606	140	SR-91 to Logan	*Moved for Area Expansion*
Weber	3607	421	FAR-3462 N Ogden Pass	*Moved for Area Expansion*
	3608	422	SR-39 Ogden Canyon	*Moved for Area Expansion*
	3609	423	I-84 to Summit	*Moved for Area Expansion*
Salt Lake	3610	NA	FAR-2688 Butterfield Cyn to Tooele	*New External*
	3611	1783	SR-201 to Tooele	
	3612	1782	I-80 to Tooele	
	3613	1784	SR-65 Mountain Dell Canyon	*Moved for Area Expansion*
	3614	1785	I-80 East Parley's	*Moved for Area Expansion*
	NA	*1786*	*FAR-2192 Millcreek Canyon*	*Removed for Area Expansion*
	3615	1787	SR-190 Guardsman Pass	
	NA	*1788*	*SR-210 Little Cottonwood*	*Removed for Area Expansion*
Utah	3616	NA	FAR-1828 Goshen Canyon	*New External*
	3617	2880	US-6 Eureka	
	3618	2881	SR-73 Rush Valley	
	3619	2874	FAR-3108 Cascade Springs	*Moved for Area Expansion*
	3620	2875	SR-189 Provo Canyon	*Moved for Area Expansion*
	3621	2876	FAR-2865 Sixth Water / Horse Creek	*Moved for Area Expansion*
	3622	NA	FAR-2863 Sheep Creek	*New External*
	3623	2877	US-6 Price Canyon	*Moved for Area Expansion*
	3624	NA	SR-96 Scofield	*New External*
	3625	NA	FAR-2495 Skyline Dr	*New External*
	3626	NA	US-89 Thistle	*New External*
	3627	2878	FAR-1822 Nebo Loop	*Moved for Area Expansion*
	3628	2879	I-15 to Juab	
	3629	NA	FAR-1826 South Ridge Farms	*New External*

Figure 3.12: v9 & v8.3.2 External Description.

3.7 Segment

The `Master_Segs_withFactors_20220915.shp` file contains the updated segments to align with 2023 RTP network changes. Additional segments for rail transit corridors were added in the Wasatch Front area.

4 Input Processing

Changes made to the `2_ModelScripts\0_InputProcessing` folder are discussed in this section.

Global changes made to all the scripts in this folder included modifications to the script to account for removal of the `CITY`, `COUNTY`, and `EXTERNAL` fields from the TAZ shapefile and updates to use true shape link and node shapefiles.

4.1 Setup

The folder setup routine was integrated into the `HailMary.s` script to run automatically. It is no longer necessary to copy empty folders or run the `_CreateOutputFolders.s` prior to running the model .

4.2 SE Processing

The `1_DemographicsAnalysis.s` script was updated to read `ControlTotal_SE_AllCounties.csv`. Weber County contains two sets of indexes bus on whether it is the UDOT Subarea `9057` or the Wasatch Front Subarea `9157`.

4.3 Network Processing

A bug in the Connected-and-Autonomous Vehicle (CAV) calculation was fixed where the column index was needed to be incremented by 1 to link up with lookup tables.

The hard-coded turn penalty node numbers in the `3_TurnPenalty.s` script were updated to the new master network node numbering.

4.4 Time of Day Factors

A new file `1_CalculateTimeOfDayFac.s` is created during the model that includes time of day factors for use in following scripts.

5 Household Disaggregation and Auto Ownership

The `1_LifeCycle.s` script was modified to account for removal of the `COUNTY` field from the TAZ shapefile and for the removal of county-specific id variables from `0_GeneralParameters.block`.

6 Distribution

Changes made to the `2_ModelScripts\3_Distribute` folder are discussed in this section. The changes described in this section were made exclusively in the `1_Distribution.s` script.

6.1 Convergence

The convergence criteria was updated for trip table and link convergences, as well as the check criteria.

6.1.1 Trip Table Convergence

For trip table convergence, the percent change threshold was reduced from 10% to 7.5%. For each iteration, only cells where the trips in the current iterations are greater than zero are considered. Cells with trips greater than zero are counted as significant trips and form the denominator in the percent converged calculation.

The trip matrix cell is considered converged if:

1. Percent change from previous iteration is within 7.5%, or
2. Trips from the current iteration are less than 1

With the exception that the cell is not converged if the trips from the current iteration are greater than zero and the trips from the previous iteration equals zero.

6.1.2 Link Convergence

For link volume convergence, the percent change threshold was increased from 5% to 7.5%. Centroid connectors are not considered when determining convergence. For each iteration, only cells where the trips in the current iterations are greater than zero are considered. Cells with trips greater than zero are counted as significant trips and form the denominator in the percent converged calculation.

The link is considered converged if:

1. Percent change from previous iteration is within 7.5%, or
2. Volume from current iteration equals zero and volume from previous iteration equals zero.

With the exception that the link is not converged if:

1. Volume from the current iteration is greater than zero and the volume from the previous iteration equals zero, or
2. Volume from the current iteration is zero and the volume from the previous iteration is greater than zero.

6.1.3 Check Criteria

The convergence check criteria was updated. The minimum of 5 iterations requirement was removed. The RGAP parameter passthrough variable was from moved from the block file to main script just before each assignment call. The EV RGAP parameter is set to the 0GeneralParameters.block value divided by 10.

6.2 Reports

The initializing and logging of trip, vehicle-miles traveled (VMT), and vehicle-hours traveled (VHT) variables were removed from the log file. The trip table and link convergence reports in the log file were updated.

The following new reports were added to better track convergence:

- _Stats - Distrib Assign - @RID@.csv
- _Stats - Distrib Loaded Net - @RID@.csv
- _Stats - Distrib Trip Table - @RID@.csv

6.3 Other

A @unloadednetprefix@_@n@_convg.net file was added to Temp\3_Distribute folder. It includes following fields (li.1=current iteration, li.2=previous iteration):

- AM_Cur = li.1.AM_VOL
- MD_Cur = li.1.MD_VOL
- PM_Cur = li.1.PM_VOL
- EV_Cur = li.1.EV_VOL
- DY_Cur = li.1.DY_VOL
- AM_Pre = li.2.AM_VOL
- MD_Pre = li.2.MD_VOL
- PM_Pre = li.2.PM_VOL
- EV_Pre = li.2.EV_VOL
- DY_Pre = li.2.DY_VOL
- AM_Diff = AM_Cur - AM_Pre
- MD_Diff = MD_Cur - MD_Pre
- PM_Diff = PM_Cur - PM_Pre
- EV_Diff = EV_Cur - EV_Pre
- DY_Diff = DY_Cur - DY_Pre
- AM_PctDiff = ABS(AM_Diff) / AM_Pre
- MD_PctDiff = ABS(MD_Diff) / MD_Pre
- PM_PctDiff = ABS(PM_Diff) / PM_Pre
- EV_PctDiff = ABS(EV_Diff) / EV_Pre
- DY_PctDiff = ABS(DY_Diff) / DY_Pre
- CONVLINK (if (DY_PctDiff<=_ConvThreshold) CONVLINK = 1)

7 Mode Choice

Changes made to the `2_ModelScripts\4_ModeChoice` folder are discussed in this section. Updates to the mode choice portion of the model include transit skims and district summaries.

7.1 Transit Skims

Modifications to the transit skim script were made to incorporate the new bus speeds input file.

7.2 District Summaries

The district summary script was modified to change `COUNTY` field references to `CO_FIPS` for county summaries due to removal of field from TAZ shapefile.

8 Highway Assignment

The summarize loaded networks script was modified to point the geometry input reference to the input processing output folder instead of the highway inputs folder.

9 Model Results - Comparison with v8.3.2

This section compares the model results between v9.0 and v8.3.2 for roadway volumes and transit.

9.1 Road Volume Comparisons

The comparison between daily volumes at the segment level can be found in Figure 9.1 for 2019 and 2050. Decreases in volume in v9.0 compared to v8.3.2 are shown in blue, while increases are shown in red.

For 2019, Salt Lake and northern Davis counties display a drop in roadway volumes, most apparent on I-15. Weber, southern Davis, and Utah Counties show increases. Most of the changes are relatively minor, with the largest decreases occurring on the freeways in Salt Lake County. However, given the large daily volume for these roadways, the percent change is relatively low.

For 2050, there are decreases in volumes on I-15 in Salt Lake and northern Davis counties. Weber and northern Davis counties show overall increase in roadway volumes. Utah County shows the most change with the two Utah Lake crossings not part of the 2050 fiscally constrained scenario. The resulting drop in volumes is evident with increases on I-15.

The comparison of daily medium and heavy truck volumes is found in Figure 9.2 for 2019 and 2050. Truck volumes decreased in the northwest portion of Salt Lake County.

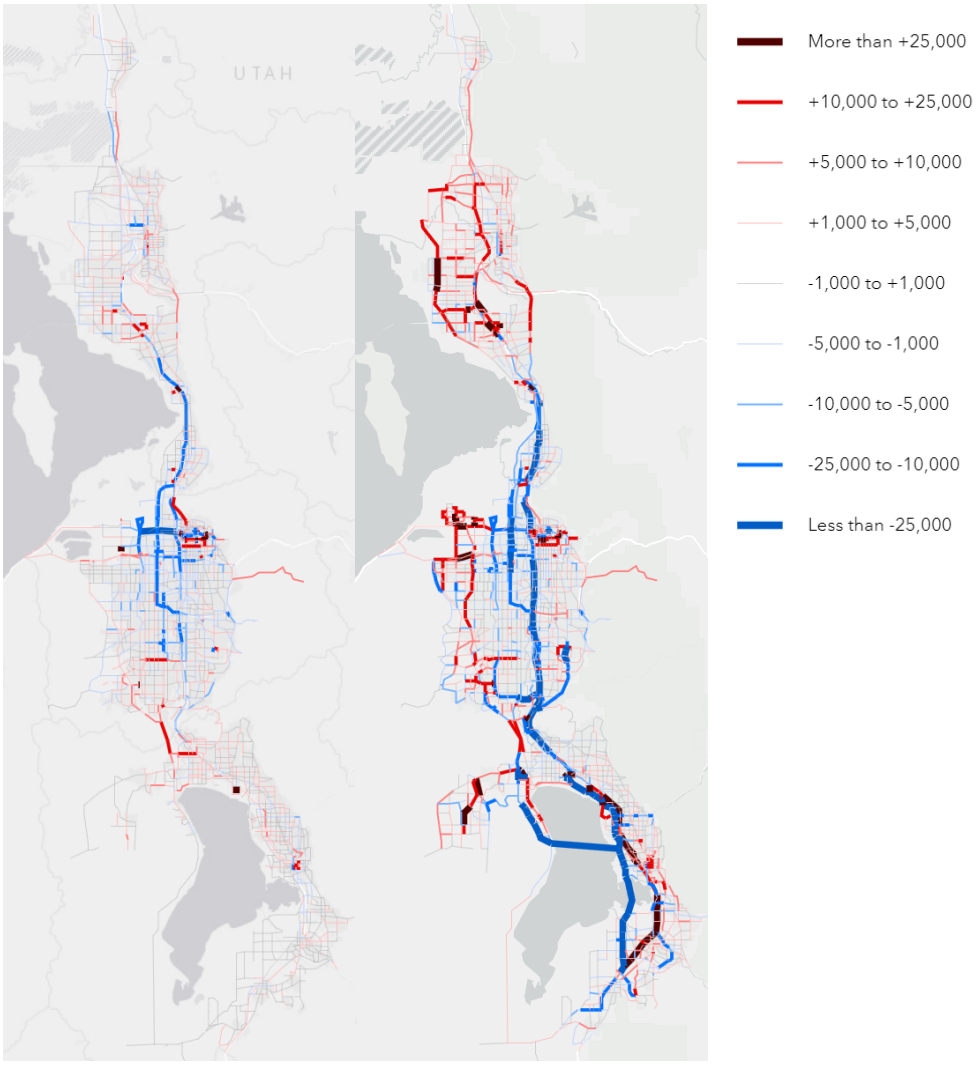
9.2 Transit Comparisons

Transit comparisons were done with ridership, trips mode share, and boardings mode share. Overall ridership increases significantly in v9.0, and Core Bus ridership takes a larger share of trips and boardings than in v8.3.2.

9.2.1 Transit Ridership

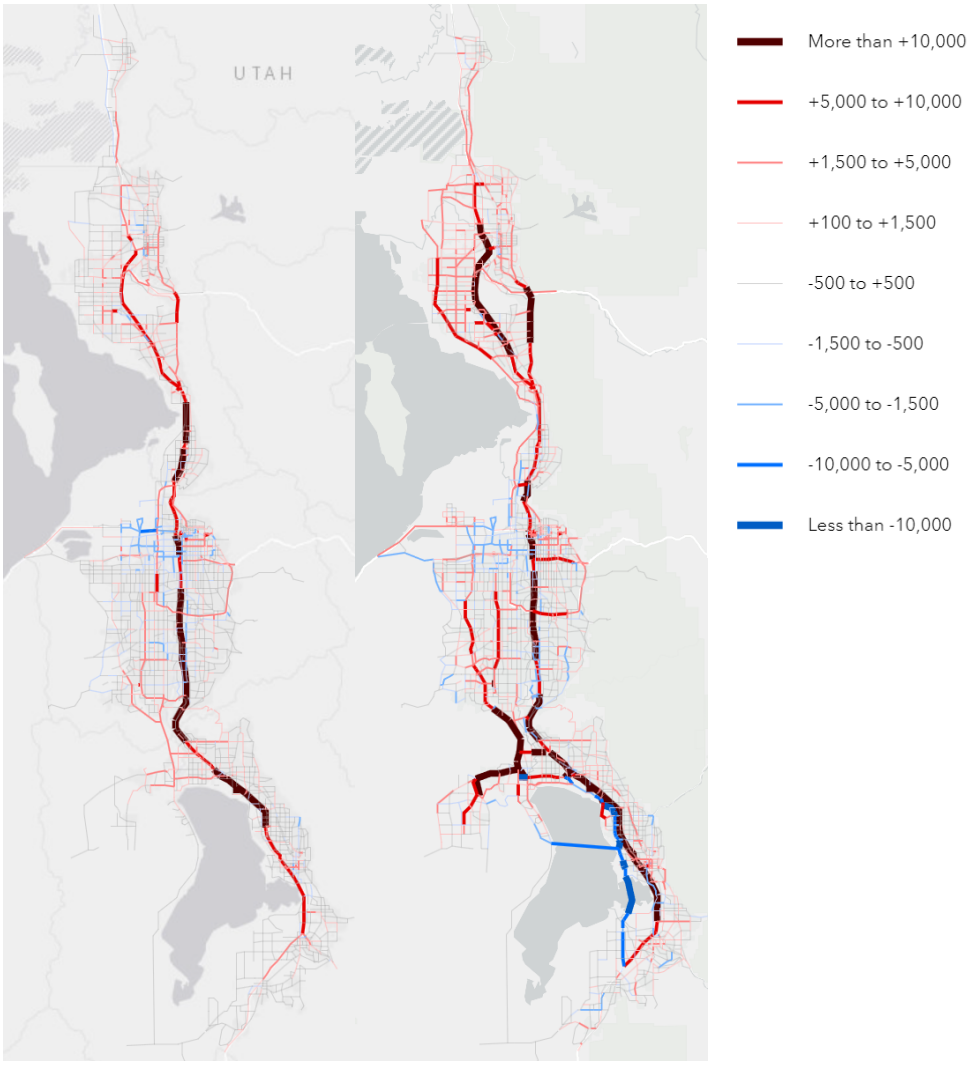
Transit ridership in v9.0 compared to v8.3.2 shows significant increase in 2032, 2042, and 2050. See Figure 9.3. The total ridership in 2050 for v9.0 is 327,000 daily trips compared to the v8.3.2 model that showed 258,000 daily trips, which equates to 26% more trips. The additional trips is largely due to the improvements in commuter rail with increased frequency and speed together with the change in the model sensitivity to changes in headway.

Transit ridership by modes are shown in the following set of figures. Light-Rail Transit sees an increase through 2028 and then a large decrease in 2032. This large decrease can



(a) 2019 (b) 2050 Fiscally Constrained

Figure 9.1: Model Daily Volumes Comparison - All Vehicles (v9.0 vs v8.3.2)



(a) 2019 (b) 2050 Fiscally Constrained

Figure 9.2: Model Daily Volumes Comparison - Trucks (v9.0 vs v8.3.2)

be explained by the shift of riders from Light Rail to Core Bus routes, with a large number of core routes coming online in 2032.

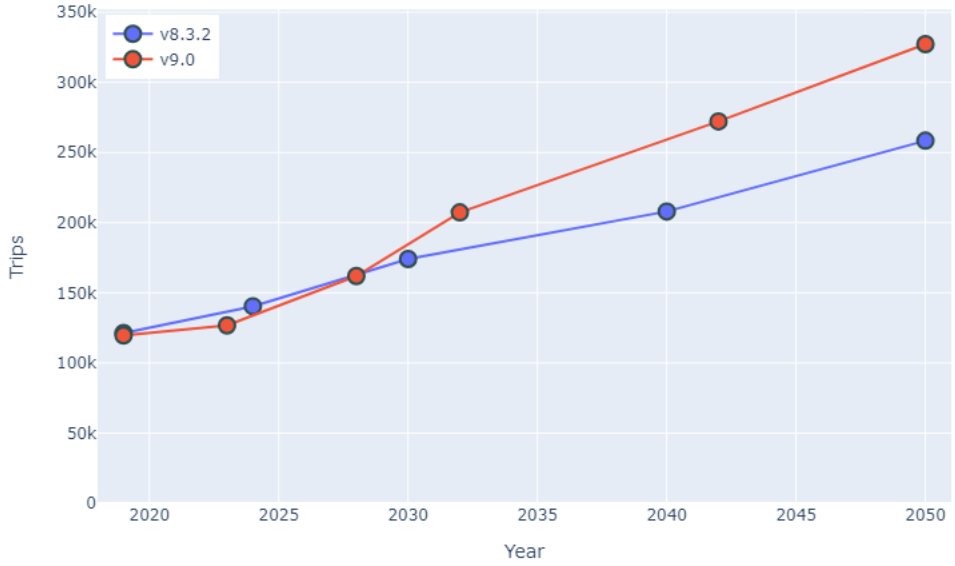


Figure 9.3: Daily Transit Ridership - All Modes

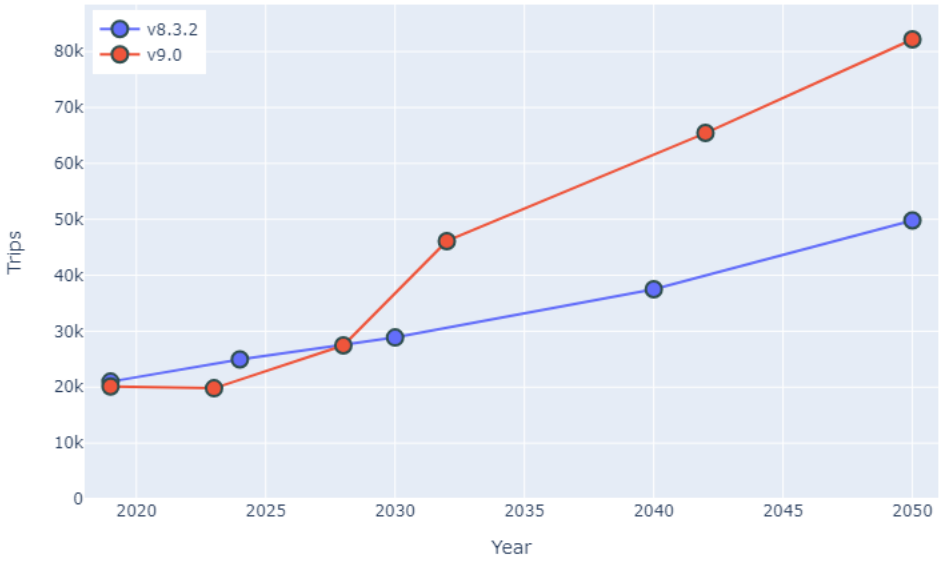


Figure 9.4: Daily Transit Ridership - Commuter-Rail Transit

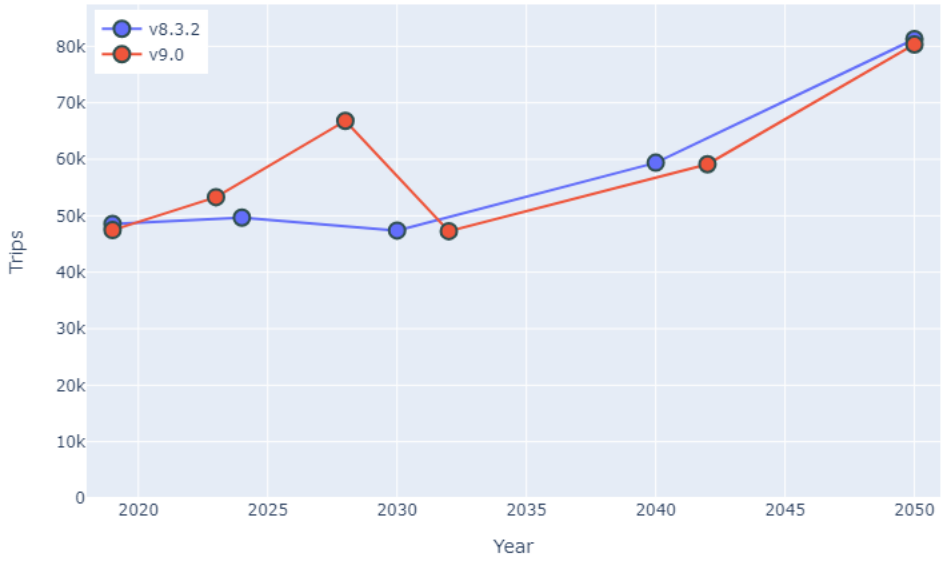


Figure 9.5: Daily Transit Ridership - Light-Rail Transit

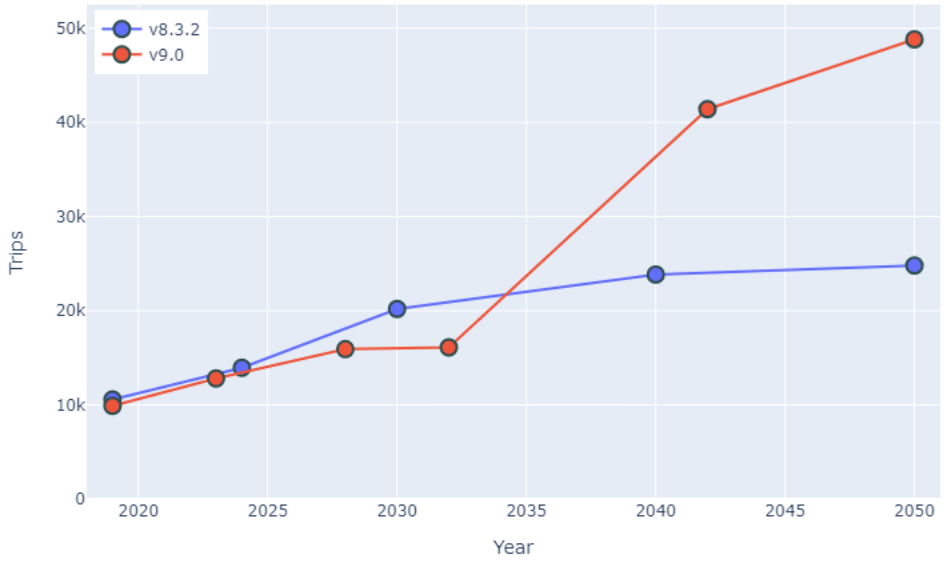


Figure 9.6: Daily Transit Ridership - Bus Rapid Transit

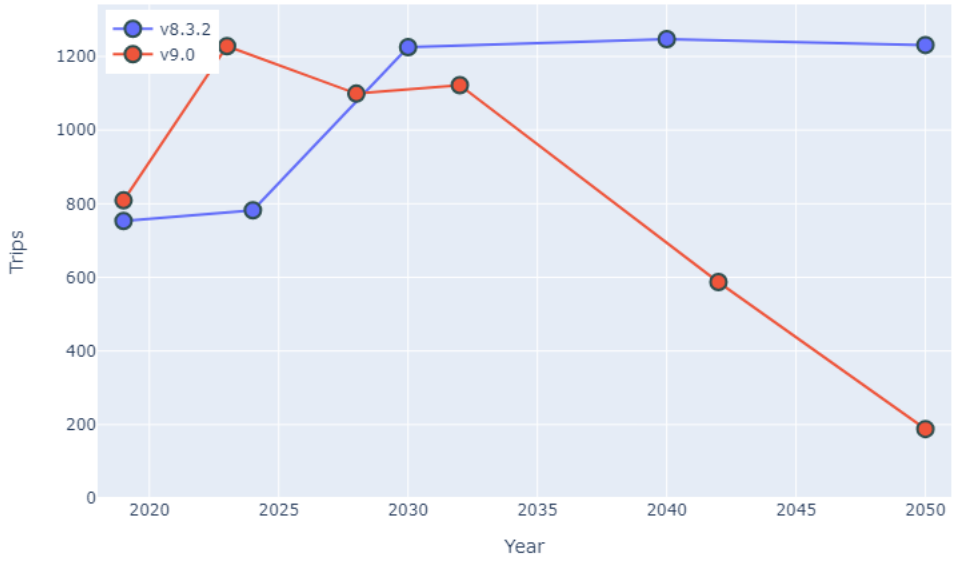


Figure 9.7: Daily Transit Ridership - Express Bus

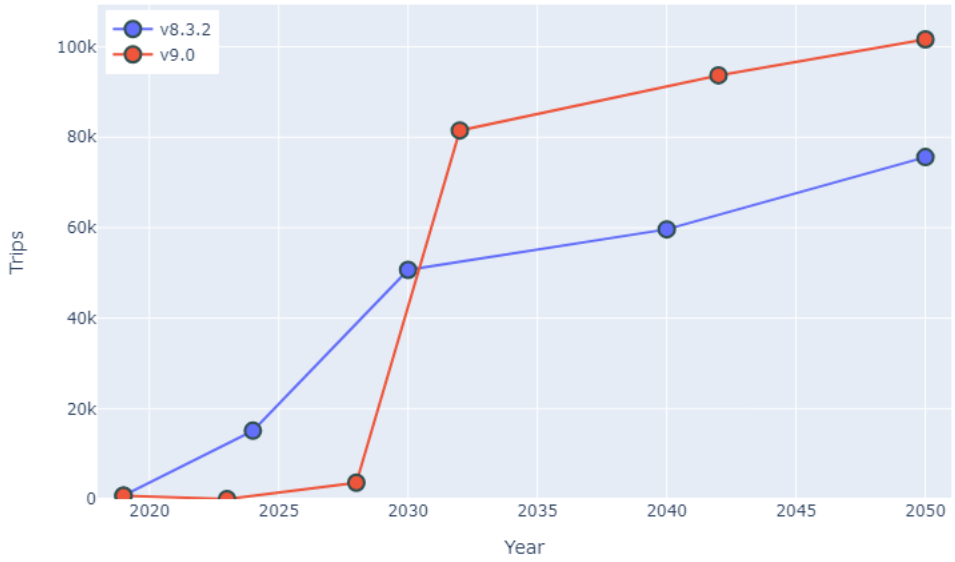


Figure 9.8: Daily Transit Ridership - Core Bus

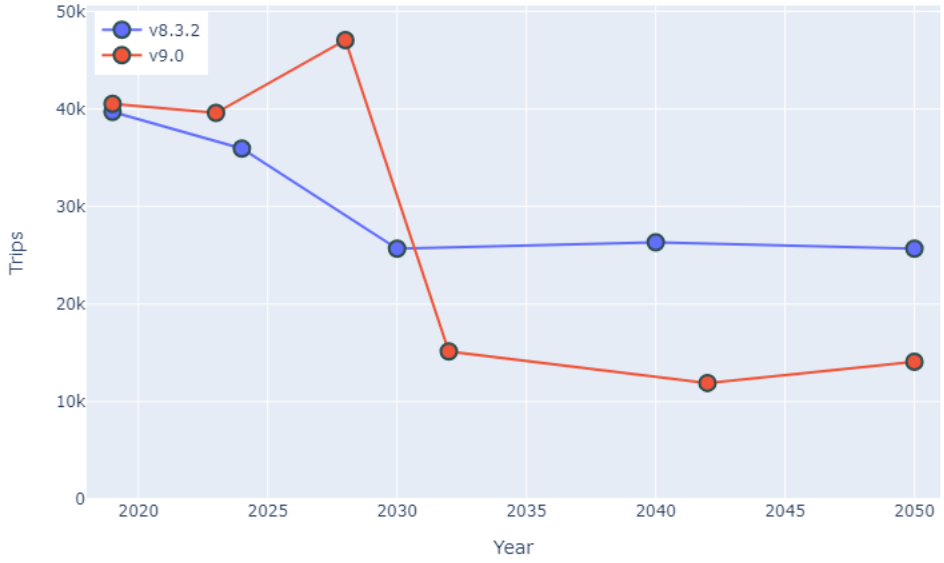


Figure 9.9: Daily Transit Ridership - Local Bus

9.2.2 Transit Share

A comparison of the share of trips amongst the various modes of transit was done for both Trips and Boardings.

The transit ridership trip shares by mode can be found in Figure 9.10 for v9.0 and Figure 9.11 for v8.3.2. The main difference in v9.0 trip share by mode is the large increase in Core Bus trips in 2032 from almost nothing in 2028, while in v8.3.2 the increase in Core Bus trips is spread out between 2024 and 2030. This large increase is consistent with the transit inputs into the model with a large number of Core Bus routes coming into production in 2032, replacing mostly local bus service. The new Core Buy takes most of the local bus ridership it is replacing, but also quite a lot of ridership from Light Rail Transit (Mode 7).

Transit boardings for v9.0 are found in Figure 9.12 and for v8.3.2 are found in Figure 9.13. Boardings follow the same pattern as trips, but boardings are able to differentiate between modes better than trips that are categorized hierarchically.

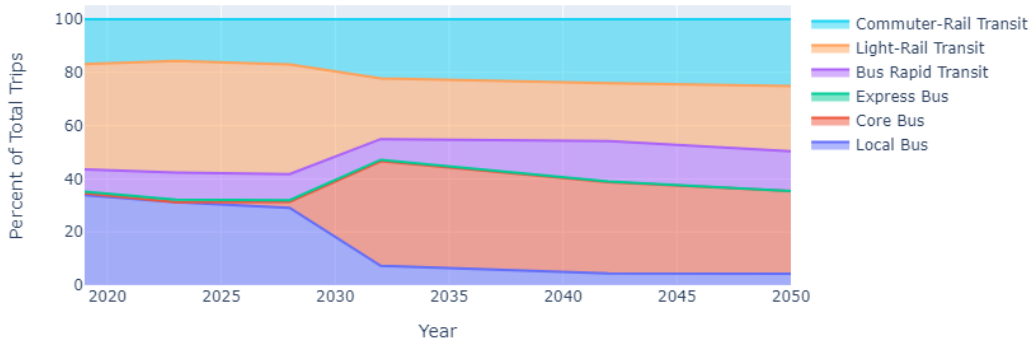


Figure 9.10: Transit Trips Share by Mode - v9.0

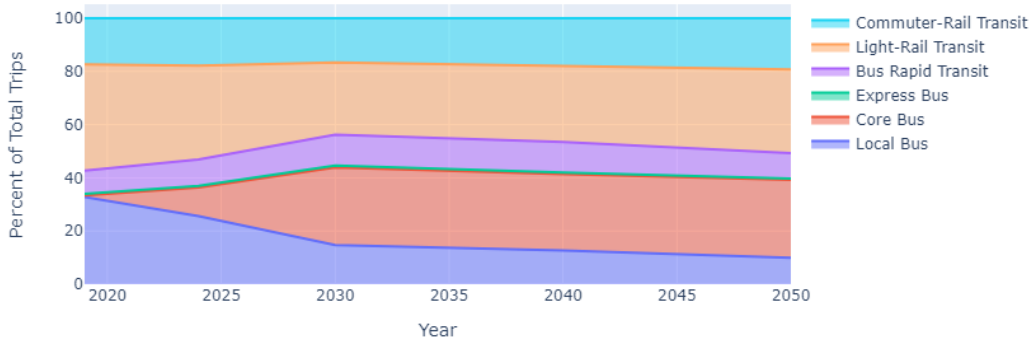


Figure 9.11: Transit Trips Share by Mode - v8.3.2

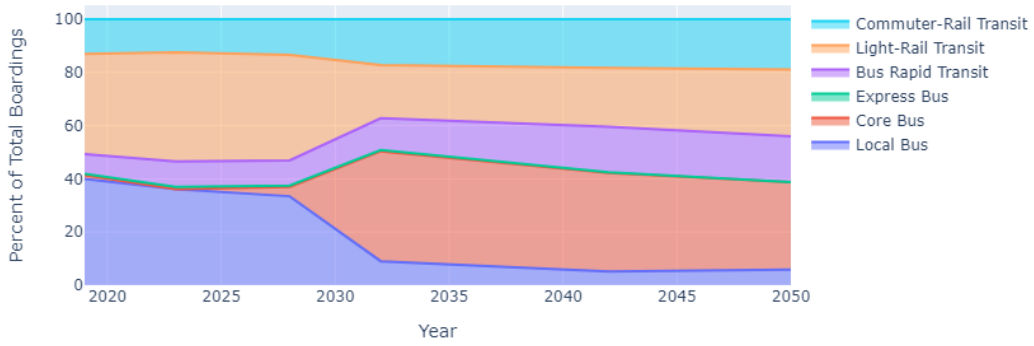


Figure 9.12: Transit Boardings Share by Mode - v9.0

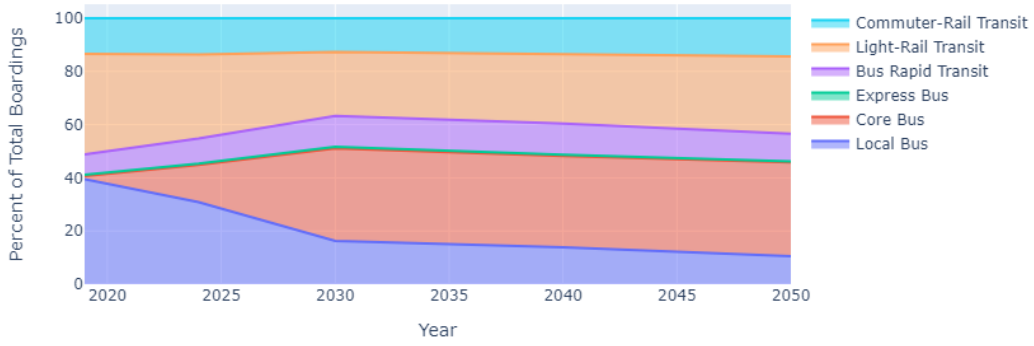


Figure 9.13: Transit Boardings Share by Mode - v8.3.2

9.2.2.1. Commuter Rail Station Boardings

The comparison of base year (2019) station-level boardings for commuter-rail transit (CRT) is found in Figure 9.14. CRT boardings were found to be higher than observed for Davis County and lower than observed for Utah County. An adjustment of 5 additional minutes to in-vehicle-time for trips to/from Davis County and 5 fewer minute to in-vehicle-time for Utah County was made to attempt to bring the model more in-line with observations.

Additional investigation was conducted into why Provo and Lehi were particularly low in the model. The findings did not turn up any obvious errors in the transit or model network. So, the conclusion is that further adjustments to CRT will be possible in the Mode Choice Update project that is currently being undertaken for the next release of the model.

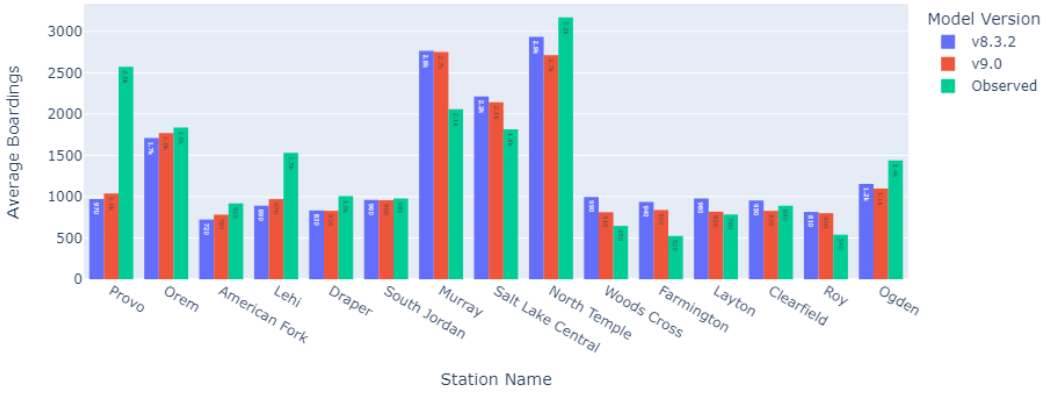


Figure 9.14: 2019 Daily CRT Boardings by Station - Model vs Observed