Southern Nevada HOV Plan

Prepared for:

Nevada Department of Transportation

Prepared by:

Jacobs Engineering Group Inc.

July 2015

Appendix A

Traffic Forecasting Memorandum – Technical Memorandum

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MEMORANDUM

Planning/Traffic Information

To: Jeff Lerud, P.E. – Project Manager

From: Randy Travis – Traffic Information Chief 1/10/14

Date: January 8, 2014

Subject: Southern Nevada HOV Plan, Traffic Forecasting Memorandum

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The Nevada Department of Transportation's Traffic Information Section has reviewed the *forecasting methodology and traffic volumes* used in the Southern Nevada HOV Plan, Traffic Forecasting Memorandum produced by John Karachepone of Jacobs dated December 23, 2013. The Traffic Information Section agrees with the forecasting methodology. The current and future traffic volumes seem reasonable for use in the traffic operation analysis. Should you require clarification or additional information please contact myself or Lori Campbell at (775) 888-7443.

RDT:lc

cc: Hoang Hong, Traffic Operations
John Karachepone, Jacobs

Technical Memorandum

TO:	Randy Travis, NDOT	**DATE:**	December 23, 2013
FROM:	John Karachepone, Jacobs		
SUBJECT:	Traffic Forecasting Memorandum		
COPIES:	Jeff Lerud, Model Task Force		

1.0. INTRODUCTION

The original Southern Nevada High-occupancy Vehicle (HOV) Plan was completed in June 2007. As recommended in the original Plan, elements of the HOV system have been constructed or have become part of the programming for freeways and ancillary facilities in Clark County. An update to the Plan is necessary to reset Plan priorities and to account for current realities.

The Southern Nevada HOV Plan Update (Plan Update) uses the Regional Transportation Commission of Southern Nevada's (RTC) Regional Travel Demand Model with the Mode-Choice element (RTC Model) released in 2012. The original plan used the Travel Demand Model RTC 2004 Update Package 1. The calibration of this prior model version was based on the 1996 household survey. Since then, RTC's adopted travel demand model has been updated with Mode-Choice modeling capabilities. The model has also been recently recalibrated with 2005 household survey data, 2005 transit on-board and visitor survey data, and 2005 counts. Several features, such as area type model elements, truck model elements, planning variables, highway networks, and transit coding, have also been updated. The improved model with Mode-Choice is a planning tool for producing multimodal travel demand forecasts, and this Plan Update is its first use with a focus on HOV lane demand.

The deliverables from the modeling effort are:

1) Developing 2025 traffic forecasts to include Project Neon improvements and providing the associated model output trip tables to the Project Neon team for Phase 1.

2) Developing 2035 HOV forecasts and conducting analyses to formulate the preferred alternative for the HOV Plan Update.

This memorandum documents the review, refinement, and application of the RTC Model for the development of HOV traffic forecasts needed for the Plan Update. This memorandum also documents the development of year 2025 and year 2035 forecasts from the travel demand model outputs.

2.0. APPROACH TO TRAVEL DEMAND MODELING

Development of the Plan Update requires the forecast of HOV travel demand based on future regional travel needs. The 2009 RTC Regional Travel Demand Model with Mode-Choice for forecast year 2013 was reviewed for its capabilities regarding HOV forecasts. The intention of the review was to understand the HOV features of the 2009 RTC Model, and to identify if any minor refinements to the model could further improve its HOV forecasting abilities. These refinements were considered, discussed, and documented for full transparency.

A Model Task Force (MTF) was convened to oversee the modeling review, refinement, and application process. The MTF membership included the Plan Update project manager, representatives from NDOT Traffic Information Division, representatives from RTC modeling staff, and members of the consultant team. The MTF met as needed throughout the modeling phase of the Plan Update. Minutes of the MTF meetings are in Appendix A.

The RTC provided the 2009 RTC Model[1]. Operation of the model assumed three feedback iterations in TransCAD Version 4.8 Build 575. The model was operated for the years 2013, 2025, and 2035.

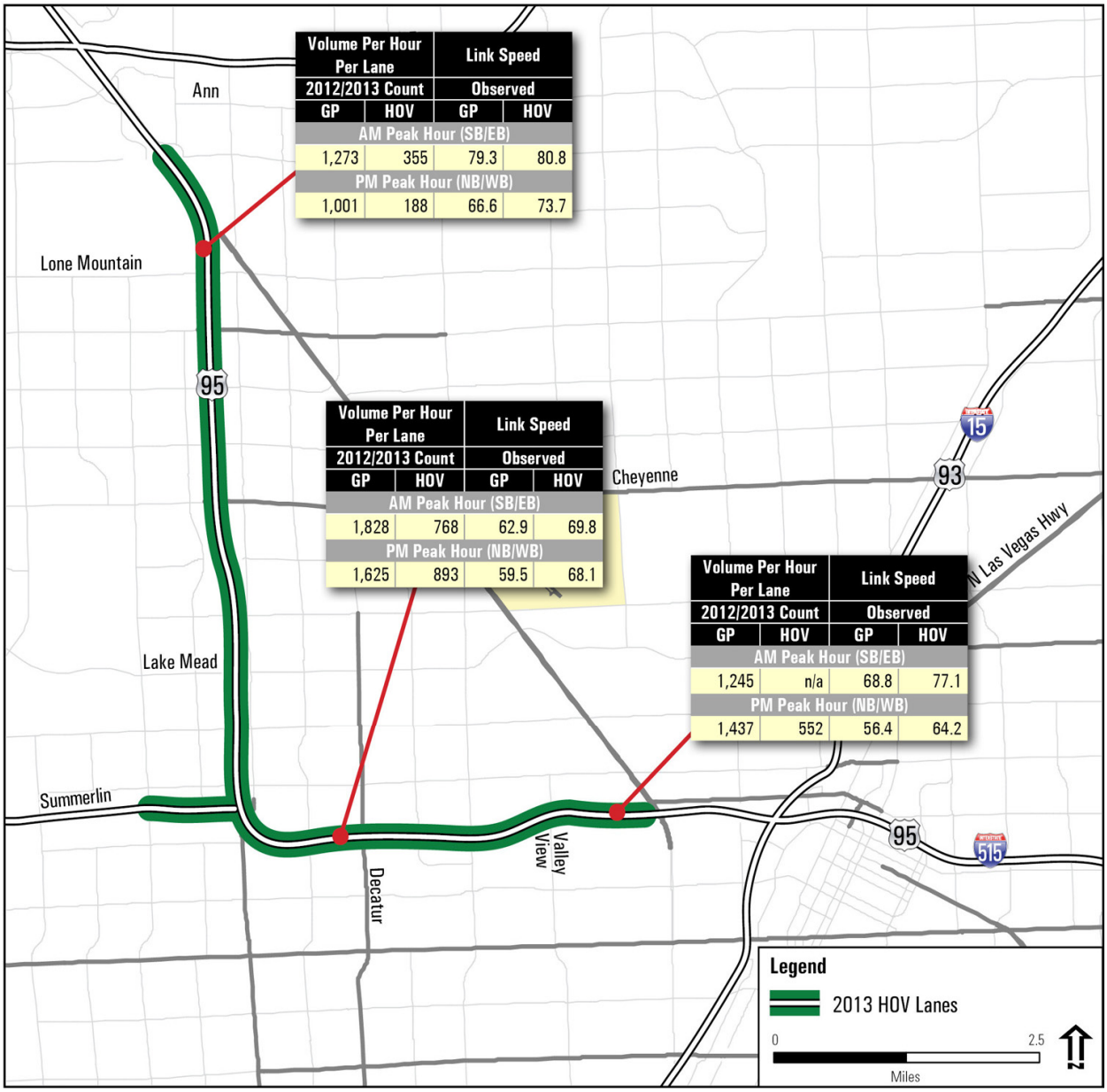
3.0. EXISTING AND PLANNED HOV NETWORK

The Las Vegas transportation network currently includes HOV lanes on US 95, for a distance of approximately 10 miles in each direction between Ann Road and South Rancho Drive. The HOV lanes are contiguous with continuous access on the inside lane. The lanes are restricted to HOV vehicles of two or more occupants (HOV 2+) during the peak periods of 6:00 to 10:00 AM and 2:00 to 7:00 PM. At other times they are open to all vehicles.

HOV lane and General-Purpose (GP) lane 2012/2013 traffic counts on US 95 were obtained from NDOT. Figure 3-1 shows volumes at key locations from these counts.

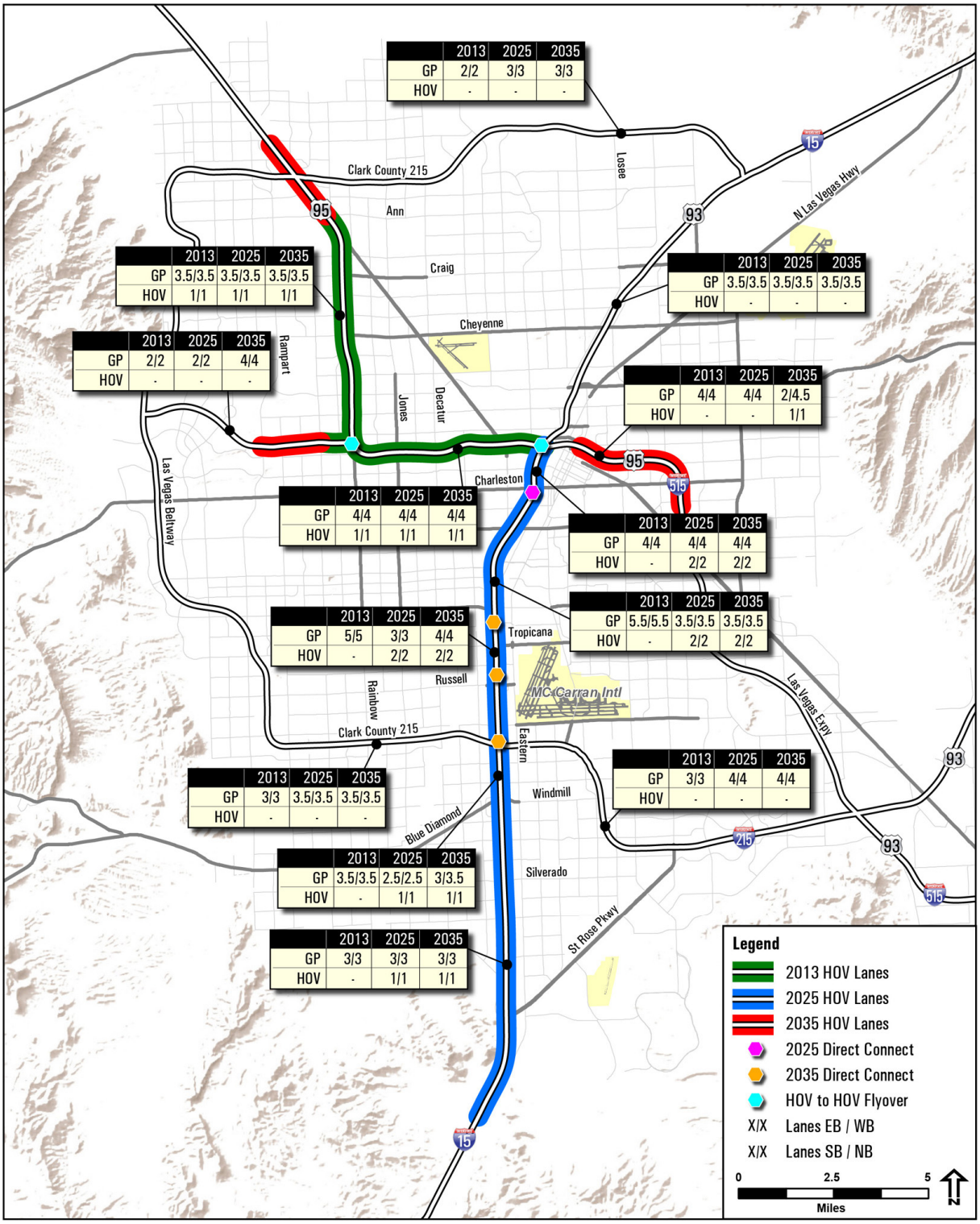
[1] TRUCKS_FINAL_RTC2009_v48_Build575_07_25_2011.RSC

Figure 3-1 – Existing 2012/2013 HOV and GP Volumes on US 95



The HOV system is planned for expansion. The 2025 and 2035 models include the adopted Regional Transportation Plan (RTP) HOV system, as depicted in Figure 3-2. The number of lanes for both HOV and GP lanes is also displayed. The HOV system grows from 22 lane-miles (both directions) in 2013 to 89 lane-miles in 2035; most of the growth is shown to occur by year 2030.

Figure 3-2 – RTP HOV System for Model Testing



4.0. REVIEW OF 2009 RTC MODEL HOV CAPABILITIES

The following provides an overview of the model features and assumptions related to HOV forecasting.

4.1. Regional Review

Network

- HOV Links are coded as FTYPE_NUM=11; HOV ingress/egress links are coded as FTYPE_NUM=1 (system-to-system ramps).
- HOV link capacity 1,950 vehicles per hour per lane (vphpl) (GP lane capacity is 2,000 vphpl).
- HOV free-flow speeds are tabulated in Table 4-1 and compared to interstate and freeway speeds.

Table 4-1 – Free-Flow Speeds

	CBD/Resort	Urban	Suburban/Rural
HOV Lanes	53 mph	56 mph	60 mph
Interstate Lanes	53 mph	56 mph	60 mph
Freeway Lanes	51 mph	54 mph	59 mph

Mode-choice Module

- The mode-choice module is a discrete nested logit model.

- The mode-choice module produces drive-alone trips, shared-ride trips of two persons, shared-ride trips of three-plus persons, as well as other modes.

- The mode-choice module includes an HOV time savings coefficient of 0.01473 per minute for a threshold of a 5-minute HOV time savings. This means that between any pair of zones where use of an HOV lane(s) provides at least a 5-minute savings compared to a time path without HOV lanes, the mode-choice module gives a slight boost to the number of shared-ride trips between those pair of zones.

Table 4-2 displays regional mode-choice statistics for residential trips in the 2013 and 2035 models. As can be seen, the model for year 2013 for home-based-work generates about 12 percent shared-ride (Shared-ride 2 and Shared-ride 3+) person trips. This compares favorably to the observed carpool percentage, which is 11.0 percent[2]. As expected, the other home-based trip purposes generate higher portions of shared-ride trips. In 2035, the portion of shared-ride trips increases slightly for each trip purpose, because of higher levels of congestion.

[2] US Census Bureau 2011 American Commuter Survey Means of Transportation to Work for Clark County, Nevada

Table 4-2 - Mode-choice Residential Person Trips

	2013 Model Year		2035 Model Year	
Home Based Work Total	**Number**	**Percent**	**Number**	**Percent**
Total Trips	980,067	100.0%	1,365,213	100.0%
Drive Alone	804,177	82.1%	1,121,051	82.1%
Shared-ride 2	87,742	9.0%	128,606	9.4%
Shared-ride 3+	29,130	3.0%	43,841	3.2%
Transit Drive	2,789	0.3%	3,741	0.3%
Transit Walk Local	45,248	4.6%	47,034	3.4%
Transit Walk Premium	10,982	1.1%	20,939	1.5%
Home Based School	**Number**	**Percent**	**Number**	**Percent**
Total Trips	552,387	100.0%	746,638	100.0%
Drive Alone	400,371	72.5%	531,517	71.2%
Shared-ride 2	89,814	16.3%	124,677	16.7%
Shared-ride 3+	54,147	9.8%	81,472	10.9%
Transit Drive	31	0.0%	47	0.0%
Transit Walk Local	7,033	1.3%	6,755	0.9%
Transit Walk Premium	992	0.2%	2,170	0.3%
Home Based Shopping	**Number**	**Percent**	**Number**	**Percent**
Total Trips	594,745	100.0%	787,162	100.0%
Drive Alone	283,045	47.6%	365,897	46.5%
Shared-ride 2	179,884	30.2%	241,201	30.6%
Shared-ride 3+	97,797	16.4%	139,261	17.7%
Transit Drive	601	0.1%	814	0.1%
Transit Walk Local	23,073	3.9%	22,590	2.9%
Transit Walk Premium	10,346	1.7%	17,398	2.2%
Home Based Other	**Number**	**Percent**	**Number**	**Percent**
Total Trips	2,845,329	100.0%	3,765,874	100.0%
Drive Alone	922,694	32.4%	1,203,623	32.0%
Shared-ride 2	985,608	34.6%	1,294,961	34.4%
Shared-ride 3+	893,885	31.4%	1,218,882	32.4%
Transit Drive	367	0.0%	434	0.0%
Transit Walk Local	37,860	1.3%	35,969	1.0%
Transit Walk Premium	4,915	0.2%	12,004	0.3%
Non Home Based	**Number**	**Percent**	**Number**	**Percent**
Total Trips	2,031,033	100.0%	2,722,278	100.0%
Drive Alone	830,185	40.9%	1,067,704	39.2%
Shared-ride 2	632,130	31.1%	849,242	31.2%
Shared-ride 3+	530,258	26.1%	755,916	27.8%
Transit Drive	-	0.0%	-	0.0%
Transit Walk Local	30,520	1.5%	32,093	1.2%
Transit Walk Premium	7,940	0.4%	17,322	0.6%

Traffic Assignment

- The traffic assignment is user equilibrium with a maximum 80 iterations and a convergence factor of 0.001 with three feedback iterations.

- The assignment procedure is structured to have the capability of restricting HOV lanes (system-wide) to either HOV 2+ or HOV 3+ vehicles. At this time, these two classes of shared-ride vehicles are combined prior to assignment. A change to the model program code is necessary to implement this feature of HOV multi-class assignment.

- The traffic assignment procedure is also structured to have the capability of implementing HOV restrictions for either the peak or off-peak periods, or both. At this point in time, a change to the model program code is necessary to actualize this feature.

Table 4-3 displays traffic assignment Vehicle Miles Traveled (VMT) statistics for the year 2013 and 2035 models. During the peak periods when the HOV restrictions are in place, the lanes serve about 100,000 VMT in 2013. As can be seen, HOV VMT approximately quadruples between 2013 and 2035.

Table 4-3 - Regional Assignment Statistics

	2013 Model Year		2035 Model Year	
AM Peak (7:00 – 9:00)	**Regional**	**HOV**	**Regional**	**HOV**
VMT	3,716,736	46,005	5,463,924	214,189
VHT	95,729	867	147,477	4,496
Average Speed	38.8	53.0	37.1	47.6
PM Peak (16:00 – 18:00)	**Regional**	**HOV**	**Regional**	**HOV**
VMT	4,878,393	58,212	7,070,622	266,662
VHT	135,785	1,175	214,624	6,763
Average Speed	35.9	49.5	32.9	39.4
Daily	**Regional**	**HOV**	**Regional**	**HOV**
VMT	35,125,828	588,173	50,800,303	2,316,392
VHT	914,122	11,137	1,384,426	51,383
Average Speed	38.4	52.8	36.7	45.1
VMT = Vehicle Miles Traveled; VHT = Vehicle Hours Traveled.				

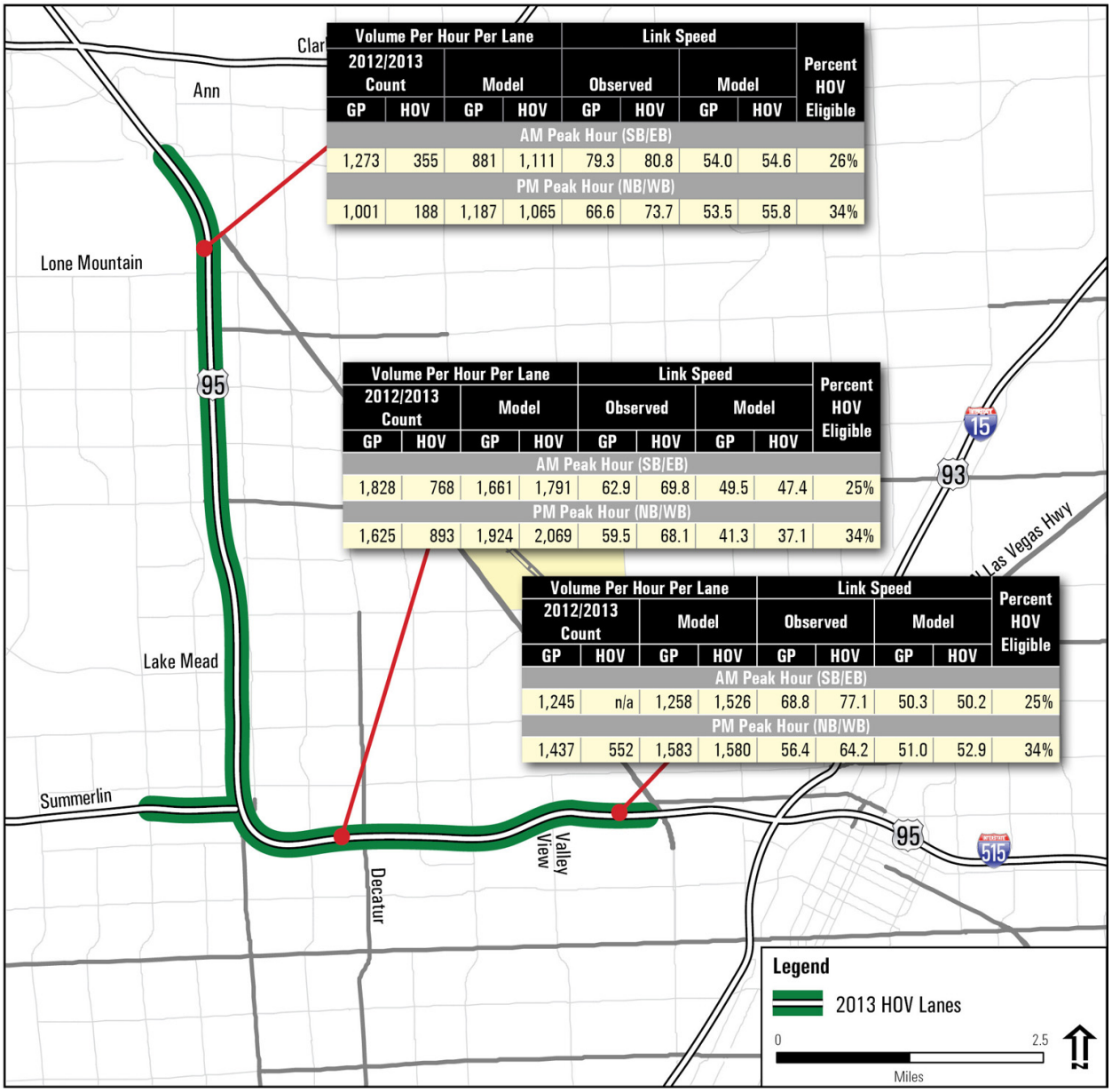
4.2. Link Results

2013 US 95 Link Comparisons

Traffic volumes and speeds on representative links from the 2013 model are presented in Figure 4-1. On US 95, the volume per lane per hour is compared between the observed 2012/2013 and the 2013 model. In general, the model for 2013 loads the HOV lane at about the same amount as

the adjacent GP lanes. This is much higher than the observed level of HOV lane volumes. The comparison of link speeds shows that US 95 seeds are higher than the observed field speeds (based on speed data obtained from the Freeway and Arterial System of Transportation [FAST] dashboard). (Note that the calibrated 2009 RTC Model free-flow speeds are not as high as current speeds on US 95.) There is not a large difference in speeds between lane types in the model. Finally, the graphic depicts the portion of HOV vehicles in the total traffic stream by direction. These vehicles are eligible to use the HOV lane, although some travel in the GP lanes. In general, the model indicates that there are a high number of HOV-lane-eligible vehicles, and there is potential demand for HOV lanes.

Figure 4-1 – Original Year 2013 Model US 95 Results



2035 Link Comparisons

Figure 4-2 shows the 2035 model HOV forecasts for the representative links on US 95. The volumes are higher than the model for 2013, and the HOV and GP lanes generally carry similar levels of volume per lane. Speeds are about the same for the GP and HOV lane types. The portion of vehicles that are eligible to use HOV lanes is slightly higher than the model for 2013.

Figure 4-2 –Original Year 2035 Model US 95 Results

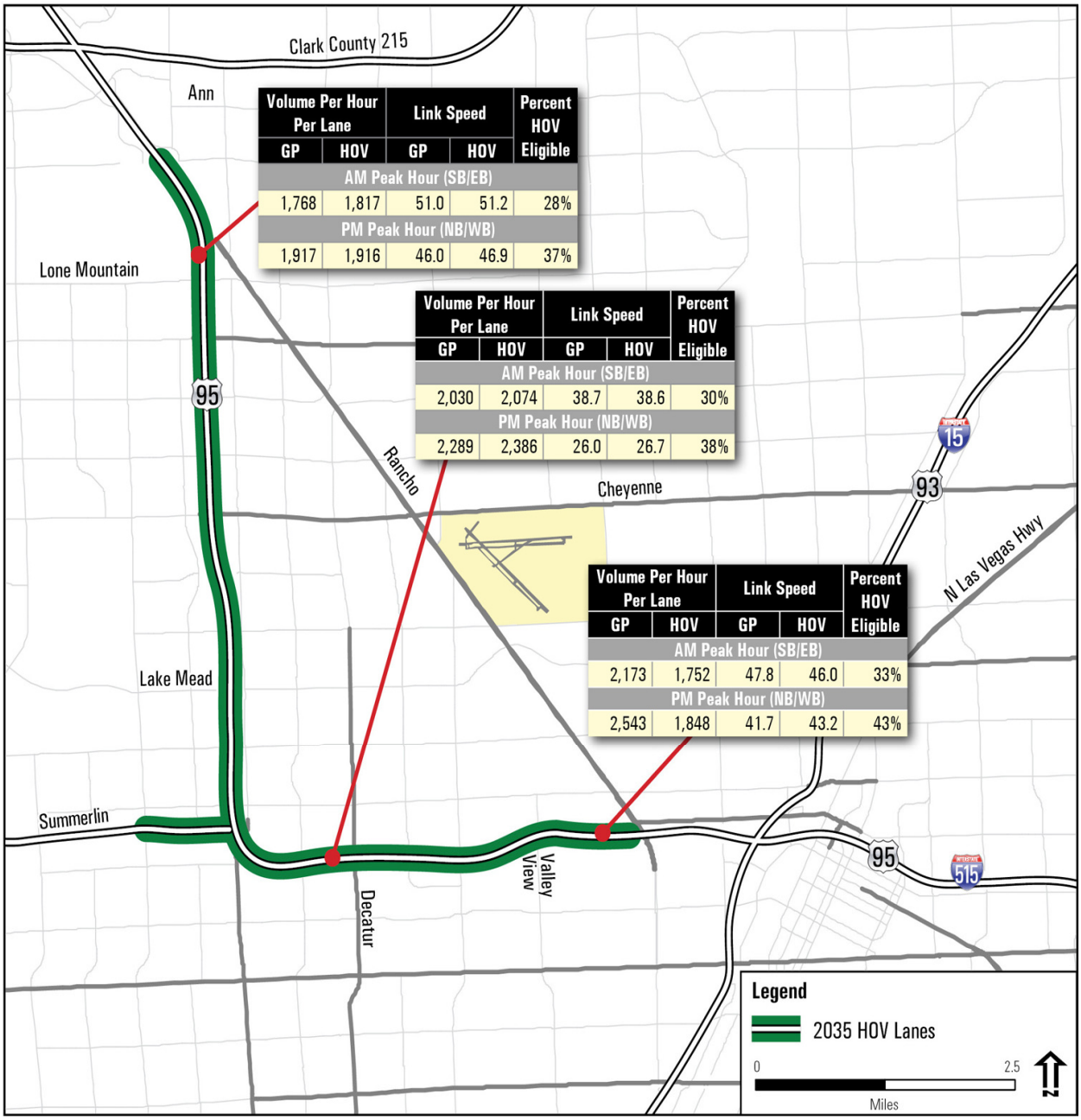
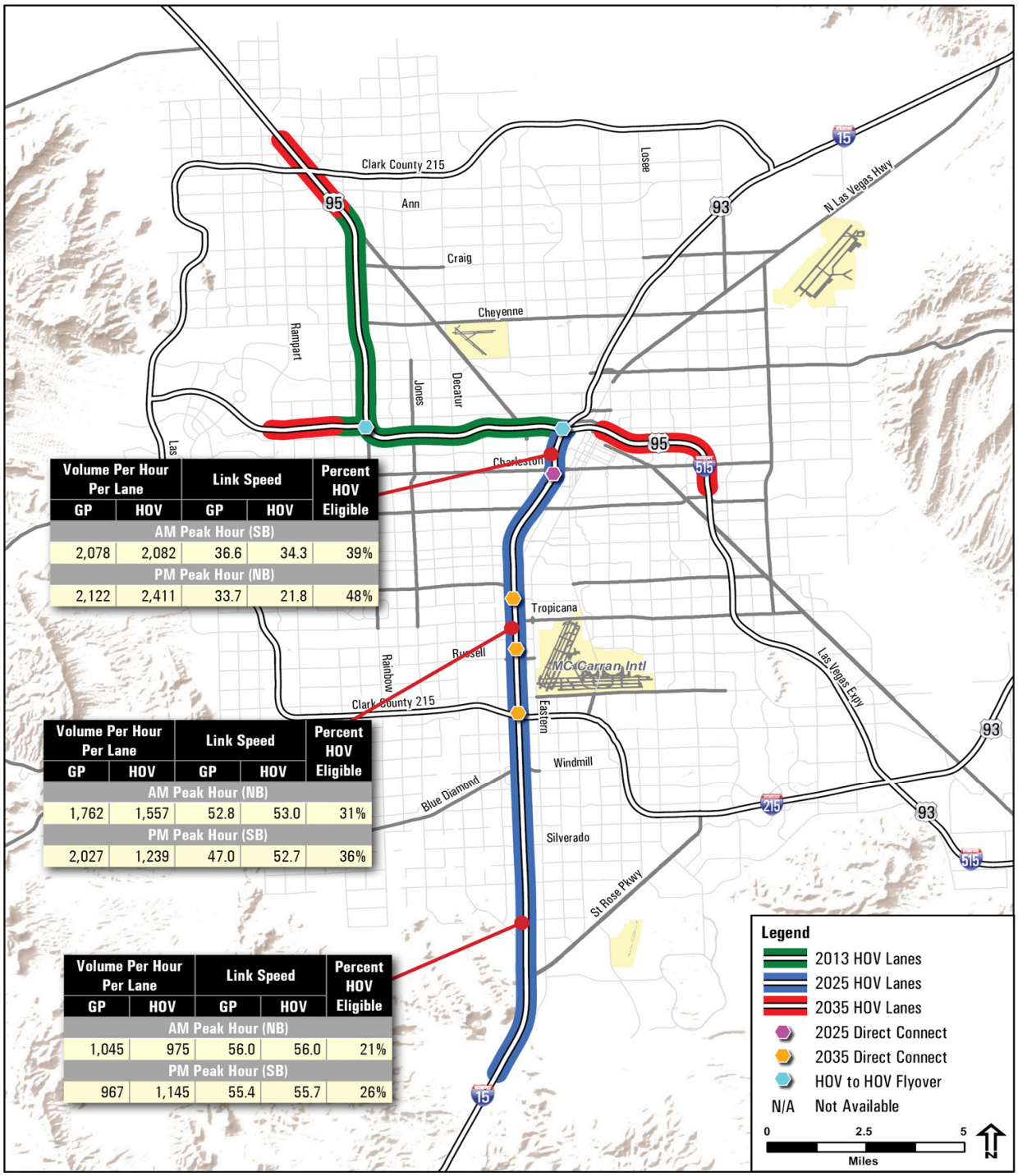


Figure 4-3 shows the 2035 model HOV forecasts for I-15. Similar results are seen as on US 95. The HOV and GP lanes generally carry similar levels of volume per lane. The portion of vehicles in the traffic stream eligible for HOV lanes ranges between 30 to 40 percent along the resort corridor.

Figure 4-3 –Original Year 2035 Model I-15 Results



Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
GP	HOV	GP	HOV	
AM Peak Hour (SB)				
2,078	2,082	36.6	34.3	39%
PM Peak Hour (NB)				
2,122	2,411	33.7	21.8	48%

Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
GP	HOV	GP	HOV	
AM Peak Hour (NB)				
1,762	1,557	52.8	53.0	31%
PM Peak Hour (SB)				
2,027	1,239	47.0	52.7	36%

Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
GP	HOV	GP	HOV	
AM Peak Hour (NB)				
1,045	975	56.0	56.0	21%
PM Peak Hour (SB)				
967	1,145	55.4	55.7	26%

4.3. Sensitivity Tests

A sensitivity run was performed to test the effect of the HOV time savings coefficient in the mode-choice module. A model run test was performed that reduced the threshold from 5.0 minutes to 0.1 minutes. In other words, if a path between two zones using HOV lanes provided any time savings over a non-HOV path, then the mode-choice module should boost the amount of shared-ride person trips. The results showed that the amount of shared-ride trips increased a modest amount, by 14,977 trips, in the 2013 model. The small amount of increase, about 0.4 percent, did not appreciably change HOV link volumes.

Other sensitivity tests were completed to test the model for its reasonableness and responsiveness to changing input parameters. These included 1) only allowing HOV 3+ person vehicles on HOV lanes; 2) operating the HOV lanes in the off-peak period, rather than only peak period HOV restrictions; and 3) coding additional HOV lanes to test the production of shared-ride trips from the mode-choice. However, the 2009 RTC model was not operational to provide sufficient direction when varying these input assumptions at the time of this study.

4.4. Summary of RTC Model HOV Status

The 2009 RTC Model with Mode-choice has the structural elements for forecasting HOV traffic. It responds to changes in inputs affecting HOV forecasts, yielding generally intuitive results at the regional scale.

However, at the level of detail of individual road segments, the 2013 model over-projects traffic volume on the US 95 HOV lanes. It should be noted that at the time of calibration of the model, HOV lanes were not yet in existence on US 95. The current field conditions of the GP lanes on US 95 are not heavily congested, and, therefore, the observed HOV lane usage is relatively low. The model, however, places a somewhat equal loading of traffic per lane between the GP lanes and the HOV lane. Similar results are seen in the 2035 model; the model places a generally equal amount of per lane traffic on the HOV lanes as it does on the adjacent GP lanes.

5.0. MODEL REFINEMENT TESTS

To address the general over-projection of HOV lane traffic, several potential strategies were considered for use in the model refinement. The purpose of the refinement was to adjust the model to produce a better representation of the travel patterns observed from the traffic count data. Refinement options that would require a major reworking of the main components of the model were not part of the scope of this study. To retain the integrity of the adopted 2009 RTC Model, the identified refinement strategies were related to network characteristics and time-of-day distribution. These parameters are often adjusted during final model validation practices to better replicate observed traffic counts.

Table 5-1 lists the identified strategies and the pros and cons of each.

Table 5-1 - Potential Refinements to the HOV Model

Code ingress and egress links as 1 lane	+ Minimal effort + Reflect actual conditions + Industry standards - May introduce an artificial capacity restriction
Increase "time cost" to traverse ingress and egress links to reduce likelihood of short trips on HOV lanes	+ Minimal effort + Attempt to simulate reasonable assumption that longer trips are those on HOV lanes - Non-intuitive - Appropriate region wide value of additional "time cost" difficult to gauge - Lack of empirical data
Adjust time-of-day distribution	+ May produce better assignment results + Could improve match to observed conditions + Modest level of effort - Indirect effect on HOV forecasting
Adjust free-flow speed and capacity of HOV lanes to maintain a reasonable balance relative to GP lanes	+ May produce better assignment results - No empirical data - Using assignment parameters to "manage" HOV use
Adjust Alpha and Beta assignment parameters for HOV links	+ May produce better assignment results - No empirical data - Using assignment parameters to "manage" HOV use
Increase number of assignment feedback iterations	+ May improve traffic assignment loading results - Increases model run time - The current number of iterations, three, is reasonable

After consideration of the pros and cons, potential strategies tested included:

- Reduction of the number of lanes on the ingress/egress links from 2 directional to 1 directional.
- Adjustment of time-of-day trips distribution.
- Adjustment of lane capacity for the HOV and HOV ingress/egress links.
- Adjustment of the speed for the HOV and HOV ingress/egress links.

Several tests were conducted using a single strategy or a combination of strategies, but only five showed marked differences. They are listed in Table 5-2.

Table 5-2 - Refinement Strategies Tests

Alt 1	Number of lanes change ingress/egress links
Alt 2	Alt 1 + Speed reduction on ingress/egress and HOV links
Alt 3	Alt 2 + Capacity reduction on ingress/egress and HOV links
Alt 4	Alt 2 + Redistribution of time-of-day trips
Alt 5	Alt 1 + HOV Links Speed same as Freeway Links Speed + Capacity reduction on ingress/egress and HOV Links + Redistribution of time-of-day trips

Details of the strategies are as follows:

- HOV and ingress/egress links speed reduction of 2 mph.
- HOV link capacity reduction from 1950 vphpl to 1500 vphpl.
- HOV ingress/egress capacity reduction from 2000 vphpl to 1500 vphpl.
- Time-of-day trips percentage reallocation.

Table 5-3 and Table 5-4 contain a comparison of time-of-day trips distribution between the original RTC model year 2013 results and 2010 traffic counts at two different locations. (Values corresponding to the AM and PM peak periods are shown in red.) Since the 2010 data was readily available and the 2012/2013 was not, 2010 data was used for this analysis after a check to confirm that the 2013 traffic counts and distribution did not vary much from the 2010.

Table 5-3 - Time-of-day Distribution I-15 South of Tropicana Avenue

Time Period	2010 Counts		Original 2013 Model Run	
12 – 7 AM	37,483	17%	26,028	13%
7 – 9 AM	25,588	12%	21,512	10%
9 AM – 2 PM	56,402	26%	62,206	30%
2 – 4 PM	24,802	11%	27,347	13%
4 – 6 PM	24,010	11%	27,700	13%
6 – 8 PM	20,850	9%	19,323	9%
8 PM – 12 AM	29,982	14%	22,134	11%
TOTAL	**219,117**		**206,251**	

Table 5-4 - Time-of-day Distribution US 95 North of Valley View Drive

Time Period	2010 Counts		Original 2013 Model Run	
12 – 7 AM	25,160	13%	23,585	11%
7 – 9 AM	24,116	13%	23,368	11%
9 AM – 2 PM	50,151	26%	68,136	31%
2 – 4 PM	24,893	13%	30,535	14%
4 – 6 PM	26,576	14%	30,486	14%
6 – 8 PM	19,551	10%	21,522	10%
8 PM – 12 AM	19,764	11%	20,655	9%
TOTAL	**190,211**		**218,287**	

Based on the comparison results, the percentage of trips between time periods was adjusted slightly through the application of refinement strategy "Alt 5." After a few trials, a new time-of-day distribution was determined, and the results are shown in Table 5-5 and Table 5-6. (Values corresponding to the AM and PM peak periods are shown in red.) As can be observed, the redistribution more closely reflects the observed counts.

Table 5-5 - I-15 South of Tropicana Avenue

Time Period	2010 Counts		Original 2013 Model Run		Alt 5 Model Run	
12 – 7 AM	37,483	17%	26,028	13%	27,741	13%
7 – 9 AM	25,588	12%	21,512	10%	22,442	11%
9 AM – 2 PM	56,402	26%	62,206	30%	60,514	29%
2 – 4 PM	24,802	11%	27,347	13%	27,291	13%
4 – 6 PM	24,010	11%	27,700	13%	26,128	13%
6 – 8 PM	20,850	9%	19,323	9%	19,873	10%
8 PM – 12 AM	29,982	14%	22,134	11%	23,739	12%
TOTAL	**219,117**		**206,251**		**207,730**	

Table 5-6 - US 95 North of Valley View Drive

Time Period	2010 Counts		Original 2013 Model Run		Alt 5 Model Run	
12 – 7 AM	25,160	13%	23,585	11%	24,474	12%
7 – 9 AM	24,116	13%	23,368	11%	24,219	12%
9 AM – 2 PM	50,151	26%	68,136	31%	64,772	31%
2 – 4 PM	24,893	13%	30,535	14%	29,961	15%
4 – 6 PM	26,576	14%	30,486	14%	28,021	14%
6 – 8 PM	19,551	10%	21,522	10%	22,036	11%
8 PM – 12 AM	19,764	10%	20,655	9%	22,494	11%
TOTAL	**190,211**		**218,287**		**215,977**	

A comparison of results between the refinement strategies was conducted to ascertain their performance with respect to the traffic counts and the original 2009 RTC Model 2013 traffic forecast. Table 5-7 displays the results for the test runs of the various refinement strategies at representative locations.

Table 5-7 - Model Refinement Test Run Representative Results

	Per Lane Volumes			
	Southbound AM Peak Hour		Northbound PM Peak Hour	
US 95 North of Lone Mountain	**GP**	**HOV**	**GP**	**HOV**
Counts	1,273	355	1,001	188
Original RTC 2013 Model	881	1,111	1,189	1,065
Alt 1	881	1,109	1,189	1,064
Alt 2	1,090	353	1,240	874
Alt 3	1,080	163	1,159	667
Alt 4	1,092	476	1,254	729
Alt 5	1,089	485	1,149	667

	Per Lane Volumes			
	Southbound AM Peak Hour		Northbound PM Peak Hour	
US 95 South of Summerlin	**GP**	**HOV**	**GP**	**HOV**
Counts	1,828	768	1,625	893
Original RTC 2013 Model	1,646	1,785	1,910	2,068
Alt 1	1,656	1,753	1,911	2,067
Alt 2	1,666	1,723	1,924	2,045
Alt 3	1,643	1,340	1,861	1,489
Alt 4	1,744	1,371	1,963	1,551
Alt 5	1,750	1,360	1,855	1,474

	Per Lane Volumes			
	Southbound AM Peak Hour		Northbound PM Peak Hour	
US 95 North of Rancho	**GP**	**HOV**	**GP**	**HOV**
Counts	1,245	1,479	1,437	552
Original RTC 2013 Model	1,258	1,526	1,583	1,580
Alt 1	1,277	1,413	1,583	1,586
Alt 2	1,320	1,305	1,635	1,494
Alt 3	1,292	890	1,553	971
Alt 4	1,386	1,005	1,633	1,141
Alt 5	1,386	1,015	1,540	991

As the comparison shows, Alternative 5 best replicates the traffic counts patterns. Based on the analysis and model alternative results, it is recommended that the refinements contained in Alternative 5 be utilized in the producing model traffic forecasts for this project.

Figure 5-1, Figure 5-2, and Figure 5-3 display the HOV volumes from the original adopted RTC model and the recommended refinement (Alt 5) model runs, for 2013 at selected locations along US 95 and for 2035 at selected locations along US 95 and I-15.

Figure 5-1 – Final Refined Model Year 2013 US 95 Results

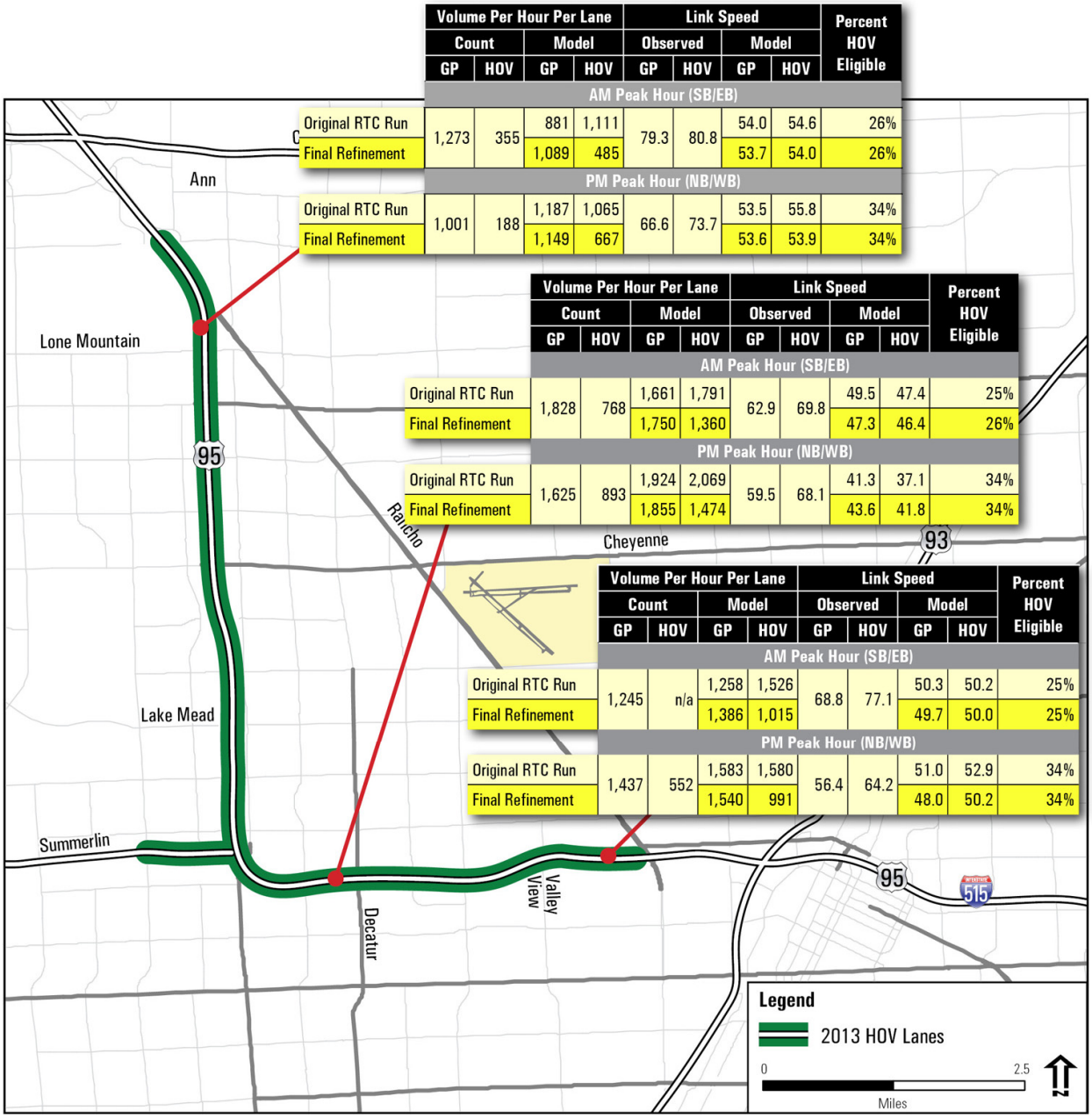
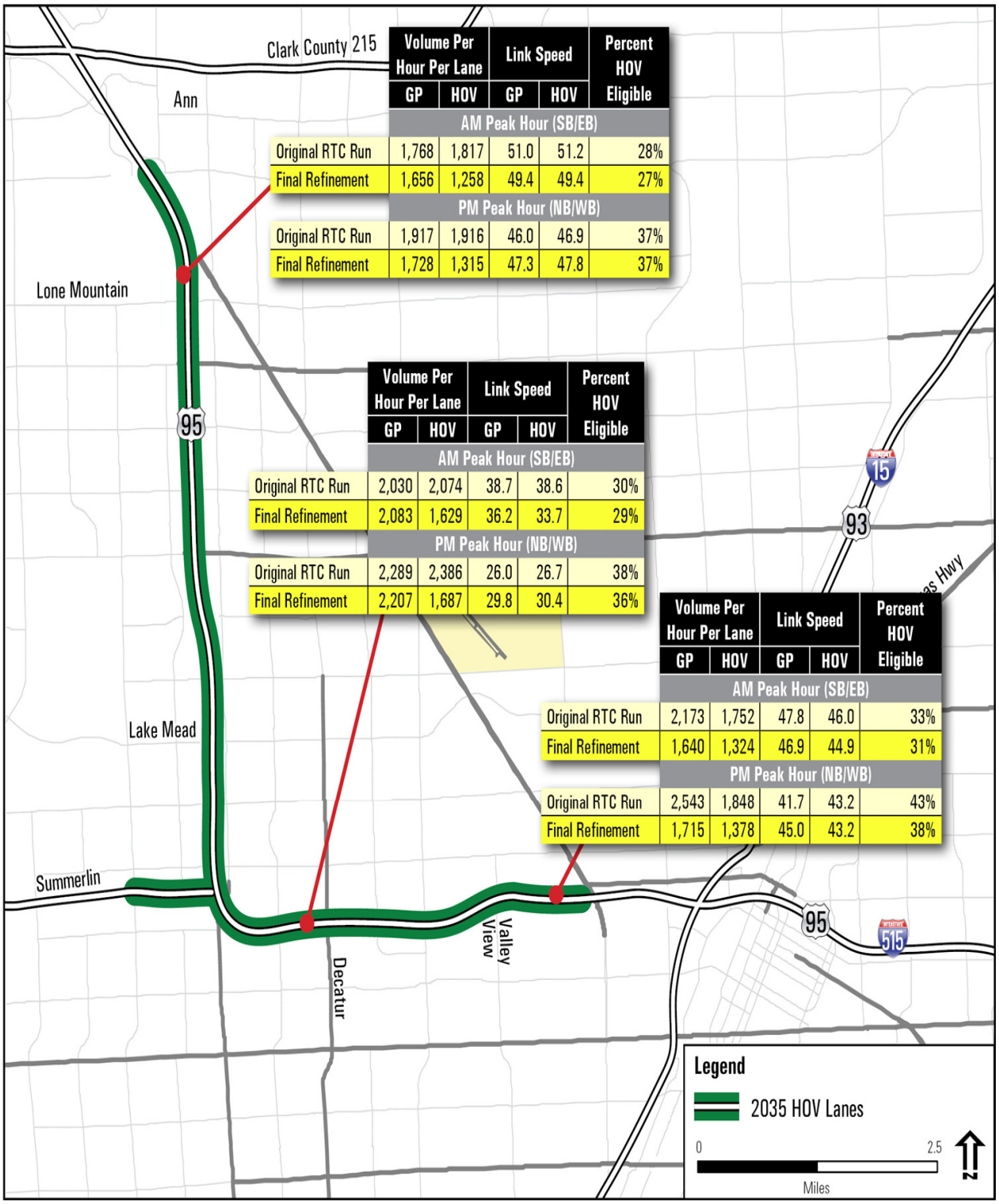


Figure 5-2 – Final Refined Model Year 2035 US 95 Results

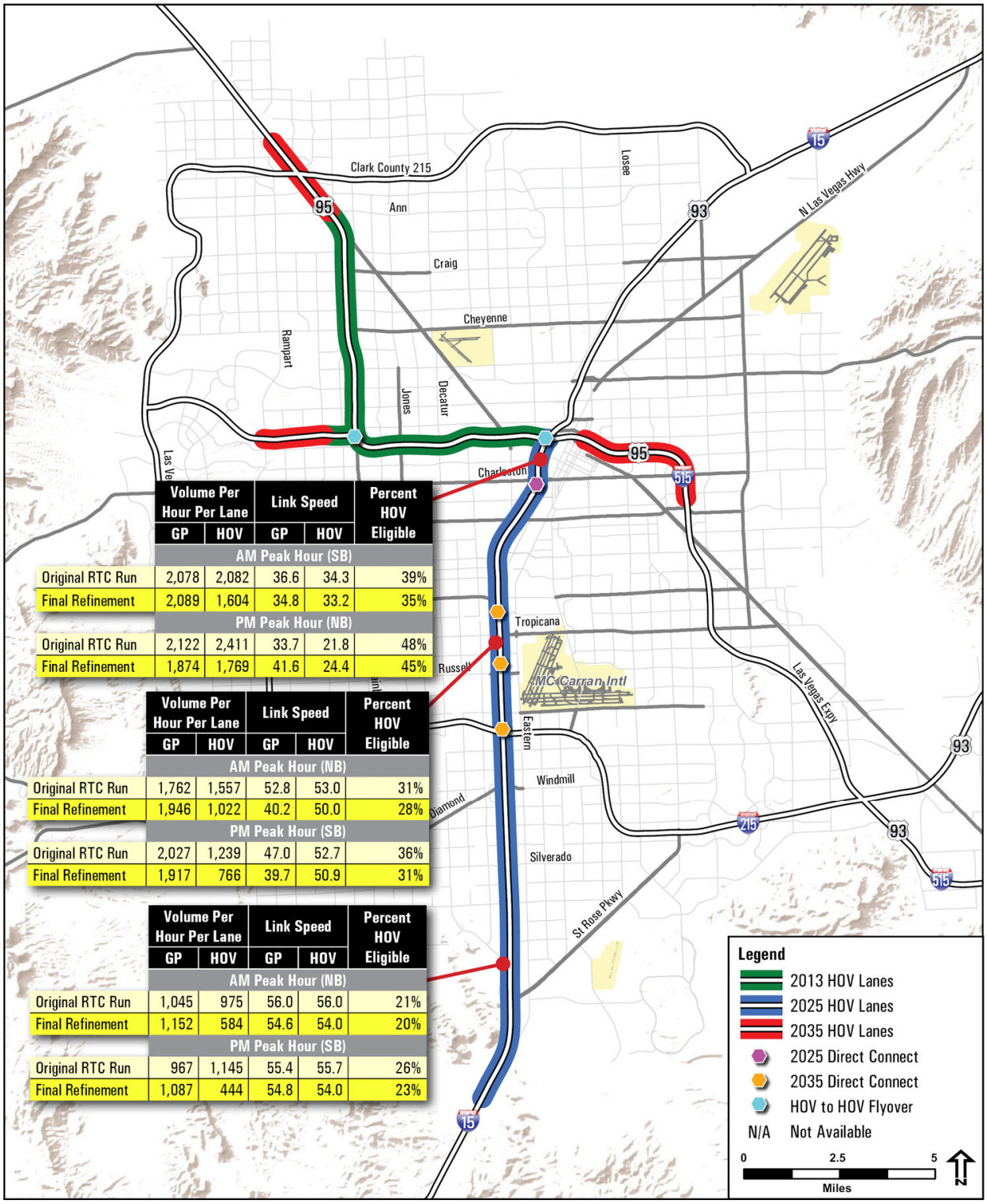


	Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)					
Original RTC Run	1,768	1,817	51.0	51.2	28%
Final Refinement	1,656	1,258	49.4	49.4	27%
PM Peak Hour (NB/WB)					
Original RTC Run	1,917	1,916	46.0	46.9	37%
Final Refinement	1,728	1,315	47.3	47.8	37%

	Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)					
Original RTC Run	2,030	2,074	38.7	38.6	30%
Final Refinement	2,083	1,629	36.2	33.7	29%
PM Peak Hour (NB/WB)					
Original RTC Run	2,289	2,386	26.0	26.7	38%
Final Refinement	2,207	1,687	29.8	30.4	36%

	Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)					
Original RTC Run	2,173	1,752	47.8	46.0	33%
Final Refinement	1,640	1,324	46.9	44.9	31%
PM Peak Hour (NB/WB)					
Original RTC Run	2,543	1,848	41.7	43.2	43%
Final Refinement	1,715	1,378	45.0	43.2	38%

Figure 5-3 – Final Refined Model Year 2035 I-15 Results



	Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
	GP	HOV	GP	HOV	
AM Peak Hour (SB)					
Original RTC Run	2,078	2,082	36.6	34.3	39%
Final Refinement	2,089	1,604	34.8	33.2	35%
PM Peak Hour (NB)					
Original RTC Run	2,122	2,411	33.7	21.8	48%
Final Refinement	1,874	1,769	41.6	24.4	45%

	Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
	GP	HOV	GP	HOV	
AM Peak Hour (NB)					
Original RTC Run	1,762	1,557	52.8	53.0	31%
Final Refinement	1,946	1,022	40.2	50.0	28%
PM Peak Hour (SB)					
Original RTC Run	2,027	1,239	47.0	52.7	36%
Final Refinement	1,917	766	39.7	50.9	31%

	Volume Per Hour Per Lane		Link Speed		Percent HOV Eligible
	GP	HOV	GP	HOV	
AM Peak Hour (NB)					
Original RTC Run	1,045	975	56.0	56.0	21%
Final Refinement	1,152	584	54.6	54.0	20%
PM Peak Hour (SB)					
Original RTC Run	967	1,145	55.4	55.7	26%
Final Refinement	1,087	444	54.8	54.0	23%

6.0. RECOMMENDED MODEL REFINEMENTS

The following list summarizes the final set of refinements implemented in the RTC Model for its application to improve its forecasts of HOV traffic for the Plan Update.

- Reduced lanes on the ingress/egress links from 2-lane directional to 1-lane directional.
- Reduced HOV link capacity from 1,950 vphpl to 1,500 vphpl.
- Reduced HOV ingress/egress capacity from 2,000 vphpl to 1,500 vphpl.
- Adjustment of time-of-day distribution.
- The HOV link speed is equal to the freeway speed.

7.0. MODEL APPLICATION AND RESULTS – 2025

The 2025 Model was coded to reflect the following:

- I-15 and US 95 were coded to reflect current phasing plans of Project Neon. The sources for the coding were the "Phase I to VI Highlighted Plans" and the "P3 30% Design Traffic Control, Signing, Lighting and ITS Plans" available from the Project Neon website (Appendix B).
- The HOV system was assumed to extend from US 95 at Elkhorn Road through I-15 to Sloan Road, as single lanes by direction except for two HOV lanes by direction on I-15 between US 95 and I-215.
- Direct connects were assumed at the proposed HOV Gateway and at Elkhorn Road.
- HOV lane restrictions were assumed to be during the AM and PM peak periods only.

The list of changes made to the 2025 RTC model network is provided in Appendix C. The 2025 HOV system is depicted in Figure 7-1. The 2025 HOV raw model volume results along the length of the HOV corridors are depicted in Figure 7-2. Figure 7-3 shows raw model volumes results at key locations, as well as the portion of traffic by direction that is served in the HOV lane.

Figure 7-1 – 2025 HOV System

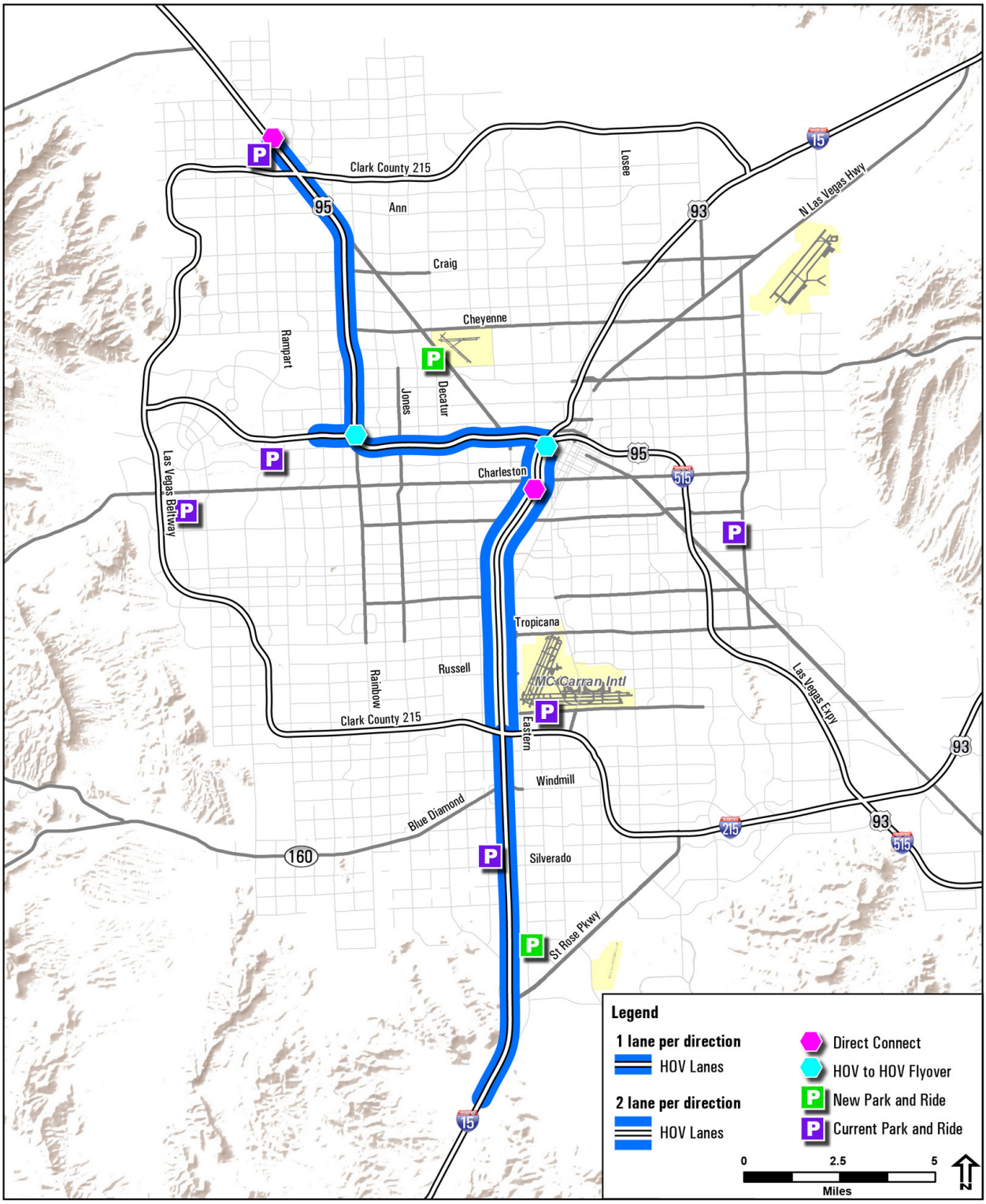


Figure 7-2 – 2025 HOV Corridor Traffic

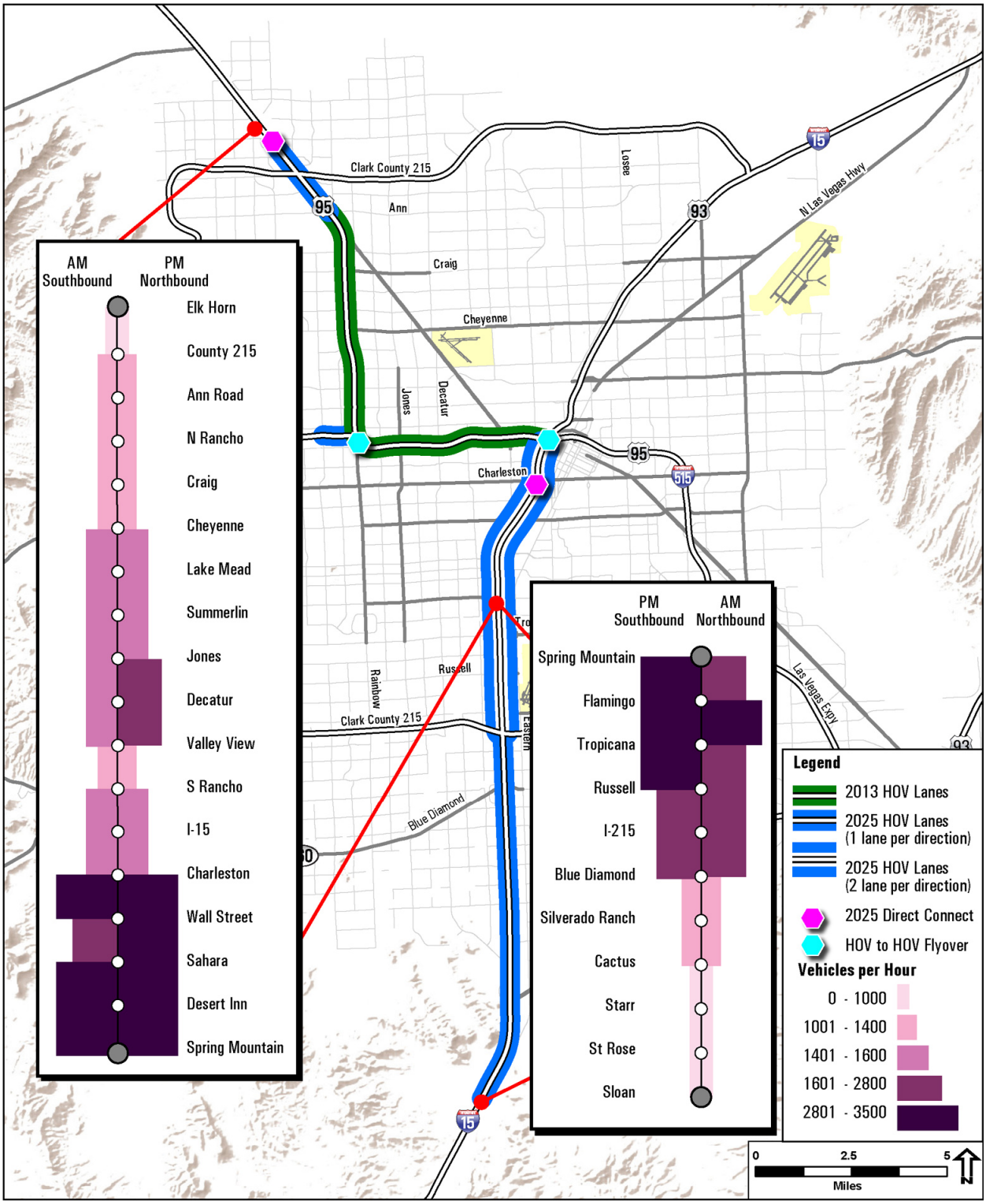
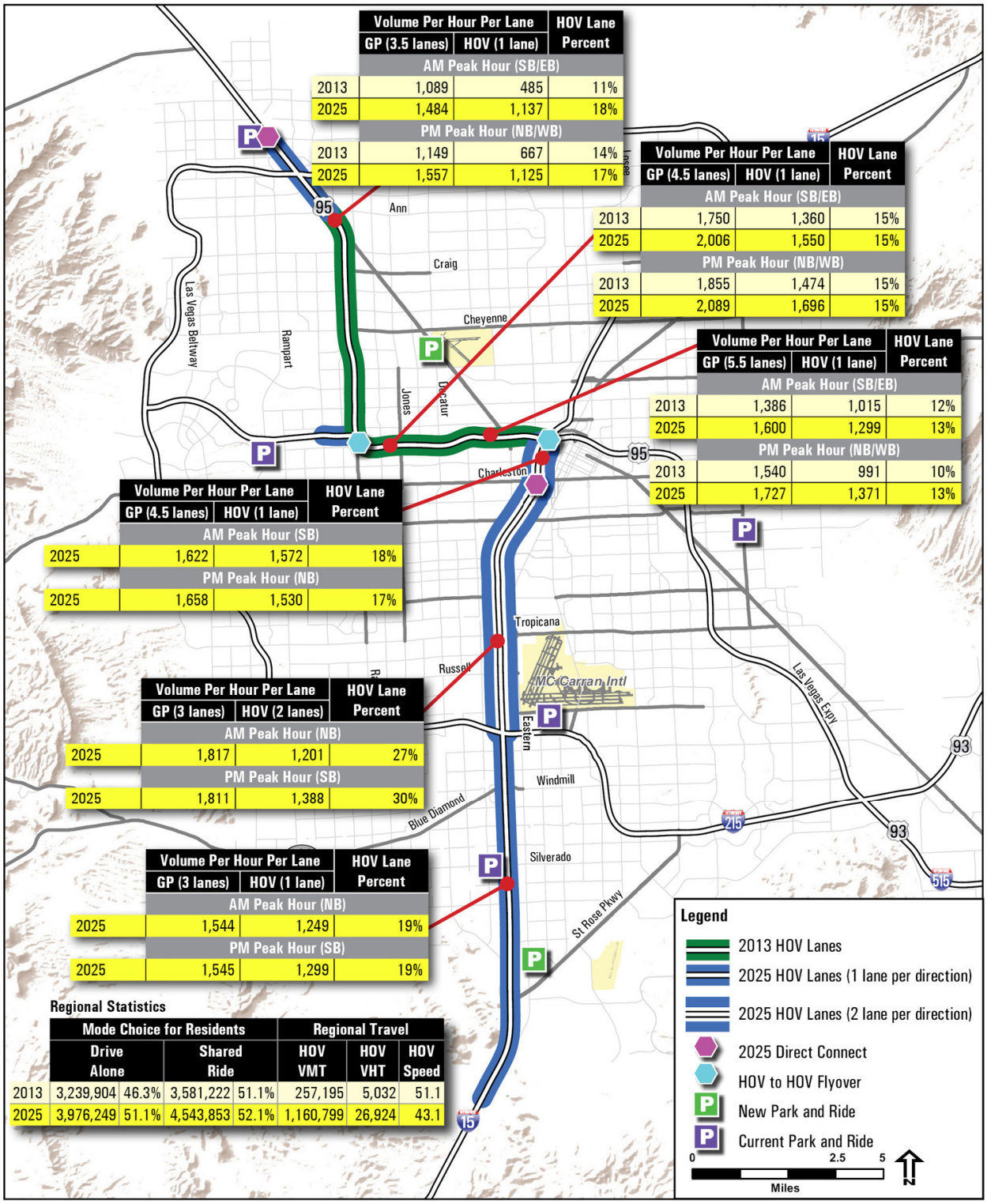


Figure 7-3 – 2025 HOV Traffic Results at Key Locations



8.0. MODEL APPLICATION– 2035

The 2035 Model was coded to reflect the following three scenarios. These scenarios are tabulated in Appendix D.

- HOV Scenario 1, depicted in Figure 8-1, includes the following:
    - All 2025 improvements
    - HOV lanes on the following facilities:
        - I-15 – From Sloan Road to CC-215 (Northern Beltway) (2 lanes HOV between I-215 and I-515)
        - US 95 – From I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)
        - 215 Southern/Western Beltway – From Summerlin Parkway to I-515 (2 lanes between I-15 and Airport Connector)
        - 215 Northern Beltway – From Pecos Road to I-15
        - I-515 – From I-215 to I-15
        - Summerlin Parkway – From US 95 to 215 Western Beltway
    - Direct Connects at:
        - Meade Avenue
        - Harmon Avenue (to/from the north)/Hacienda Avenue (to/from the south)
        - Warm Springs Road (to/from the north)
        - Blue Diamond Road (to/from the north)
        - St. Rose Parkway (to/from the north)
        - Peak Drive
        - Smoke Ranch Road & US 95
        - Maryland Parkway & I-515
        - Rampart Drive & Summerlin Parkway (to/from the east)
        - Sunset Road & Western Beltway
    - HOV to HOV Flyover at:
        - I-15 to US 95 Interchange (I-15 NB to US 95 NB, US 95 SB to I-15 SB, each connection 2 lanes)
        - I-215 to I-15 Interchange (I-215 WB to I-15 NB, I-215 EB to I-15 NB, I-15 SB to I-215 WB, I-15 SB to I-215 EB)
        - I-15 to Northern Beltway Interchange (I-15 NB to CC-215 WB, CC-215 EB to I-15 SB)
        - I-215 to Airport Connector (I-215 EB to Airport, and Airport to I-215 WB)

- HOV Scenario 2, depicted in Figure 8-2, includes the following:
    - All 2025 improvements
    - HOV lanes on the following facilities:
        - I-15 – From Sloan Road to CC-215 (Northern Beltway) (2 lanes HOV between I-215 and I-515)
        - US 95 – From I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)
        - 215 Southern/Western Beltway – From Summerlin Parkway to I-515
        - 215 Northern Beltway – From Pecos Road to I-15

        - I-515 – From Wyoming Avenue to I-15
        - Summerlin Parkway – From US 95 to Rampart Boulevard
    - Direct Connects at:
        - Meade Avenue
        - Hacienda Avenue (to/from the south)/Sunset Road(to/from the north)
        - Blue Diamond Road (to/from the north)
        - St. Rose Parkway (to/from the north)
        - Peak Drive (ramps to the north)
        - Maryland Parkway & I-515
    - HOV to HOV Flyover at:
        - I-15 to US 95 Interchange (I-15 NB to US 95 NB, US 95 SB to I-15 SB, each connection 1 lane)
        - I-215 to I-15 Interchange (I-215 EB to I-15 NB, I-15 SB to I-215 WB)
        - I-15 to Northern Beltway Interchange (I-15 NB to CC-215 WB, CC-215 EB to I-15 SB)

- HOV Scenario 3 (base model run representing 2007 HOV Plan network), depicted in Figure 8-3, includes the following:
    - All 2025 improvements
    - HOV lanes on the following facilities:
        - I-15 – From Sloan Road to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)
        - US 95 – From I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)
        - 215 Southern/Western Beltway – From Summerlin Parkway to I-515 (2 lanes between I-15 and Airport Connector)
        - I-515 – From I-215 to I-15
        - Summerlin Parkway – From US 95 to Rampart Boulevard
    - Direct Connects at:
        - Harmon Avenue (to/from the north)/Hacienda Avenue (to/from the south)
        - Warm Springs Road as option to Hacienda (to/from the south)
    - HOV to HOV Flyover at:
        - I-15 to US 95 Interchange (I-15 NB to US 95 NB, US 95 SB to I-15 SB, each connection 2 lanes)
        - I-215 to I-15 Interchange (I-215 WB to I-15 NB, I-15 SB to I-215 EB)
        - I-215 to Airport Connector (I-215 EB to Airport, and Airport to I-215 WB)

A list of changes made to the 2035 RTC model network that are common to all three scenarios is provided in Appendix E.

Figure 8-1 – 2035 HOV Scenario 1

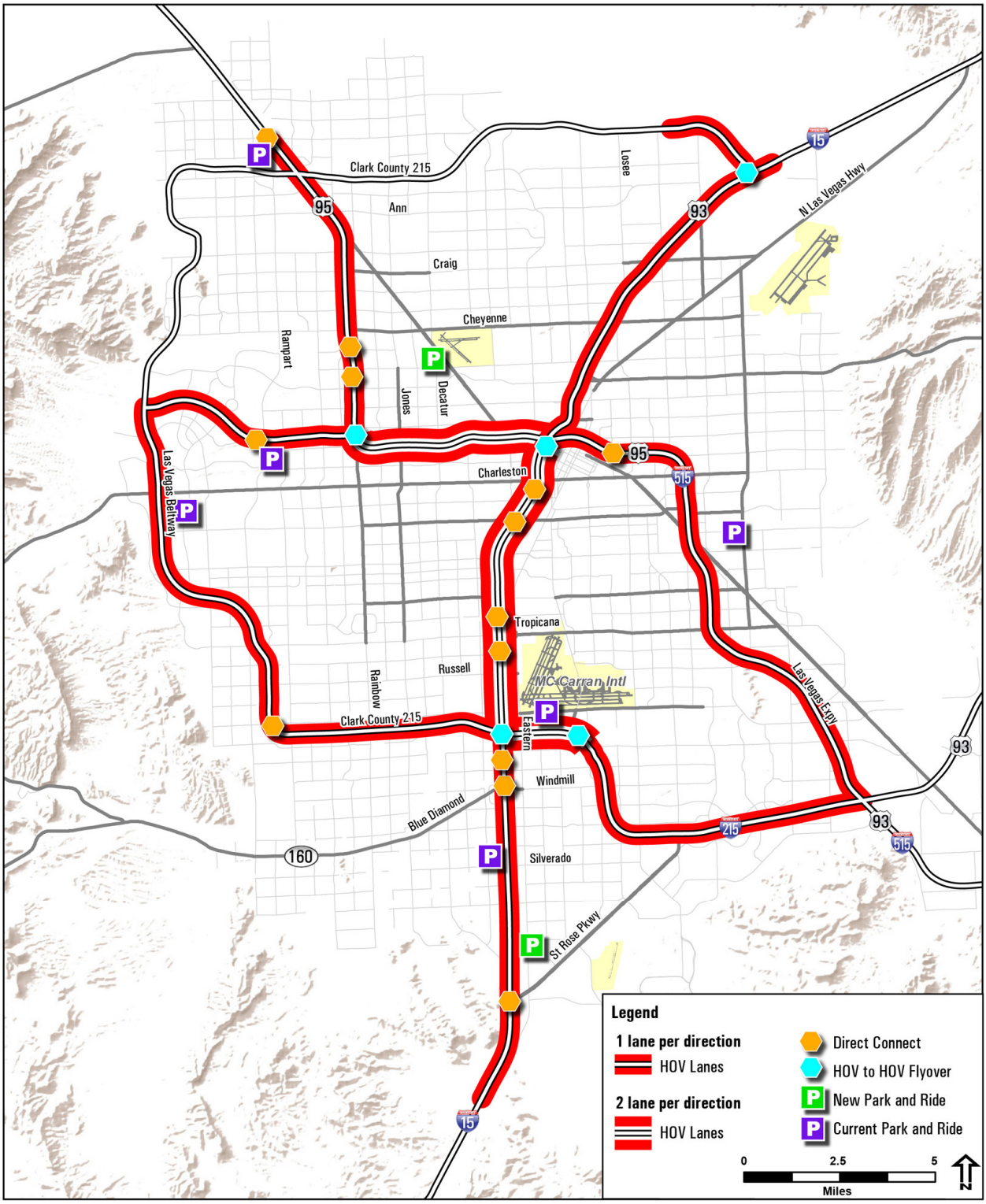


Figure 8-2 – 2035 HOV Scenario 2

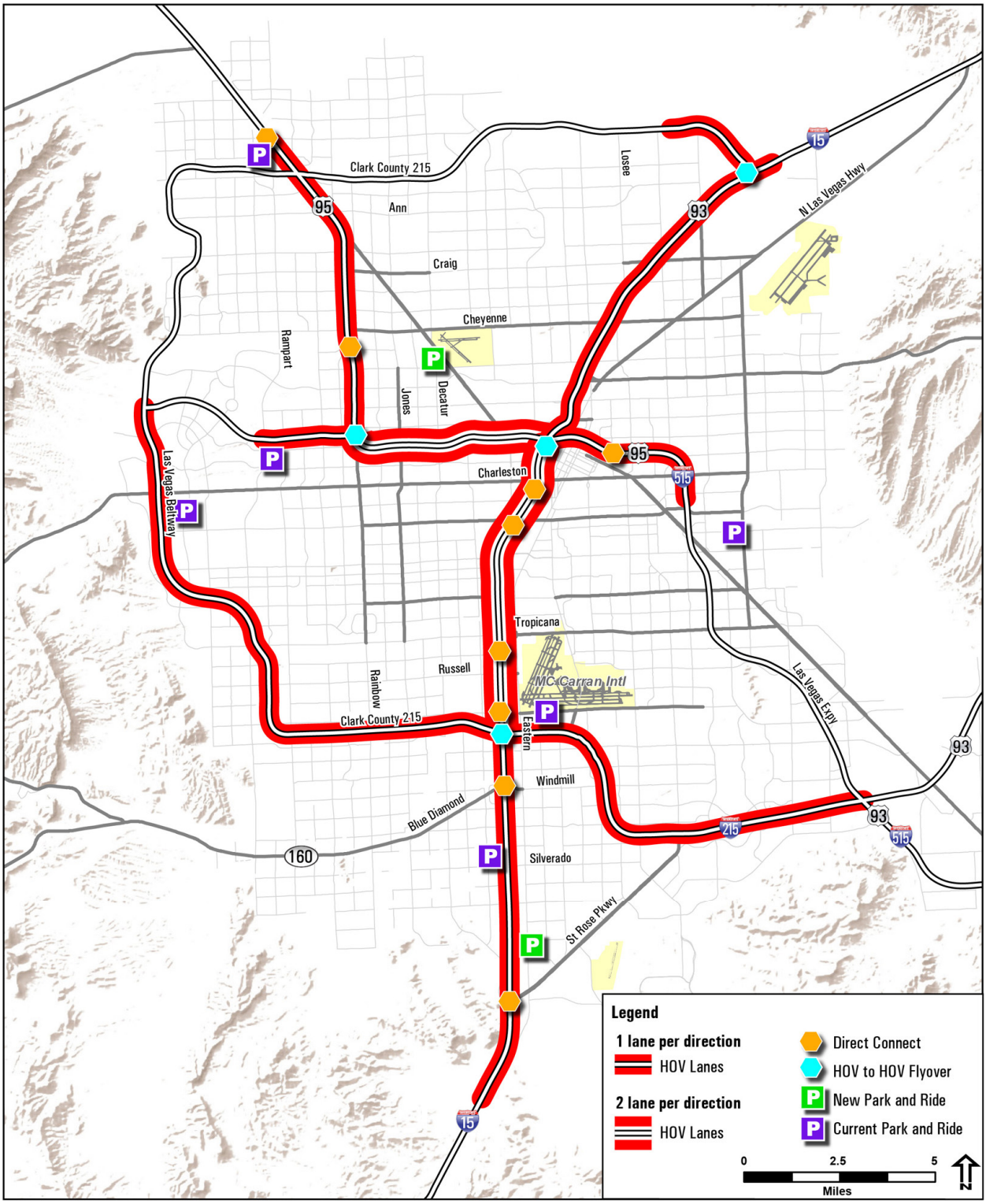
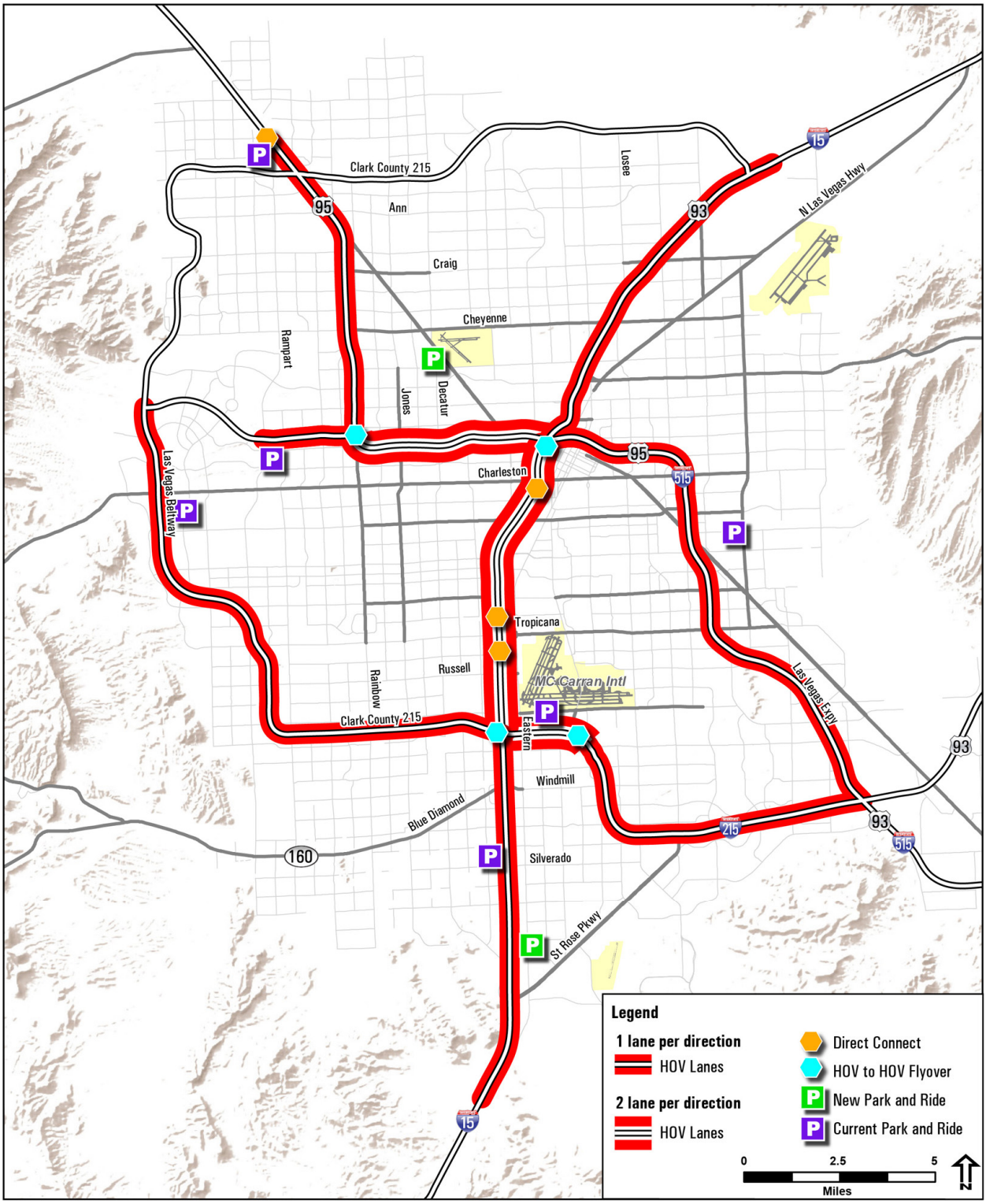


Figure 8-3 – 2035 HOV Scenario 3



9.0. TRAFFIC FORECASTS FROM THE TRAVEL DEMAND MODELS

This section explains the development of the year 2025 and year 2035 traffic forecasts for the near-term study area. This study area, I-15 between St. Rose Parkway and US 95/I-515, and US 95/I-515 between South Rancho Drive and West Charleston Boulevard, is shown in Figure 9-1.

Raw model volumes were used to develop AM and PM peak hour volume forecasts following the NDOT Traffic Forecasting Guidelines (Guidelines). Year 2025 and year 2035 forecasts were developed from the "Year 2025 Model" previously described in Chapter 7 and from the "Year 2035 HOV System Scenario 2 Model" described in Chapter 8. The Traffic Forecasting Guidelines Checklist was completed as required by the Guidelines and is provided as Appendix F.

9.1. Model Output (AAWDT) Conversion to AADT

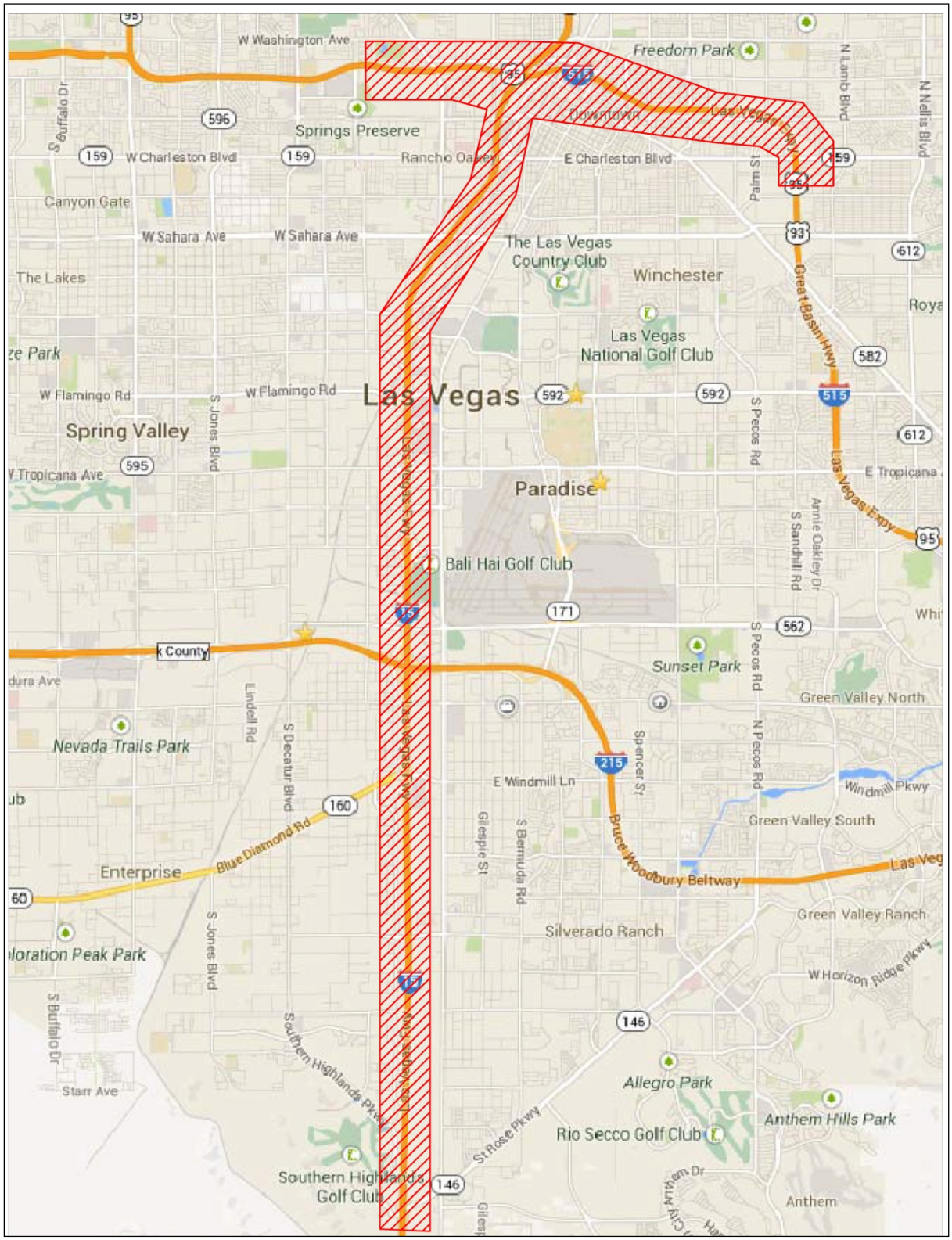
The RTC models produce Annual Average Weekday (Monday through Friday) Daily Traffic (AAWDT) forecasts. The models' daily volume forecasts were first converted to Annual Average Daily Traffic (AADT) forecasts through the application of the Model Output Conversion Factor (MOCF). The MOCF was calculated following the Guidelines, based on existing counts available from the NDOT count stations listed in Table 9-1; Table 9-1 shows the calculation of the project MOCF.

9.2. NCHRP Report 255 Adjustments

Per the Guidelines, the base year model's (year 2013) traffic output was compared to field traffic counts and is shown in Table 9-2. Both the Percent Deviation comparisons and the Coefficient of Variation of Root Mean Square Error (CV[RMSE]) comparisons were made as required by the Guidelines. The results of these comparisons are also tabulated in Table 9-2.

From Table 9-2, it can be seen that the consistency thresholds stipulated in the Guidelines are not satisfied. Therefore, NCHRP Report 255 adjustments are needed to adjust the year 2025 and year 2035 model output volumes to enhance the accuracy of the traffic forecasts.

Figure 9-1 - Near-Term Study Area



Source: Google Maps™, 2013.

Table 9-1 - Calculation of MOCF

Freeway	NDOT Count Station Location	NDOT Count Station	NDOT Count AADT	NDOT Count AAWDT	MOCF
I-15	Between the Saint Rose Parkway Interchange and the Silverado Ranch Boulevard Interchange	30728	62,229	63,077	0.987
I-15	South of the Blue Diamond Road Interchange	35340	113,129	114,362	0.989
I-15	North of the Sahara Avenue Interchange	31210	259,869	268,204	0.969
I-15	Between the Charleston Avenue Interchange and the Las Vegas Expressway Interchange	30092	255,452	262,645	0.973
I-15	North of the Cheyenne Avenue Interchange	30387	86,197	92,289	0.934
US 95	South of the Decatur Boulevard Interchange	30323	204,923	206,973	0.990
US 95	South of the Craig Avenue Interchange	30715	121,052	128,117	0.945
I-215	Between the Windmill Lane Interchange and the Eastern Avenue Interchange	30078	126,122	134,848	0.935
CC-215	South of the Far Hills Avenue Interchange	35270	69,218	75,912	0.912
I-515	Between the Las Vegas Boulevard Interchange and the Eastern Avenue Interchange	30784	122,995	131,406	0.936
Project MOCF					**0.957**
Note: Year 2012 and year 2013 counts were used in the estimation of MOCF.					

The three NCHRP Report 255 adjustment methods are the "ratio adjustment method," "difference adjustment method," and the "combination adjustment method." The "difference adjustment method" and the "combination adjustment method" require the availability of field counts along the respective project links. Representative existing year counts were unavailable for many of the study links. For these study segments and for segments that do not exist in the base year, the ratio adjustment method was followed. In addition to the NCHRP Report 255 adjustments, manual adjustment of forecast volumes was required at many locations for balancing and continuity, and was performed as necessary.

Table 9-2 - Percent Deviation & CV(RMSE) Comparison

Freeway	Location	NDOT Count Station	Year 2013 NDOT Count AADT	Year 2013 Model AADT	Percent Deviation	Percent Deviation Meets Thresholds?	CV(RMSE)	CV(RMSE) Meets Thresholds?
I-15	Between the Saint Rose Parkway Interchange and the Silverado Ranch Boulevard Interchange	30728	62,229	66,243	-6%	Yes	14%	No
I-15	South of the Blue Diamond Road Interchange	35340	113,129	105,907	6%	Yes		
I-15	North of the Sahara Avenue Interchange	31210	259,869	283,169	-9%	No		
I-15	Between the Charleston Avenue Interchange and the Las Vegas Expressway Interchange	30092	255,452	252,225	1%	Yes		
I-15	North of the Cheyenne Avenue Interchange	30387	86,197	67,058	22%	No		
US 95	South of the Decatur Boulevard Interchange	30323	204,923	173,281	15%	No		
US 95	South of the Craig Avenue Interchange	30715	121,052	122,178	-1%	Yes		
I-215	Between the Windmill Lane Interchange and the Eastern Avenue Interchange	30078	126,122	151,856	-20%	No		
I-215	South of the Far Hills Avenue Interchange	35270	69,218	38,796	44%	No		

Freeway	Location	NDOT Count Station	Year 2013 NDOT Count AADT	Year 2013 Model AADT	Percent Deviation	Percent Deviation Meets Thresholds?	CV(RMSE)	CV(RMSE) Meets Thresholds?
I-515	Between the Las Vegas Boulevard Interchange and the Eastern Avenue Interchange	30784	122,995	146,315	-19%	No		
US 95 (HOV Lane)	North of the Rancho Drive Interchange	30322	14,485	23,489	-62%	No	106%	No
US 95 (HOV Lane)	South of the Summerlin/Rainbow Interchange	30716	14,587	34,429	-136%	No		
US 95 (HOV Lane)	South of the Cheyenne Avenue Interchange	30719	6,191	24,672	-299%	No	299%	No
US 95 (HOV Lane)	North of the Lone Mountain Road Interchange	30713	3,697	6,492	-76%	No	76%	No

For year 2025 and year 2035 HOV links along I-15, which do not exist in the base year, adjustments were based on the NDOT count data available from the existing HOV lanes along US 95. The year 2025 and year 2035 AADT forecasts for all the study links are provided in Appendix G and Appendix H respectively.

9.3. Comparison of Forecasts with Historical Trend Projections

As recommended in the Guidelines, the reasonability of the AADT forecasts from the travel demand models was verified by comparisons with historical trend projection of existing field counts. Historical AADT values extending from the year 1993 to year 2012 were obtained for the following NDOT short-term count stations within the study limits.

- NDOT Count Station# 30728 – I-15, between the Saint Rose Parkway interchange and the Silverado Ranch Boulevard interchange.
- NDOT Count Station# 30074 – I-15, North of the Spring Mountain Road interchange.
- NDOT Count Station# 30092 – I-15, between the Charleston Boulevard interchange and the Las Vegas Expressway interchange.
- NDOT Count Station# 30784 – I-515 between the Las Vegas Boulevard interchange and the Eastern Avenue interchange.

Logarithmic, linear, and exponential trend projections were performed based on the existing and expected land use and traffic characteristics of the location. Appendix I provides the outputs of this historical trend projection analysis. The traffic forecasts developed from the travel demand models were deemed to be reasonable when compared to the historical trend analysis. Therefore, the year 2025 and year 2035 forecasts were deemed to be acceptable.

9.4. Estimation of Peak Hour Volumes

Once the year 2025 and year 2035 AADTs were obtained, the next step was to estimate the Design Hour Volumes (DHVs) from the AADTs. The DHVs (peak hour volumes) were obtained from the AADTs by the application of K_{30}. Table 9-3 shows the K_{30} values used in the estimation of the peak hour volumes, and the basis for the K_{30} values.

The peak hour volume estimated by the application of K_{30} is the hourly volume during the critical peak period of the facility. The hourly volume during the other peak period of the day was estimated by applying the $\frac{\text{(Other Peak Period Volume)}}{\text{(Critical Peak Period Volume)}}$ ratio; this is listed in Table 9-4. The critical peak period and the other peak period for the study facilities are also identified in Table 9-4. These were determined from an examination of the existing NDOT counts within the study area.

Table 9-3 - Traffic Forecasting Parameters – K_{30}

Facility	K_{30} Value	Value Based On
• I-15 – North of the I-215 Interchange • US 95/I-515	7.00%	• NDOT ATR# 31210 (North of the Sahara Avenue Interchange) • NDOT ATR# 32220 (South of the Jones Boulevard Interchange) • 15th percentile value of all K_{30} for Urban Principal Arterial: Interstate, from the Guidelines
I-15 – South of the I-215 Interchange	7.60%	• NDOT ATR# 35340 (South of the Blue Diamond Road Interchange) • Falls within the recommended range of K_{30} values for Urban Principal Arterial: Interstate, from the Guidelines

Table 9-4 - Traffic Forecasting Parameters – Off-Peak Period/Peak Period Ratio and Traffic Flow Directionality

Facility	Critical Peak Period	Other Peak Period	Average (Other Peak Period Volume)/(Critical Peak Period Volume) Ratio
I-15 Northbound - South of Spring Mountain Road	AM	PM	0.870
I-15 Southbound - South of Spring Mountain Road	PM	AM	
I-15 Northbound - North of Spring Mountain Road	PM	AM	
I-15 Southbound - North of Spring Mountain Road	AM	PM	
US 95 Northbound - North of I-15	PM	AM	0.843
US 95 Southbound - North of I-15	AM	PM	
I-515 Northbound - South of I-15	AM	PM	
I-515 Southbound - South of I-15	PM	AM	

9.5. Restricted Access to/from the HOV System

The year 2025 system is expected to have restricted access to/from the HOV lane through limited ingress/egress locations; whereas the year 2035 system was not likewise restricted (to preserve the flexibility of NDOT in operating the HOV system). The peak hour volume forecasts were developed to reflect these conditions.

Along I-15 both in the northbound and southbound direction, between I-215 and the proposed HOV Gateway, three ingress/egress locations to/from the HOV lane are recommended. These ingress/egress locations are approximately located near Russell Road, near the Flamingo Road overpass, and near the Sahara Avenue overpass. South of I-215, ingress/egress locations are proposed between every interchange. The final HOV lane ingress/egress locations are to be re-evaluated based on an operational analysis during the design phase of the implementation of the HOV system.

Northbound I-15 – Description of Ingress/Egress Locations

- Along I-15, south of the Blue Diamond Road interchange, ingress/egress locations are to be determined based on a weaving analysis.

- Egress location near the Blue Diamond Road interchange:

    - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Russell Road and the Tropicana Avenue off-ramp.

- Ingress/egress location near Russell Road:
    - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Blue Diamond Road on-ramps and the I-215 westbound on-ramp.
    - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Flamingo Road off-ramp and the Spring Mountain Road off-ramp.

- Ingress/egress location near the Flamingo Road overpass:
    - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the slip-ramp from the I-15 Collector-Distributor (CD) road (near Tropicana Avenue) and the Tropicana Avenue on-ramp.
    - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Sahara Avenue off-ramp.

- Ingress/egress location near the Sahara Avenue overpass:

  - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Flamingo Road on-ramp and the Spring Mountain Road on-ramps.
  - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Charleston Boulevard off-ramp, the I-15 northbound to MLK Boulevard off-ramp and the I-15 northbound to I-515 southbound off-ramp.

Southbound I-15 – Description of Ingress/Egress Locations

- Ingress/egress location near the Sahara Avenue overpass:
  - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the I-515 northbound to I-15 southbound on-ramp, the Charleston Boulevard on-ramp, and the on-ramp from the CD road (near Oakey Boulevard).
  - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Spring Mountain Road off-ramp and the Flamingo Road off-ramps.

- Ingress/egress location near the Flamingo Road overpass:
  - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Sahara Avenue on-ramp and the Spring Mountain Road on-ramp.
  - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Tropicana Avenue off-ramp and the slip-ramp to the CD road (south of Tropicana Avenue).

- Ingress/egress location near Russell Road:
  - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Flamingo Road on-ramp.
  - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the I-15 southbound to I-215 eastbound off-ramp.

- Ingress/egress location near the Blue Diamond Road interchange:
  - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the on-ramp from the CD road (near I-215).
  - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Blue Diamond Road off-ramp.

- South of the Blue Diamond Road interchange, ingress/egress locations are to be determined based on a weaving analysis.

9.6. Summary of Post-Processing Methodology

The following is a step-by-step description of the procedure adopted to estimate the final peak hour volumes from the raw model volumes:

1. The raw daily model volumes (AAWDT) were refined using the NCHRP Report 255 adjustment methods.

2. The refined daily volumes were balanced to meet the following constraints:

    a. (Upstream GP lane volume + upstream HOV lane volume) – off-ramp volume = (downstream GP lane volume + downstream HOV lane volume)

    b. (Upstream GP lane volume + upstream HOV lane volume) + on-ramp volume = (downstream GP lane volume + downstream HOV lane volume)

3. The MOCF was applied to the refined, balanced daily volumes (AAWDT) to obtain AADT forecast volumes.

4. The AADT forecast volumes were compared with historical trend projections to check for the reasonability of forecasts. If a reasonable justification for large differences was not apparent, Step 1 was revisited and the NCHRP Report 255 adjustments were reviewed and refined.

5. For each study link, the K_{30} was applied to the AADT to obtain the DHV. This is the critical peak hour volume for the study link.

    a. As shown in Table 9-3, different K_{30} values were used for different regions of the study area to accurately reflect the traffic characteristics of the region.

    b. The K_{30} value was gradually changed (linearly) along the corridor to result in a smooth transition of K_{30} values. This resulted in more accurate forecasts by eliminating big 'jumps' in the peak hour volumes and resulted in minimal imbalance in the peak hour volumes.

6. For each study link, the $\frac{\text{(Other Peak Period Volume)}}{\text{(Critical Peak Period Volume)}}$ ratio was applied to the DHV to obtain the other peak period volume.

    a. As shown in Table 9-4, the peak directionality of traffic flow of the corridors flip within the study area. For example:

i. On I-15, in the AM peak period, northbound is the peak direction of flow south of Spring Mountain Road, whereas southbound is the peak direction of flow north of Spring Mountain Road.

ii. Similarly, on US 95/I-515, in the AM peak period, northbound I-515 is the peak direction of flow south of I-15, whereas southbound US 95 is the peak direction of flow north of I-15.

b. So, the $\frac{\text{(Other Peak Period Volume)}}{\text{(Critical Peak Period Volume)}}$ ratio was gradually changed (linearly) along the corridor to ensure that the change in the peak direction of flow occurs gradually. This resulted in more accurate and realistic forecasts by eliminating big 'jumps' in the peak hour volumes and resulted in minimal imbalance in the peak hour volumes.

7. The resulting peak hour volume forecasts were compared with the existing peak hour volumes for reasonability. If the peak hour volumes forecasts were found to be unreasonable, Step 1 was revisited and the NCHRP Report 255 adjustments were reviewed and refined.

8. In the development of the year 2025 forecasts, the HOV and GP lane forecast volumes were adjusted to reflect the restricted access to/from the HOV lane through limited ingress/egress locations.

9. The final peak hour volume forecasts were balanced to ensure the constraints listed in Step 2 were satisfied.

The year 2025 and year 2035 peak hour volume forecasts obtained from the application of the above procedure are provided in Figure 9-2 and Figure 9-3, respectively.

Figure 9-2 - Year 2025 Forecast Traffic Volumes

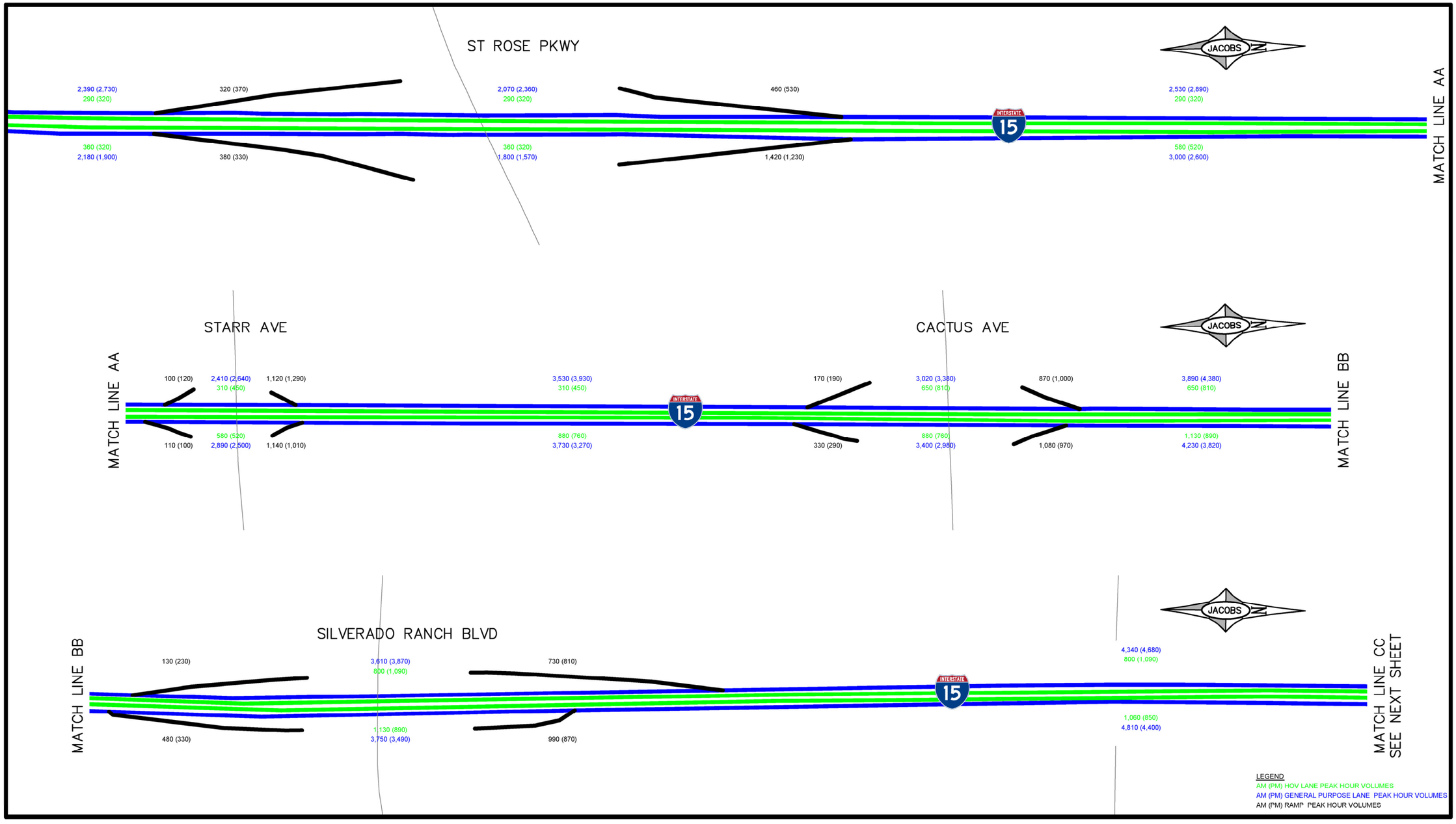


Figure 9-2 - Year 2025 Forecast Traffic Volumes

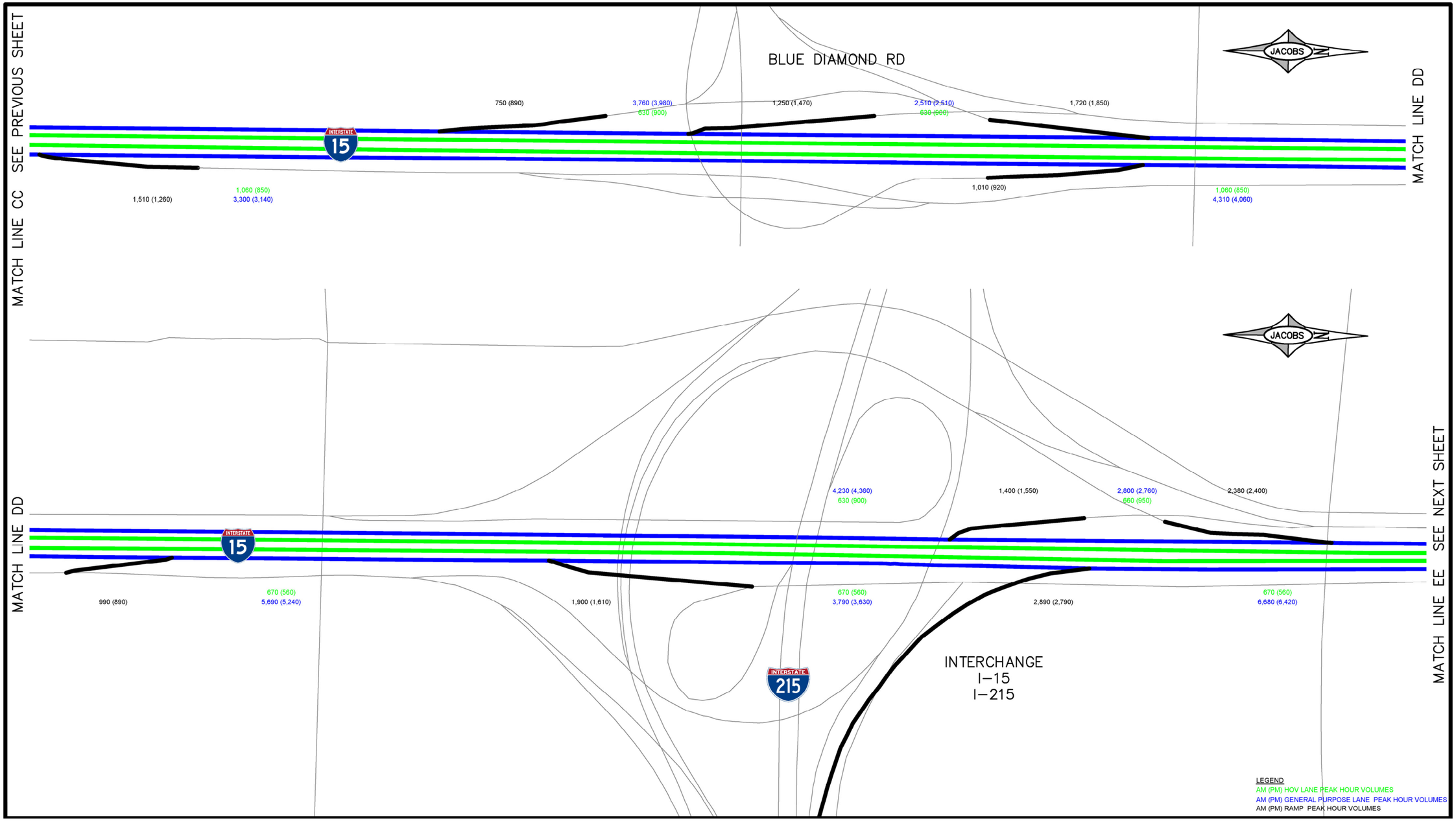


Figure 9-2 - Year 2025 Forecast Traffic Volumes

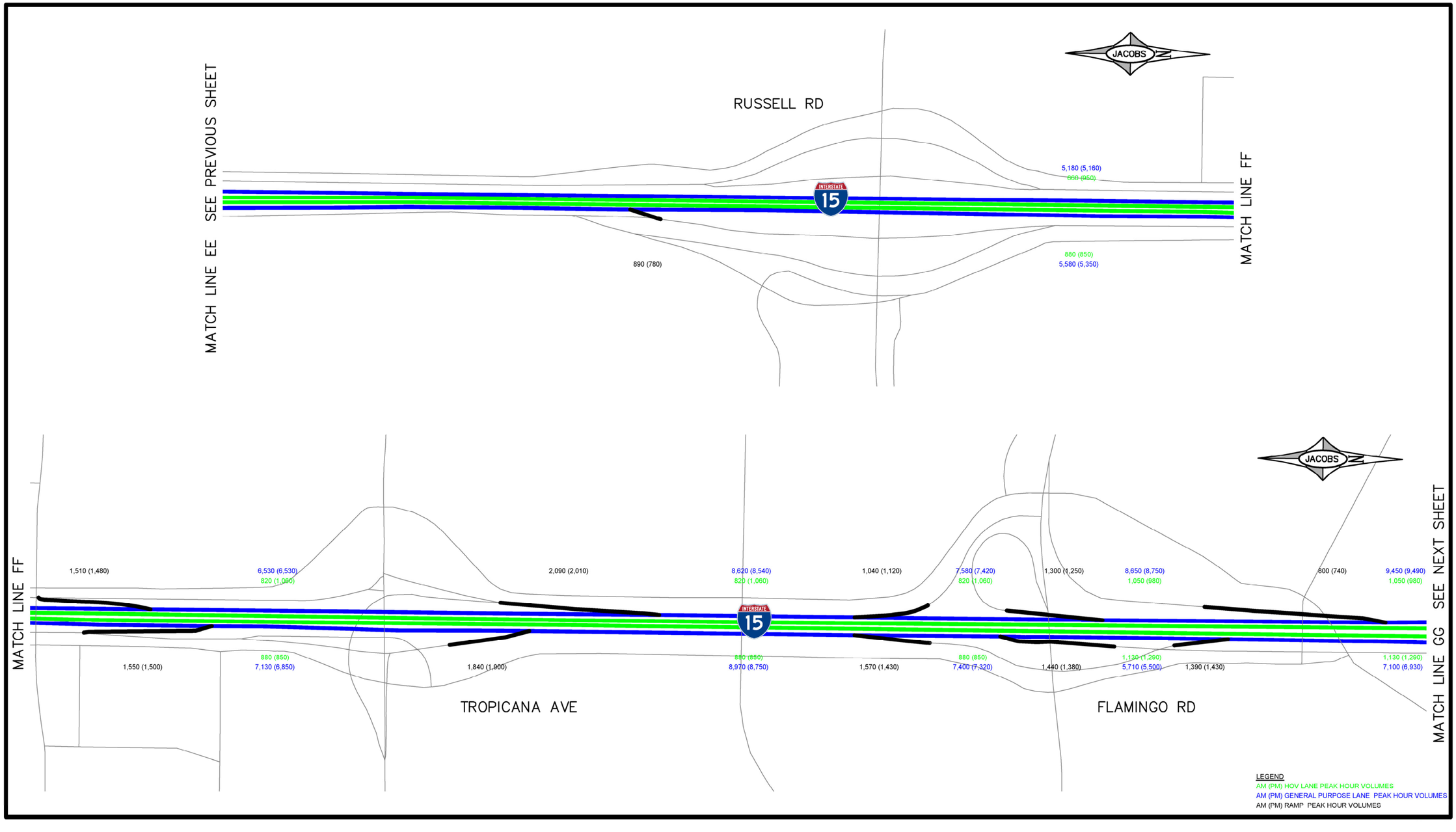


Figure 9-2 - Year 2025 Forecast Traffic Volumes

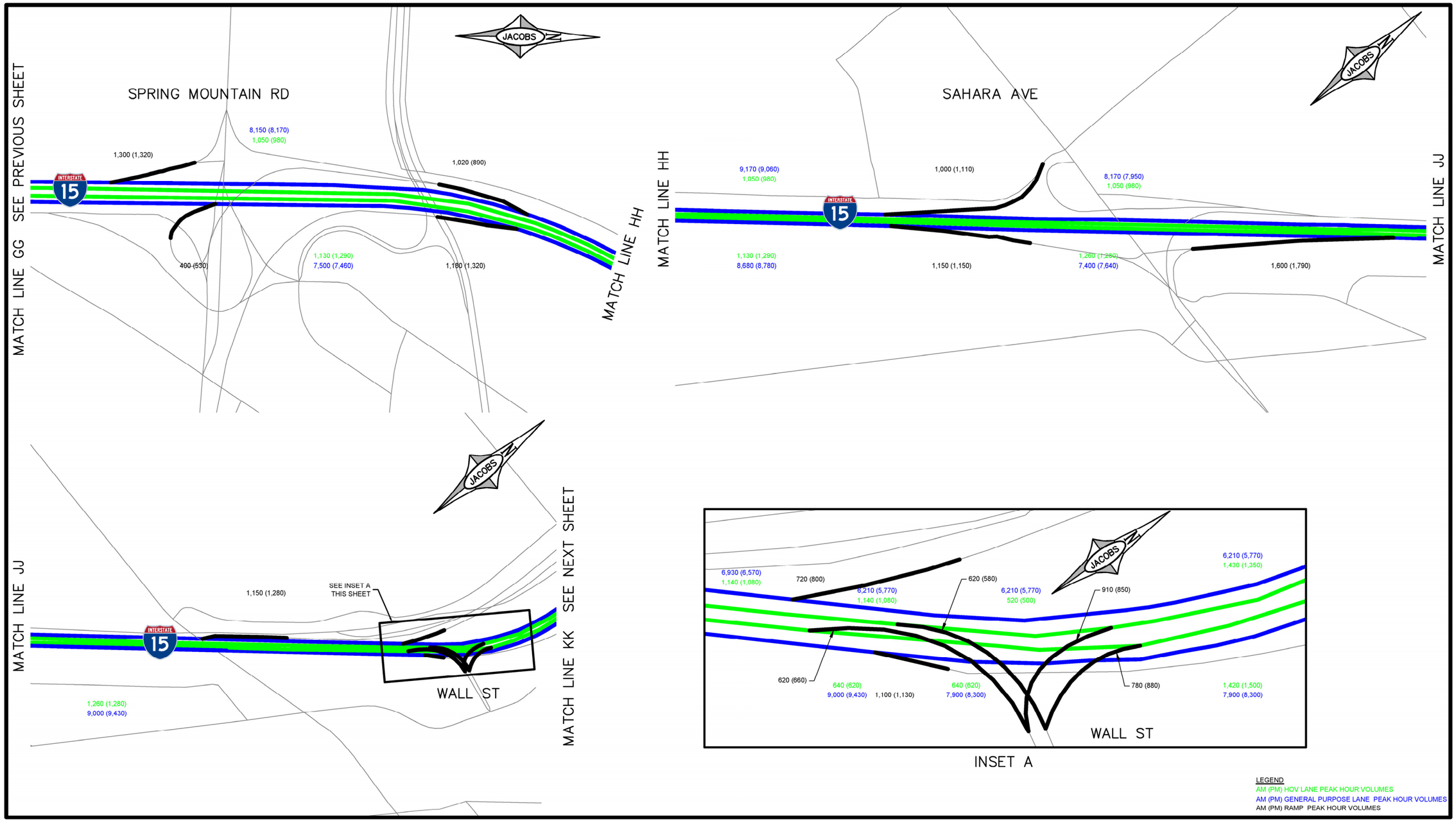


Figure 9-2 - Year 2025 Forecast Traffic Volumes

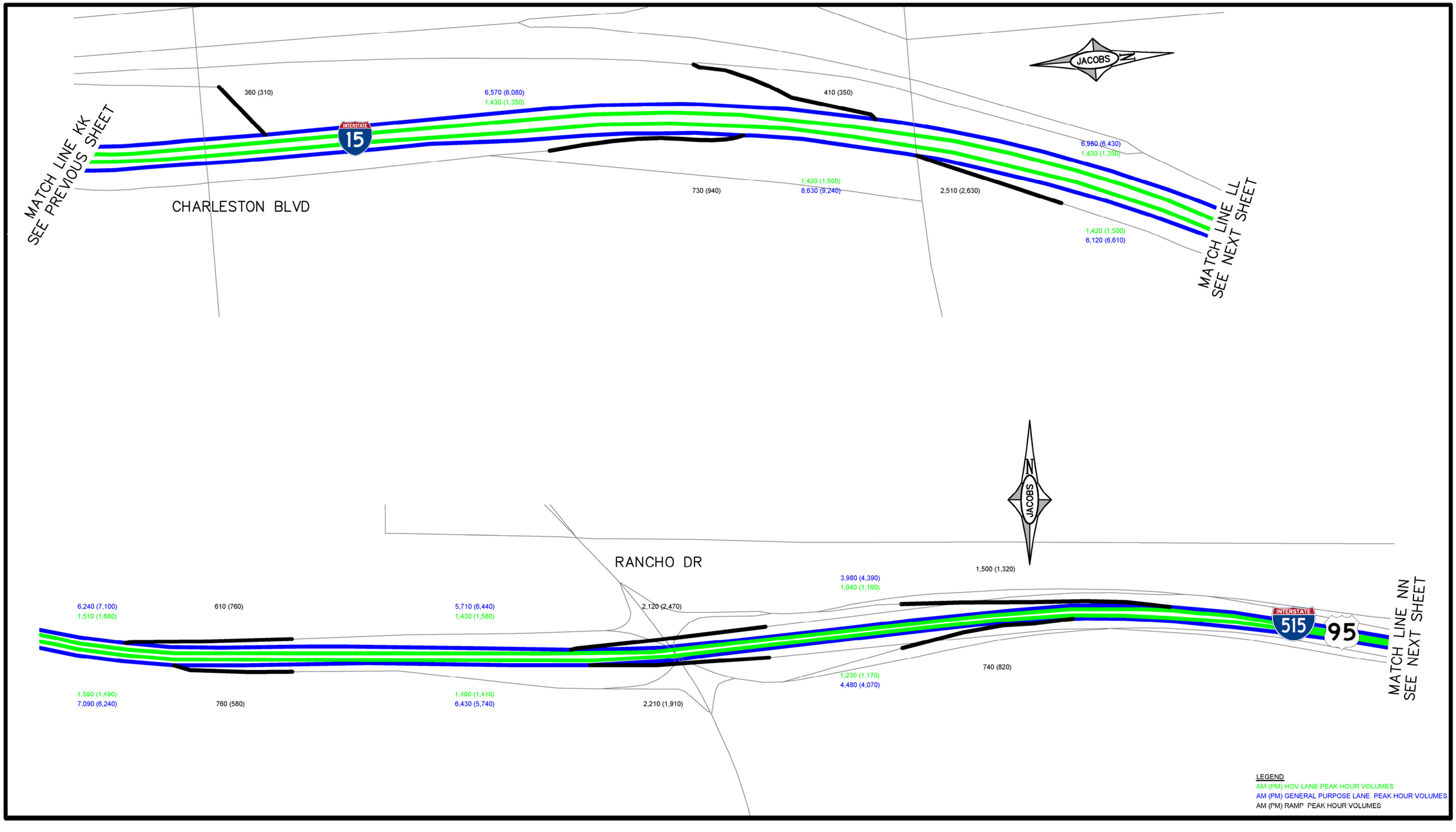


Figure 9-2 - Year 2025 Forecast Traffic Volumes

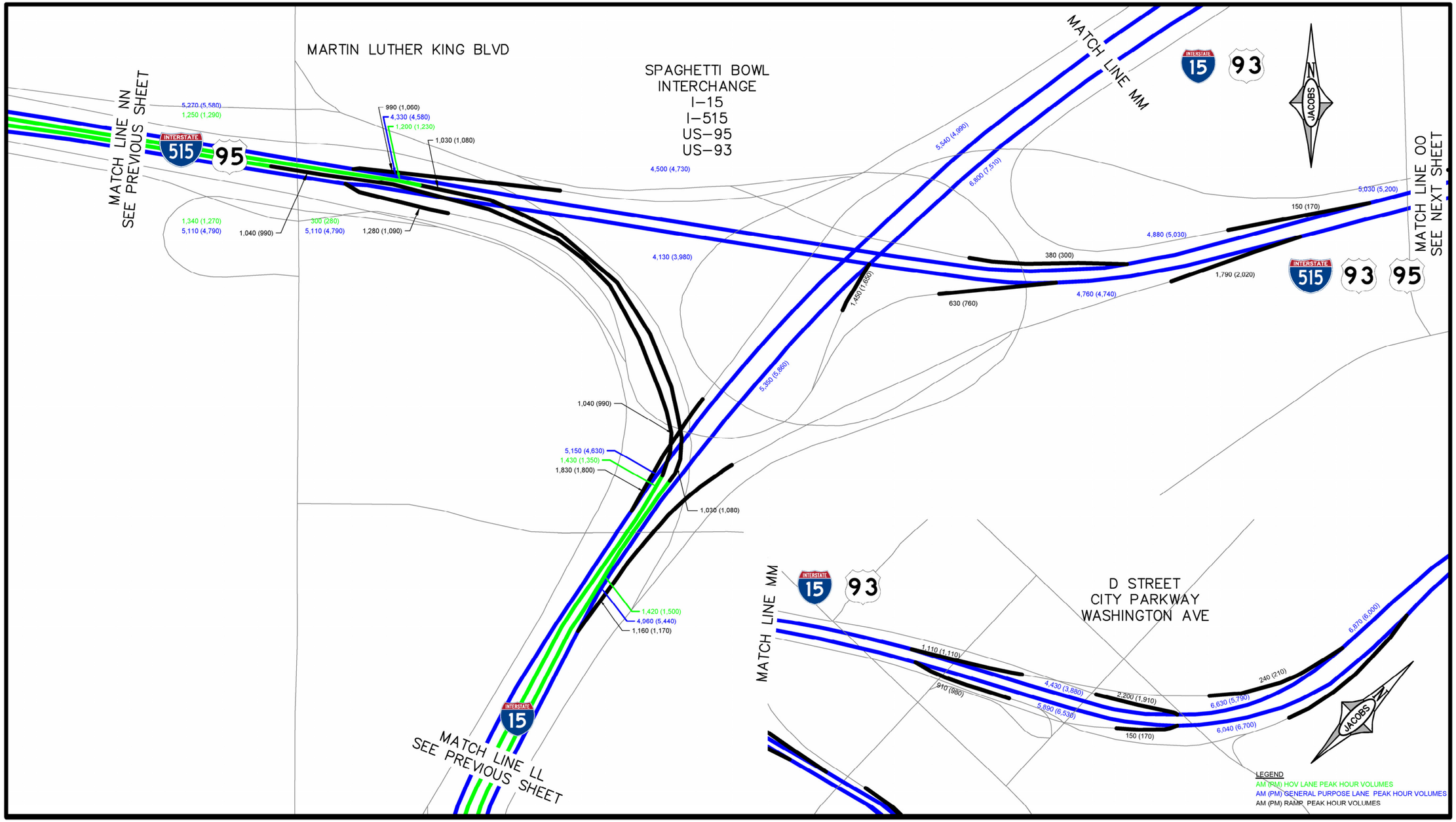


Figure 9-2 - Year 2025 Forecast Traffic Volumes

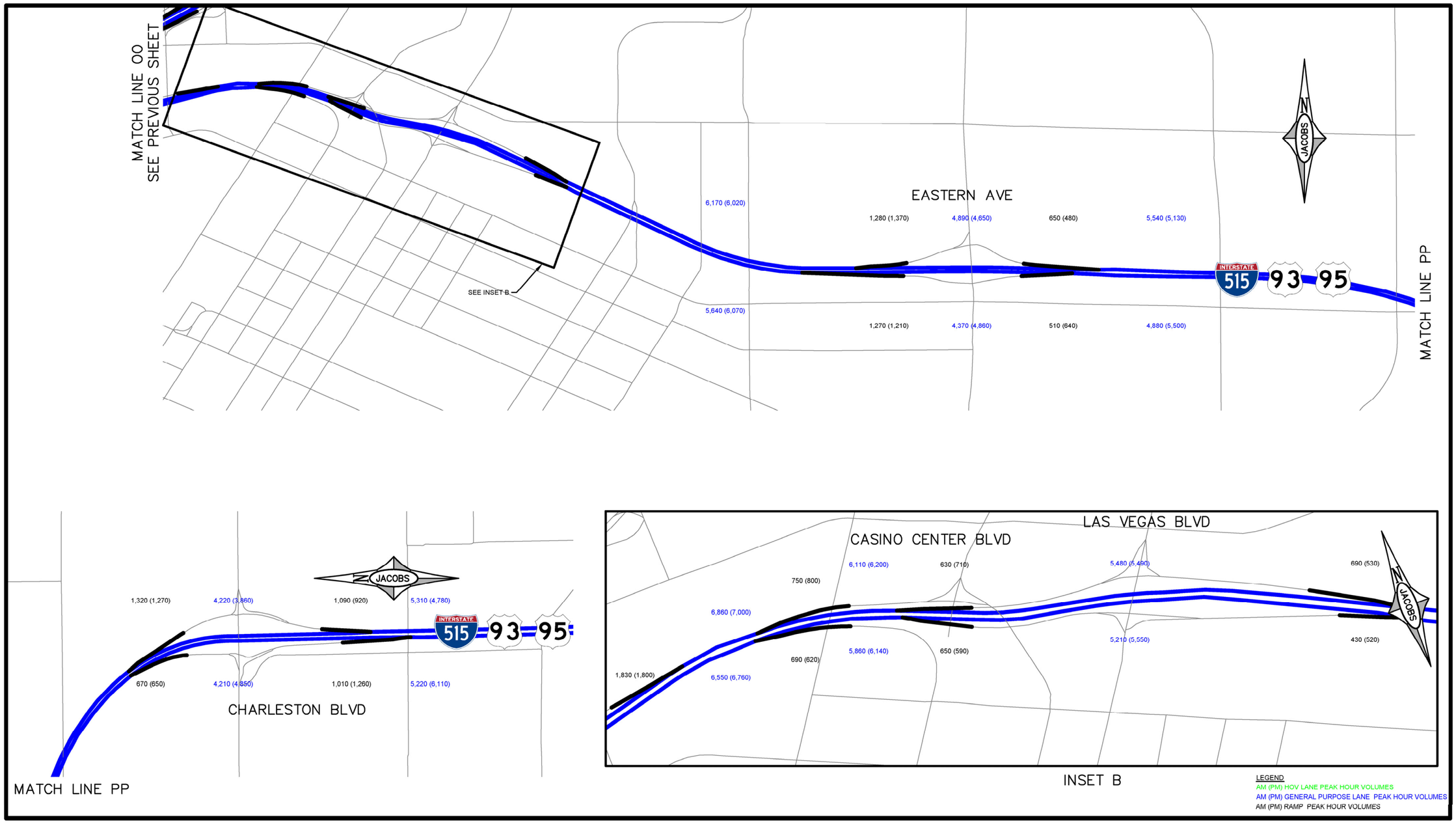


Figure 9-3 - Year 2035 Forecast Traffic Volumes

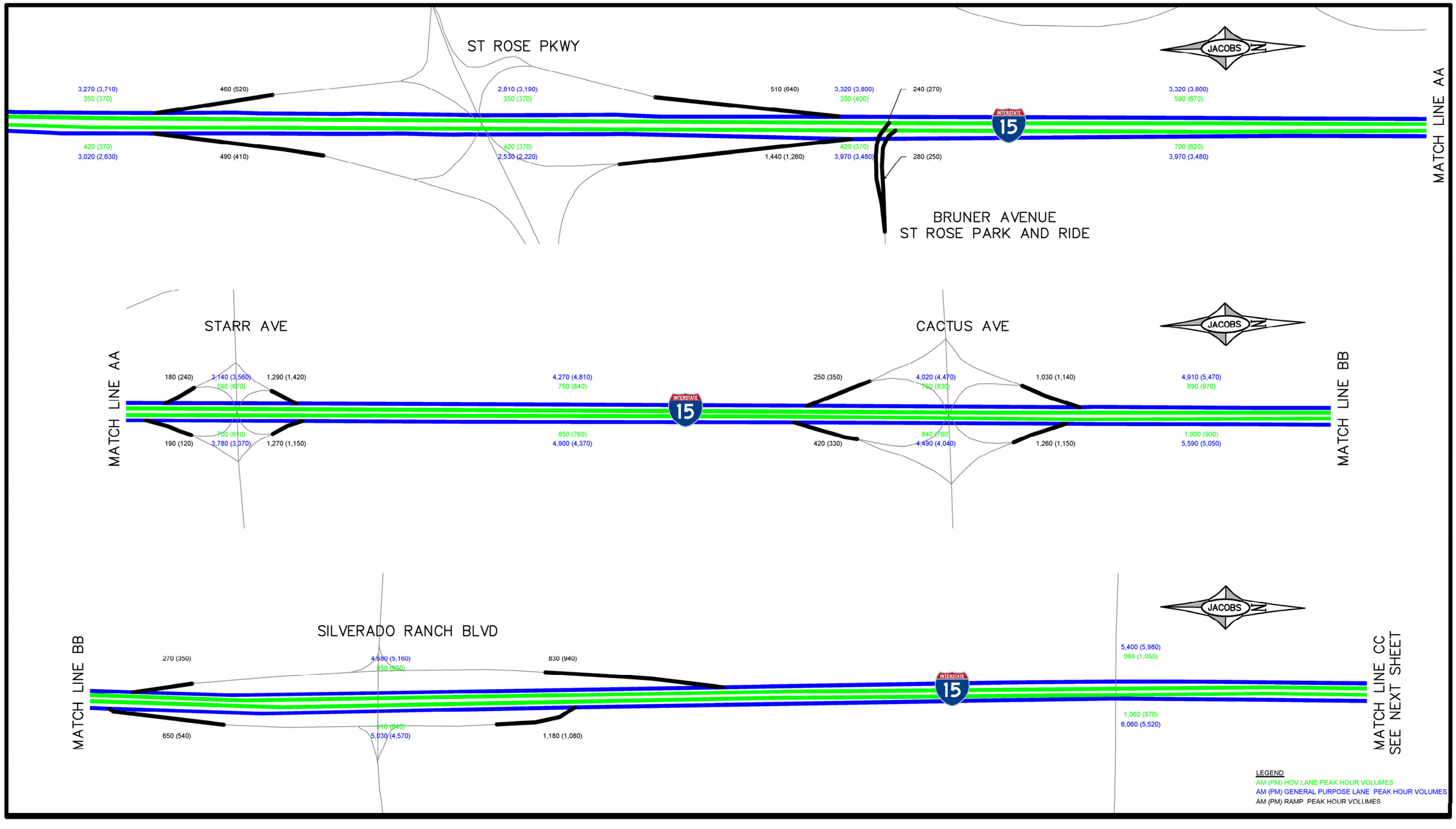


Figure 9-3 - Year 2035 Forecast Traffic Volumes

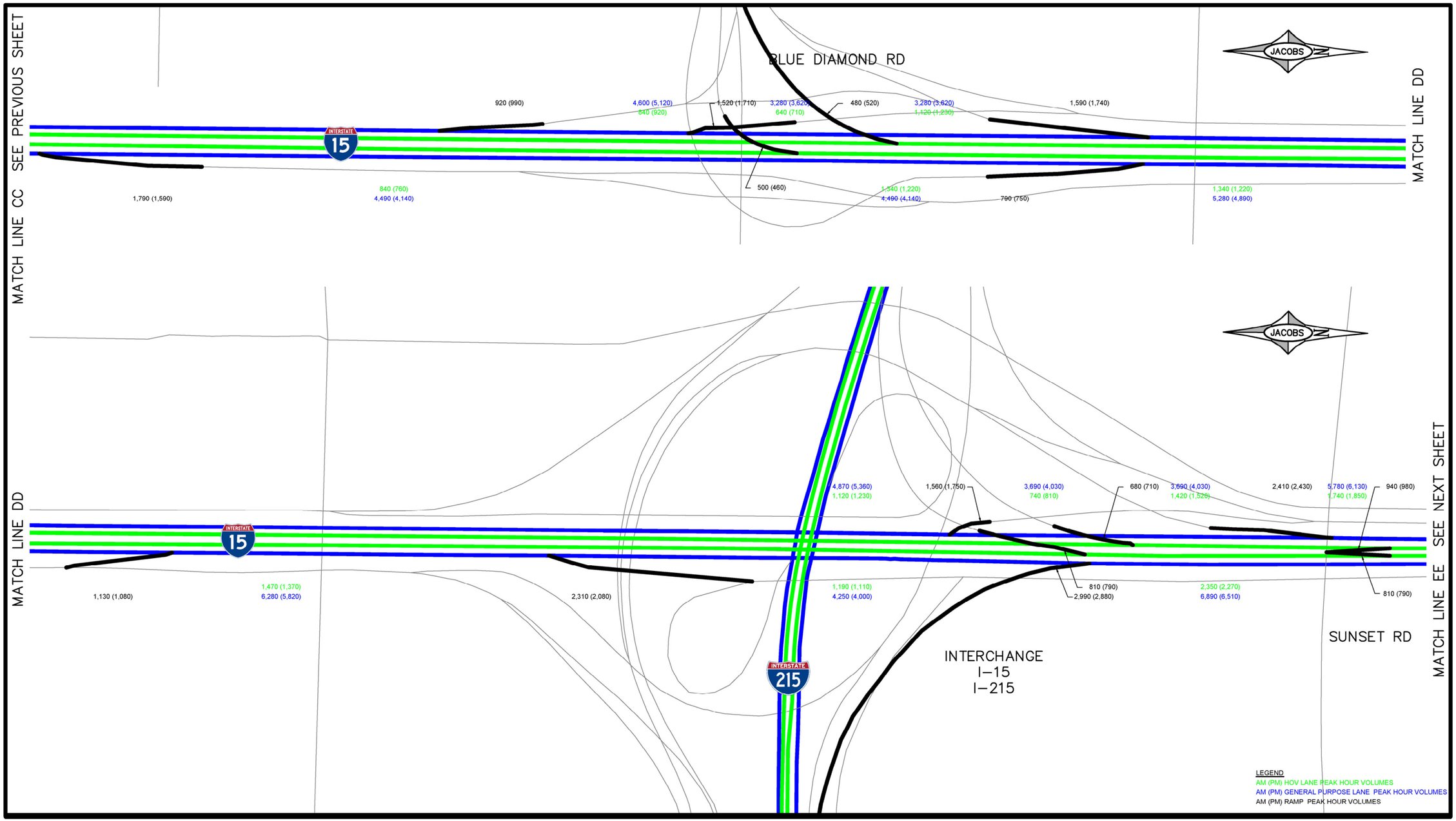


Figure 9-3 - Year 2035 Forecast Traffic Volumes

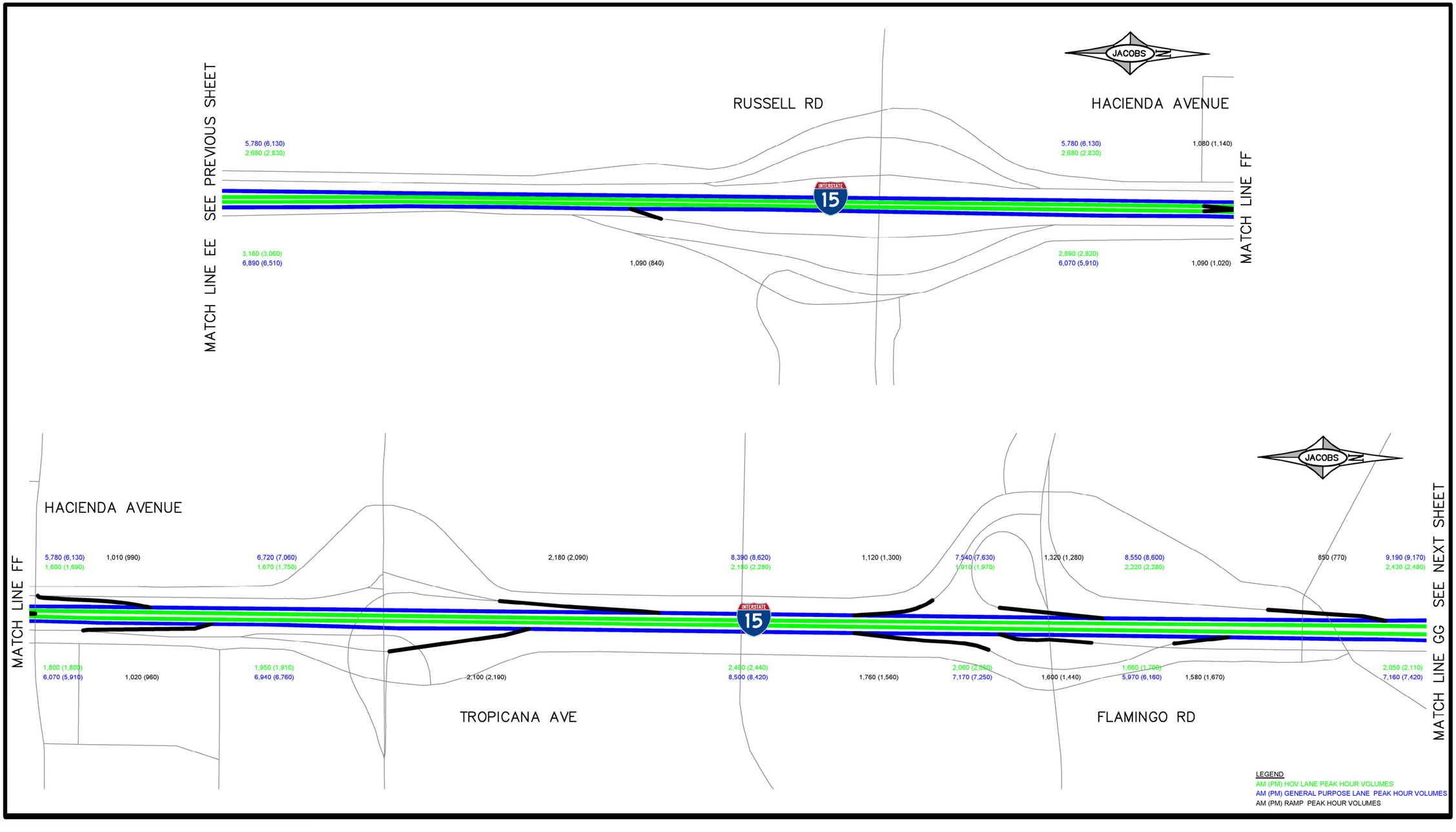


Figure 9-3 - Year 2035 Forecast Traffic Volumes

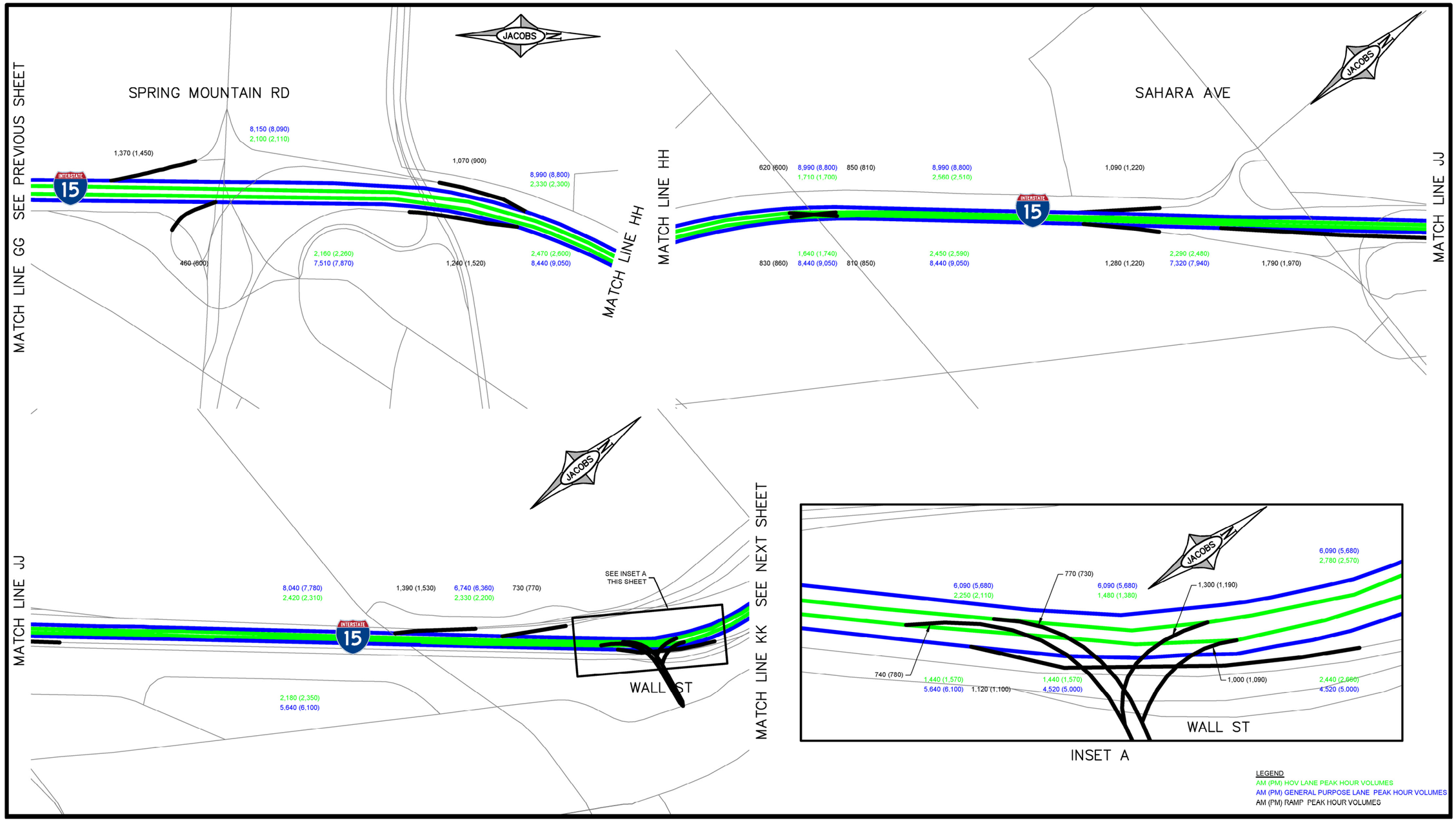


Figure 9-3 - Year 2035 Forecast Traffic Volumes

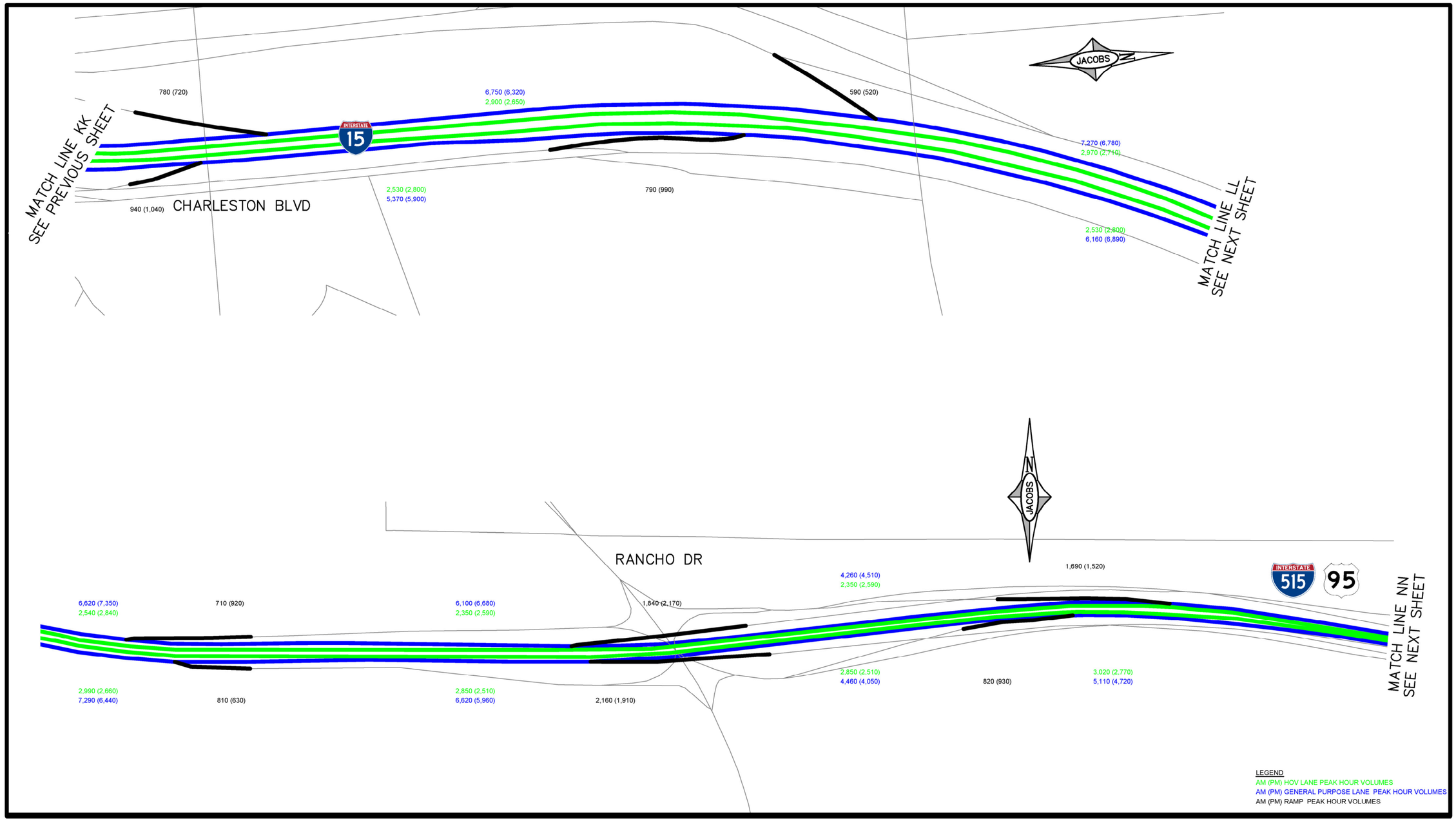


Figure 9-3 - Year 2035 Forecast Traffic Volumes

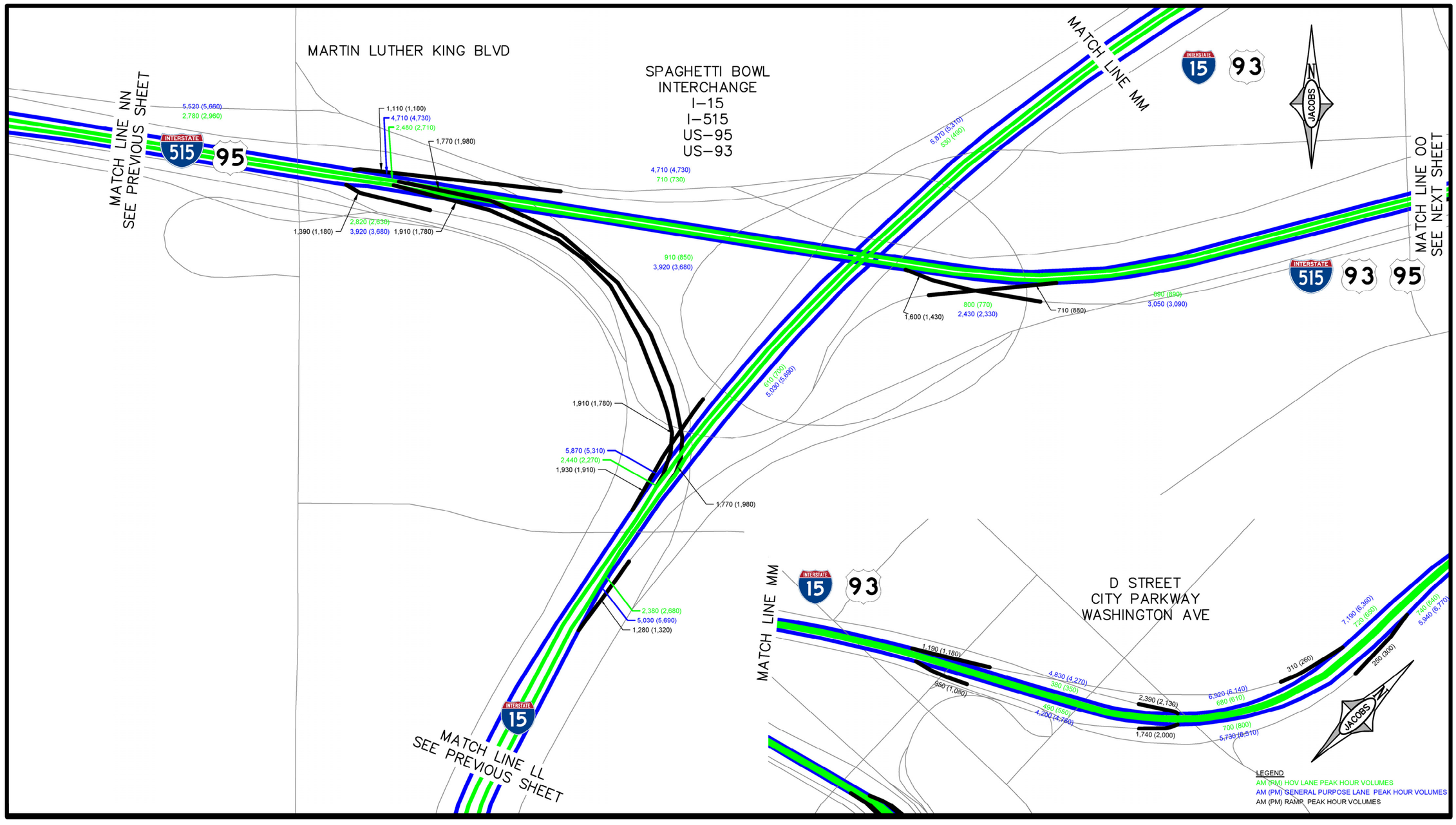
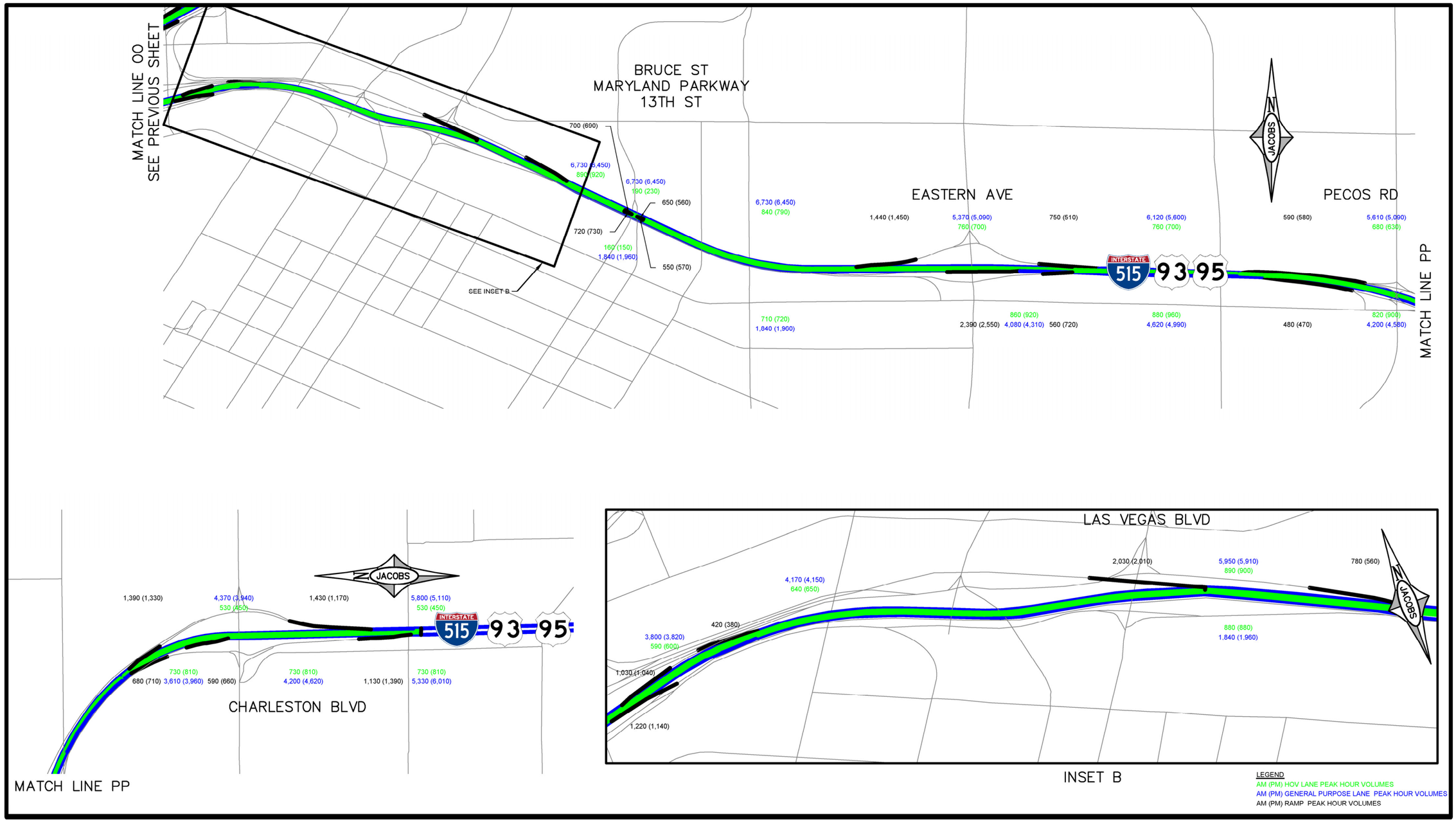


Figure 9-3 - Year 2035 Forecast Traffic Volumes



9.7. Heavy Vehicles Traffic Forecast

The year 2025 and year 2035 forecast of heavy vehicles was completed per the Guidelines. Adequate historical heavy vehicle volume data is unavailable within the project limits to perform a historical trend projection; therefore, the current proportion of heavy vehicles in the total traffic was used as an estimate. This percent of heavy vehicles in the total traffic is assumed to remain stable into the future (to year 2035).

The heavy vehicle volumes from the NDOT Vehicle Classification Distribution Report (Annual Traffic Report) and the AADT from NDOT's Traffic Records Information Access (TRINA) were used in the estimation of the heavy vehicles percentage. They are shown in Table 9-5.

Table 9-5 - Heavy Vehicles Traffic Forecast

Freeway	From	To	Heavy Vehicles AADT	Total Average AADT	Daily Heavy Vehicles Percent
I-15	California/Nevada Stateline	St. Rose Parkway	5,610	44,500	12.6%
I-15	St. Rose Parkway	Flamingo Road	8,653	163,667	5.3%
I-15	Flamingo Road	Spring Mountain Road	8,825	252,000	3.5%
I-15	Spring Mountain Road	Sahara Avenue	10,525	257,000	4.1%
I-15	Sahara Avenue	Las Vegas Expressway Interchange	9,925	253,500	3.9%
I-515	Boulder Highway	I-15	5,235	146,000	3.6%
US 95	I-15	Rainbow Boulevard	2,745	197,600	1.4%

APPENDICES

A. MTF MEETING MINUTES

B. PROJECT NEON PLANS

C. 2025 NETWORK CODING LIST

D. 2035 HOV SYSTEM SCENARIOS

E. 2035 NETWORK CODING LIST

F. TRAFFIC FORECASTING GUIDELINES CHECKLIST

G. YEAR 2025 AADT FORECASTS

H. YEAR 2035 AADT FORECASTS

I. HISTORICAL TREND PROJECTIONS

TRAFFIC FORECASTING MEMORANDUM

APPENDICES

APPENDIX A

MTF MEETING MINUTES

Meeting Minutes

Purpose: Model Task Force (MTF) Meeting #1

Date Held: August 7, 2013

Location: RTC Conference Room 296

Attendees: See attached

Copies: Attendees, File

Attachments: Sign-in Sheet, Agenda, Handouts

The meeting is summarized below by each agenda item. Agenda and the handouts are attached. Action items are provided on the last page of these minutes.

Agenda Item 1: Introductions:

- John Karachepone (Jacobs Project Manager) began the meeting by explaining the purpose of these Model Task Force (MTF) meetings:
    - These meetings will allow the Modeling Team to work together in a real partnership; and will allow the members to notify the Team immediately on any questions and concerns.
    - The meeting will be held often, and additionally there will be phone calls. The members are encouraged to ask questions immediately.
- Chris Primus (Jacobs Modeling Lead) led the meeting discussion. He started with introductions (see sign-in sheet for the list of attendees).
- Beth Xie will include the network modeler(s) in the future meetings.

Agenda Item 2: Brief Project Overview

This was skipped since everyone is familiar with the Project.

Agenda Item 3: Model Validation Schedule

A handout that shows MTF Milestones were distributed (see attached), and highlights of the schedule was discussed.

- The September 4 (or 10) meeting will be in-person, but others are not certain yet.
- Beth Xie is not available on September 4, and therefore the date of the meeting was fixed to be September 10th. Beth Xie will not be able to travel to Carson City for meetings.

- Randy Travis and Lori Campbell would likely be able to join Las Vegas meetings if they are given advance notification (1.5 weeks or so). A 10 AM meeting is a good option for them, because they could catch the State plane.
- Next meeting is tentatively scheduled for August 22; and it may be in-person. There will be some initial model results at this meeting.
- August 29 meeting will most likely be a phone meeting. Refined results will be discussed.
- The first technical memorandum will include everything related to the modeling. This will give Randy and the MTF a chance to review modeling activity documentation prior to seeing the actual traffic forecasts (which will be in the second memorandum due on October 8).
- It is entirely possible that there will be additional phone meetings (in addition to the schedule shown in the handout).

Agenda Item 4: Model HOV Concerns

Attendees were asked if they have any overall concerns/questions regarding the model:

- Patrizia Gonella asked if there is any specific reason why the connection between HOV lanes and GP lanes are coded as two lanes in each direction even for one-lane HOV facilities. Beth Xie will check this with the Network coders. She mentioned that model used to be coded as "limited access" in such a way that you could get in to the HOV lane, but cannot get out for several miles. This is not the case anymore (there are two-way connections between every interchange). Nonetheless, she will find out the answer.
- Jeff Lerud informed the group on an e-mail from Mike Janssen (City of Las Vegas). Mike wants to ensure that the modeling takes the long range plans for park-and-ride lots and Summerlin Parkway into account. The Team will ensure this. John Karachepone and Jeff Lerud will circulate this e-mail.

Agenda Item 5: Model Review

Several exhibits that show initial model observations were provided (see attached). Highlights of the information/comments for these exhibits were as follows:

- The first exhibit shows how the HOV System is currently coded in the model. This will be the network that will be used to test the system for validation purposes.
    - There is a gap on I-515 between I-15 and Casino Center (i.e. no HOV lanes coded) for 2035. Beth Xie will find out what the reason is.
- Second exhibit shows number of GP and HOV lanes coded in the model. It was highlighted that the orange cells show those facilities where the number of GP lanes drop in the future system from the existing 2013 (i.e. GP lanes being converted to HOV lanes).
- Third exhibit (the two page spreadsheet) shows a summary of HOV characteristics of the model. It is a general reasonability check of the model's (as obtained from RTC) behavior for mode-choice.
    - The difference between the functional class freeway and interstate in the model was asked. The free-flow speed for interstate is coded higher. Beth Xie answered that they

are essentially the same, but the facilities that serve longer trips are generally coded as interstate. She also mentioned that there is a third class called expressway, and as an example, the Southern Beltway (before it was reconstructed as a freeway) was coded as an expressway.

- Beth Xie is agreeable to the group asking model network questions directly to the network coder. She will provide the contact name and number.
- For each model year, HOV aggregate travel time is less than that of GP lanes. This is a good sign, i.e. it shows the model is behaving reasonably.
- Mode choice characteristics of the model seem reasonable. The home based work mode splits are close to the typical mode split results and to the American Commuter Survey carpooling survey data for the Clark County (which is 11.0%).
- The mode split percentages grow a little bit as the model year increases. Again, this is reasonable since the HOV system gets larger.
- The HOV related coefficients and constants are on par with other regional models.
- Drive-alone trips drop from the home-based work trips for other types of trips (home-based shopping etc.). Again, this is reasonable.
- J. Karachepone pointed out that the total number of home-based other and non-home based trips is a lot higher than the other types of trips. Considering the fact that, these are also the types of trips with high shared-ride splits, he asked if this was typical; and he suggested that it is a good idea to pay more attention to these trip types.
    - Patrizia Gonella thinks they may be a little on the high side compared to other regional models.
    - Chris Primus explained that the home-based work trips are the ones that occur during peak periods, i.e. during which the HOV facilities are operational.
    - J. Karachepone reminded that the 2035 analysis will likely assume 24-hour operation; hence there is good potential for these types of trips to utilize HOV facilities since their shared-use percentage are pretty high.
    - Beth Xie informed that the HOV lanes in the current model are operational during the two-hour peak periods (7 to 9 AM, 4 to 6 PM). Jeff Lerud mentioned that the HOV lanes are actually operational from 6 to 10 AM, and 2 to 7 PM. However in the model HOV operations are coded for only the two-hour peak periods because the other model time periods do not match the actual HOV operational hours.
    - It was agreed that these may be reasonable due to the unique nature of Las Vegas. Nonetheless, it will be examined, perhaps by comparing with actual survey data. RTC modeling staff may be able to assist with this comparison.
- It was asked if the US 95 HOV lanes (which are the only HOV lanes that exist today) are enforced. J. Karachepone was told by the law enforcement that they are generally not enforced at this time.

  - Assignment characteristics/output was discussed (VMT, VHT and speeds). The output shown in the exhibit is regional; thus the average speeds for HOV facilities are not necessarily higher than the interstate facilities. The Project will evaluate individual corridors to assess the travel time advantage of HOV lanes over GP lanes.
  - It was asked how the average speed shown on the exhibits are calculated: 'average of each segment's speed along the route' versus 'total route distance divided by total travel time'. The answer was the former. These will be recalculated using the latter method.
  - Another reasonability test was comparison of percentages of daily traffic for each model period slice (model versus actual). The results showed that the model was close to the actual data. The results were displayed in "pie-chart" graphics and will be provided to the group.
  - It was concluded that the model seems to behave reasonably for regional HOV characteristics.

- Fourth exhibit shows actual and model volumes on the current HOV system on US 95. Model volumes are generally a lot higher compared to actual data. The data is obtained from FAST sensors since NDOT data does not have HOV lanes separately.
  - It was asked how reliable the FAST data is. John replied that, generally the data from sensors may have gaps and problems due to sensor malfunctions, etc. A cursory review was done to ensure that the selected FAST data did not have any major gaps.
  - It was acknowledged that there may be some single occupant vehicles on the HOV lane data since the HOV lanes are not fully enforced. However, it is assumed that this would not be a high percentage.
  - Randy Travis informed the group that the Department collects data by lane; it is just not published that way (i.e. they publish all lanes combined). He offered to provide the "by-lane" raw data if it is really needed. Since there are no issues at this point, it was decided to not to look at this NDOT data now. Data from a single location may possibly be requested if needed.
  - The conclusion of this exhibit was that the model HOV volumes for 2013 are high.
- Last exhibit shows volumes on representative locations on all freeways for all model years. The data on this exhibit is from NDOT counts. Again, HOV volumes seem high.
  - John pointed out that some of the mainline count data in the exhibit are based on 2005 and 2008 data; because that was the latest year the data was available in TRINA site and ftp site. John provided the locations with 2005 and 2008 data to Lori Campbell. She will try to provide more recent data. She thinks there may be recent data for the subject areas.
  - The HOV volume shown for the I-15 segment just north of St Rose Parkway on the exhibit is in error. The number will be corrected. Additionally, a QC will be performed for all data.
  - For the Western Beltway, there is no NDOT count data available except for one ATR location. Randy Travis explained that this is because they do not own or maintain this

freeway. The decision was to use FAST data for locations where NDOT data is not available. Additionally, NDOT can provide the detailed data for the ATR location.

- In summary, these model exhibits show the system that the Project Team will work with to test HOV lanes, and come up with a recommended system. The 2025 network includes Neon improvements, 2035 network includes valley-wide HOV improvements.

Agenda Item 6: Planned Sensitivity Tests

- Jacobs team will perform several sensitivity tests as part of the validation process.

Agenda Item 7: Network Assumptions

- Jeff Lerud informed the group that the Project Neon files will be uploaded to the Neon website soon. The Team will get the files from the website for network coding. Both 2025 and 2035 information will be obtained.

Agenda Items 8 and 9: Documentation / Model Results Approval Process

- A Methodology Memorandum that provides an overview of methods to complete modeling and traffic forecasting tasks will be provided to the group soon (this Friday or early next week).
- Traffic forecasts submitted for Traffic Information Division approval will focus on the near-term priority system. For the ultimate system for the rest of the Valley, approval is not required since those projects would be very long-term; and approving those numbers at this point is not necessary.
- Documents will be provided to everyone in the MTF.
- On a separate note, Beth Xie informed the group that a Modeling Working Group will be formed for RTC's upcoming model validation/calibration process for their regional model; and asked if NDOT and Jacobs would be interested to be included in this group. Both NDOT and Jacobs would like to be part of it.

Agenda Item 10: Next Meeting

- Tentative date for the next meeting is August 22 at 10 AM at RTC. Beth Xie will schedule a conference room. This meeting may or may not be in-person. Even if the meeting is not in-person, Jacobs' local team would still meet at the RTC.
- Randy Travis will check flight schedule; he believes he could attend in-person if needed.
- This next meeting will focus on sensitivity test results and ideas on what to modify in the model for validation.

Summary of Action Items

No.	Action Item	Person
1	Check why the HOV lane-GP connections are coded as two lanes in each direction.	Beth Xie
2	Forward Mike Janssen's e-mail to the group.	J. Karachepone
3	Find out why there is a gap in the 2035 HOV system on I-515 between I-15 and Casino Center.	Beth Xie
4	Provide contact name and number for the network coder.	Beth Xie
5	Provide the 'pie-chart' graphics that shows the model period percentages versus actual data.	J. Karachepone
6	Download Project Neon files from the Project Neon website.	Jacobs Team
7	Schedule conference room for August 22 meeting.	Beth Xie

Model Task Force Meeting # 1

August 7, 2013
1:00 PM to 2:30 PM
RTC Room 296
600 S. Grand Central Parkway, Las Vegas, Nevada

Agenda

1. Introductions
2. Brief Project Overview
3. Model Validation Schedule
    a. MTF Meeting Topics
    b. Methodology Memo
4. Model HOV Concerns - Roundtable
5. Model Review
    a. Assumed HOV Systems 2013, 2025, 2035
    b. HOV Outputs
6. Planned Sensitivity Tests
7. Network Assumptions
    a. NEON Coordination
8. Documentation
    a. Technical Memorandum – Travel Model Validation Review and Application
    b. Technical Memorandum – Traffic Forecasts
9. Model Results Approval Process
10. Next Meeting
    a. Date and location
    b. Sensitivity test results
    c. Potential Improvements – Initial results?

MTF Milestone Meetings

1. MTF Meeting 1 = August 7, 2013 (In-person meeting)
    a. Background HOV Planning in Las Vegas
    b. Vision of HOV Planning – input from MTF
    c. Describe task to review and refine HOV Modeling
    d. Concerns on HOV Modeling – input from MTF
    e. Initial observations of HOV model
    f. Describe modeling task deliverables
        i. Documentation of HOV capabilities, refinements, validation, application, final forecasts
        ii. Trip tables
        iii. Input from MTF

2. Review of Findings = August 22, 2013; 10 AM to 11:30 AM; RTCSNV conference room in Las Vegas. (In-person meeting)
    a. Report to MTF on Status of HOV Model
    b. Sensitivity test results
    c. List of potential refinements with pros and cons
        i. Input from MTF

3. Refinement/Validation Results = August 29, 2013 (MTF Progress teleconference if needed)
    a. Report to MTF

4. Model Application = September 10, 2013 (In-person meeting in Las Vegas)
    a. Report to MTF
        i. Model results
        ii. Final raw model forecast results

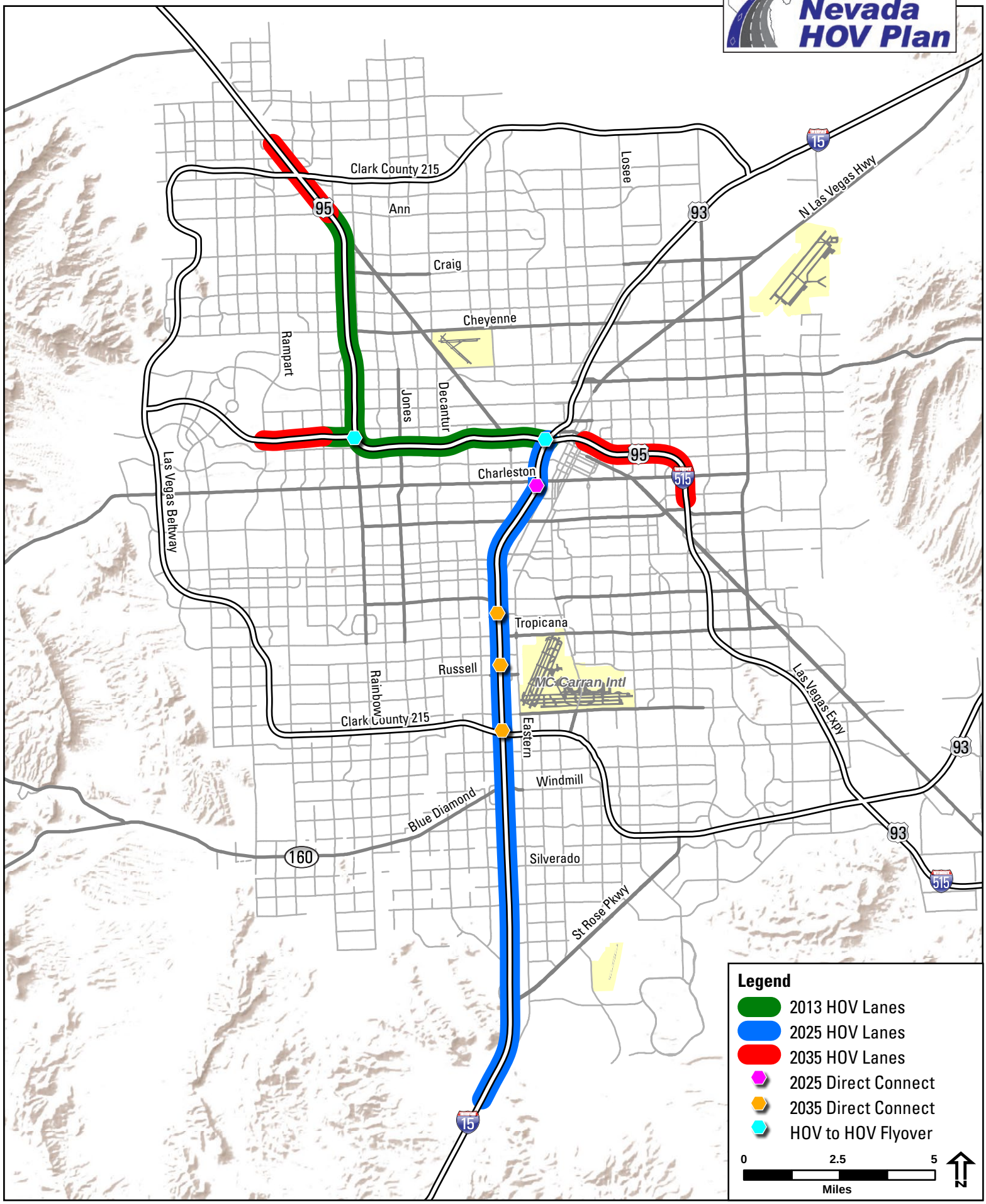
5. Documentation (milestone but not a meeting) = September 17, 2013
    a. Submit technical memorandum – Travel Demand Validation Review and Application
    b. Review by MTF – comments due on September 24, 2013

6. Traffic Forecast for Near-Term Priority Area for approval by NDOT= October 8, 2013

MTF progress teleconferences will be held in between milestone meetings as appropriate

HOV System

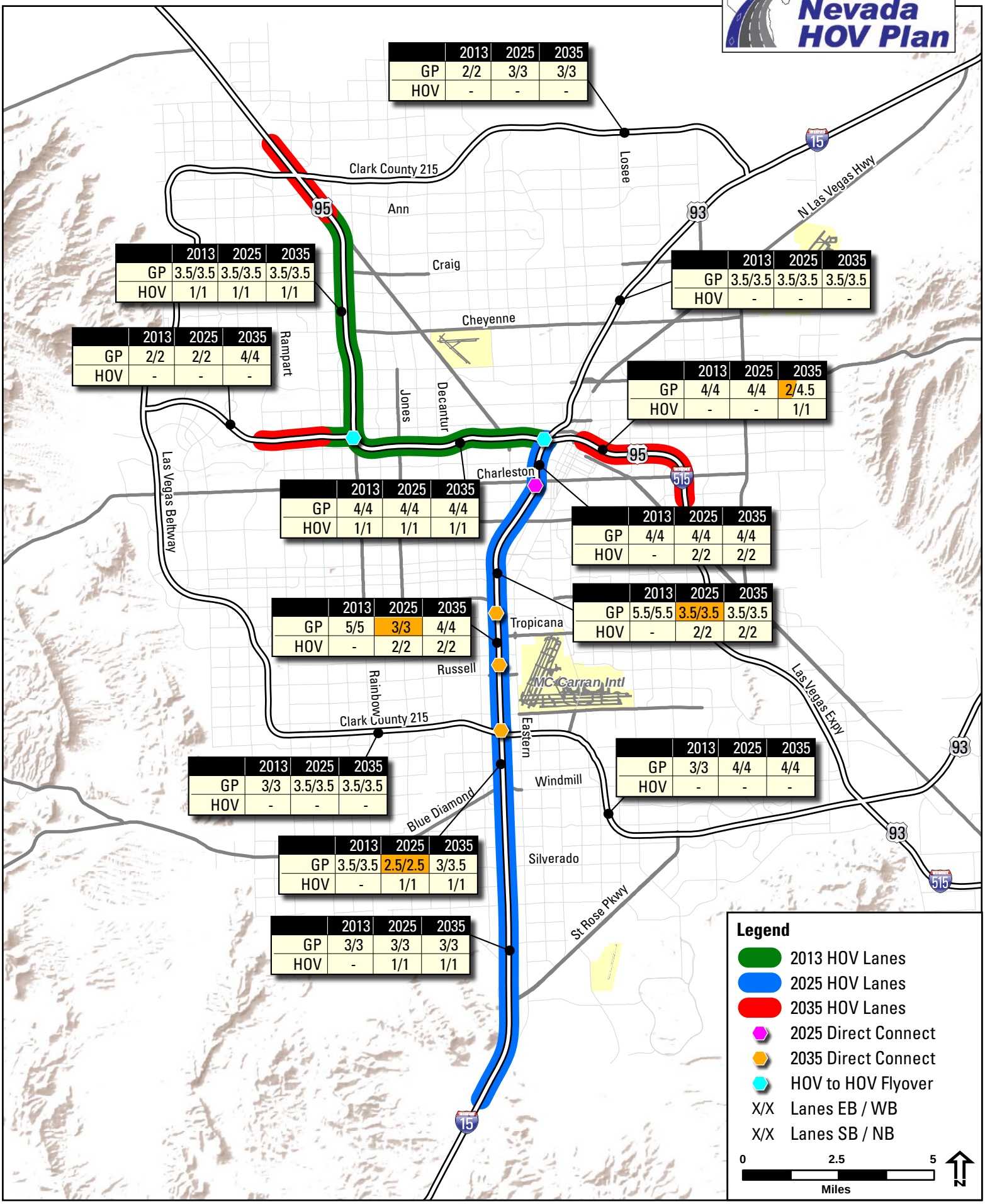
2013, 2025, & 2035 RTC Models



Number of Lanes

2013, 2025, & 2035 RTC Models

Southern Nevada HOV Plan



	2013	2025	2035
GP	2/2	3/3	3/3
HOV	-	-	-

	2013	2025	2035
GP	3.5/3.5	3.5/3.5	3.5/3.5
HOV	1/1	1/1	1/1

	2013	2025	2035
GP	3.5/3.5	3.5/3.5	3.5/3.5
HOV	-	-	-

	2013	2025	2035
GP	2/2	2/2	4/4
HOV	-	-	-

	2013	2025	2035
GP	4/4	4/4	2/4.5
HOV	-	-	1/1

	2013	2025	2035
GP	4/4	4/4	4/4
HOV	1/1	1/1	1/1

	2013	2025	2035
GP	4/4	4/4	4/4
HOV	-	2/2	2/2

	2013	2025	2035
GP	5/5	3/3	4/4
HOV	-	2/2	2/2

	2013	2025	2035
GP	5.5/5.5	3.5/3.5	3.5/3.5
HOV	-	2/2	2/2

	2013	2025	2035
GP	3/3	3.5/3.5	3.5/3.5
HOV	-	-	-

	2013	2025	2035
GP	3/3	4/4	4/4
HOV	-	-	-

	2013	2025	2035
GP	3.5/3.5	2.5/2.5	3/3.5
HOV	-	1/1	1/1

	2013	2025	2035
GP	3/3	3/3	3/3
HOV	-	1/1	1/1

Southern Nevada HOV Plan

Southern Nevada HOV Plan Update

Comparison of 2013, 2025, and 2035 RTC Model HOV Characteristics

Network Characteristics & Output

HOV links:	FTYPE_NUM= 11		
HOV access/egress lanes:	FTYPE_NUM=1		
HOV Veh per Hour per Lane:	1950		
GP Interstate & Freeway, Veh per Hour per Lane:	2000		
HOV Free Flow Speeds (CBD/Resort, Urban, Sub/Rural)	53	56	60
Interstate Free Flow Speeds (CBD/Resort, Urban, Sub/Rural)	53	56	60
Freeway Free Flow Speeds (CBD/Resort, Urban, Sub/Rural)	51	54	59

	2013	2025	2035
	Number	Number	Number
HOV lane miles	21.7	78.1	88.7
GP Aggregate Congested Travel Time (pk_Skim)	74,985,713	76,756,237	78,275,956
HOV Aggregate Congested Travel Time (pk_Skim)	74,919,925	75,966,061	77,574,576

Mode Choice Characteristics & Output

Discrete choice nested logit model

Mode Choice Person Trips	2013		2025		2035	
	Number	Percent	Number	Percent	Number	Percent
Home Based Work Total						
Total Trips	980,067	100.0%	1,200,205	100.0%	1,365,213	100.0%
Drive Alone	804,177	82.1%	985,266	82.1%	1,121,051	82.1%
Shared Ride 2	87,742	9.0%	111,348	9.3%	128,606	9.4%
Shared Ride 3+	29,130	3.0%	37,892	3.2%	43,841	3.2%
Transit Drive	2,789	0.3%	3,298	0.3%	3,741	0.3%
Transit Walk Local	45,248	4.6%	43,577	3.6%	47,034	3.4%
Transit Walk Premium	10,982	1.1%	18,824	1.6%	20,939	1.5%
Home Based School						
Total Trips	552,387	100.0%	697,002	100.0%	746,638	100.0%
Drive Alone	400,371	72.5%	497,598	71.4%	531,517	71.2%
Shared Ride 2	89,814	16.3%	115,977	16.6%	124,677	16.7%
Shared Ride 3+	54,147	9.8%	74,442	10.7%	81,472	10.9%
Transit Drive	31	0.0%	45	0.0%	47	0.0%
Transit Walk Local	7,033	1.3%	6,740	1.0%	6,755	0.9%
Transit Walk Premium	992	0.2%	2,200	0.3%	2,170	0.3%
Home Based Shopping						
Total Trips	594,745	100.0%	743,770	100.0%	787,162	100.0%
Drive Alone	283,045	47.6%	346,309	46.6%	365,897	46.5%
Shared Ride 2	179,884	30.2%	227,201	30.5%	241,201	30.6%
Shared Ride 3+	97,797	16.4%	129,710	17.4%	139,261	17.7%
Transit Drive	601	0.1%	797	0.1%	814	0.1%
Transit Walk Local	23,073	3.9%	22,469	3.0%	22,590	2.9%
Transit Walk Premium	10,346	1.7%	17,283	2.3%	17,398	2.2%
Home Based Other						
Total Trips	2,845,329	100.0%	3,558,282	100.0%	3,765,874	100.0%
Drive Alone	922,694	32.4%	1,136,580	31.9%	1,203,623	32.0%
Shared Ride 2	985,608	34.6%	1,226,561	34.5%	1,294,961	34.4%
Shared Ride 3+	893,885	31.4%	1,147,024	32.2%	1,218,882	32.4%
Transit Drive	367	0.0%	403	0.0%	434	0.0%
Transit Walk Local	37,860	1.3%	35,759	1.0%	35,969	1.0%
Transit Walk Premium	4,915	0.2%	11,954	0.3%	12,004	0.3%
Non Home Based						
Total Trips	2,031,033	100.0%	2,532,092	100.0%	2,722,278	100.0%
Drive Alone	830,185	40.9%	1,010,433	39.9%	1,067,704	39.2%
Shared Ride 2	632,130	31.1%	789,217	31.2%	849,242	31.2%
Shared Ride 3+	530,258	26.1%	685,427	27.1%	755,916	27.8%
Transit Drive	-	0.0%	0	0.0%	-	0.0%
Transit Walk Local	30,520	1.5%	30,988	1.2%	32,093	1.2%
Transit Walk Premium	7,940	0.4%	16,027	0.6%	17,322	0.6%
Hotel Based Convention Plus						
Total Trips	8,158	100.0%	9,419	100.0%	10,244	100.0%
Walk	827	10.1%	1,022	10.9%	1,138	11.1%
Taxi	1,495	18.3%	1,690.14	17.9%	1,824	17.8%
Shuttle Bus	223	2.7%	237	2.5%	247	2.4%
Auto	5,573	68.3%	6,421.76	68.2%	6,983	68.2%
Public Bus	19	0.2%	23	0.2%	26	0.3%
Premium Transit	20	0.2%	25	0.3%	27	0.3%

Comparison of 2013, 2025, and 2035 RTC Model HOV Characteristics

Hotel Based Gaming									
Total Trips	86,816	100.0%		99,298	100.0%		109,364	100.0%	
Walk	36,523	42.1%		43,103	43.4%		48,262	44.1%	
Taxi	10,893	12.5%		12,110	12.2%		12,947	11.8%	
Shuttle Bus	1,455	1.7%		1,464	1.5%		1,446	1.3%	
Auto	20,523	23.6%		22,623	22.8%		24,107	22.0%	
Public Bus	11,791	13.6%		11,942	12.0%		13,664	12.5%	
Premium Transit	5,632	6.5%		8,055	8.1%		8,938	8.2%	
Hotel Based Other									
Total Trips	253,285	100.0%		295,237	100.0%		333,760	100.0%	
Walk	95,753	37.8%		115,545	39.1%		134,286	40.2%	
Taxi	54,525	21.5%		62,694.57	21.2%		70,041	21.0%	
Shuttle Bus	9,350	3.7%		10,262	3.5%		10,622	3.2%	
Auto	79,121	31.2%		90,150.00	30.5%		100,013	30.0%	
Public Bus	9,903	3.9%		10,033	3.4%		11,412	3.4%	
Premium Transit	4,632	1.8%		6,552	2.2%		7,386	2.2%	
Non Hotel Based Gaming									
Total Trips	211,937	100.0%		243,473	100.0%		270,836	100.0%	
Walk	139,465	65.8%		163,069	67.0%		183,342	67.7%	
Taxi	14,283	6.7%		15,588	6.4%		16,780	6.2%	
Shuttle Bus	2,491	1.2%		2,677	1.1%		2,769	1.0%	
Auto	39,026	18.4%		42,905	17.6%		46,371	17.1%	
Public Bus	9,449	4.5%		9,688	4.0%		10,884	4.0%	
Premium Transit	7,222	3.4%		9,547	3.9%		10,692	3.9%	
Resident Air									
Total Trips	16,364	100.0%		19,639	100.0%		20,949	100.0%	
Auto	15,083	92.2%		18,449	93.9%		19,705	94.1%	
Taxi	1,235	7.5%		1,190	6.1%		1,194	5.7%	
Shuttle Bus	-	0.0%		-	0.0%		-	0.0%	
Tour Bus	-	0.0%		-	0.0%		-	0.0%	
Public Bus	32	0.2%		-	0.0%		39	0.2%	
Premium Transit	13	0.1%		-	0.0%		11	0.1%	
Visitor Air									
Total Trips	108,279	100.0%		158,485	100.0%		164,145	100.0%	
Auto	43,937	40.6%		74,015	46.7%		71,493	43.6%	
Taxi	35,500	32.8%		45,722	28.8%		44,155	26.9%	
Shuttle Bus	11,168	10.3%		15,140	9.6%		16,306	9.9%	
Tour Bus	16,785	15.5%		23,608	14.9%		30,610	18.6%	
Public Bus	564	0.5%		-	0.0%		1,257	0.8%	
Premium Transit	324	0.3%		-	0.0%		325	0.2%	

Description/ Notes

Assignment Characteristics & Output

Regional Statistics

		2013			2025			2035		
AM Peak (7:00-9:00)	Regional	HOV	Interstate	Regional	HOV	Interstate	Regional	HOV	Interstate	
	VMT	3,716,736	46,005	980,611	4,906,621	175,876	1,182,283	5,463,924	214,189	1,219,679
	VHT	95,729	867	18,235	133,673	3,563	22,768	147,477	4,496	24,181
	Avg Speed	38.8	53.0	53.8	36.7	49.4	51.9	37.1	47.6	50.4
PM Peak (16:00-18:00)	Regional	HOV	Interstate	Regional	HOV	Interstate	Regional	HOV	Interstate	
	VMT	4,878,393	58,212	1,276,501	6,380,029	231,141	1,477,915	7,070,622	266,662	1,525,463
	VHT	135,785	1,175	25,604	189,127	5,638	31,879	214,624	6,763	34,561
	Avg Speed	35.9	49.5	49.9	33.7	41.0	46.4	32.9	39.4	44.1
Daily	Regional	HOV	Interstate	Regional	HOV	Interstate	Regional	HOV	Interstate	
	VMT	35,125,828	588,173	9,398,774	46,138,734	1,988,581	11,275,262	50,800,303	2,316,392	11,648,426
	VHT	914,122	11,137	177,643	1,243,128	43,394	220,052	1,384,426	51,383	234,489
	Avg Speed	38.4	52.8	52.9	37.1	45.8	51.2	36.7	45.1	49.7

Description/ Notes

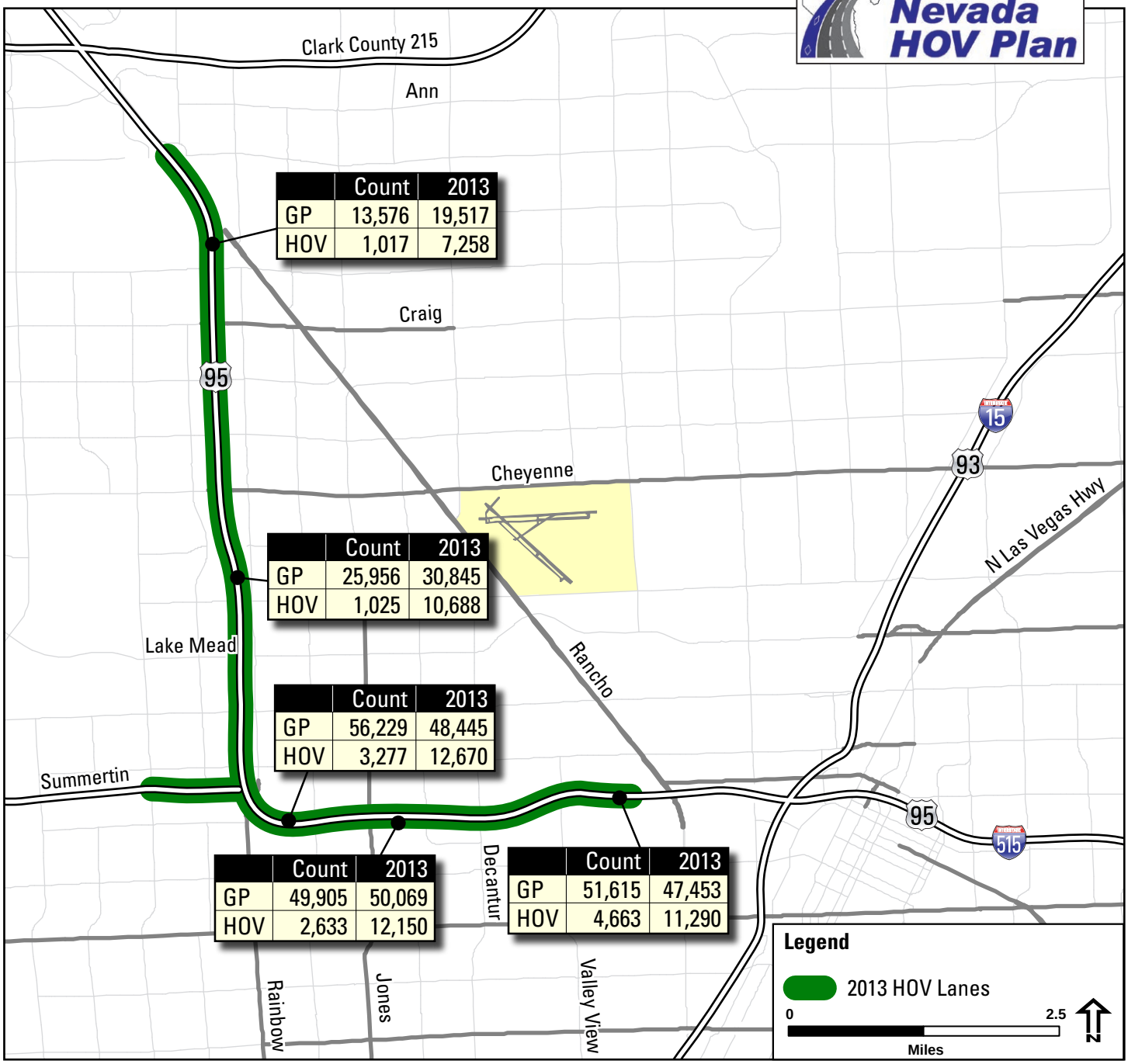
Travel Times

	2013			2025			2035		
SB/EB US 95	GP	HOV		GP	HOV		GP	HOV	
Segment End-to-End Travel Time									
AM Peak (7:00-9:00)	10.8	10.7		17.1	16.5		17.4	17.2	
Midday (9:00-14:00)	10.6	10.6		16.7	16.2		16.7	16.8	
PM Peak (16:00-18:00)	10.5	10.5		16.0	15.5		15.9	15.9	
Average Segment Speed	53.9	55.7		54.4	55.6		54.4	55.6	
NB/WB US 95	GP	HOV		GP	HOV		GP	HOV	
Segment End-to-End Travel Time									
AM Peak (7:00-9:00)	10.3	10.0		14.8	14.5		14.8	14.7	
Midday (9:00-14:00)	10.5	10.5		15.7	15.7		16.3	16.3	
PM Peak (16:00-18:00)	11.4	11.4		19.1	18.6		20.3	20.1	
Average Segment Speed	53.8	55.7		54.4	55.6		54.4	55.6	

Description/ Notes

HOV Volumes on Current System
(7-9am and 4-6pm)

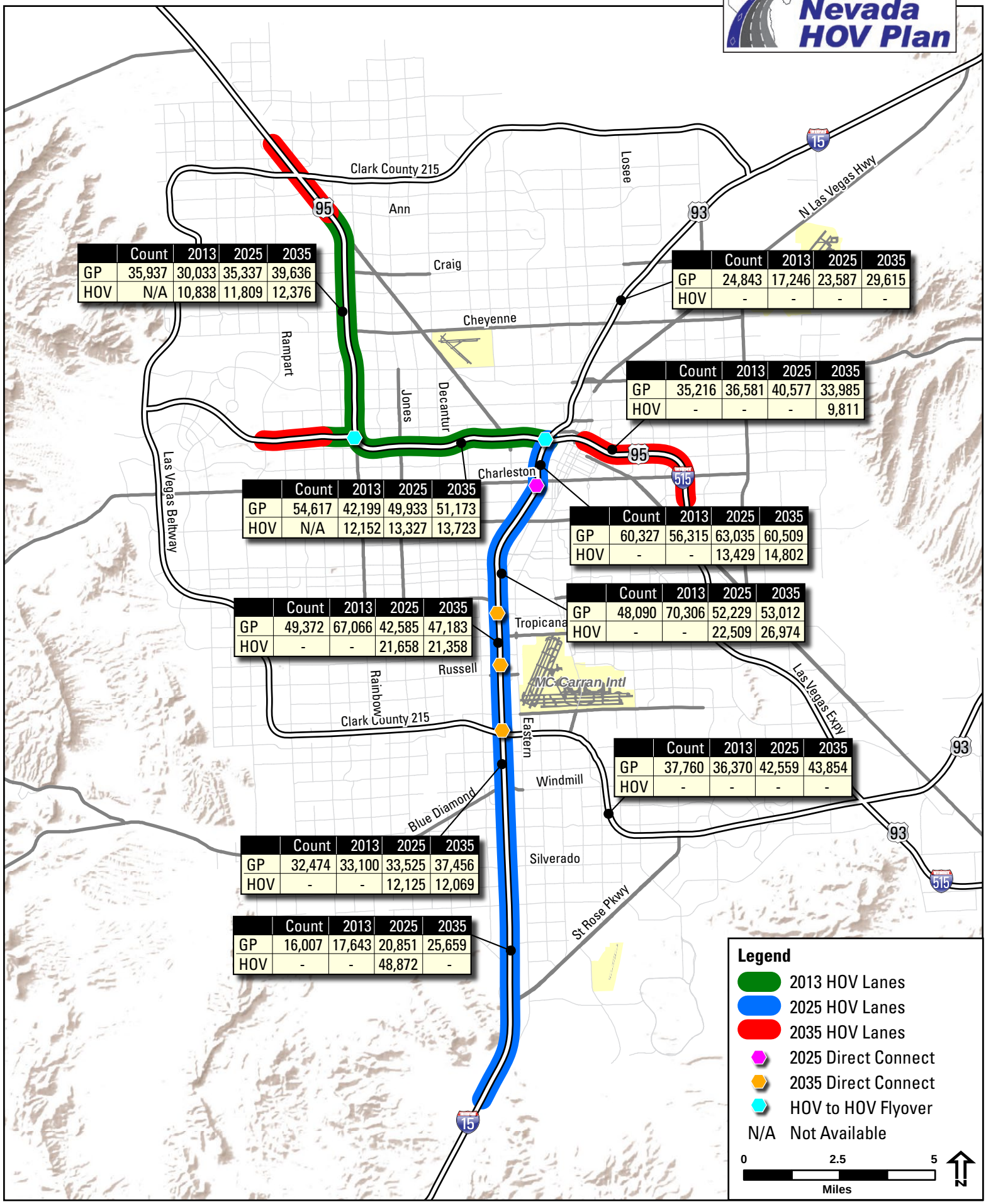
2013 RTC Models



AM + PM Volumes (7-9am and 4-6pm)

2013, 2025, & 2035 RTC Models

Southern Nevada HOV Plan



	Count	2013	2025	2035
GP	35,937	30,033	35,337	39,636
HOV	N/A	10,838	11,809	12,376

	Count	2013	2025	2035
GP	24,843	17,246	23,587	29,615
HOV	-	-	-	-

	Count	2013	2025	2035
GP	35,216	36,581	40,577	33,985
HOV	-	-	-	9,811

	Count	2013	2025	2035
GP	54,617	42,199	49,933	51,173
HOV	N/A	12,152	13,327	13,723

	Count	2013	2025	2035
GP	60,327	56,315	63,035	60,509
HOV	-	-	13,429	14,802

	Count	2013	2025	2035
GP	49,372	67,066	42,585	47,183
HOV	-	-	21,658	21,358

	Count	2013	2025	2035
GP	48,090	70,306	52,229	53,012
HOV	-	-	22,509	26,974

	Count	2013	2025	2035
GP	37,760	36,370	42,559	43,854
HOV	-	-	-	-

	Count	2013	2025	2035
GP	32,474	33,100	33,525	37,456
HOV	-	-	12,125	12,069

	Count	2013	2025	2035
GP	16,007	17,643	20,851	25,659
HOV	-	-	48,872	-

Legend

- 2013 HOV Lanes
- 2025 HOV Lanes
- 2035 HOV Lanes
- 2025 Direct Connect
- 2035 Direct Connect
- HOV to HOV Flyover
- N/A Not Available

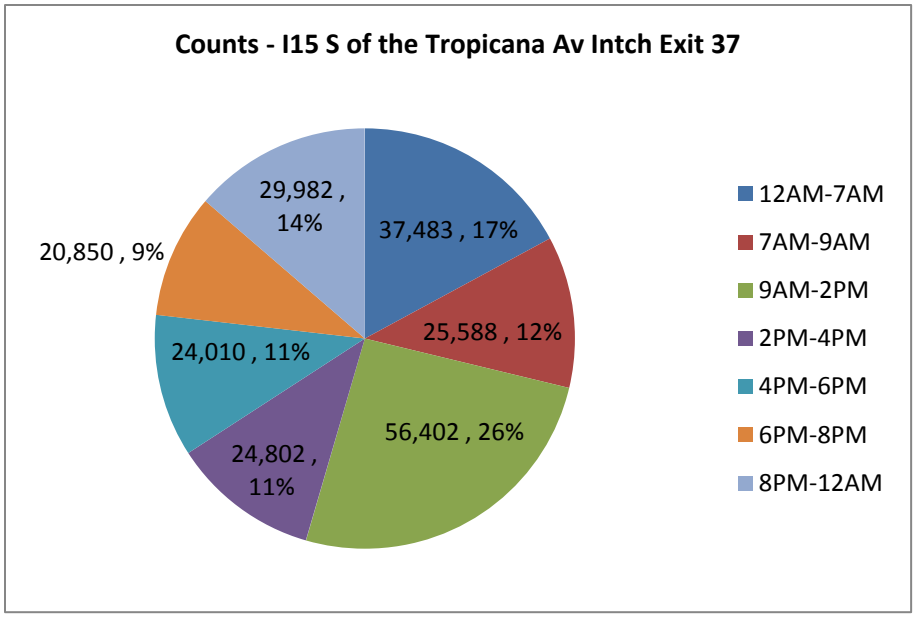
0 2.5 5 Miles

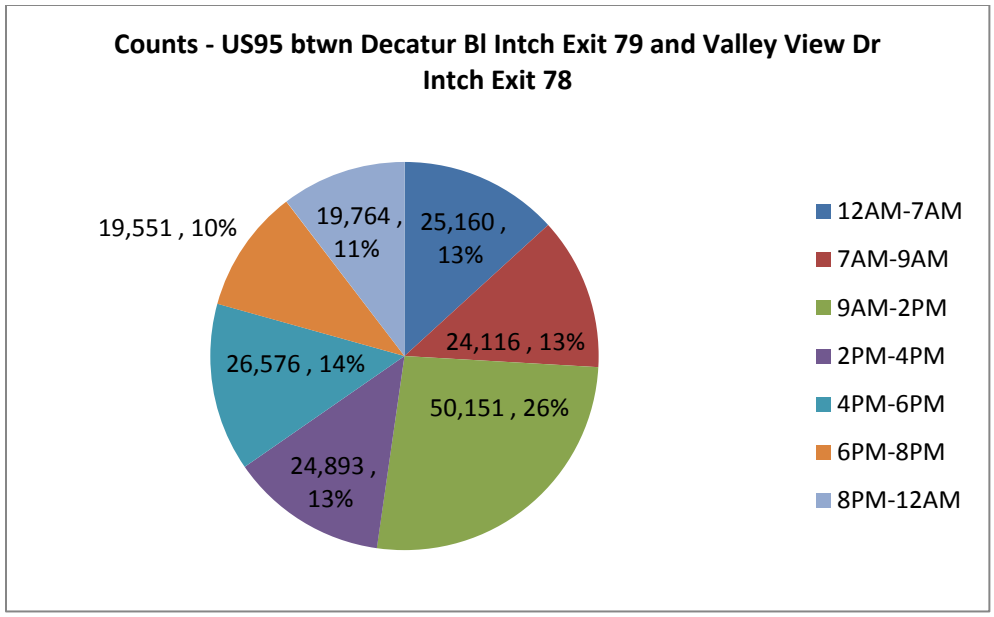
N

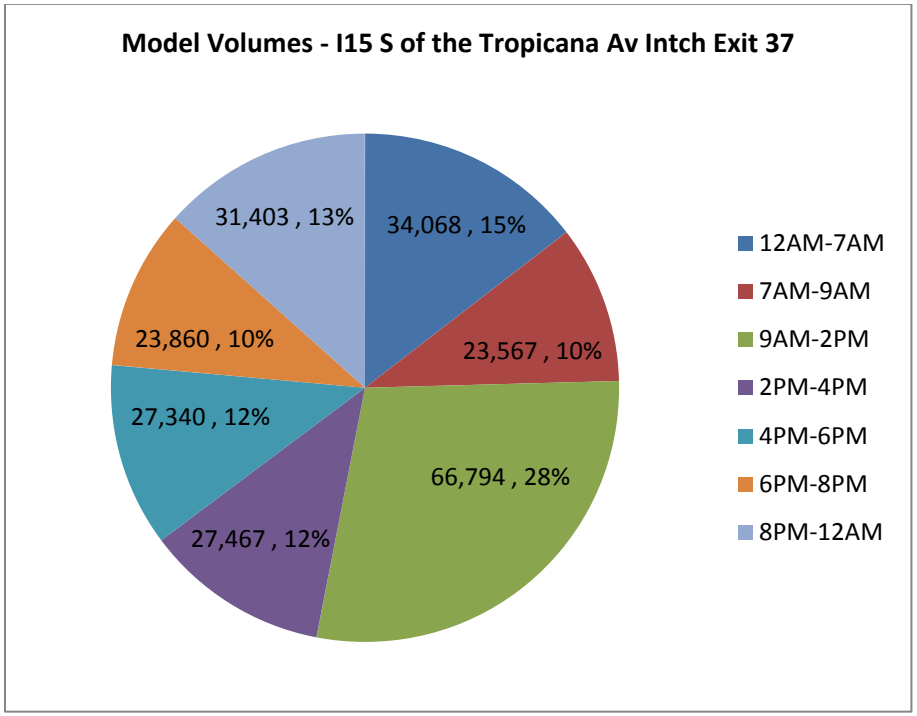
MTF Meeting #1

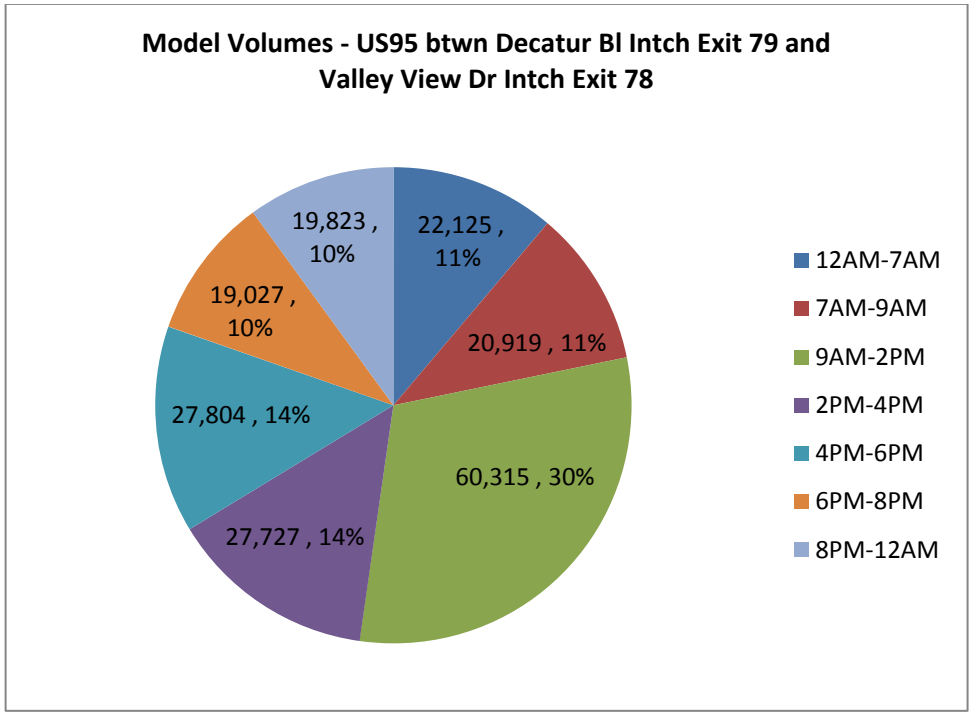
Sign-in Sheet

Name	Agency/Company	Phone Number	E-mail address
Cigdem Mulazimoglu	Jacobs	702_938_5473	cigdem.mulazimoglu@jacobs.com
John Karachepone	JACOBS	702 938 5508	John.Karachepone@jacobs.com
Jeff Lerud	NDOT- PM	(775) 888-7589	jlerud@dot.state.nv.us.
CHRIS Primus	Jacobs	303 820 4875	chris.primus@jacobs.com
Befa Xie	RTC	702-676-1722	xieb@rtcsnv.com
Lora Campbell	NDOT- Traffic	(775) 888-7643	lcampbell@dot.state.nv.us
Randy Travis	" "	775-888-7158	rtravis@dot.state.nv.us
Keith Dorsheim	Jacobs	⇒ CONFERENCE CALL	
Sharon Dhanarajan	Jacobs		
Patricia Gonella	Jacobs		


Counts - I15 S of the Tropicana Av Intch Exit 37
37,483 , 17%
25,588 , 12%
56,402 , 26%
24,802 , 11%
24,010 , 11%
20,850 , 9%
29,982 , 14%
12AM-7AM
7AM-9AM
9AM-2PM
2PM-4PM
4PM-6PM
6PM-8PM
8PM-12AM


Counts - US95 btwn Decatur Bl Intch Exit 79 and Valley View Dr Intch Exit 78
25,160 , 13%
24,116 , 13%
50,151 , 26%
24,893 , 13%
26,576 , 14%
19,551 , 10%
19,764 , 11%
12AM-7AM
7AM-9AM
9AM-2PM
2PM-4PM
4PM-6PM
6PM-8PM
8PM-12AM


Model Volumes - I15 S of the Tropicana Av Intch Exit 37
34,068 , 15%
23,567 , 10%
66,794 , 28%
27,467 , 12%
27,340 , 12%
23,860 , 10%
31,403 , 13%
12AM-7AM
7AM-9AM
9AM-2PM
2PM-4PM
4PM-6PM
6PM-8PM
8PM-12AM


Model Volumes - US95 btwn Decatur Bl Intch Exit 79 and Valley View Dr Intch Exit 78
22,125 , 11%
20,919 , 11%
60,315 , 30%
27,727 , 14%
27,804 , 14%
19,027 , 10%
19,823 , 10%
12AM-7AM
7AM-9AM
9AM-2PM
2PM-4PM
4PM-6PM
6PM-8PM
8PM-12AM

Meeting Minutes

Purpose: Model Task Force (MTF) Meeting #2

Date Held: August 22, 2013

Location: RTC Conference Room 296

Attendees: See attached

Copies: Attendees, File

Attachments: Sign-in Sheet, Agenda, Handouts

The meeting is summarized below by each agenda item. Agenda and the handouts are attached. Action items are provided on the last page of these minutes.

Introductions:

- John Karachepone (Jacobs Project Manager) began the meeting with introductions (see sign-in sheet for the list of attendees).
- John Karachepone reminded that the meeting minutes from the last MTF meeting had been distributed to the group. He also thanked the MTF members for completing their action items in a timely manner.
- The following discussion items from the MTF meeting #1 were briefly revisited:
    - A section of I-515, west of Eastern Avenue, in the 2035 model network has only two GP lanes in the eastbound/southbound direction. Investigation by the Jacobs team showed that there is a frontage road in the model, in addition to the GP lanes. A cursory check in the RTP showed that there was no project identified to construct frontage roads along I-515. John Karachepone mentioned that this will be discussed further with Hui Shen subsequent to the meeting.
    - There is a gap on I-515 between I-15 and Casino Center (i.e. no HOV lanes coded) for 2035. Hui Shen had informed the Jacobs team that this was based on advice from a design consultant. Mike Janssen added that this was primarily due to the structural limitations of the Spaghetti bowl which do not accommodate lane additions. He also added that at the time the last I-515 study was completed, the HOV lane concept in Las Vegas was not mature. But, in the context of the upcoming I-515 study, HOV lanes have become important and it would be useful for the SNV HOV Plan document to include the HOV lanes through the Spaghetti bowl even though this may not be feasible without changes to the Spaghetti bowl. John Karachepone proposed that HOV lanes will be included through the Spaghetti bowl in the 2035 model.
    - The connection between the HOV lanes and GP lanes are coded as two lanes in each direction even for one-lane HOV facilities. Hui Shen had confirmed that this was a

judgment call on his part to ensure that these connections were not bottlenecks in the system.

Agenda Item 1: City of Las Vegas Direct Connect Locations for modeling

- John Karachepone requested Mike Janssen to update the MTF group on the City of Las Vegas' vision regarding potential HOV direct connect locations and park-and-ride locations.
- Mike Janssen described the short-term, medium-term and long-term vision of the City of Las Vegas. The short-term vision includes the improvements envisioned to be complete within the next five to seven years.
- The City's vision for HOV direct connect locations:
    - Mike Janssen reminded that NDOT is planning to extend the HOV lanes along US95 from Ann Road to Elkhorn Road. The City expects this to be complete in the next few years. The City envisions the HOV lane system to begin and end at the Elkhorn Road overpass instead of ending along the US95 mainline.
        - The City expects this to be beneficial because of a park-and-ride lot off Elkhorn Road, the Centennial Hills Hospital Medical Center and a large entitled mall site in the vicinity. The City is working with the mall and considerable trip activity is expected to be generated. The City expects that this direct connect will be needed in the next five to seven years.
        - John Karachepone asked whether the implementation of this HOV direct connect will be a separate project in the RTP.
        - Mike Janssen confirmed that a separate EA will deal with this; a standalone EA will be developed in the next few years to clear the connection.
        - John Karachepone asked whether this connection will need to be in the 2025 model network. Mike Janssen answered in the affirmative.
    - Mike Janssen mentioned that in the City's view, another potential location for a HOV direct connect is at Peak Drive.
        - There is currently no bridge along Peak Drive over US95. Mike Janssen mentioned that this could be environmentally cleared together with the Elkhorn Road HOV direct connect.
        - The City expects this direct connect at Peak Drive to be attractive for traffic to/from the north and not for traffic to/from the south. The direct connect would be constructed to reflect this; Mike Janssen showed preliminary drawings developed by the City of Las Vegas illustrating this connection.
        - The City expects this HOV direct connect to be beneficial because of the Las Vegas Tech center (which generates a lot of traffic) and a medical facility (which usually generates two person trips) nearby. These trips could use this direct connect instead of using the Cheyenne Avenue interchange.
        - Mike Janssen added that pedestrian and bicycle facilities would be provided on the proposed bridge to connect communities east and west of US95 along Peak Drive.

        - John Karachepone asked about the rationale for not including the direct connect ramp serving the south. Mike Janssen replied that the medical facility mainly serves people to the north who use the 215 Beltway and U95 to get to the medical facility. He suggested that the model could include ramps to the south to study their effectiveness.
        - John Karachepone asked whether this connection will need to be in the 2025 model network. Mike Janssen answered in the affirmative. John Karachepone mentioned that in the kick-off meeting, there was specific direction to not include any direct connectors in the 2025 network other than the one at Wall Street. John Karachepone added that he would discuss with Jeff Lerud regarding this subsequent to the meeting.
        - Mike Janssen informed that it would be acceptable to the City if this HOV direct connect is included in the 2035 model only.
    - Mike Janssen added that in the long term, there could be a potential HOV direct connect location along I-515 at Maryland Parkway. He added that this is one mile south of the Las Vegas Boulevard interchange and that Maryland Parkway is a designated BRT corridor. Maryland Parkway also serves UNLV and the airport and could provide a HOV connection to the Cashman field area (which is likely to be redeveloped).
    - Mike Janssen also expressed the City of Las Vegas' interest in the Meade Avenue HOV direct connect identified in the I-15 corridor study.
- Park-and-ride locations:
    - John Karachepone updated the MTF group on the park-and-ride locations coded in the models.
        - In the 2013 model, six park-and-ride locations are coded; of these six, three park-and-ride locations in the model do not correspond to the exact physical location of known park-and-ride locations.
        - In the 2025 model, the number of park-and-rides increases to seven. The Bruner park-and-ride is the additional park-and-ride compared to the 2013 model.
        - The 2035 model has the same number of park-and-rides as the 2025 model.
        - Jeff Lerud asked whether the park-and-rides in the model are manually coded or whether the model recommends the locations of the park-and-rides.
        - John Karachepone answered that the park-and-rides are coded manually in to the model.
        - Mike Janssen asked the reason that new park-and-ride lots are not included in the 2035 model.
        - John Karachepone and Beth Xie replied that this was due to financial constraints; funding has not been identified for additional park-and-rides and new transit service that far into the future.

        - John Karachepone added that the HOV Plan update study is not limited by the RTC's financial constraints.
        - Mike Janssen asked about the sensitivity of the HOV system to the presence of park-and-rides.
        - Beth Xie replied that there is some impact due to the presence of park-and-rides; most of the impact is on the transit ridership and there is little impact on the number of HOV vehicles.
    - John Karachepone asked whether the City had identified potential locations for park-and-ride lots.
    - Mike Janssen informed that one park-and-ride location, near Rancho Drive/Decatur Boulevard was discussed informally. A transit-only lane is planned for Rancho Drive.
        - Mike Janssen added that the Decatur, Rancho and Cheyenne transit routes converge at this location and that vacant land is available near the North Las Vegas airport.
        - John Karachepone asked whether there is vacant public land available nearby.
        - Mike Janssen replied that the available public land nearby is owned by the North Las Vegas airport.

Agenda Item 2: Model Output – AAWDT

- John Karachepone updated the MTF group about his conversation with Beth Xie.
    - John Karachepone added that the RTC model is a five-day weekday model and that Annual Average Weekday Traffic (AAWDT) volumes will be used for the validation of the model.
    - The model outputs will also be AAWDT volumes based on which forecasts will be developed. This is consistent with the NDOT Traffic Forecasting Guidelines.

Agenda Item 3 - Agenda Item 7

Chris Primus (Jacobs Modeling Lead) led the discussions on model review/results. Several exhibits that show model observations, results of sensitivity tests and potential improvement options were provided (see attached). Highlights of the information/comments for these exhibits are as follows:

Agenda Item 3: Model Review

- The first exhibit shows the year 2013 field observed vs. model volumes and speeds at representative locations along US95. This exhibit also shows the "Percent shared ride" for these locations.
    - Chris Primus explained that this exhibit shows the directional peak hour volume per lane at the representative locations.
    - Chris Primus pointed out that the model HOV volume per lane at many locations are higher than the model GP lane volumes per lane. This contradicts the trend observed

in the field counts. He added that this was observed at other locations in the model as well.

- AM peak hour speeds are usually higher than the PM peak hour speeds as expected.
- Mike Janssen indicated that proposed developments along US95 that would have added approximately 12,000 homes did not materialize due to the recession.
    - He added that the model likely included a lot of trips from these developments and expected them to materialize and perhaps this could be the reason for the variation between the observed field count volumes and the model volumes.
- Beth Xie added that the 2013 model includes land use information that was obtained from the City of Las Vegas in 2010. She suggested that the land use data might already account for the absence of these developments.
- Mike Janssen offered to get the MTF group the latest entitlement numbers from the City of Las Vegas.
- Chris Primus explained the percent shared ride shown in the exhibit is the percent of HOV eligible vehicles (2+ persons) in the traffic stream in the model.
- Mike Janssen asked whether the field observed percent shared ride could be obtained for model validation purpose.
- John Karachepone replied that the original HOV Plan study conducted an occupancy study and these values were incorporated into the original models. No additional model validation of vehicle occupancy was planned.

- The second exhibit shows the year 2035 model volumes and speeds at representative locations along US95. This exhibit also shows the "Percent shared ride" for these locations.
    - Chris Primus explained that the percent shared ride increases in 2035 compared to 2013.
    - The model's HOV and GP volumes per lane and speeds are similar. The model allocates volumes relatively equally between the GP and HOV lanes.
    - Jeff Lerud inquired about the speed limits in the model.
    - Beth Xie informed that the Interstate functional class has a free flow speed of 60 mph.
- The third exhibit shows the year 2035 model volumes and speeds at representative locations along I-15. This exhibit also shows the "Percent shared ride" for these locations.
    - Chris Primus explained that the HOV lanes along I-15 have two lanes in each direction for the most part. Even with an additional lane, the volume per lane along I-15 is usually higher than the volume per lane along US95.

        - Beth Xie pointed out that at the location near Tropicana Avenue, the HOV volume per lane is very high, but the HOV lane speeds are high at the same time. Chris Primus indicated that this might have been a typo. He offered to check this volume.

    - John Karachepone pointed out that at I-15 south of I-215, the AM peak hour direction and the PM peak hour direction would have to be northbound and southbound respectively.

        - Chris Primus agreed that there is a distinct directionality to I-15 south of I-215 and mentioned that future graphics would reflect this.

Agenda Item 4: Sensitivity Runs

- The fourth exhibit shows the sensitivity tests completed on the models and the corresponding results.
- Chris Primus explained some of the findings of the sensitivity tests:
    - HOV Flagged All Day
        - Number of shared ride trips increase slightly if the HOV lanes are open all day, and the HOV lane VMT stays about the same. If the HOV lanes are flagged HOV all-day, non HOV trips cannot use these lanes, but the lanes attract about the same VMT, indicating that there is plenty of shared ride vehicle demand in the off-peak period.
    - HOV time savings
        - In the real world, carpooling increases if HOV lanes exist and provide a reasonable time savings. The travel demand model has a feature to simulate this.
        - A five minute threshold (of time savings) between each pair of zones was tested. The number of shared ride trips produced by the mode choice model would increase slightly if time savings is greater than five minutes.
        - In the 2013 model, there are not many origin-destination pairs that have five minute time savings; so there were not many added shared ride person trips.
        - So, a zero minute threshold was tested. Approximately 15,000 additional shared ride trips were added.
        - This feature is incorporated into the 2025 and 2035 model as well.

Agenda Item 5: Potential Improvement Options

- The fifth exhibit shows the test run results, and the table for Agenda Item 5 describes the pros and cons for the potential improvement options.
- Patrizia Gonella explained that the final improvements planned to be implemented to the models would not compromise the validity of the models.

- Patrizia Gonella explained the difference between calibration and validation and added that no changes will be made to the calibration parameters, including the mode choice parameters, which had been obtained from surveys.
- Jeff Lerud asked whether there are ingress/egress links along US95 in the model and asked why the model does not have continuous access.
- Chris Primus replied that there are ingress/egress links along US95 because the GP lanes and HOV lanes are modeled as separate facilities. He added that this level of detail is not important in a macro-simulation environment. The macro level model cannot discern between limited access and continuous access to the HOV lanes.
- Patrizia Gonella briefly explained the tests completed to the models.
- Patrizia Gonella explained the need to finalize the improvements that will be made to the models and requested the MTF group to provide comments on the tests and the model improvement options.

Agenda Item 6: Methodology Memo - Review status

- John Karachepone reminded that the methodology memorandum had been submitted earlier in the week and requested for comments on the document.
- Randy Travis mentioned that he had only one comment on the methodology memorandum. Regarding the statement in the methodology memorandum "year 2035 forecasts (for segments outside of the near-term study area) will not require NDOT Traffic Information Division approval since those HOV improvements are not planned for design or construction in the near-term", Randy mentioned that NDOT Traffic Information Division would like to review all forecasts.
- John Karachepone said that the necessary changes will be made and the methodology memorandum resubmitted for approval.

Agenda Item 7: 2025 and 2035 Scenarios

- The "Project Neon Improvements" tables and the Project Neon lane schematic plans show the proposed changes to the year 2025 and year 2035 model networks.
- John Karachepone explained that the Jacobs team had reviewed the Project Neon lane schematics to identify the changes needed to the year 2025 and year 2035 model networks.
- Mike Janssen indicated that the Grand Central Parkway and Charleston Boulevard intersection is to be an at-grade intersection.
- John Karachepone asked about the widening of Alta/Bonneville Drive.
    - Mike Janssen replied that an EA completed in the 1990's indicated the widening Alta/Bonneville Drive to 6 lanes.
    - The City envisions providing a sidewalk and bike lane along Alta/Bonneville Drive and the available right-of-way might not be sufficient for 6 lanes of vehicular traffic with additional bike lanes and sidewalk.

  - He added that the City plans to complete a study to determine the final configuration; but Alta/Bonneville Drive as of now, is officially planned to be widened to 6 lanes of vehicular traffic.
  - John Karachepone mentioned that Alta/Bonneville Drive is 6 lanes in the model and proposed to maintain this in the model.

- John Karachepone requested Jeff Lerud to provide comments on the identified Project Neon Improvements planned to be made to the year 2025 and year 2035 model networks.

Agenda Item 8: Next Meeting

- Tentative date for the next meeting is August 29 at 1:30 PM (Post-meeting, the time is rescheduled to 1:00 PM). This meeting will not be an in-person meeting; the meeting will be over a conference call/Webex. This next meeting will focus on refined model results.

Summary of Action Items

No.	Action Item	Person	Action Item Status	Date Completed
1	Confirm with Hui Shen regarding the GP lanes laneage along I-515	John Karachepone		
2	Discuss with Jeff Lerud regarding HOV direct connect locations for the year 2025 model	John Karachepone		
3	Provide the latest entitlement numbers	Mike Janssen		
4	Check year 2035 HOV lane volume (reported in the third exhibit) along I-15 near Tropicana Avenue	Chris Primus		
5	Update methodology memorandum and resubmit to NDOT Traffic Information Division	John Karachepone		
6	Review Project Neon Improvements – Proposed changes to the year 2025 and year 2035 model network	Jeff Lerud		

Model Task Force Meeting # 2

August 22, 2013
10:00 AM to 12:00 PM
RTC Conference Room 296
600 S. Grand Central Parkway, Las Vegas, Nevada

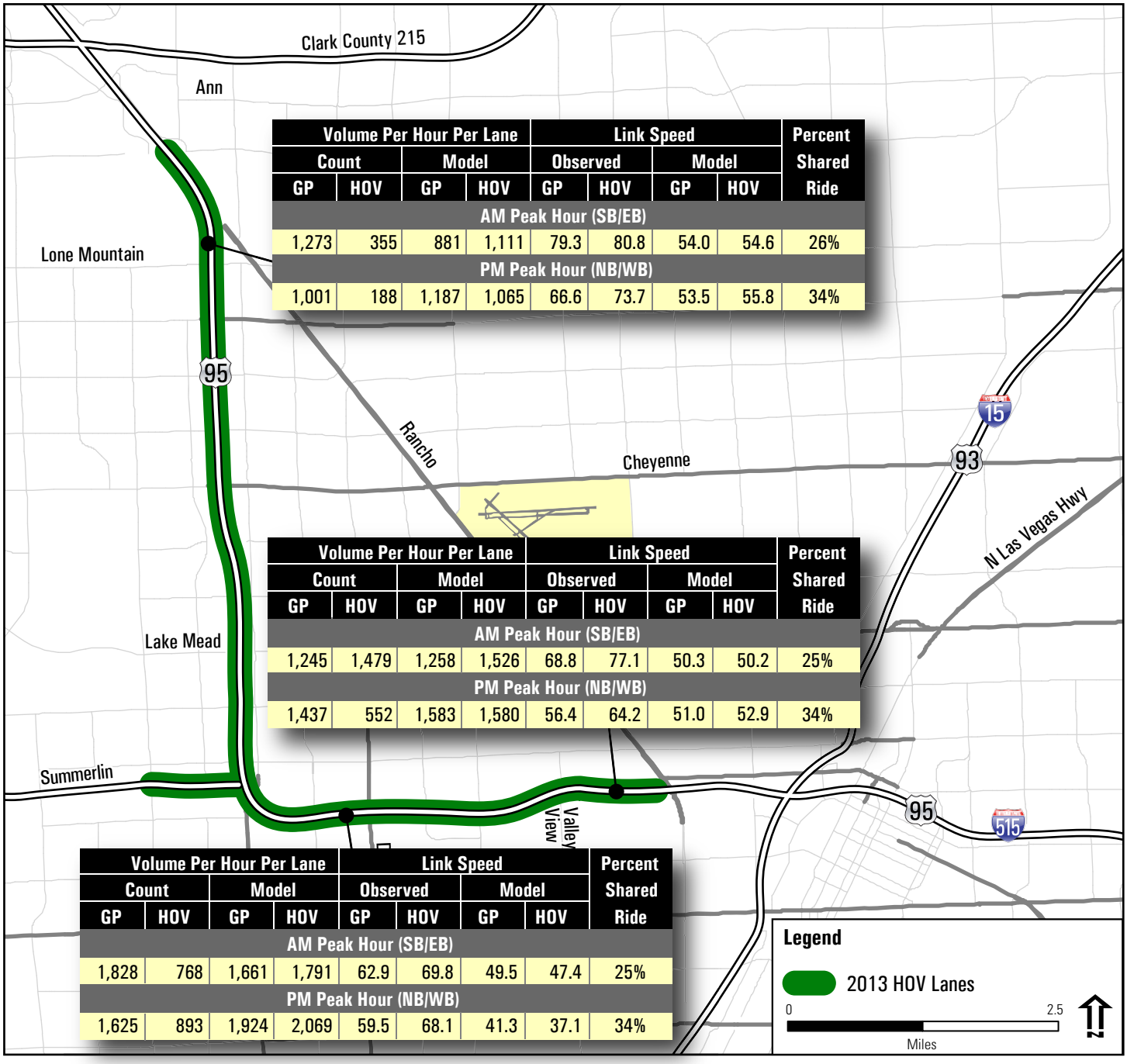
Agenda

1. City of Las Vegas Direct Connect Locations for modeling
2. Model Output
    a. AAWDT
3. Model Review
    a. US-95 – a closer look
    b. I-15
4. Sensitivity Runs
5. Potential Improvement Options
    a. Pros and Cons
    b. Test Runs and Results
6. Methodology Memo - review status
7. Scenarios
    a. 2025
    b. 2035
8. Next Meeting
    a. Tentative: August 29, 1:30 to 2:30. Conference call/WebEx
    b. Refined model results

2013 US 95 HOV Lane Statistics

Peak Hour by Direction

Southern Nevada HOV Plan



Volume Per Hour Per Lane				Link Speed				Percent Shared Ride
Count		Model		Observed		Model		
GP	HOV	GP	HOV	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)								
1,273	355	881	1,111	79.3	80.8	54.0	54.6	26%
PM Peak Hour (NB/WB)								
1,001	188	1,187	1,065	66.6	73.7	53.5	55.8	34%

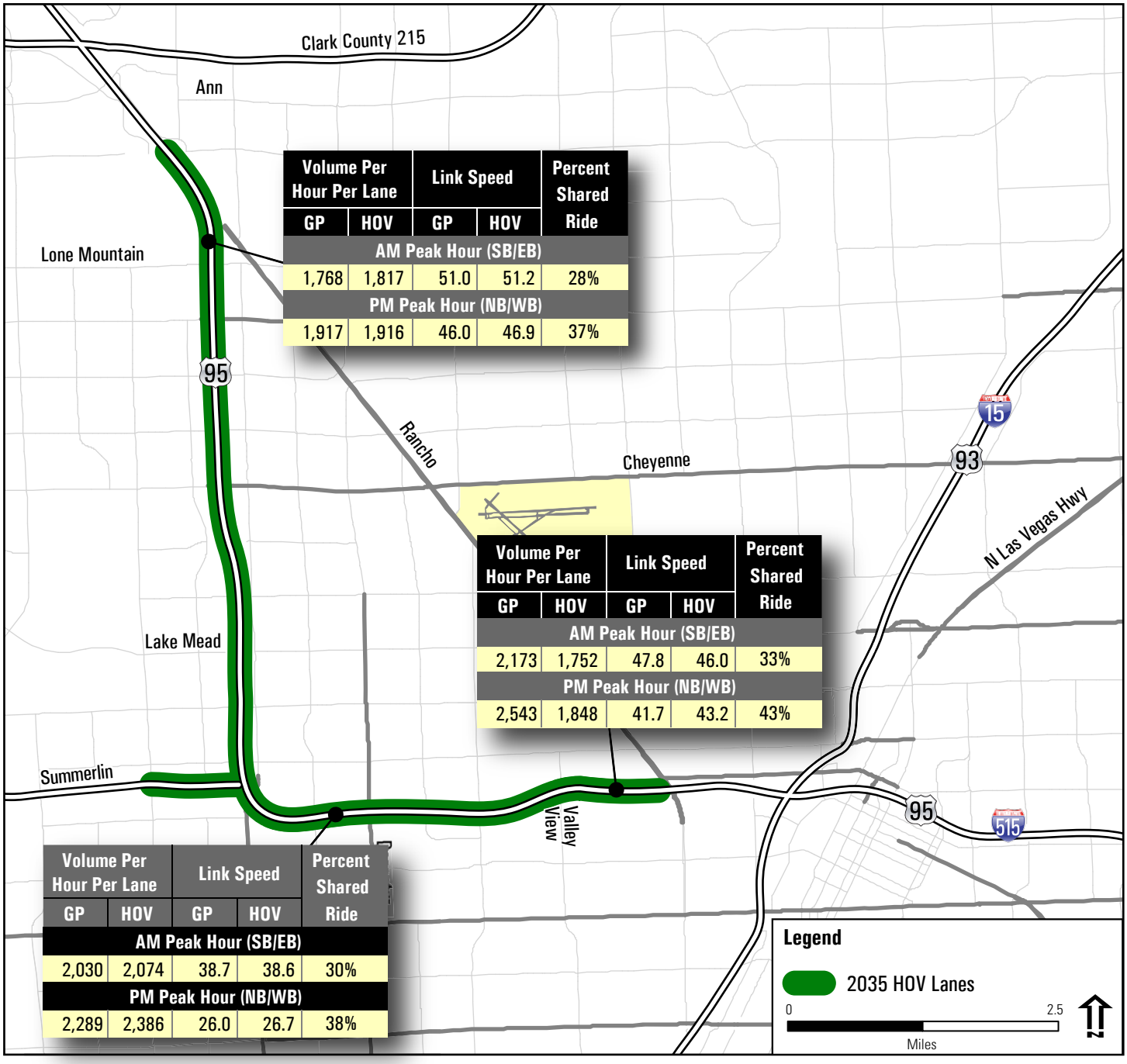
Volume Per Hour Per Lane				Link Speed				Percent Shared Ride
Count		Model		Observed		Model		
GP	HOV	GP	HOV	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)								
1,245	1,479	1,258	1,526	68.8	77.1	50.3	50.2	25%
PM Peak Hour (NB/WB)								
1,437	552	1,583	1,580	56.4	64.2	51.0	52.9	34%

Volume Per Hour Per Lane				Link Speed				Percent Shared Ride
Count		Model		Observed		Model		
GP	HOV	GP	HOV	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)								
1,828	768	1,661	1,791	62.9	69.8	49.5	47.4	25%
PM Peak Hour (NB/WB)								
1,625	893	1,924	2,069	59.5	68.1	41.3	37.1	34%

2035 US 95 HOV Lane Statistics

Peak Hour by Direction

Southern Nevada HOV Plan



Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)				
1,768	1,817	51.0	51.2	28%
PM Peak Hour (NB/WB)				
1,917	1,916	46.0	46.9	37%

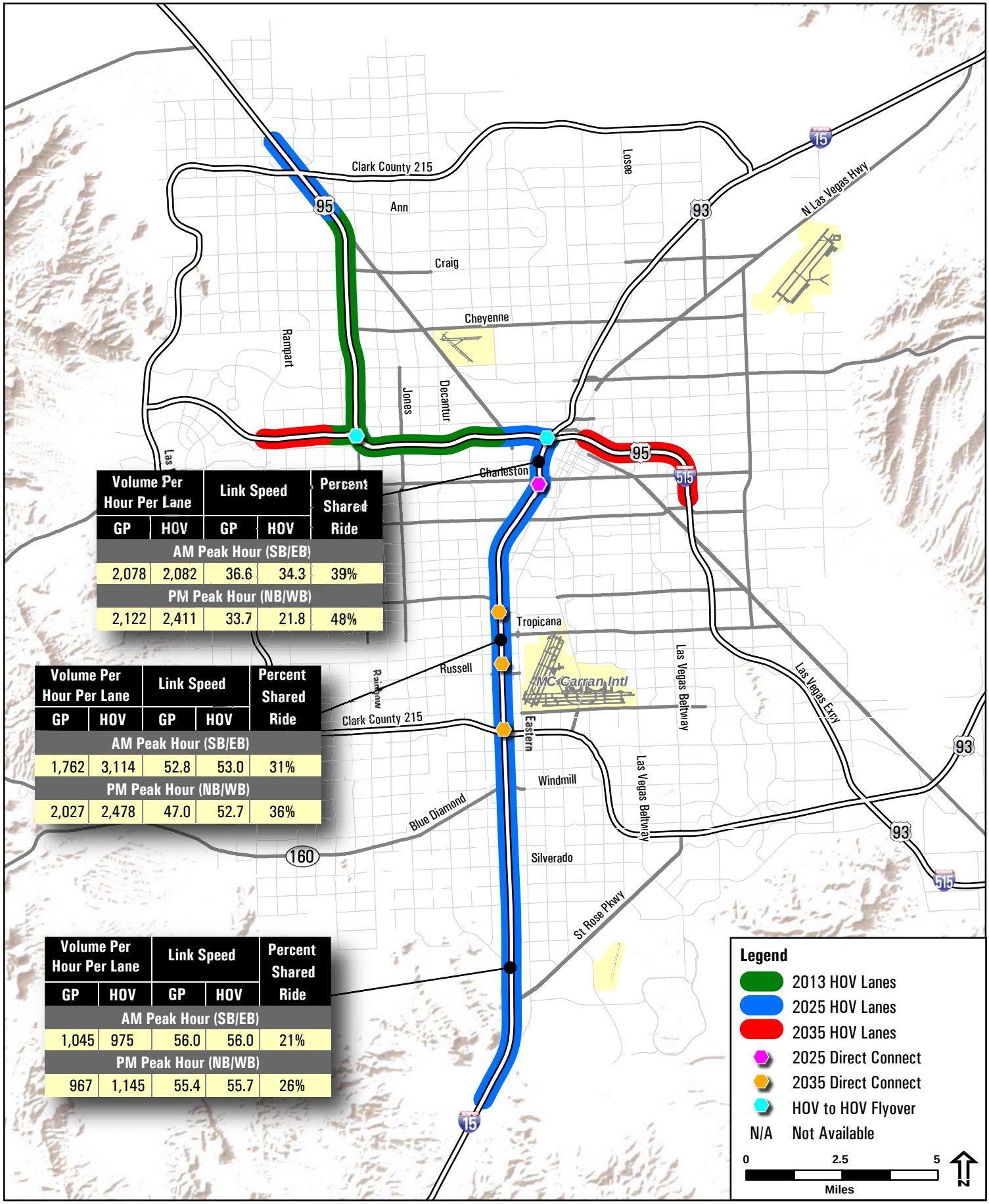
Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)				
2,173	1,752	47.8	46.0	33%
PM Peak Hour (NB/WB)				
2,543	1,848	41.7	43.2	43%

Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)				
2,030	2,074	38.7	38.6	30%
PM Peak Hour (NB/WB)				
2,289	2,386	26.0	26.7	38%

2035

I-15 HOV Statistics

Southern Nevada HOV Plan

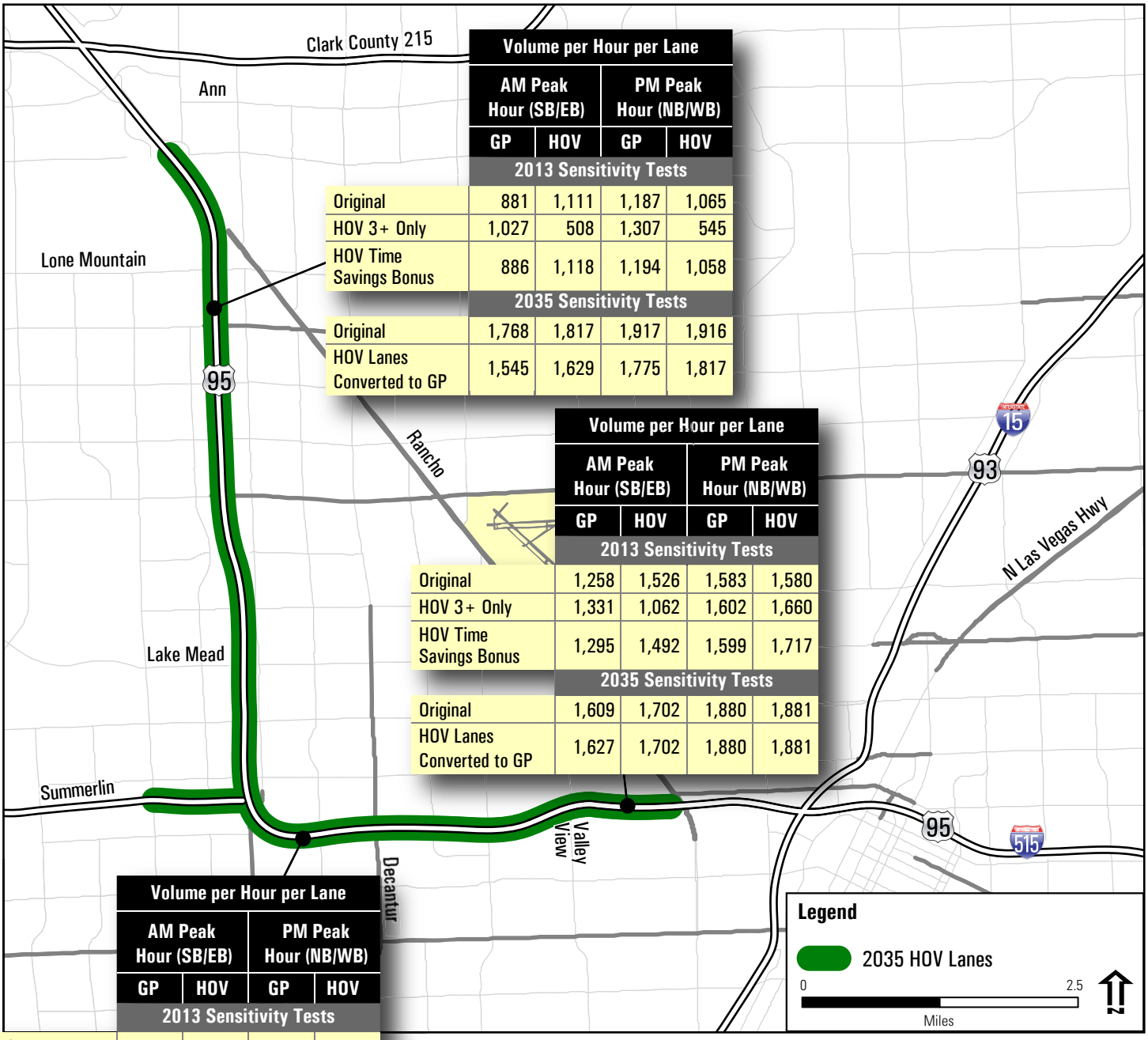


Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)				
2,078	2,082	36.6	34.3	39%
PM Peak Hour (NB/WB)				
2,122	2,411	33.7	21.8	48%

Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)				
1,762	3,114	52.8	53.0	31%
PM Peak Hour (NB/WB)				
2,027	2,478	47.0	52.7	36%

Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)				
1,045	975	56.0	56.0	21%
PM Peak Hour (NB/WB)				
967	1,145	55.4	55.7	26%

Sensitivity Run Results



Volume per Hour per Lane	AM Peak Hour (SB/EB)		PM Peak Hour (NB/WB)	
	GP	HOV	GP	HOV
2013 Sensitivity Tests				
Original	881	1,111	1,187	1,065
HOV 3+ Only	1,027	508	1,307	545
HOV Time Savings Bonus	886	1,118	1,194	1,058
2035 Sensitivity Tests				
Original	1,768	1,817	1,917	1,916
HOV Lanes Converted to GP	1,545	1,629	1,775	1,817

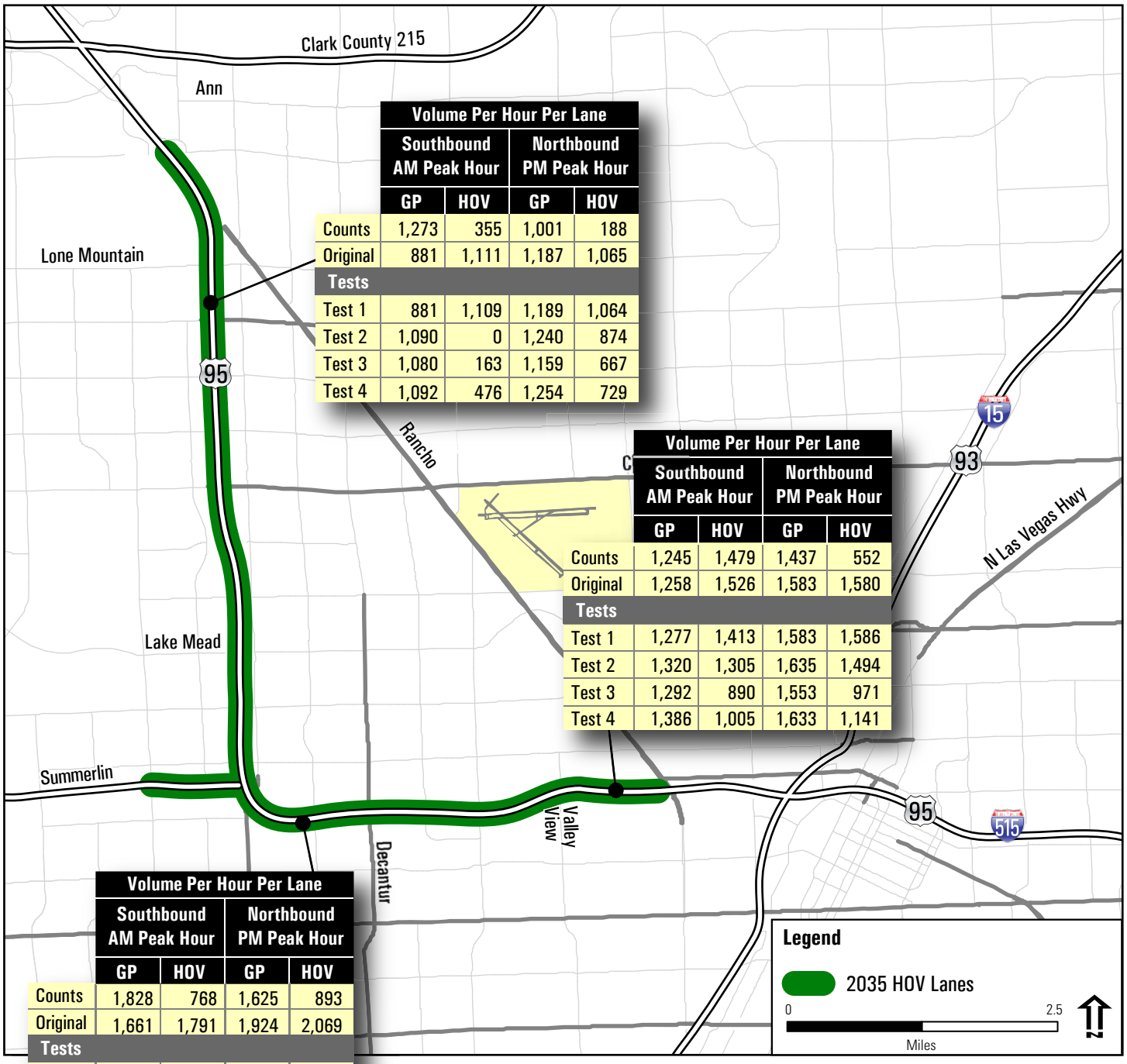
Volume per Hour per Lane	AM Peak Hour (SB/EB)		PM Peak Hour (NB/WB)	
	GP	HOV	GP	HOV
2013 Sensitivity Tests				
Original	1,258	1,526	1,583	1,580
HOV 3+ Only	1,331	1,062	1,602	1,660
HOV Time Savings Bonus	1,295	1,492	1,599	1,717
2035 Sensitivity Tests				
Original	1,609	1,702	1,880	1,881
HOV Lanes Converted to GP	1,627	1,702	1,880	1,881

Volume per Hour per Lane	AM Peak Hour (SB/EB)		PM Peak Hour (NB/WB)	
	GP	HOV	GP	HOV
2013 Sensitivity Tests				
Original	1,661	1,791	1,924	2,069
HOV 3+ Only	1,712	1,185	1,932	1,890
HOV Time Savings Bonus	1,636	1,911	1,918	2,077
2035 Sensitivity Tests				
Original	2,030	2,074	2,289	2,386
HOV Lanes Converted to GP	2,045	2,026	2,280	2,459

Regional Statistics for Sensitivity Tests

2013 Senstivity Tests	Mode Choice for Residents: Drive Alone	Mode Choice for Residents: Shared Ride 2	Regional Travel: HOV VMT	Regional Travel: HOV VHT	Regional Travel: HOV Speed
Original	3,240,471	3,580,394	591,730	11,244	52.6
HOV Flagged All Day	3,230,072	3,594,971	582,134	11,038	52.7
Difference	(10,399)	14,577	(9,596)	(206)	0.1
HOV 3+ Only	3,229,740	3,595,283	553,493	10,417	53.1
Difference	(10,731)	14,889	(38,237)	(827)	0.5
HOV Time Savings Bonus	3,229,655	3,595,371	588,439	11,188	52.6
Difference	(10,816)	14,977	(3,291)	(56)	-
2035 Sensitivity Tests					
Original	4,261,927	4,913,939	2,349,722	53,386	44.0
HOV Lanes Converted to GP	4,264,193	4,911,442	-	-	-
Difference	2,266	(2,497)	(2,349,722)	(53,386)	-

Test Run Results



Volume Per Hour Per Lane	Southbound AM Peak Hour		Northbound PM Peak Hour	
	GP	HOV	GP	HOV
Counts	1,273	355	1,001	188
Original	881	1,111	1,187	1,065
Tests				
Test 1	881	1,109	1,189	1,064
Test 2	1,090	0	1,240	874
Test 3	1,080	163	1,159	667
Test 4	1,092	476	1,254	729

Volume Per Hour Per Lane	Southbound AM Peak Hour		Northbound PM Peak Hour	
	GP	HOV	GP	HOV
Counts	1,245	1,479	1,437	552
Original	1,258	1,526	1,583	1,580
Tests				
Test 1	1,277	1,413	1,583	1,586
Test 2	1,320	1,305	1,635	1,494
Test 3	1,292	890	1,553	971
Test 4	1,386	1,005	1,633	1,141

Volume Per Hour Per Lane	Southbound AM Peak Hour		Northbound PM Peak Hour	
	GP	HOV	GP	HOV
Counts	1,828	768	1,625	893
Original	1,661	1,791	1,924	2,069
Tests				
Test 1	1,656	1,753	1,911	2,067
Test 2	1,666	1,723	1,924	2,045
Test 3	1,643	1,340	1,861	1,489
Test 4	1,744	1,371	1,963	1,551

Test Description

Test 1 – Changed number of lanes of ingress/egress links from 2 lane to 1 lane directional

Test 2 – Alt 1+ Reduced free flow speed on ingress/egress links by 2 mph and HOV Links by 1 mph

Test 3 – Alt 1+ Alt 2 + Reduced lane capacity on ingress/egress links to 1500 vphpl and HOV Links to 1500 vphpl

Test 4 – Alt 1 + Reduced lane capacity on ingress/egress links to 1500 vphpl and HOV Links to 1500 vphpl + Redistribution of time of day trips to reflect traffic counts flow patterns

Agenda Item 5: Potential Improvement Options

Refinement Option	Pros/Cons
Code access and egress links as 1 lane • Code to simulate actual conditions	+ Minimal effort + Reflects actual conditions
Limit access and egress links to reduce short HOV trips • Code to simulate real/perceived conditions • Increase "time cost" to access and egress HOV lanes to reduce likelihood of short trips on HOV lanes	+ Minimal effort + Attempts to simulate reasonable assumption that longer trips are those on HOV lanes - Non-intuitive - Appropriate region-wide value of additional time cost difficult to gauge - Lack of empirical data
Refine Mode Choice • Residential non-home-based shared ride trips may be high	+ Mode choice revalidation with a focus on Shared Ride/HOV needs - Summary survey data indicates Las Vegas may have higher than average shared ride patterns, but model NHB SR trips appear even higher - Extensive effort to review detailed survey data and recalibrate and validate mode choice model
Adjust free-flow speed and capacity of HOV lanes • Maintain reasonable balance relative to GP lanes	+ May produce better assignment results - No empirical data - Using assignment parameters to "manage" HOV use -
Adjust Alpha and Beta assignment parameters for HOV links	+ May produce better assignment results - No empirical data - Using assignment parameters to "manage" HOV use
Increase number of assignment feedback iterations	+ May improve traffic assignment loading results - Increases model run time

Refinement Option	Pros/Cons
Reduce capacity of access and egress links and HOV	+ Minimal effort + Attempt to keep more of the short shared trips traveling on the general purpose lanes - This is location specific and will have different effects region-wide - Non-intuitive - Unknown impacts between future congestion and HOV usage
Change time of day trip distribution	+ Could reduce the number of HOV trip for specific time period to match count data - Need to analyze recent data to make changes - This is location specific and will have different effects region-wide
Combination of capacity reduction of access and egress links and HOV and change in time of day trip distribution	+ Could reduce the number of HOV trip for specific time period to match count data - Need to analyze recent data to make changes - This is location specific and will have different effects region-wide - Unknown impacts between future congestion and HOV usage

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Model Task Force Meeting # 2

Project Neon Improvements – Changes to the 2025 Model Network:

Reference Number	Link	Condition in the Model	Proposed Change
1	I-15 southbound collector-distributor road between the Spaghetti bowl and Oakey Boulevard	Does not exist	Code these in the model
2	I-15 northbound to US95 southbound ramp (after the merge with the I-15 southbound to US95 southbound ramp)	1 lane	2 lanes
3	US95 southbound/Martin Luther King Boulevard ramp to I-15 northbound	1 lane	2 lanes
4	A short stretch of I-15 southbound just south of the point where the US95 northbound ramp to I-15 southbound merges with I-15 southbound	4 lanes	4.5 lanes
5	Charleston Boulevard between the I-15 ramp terminal intersections	3 lanes in each direction	4 lanes in each direction
	I-215 westbound to I-15 northbound HOV connector	Exists	Remove
	I-15 southbound to I-215 eastbound HOV connector	Exists	Remove

Project Neon Improvements – Changes to the 2035 Model Network:

Reference Number	Link	Condition in the Model	Proposed Change
3	US95 southbound/Martin Luther King Boulevard ramp to I-15 northbound (same as 2025)	1 lane	2 lanes
4	A short stretch of I-15 southbound just south of the point where the US95 northbound ramp to I-15 southbound merges with I-15 southbound (same as 2025)	4 lanes	4.5 lanes
5	Charleston Boulevard between the I-15 ramp terminal intersections (same as 2025)	3 lanes in each direction	4 lanes in each direction
6	Ramp connection from the Martin Luther King Boulevard/US95 southbound to I-15 southbound (just south of Alta Drive)	Redundant Connection	Remove
7	Pinto Lane (intersection with Martin Luther King Boulevard)	Does not exist	Two-way street, 1 lane in each direction
8	Bearden Drive between Martin Luther King Boulevard and Shadow Lane	2 lanes in each direction	1 lane in each direction
9	West leg of the Bearden Drive/Shadow Lane intersection	Does not exist	Westbound link has 2 lanes, eastbound link has 1 lane
10	Northbound link of the south leg of the Bearden Drive/Shadow Lane intersection	2 lanes	1 lane
11	I-15 northbound (just north of the point where the ramp from Sahara Avenue merges with I-15)	3 lanes	4 lanes

Project Neon PHASE 4

Phase IV Highlighted Plan

70% Confidence Cost – yoe (NDOT)

PE $83M

R/W $9.8M

Utilities $9.5M

Construction $137.1M

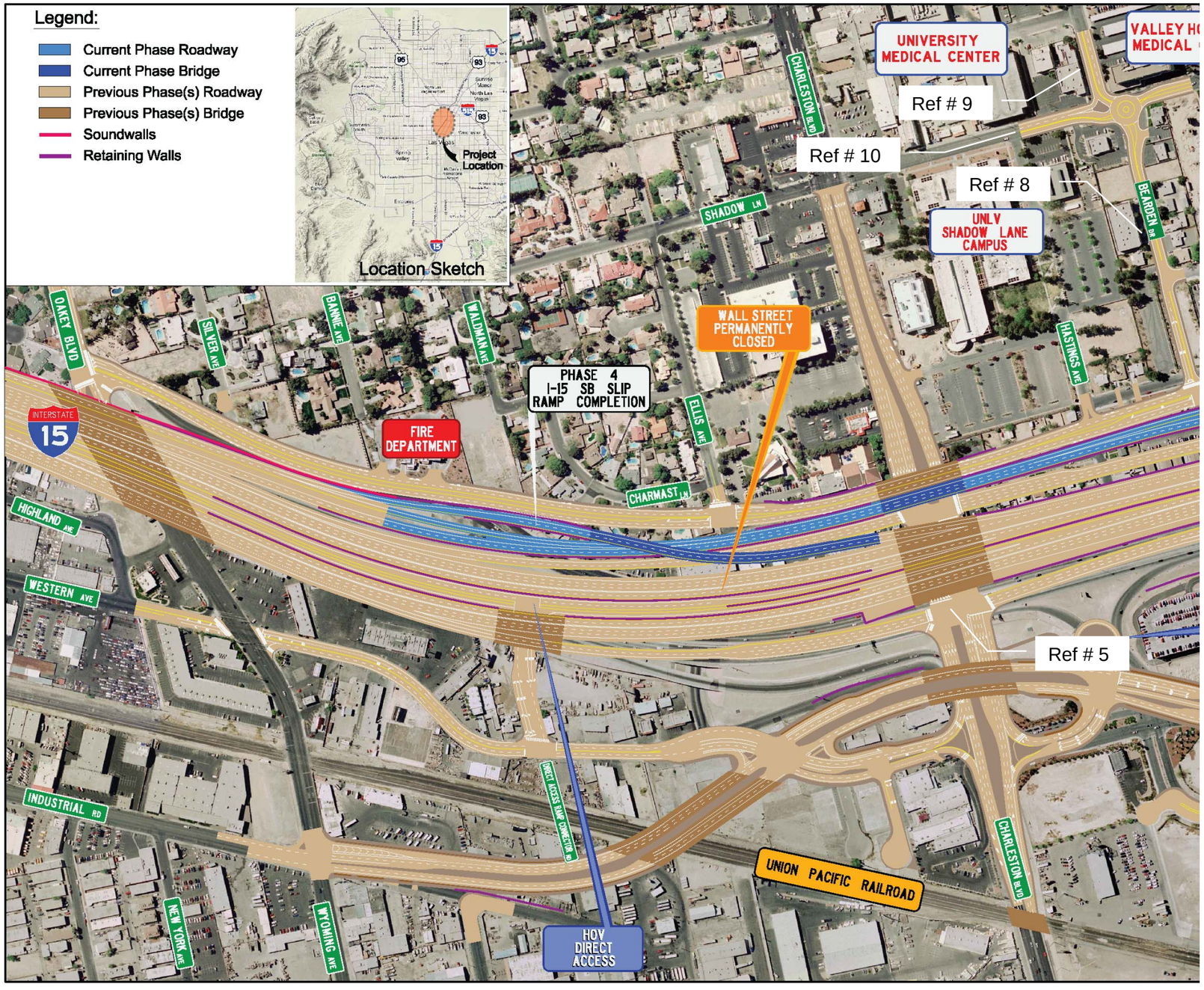
Admin $10.9M

Major Phase Elements

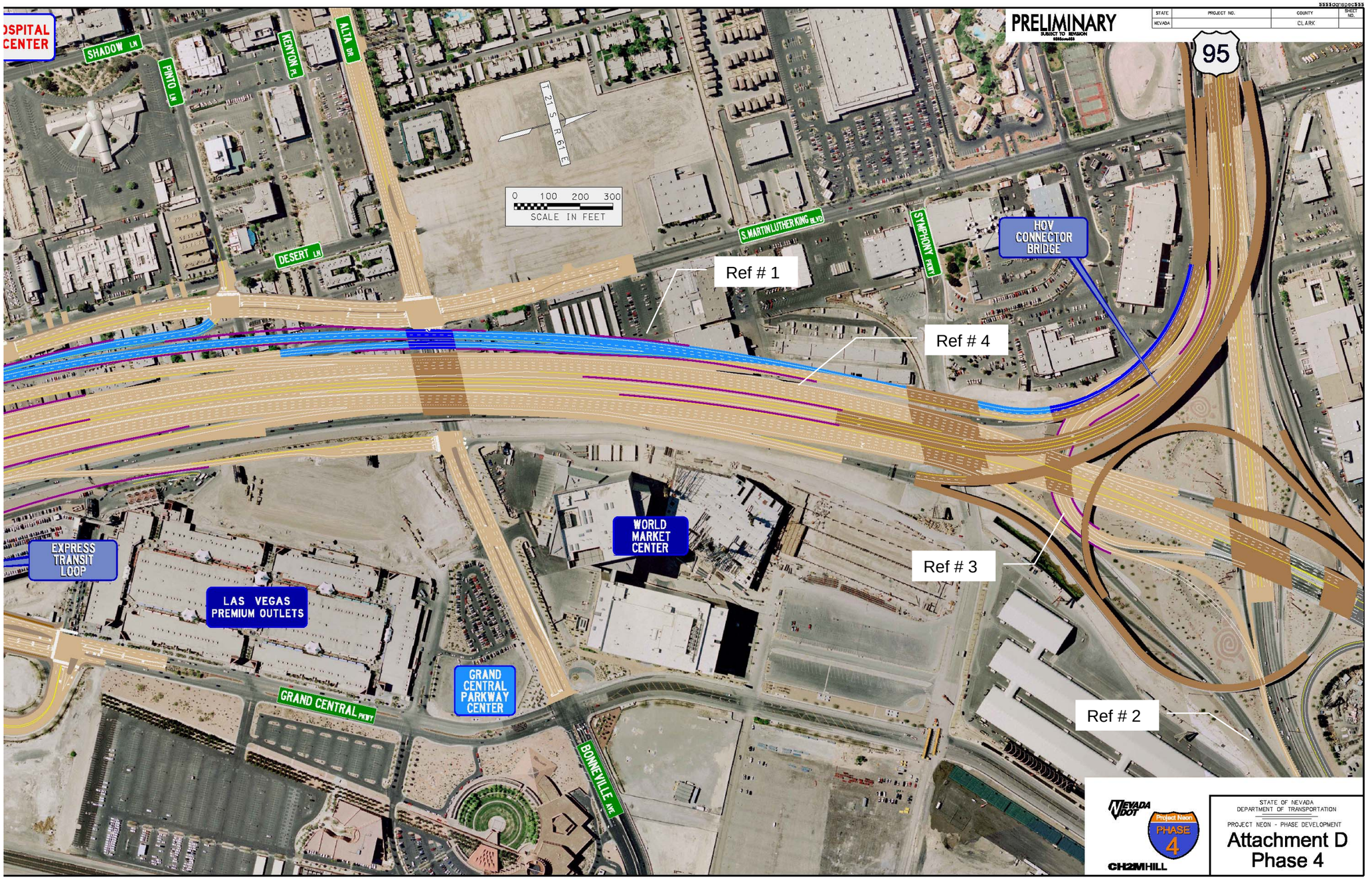
- Ramp Bridge SB US 95 to I-15, Charleston (EN + EX) and Sahara EX
- Charleston Slip Ramp

Improvements

- MLK Boulevard is completely separated from the Charleston Interchange Ramps
- SB Freeway weaving is fully optimized



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION

Project Neon PHASE 6

Phase VI Highlighted Plan

70% Confidence Cost – yoe (City)

PE $2.9M

R/W..... $54.6M

Utilities..... $6.4M

Construction $39.6M

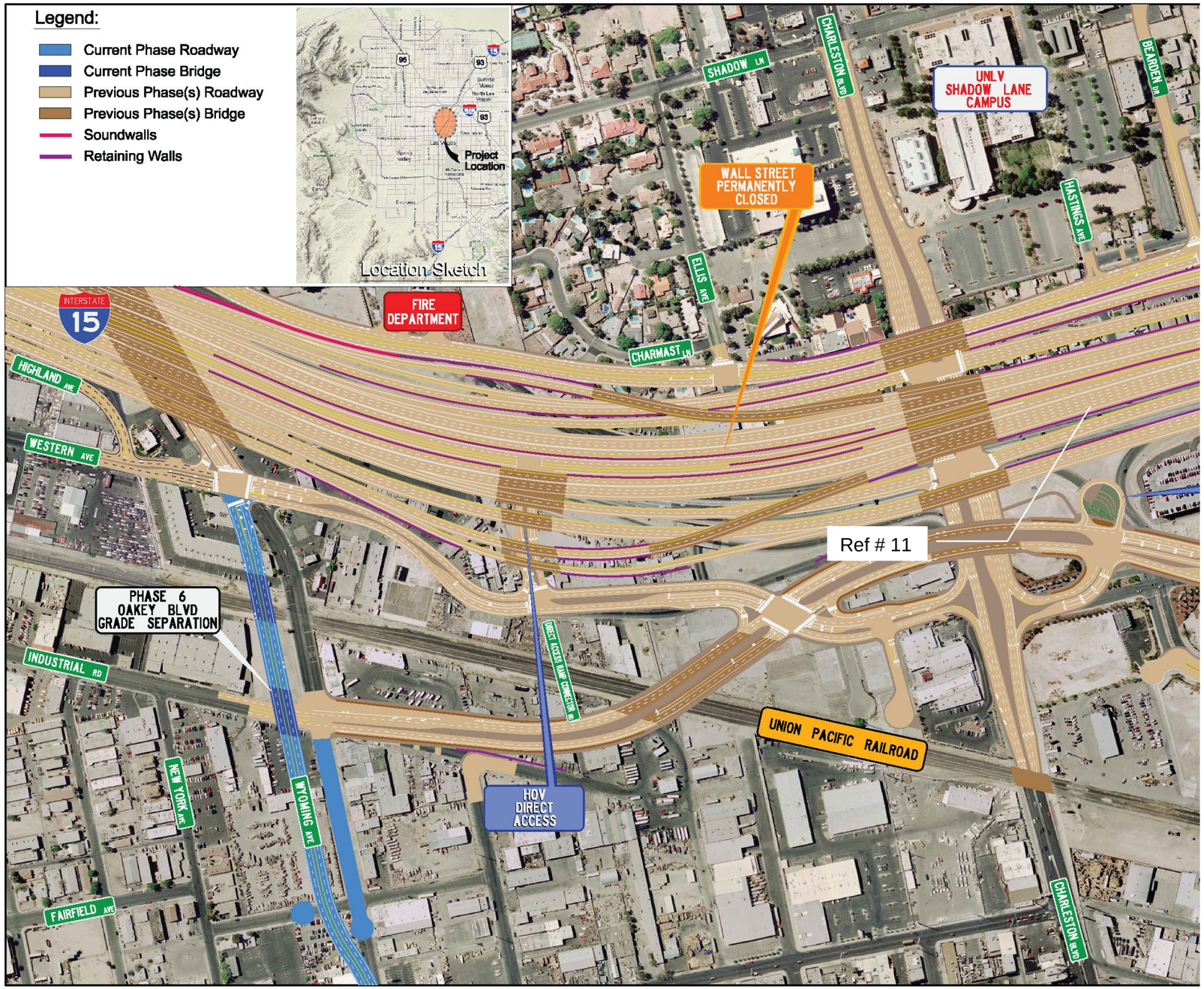
Admin..... $3.1M

Major Phase Elements

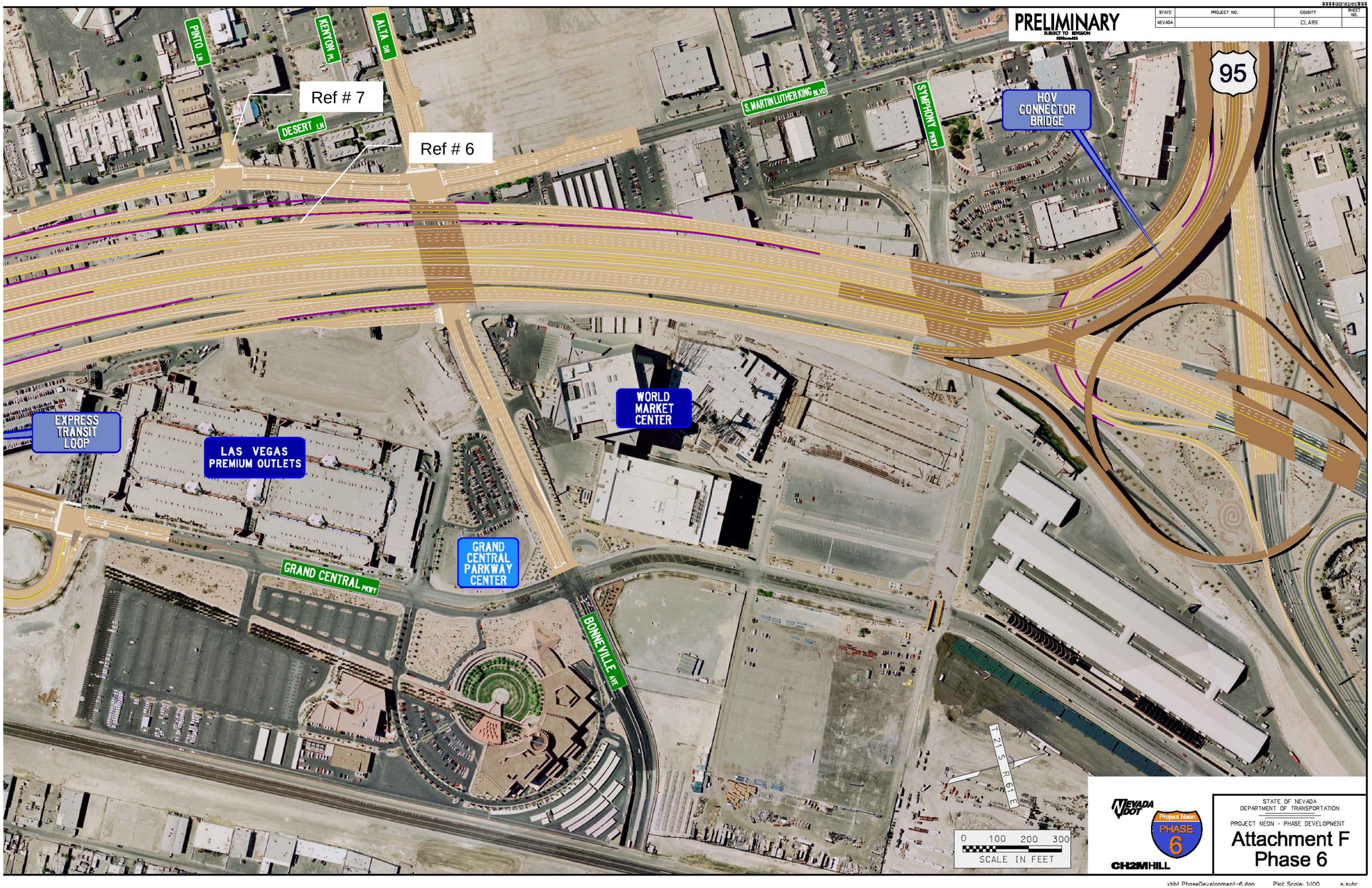
- Oakey/Wyoming – UPRR grade separation

Improvements

- Highest priority RR crossing in Nevada
- Design likely to be revised to be under



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION

Model Task Force Meeting 2

August 22, 2013

Sign-in Sheet

Name	Agency/Company	Phone Number	E-mail address
JOHN KARACHEPONE	JACOBS	702 938 5508	John.Karachepone@Jacobs.com
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Beth Xie	RTC	702-676-1722	xieb@rtcsnv.com
Hui Shen	RTC	702-676-1727	shenh@rtcsnv.com
Randy Travis	NDOT	775-888-7158	rtravis@dot.state.nv.us
Lori Campbell	NDOT	775-888-7443	lcampbell@dot.state.nv.us
Jeff Lerud	NDOT	775-888-7589	jlerud@dot.state.nv.us
SHARAN DHANARAJU	JACOBS		SHARAN.DHANARAJU@JACOBS.COM
ATTENDEES ON THE PHONE:			
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PATRIZIA GONELLA	JACOBS	602-650-4942	PATRIZIA.GONELLA@JACOBS.COM
CASSANDRA SMITH	JACOBS	602-650-4961	CASSANDRA.SMITH@JACOBS.COM

Meeting Minutes

Purpose: Model Task Force (MTF) Meeting #3

Date Held: August 29, 2013

Location: Teleconference and WebEx

Attendees: See attached

Copies: Attendees, File

Attachments: Sign-in Sheet, Agenda, Handouts

The meeting is summarized below by each agenda item. Agenda and the handouts are attached. Action items are provided on the last page of these minutes.

Introductions:

- Chris Primus (Jacobs Modeling Task Lead) began the meeting with introductions (see sign-in sheet for the list of attendees).

Agenda Item 1: Model Refinement Results

- Chris Primus explained some of the findings of the modeling process. This includes the high value of the Percent Shared Ride and the challenges in making adjustments to the model to ensure that the model generated HOV volumes are consistent with the HOV observed counts.
- Patrizia Gonella described the various model refinements that were tested and the effectiveness of these refinements in improving the model results. She added that a variety of refinements were tested; most did not result in significant changes and were abandoned.
- Patrizia Gonella explained the five refinement strategies shown in Attachment 1.
    - The details of the refinement strategies are:
        - Alt 1: Number of lanes of the ingress/egress links changed from two to one.
        - Alt 2: Alt 1 + Speed reduction of 2 mph on ingress/egress and HOV Links.
        - Alt 3: Alt 2 + Capacity reduction on ingress/egress (2,000 vphpl to 1,500 vphpl) and HOV Links (1,950 vphpl to 1,500 vphpl).
        - Alt 4: Alt 2 + Redistribution of time-of-day trips.
        - Alt 5: Alt 1 + Capacity reduction on ingress/egress (2,000 vphpl to 1,500 vphpl) and HOV Links (1,950 vphpl to 1,500 vphpl) + Redistribution of time-of-day trips.
    - Patrizia Gonella indicated that Alt 5 produced model results that better reflected the observed patterns.

- Beth Xie asked whether the speed reduction was a global or a local change.
  - Patrizia Gonella replied that this was a global change; she added that in order to make a local change, a new functional class would have to be added and the model code and summary table would have to be modified following this addition.
  - Patrizia Gonella mentioned that this ad-hoc global change was made for this testing process and a new functional class could be added before the final model run.
  - She clarified that the speed reduction was a global change whereas the capacity reduction was a local change.
- Regarding Alt 5, Patrizia Gonella mentioned that the time of day distribution percentages in the model were adjusted to make the time of day model volumes better match the time of day observed counts.
- Patrizia Gonella shared the time of day distribution results of the Original 2013 model run, Alt 5 model run and the time of day distribution of the 2010 counts and pointed out that the Alt 5 model run results better reflects the observed counts.
- John Karachepone asked the reason for comparing the 2010 counts with the 2013 model run results.
  - Patrizia Gonella explained that the 2010 counts were readily available from a previously completed test and that spot checks were done to compare the 2010 and 2013 counts. There was not much difference between the 2010 and 2013 counts.
- Regarding the adjustments to the time of day distribution, Beth Xie asked whether the daily O-D volumes remained constant during this change.
  - Patrizia Gonella answered in the affirmative and added that only the percent distribution over the day was adjusted.
- Patrizia Gonella explained the results along US95; and among the five refinement strategies tested, Alt 5 best replicates the traffic patterns.
- Patrizia Gonella proposed applying the refinements of Alt 5 to the 2025 and 2035 models.

- The first exhibit shows the year 2013 field observed, original model run and the Alt 5 model run volumes and speeds at representative locations along US95. This exhibit also shows the "Percent shared ride" for these locations.
  - Keith Borsheim explained that the HOV volumes are generally lower in the Alt 5 model run compared to the original model run. This better reflects the observed counts.
- The second exhibit shows the year 2035 original model run and the Alt 5 model run volumes and speeds at representative locations along US95. This exhibit also shows the "Percent shared ride" for these locations.

  - Keith Borsheim explained that the HOV volumes are generally lower in the Alt 5 model run compared to the original model run.

- The third exhibit shows the year 2035 original model run and the Alt 5 model run volumes and speeds at representative locations along I-15. This exhibit also shows the "Percent shared ride" for these locations.
  - Keith Borsheim explained that the I-15 HOV volumes are lower near St. Rose Parkway compared to the other representative locations near Tropicana Avenue and near Charleston Boulevard.

Agenda Item 2: Model Run Schedule

- Chris Primus mentioned that the year 2025 model network coding was completed and is undergoing Jacobs' internal review.
- He added that he expects to complete the year 2025 model run by the end of the next week (September 6, 2013).
- Coding of the 2035 model network will also be done in the week of September 2, 2013.

Agenda Item 3: Comparison of 2025 Results with Project NEON – Proposed process

- John Karachepone mentioned that the trip tables are different from that of the RTC's models because of the refinements made to the model and that the year 2025 trip tables would be provided to the Project Neon team.
- Chris Primus expects to provide the year 2025 trip tables by September 9, 2013.
- In order to compare the forecasts developed by the Project Neon team with the forecasts from the travel demand models developed for this HOV Plan update project, John Karachepone suggested developing a table/matrix which will be populated with forecasts from representative locations.
  - He added that the Project Neon team could populate this table/matrix and that Jeff Lerud and Randy Travis could compare the forecasts for consistency.
- John Karachepone added that these volumes from the travel demand models would be raw model volumes before post-processing, and therefore such raw volumes were to be considered cautiously; the final forecasts will be provided after post processing.
- John Karachepone requested direction from Jeff Lerud and Randy Travis on whether to use raw model volumes or post-processed final forecast volumes in the comparison with the forecasts from the Project Neon team.
  - John Karachepone added that the year 2025 raw model volumes will be available by September 9, 2013 and the post-processed final forecast volumes will be available by October 9, 2013.

Agenda Item 4: HOV System Scenarios for 2025 and 2035 Model Runs

- The fourth exhibit shows the year 2025 HOV system, including the extent and number of HOV lanes, direct connect locations, HOV to HOV connector locations and park-and-ride lots.

  - John Karachepone mentioned that the major change in the proposed 2025 HOV system is the presence of direct connect at Elkhorn Road as per Mike Janssen's direction in the MTF meeting #2. He added that this is different from the direction that was given in the kick-off meeting.
  - John Karachepone requested for direction from Jeff Lerud regarding the inclusion or exclusion of this direct connect at Elkhorn Road.
  - Jeff Lerud inquired whether the inclusion of this direct connect at Elkhorn Road would impact the budget. John Karachepone replied that there would not be any impact in including this in the travel demand models.
  - John Karachepone mentioned that the I-215/I-15 HOV to HOV connector has been removed as per direction from the kick-off meeting.

- The fifth exhibit shows the Scenario 1 for the year 2035 HOV system.
  - John Karachepone mentioned that this scenario corresponds to maximum coverage of the HOV facilities.
  - John Karachepone pointed out that certain freeways would not have HOV lanes even in this maximum HOV coverage scenario. These include segments of the northern/western beltway. He added that this decision was based on an inspection of the raw model volumes at these segments, which were in the order of 1,000 vehicles/hour/lane and thus do not indicate HOV facilities.
- The sixth exhibit shows the Scenario 2 for the year 2035 HOV system.
  - John Karachepone mentioned that this scenario corresponds to moderate coverage of the HOV facilities.
  - In this scenario, the extent of the HOV lanes along I-515 would match the extent of the HOV lanes in the RTC models.
  - A direct connect at Sunset Road and the 215 Western Beltway is proposed because of the expected future development in the vicinity.
- The seventh exhibit shows the Scenario 3 for the year 2035 HOV system.
  - This scenario corresponds to minimum coverage of the HOV facilities.
  - The only additional HOV lane proposed in this scenario is the extension of HOV lanes along I-15 to the Northern Beltway (CC-215).
- Randy Travis asked whether the existing HOV plan was considered in developing the scenarios.
  - John Karachepone explained that the recommendations of the existing HOV plan were reviewed and the priority of implementation proposed in the existing HOV plan was considered in developing the scenarios.
- Chris Primus pointed out that the HOV lanes along I-15 between I-215 and US95 is the only facility with two lanes in each direction in these scenarios.

  - Sharan Dhanaraju clarified that the existing HOV plan proposes two HOV lanes in each direction along US95 between I-15 and Rainbow Boulevard, but the RTC models include only one lane in each direction.
  - John Karachepone suggested converting the US95 segments between I-15 and Rainbow Boulevard to two lanes in each direction in the maximum and moderate HOV coverage scenarios.

- Lori Campbell asked which of these three scenarios correspond to the system proposed in the existing HOV plan.
  - John Karachepone replied that the system proposed in the existing HOV plan would be a hybrid of the moderate and minimum HOV coverage scenarios.
  - John Karachepone requested direction from Jeff Lerud and Randy Travis on the need to model the exact system proposed in the existing HOV plan as one of these scenarios.

Agenda Item 5: Methodology Memorandum

- John Karachepone mentioned that the comments on the methodology memorandum from the MTF meeting #2 had been addressed and the document submitted to NDOT Traffic Information Division on August 28, 2013.

- Randy Travis indicated that he was satisfied with the changes and added that an email approving the methodology memorandum would be sent to John Karachepone.

Agenda Item 6: Next Meeting

- Tentative date for the next meeting is September 10 at 2:00 PM. (This was subsequently confirmed to be the final schedule).
- The meeting will be at the NDOT HQ Safety Conference Room, Carson City and through video conference at Room Number 127, Southern Nevada RTC, Las Vegas.

Summary of Action Items

No.	Action Item	Person	Action Item Status	Date Completed
1	Provide direction on whether to use raw model volumes or post-processed final forecast volumes in the comparison with the forecasts from the Project Neon team.	Jeff Lerud and Randy Travis	Done – Both raw and post-processed volumes will be provided to the Department	09/04/2013
2	Provide direction regarding the inclusion or exclusion of the direct connect at Elkhorn Road	Jeff Lerud	Done – Include per post-meeting discussion	08/29/2013
3	Provide direction on the need to model the exact system proposed in the existing HOV plan as one of the scenarios.	John Karachepone, Jeff Lerud and Randy Travis	John K to provide revised listing and discussion to Jeff and Randy; Jeff and Randy to provide direction based on revised listing	
4	Approve the Methodology Memorandum	Randy Travis		

Model Task Force Meeting # 3

August 29, 2013
1:00 to 2:00 PM
Conference Call / WebEx

Agenda

1. Model Refinement Results
2. Model Run Schedule
    a. 2025
    b. 2035
3. Comparison of 2025 Results with Project NEON – Proposed process
4. HOV System Scenarios for 2035 Model Runs
5. Methodology Memorandum
6. Next Meeting
    a. September 10 (?), In-Person Meeting in Las Vegas
    RTCSNV Room TBD:
    2 to 4 PM

Attachment 1

Proposed RTC Regional Travel Demand Model (TDM) Refinements

At the onset of this project, Jacobs was tasked with reviewing the RTC Regional TDM performance, especially along US 95 where high occupancy vehicle (HOV) lanes are currently located. We performed our review and identify some discrepancies between the traffic count data and the 2013 model traffic projections. Upon further investigation, we identified potential strategies that could be utilized to refine the model in order to obtain a better representation of the travel patterns observed from the traffic count data.

To retain the integrity of RTC TDM, we identified strategies related to speed, capacity and time of day distribution. These parameters are often adjusted during model validation practices in order to better replicate observed traffic counts. Potential strategies include:

- Reduction of the number of lanes on the ingress/egress links from 2 directional to 1 directional. This is to keep with industry standards.
- Adjustment of lane capacity for the HOV and HOV ingress/egress links
- Adjustment of time-of-day trips distribution
- Adjustment of the speed for the HOV and HOV ingress/egress links

We conducted several tests using a single strategy or a combination of strategies, shown in Table 1.

Table 1. Refinement Strategies Combinations

Alt 1	Number of lanes change ingress/egress links
Alt 2	Alt 1 + Speed reduction on ingress/egress and HOV Links
Alt 3	Alt 1 + Alt 2 + Capacity reduction on ingress/egress and HOV Links
Alt 4	Alt 1 + Speed reduction on ingress/egress and HOV Links+ Redistribution of time-of-day trips
Alt 5	Alt 1 + Capacity reduction on ingress/egress and HOV Links + Redistribution of time-of-day trips

Details of the strategies are as follows:

- TDM HOV and Ingress/Egress Links Speed Reduction of 2 miles per hours
- TDM HOV Link Capacity Reduction from 1950 vphpl to 1500 vphpl
- TDM HOV Ingress/Egress Capacity Reduction from 2000 vphpl to 1500 vphpl

For the time of day distribution adjustment we utilized the following information:

I-15 S of Tropicana Ave

Time Period	2010 Counts		Orig 2013 Model Run	
12 - 7 AM	25,160	13%	23,585	11%
7 -9 AM	24,116	13%	23,368	11%
9 AM - 2 PM	50,151	26%	68,136	31%
2 - 4 PM	24,893	13%	30,535	14%
4 - 6 PM	26,576	14%	30,486	14%
6 - 8 PM	19,551	10%	21,522	10%
8 PM - 12AM	19,764	11%	20,655	9%
TOTAL	**190,211**		**218,287**	

US 95 between Decatur Blvd and Valley View Dr

Time Period	2010 Counts		Orig 2013 Model Run	
12 - 7 AM	37,483	17%	26,028	13%
7 -9 AM	25,588	12%	21,512	10%
9 AM - 2 PM	56,402	26%	62,206	30%
2 - 4 PM	24,802	11%	27,347	13%
4 - 6 PM	24,010	11%	27,700	13%
6 - 8 PM	20,850	9%	19,323	9%
8 PM - 12AM	29,982	14%	22,134	11%
TOTAL	**219,117**		**206,251**	

Based on the findings, we began adjusting the percentages of trips between time periods. After a few different trials, we have obtained the following time of day distribution.

I-15 S of Tropicana Ave

Time Period	2010 Counts		Orig 2013 Model Run		Alt 5 Model Run	
12 - 7 AM	37,483	17%	26,028	13%	27,741	13%
7 -9 AM	25,588	12%	21,512	10%	22,442	11%
9 AM - 2 PM	56,402	26%	62,206	30%	60,514	29%
2 - 4 PM	24,802	11%	27,347	13%	27,291	13%
4 - 6 PM	24,010	11%	27,700	13%	26,128	13%
6 - 8 PM	20,850	9%	19,323	9%	19,873	10%
8 PM - 12AM	29,982	14%	22,134	11%	23,739	12%
TOTAL	**219,117**		**206,251**		**207,730**	

US 95 between Decatur Blvd and Valley View Dr

Time Period	2010 Counts		Orig 2013 Model Run		Alt 5 Model Run	
12 - 7 AM	25,160	13%	23,585	11%	24,474	12%
7 -9 AM	24,116	13%	23,368	11%	24,219	12%
9 AM - 2 PM	50,151	26%	68,136	31%	64,772	31%
2 - 4 PM	24,893	13%	30,535	14%	29,961	15%
4 - 6 PM	26,576	14%	30,486	14%	28,021	14%
6 - 8 PM	19,551	10%	21,522	10%	22,036	11%
8 PM - 12AM	19,764	10%	20,655	9%	22,494	11%
TOTAL	**190,211**		**218,287**		**215,977**	

As can be observed, the redistribution more closely reflects the observed counts. Table 2 display the results for the various refinement strategies presented in Table 1.

Table 2. TDM Refinement Strategies Representative Results

US 95 North of Lone Mountain	Per Lane Volumes			
	Southbound AM Peak Hour		Northbound PM Peak Hour	
	GP	HOV	GP	HOV
Counts	1273	355	1001	188
Original				
RTC 2013 Model	881	1,111	1,189	1,065
Alt 1	881	1,109	1,189	1,064
Alt 2	1,090	0	1,240	874
Alt 3	1,080	163	1,159	667
Alt 4	1,092	476	1,254	729
Alt 5	1,089	484	1,149	666

US 95 North of Rancho	Per Lane Volumes			
	Southbound AM Peak Hour		Northbound PM Peak Hour	
	GP	HOV	GP	HOV
Counts	1245	1479	1437	552
Original				
RTC 2013 Model	1,258	1,526	1,583	1,580
Alt 1	1,277	1,413	1,583	1,586
Alt 2	1,320	1,305	1,635	1,494
Alt 3	1,292	890	1,553	971
Alt 4	1,386	1,005	1,633	1,141
Alt 5	1,386	1,015	1,540	991

US 95 South of Summerlin	Per Lane Volumes			
	Southbound AM Peak Hour		Northbound PM Peak Hour	
	GP	HOV	GP	HOV
Counts	1828	768	1625	893
Original				
RTC 2013 Model	1,646	1,785	1,910	2,068
Alt 1	1,656	1,753	1,911	2,067
Alt 2	1,666	1,723	1,924	2,045
Alt 3	1,643	1,340	1,861	1,489
Alt 4	1,744	1,371	1,963	1,551
Alt 5	1,750	1,360	1,855	1,474

As the results show, Alternative 5 currently best replicates the traffic counts patterns.
Based on our analysis and model alternative results, we would like to recommend that the refinements contained in Alternative 5 be utilized to produce model traffic forecasts for this project.

2013 US 95 HOV Lane Statistics

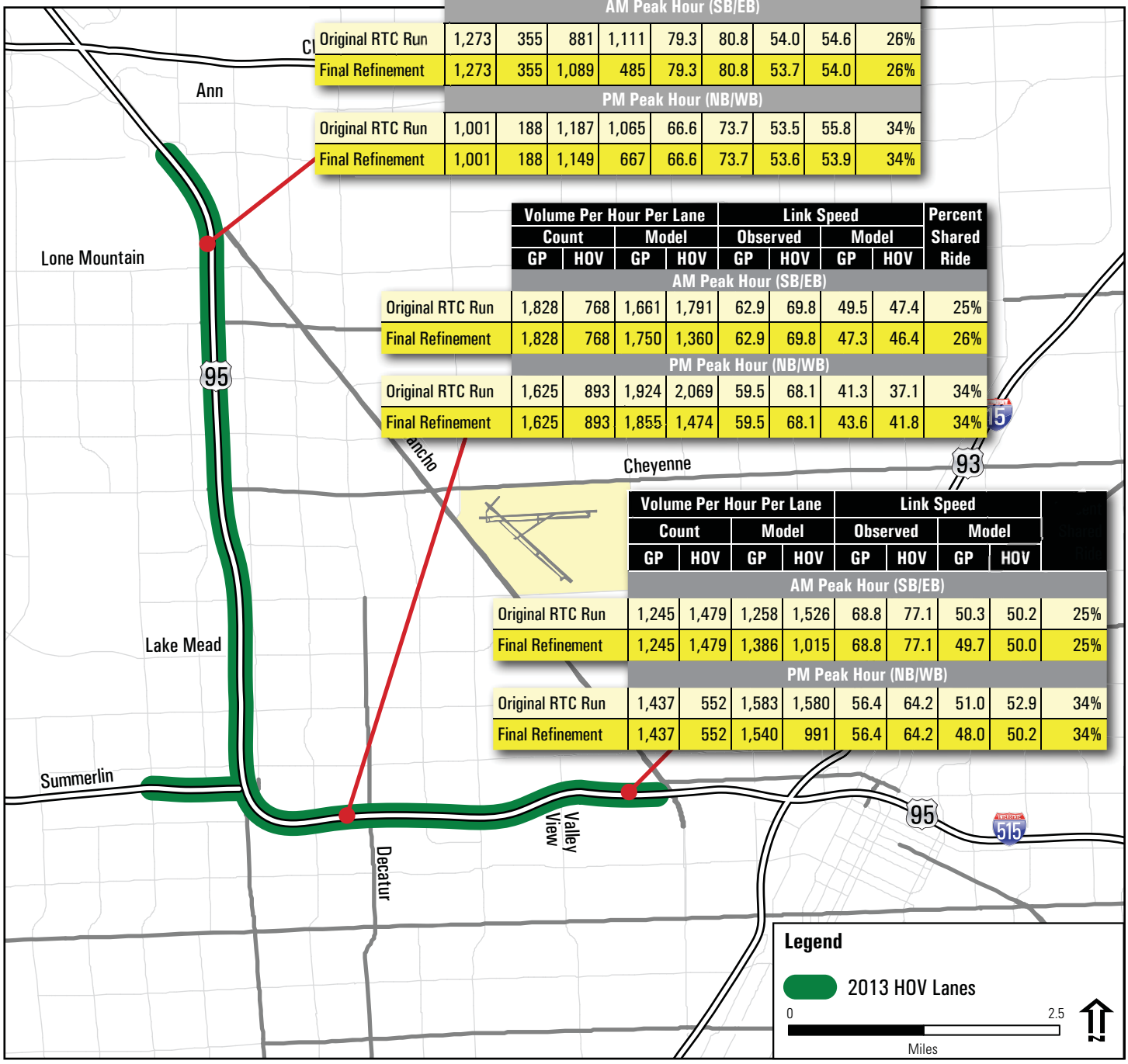
Peak Hour by Direction

Southern Nevada HOV Plan

	Volume Per Hour Per Lane				Link Speed				Percent Shared Ride
	Count		Model		Observed		Model		
	GP	HOV	GP	HOV	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)									
Original RTC Run	1,273	355	881	1,111	79.3	80.8	54.0	54.6	26%
Final Refinement	1,273	355	1,089	485	79.3	80.8	53.7	54.0	26%
PM Peak Hour (NB/WB)									
Original RTC Run	1,001	188	1,187	1,065	66.6	73.7	53.5	55.8	34%
Final Refinement	1,001	188	1,149	667	66.6	73.7	53.6	53.9	34%

	Volume Per Hour Per Lane				Link Speed				Percent Shared Ride
	Count		Model		Observed		Model		
	GP	HOV	GP	HOV	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)									
Original RTC Run	1,828	768	1,661	1,791	62.9	69.8	49.5	47.4	25%
Final Refinement	1,828	768	1,750	1,360	62.9	69.8	47.3	46.4	26%
PM Peak Hour (NB/WB)									
Original RTC Run	1,625	893	1,924	2,069	59.5	68.1	41.3	37.1	34%
Final Refinement	1,625	893	1,855	1,474	59.5	68.1	43.6	41.8	34%

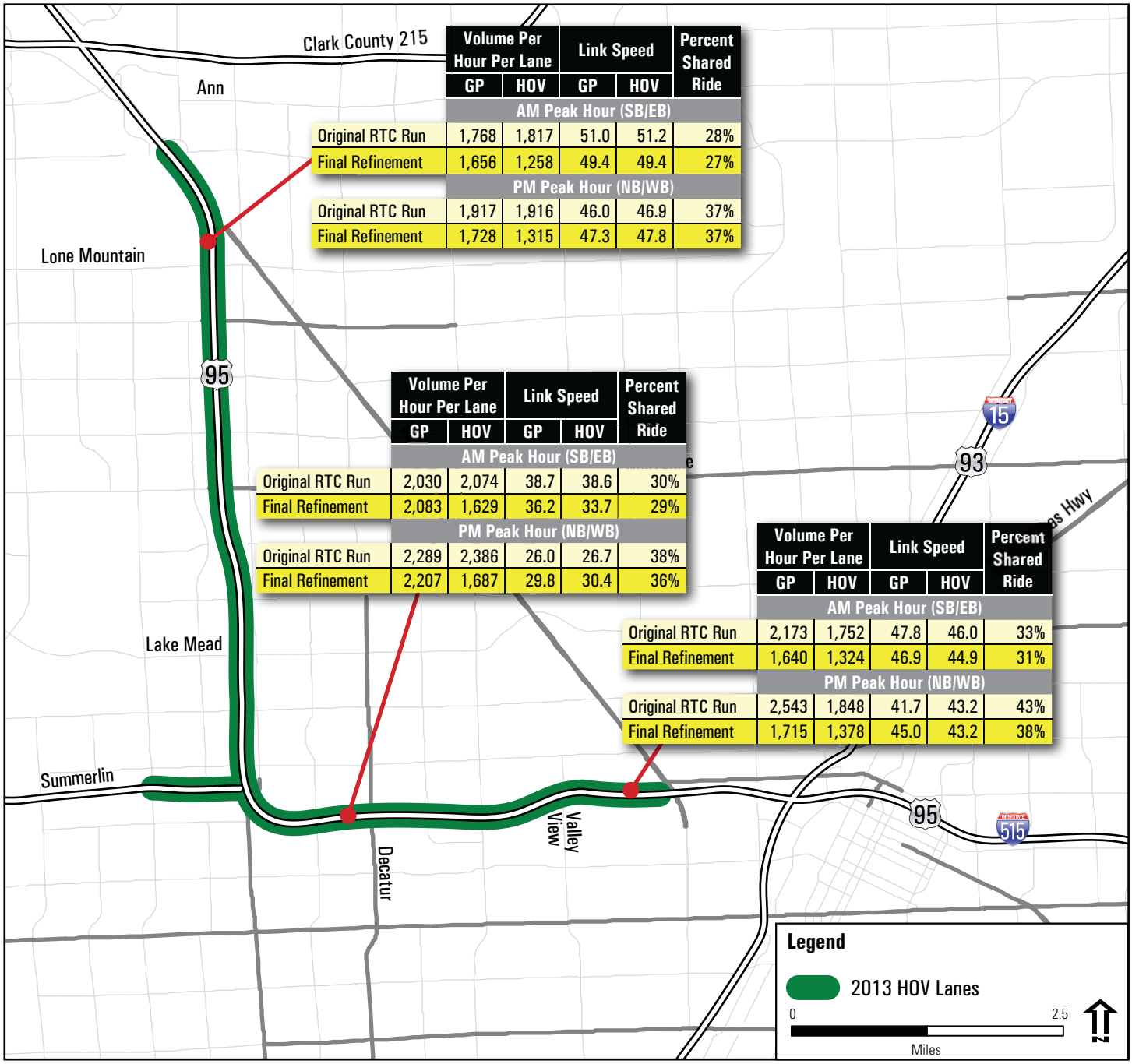
	Volume Per Hour Per Lane				Link Speed				Percent Shared Ride
	Count		Model		Observed		Model		
	GP	HOV	GP	HOV	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)									
Original RTC Run	1,245	1,479	1,258	1,526	68.8	77.1	50.3	50.2	25%
Final Refinement	1,245	1,479	1,386	1,015	68.8	77.1	49.7	50.0	25%
PM Peak Hour (NB/WB)									
Original RTC Run	1,437	552	1,583	1,580	56.4	64.2	51.0	52.9	34%
Final Refinement	1,437	552	1,540	991	56.4	64.2	48.0	50.2	34%



2035 US 95 HOV Lane Statistics

Peak Hour by Direction

Southern Nevada HOV Plan



	Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)					
Original RTC Run	1,768	1,817	51.0	51.2	28%
Final Refinement	1,656	1,258	49.4	49.4	27%
PM Peak Hour (NB/WB)					
Original RTC Run	1,917	1,916	46.0	46.9	37%
Final Refinement	1,728	1,315	47.3	47.8	37%

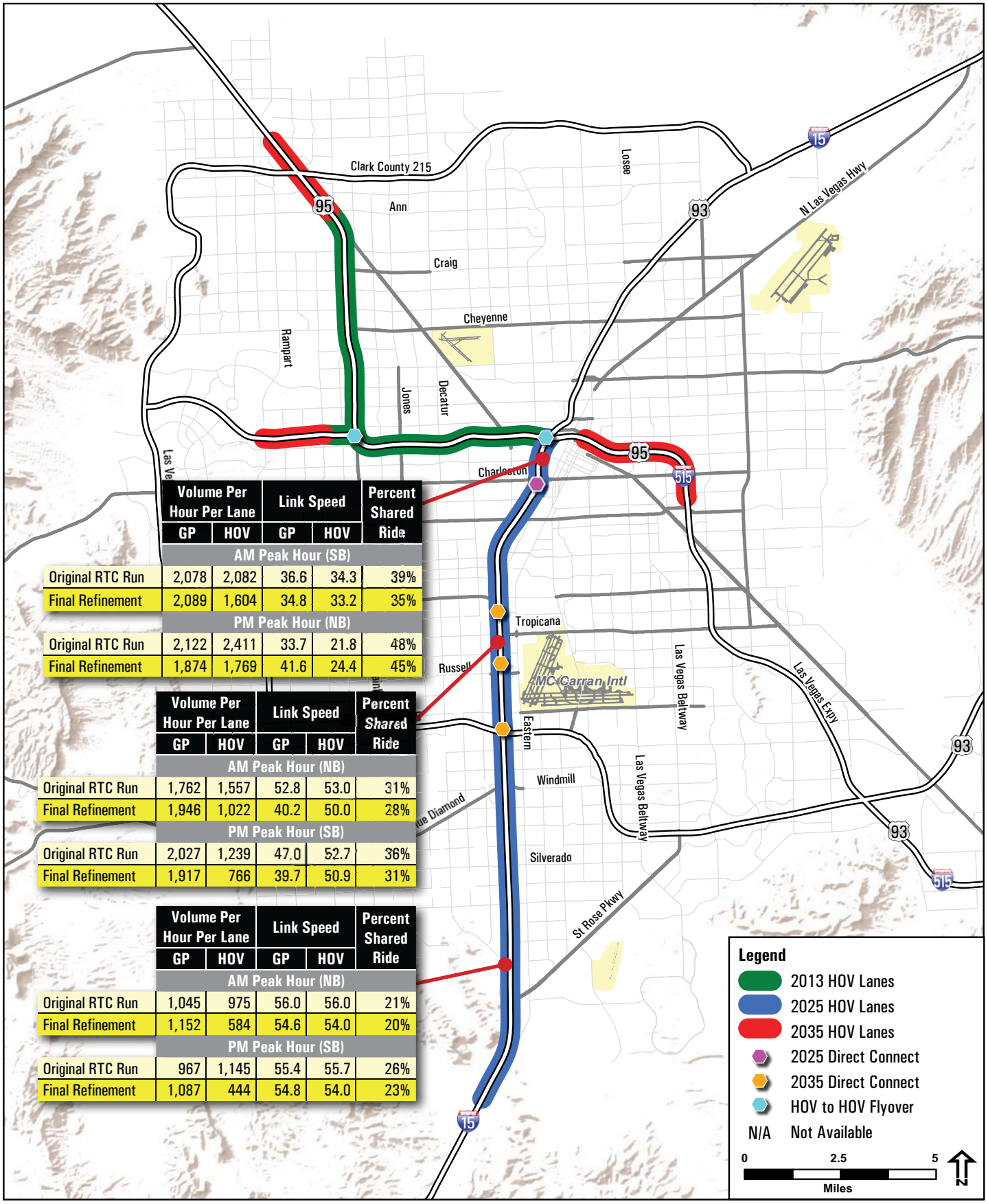
	Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)					
Original RTC Run	2,030	2,074	38.7	38.6	30%
Final Refinement	2,083	1,629	36.2	33.7	29%
PM Peak Hour (NB/WB)					
Original RTC Run	2,289	2,386	26.0	26.7	38%
Final Refinement	2,207	1,687	29.8	30.4	36%

	Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
	GP	HOV	GP	HOV	
AM Peak Hour (SB/EB)					
Original RTC Run	2,173	1,752	47.8	46.0	33%
Final Refinement	1,640	1,324	46.9	44.9	31%
PM Peak Hour (NB/WB)					
Original RTC Run	2,543	1,848	41.7	43.2	43%
Final Refinement	1,715	1,378	45.0	43.2	38%

2035 I-15 HOV Lane Statistics

Peak Hour by Direction

Southern Nevada HOV Plan



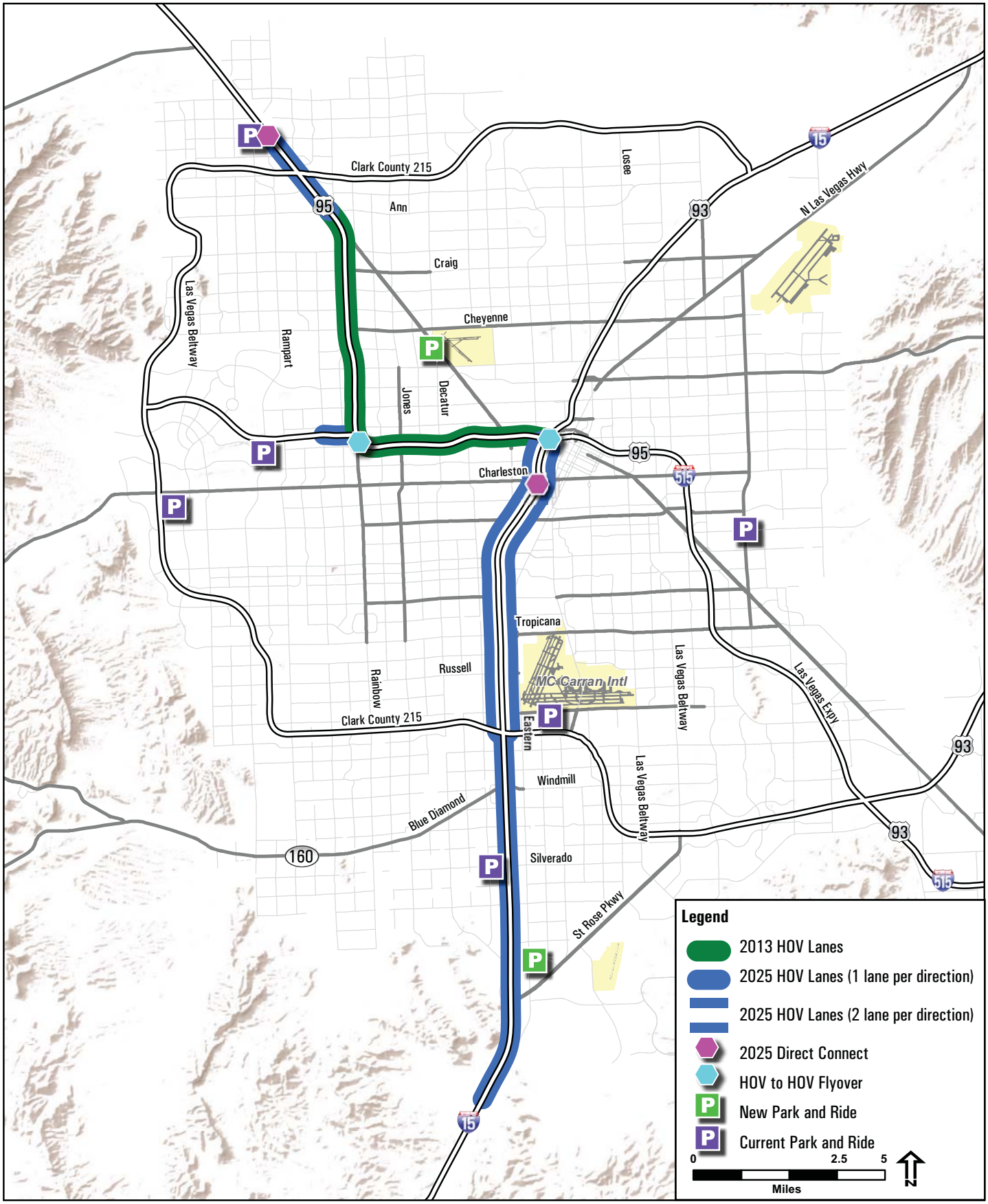
	Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
	GP	HOV	GP	HOV	
AM Peak Hour (SB)					
Original RTC Run	2,078	2,082	36.6	34.3	39%
Final Refinement	2,089	1,604	34.8	33.2	35%
PM Peak Hour (NB)					
Original RTC Run	2,122	2,411	33.7	21.8	48%
Final Refinement	1,874	1,769	41.6	24.4	45%

	Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
	GP	HOV	GP	HOV	
AM Peak Hour (NB)					
Original RTC Run	1,762	1,557	52.8	53.0	31%
Final Refinement	1,946	1,022	40.2	50.0	28%
PM Peak Hour (SB)					
Original RTC Run	2,027	1,239	47.0	52.7	36%
Final Refinement	1,917	766	39.7	50.9	31%

	Volume Per Hour Per Lane		Link Speed		Percent Shared Ride
	GP	HOV	GP	HOV	
AM Peak Hour (NB)					
Original RTC Run	1,045	975	56.0	56.0	21%
Final Refinement	1,152	584	54.6	54.0	20%
PM Peak Hour (SB)					
Original RTC Run	967	1,145	55.4	55.7	26%
Final Refinement	1,087	444	54.8	54.0	23%

2025 HOV System

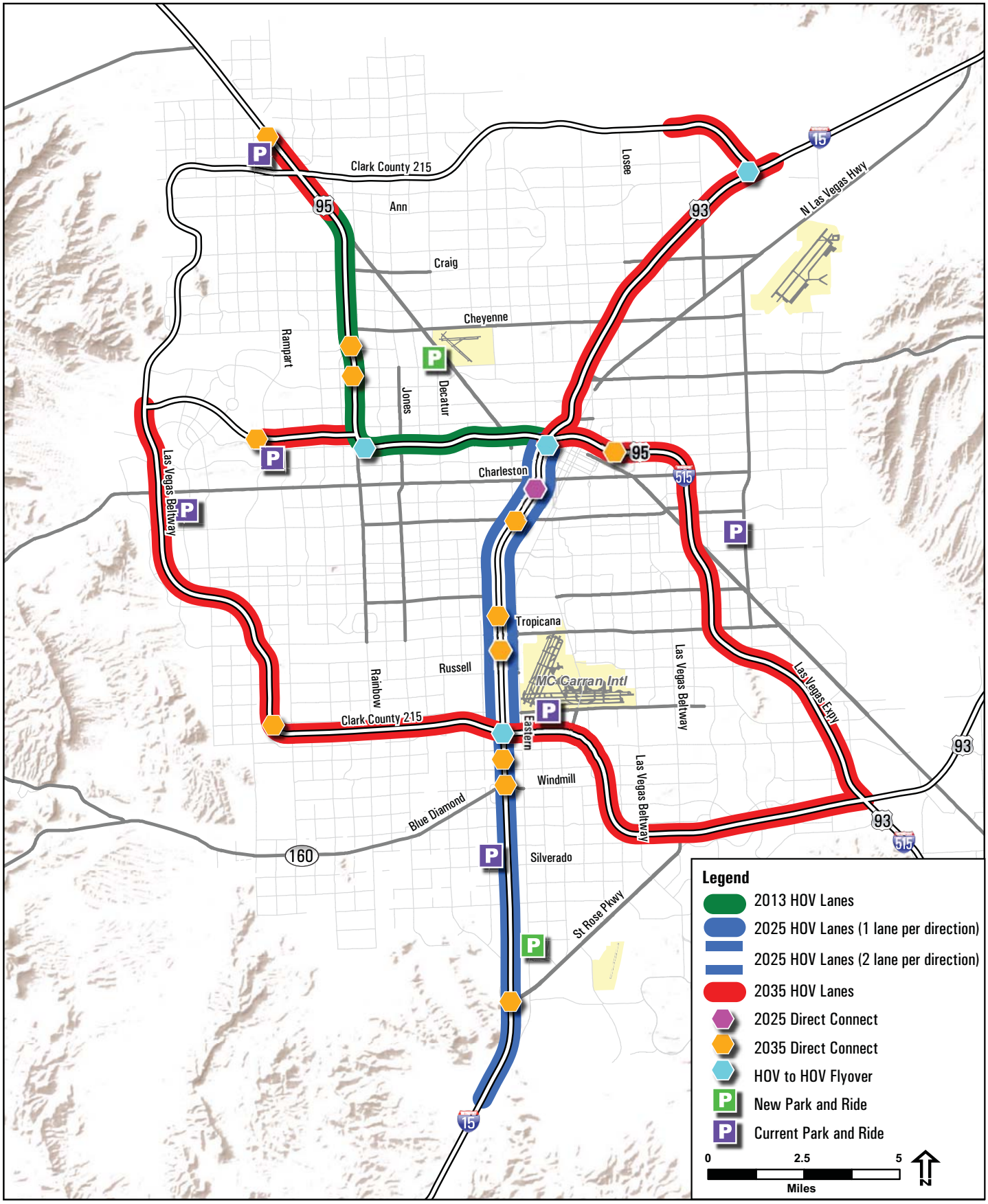
Southern Nevada HOV Plan



2035 HOV System

Scenario 1 (Maximum HOV Coverage)

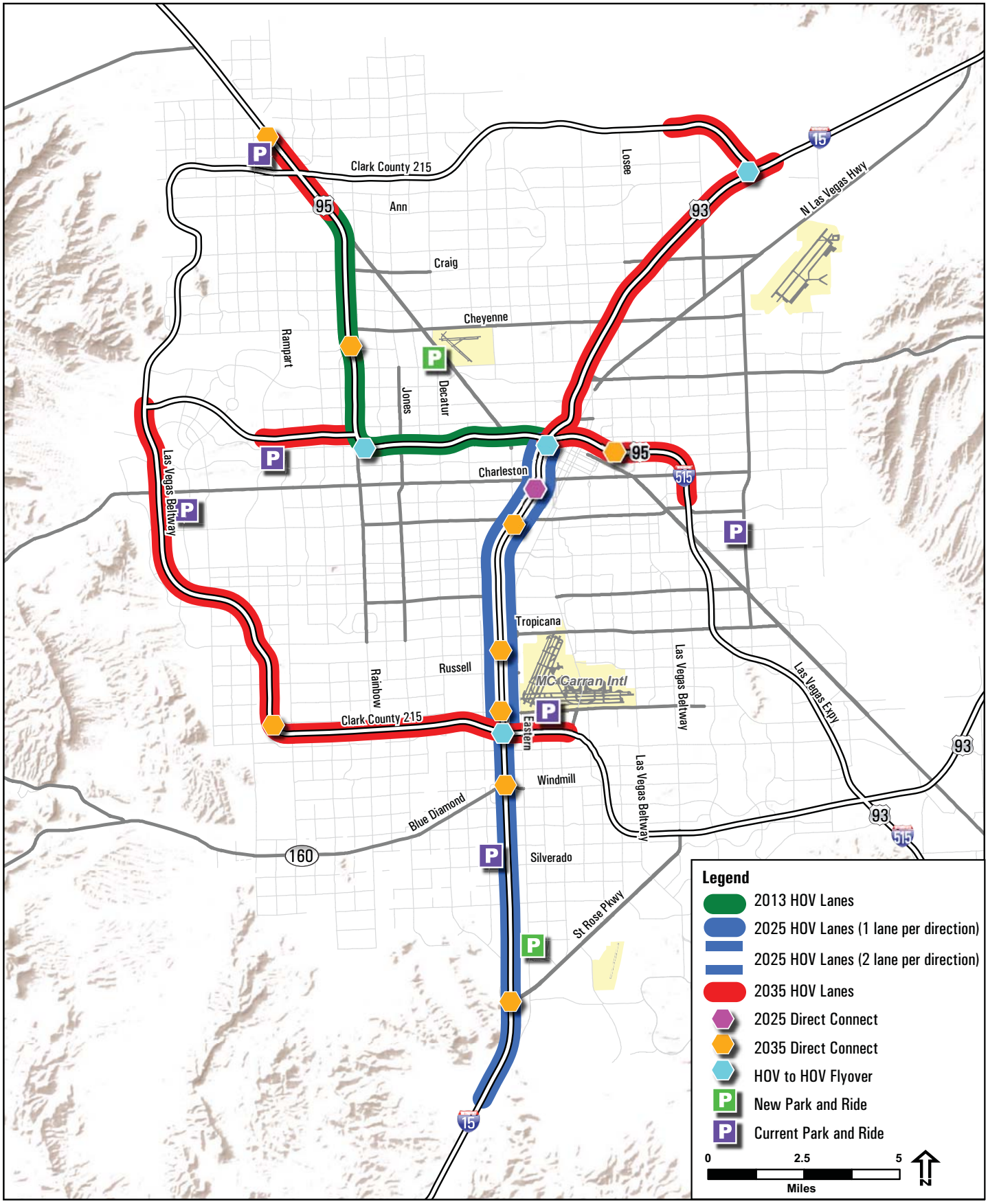
Southern Nevada HOV Plan



2035 HOV System

Scenario 2 (Moderate HOV Coverage)

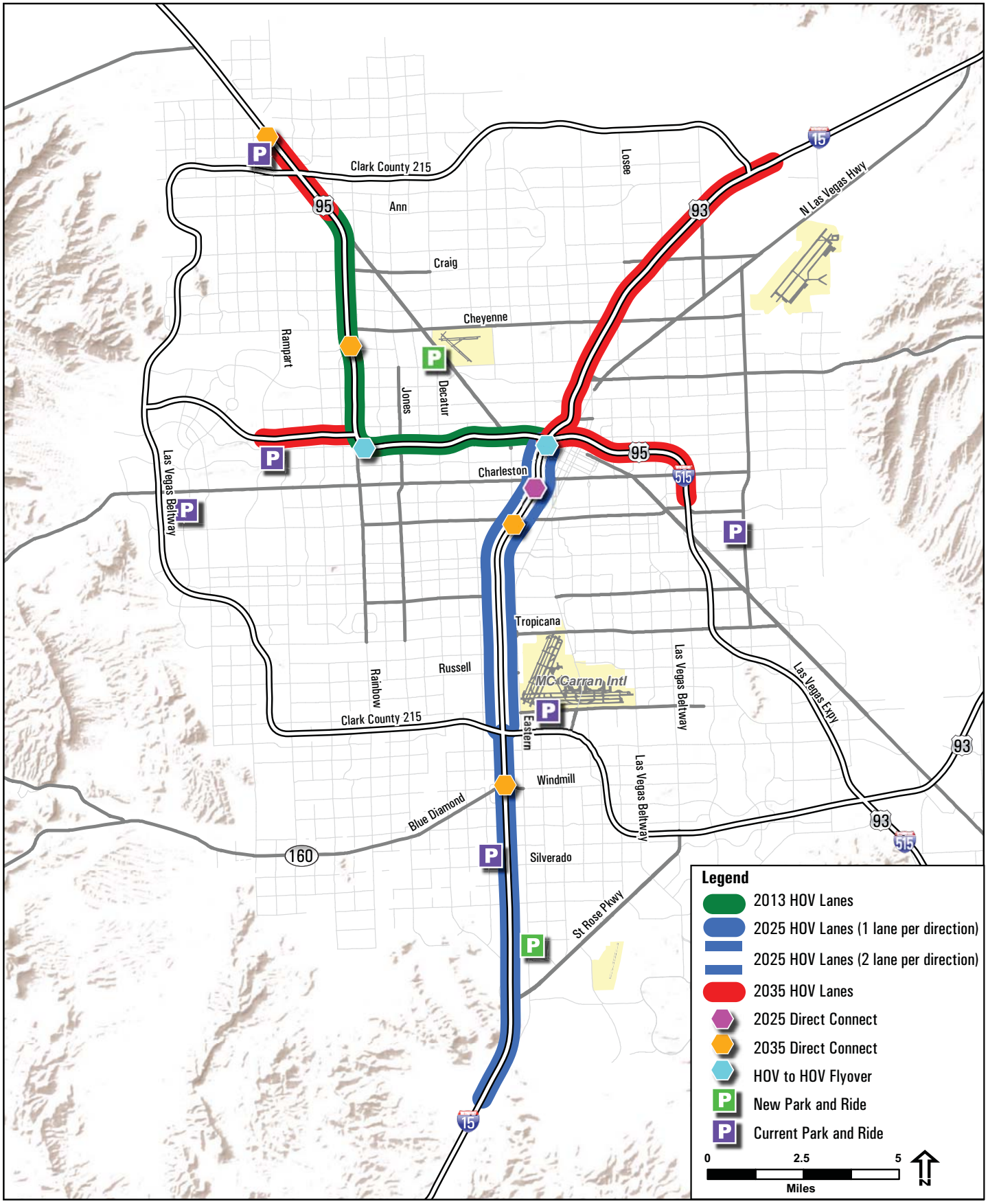
Southern Nevada HOV Plan



2035 HOV System

Scenario 3 (Minimum HOV Coverage)

Southern Nevada HOV Plan



Model Task Force Meeting 3

August 29, 2013

Sign-in Sheet

Name	Agency/Company	Phone Number	E-mail address
SHARAN DHANARAJU	JACOBS	702 938 5504	SHARAN.DHANARAJ@JACOBS.COM
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NORTHERN NEVADA			
JOHN KARACHEPONE	JACOBS		
JEFF LEND	NDOT		
RANDY TRAVIS	NDOT		
LORI CAMPBELL	NDOT		
ON THE PHONE			
CHRIS PRIMUS	JACOBS		
KEITH BORSHEIM	JACOBS		
PATRIZIA GONELLA	JACOBS		
CASSONDRA SMITH	JACOBS		

Meeting Minutes

Purpose: Model Task Force (MTF) Meeting #4

Date Held: September 10, 2013

Location: Video Conference and WebEx

Attendees: See attached

Copies: Attendees, File

Attachments: Sign-in Sheet, Agenda, Handouts

The meeting is summarized below by each agenda item. Agenda and the handouts are attached. Action items are provided on the last page of these minutes.

Agenda Item 1: Introductions:

- Chris Primus (Jacobs Modeling Task Lead) began the meeting with introductions (see sign-in sheet for the list of attendees).

Agenda Item 2: 2025 Network Coding

- Chris Primus mentioned that the year 2025 network coding was completed and the model was run successfully.
- Chris Primus displayed a spreadsheet developed by the Jacobs' Modeling team that summarized all the changes made by the Jacobs' team to the RTC model. Cassondra Smith briefly explained these changes made to the RTC model.
- John Karachepone mentioned that this spreadsheet is the detailed list of all changes and that a more concise list of the changes made to the RTC model was developed and sent via email to Jeff Lerud.
- John Karachepone explained a couple of issues faced during the network coding process.
    - In the RTC's 2025 model, a short section of I-15 northbound just north of Desert Inn is coded as 3.5 lanes whereas, the design files from Project Neon indicate this to be 4 lanes. In order to update the laneage, the concerned link had to split; but this link also serves as a transit link and splitting the link resulted in glitches during the model run. Hence, this change was reverted back to the original state.
    - In the RTC's 2025 model, south of I-215, the GP links and HOV links have different Area Types. GP links are coded as Area Type = Suburban, while HOV links are coded as Area Type = Urban. Adjusting the Area Type resulted in glitches during the model run. Hence, no adjustments were made to the Area Type for these links.

Agenda Item 3: 2025 Model Results

- Patrizia Gonella briefly reviewed the model refinements that were carried out; these were explained in detail in the MTF#3 as well. The final model refinements include changing the number of lanes of the ingress/egress links from two to one, reduction of capacity on ingress/egress (2,000 vphpl to 1,500 vphpl) and HOV Links (1,950 vphpl to 1,500 vphpl) and redistribution of time-of-day trips. She added that these same refinements will be made to the 2035 model as well.
- John Karachepone pointed out that no changes were made to the HOV hours of operation in the 2025 model; HOV lanes are modeled to be in operation in peak periods only. He requested direction from Jeff Lerud regarding the hours of HOV operation that needed to be modeled in the 2035 model.
- Jeff Lerud inquired whether the 2025 model has the same hours of HOV operation as that exists in the field.
    - John Karachepone replied that the HOV lanes are in effect in the model from 7-9 AM and from 4-6 PM. The hours of HOV operation in the model differs from the real world because of the difference in the way the various periods are defined in the RTC model.
- The first exhibit shows the year 2025 HOV lane peak hour volumes in the peak direction for the entire I-15 and US-95 corridors. This exhibit shows the total HOV volume along the corridor, not the volume per lane.
    - Jeff Lerud inquired about the volumes in the off-peak direction in the same peak periods. Chris Primus indicated that the critical volumes were displayed in the exhibit and proposed to investigate the volumes in the off-peak direction in the peak periods.
        - John Karachepone and Beth Xie stated that between Tropicana Avenue and Sahara Avenue, the volumes in the off-peak direction could be close to the volumes in the peak direction because this is the region where the peak direction of traffic is flipped.
- The second exhibit shows the year 2025 HOV and GP model volumes at representative locations for the peak hour in the peak direction. This exhibit also shows the year 2013 model volumes along US95.
    - Chris Primus explained that the HOV Lane Percent is the percentage of HOV volume of the total volume. He pointed out that along US95, this HOV Lane Percent increases in the 2025 model compared to the 2013 model. Along I-15, the HOV Lane Percent is 25-30 percent at the location where there are two HOV lanes in each direction; the HOV lanes carry a significant portion of the traffic.
    - Patrizia Gonella that the HOV volume data from Phoenix was analyzed as a check to compare the HOV Lane Percent and indicated that this value is usually around 15 percent. Phoenix has one HOV lane in each direction on their HOV system.
    - Chris Primus explained the regional statistics and pointed out that the HOV VMT in the 2025 model is four times the HOV VMT in the 2013 model; this is due to the expansion of the HOV system and increased demand.

- Chris Primus pointed out that the model HOV volumes near St. Rose Parkway was zero and added that this was the case in the RTC model as well.
    - John Karachepone added that HOV volumes start to show up in the system north of the Starr interchange and suggested that the introduction of the Starr interchange eliminates the need for out-of-direction travel along St. Rose Parkway. This could explain the lack of HOV demand near St. Rose Parkway.
    - Patrizia Gonella explained the speed differential between the HOV and GP lanes in the model. The HOV lanes are coded with a speed limit of 54 mph whereas the GP lanes are coded with a speed limit of 60 mph. She explained that if the traffic on the GP lanes is at free-flow, then there is a disincentive in the model to use the HOV lanes: in the model it is faster to travel on GP than on HOV, therefore HOV volume is zero near St. Rose.
    - Lori Campbell reminded the group about Mike Janssen's comment regarding the land use information in the model vs. the actual land use and inquired whether a similar investigation should be done for this region as well.
    - John Karachepone mentioned that an investigation was completed regarding the land use along US95 and that this information would be used during the model volumes post-processing. He said that a similar check would be done for the region near I-15 and St. Rose Parkway.
    - Patrizia Gonella suggested that there may not be a need to extend the HOV lanes to St. Rose Parkway because of the lack of demand.
    - Regarding the proposed Ivanpah airport, Beth Xie indicated that in the 2025 model, the traffic volume to/from the airport would be low. She added that even in the 2035 model, the traffic volume to/from the airport would be low.

- The third exhibit shows the year 2025 volumes on the Direct Connect at Wall Street. The southbound volume from I-15 on the direct connect is around 1,500 both in the AM and PM peak hour and near capacity. The volumes are generally high to/from the north.
- The fourth exhibit shows the year 2025 volumes on the Direct Connect at US95 and Elkhorn Road.
    - Chris Primus mentioned that two scenarios were modeled; one with the direct connect ramps at Elkhorn Road and one without the direct connect ramps at Elkhorn Road. This exhibit shows the results from both these scenarios.
    - John Karachepone pointed out that the direct connect ramps carry a fair amount of traffic and indicated that in the post-processing, these volumes might decrease a little bit. The state HOV manual suggests a threshold of 200 vph for the implementation of direct connect ramps.
    - John Karachepone requested direction from Jeff Lerud regarding the scenario to be used in model volumes post-processing.

Agenda Item 4: Post Processing Preview

- John Karachepone mentioned that the model volumes post-processing will be completed following NDOT's Traffic Forecasting Guidelines. He added that the 2013 model over-estimates the HOV volumes. However the NCHRP Report 255 adjustment process should be done carefully to prevent the final 2025 HOV volumes from becoming very low. This level of care is because of what we have learned about the model from the City of Las Vegas with respect to the coding of anticipated development for years 2010 and 2015. (Year 2013 planning variables in the model were interpolated between 2010 and 2015 values).
- John Karachepone indicated that HOV lane volume data from Phoenix and other regions in the country, as available, will be studied and used in the post-processing.
- Randy Travis requested the Jacobs' team to share any issues/challenges faced during the post-processing so that the traffic forecasting process can be improved.

Agenda Item 5: Process for Comparison of 2025 Results with Project NEON

- John Karachepone mentioned that the 2025 raw model volumes could be entered in a matrix form or a graphic could be developed for the Project Neon area showing the model link volumes.
- He added that the 2025 model trip tables and a graphic showing the model link volumes would be delivered to NDOT. These would correspond to the scenario with the direct connect ramps at Elkhorn Road.

Agenda Item 6: HOV System Scenarios for 2035 Model Runs

- Chris Primus mentioned that the 2035 model scenarios will be developed and run next.
- The HOV system scenarios presented in MTF#3 were modified to incorporate Lori Campbell's comment that one scenario should be the 2006 HOV Plan scenario (as a base case). One of the scenarios (scenario 3) now corresponds to the HOV system proposed in the 2006 HOV plan.
- Exhibits 5, 6, 7 illustrate the three 2035 HOV system scenarios.
- John Karachepone indicated that the final recommendations made as part of this study need not necessarily match any of these 3 scenarios. These serve as the tools in the evaluation of what would be the best configuration for HOV lanes in the Valley.

Agenda Item 7: Model Run Update

- Patrizia Gonella mentioned that the changes to the RTC model to reflect the Project Neon improvements were already coded to the 2035 model.
- Scenario 3 will be coded first and the other scenarios will be developed subsequent to that and she added that all scenarios are expected to be complete by the end of the week of September 20, 2013.
- John Karachepone mentioned that a list of changes made to the 2035 model reflecting the Project Neon improvements will be provided to NDOT.

Agenda Item 8: Next Milestone: Travel Demand Validation Review and Application Technical Memorandum

- Chris Primus mentioned that the technical memorandum covering the travel demand modeling aspects of the project will be submitted to NDOT by September 17, 2013. The 2035 scenarios completed by that time will be included.
- This technical memorandum will focus on the issues and refinements made to the models.

Summary of Action Items

No.	Action Item	Person	Action Item Status	Date Completed
1	Provide direction regarding the hours of HOV operation in the 2035 model.	Jeff Lerud	"All-day" advised post-meeting	09/10/2013
2	Compare the land use in the model vs. the actual land use near I-15 and St. Rose Parkway and Starr Avenue.	John Karachepone	Completed	09/19/2013
3	Provide direction regarding the scenario to be used in model volumes post-processing. (Scenario with the direct connect ramps at Elkhorn Road vs. the scenario without the direct connect ramps at Elkhorn Road).	Jeff Lerud	"Scenario with direct-connect ramps" (post meeting)	09/10/2013
4	Deliver 2025 model trip tables and a graphic showing the model link volumes to NDOT.	John Karachepone	Completed. Model volumes provided on 09/11/2013, different format requested 9/17/2013	Trip tables on 09/12/2013 and model link volumes in specific format on 09/19/2013
5	Provide NDOT a list of changes made to the 2035 model reflecting the Project Neon improvements.	John Karachepone	Completed	09/12/2013

Model Task Force Meeting # 4

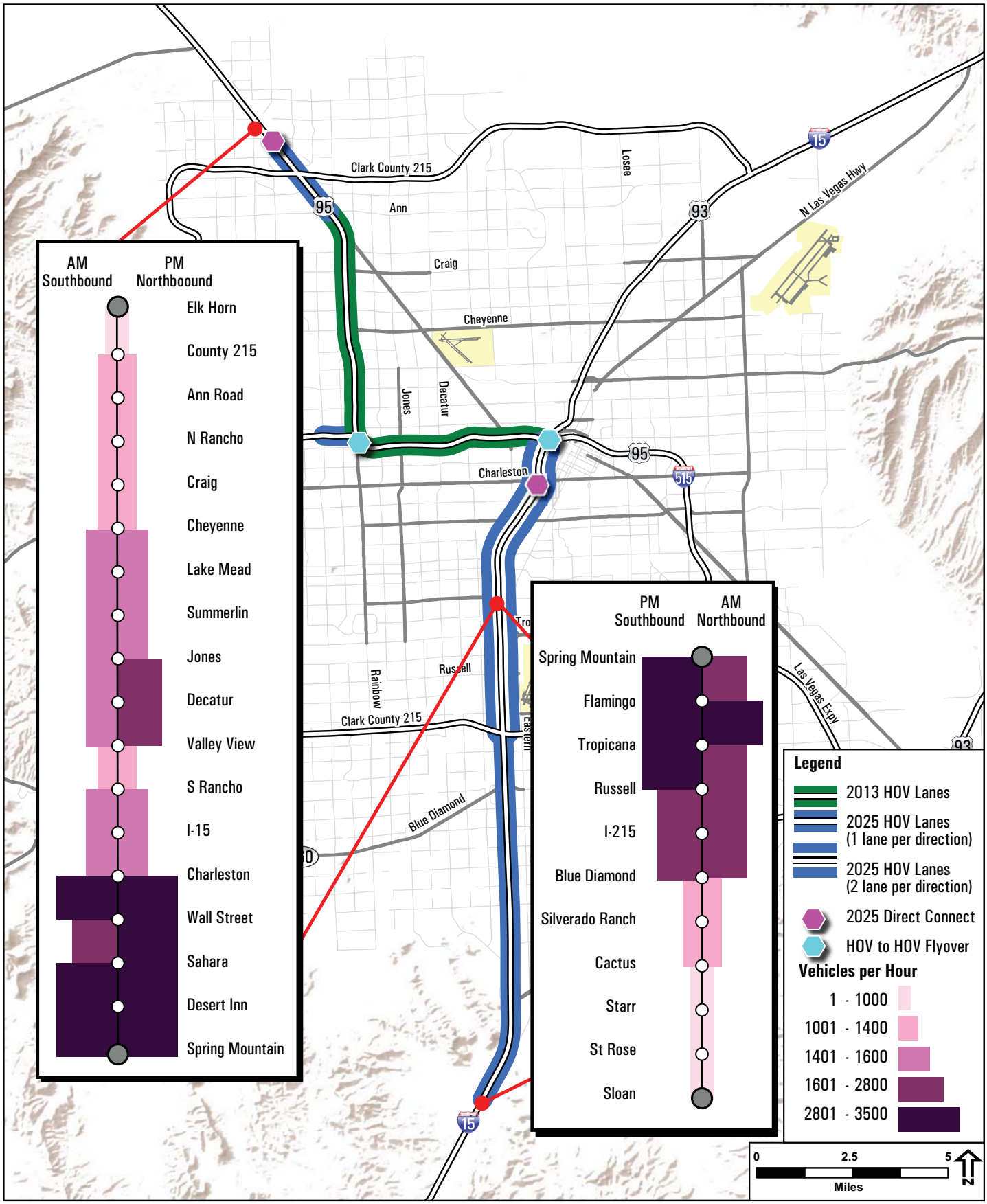
September 10, 2013
2:00 to 4:00 PM
NDOT and RTC
Conference Call and WebEx

Agenda

1. Introductions
2. 2025 Network Coding
3. 2025 Model Results
4. Post Processing Preview
5. Process for Comparison of 2025 Results with Project NEON
6. HOV System Scenarios for 2035 Model Runs
7. Model Run Update
    a. 2035
8. Next Milestone: Travel Demand Validation Review and Application Technical Memorandum
    a. September 17
9. Other

2025 HOV Lane Peak Hour Volumes

Southern Nevada HOV Plan



2025 HOV System

Southern Nevada HOV Plan

	Volume Per Hour Per Lane		HOV Lane Percent
	GP (3.5 lanes)	HOV (1 lane)	
AM Peak Hour (SB/EB)			
2013	1,089	485	11%
2025	1,484	1,137	18%
PM Peak Hour (NB/WB)			
2013	1,149	667	14%
2025	1,557	1,125	17%

	Volume Per Hour Per Lane		HOV Lane Percent
	GP (4.5 lanes)	HOV (1 lane)	
AM Peak Hour (SB/EB)			
2013	1,750	1,360	15%
2025	2,006	1,550	15%
PM Peak Hour (NB/WB)			
2013	1,855	1,474	15%
2025	2,089	1,696	15%

	Volume Per Hour Per Lane		HOV Lane Percent
	GP (5.5 lanes)	HOV (1 lane)	
AM Peak Hour (SB/EB)			
2013	1,386	1,015	12%
2025	1,600	1,299	13%
PM Peak Hour (NB/WB)			
2013	1,540	991	10%
2025	1,727	1,371	13%

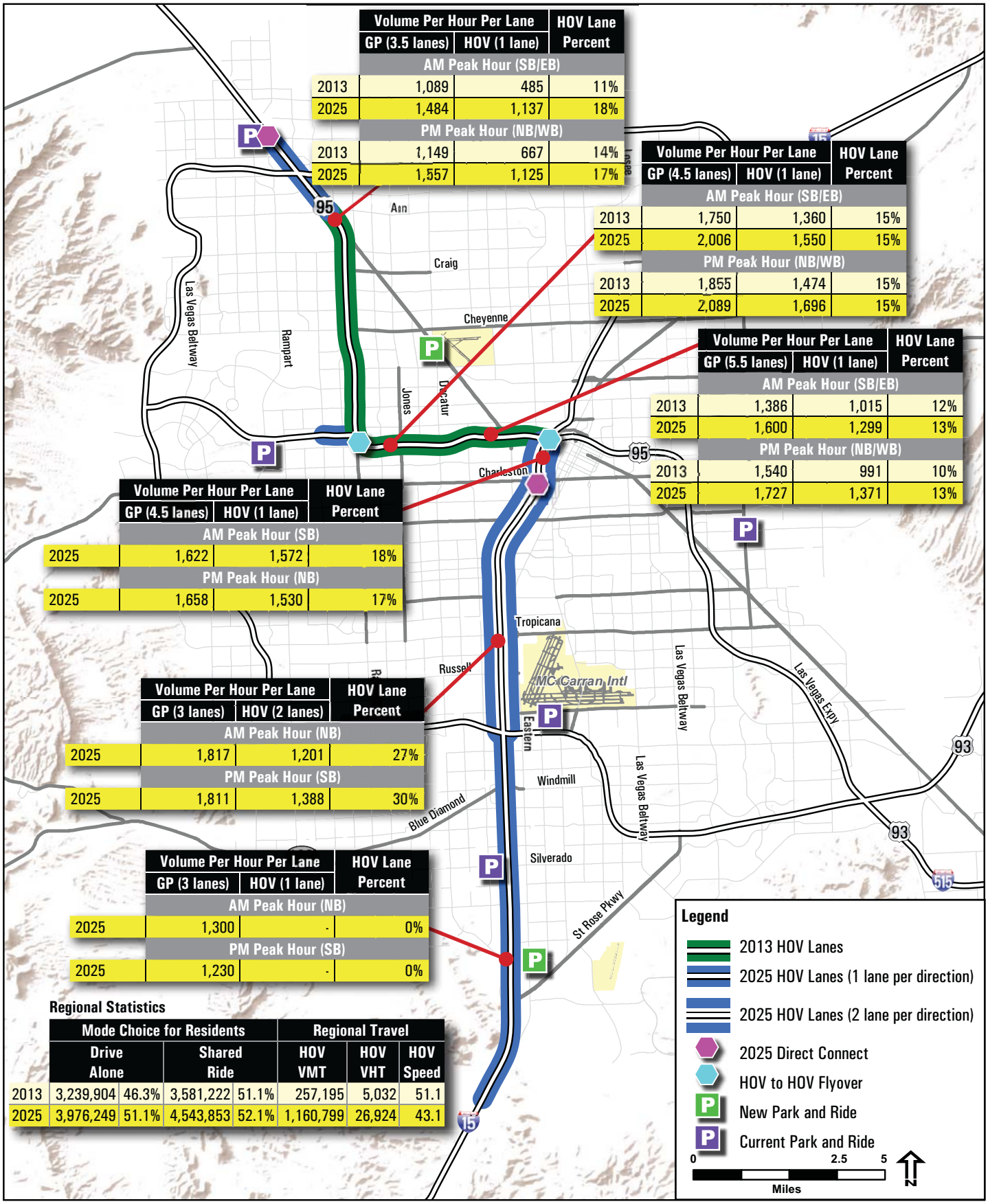
	Volume Per Hour Per Lane		HOV Lane Percent
	GP (4.5 lanes)	HOV (1 lane)	
AM Peak Hour (SB)			
2025	1,622	1,572	18%
PM Peak Hour (NB)			
2025	1,658	1,530	17%

	Volume Per Hour Per Lane		HOV Lane Percent
	GP (3 lanes)	HOV (2 lanes)	
AM Peak Hour (NB)			
2025	1,817	1,201	27%
PM Peak Hour (SB)			
2025	1,811	1,388	30%

	Volume Per Hour Per Lane		HOV Lane Percent
	GP (3 lanes)	HOV (1 lane)	
AM Peak Hour (NB)			
2025	1,300	-	0%
PM Peak Hour (SB)			
2025	1,230	-	0%

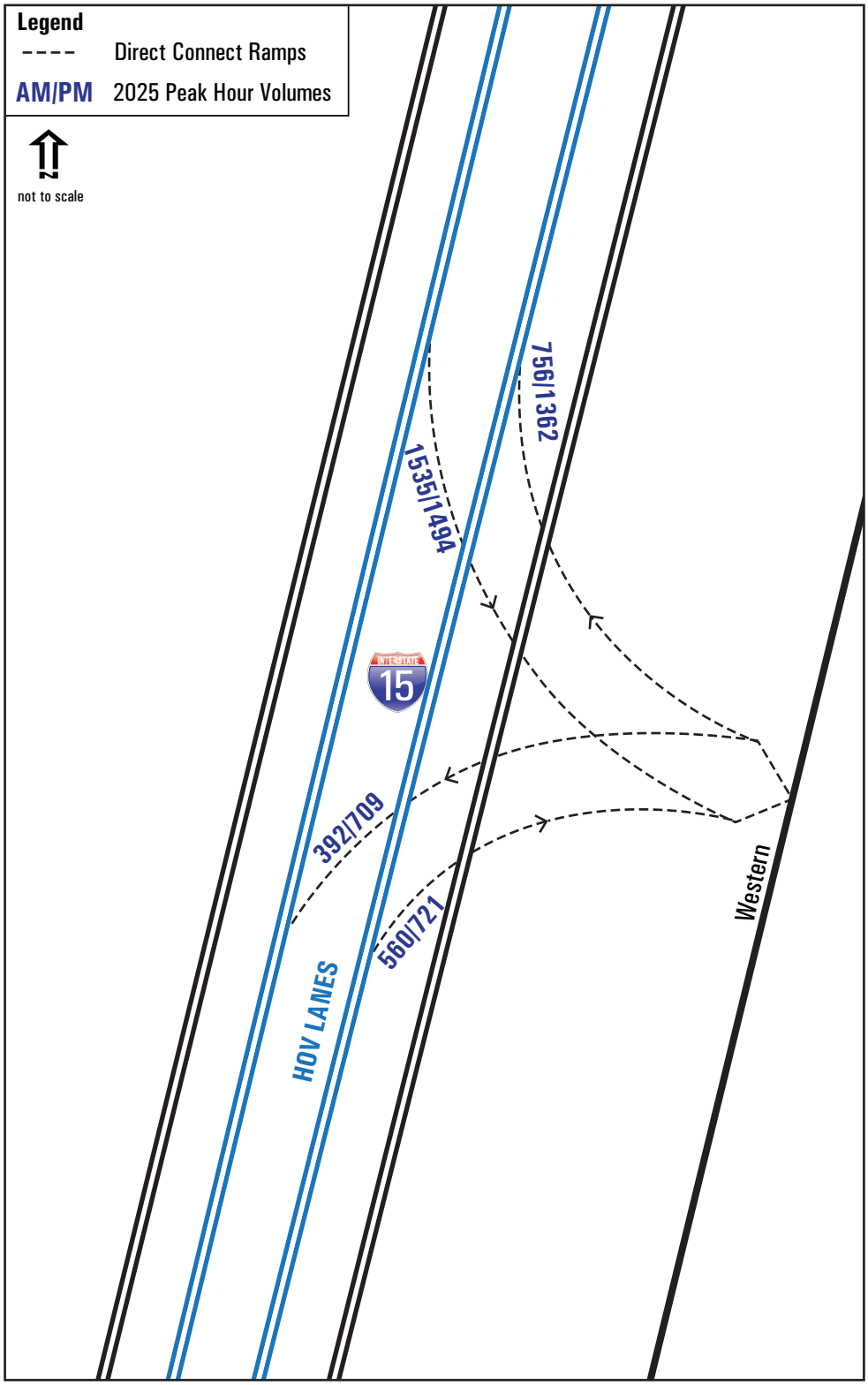
Regional Statistics

	Mode Choice for Residents				Regional Travel		
	Drive Alone		Shared Ride		HOV VMT	HOV VHT	HOV Speed
2013	3,239,904	46.3%	3,581,222	51.1%	257,195	5,032	51.1
2025	3,976,249	51.1%	4,543,853	52.1%	1,160,799	26,924	43.1



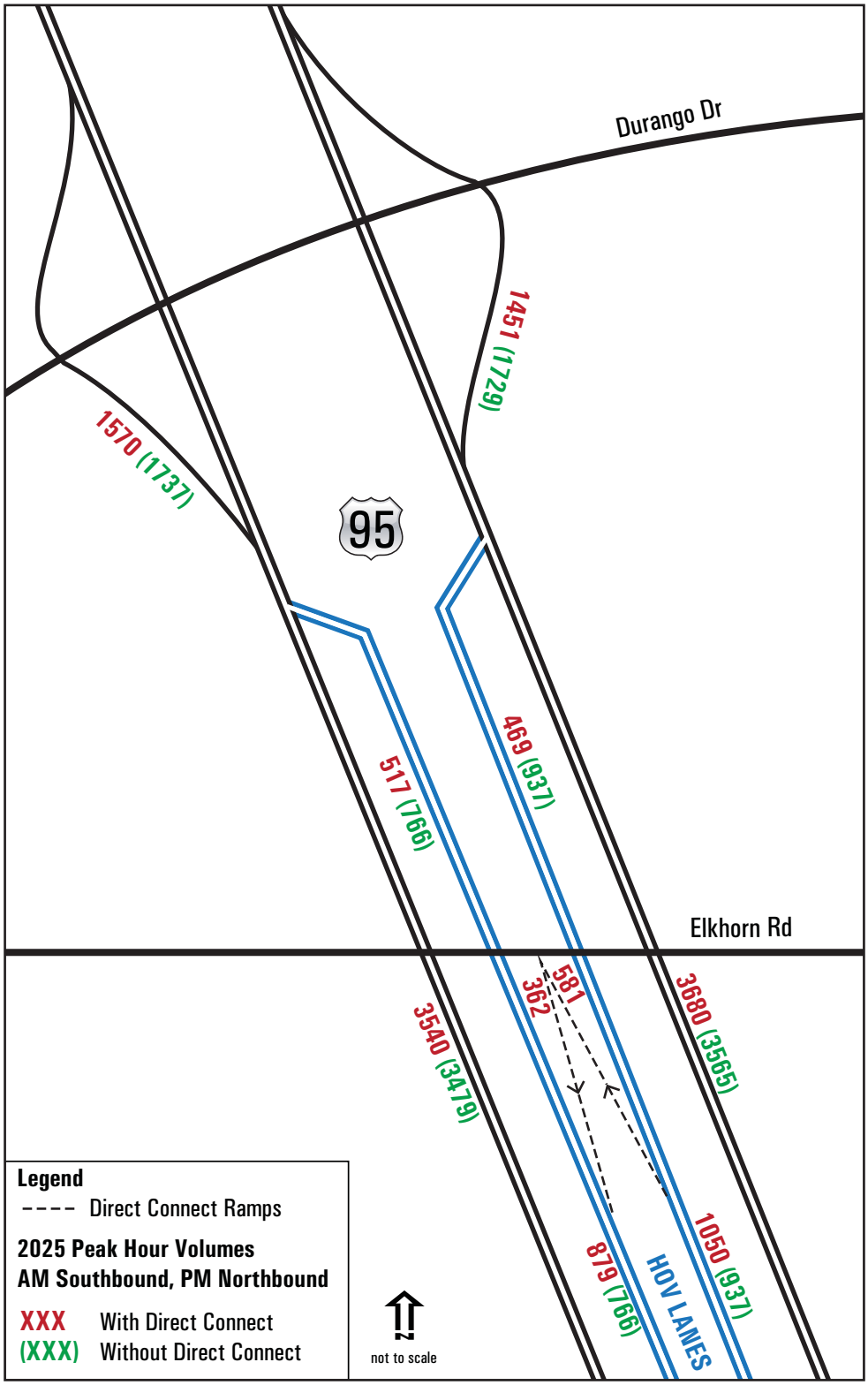
Direct Connect at Wall Street

Southern Nevada HOV Plan



Direct Connect at Elkhorn

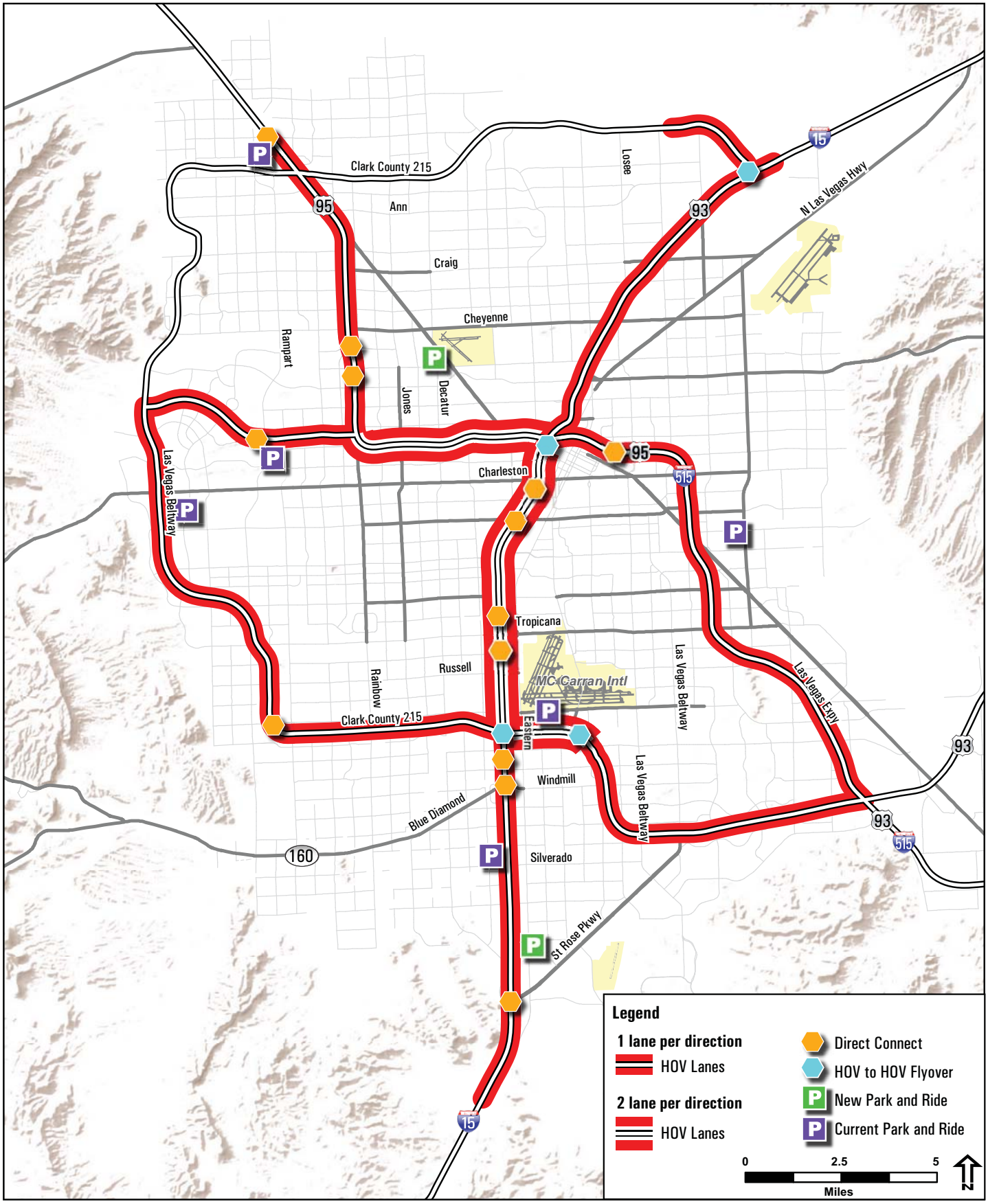
Southern Nevada HOV Plan



2035 HOV System

Scenario 1

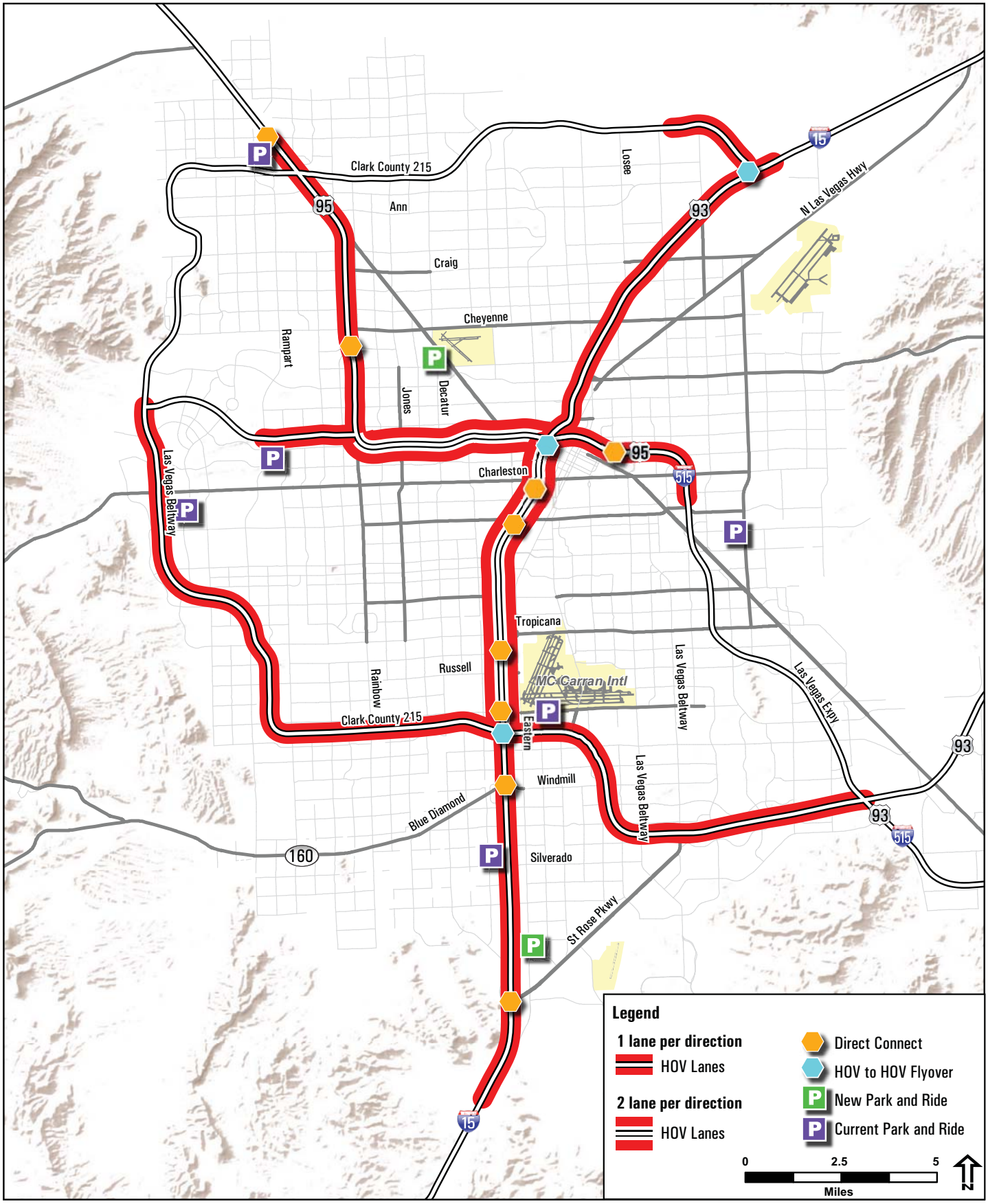
Southern Nevada HOV Plan



2035 HOV System

Scenario 2

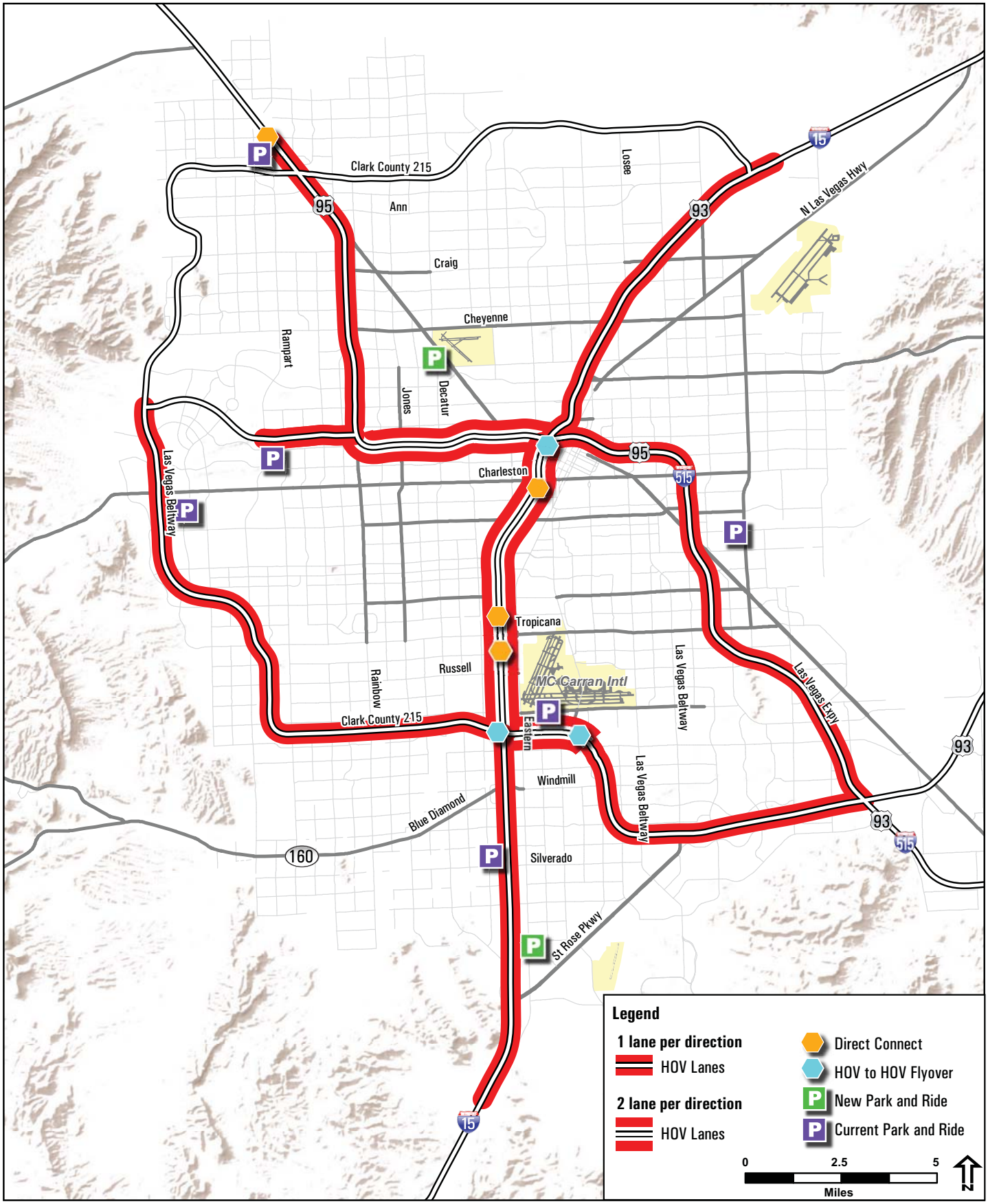
Southern Nevada HOV Plan



2035 HOV System

Scenario 3

Southern Nevada HOV Plan



2025 Scenario (Also Default in all 2035 scenarios)	2035 - Choices
HOV Lanes	**HOV Lanes**
HOV system in the RTC models	I-15
	US95
	215 Southern/Western Beltway
	215 Northern Beltway
	I-515
	Summerlin Parkway

Scenario 1	Scenario 2	Scenario 3 (2007 HOV Plan Scenario)
HOV Lanes	**HOV Lanes**	**HOV Lanes**
I-15	**I-15**	**I-15**
Sloan to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)	Sloan to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)	Sloan to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)
US95	**US95**	**US95**
I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)	I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)	I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)
215 Southern/Western Beltway	**215 Southern/Western Beltway**	**215 Southern/Western Beltway**
Summerlin Parkway to I-515 (2-lanes between I-15 and Airport Connector)	Summerlin Parkway to I-515	Summerlin Parkway to I-515 (2-lanes between I-15 and Airport Connector)
215 Northern Beltway	**215 Northern Beltway**	**215 Northern Beltway**
Pecos Road to I-15	Pecos Road to I-15	
I-515	**I-515**	**I-515**
I-215 to I-15	Wyoming Avenue to I-15	I-215 to I-15
Summerlin Parkway	**Summerlin Parkway**	**Summerlin Parkway**
US95 to 215 Western Beltway	US95 to Rampart Boulevard	US95 to Rampart Boulevard

HOV Direct Connect	HOV Direct Connect
I-15 to US95 Interchange Direct Connect	Meade Avenue
Wall Street	Harmon/ Hacienda Direct Connect
Elkhorn	Sunset & I-15
	Warm Springs
	Blue Diamond
	St. Rose Parkway
	Peak & US95
	Smoke Ranch & US95
	Maryland Parkway & I-515
	Rampart & Summerlin
	Sunset & Western Beltway
	I-215 to I-15 Interchange Direct Connect
	I-15 to Northern Beltway Interchange Direct Connect
	I-215 to Airport Connector

HOV Direct Connect*	HOV Direct Connect*	HOV Direct Connect*
Meade Avenue	Meade Avenue	
Harmon (to/from North)/Hacienda (to/from South)		Harmon (to/from North)/Hacienda (to/from South)
	Hacienda (to/from South)/Sunset (to/from north)	
Warm Springs (to/from North)		Warm Springs as option to Hacienda (to/from South)
Blue Diamond (to/from North)	Blue Diamond (to/from North)	
St. Rose Parkway (to/from North)	St. Rose Parkway (to/from North)	
Peak	Peak (ramps to the north)	
Smoke Ranch & US95		
Maryland Parkway & I-515	Maryland Parkway & I-515	
Rampart & Summerlin (to/from the East)		
Sunset & Western Beltway		
I-15 to US95 Interchange Direct Connect (I-15 NB to US95 NB, US95 SB to I-15 SB, each connection 2 lanes)	I-15 to US95 Interchange Direct Connect (I-15 NB to US95 NB, US95 SB to I-15 SB, each connection 1 lane)	I-15 to US95 Interchange Direct Connect (I-15 NB to US95 NB, US95 SB to I-15 SB, each connection 2 lanes)
I-215 to I-15 Interchange Direct Connect (I-215 WB to I-15 NB, I-215 EB to I-15 NB, I-15 SB to I-215 WB, I-15 SB to I-215 EB)	I-215 to I-15 Interchange Direct Connect (I-215 EB to I-15 NB, I-15 SB to I-215 WB)	I-215 to I-15 Interchange Direct Connect (I-215 WB to I-15 NB, I-15 SB to I-215 EB)
I-15 to Northern Beltway Interchange Direct Connect (I-15 NB to CC-215 WB, CC-215 EB to I-15 SB)	I-15 to Northern Beltway Interchange Direct Connect (I-15 NB to CC-215 WB, CC-215 EB to I-15 SB)	
I-215 to Airport Connector (I-215 EB to Airport, and Airport to I-215 WB)		I-215 to Airport Connector (I-215 EB to Airport, and Airport to I-215 WB)

* Note: Direct Connect ramps are to/from both directions unless otherwise specified

Park-and-ride	Park-and-ride
Bruner	
Rancho/Decatur	

Model Task Force Meeting 4

September 10, 2013

Sign-in Sheet — CARSON CITY

Name	Agency/Company	Phone Number	E-mail address
John Karachepone	JACOBS	702 938 5508	John.Karachepone@Jacobs.com
Jeff Lerud	NDOT	775 888 7589	~~jeff~~ jlerud@dot.state.NV.US
Randy Travis	"	775 888-7158	rtravis@dot.state.NV.US
Lori Campbell	"	775 888-7443	lcampbell@dot.state.NV.us
Chris Pimmel	Jacobs	303 820 4875	Chris.pimmel@jacobs.com

Southern Nevada HOV Plan

Model Task Force Meeting 4

September 10, 2013

Sign-in Sheet - LAS VEGAS

Name	Agency/Company	Phone Number	E-mail address
Hui Shen	RTC	(702) 676-1727	shenh@rtcsnv.com
Beth Xie	RTC	702 676-1722	xieb@rtcsnv.com
Patrizia Gonella	RTC	(602) 650-4942	patrizia.gonella@Jacobs.com
SHARAN DHANARAJU	JACOBS	(702) - 938 - 5504	SHARAN.DHANARAJU@JACOBS.COM

Southern Nevada HOV Plan

Meeting Minutes

Purpose: Model Task Force (MTF) Meeting #5

Date Held: September 25, 2013

Location: Tele-Conference

Attendees: Jeff Lerud, Randy Travis, Lori Campbell NDOT

Beth Xie, Hui Shen RTC

John Karachepone, Sharan Dhanaraju, Keith Borsheim, Cassondra Smith, Patrizia Gonella Jacobs

Copies: Attendees, File

Attachments: Sign-in Sheet, Agenda, Handouts

The meeting is summarized below by each agenda item. Agenda and the handouts are attached. Action items are provided on the last page of these minutes.

Introductions:

- John Karachepone (Jacobs Project Manager) began the meeting with introductions.

2035 Modeling Status

- Chris Primus reported the 2035 modeling runs are completed.
- Patrizia Gonella provided additional detail regarding the assumed HOV free-flow speeds. Since the RTC model has both interstate and freeway speeds, two versions of the HOV scenario models were run: 1) with HOV free-flow speeds set to interstate speeds, and 2) with HOV free-flow speeds set to freeway speeds. This provides an upper and lower bound to volumes on the freeway and interstate facilities from a raw model starting point basis. This information will inform the post-processing of raw model volumes for final HOV traffic forecasts.

2035 Initial Raw Model Results

- Chris Primus guided the group through two handouts. These handouts provide a preview of raw model results:
    - HOV Scenario Model Results – PM Peak Hour Outbound
        - Volumes from each of the 2025 and 2035 scenarios are displayed at key locations. Along the interstate, the graphic shows the results from the model run assuming interstate HOV speeds; along the freeways, the graphic shows the results from the model run assuming freeway HOV speeds. Most locations

show HOV demand at or near capacity of the one or two lane HOV segments. Some outlying areas of the proposed HOV systems have lower volumes – these will be reviewed in more detail.

- HOV Direct Connect Volume Activity – PM Peak Hour
  - A quick preview of Direct Connect activity was prepared from the 2035 HOV Scenario 1 (which has the greatest number of proposed Direct Connects). The graphic displays the sum total of drop ramp PM Peak volume activity at the respective locations. In general, it shows the direct connects are successful at attracting volume. Particular high volume locations are those at Harmon, Hacienda, and Wall Street.
- It was noted that a comparison of these results to the prior plan HOV forecasts would be beneficial.
- It was noted that a flyover should be depicted at US-95 and Summerlin Parkway, on all graphics. It was confirmed that the model coding included the flyover.
- RTC will confirm the number of assumed park-and-rides.

Traffic Forecasting for SNV HOV Plan

- John Karachepone reported that the post-processing for the 2025 run is nearing completion and should be available by Friday; for initial review by NDOT and then transmittal to the Project Neon team. John will update Jeff Lerud regarding the final anticipated schedule of completing the 2025 post-processing.
- John reported that the 2035 post-processing will then begin. John will keep the MTF informed regarding the target date of October 8 for completing the 2035 post-processed traffic forecasts.

Travel Demand Validation Review and Application Technical Memorandum

- Chris Primus reported that the draft memorandum had been transmitted last Tuesday, September 17, for review by NDOT and RTC.
  - NDOT stated that they had not received it – due to email limitations. This will be investigated; it will be re-transmitted immediately following the meeting and sent by ftp as necessary today.
  - RTC received the draft memorandum and will provide comments later this week.

Other

- No other items were discussed

Summary of Action Items

No.	Action Item	Person	Action Item Status	Date Completed
1	Confirm with Jeff Lerud the schedule for completing the 2025 post-processed forecasts	John Karachepone	Completed. Post-processed 2025 volumes transmitted on 10/04/2013	10/01/2013
2	Compare new HOV forecasts with the prior plan forecasts	John Karachepone	Completed	10/10/2013
3	Transmit the modeling technical memorandum via ftp if necessary	Chris Primus	Completed	9/25/2013

Model Task Force Meeting # 5

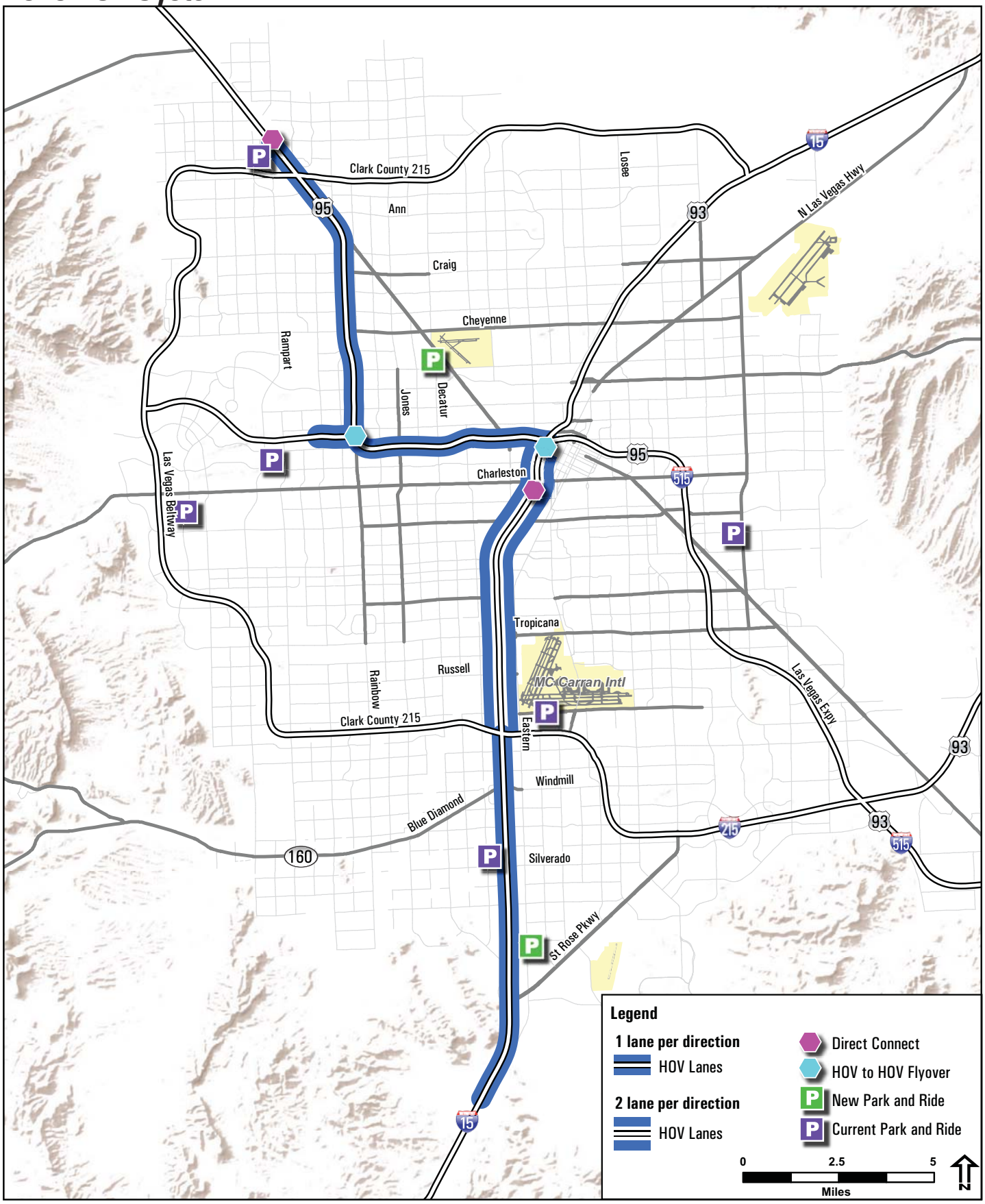
September 25, 2013
9:00 to 10:00 AM
NDOT and RTC
Conference Call: 866.365.4406, Code = 3063362

Agenda

1. Introductions
2. 2035 Modeling Status
3. 2035 Initial Raw Model Results
4. Traffic forecasting for SNV HOV Plan (post-processing status)
5. Travel Demand Validation Review and Application Technical Memorandum (NDOT and RTC review Status/Comments)
6. Other

2025 HOV System

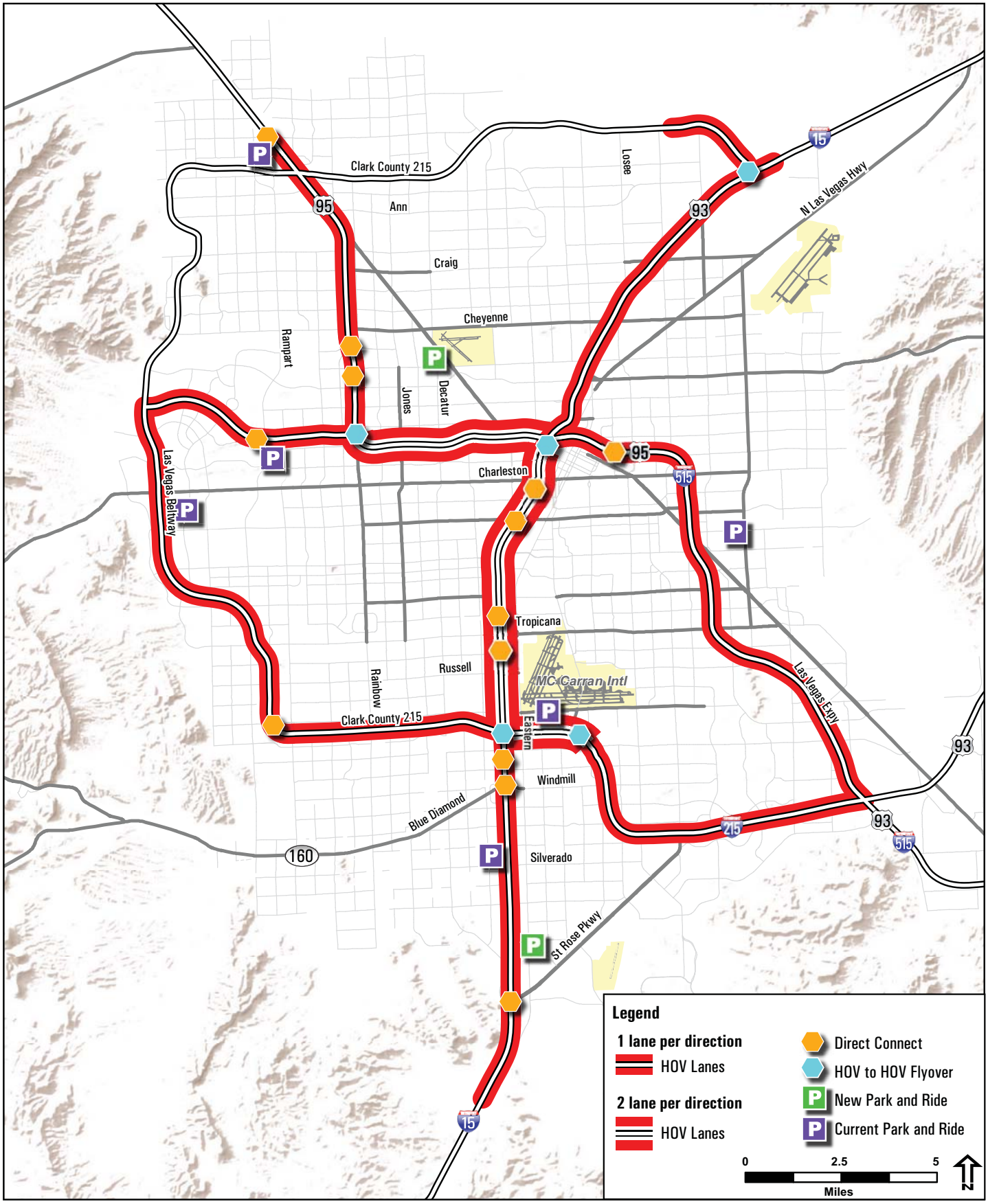
Southern Nevada HOV Plan



2035 HOV System

Scenario 1

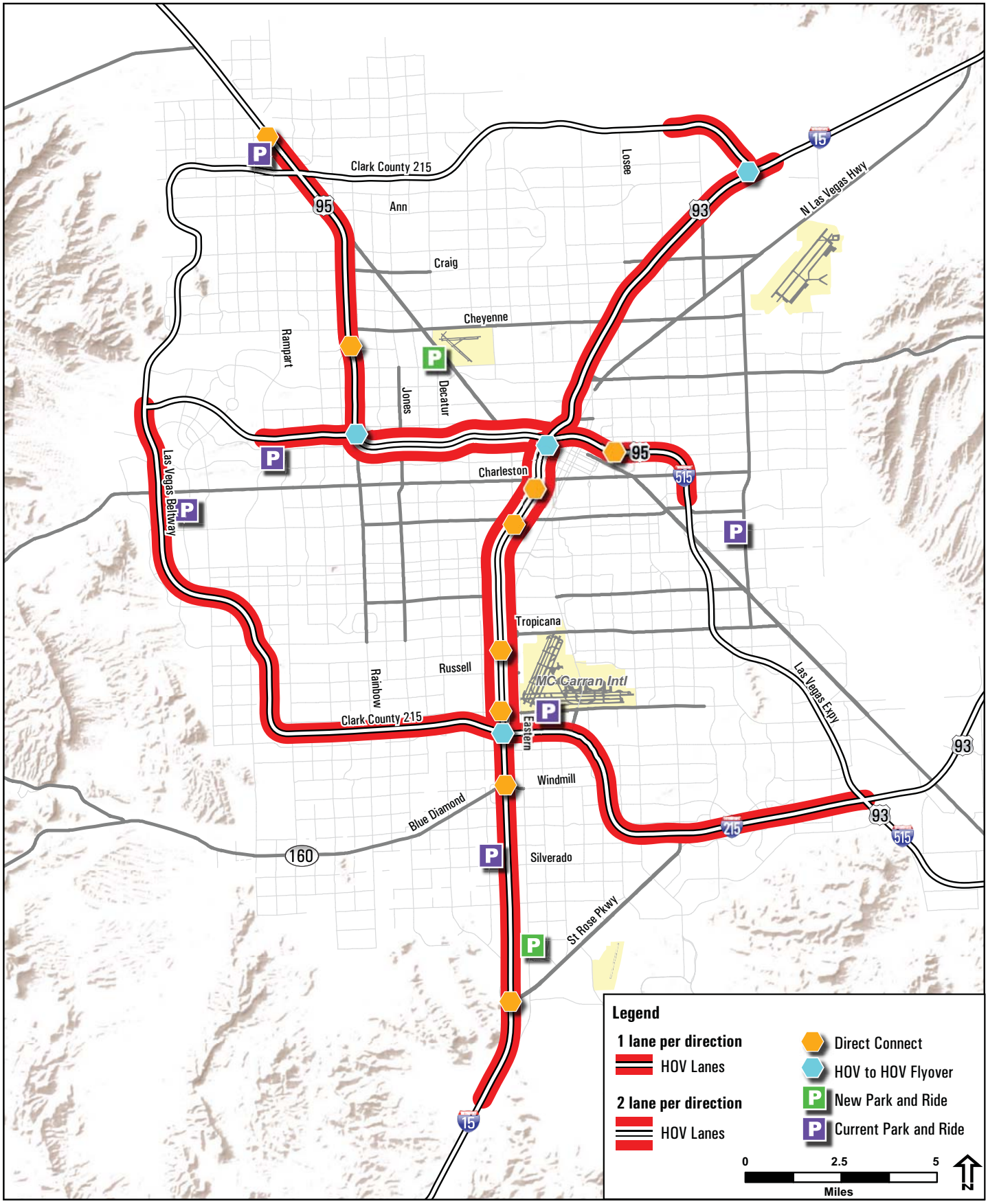
Southern Nevada HOV Plan



2035 HOV System

Scenario 2

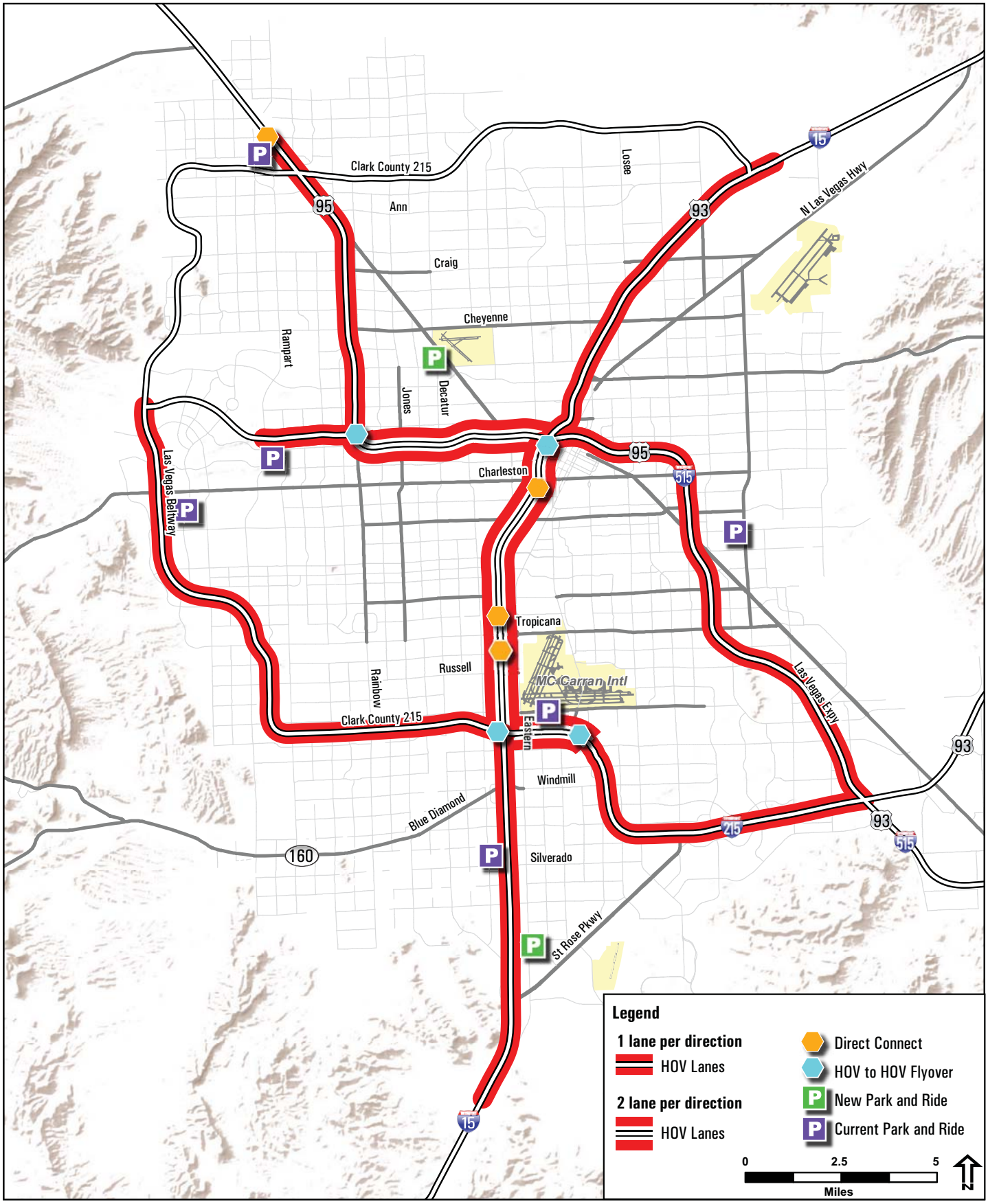
Southern Nevada HOV Plan



2035 HOV System

Scenario 3

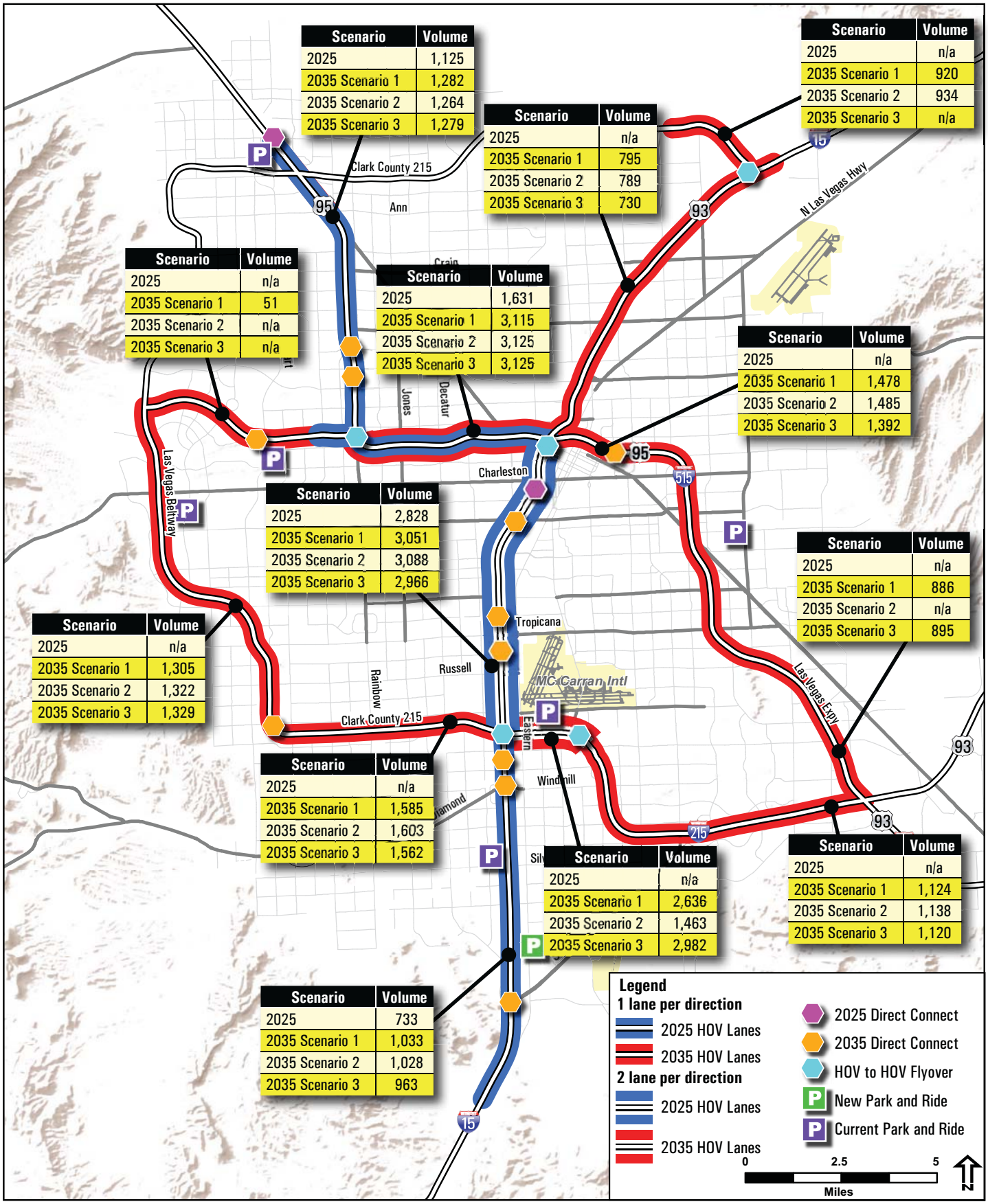
Southern Nevada HOV Plan



HOV Scenario Model Volumes

PM Peak Hour Outbound

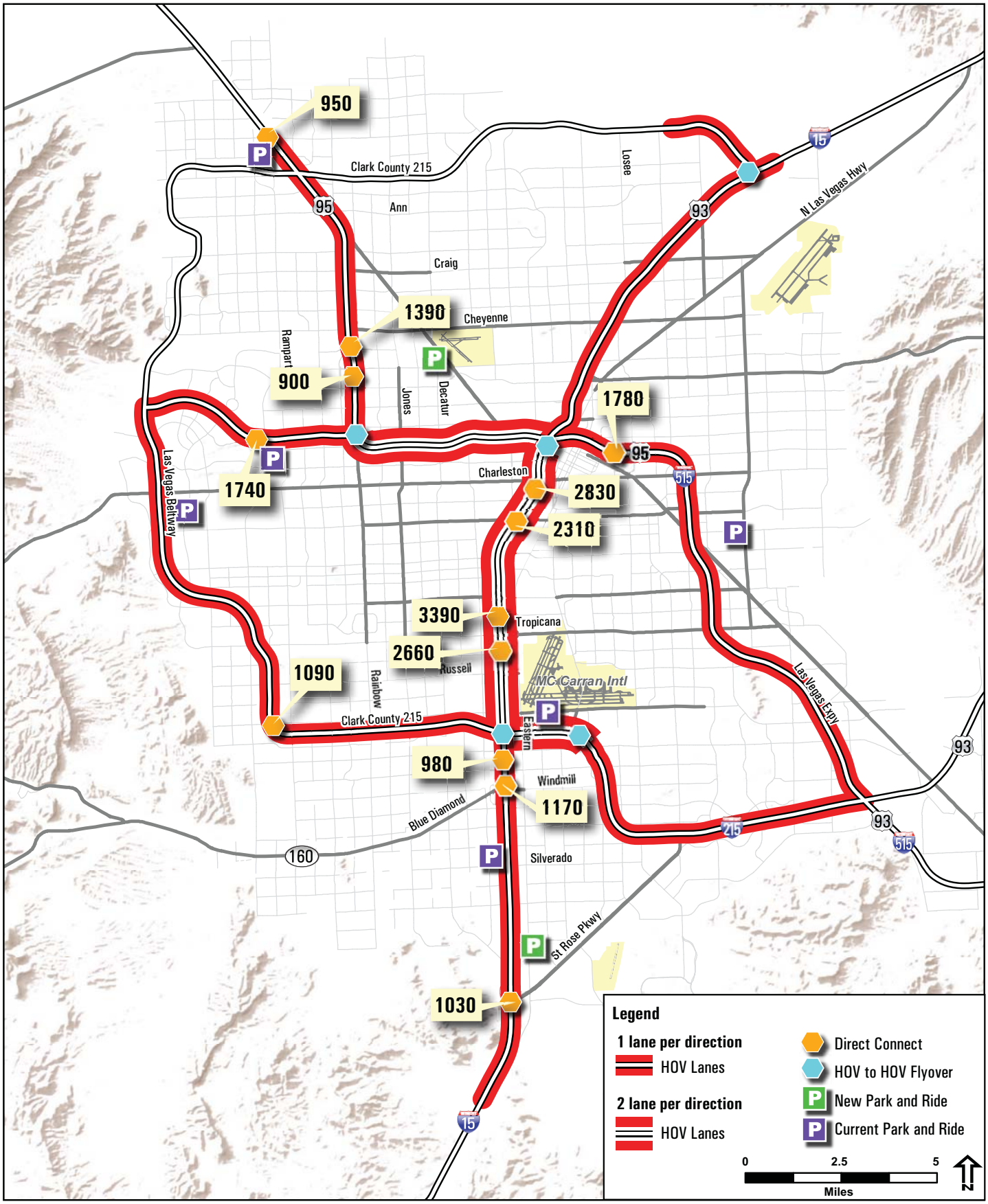
Southern Nevada HOV Plan



Direct Connect Two-Way Volume Activity - Scenario 1

2035 PM Peak Hour

Southern Nevada HOV Plan



APPENDIX B

PROJECT NEON PLANS

Project Neon PHASE 1

Phase I Highlighted Plan

70% Confidence Cost – yoe (NDOT)

PE $13.7M

R/W $103.3M

Utilities $23.8M

Construction $233.7M

Admin $28.9M

70% Confidence Cost – yoe (City)

PE $3.7M

R/W $14.0M

Construction $53.7M

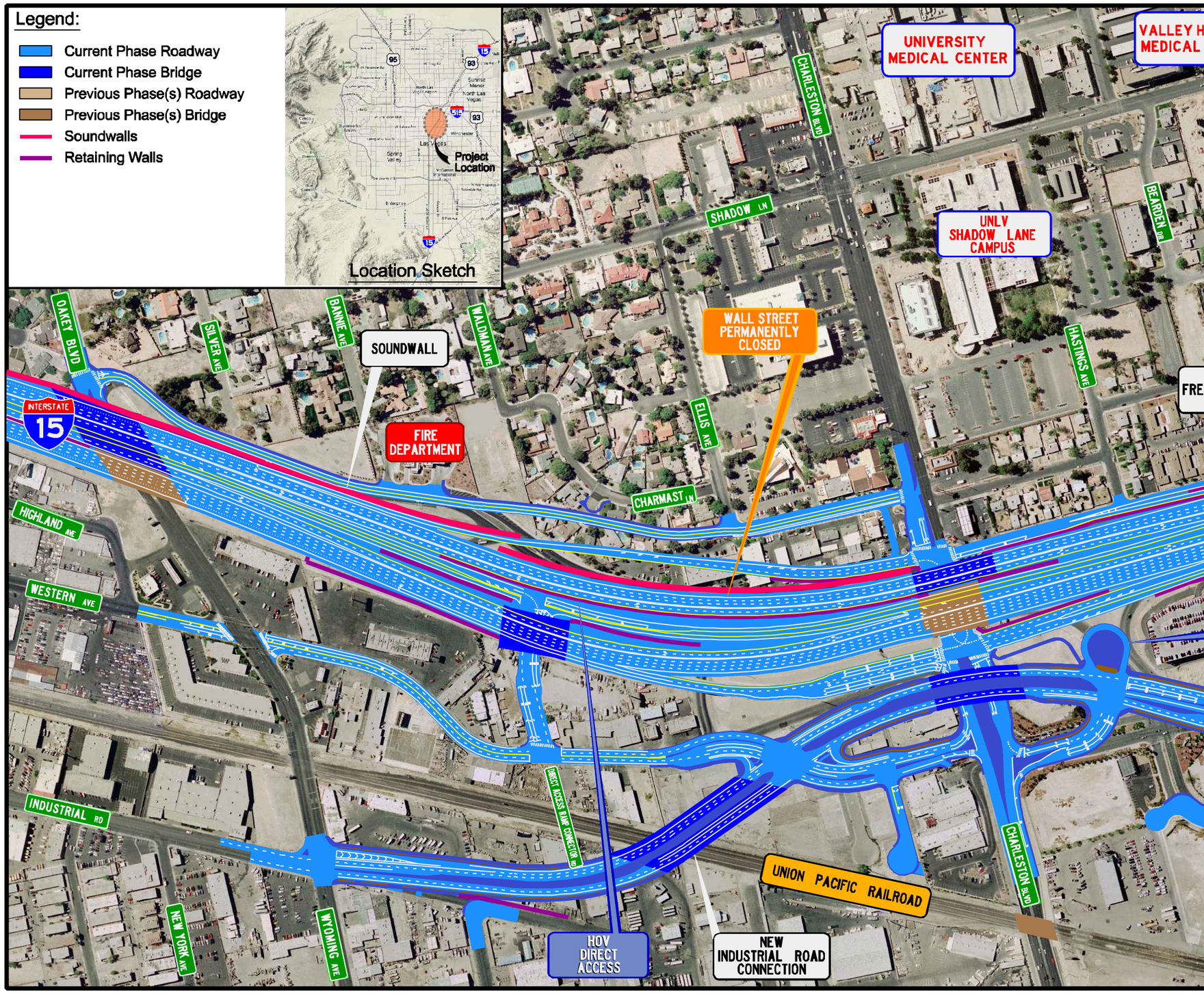
Admin $6.6M

Major Phase Elements

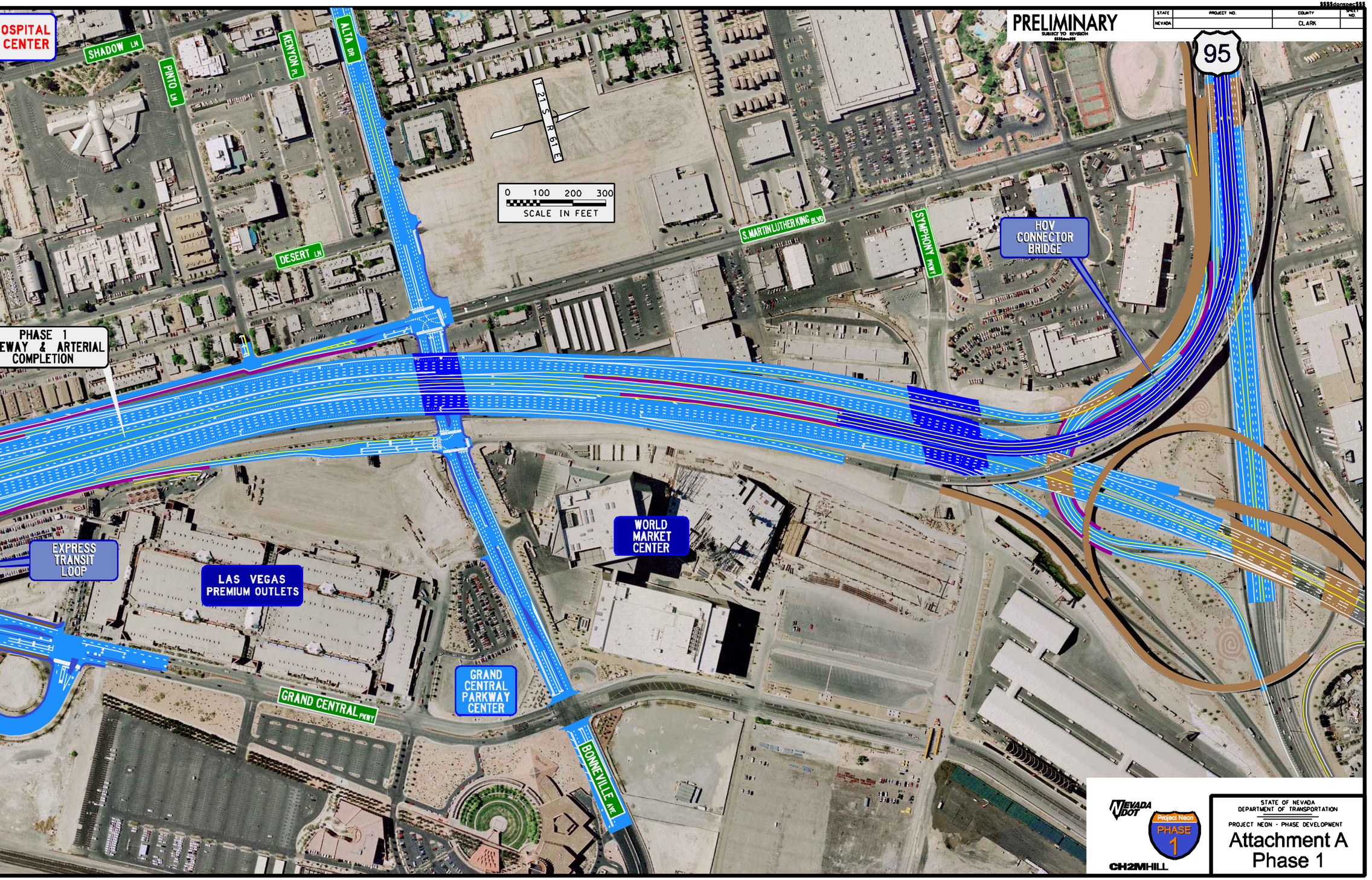
- HOV Viaduct I-15 – US 95
- Charleston Interchange Reconstruction
- HOV Direct Access Interchange
- Grand Central – Industrial Connection

Improvements

- Operation/Safety/Connectivity on the local system (Charleston/Western/ Grand Central-Industrial)
- Operation/Safety on I-15
- Operation/Safety on US 95
- Charleston Interchange (MLK – Alta couplet)
- Transit accommodations
- RR Xing



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION


PRELIMINARY
SUBJECT TO REVISION
STATE
NEVADA
PROJECT NO.
COUNTY
CLARK
SHEET NO.
OSPITAL CENTER
SHADOW LN
PINTO LN
KENYON PL
ALTA DR
DESERT LN
I-21 S R 61 E
0 100 200 300
SCALE IN FEET
S. MARTIN LUTHER KING BLVD
SYMPHONY PKWY
95
HOV CONNECTOR BRIDGE
PHASE 1
EWAY & ARTERIAL
COMPLETION
EXPRESS TRANSIT LOOP
LAS VEGAS PREMIUM OUTLETS
WORLD MARKET CENTER
GRAND CENTRAL PKWY
GRAND CENTRAL PARKWAY CENTER
BONNEVILLE AVE
NEVADA DOT
Project Neon
PHASE 1
CH2MHILL
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - PHASE DEVELOPMENT
Attachment A
Phase 1

Project Neon PHASE 2

Phase II Highlighted Plan

70% Confidence Cost – yoe (City)

PE $1.4M

R/W $23.4M

Utilities $5.3M

Construction $22.3M

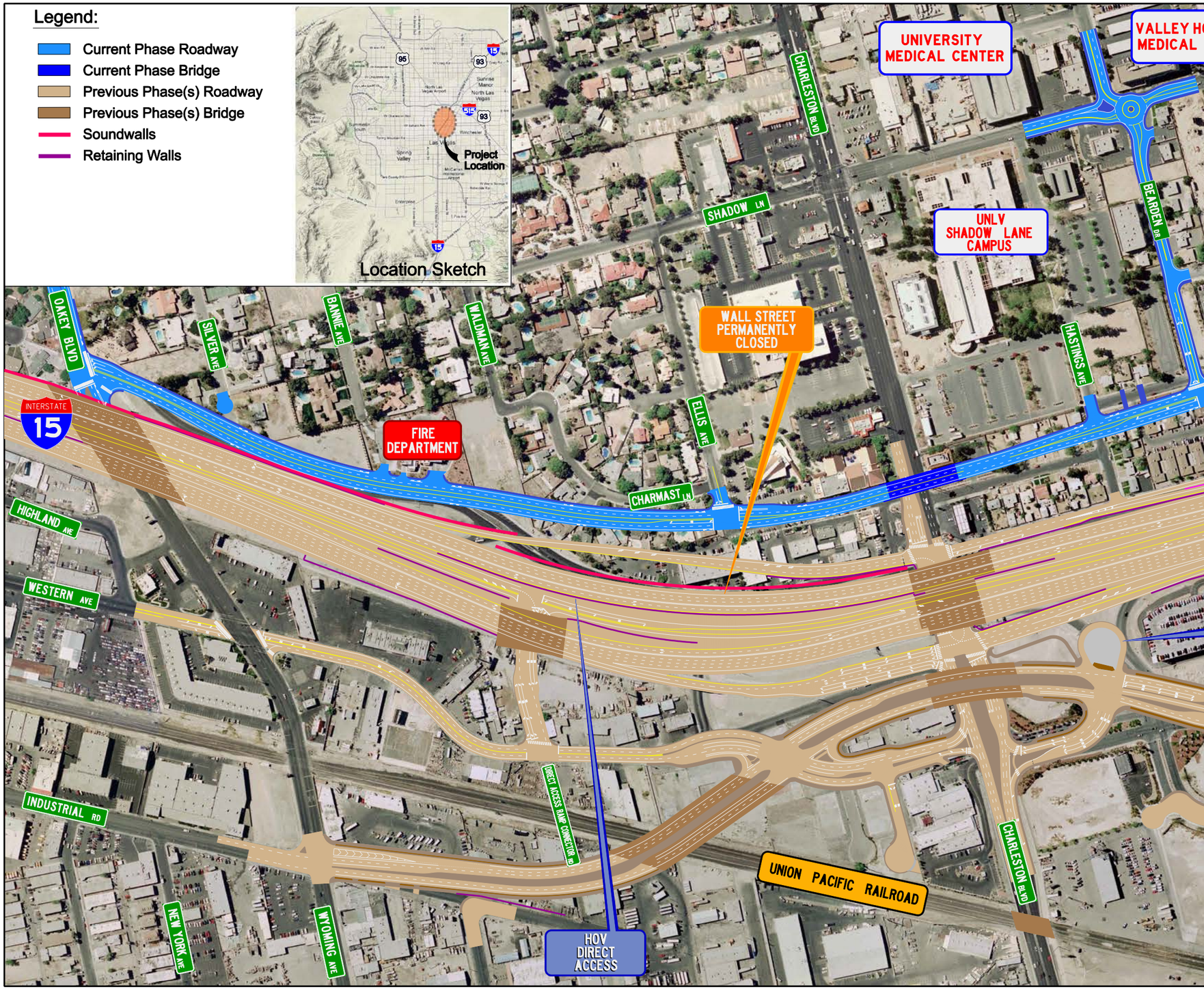
Admin $1.9M

Major Phase Elements

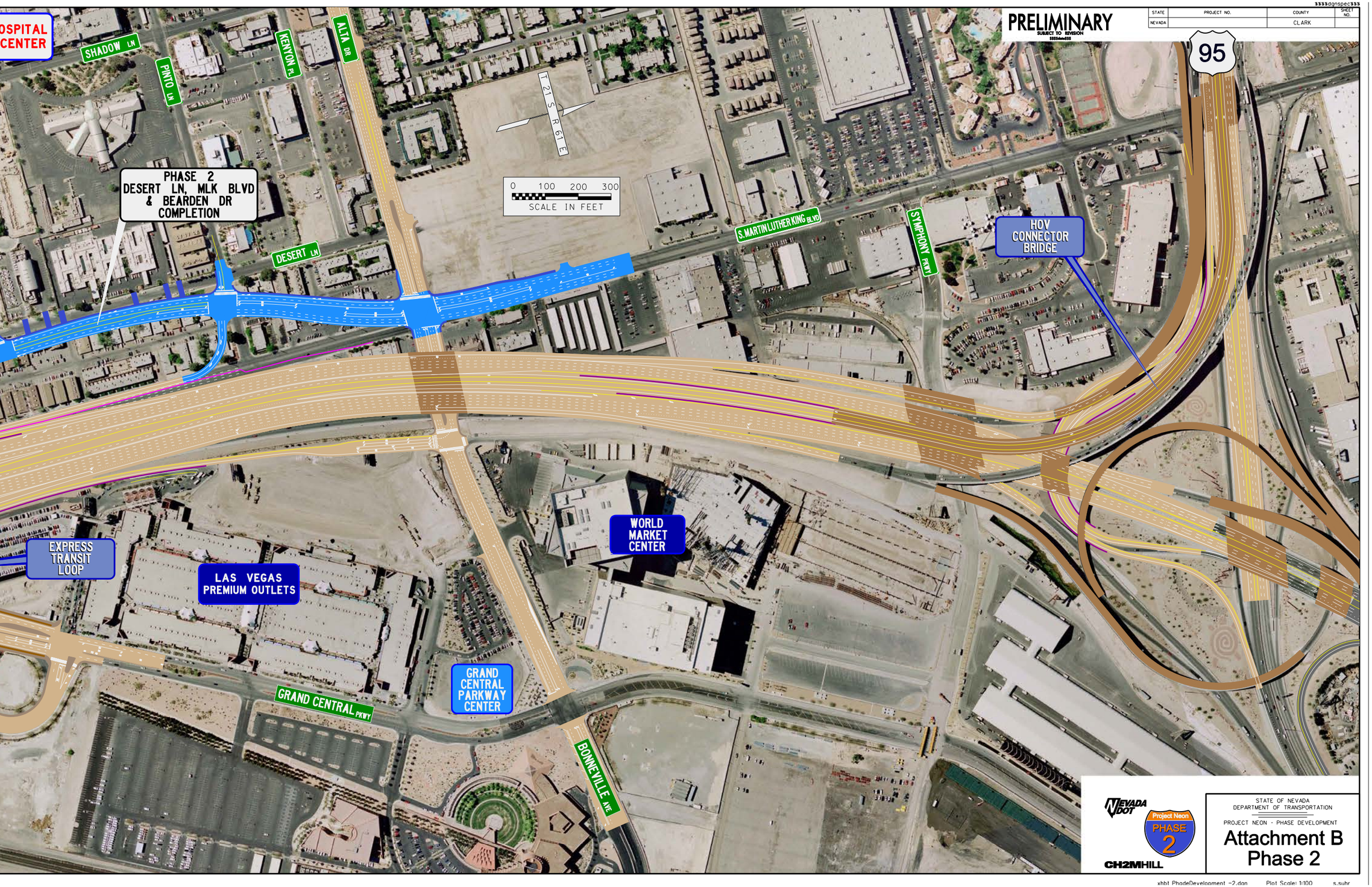
- MLK Extension to Oakey
- Charleston grade separation
- Bearden connection

Improvements

- Operation/Safety/Connectivity on the local system
- Using the City's complete streets guidelines



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION


PRELIMINARY
SUBJECT TO REVISION
$$$$dgnspec$$$
STATE
NEVADA
PROJECT NO.
COUNTY
CLARK
SHEET NO.
95
OSPITAL CENTER
SHADOW LN
PINTO LN
KENYON PL
ALTA DR
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SCALE IN FEET
PHASE 2
DESERT LN, MLK BLVD & BEARDEN DR COMPLETION
DESERT LN
S.MARTIN LUTHER KING BLVD
SYMPHONY PKWY
HOV CONNECTOR BRIDGE
EXPRESS TRANSIT LOOP
LAS VEGAS PREMIUM OUTLETS
WORLD MARKET CENTER
GRAND CENTRAL PARKWAY CENTER
GRAND CENTRAL PKWY
BONNEVILLE AVE
NEVADA DOT
Project Neon
PHASE 2
CH2MHILL
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - PHASE DEVELOPMENT
Attachment B
Phase 2
xhbt_PhaseDevelopment_2.dgn
Plot Scale: 1:100
s.suhr

Project Neon PHASE 3

Phase III Highlighted Plan

70% Confidence Cost – yoe (NDOT)

PE $8.4M

R/W $96.7M

Utilities $8.7M

Construction $129.4M

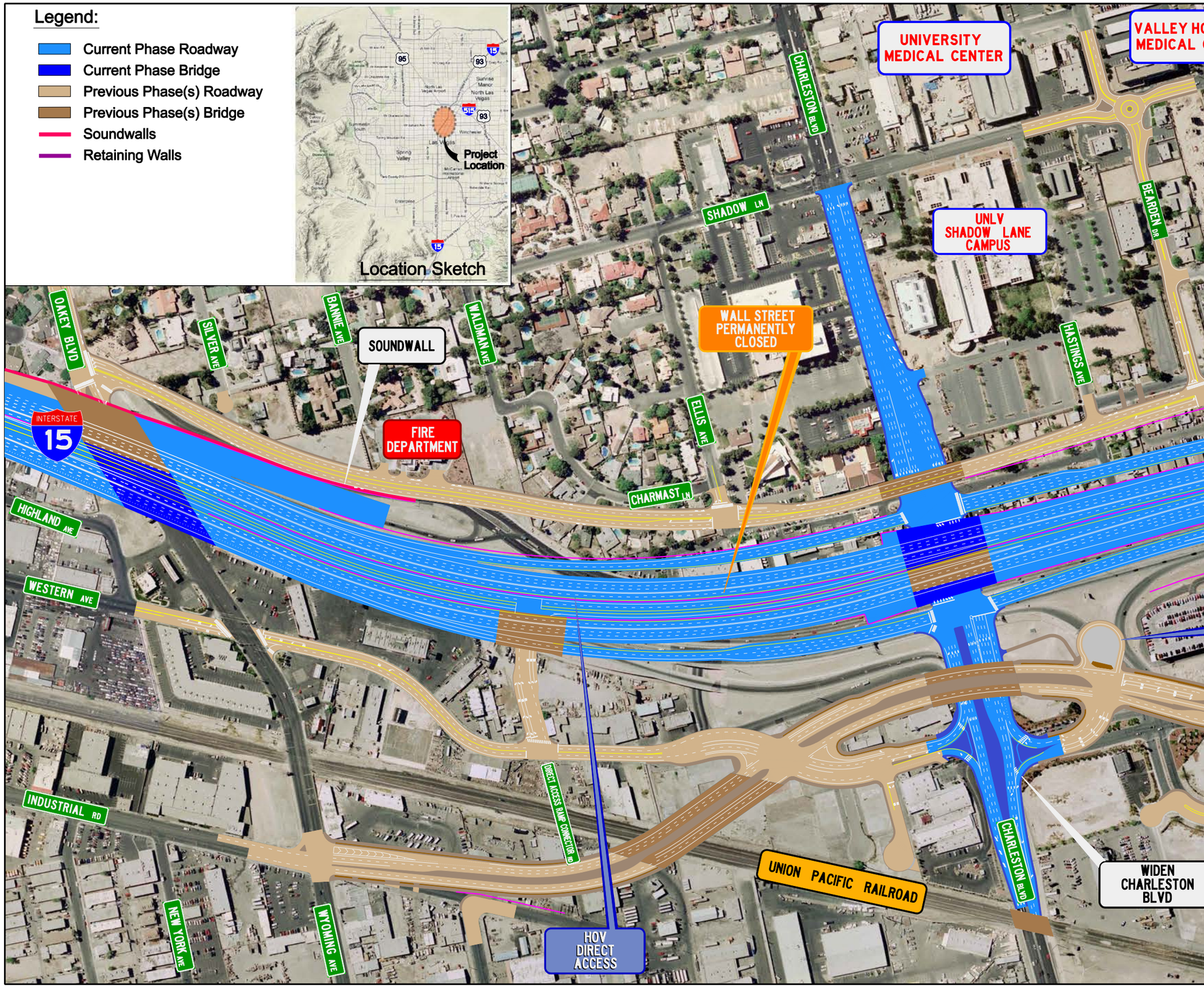
Admin $10.1M

Major Phase Elements

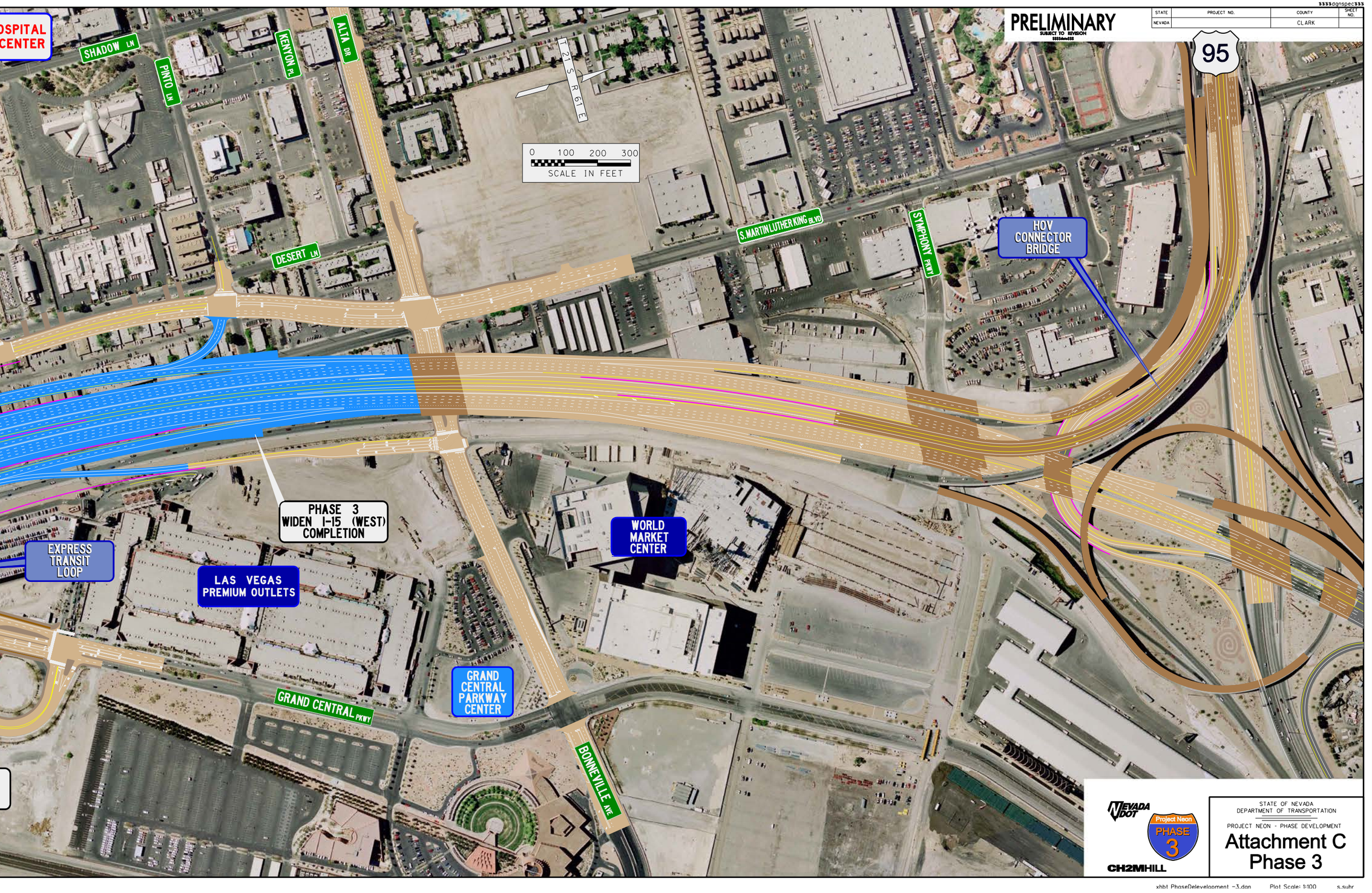
- Charleston Interchange Reconstruction
- HOV Direct Access Interchange Reconstruction
- I-15 Widening to minimize Phase I design exceptions

Improvements

- Operation/Safety Charleston Interchange
- Operation/Safety Direct Access Interchange
- Operation/Safety on Charleston Boulevard
- Realignment to accommodate Phase V



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION


PRELIMINARY
SUBJECT TO REVISION
STATE
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PROJECT NO.
COUNTY
CLARK
SHEET NO.
95
SHADOW LN
PINTO LN
KENYON PL
ALTA DR
DESERT LN
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0 100 200 300
SCALE IN FEET
S. MARTIN LUTHER KING BLVD
SYMPHONY PKWY
HOV CONNECTOR BRIDGE
PHASE 3 WIDEN I-15 (WEST) COMPLETION
EXPRESS TRANSIT LOOP
LAS VEGAS PREMIUM OUTLETS
WORLD MARKET CENTER
GRAND CENTRAL PARKWAY CENTER
GRAND CENTRAL PKWY
BONNEVILLE AVE
NEVADA DOT
Project Neon
PHASE 3
CH2MHILL
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - PHASE DEVELOPMENT
Attachment C
Phase 3

Project Neon PHASE 4

Phase IV Highlighted Plan

70% Confidence Cost – yoe (NDOT)

PE $83M

R/W $9.8M

Utilities $9.5M

Construction $137.1M

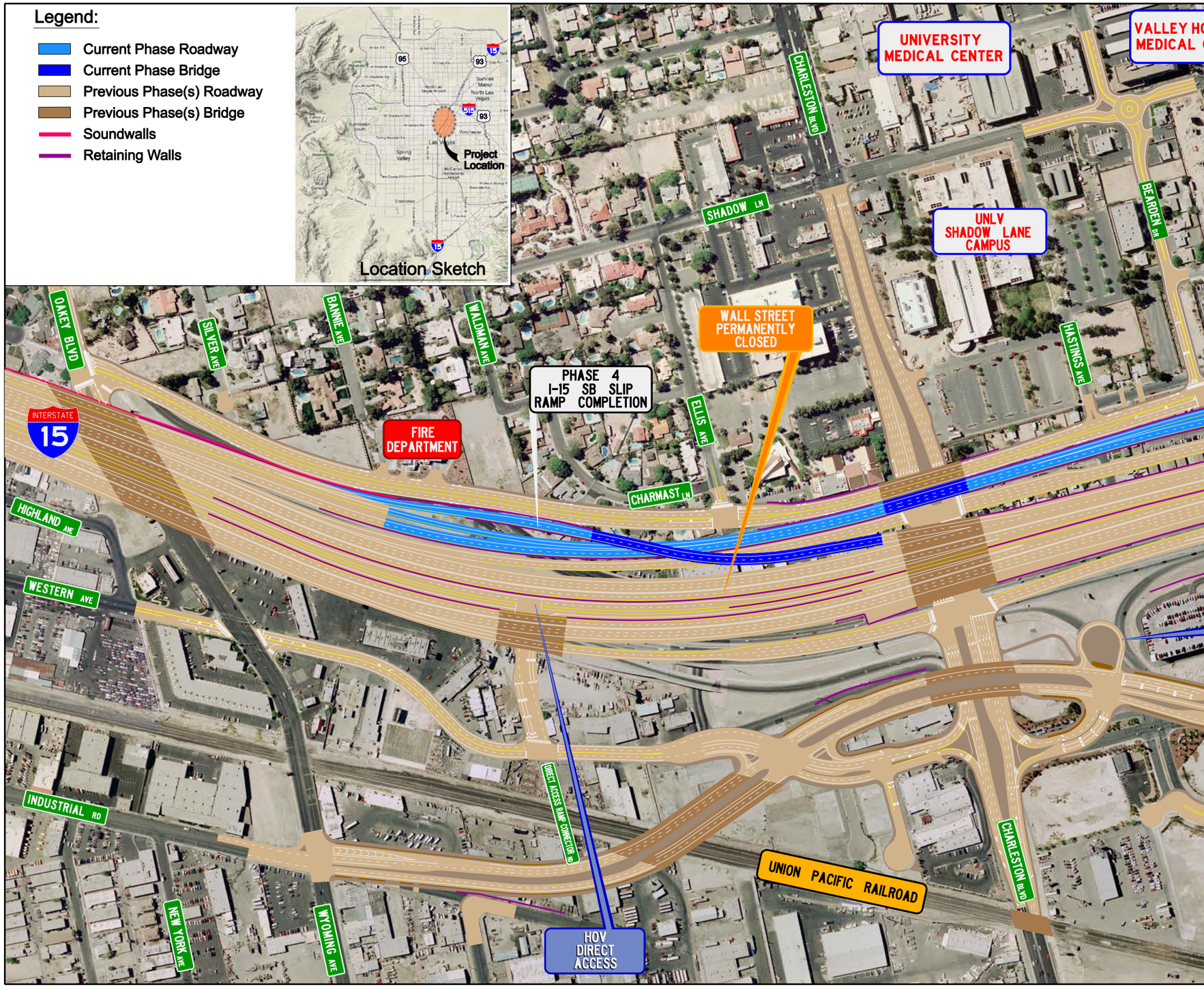
Admin $10.9M

Major Phase Elements

- Ramp Bridge SB US 95 to I-15, Charleston (EN + EX) and Sahara EX
- Charleston Slip Ramp

Improvements

- MLK Boulevard is completely separated from the Charleston Interchange Ramps
- SB Freeway weaving is fully optimized



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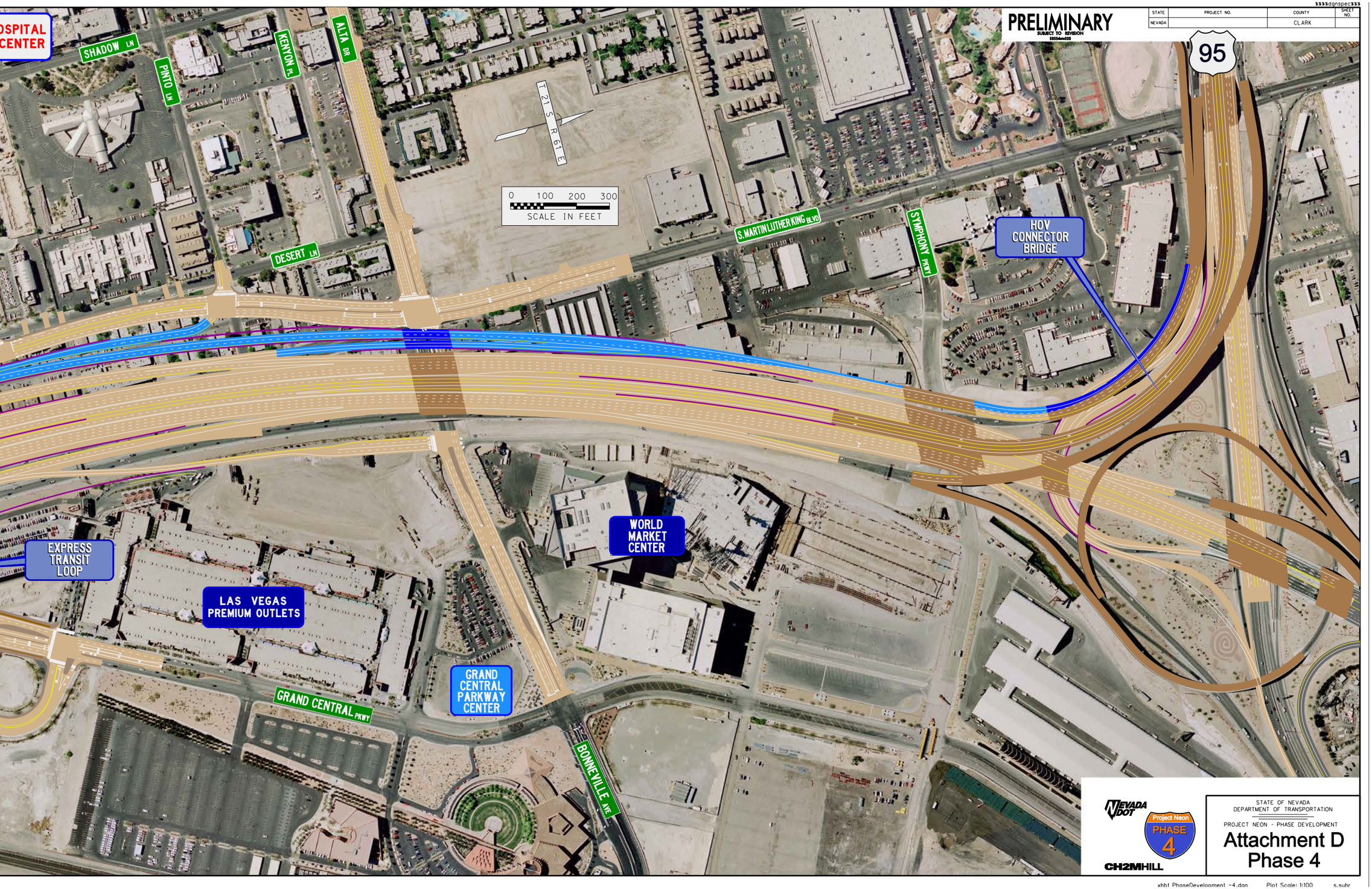
PRELIMINARY
SUBJECT TO REVISION
$$$$dgnspec$$$
STATE
NEVADA
PROJECT NO.
COUNTY
CLARK
SHEET NO.
OSPITAL CENTER
SHADOW LN
PINTO LN
KENYON PL
ALTA DR
DESERT LN
T 21 S R 61 E
0 100 200 300
SCALE IN FEET
S. MARTIN LUTHER KING BLVD
SYMPHONY PKWY
HOV CONNECTOR BRIDGE
95
WORLD MARKET CENTER
EXPRESS TRANSIT LOOP
LAS VEGAS PREMIUM OUTLETS
GRAND CENTRAL PKWY
GRAND CENTRAL PARKWAY CENTER
BONNEVILLE AVE
NEVADA DOT
Project Neon
PHASE 4
CH2MHILL
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - PHASE DEVELOPMENT
Attachment D
Phase 4
xhbt_PhaseDevelopment_4.dgn
Plot Scale: 1:100
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Project Neon PHASE 5

Phase V Highlighted Plan

70% Confidence Cost – yoe (NDOT)

PE $8.3M

R/W $9.8M

Utilities $9.5M

Construction $137.1M

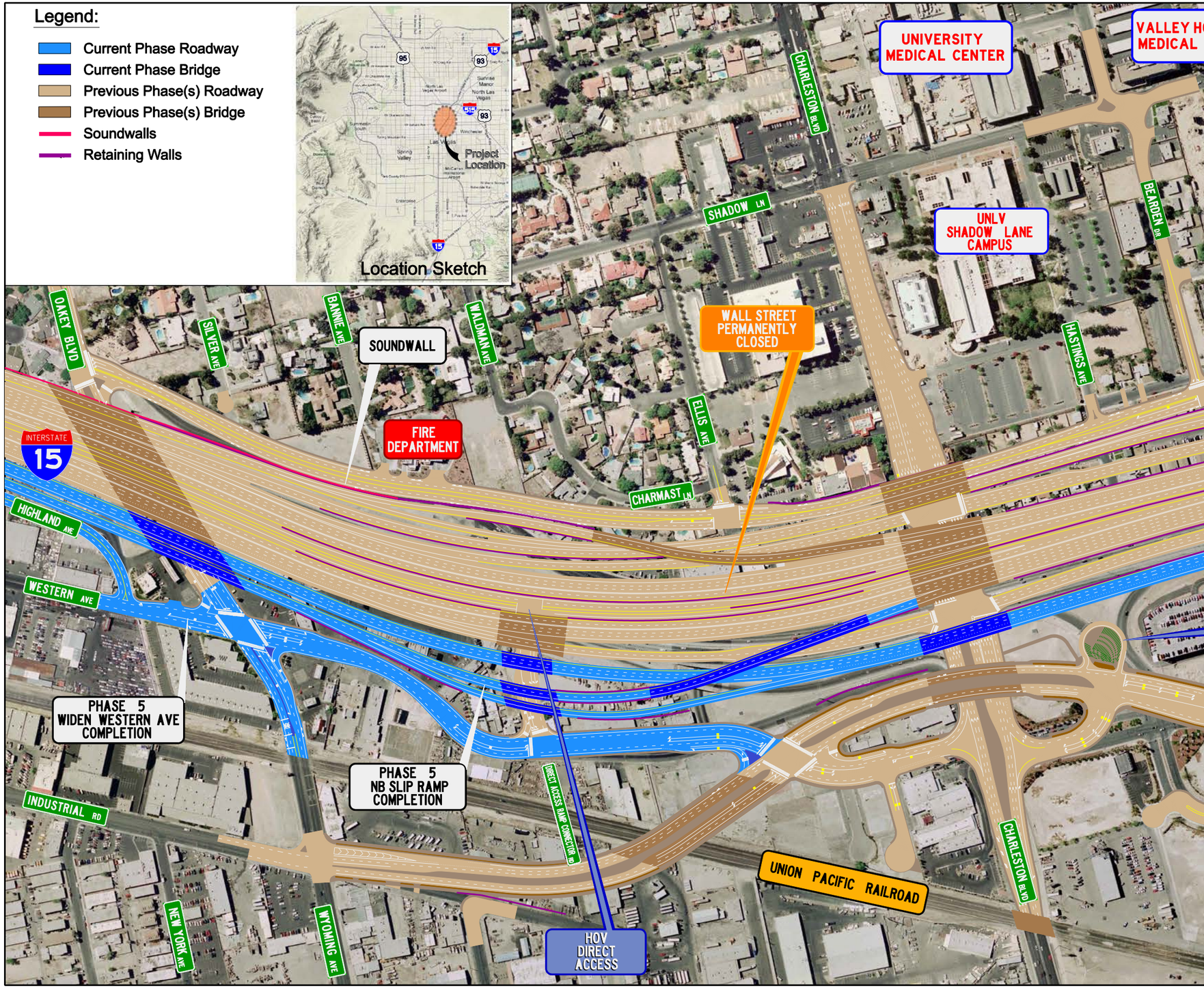
Admin $10.9M

Major Phase Elements

- Ramp Braiding NB I-15 to US 95, Charleston (EN + EX) and Sahara EN
- Alta slip ramp

Improvements

- Charleston Interchange fully optimized
- NB Freeway weaving is fully optimized



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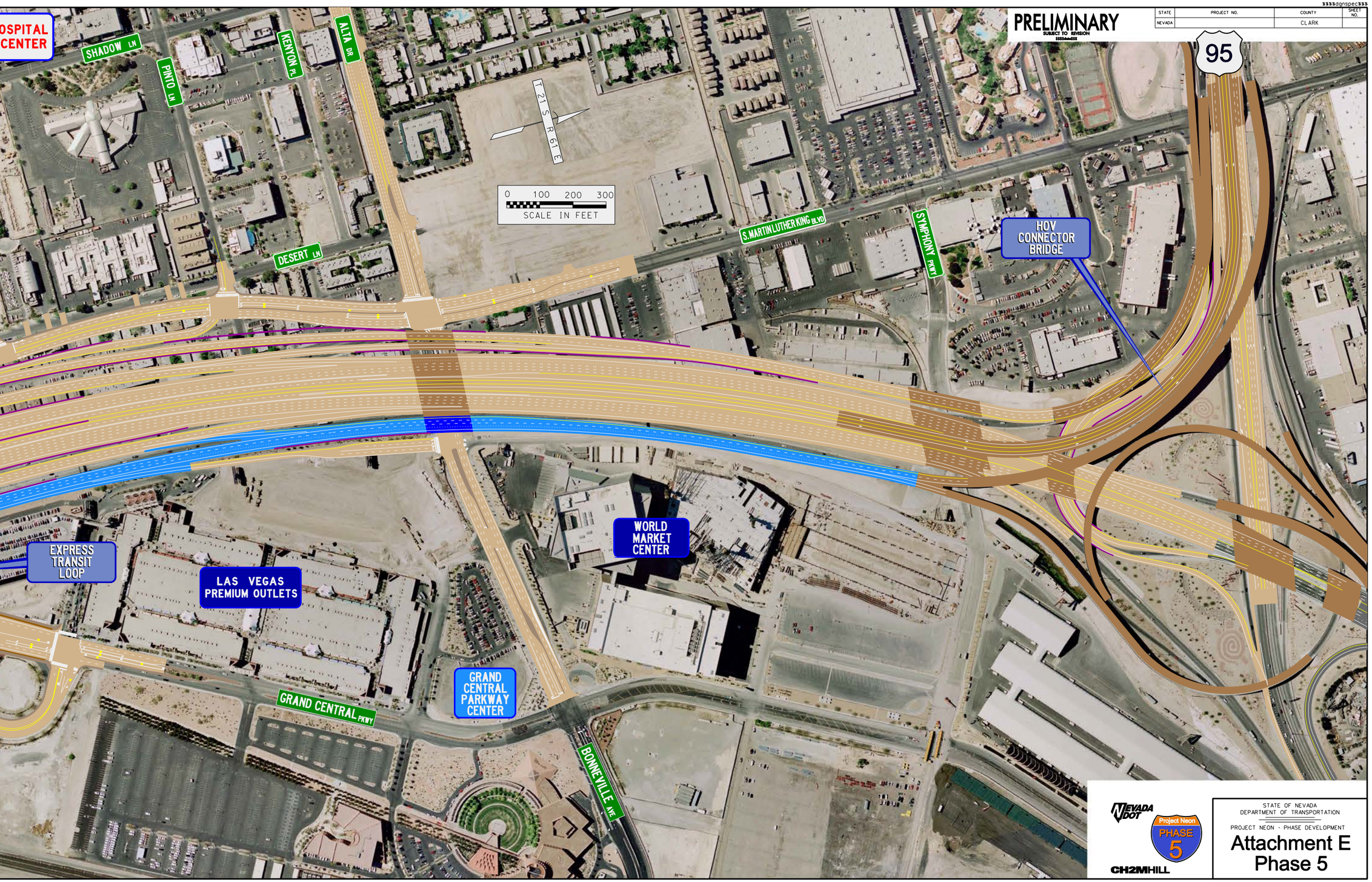

OSPITAL CENTER
SHADOW LN
PINTO LN
KENYON PL
ALTA DR
T 21 S R 61 E
0 100 200 300
SCALE IN FEET
DESERT LN
S. MARTIN LUTHER KING BLVD
SYMPHONY PKWY
HOV CONNECTOR BRIDGE
95
EXPRESS TRANSIT LOOP
LAS VEGAS PREMIUM OUTLETS
WORLD MARKET CENTER
GRAND CENTRAL PKWY
GRAND CENTRAL PARKWAY CENTER
BONNEVILLE AVE
PRELIMINARY
SUBJECT TO REVISION
$$$$dgnspec$$$
STATE
NEVADA
PROJECT NO.
COUNTY
CLARK
SHEET NO.
NEVADA DOT
Project Neon
PHASE 5
CH2MHILL
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - PHASE DEVELOPMENT
Attachment E
Phase 5
xhbt_PhaseDevelopment-5.dgn
Plot Scale: 1:100
s.suhr

Project Neon PHASE 6

Phase VI Highlighted Plan

70% Confidence Cost – yoe (City)

PE $2.9M

R/W $54.6M

Utilities $6.4M

Construction $39.6M

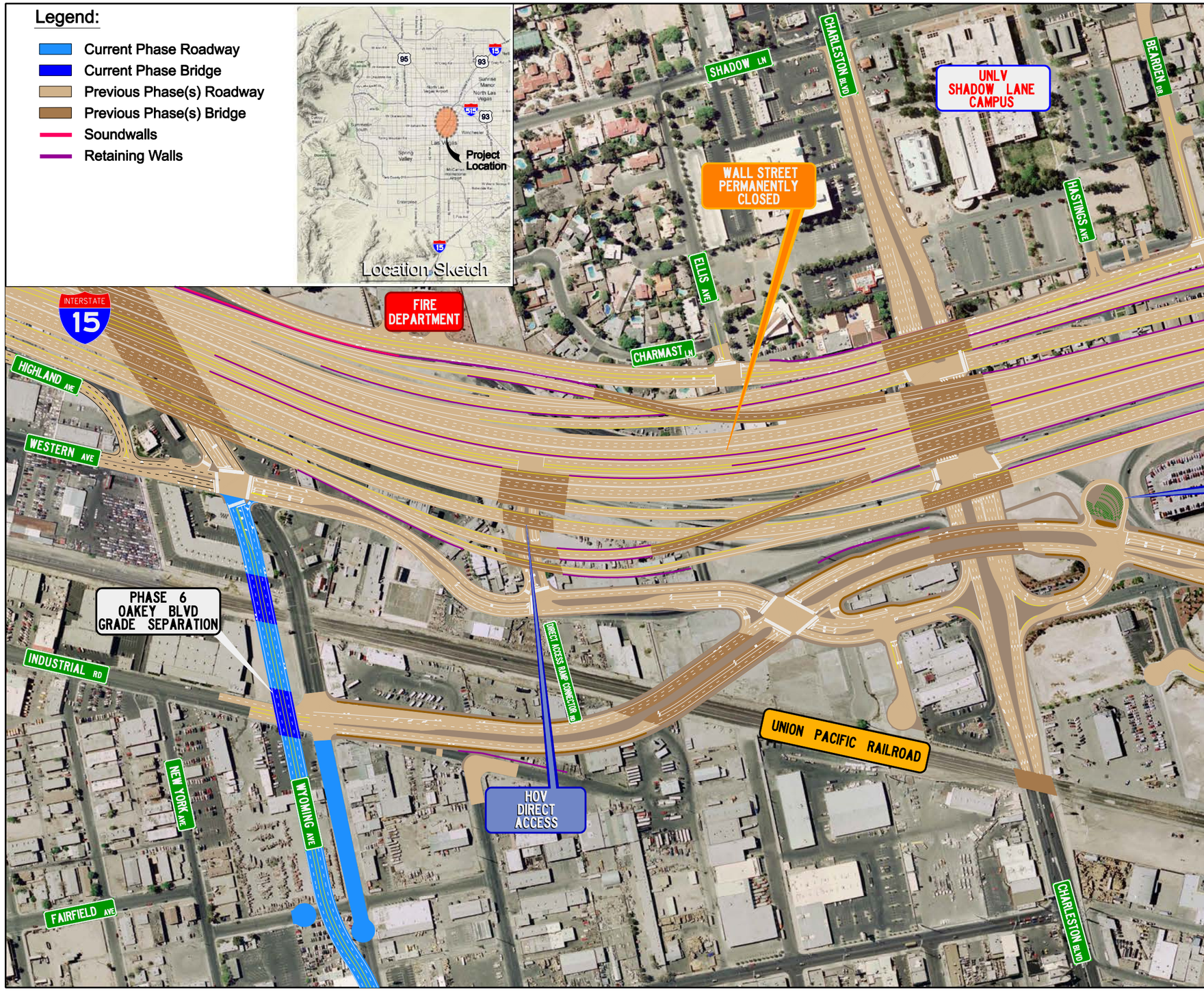
Admin $3.1M

Major Phase Elements

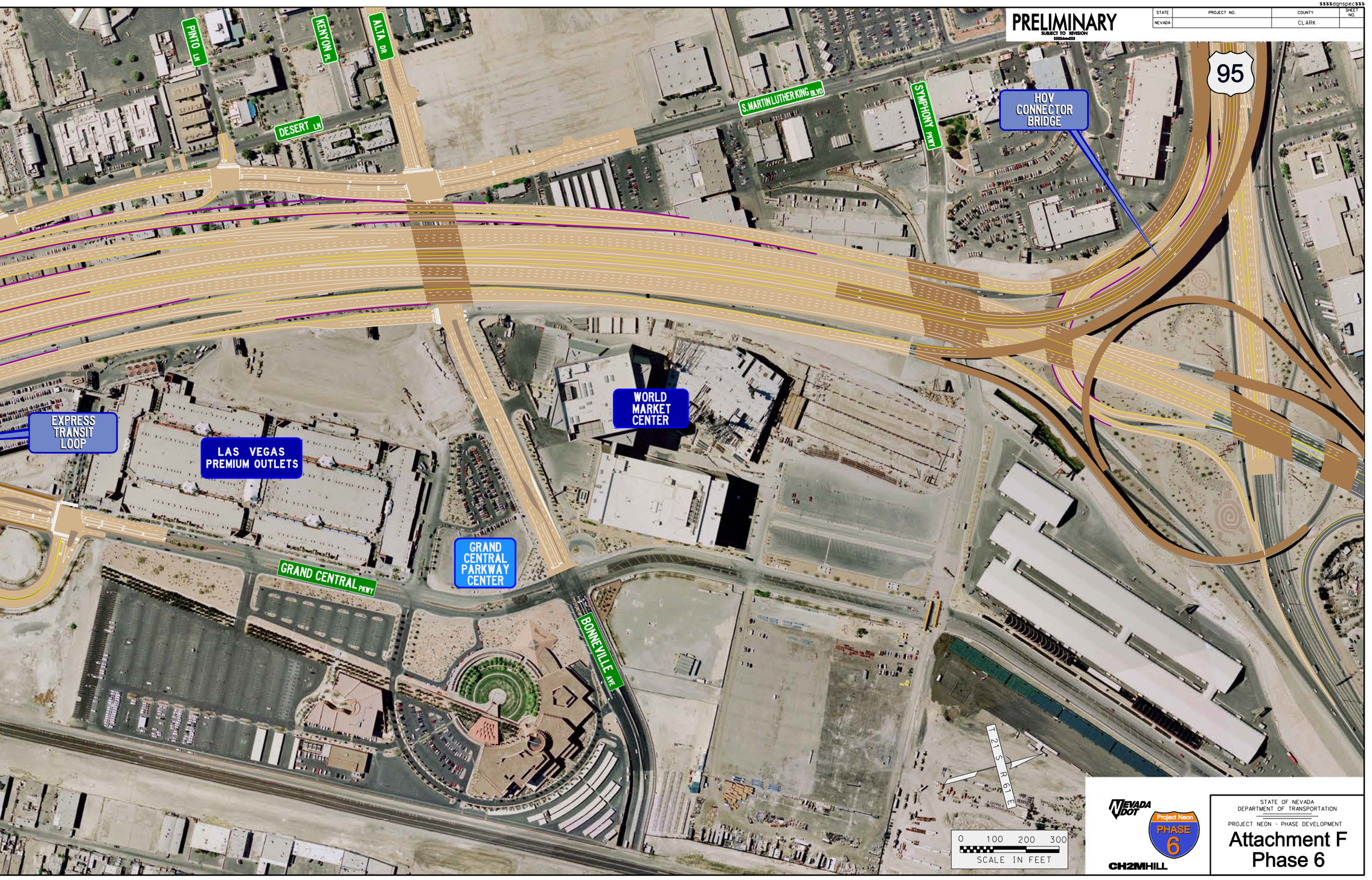
- Oakey/Wyoming – UPRR grade separation

Improvements

- Highest priority RR crossing in Nevada
- Design likely to be revised to be under



ALL INFORMATION PRELIMINARY/SUBJECT TO REVISION


PINTO LN
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ALTA DR
DESERT LN
S.MARTIN LUTHER KING BLVD
SYMPHONY PKWY
HOV CONNECTOR BRIDGE
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WORLD MARKET CENTER
EXPRESS TRANSIT LOOP
LAS VEGAS PREMIUM OUTLETS
GRAND CENTRAL PARKWAY CENTER
GRAND CENTRAL PKWY
BONNEVILLE AVE
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SCALE IN FEET
PRELIMINARY
SUBJECT TO REVISION
STATE
NEVADA
PROJECT NO.
COUNTY
CLARK
SHEET NO.
NEVADA DOT
Project Neon
PHASE 6
CH2MHILL
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - PHASE DEVELOPMENT
Attachment F
Phase 6


ALL INFORMATION IS PRELIMINARY
SUBJECT TO REVISION
STATE: NEVADA
PROJECT NO.: NH-STP-015-11147(
COUNTY: CLARK
SHEET NO.:
Matchline
NOTE: EXISTING STRIPING INFORMATION SHOWN ON I-15 IS FOR INFORMATIONAL PURPOSES ONLY.
EXACT LOCATION AND WIDTHS OF EXISTING TRAVEL LANES AT THE NORTH
AND SOUTH TIE-IN POINTS NEED TO BE FIELD VERIFIED.
0 200 400 600
SCALE IN FEET
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PROJECT NEON - P3 DESIGN
CONCEPTUAL SIGN PLAN
I-15
200.000000-1.000000 PLOT SCALE
fpauto
PRE-FINAL PLAN SET - PRELIMINARY/SUBJECT TO CHANGE - NOT FOR CONSTRUCTION

APPENDIX C

2025 NETWORK CODING LIST

ID#	Changes Made to the Model	Comments
1	I-15 southbound collector-distributor road between the Spaghetti bowl and Sahara Avenue was coded as per “Phase IV Highlighted Plan” available from the Project Neon website.	
2	I-15 northbound to US95 southbound ramp (after the merge with the I-15 southbound to US95 southbound ramp) was coded as 2 lanes.	
3	US95 southbound/Martin Luther King Boulevard ramp to I-15 northbound was coded as 2 lanes.	
4	A short stretch of I-15 southbound just south of the point where the US95 northbound ramp to I-15 southbound merges with I-15 southbound was coded as 4.5 lanes.	
5	Laneage of I-15 northbound between Desert Inn Road and the Spaghetti Bowl was updated to match the “P3 30% Design Traffic Control, Signing, Lighting and ITS Plans” available from the Project Neon website.	
6	Charleston Boulevard between the I-15 ramp terminal intersections was coded as 4 lanes in each direction.	
7	Utah Avenue was extended to intersect with Industrial Road.	
8	Industrial Road was coded to be a dead-end street, to end at the location where Industrial Road ends today.	
9	Grand Central Parkway intersection with Charleston Boulevard was coded as an at-grade intersection.	
10	Martin L King Boulevard was coded as 4 lanes between Alta Drive and Oakey Boulevard.	
11	The I15S HOV I215E connector was removed as per guidance from the kick-off meeting.	
12	The I215W I15N HOV connector was removed as per guidance from the kick-off meeting.	
13	The functional classification of all the CD roads in the model was changed to "Expressway".	Change functional classification for the newly coded CD roads, as well as the entire system.
14	The location of the slip ramp from the I-15 NB mainline to the CD road was updated. This change reflects the location of the slip ramp in the field.	Move link to new location, new link id is 36953
15	A park-and-ride was added near the North Las Airport at Rancho/Decatur.	Added PNR = 15 to node 5370, other node has signal ID
16	HOV Direct Connect Ramps were coded at Elkhorn Road at US95 (ramps to/from the south)	
17	HOV Ingress/Egress lanes were changed from 2-lanes directional to 1-lane directional.	To keep consistent with 2013 model revisions, changed lanes on the HOV access links.
18	Time of day percent distribution of trips was adjusted as explained in MTF#3.	
19	HOV Link Capacity was reduced from 1950 vphpl to 1500 vphpl.	
20	HOV Ingress/Egress link Capacity was reduced from 2000 vphpl to 1500 vphpl.	

APPENDIX D

2035 HOV SYSTEM SCENARIOS

2025 Scenario (Also Default in all 2035 scenarios)	2035 - Choices
HOV Lanes	**HOV Lanes**
HOV system in the RTC models	I-15
	US95
	215 Southern/Western Beltway
	215 Northern Beltway
	I-515
	Summerlin Parkway

Scenario 1	Scenario 2	Scenario 3 (2007 HOV Plan Scenario)
HOV Lanes	**HOV Lanes**	**HOV Lanes**
I-15	**I-15**	**I-15**
Sloan to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)	Sloan to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)	Sloan to CC-215 (Northern Beltway) (2-lanes HOV between I-215 and I-515)
US95	**US95**	**US95**
I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)	I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)	I-15 to Elkhorn Road (2 lanes HOV between I-15 and Rainbow Boulevard)
215 Southern/Western Beltway	**215 Southern/Western Beltway**	**215 Southern/Western Beltway**
Summerlin Parkway to I-515 (2-lanes between I-15 and Airport Connector)	Summerlin Parkway to I-515	Summerlin Parkway to I-515 (2-lanes between I-15 and Airport Connector)
215 Northern Beltway	**215 Northern Beltway**	**215 Northern Beltway**
Pecos Road to I-15	Pecos Road to I-15	
I-515	**I-515**	**I-515**
I-215 to I-15	Wyoming Avenue to I-15	I-215 to I-15
Summerlin Parkway	**Summerlin Parkway**	**Summerlin Parkway**
US95 to 215 Western Beltway	US95 to Rampart Boulevard	US95 to Rampart Boulevard

HOV Direct Connect	HOV Direct Connect
I-15 to US95 Interchange Direct Connect	Meade Avenue
Wall Street	Harmon/ Hacienda Direct Connect
Elkhorn	Sunset & I-15
	Warm Springs
	Blue Diamond
	St. Rose Parkway
	Peak & US95
	Smoke Ranch & US95
	Maryland Parkway & I-515
	Rampart & Summerlin
	Sunset & Western Beltway
	I-215 to I-15 Interchange Direct Connect
	I-15 to Northern Beltway Interchange Direct Connect
	I-215 to Airport Connector

HOV Direct Connect*	HOV Direct Connect*	HOV Direct Connect*
Meade Avenue	Meade Avenue	
Harmon (to/from North)/Hacienda (to/from South)		Harmon (to/from North)/Hacienda (to/from South)
	Hacienda (to/from South)/Sunset (to/from north)	
Warm Springs (to/from North)		Warm Springs as option to Hacienda (to/from South)
Blue Diamond (to/from North)	Blue Diamond (to/from North)	
St. Rose Parkway (to/from North)	St. Rose Parkway (to/from North)	
Peak	Peak (ramps to the north)	
Smoke Ranch & US95		
Maryland Parkway & I-515	Maryland Parkway & I-515	
Rampart & Summerlin (to/from the East)		
Sunset & Western Beltway		
I-15 to US95 Interchange Direct Connect (I-15 NB to US95 NB, US95 SB to I-15 SB, each connection 2 lanes)	I-15 to US95 Interchange Direct Connect (I-15 NB to US95 NB, US95 SB to I-15 SB, each connection 1 lane)	I-15 to US95 Interchange Direct Connect (I-15 NB to US95 NB, US95 SB to I-15 SB, each connection 2 lanes)
I-215 to I-15 Interchange Direct Connect (I-215 WB to I-15 NB, I-215 EB to I-15 NB, I-15 SB to I-215 WB, I-15 SB to I-215 EB)	I-215 to I-15 Interchange Direct Connect (I-215 EB to I-15 NB, I-15 SB to I-215 WB)	I-215 to I-15 Interchange Direct Connect (I-215 WB to I-15 NB, I-15 SB to I-215 EB)
I-15 to Northern Beltway Interchange Direct Connect (I-15 NB to CC-215 WB, CC-215 EB to I-15 SB)	I-15 to Northern Beltway Interchange Direct Connect (I-15 NB to CC-215 WB, CC-215 EB to I-15 SB)	
I-215 to Airport Connector (I-215 EB to Airport, and Airport to I-215 WB)		I-215 to Airport Connector (I-215 EB to Airport, and Airport to I-215 WB)

* Note: Direct Connect ramps are to/from both directions unless otherwise specified

Park-and-ride	Park-and-ride
Bruner	
Rancho/Decatur	

APPENDIX E

2035 NETWORK CODING LIST

ID#	Changes Made to the Model	Comments
1	US95 southbound/Martin Luther King Boulevard ramp to I-15 northbound was coded as 2 lanes.	Changed the number of lanes between nodes 7011 and 7020
2	A short stretch of I-15 southbound just south of the point where the US95 northbound ramp to I-15 southbound merges with I-15 southbound was coded as 4.5 lanes.	Changed the number of lanes between nodes 15138 and 4032
3	The "RAMP MLK/US95S to I15S" in the model, north of Alta was removed. This is as per the “Phase VI Highlighted Plan” available from the Project Neon website.	
4	The functional classification of all the CD roads in the model was changed to "Expressway".	Changed CD roads functional classification from Minor Arterial and/or System to System Ramp to Expressway, similar to 2025 network.
5	Bearden Drive between Martin L King Boulevard and Shadow lane was coded as 1 lane in each direction.	Changed the number of lanes between nodes 9343 and 7858
6	The northbound link of the Bearden Drive and Shadow lane intersection was coded as 1 lane.	Changed the number of lanes between nodes 9343 and 6185
7	Laneage of I-15 northbound between Desert Inn Road and the Spaghetti Bowl was updated to match the “P3 30% Design Traffic Control, Signing, Lighting and ITS Plans” available from the Project Neon website.	
8	Charleston Boulevard between the I-15 ramp terminal intersections was coded as 4 lanes in each direction.	Changed the number of lanes between nodes 7866 and 9432
9	The southbound I-15 CD road (just north of Oakey Boulevard) after the merge with RAMP I15S CD I15S was coded as 2 lanes.	Changed the number of lanes between nodes 15466 and 14994
10	Utah Avenue was extended to intersect with Industrial Road.	
11	Industrial Road was coded to be a dead-end street, to end at the location where Industrial Road ends today.	
12	Grand Central Parkway intersection with Charleston Boulevard was coded as an at-grade intersection.	
13	The laneage for the Charleston Boulevard on-ramp to I-15 SB was adjusted to match the highlighted plans available from the Project Neon website.	
14	The location of the merge points of the Charleston Boulevard on-ramp to I-15 SB and the ramp from the SB CD road to I-15 SB was adjusted to match the highlighted plans available from the Project Neon website.	
15	The laneage of the off-ramp (just north of Charleston Boulevard) from the I-15 SB to the SB CD roads was adjusted to match the highlighted plans available from the Project Neon website.	
16	The location of the slip ramp from the I-15 NB mainline to the CD road was updated. This change reflects the location of the slip ramp in the field.	Move link to new location (similar to 2025 network), new link id is 36933
17	Area Type for I-15 CD roads between Tropicana and Sunset was adjusted from AT = 3 to 2.	
18	Area Type for I-15 HOV lanes between St. Rose Parkway and Sloan Road was adjusted from AT = 3 to 4.	
19	Area Type for the HOV ramps to/from I-15 and I-215 was adjusted from AT = 1 to 3	
20	Area Type for US-95 EB east of Summerlin was adjusted from AT = 4 to 3	
21	Ramps for SPUI were connected to Mainline and HOV at more than one location at the US-95 and Pecos Rd interchange; this was fixed. The functional classification of Ramp (link ID #25338) was changed from FC=3 to FC=4.	
22	HOV Ingress/Egress lanes were changed from 2-lanes directional to 1-lane directional.	To keep consistent with 2013 model revisions, changed lanes on the HOV access links.
23	Time of day percent distribution of trips was adjusted as explained in MTF#3.	
24	HOV Link Capacity was reduced from 1950 vphpl to 1500 vphpl.	
25	HOV Ingress/Egress link Capacity was reduced from 2000 vphpl to 1500 vphpl.	

APPENDIX F

TRAFFIC FORECASTING GUIDELINES CHECKLIST

Instructions: Please check-off the specific guidance from the Traffic Forecasting Guidelines that were followed in the preparation of your traffic forecast			
No.	**Item**	**Description**	**Check**
1	Definitions	Terms used in your traffic forecast are in accordance with the definitions provided in the Traffic Forecasting Guidelines.	✓
2	Truth in Data Principle	The traffic forecast satisfies the requirements of the Truth in Data principle.	✓
3	Rounding Convention	The traffic forecast was developed adhering to the rounding convention.	✓
4	Methodology Memorandum	A methodology memorandum document was prepared and submitted to NDOT as per guidance offered in the Traffic Forecasting Guidelines. Any changes from the accepted methodology memorandum are documented clearly in the traffic forecasting report.	✓
5	Traffic Factors (Seasonal Factors, Axle Factors, AADT, K_{30}, D_{30}, T%, etc.)	The traffic factors were obtained according to the guidance offered in the Traffic Forecasting Guidelines.	✓
6	Data Sources	The data sources were chosen according to the guidance offered in the Traffic Forecasting Guidelines.	✓
7	Adjusting K_{30} and D_{30}	K_{30} and D_{30} values were adjusted according to the guidance offered in the Traffic Forecasting Guidelines.	✓
Items 8 through 10 are relevant only if a travel demand model was used for traffic forecasting.			
8	Accuracy Levels	The accuracy levels listed in the Traffic Forecasting Guidelines were met or the necessary NCHRP Report 255 adjustments were performed.	✓
9	Model Output Conversion Factor (MOCF) (if needed)	An MOCF was estimated to obtain AADT from model outputs.	✓
10	Reasonableness Check with Historical Trend Projection	Historical trend projection was carried out to evaluate the reasonableness of the model projected volumes.	✓
11	Historical Trend Projection	A historical trend projection analysis was carried out according to the guidance in the Traffic Forecasting Guidelines.	✓
12	Constrained Facilities (if needed)	Guidance offered in the Traffic Forecasting Guidelines pertaining to constrained facilities was adopted.	✓
13	Peak Hour Volumes from DDHV	Peak hours of traffic were identified and the peak hour volumes were obtained from DDHV as per guidance offered in the Traffic Forecasting Guidelines.	✓
14	Estimation of Intersection Turning Movements	Intersection turning movements were estimated following recommended methodologies.	N/A
15	Truck Traffic Forecasting	Truck traffic was forecast according to the guidance offered in the Traffic Forecasting Guidelines.	✓

APPENDIX G

YEAR 2025 AADT FORECASTS

S.No	Freeway	Direction	Link Type	Link	2025 Forecast AADT
1	I-15	NB	Freeway	South of St. Rose off-ramp	33,500
2	I-15	NB	Ramp	St. Rose off-ramp	5,000
3	I-15	NB	Freeway	Between St. Rose off-ramp and on-ramp	28,500
4	I-15	NB	Ramp	St. Rose on-ramp	18,500
5	I-15	NB	Freeway	Between St. Rose on-ramp and Starr off-ramp	47,000
6	I-15	NB	Ramp	Starr off-ramp	1,400
7	I-15	NB	Freeway	Between Starr off-ramp and on-ramp	45,500
8	I-15	NB	Ramp	Starr on-ramp	15,000
9	I-15	NB	Freeway	Between Starr on-ramp and Cactus off-ramp	60,500
10	I-15	NB	Ramp	Cactus off-ramp	4,300
11	I-15	NB	Freeway	Between Cactus off-ramp and on-ramp	56,500
12	I-15	NB	Ramp	Cactus on-ramp	14,500
13	I-15	NB	Freeway	Between Cactus on-ramp and Silverado off-ramp	71,000
14	I-15	NB	Ramp	Silverado off-ramp	5,000
15	I-15	NB	Freeway	Between Silverado off-ramp and on-ramp	66,000
16	I-15	NB	Ramp	Silverado on-ramp	13,000
17	I-15	NB	Freeway	Between Silverado on-ramp and B.D/CD road off-ramp	79,000
18	I-15	NB	Ramp	B.D/CD road off-ramp	19,000
19	I-15	NB	Freeway	Between B.D/CD road off-ramp and B.D on-ramp	60,000
20	I-15	NB	Ramp	B.D on-ramp	13,500
21	I-15	NB	Freeway	Between B.D on-ramp and slip-ramp from CD road	74,000
22	I-15	NB	Ramp	Slip-ramp from CD road (near B.D)	13,000
23	I-15	NB	Freeway	Between slip-ramp from CD road (near B.D) and off-ramp to CD road	87,000
24	I-15	NB	Ramp	Off-ramp to CD road (near I-215)	21,000
25	I-15	NB	Freeway	Between off-ramp to CD road (near I-215) and on-ramp from I-215 WB	66,000
26	I-15	NB	Ramp	On-ramp from I-215 WB	42,500
27	I-15	NB	Freeway	Between on-ramp from I-215 WB and slip ramp to CD road (near Russell)	109,000
28	I-15	NB	Ramp	Slip ramp to CD road (near Russell)	14,500
29	I-15	NB	Freeway	Between slip ramp to CD road (near Russell) and slip ramp from CD road (near Trop)	93,000
30	I-15	NB	Ramp	Slip ramp from CD road (near Trop)	22,500
31	I-15	NB	Freeway	Between slip ramp from CD road (near Trop) and Tropicana on-ramp	116,000
32	I-15	NB	Ramp	Tropicana on-ramp	27,000
33	I-15	NB	Freeway	Between Tropicana on-ramp and Flamingo off-ramp	143,000
34	I-15	NB	Ramp	Flamingo off-ramp	21,500
35	I-15	NB	Freeway	Between Flamingo off-ramp and Spring Mtn off-ramp	121,000
36	I-15	NB	Ramp	Spring Mtn off-ramp	20,000
37	I-15	NB	Freeway	Between Spring Mtn off-ramp and Flamingo on-ramp	102,000

S.No	Freeway	Direction	Link Type	Link	2025 Forecast AADT
38	I-15	NB	Ramp	Flamingo on-ramp	20,000
39	I-15	NB	Freeway	Between Flamingo on-ramp and EB Spring Mtn on-ramp	122,000
40	I-15	NB	Ramp	EB Spring Mtn on-ramp	6,100
41	I-15	NB	Freeway	Between EB Spring Mtn on-ramp and WB Spring Mtn on-ramp	128,000
42	I-15	NB	Ramp	WB Spring Mtn on-ramp	18,500
43	I-15	NB	Freeway	Between WB Spring Mtn on-ramp and Sahara off-ramp	146,000
44	I-15	NB	Ramp	Sahara off-ramp	16,500
45	I-15	NB	Freeway	Between Sahara off-ramp and Sahara on-ramp	130,000
46	I-15	NB	Ramp	Sahara on-ramp	25,500
47	I-15	NB	Freeway	Between Sahara on-ramp and NB HOV DC to Wall St	155,000
48	I-15	NB	Ramp	NB HOV DC to Wall St	10,500
49	I-15	NB	Freeway	Between NB HOV DC to Wall St and Charleston off-ramp	145,000
50	I-15	NB	Ramp	Charleston off-ramp	15,000
51	I-15	NB	Freeway	Between Charleston off-ramp and DC from Wall St to NB HOV	130,000
52	I-15	NB	Ramp	DC from Wall St to NB HOV	12,000
53	I-15	NB	Freeway	Between DC from Wall St to NB HOV and Charleston on-ramp	142,000
54	I-15	NB	Ramp	Charleston on-ramp	12,000
55	I-15	NB	Freeway	Between Charleston on-ramp and off-ramp to US95 and MLK	154,000
56	I-15	NB	Ramp	Off-ramp to US95NB and MLK	31,500
57	I-15	NB	Freeway	Between off-ramp to US95NB and MLK and off-ramp to US95SB	122,000
58	I-15	NB	Ramp	Off-ramp to US95SB	17,000
59	I-15	NB	Freeway	Between Off-ramp to US95SB and HOV Flyover to US95 NB	105,000
60	I-15	NB	Ramp	HOV Flyover to US95 NB	21,500
61	I-15	NB	Freeway	Between HOV Flyover to US95 NB and on-ramp from US95SB and MLK	83,500
62	I-15	NB	Ramp	On-ramp from US95SB and MLK	23,500
63	I-15	NB	Freeway	Between on-ramp from US95SB and MLK and Washington D St off-ramp	107,000
64	I-15	NB	Ramp	Washington D St off-ramp	14,000
65	I-15	NB	Freeway	Between Washington D St off-ramp and US95NB on-ramp	93,500
66	I-15	NB	Ramp	US95NB on-ramp	2,400
67	I-15	NB	Freeway	North of US95NB on-ramp	95,500
68	I-15	SB	Freeway	North of Washington St off-ramp	98,000
69	I-15	SB	Ramp	Washington St off-ramp	3,500
70	I-15	SB	Freeway	Between Washington St off-ramp and US95NB off-ramp	94,500
71	I-15	SB	Ramp	US95NB off-ramp	31,500
72	I-15	SB	Freeway	Between US95NB off-ramp and D St on-ramp	63,500
73	I-15	SB	Ramp	D St on-ramp	16,000
74	I-15	SB	Freeway	Between D St on-ramp and HOV Flyover from US95 SB	79,000

S.No	Freeway	Direction	Link Type	Link	2025 Forecast AADT
75	I-15	SB	Ramp	HOV Flyover from US95 SB	18,500
76	I-15	SB	Freeway	Between HOV Flyover from US95 SB and US95NB on-ramp	97,500
77	I-15	SB	Ramp	US95NB on-ramp	26,000
78	I-15	SB	Freeway	Between US95NB on-ramp and Charleston off-ramp	124,000
79	I-15	SB	Ramp	Charleston off-ramp	7,600
80	I-15	SB	Freeway	Between Charleston off-ramp and off-ramp to CD road (to Sahara)	117,000
81	I-15	SB	Ramp	Off-ramp to CD road (to Sahara)	6,900
82	I-15	SB	Freeway	Between Off-ramp to CD road (to Sahara) and SB HOV DC to Wall St	109,000
83	I-15	SB	Ramp	SB HOV DC to Wall St	16,500
84	I-15	SB	Freeway	Between SB HOV DC to Wall St and Wall St DC to SB	93,000
85	I-15	SB	Ramp	Wall St DC to SB	10,500
86	I-15	SB	Freeway	Between Wall St DC to SB and Charleston on-ramp	103,000
87	I-15	SB	Ramp	Charleston on-ramp	8,800
88	I-15	SB	Freeway	Between Charleston on-ramp and on-ramp from CD road (near Oakey)	112,000
89	I-15	SB	Ramp	On-ramp from CD road (near Oakey)	18,000
90	I-15	SB	Freeway	Between On-ramp from CD road (near Oakey) and Sahara on-ramp	130,000
91	I-15	SB	Ramp	Sahara on-ramp	15,500
92	I-15	SB	Freeway	Between Sahara on-ramp and Spring Mtn off-ramp	146,000
93	I-15	SB	Ramp	Spring Mtn off-ramp	13,000
94	I-15	SB	Freeway	Between Spring Mtn off-ramp and Spring Mtn on-ramp	133,000
95	I-15	SB	Ramp	Spring Mtn on-ramp	18,500
96	I-15	SB	Freeway	Between Spring Mtn on-ramp and Flamingo WB off-ramp	151,000
97	I-15	SB	Ramp	Flamingo WB off-ramp	11,000
98	I-15	SB	Freeway	Between Flamingo WB off-ramp Flamingo EB off-ramp	141,000
99	I-15	SB	Ramp	Flamingo EB off-ramp	18,000
100	I-15	SB	Freeway	Between Flamingo EB off-ramp and Flamingo on-ramp	122,000
101	I-15	SB	Ramp	Flamingo on-ramp	15,000
102	I-15	SB	Freeway	Between Flamingo on-ramp and Tropicana off-ramp	137,000
103	I-15	SB	Ramp	Tropicana off-ramp	29,000
104	I-15	SB	Freeway	Between Tropicana off-ramp and slip ramp to CD road (near Trop)	108,000
105	I-15	SB	Ramp	Slip ramp to CD road (near Trop)	21,500
106	I-15	SB	Freeway	Between slip ramp to CD road (near Trop) and off-ramp to I-215	86,500
107	I-15	SB	Ramp	Off-ramp to I-215	35,500
108	I-15	SB	Freeway	Between Off-ramp to I-215 and ramp from CD road (near I-215)	51,000
109	I-15	SB	Ramp	Ramp from CD road (near I-215)	21,500
110	I-15	SB	Freeway	Between Ramp from CD road (near I-215) and B.D off-ramp	72,000
111	I-15	SB	Ramp	B.D off-ramp	25,500

S.No	Freeway	Direction	Link Type	Link	2025 Forecast AADT
112	I-15	SB	Freeway	Between B.D off-ramp and ramp from CD road (near B.D)	47,000
113	I-15	SB	Ramp	Ramp from CD road (near B.D)	19,000
114	I-15	SB	Freeway	Between Ramp from CD road (near B.D) and B.D on-ramp	66,000
115	I-15	SB	Ramp	B.D on-ramp	11,500
116	I-15	SB	Freeway	Between B.D on-ramp and Silverado off-ramp	77,000
117	I-15	SB	Ramp	Silverado off-ramp	11,000
118	I-15	SB	Freeway	Between Silverado off-ramp and on-ramp	66,500
119	I-15	SB	Ramp	Silverado on-ramp	2,000
120	I-15	SB	Freeway	Between Silverado on-ramp and Cactus off-ramp	68,500
121	I-15	SB	Ramp	Cactus off-ramp	13,000
122	I-15	SB	Freeway	Between Cactus off-ramp and on-ramp	55,500
123	I-15	SB	Ramp	Cactus on-ramp	2,500
124	I-15	SB	Freeway	Between Cactus on-ramp and Starr off-ramp	58,000
125	I-15	SB	Ramp	Starr off-ramp	17,000
126	I-15	SB	Freeway	Between Starr off-ramp and on-ramp	40,500
127	I-15	SB	Ramp	Starr on-ramp	1,600
128	I-15	SB	Freeway	Between Starr on-ramp and St.Rose off-ramp	42,000
129	I-15	SB	Ramp	St.Rose off-ramp	6,900
130	I-15	SB	Freeway	Between St.Rose off-ramp and on-ramp	35,500
131	I-15	SB	Ramp	St.Rose on-ramp	5,100
132	I-15	SB	Freeway	South of St.Rose on-ramp	40,500
133	US95	NB	Freeway	South of Charleston off-ramp	76,000
134	US95	NB	Ramp	Charleston off-ramp	15,500
135	US95	NB	Freeway	Between Charleston off-ramp and Charleston on-ramp	60,500
136	US95	NB	Ramp	Charleston on-ramp	19,000
137	US95	NB	Freeway	Between Charleston on-ramp and Eastern off-ramp	79,500
138	US95	NB	Ramp	Eastern off-ramp	8,000
139	US95	NB	Freeway	Between Eastern off-ramp and on-ramp	71,500
140	US95	NB	Ramp	Eastern on-ramp	19,000
141	US95	NB	Freeway	Between Eastern on-ramp and Las Vegas off-ramp	90,500
142	US95	NB	Ramp	Las Vegas off-ramp	8,500
143	US95	NB	Freeway	Between Las Vegas off-ramp and on-ramp	82,000
144	US95	NB	Ramp	Las Vegas on-ramp	9,400
145	US95	NB	Freeway	Between Las Vegas on-ramp and 4th St on-ramp	91,500
146	US95	NB	Ramp	4th St on-ramp	12,000
147	US95	NB	Freeway	Between 4th St on-ramp and I-15SB off-ramp	103,000
148	US95	NB	Ramp	I-15SB off-ramp	26,000

S.No	Freeway	Direction	Link Type	Link	2025 Forecast AADT
149	US95	NB	Freeway	Between I-15SB off-ramp and I-15NB off-ramp	77,000
150	US95	NB	Ramp	I-15NB off-ramp	2,400
151	US95	NB	Freeway	Between I-15NB off-ramp and MLK off-ramp	75,000
152	US95	NB	Ramp	MLK off-ramp	4,700
153	US95	NB	Freeway	Between MLK off-ramp and HOV I-15NB Flyover	70,500
154	US95	NB	Ramp	HOV I-15NB Flyover	21,500
155	US95	NB	Freeway	Between HOV I-15NB Flyover and I-15SB on-ramp	91,500
156	US95	NB	Ramp	I-15SB on-ramp	16,000
157	US95	NB	Freeway	Between I-15SB on-ramp and Rancho off-ramp	107,000
158	US95	NB	Ramp	Rancho off-ramp	21,000
159	US95	NB	Freeway	Between Rancho off-ramp and I-15NB on-ramp	86,000
160	US95	NB	Ramp	I-15NB on-ramp	29,500
161	US95	NB	Freeway	Between I-15NB on-ramp and Rancho on-ramp	116,000
162	US95	NB	Ramp	Rancho on-ramp	10,000
163	US95	NB	Freeway	North of Rancho on-ramp	126,000
164	US95	SB	Freeway	North of Rancho off-ramp	125,000
165	US95	SB	Ramp	Rancho off-ramp	9,700
166	US95	SB	Freeway	Between Rancho off-ramp and I-15 SB off-ramp	115,000
167	US95	SB	Ramp	I-15 SB off-ramp	27,500
168	US95	SB	Freeway	Between I-15 SB off-ramp and Rancho on-ramp	87,500
169	US95	SB	Ramp	Rancho on-ramp	11,500
170	US95	SB	Freeway	Between Rancho on-ramp and I-15SB HOV Flyover	99,000
171	US95	SB	Ramp	I-15SB HOV Flyover	18,500
172	US95	SB	Freeway	Between I-15SB HOV Flyover and I-15NB off-ramp	80,500
173	US95	SB	Ramp	I-15NB off-ramp	18,000
174	US95	SB	Freeway	Between I-15NB off-ramp and MLK on-ramp	62,500
175	US95	SB	Ramp	MLK on-ramp	10,500
176	US95	SB	Freeway	Between MLK on-ramp and I-15NB on-ramp	73,000
177	US95	SB	Ramp	I-15NB on-ramp	29,000
178	US95	SB	Freeway	Between I-15NB on-ramp and Casino off-ramp	102,000
179	US95	SB	Ramp	Casino off-ramp	9,900
180	US95	SB	Freeway	Between Casino off-ramp and Las Vegas off-ramp	92,000
181	US95	SB	Ramp	Las Vegas off-ramp	9,400
182	US95	SB	Freeway	Between Las Vegas off-ramp and on-ramp	82,500
183	US95	SB	Ramp	Las Vegas on-ramp	7,100
184	US95	SB	Freeway	Between Las Vegas on-ramp and Eastern off-ramp	90,000
185	US95	SB	Ramp	Eastern off-ramp	18,000

S.No	Freeway	Direction	Link Type	Link	2025 Forecast AADT
186	US95	SB	Freeway	Between Eastern off-ramp and on-ramp	71,500
187	US95	SB	Ramp	Eastern on-ramp	8,700
188	US95	SB	Freeway	Between Eastern on-ramp and Charleston off-ramp	80,500
189	US95	SB	Ramp	Charleston off-ramp	9,600
190	US95	SB	Freeway	Between Charleston off-ramp and on-ramp	71,000
191	US95	SB	Ramp	Charleston on-ramp	17,000
192	US95	SB	Freeway	South of Charleston on-ramp	88,000

APPENDIX H

YEAR 2035 AADT FORECASTS

S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
1	I-15	NB	Freeway	South of St. Rose off-ramp	45,000
2	I-15	NB	Ramp	St. Rose off-ramp	6,200
3	I-15	NB	Freeway	Between St. Rose off-ramp and on-ramp	39,000
4	I-15	NB	Ramp	St. Rose on-ramp	19,000
5	I-15	NB	Freeway	Between St. Rose on-ramp and DC from Bruner	58,000
6	I-15	NB	Ramp	DC from Bruner	3,700
7	I-15	NB	Freeway	Between DC from Bruner and Starr off-ramp	61,500
8	I-15	NB	Ramp	Starr off-ramp	1,800
9	I-15	NB	Freeway	Between Starr off-ramp and on-ramp	59,500
10	I-15	NB	Ramp	Starr on-ramp	17,000
11	I-15	NB	Freeway	Between Starr on-ramp and Cactus off-ramp	77,000
12	I-15	NB	Ramp	Cactus off-ramp	4,900
13	I-15	NB	Freeway	Between Cactus off-ramp and on-ramp	72,500
14	I-15	NB	Ramp	Cactus on-ramp	17,500
15	I-15	NB	Freeway	Between Cactus on-ramp and Silverado off-ramp	89,500
16	I-15	NB	Ramp	Silverado off-ramp	8,100
17	I-15	NB	Freeway	Between Silverado off-ramp and on-ramp	81,500
18	I-15	NB	Ramp	Silverado on-ramp	16,500
19	I-15	NB	Freeway	Between Silverado on-ramp and B.D/CD road off-ramp	97,500
20	I-15	NB	Ramp	B.D/CD road off-ramp	24,000
21	I-15	NB	Freeway	Between B.D/CD road off-ramp and DC from B.D	73,500
22	I-15	NB	Ramp	DC from B.D	6,900
23	I-15	NB	Freeway	Between DC from B.D and B.D on-ramp	80,500
24	I-15	NB	Ramp	B.D on-ramp	11,000
25	I-15	NB	Freeway	Between B.D on-ramp and slip-ramp from CD road	91,500
26	I-15	NB	Ramp	Slip-ramp from CD road (near B.D)	16,000
27	I-15	NB	Freeway	Between slip-ramp from CD road (near B.D) and off-ramp to CD road	108,000
28	I-15	NB	Ramp	Off-ramp to CD road (near I-215)	28,000
29	I-15	NB	Freeway	Between Off-ramp to CD road (near I-215) and HOV Flyover from I-215 EB	79,500
30	I-15	NB	Ramp	HOV Flyover from I-215 EB	12,500
31	I-15	NB	Freeway	Between HOV Flyover from I-215 EB and on-ramp from I-215 WB	92,000
32	I-15	NB	Ramp	On-ramp from I-215 WB	42,500
33	I-15	NB	Freeway	Between on-ramp from I-215 WB and DC from Sunset	135,000
34	I-15	NB	Ramp	DC from Sunset	12,000
35	I-15	NB	Freeway	Between DC from Sunset and slip ramp to CD road (near Russell)	147,000
36	I-15	NB	Ramp	Slip ramp to CD road (near Russell)	16,500
37	I-15	NB	Freeway	Between Slip ramp to CD road (near Russell) and DC to Hacienda	130,000

S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
38	I-15	NB	Ramp	DC to Hacienda	16,000
39	I-15	NB	Freeway	Between DC to Hacienda and slip ramp from CD road (near Trop)	114,000
40	I-15	NB	Ramp	Slip ramp from CD road (near Trop)	15,000
41	I-15	NB	Freeway	Between slip ramp from CD road (near Trop) and Tropicana on-ramp	129,000
42	I-15	NB	Ramp	Tropicana on-ramp	31,500
43	I-15	NB	Freeway	Between Tropicana on-ramp and Flamingo off-ramp	161,000
44	I-15	NB	Ramp	Flamingo off-ramp	24,000
45	I-15	NB	Freeway	Between Flamingo off-ramp and Spring Mtn off-ramp	137,000
46	I-15	NB	Ramp	Spring Mtn off-ramp	18,500
47	I-15	NB	Freeway	Between Spring Mtn off-ramp and Flamingo on-ramp	118,000
48	I-15	NB	Ramp	Flamingo on-ramp	24,500
49	I-15	NB	Freeway	Between Flamingo on-ramp and EB Spring Mtn on-ramp	142,000
50	I-15	NB	Ramp	EB Spring Mtn on-ramp	6,700
51	I-15	NB	Freeway	Between EB Spring Mtn on-ramp and WB Spring Mtn on-ramp	149,000
52	I-15	NB	Ramp	WB Spring Mtn on-ramp	17,500
53	I-15	NB	Freeway	Between WB Spring Mtn on-ramp and DC to Meade	167,000
54	I-15	NB	Ramp	DC to Meade	12,500
55	I-15	NB	Freeway	Between DC to Meade and DC from Meade	155,000
56	I-15	NB	Ramp	DC from Meade	12,500
57	I-15	NB	Freeway	Between DC from Meade and Sahara off-ramp	167,000
58	I-15	NB	Ramp	Sahara off-ramp	15,500
59	I-15	NB	Freeway	Between Sahara off-ramp and off-ramp to CD road near Sahara	151,000
60	I-15	NB	Ramp	Off-ramp to CD road near Sahara	28,500
61	I-15	NB	Freeway	Between off-ramp to CD road near Sahara and NB HOV DC to Wall St	123,000
62	I-15	NB	Ramp	NB HOV DC to Wall St	11,500
63	I-15	NB	Freeway	Between NB HOV DC to Wall St and Charleston off-ramp	112,000
64	I-15	NB	Ramp	Charleston off-ramp	16,000
65	I-15	NB	Freeway	Between Charleston off-ramp and DC from Wall St to NB HOV	95,500
66	I-15	NB	Ramp	DC from Wall St to NB HOV	16,000
67	I-15	NB	Freeway	Between DC from Wall St to NB HOV and on-ramp from CD road (near Charleston)	112,000
68	I-15	NB	Ramp	On-ramp from CD road (near Charleston)	15,000
69	I-15	NB	Freeway	Between on-ramp from CD road (near Charleston) and Charleston on-ramp	127,000
70	I-15	NB	Ramp	Charleston on-ramp	12,500
71	I-15	NB	Freeway	Between Charleston on-ramp and off-ramp to US95 SB	139,000
72	I-15	NB	Ramp	Off-ramp to US95 SB	18,500
73	I-15	NB	Freeway	Between Off-ramp to US95SB and HOV Flyover to US95 NB	120,000
74	I-15	NB	Ramp	HOV Flyover to US95 NB	28,500

S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
75	I-15	NB	Freeway	Between HOV Flyover to US95 NB and Washington D St off-ramp	91,500
76	I-15	NB	Ramp	Washington D St off-ramp	15,500
77	I-15	NB	Freeway	Between Washington D St off-ramp and US95 NB/SB on-ramp	76,500
78	I-15	NB	Ramp	US95 NB/SB on-ramp	28,500
79	I-15	NB	Freeway	Between US95 NB/SB on-ramp and Washington St on-ramp	105,000
80	I-15	NB	Ramp	Washington St on-ramp	4,000
81	I-15	NB	Freeway	North of Washington St on-ramp	109,000
82	I-15	SB	Freeway	North of Washington St off-ramp	114,000
83	I-15	SB	Ramp	Washington St off-ramp	4,200
84	I-15	SB	Freeway	Between Washington St off-ramp and US95NB off-ramp	109,000
85	I-15	SB	Ramp	US95NB off-ramp	34,500
86	I-15	SB	Freeway	Between US95NB off-ramp and D St on-ramp	75,000
87	I-15	SB	Ramp	D St on-ramp	17,000
88	I-15	SB	Freeway	Between D St on-ramp and HOV Flyover from US95 SB	92,000
89	I-15	SB	Ramp	HOV Flyover from US95 SB	28,500
90	I-15	SB	Freeway	Between HOV Flyover from US95 SB and US95NB on-ramp	121,000
91	I-15	SB	Ramp	US95NB on-ramp	28,000
92	I-15	SB	Freeway	Between US95NB on-ramp and Charleston off-ramp	149,000
93	I-15	SB	Ramp	Charleston off-ramp	6,700
94	I-15	SB	Freeway	Between Charleston off-ramp and off-ramp to CD road (to Sahara)	142,000
95	I-15	SB	Ramp	Off-ramp to CD road (to Sahara)	11,500
96	I-15	SB	Freeway	Between Off-ramp to CD road (to Sahara) and SB HOV DC to Wall St	131,000
97	I-15	SB	Ramp	SB HOV DC to Wall St	19,000
98	I-15	SB	Freeway	Between SB HOV DC to Wall St and Wall St DC to SB	112,000
99	I-15	SB	Ramp	Wall St DC to SB	11,500
100	I-15	SB	Freeway	Between Wall St DC to SB and Charleston on-ramp	123,000
101	I-15	SB	Ramp	Charleston on-ramp	11,000
102	I-15	SB	Freeway	Between Charleston on-ramp and on-ramp from CD road (near Oakey)	134,000
103	I-15	SB	Ramp	On-ramp from CD road (near Oakey)	20,500
104	I-15	SB	Freeway	Between On-ramp from CD road (near Oakey) and Sahara on-ramp	154,000
105	I-15	SB	Ramp	Sahara on-ramp	14,500
106	I-15	SB	Freeway	Between Sahara on-ramp and DC to Meade	169,000
107	I-15	SB	Ramp	DC to Meade	12,500
108	I-15	SB	Freeway	Between DC to Meade and DC from Meade	157,000
109	I-15	SB	Ramp	DC from Meade	9,200
110	I-15	SB	Freeway	Between DC from Meade and Spring Mtn off-ramp	166,000
111	I-15	SB	Ramp	Spring Mtn off-ramp	12,500

S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
112	I-15	SB	Freeway	Between Spring Mtn off-ramp and Spring Mtn on-ramp	154,000
113	I-15	SB	Ramp	Spring Mtn on-ramp	19,000
114	I-15	SB	Freeway	Between Spring Mtn on-ramp and Flamingo WB off-ramp	172,000
115	I-15	SB	Ramp	Flamingo WB off-ramp	11,500
116	I-15	SB	Freeway	Between Flamingo WB off-ramp and Flamingo EB off-ramp	160,000
117	I-15	SB	Ramp	Flamingo EB off-ramp	18,500
118	I-15	SB	Freeway	Between Flamingo EB off-ramp and Flamingo on-ramp	142,000
119	I-15	SB	Ramp	Flamingo on-ramp	16,500
120	I-15	SB	Freeway	Between Flamingo on-ramp and Tropicana off-ramp	159,000
121	I-15	SB	Ramp	Tropicana off-ramp	30,500
122	I-15	SB	Freeway	Between Tropicana off-ramp and slip ramp to CD road (near Trop)	128,000
123	I-15	SB	Ramp	Slip ramp to CD road (near Trop)	14,500
124	I-15	SB	Freeway	Between Slip ramp to CD road (near Trop) and DC from Hacienda	114,000
125	I-15	SB	Ramp	DC from Hacienda	16,000
126	I-15	SB	Freeway	Between DC from Hacienda and DC to Sunset	130,000
127	I-15	SB	Ramp	DC to Sunset	14,000
128	I-15	SB	Freeway	Between DC to Sunset and off-ramp to I-215	116,000
129	I-15	SB	Ramp	Off-ramp to I-215	34,000
130	I-15	SB	Freeway	Between Off-ramp to I-215 and HOV Flyover to I-215 WB	81,500
131	I-15	SB	Ramp	HOV Flyover to I-215 WB	10,000
132	I-15	SB	Freeway	Between HOV Flyover to I-215 WB and ramp from CD road (near I-215)	71,500
133	I-15	SB	Ramp	Ramp from CD road (near I-215)	22,000
134	I-15	SB	Freeway	Between Ramp from CD road (near I-215) and B.D off-ramp	93,500
135	I-15	SB	Ramp	B.D off-ramp	24,500
136	I-15	SB	Freeway	Between B.D off-ramp and DC to B.D	69,000
137	I-15	SB	Ramp	DC to B.D	7,200
138	I-15	SB	Freeway	Between DC to B.D and ramp from CD road (near B.D)	61,500
139	I-15	SB	Ramp	Ramp from CD road (near B.D)	22,000
140	I-15	SB	Freeway	Between Ramp from CD road (near B.D) and B.D on-ramp	84,000
141	I-15	SB	Ramp	B.D on-ramp	13,500
142	I-15	SB	Freeway	Between B.D on-ramp and Silverado off-ramp	97,000
143	I-15	SB	Ramp	Silverado off-ramp	12,500
144	I-15	SB	Freeway	Between Silverado off-ramp and on-ramp	84,500
145	I-15	SB	Ramp	Silverado on-ramp	3,900
146	I-15	SB	Freeway	Between Silverado on-ramp and Cactus off-ramp	88,500
147	I-15	SB	Ramp	Cactus off-ramp	15,500
148	I-15	SB	Freeway	Between Cactus off-ramp and on-ramp	72,500

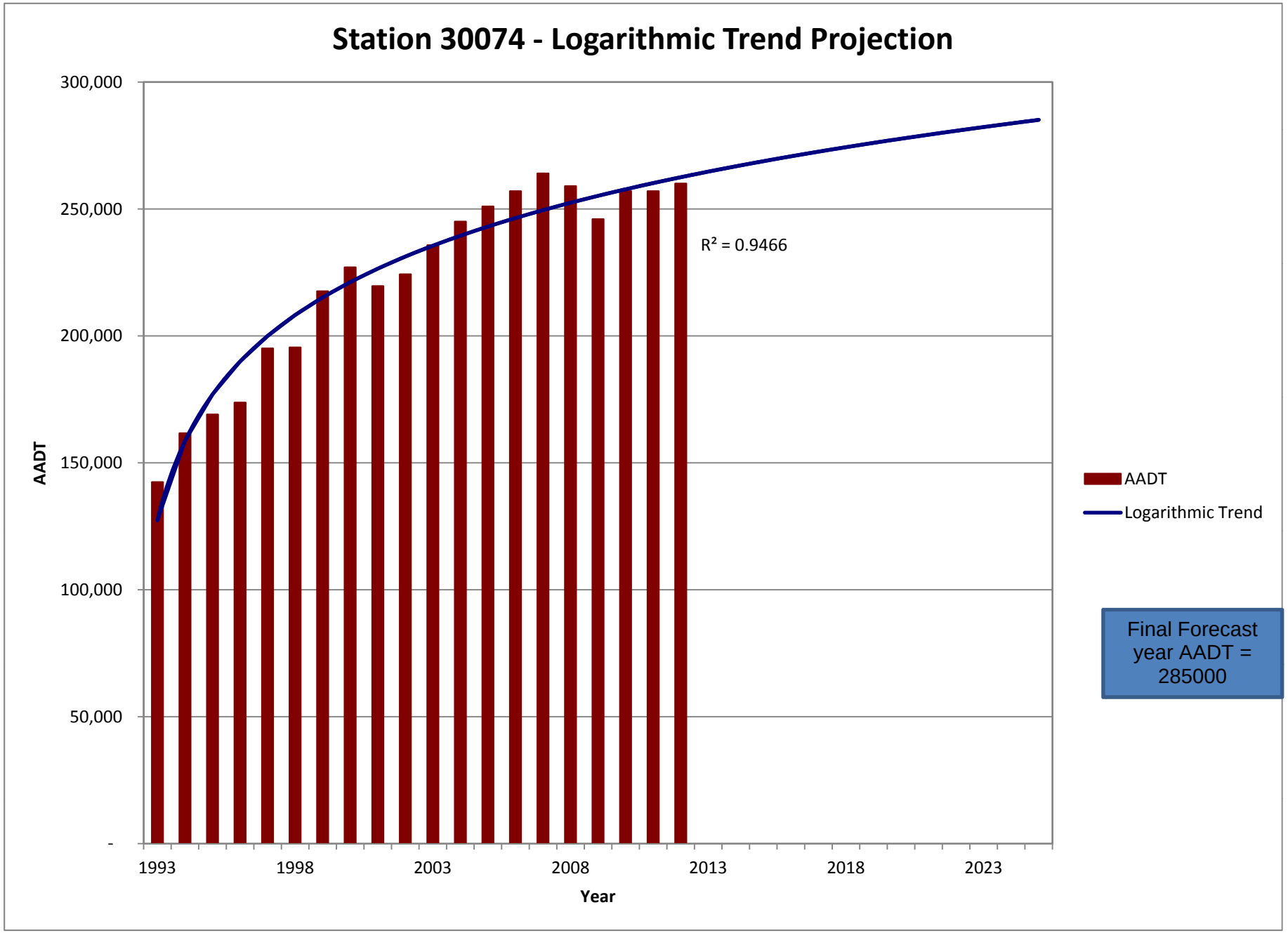
S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
149	I-15	SB	Ramp	Cactus on-ramp	3,800
150	I-15	SB	Freeway	Between Cactus on-ramp and Starr off-ramp	76,500
151	I-15	SB	Ramp	Starr off-ramp	19,500
152	I-15	SB	Freeway	Between Starr off-ramp and on-ramp	57,000
153	I-15	SB	Ramp	Starr on-ramp	2,600
154	I-15	SB	Freeway	Between Starr on-ramp and DC to Bruner	59,500
155	I-15	SB	Ramp	DC to Bruner	3,600
156	I-15	SB	Freeway	Between DC to Bruner and St.Rose off-ramp	56,000
157	I-15	SB	Ramp	St.Rose off-ramp	7,700
158	I-15	SB	Freeway	Between St.Rose off-ramp and on-ramp	48,500
159	I-15	SB	Ramp	St.Rose on-ramp	6,200
160	I-15	SB	Freeway	South of St.Rose on-ramp	54,500
161	US95	NB	Freeway	South of Charleston off-ramp	89,000
162	US95	NB	Ramp	Charleston off-ramp	16,500
163	US95	NB	Freeway	Between Charleston off-ramp and Charleston on-ramp	72,500
164	US95	NB	Ramp	Charleston on-ramp	19,500
165	US95	NB	Freeway	Between Charleston on-ramp and Pecos on-ramp	92,500
166	US95	NB	Ramp	Pecos on-ramp	8,700
167	US95	NB	Freeway	Between Pecos on-ramp and Eastern off-ramp	101,000
168	US95	NB	Ramp	Eastern off-ramp	6,000
169	US95	NB	Freeway	Between Eastern off-ramp and on-ramp	95,000
170	US95	NB	Ramp	Eastern on-ramp	18,500
171	US95	NB	Freeway	Between Eastern on-ramp and DC to Maryland	114,000
172	US95	NB	Ramp	DC to Maryland	8,700
173	US95	NB	Freeway	Between DC to Maryland and DC from Maryland	105,000
174	US95	NB	Ramp	DC from Maryland	10,500
175	US95	NB	Freeway	Between DC from Maryland and Las Vegas off-ramp	115,000
176	US95	NB	Ramp	Las Vegas off-ramp	6,700
177	US95	NB	Freeway	Between Las Vegas off-ramp and I-15 NB/SB off-ramp	109,000
178	US95	NB	Ramp	I-15 NB/SB off-ramp	28,500
179	US95	NB	Freeway	Between I-15 NB/SB off-ramp and MLK off-ramp	80,000
180	US95	NB	Ramp	MLK off-ramp	6,600
181	US95	NB	Freeway	Between MLK off-ramp and Las Vegas on-ramp	73,500
182	US95	NB	Ramp	Las Vegas on-ramp	10,000
183	US95	NB	Freeway	Between Las Vegas on-ramp and HOV I-15NB Flyover	83,500
184	US95	NB	Ramp	HOV I-15NB Flyover	28,500
185	US95	NB	Freeway	Between HOV I-15NB Flyover and I-15SB on-ramp	112,000

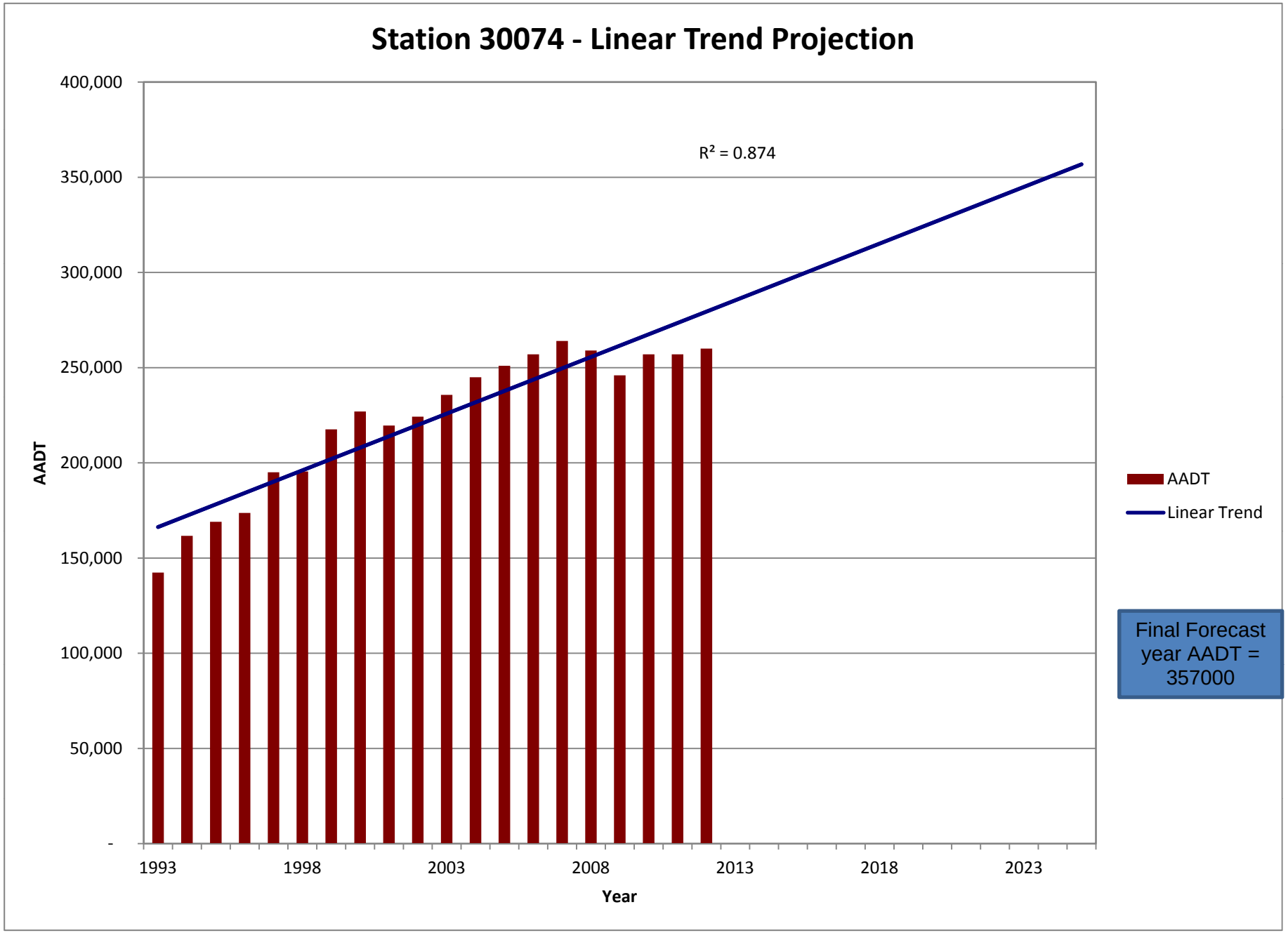
S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
186	US95	NB	Ramp	I-15SB on-ramp	16,000
187	US95	NB	Freeway	Between I-15SB on-ramp and Rancho off-ramp	128,000
188	US95	NB	Ramp	Rancho off-ramp	25,000
189	US95	NB	Freeway	Between Rancho off-ramp and I-15NB on-ramp	104,000
190	US95	NB	Ramp	I-15NB on-ramp	29,500
191	US95	NB	Freeway	Between I-15NB on-ramp and Rancho on-ramp	133,000
192	US95	NB	Ramp	Rancho on-ramp	12,000
193	US95	NB	Freeway	North of Rancho on-ramp	146,000
194	US95	SB	Freeway	North of Rancho off-ramp	145,000
195	US95	SB	Ramp	Rancho off-ramp	10,000
196	US95	SB	Freeway	Between Rancho off-ramp and I-15 SB off-ramp	135,000
197	US95	SB	Ramp	I-15 SB off-ramp	29,000
198	US95	SB	Freeway	Between I-15 SB off-ramp and Rancho on-ramp	106,000
199	US95	SB	Ramp	Rancho on-ramp	12,500
200	US95	SB	Freeway	Between Rancho on-ramp and I-15 NB off-ramp	118,000
201	US95	SB	Ramp	I-15 NB off-ramp	19,500
202	US95	SB	Freeway	Between I-15 NB off-ramp and I-15SB HOV Flyover	98,500
203	US95	SB	Ramp	I-15SB HOV Flyover	28,500
204	US95	SB	Freeway	Between I-15SB HOV Flyover and Casino/Las Vegas off-ramp	70,000
205	US95	SB	Ramp	Casino/Las Vegas off-ramp	20,500
206	US95	SB	Freeway	Between Casino/4th/Las Vegas off-ramp and MLK on-ramp	50,000
207	US95	SB	Ramp	MLK on-ramp	11,000
208	US95	SB	Freeway	Between MLK on-ramp and off-ramp to CD road (Near City Parkway)	61,500
209	US95	SB	Ramp	Off-ramp to CD road (Near City Parkway)	17,500
210	US95	SB	Freeway	Between Off-ramp to CD road (Near City Parkway) and DC to Maryland	43,500
211	US95	SB	Ramp	DC to Maryland	11,500
212	US95	SB	Freeway	Between DC to Maryland and DC from Maryland	32,000
213	US95	SB	Ramp	DC from Maryland	8,700
214	US95	SB	Freeway	Between DC from Maryland and on-ramp from CD road (near Eastern)	40,500
215	US95	SB	Ramp	On-ramp from CD road (near Eastern)	38,000
216	US95	SB	Freeway	Between On-ramp from CD road (near Eastern) and Eastern on-ramp	78,500
217	US95	SB	Ramp	Eastern on-ramp	8,900
218	US95	SB	Freeway	Between Eastern on-ramp and Pecos off-ramp	87,500
219	US95	SB	Ramp	Pecos off-ramp	6,900
220	US95	SB	Freeway	Between Pecos off-ramp and Charleston off-ramp	80,000
221	US95	SB	Ramp	Charleston off-ramp	10,500
222	US95	SB	Freeway	Between Charleston off-ramp and Pecos on-ramp	70,000

S.No	Freeway	Direction	Link Type	Link	2035 Forecast AADT
223	US95	SB	Ramp	Pecos on-ramp	8,500
224	US95	SB	Freeway	Between Pecos on-ramp and Charleston on-ramp	78,500
225	US95	SB	Ramp	Charleston on-ramp	18,000
226	US95	SB	Freeway	South of Charleston on-ramp	96,500

APPENDIX I

HISTORICAL TREND PROJECTIONS – YEAR 2025


Station 30074 - Logarithmic Trend Projection
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
Year
R² = 0.9466
AADT
Logarithmic Trend
Final Forecast year AADT = 285000


Station 30074 - Linear Trend Projection
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350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
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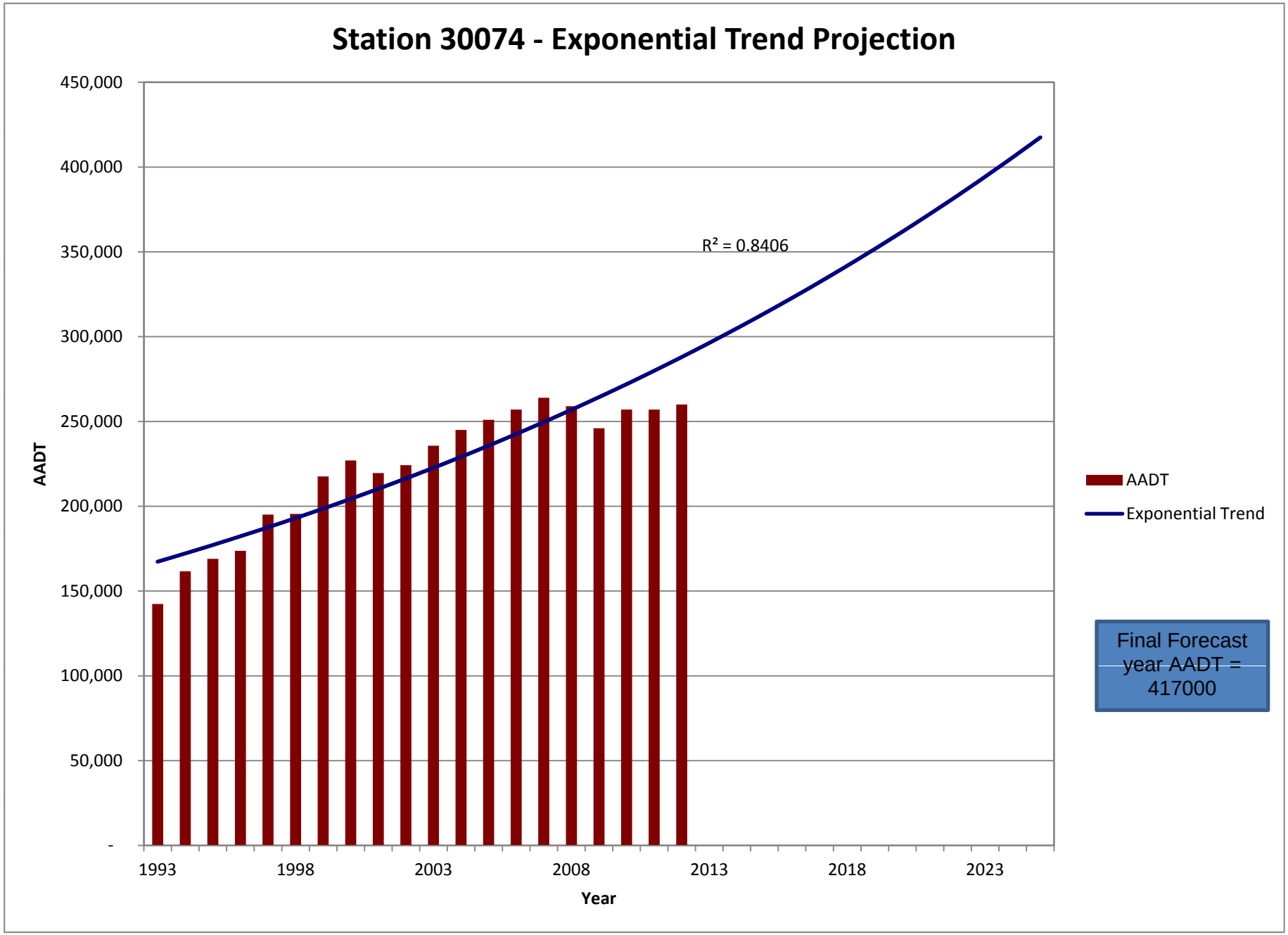
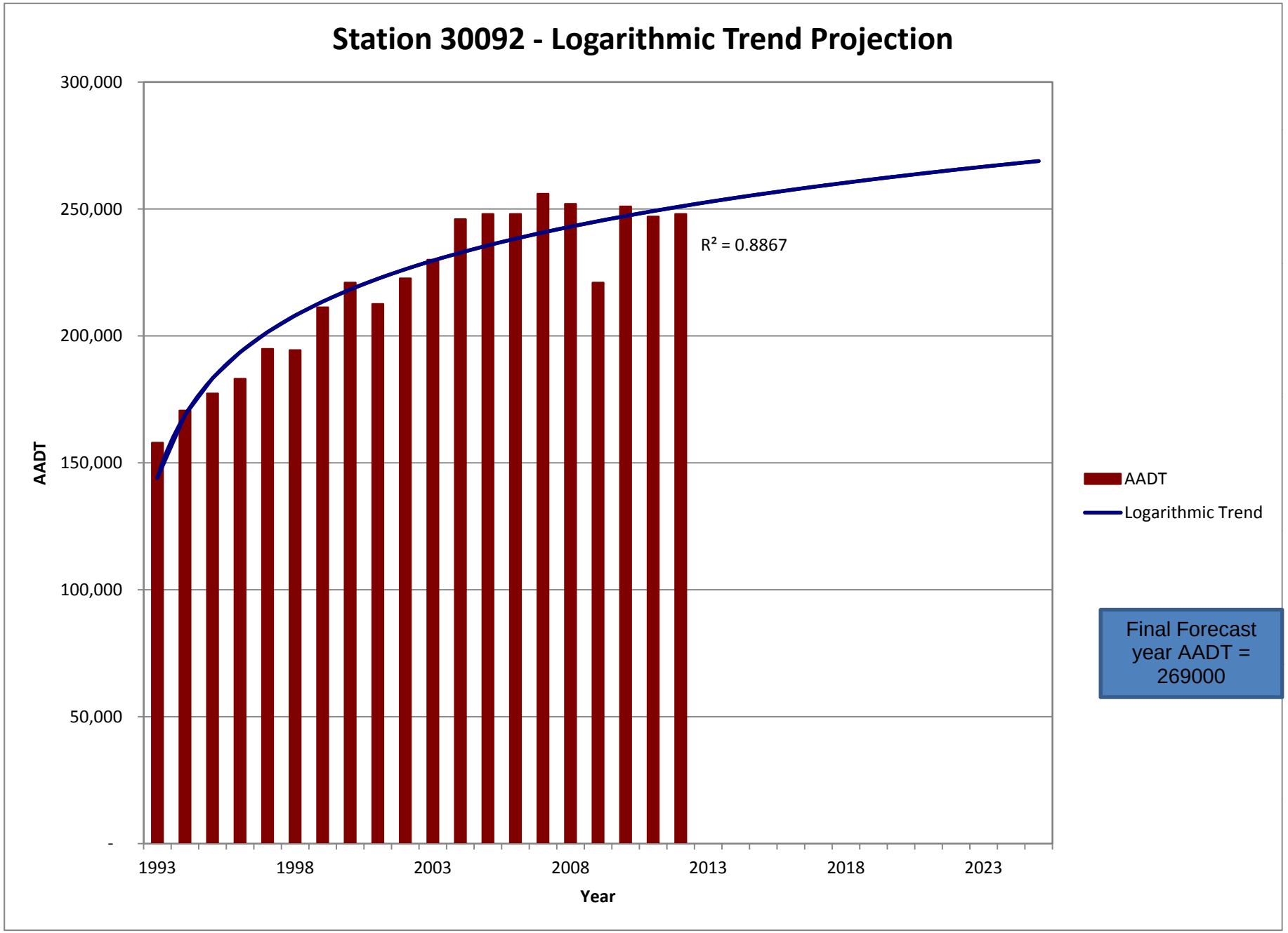
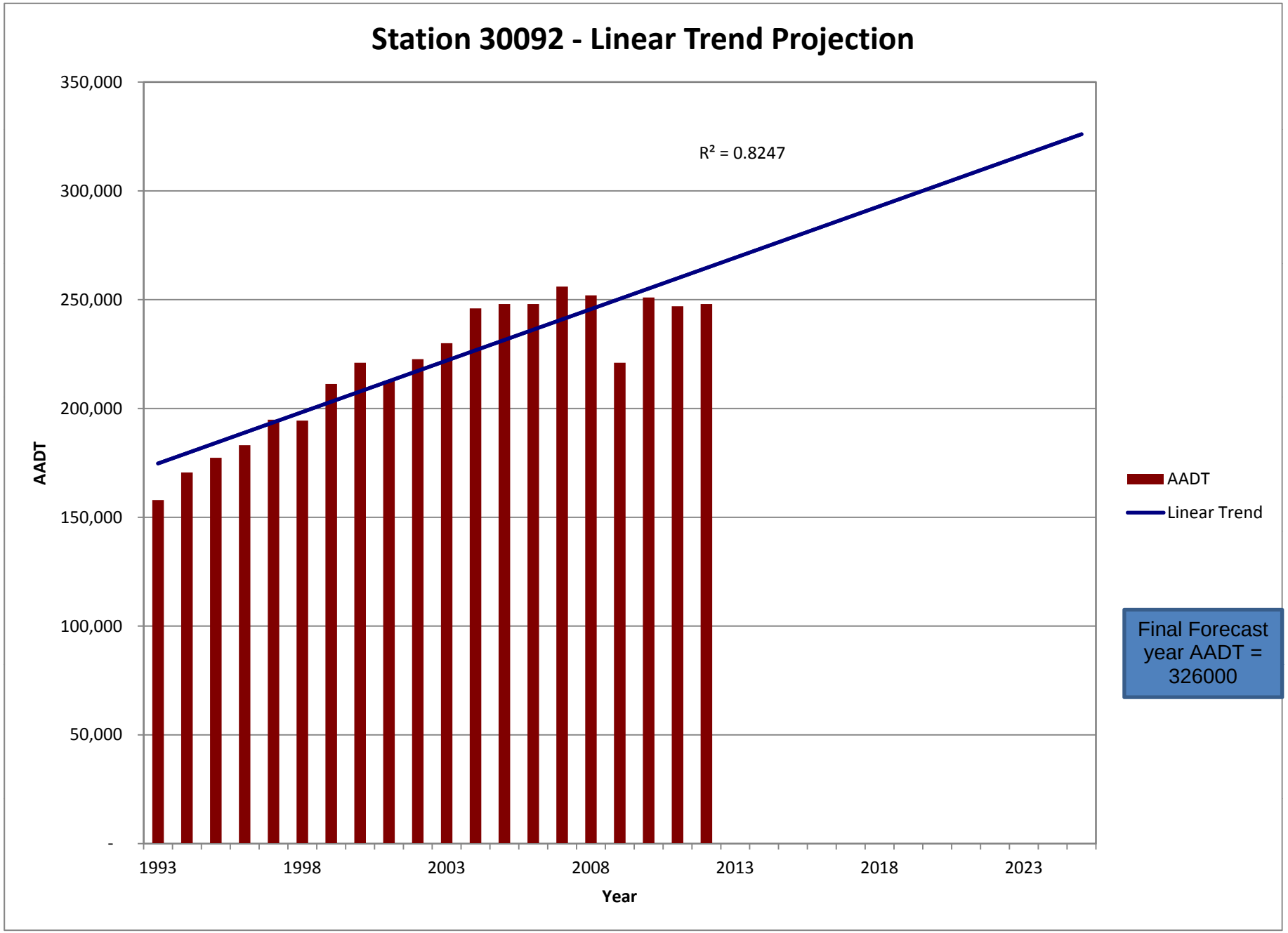
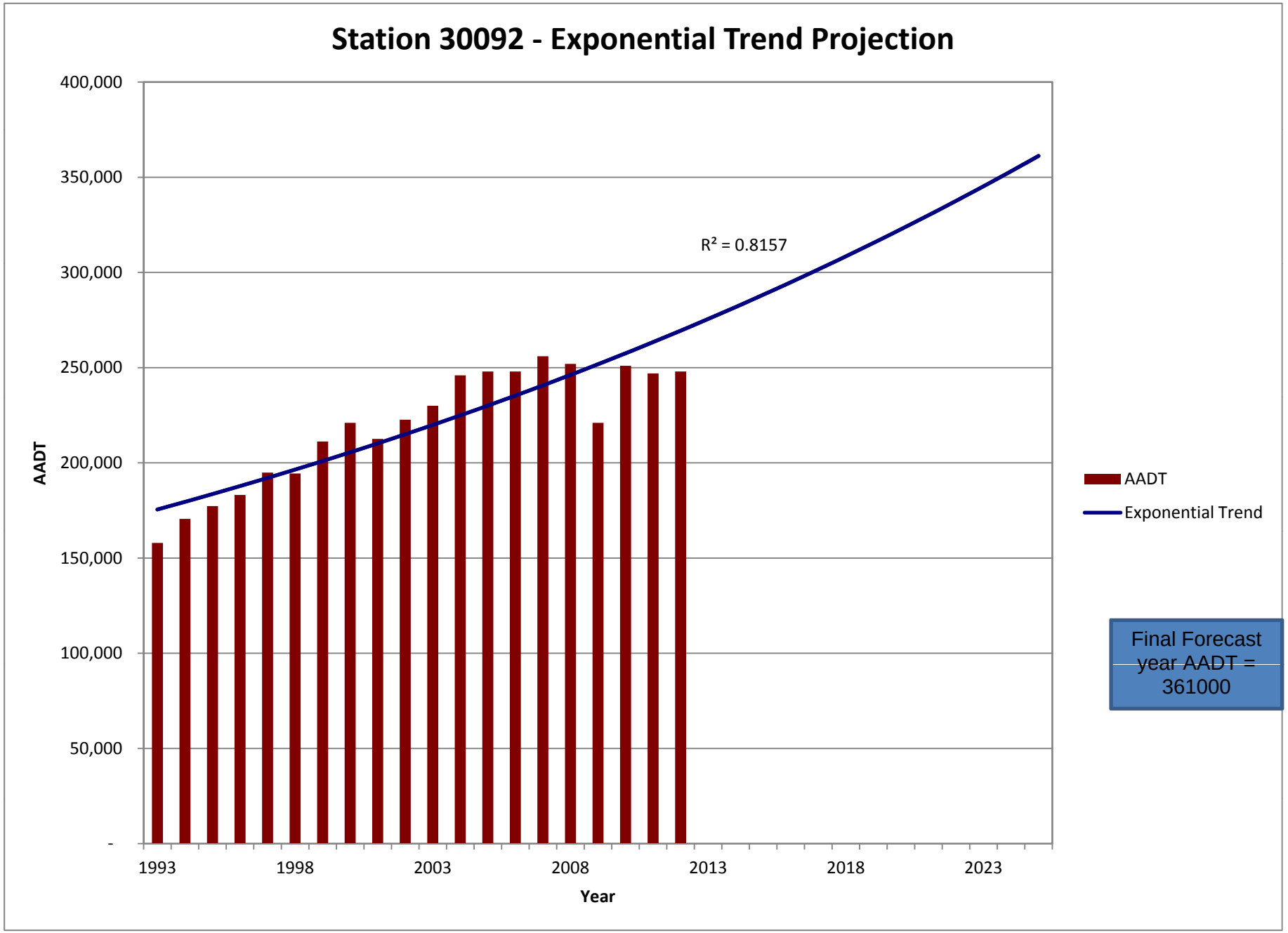
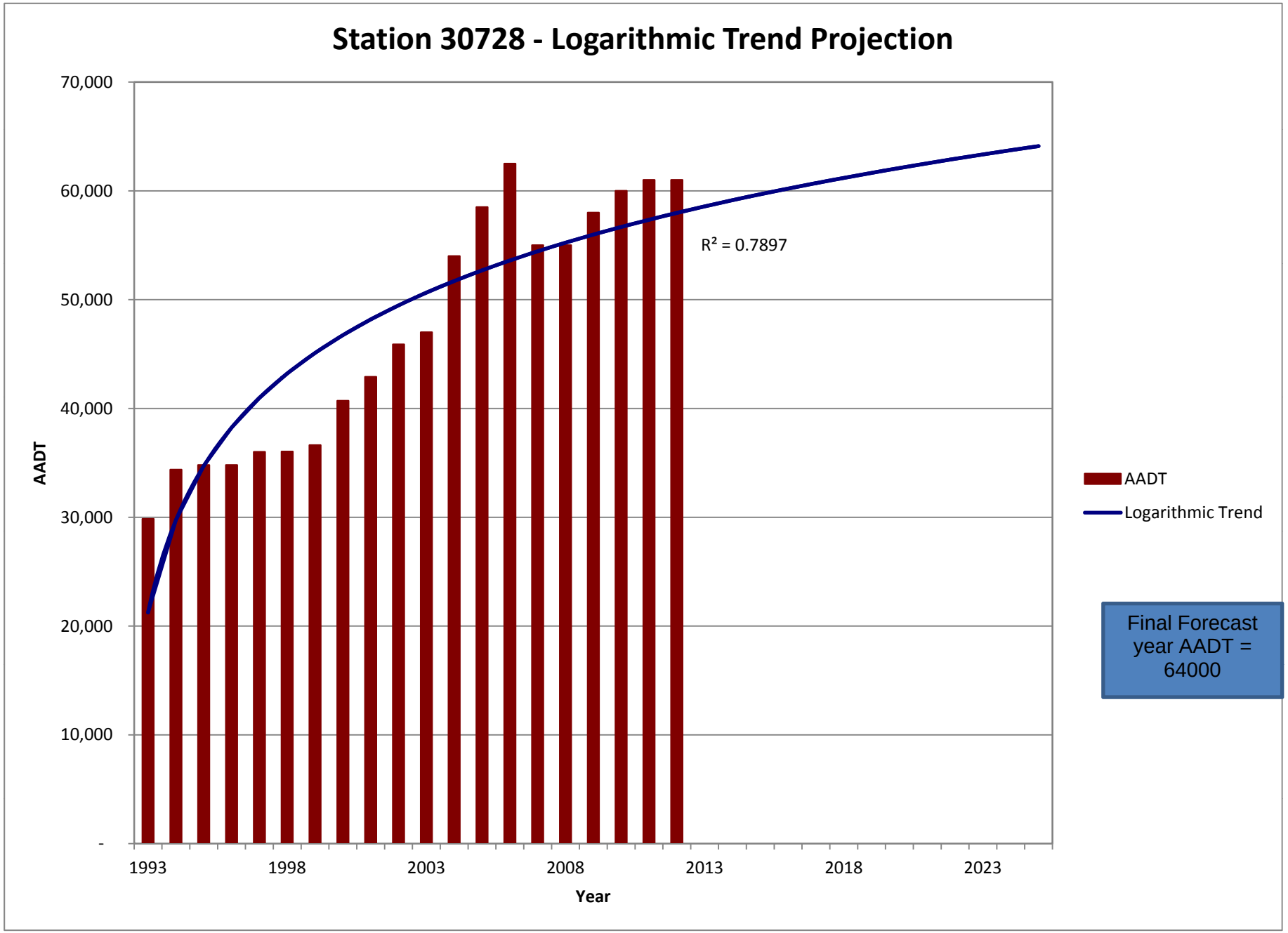
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Linear Trend
Final Forecast year AADT = 357000

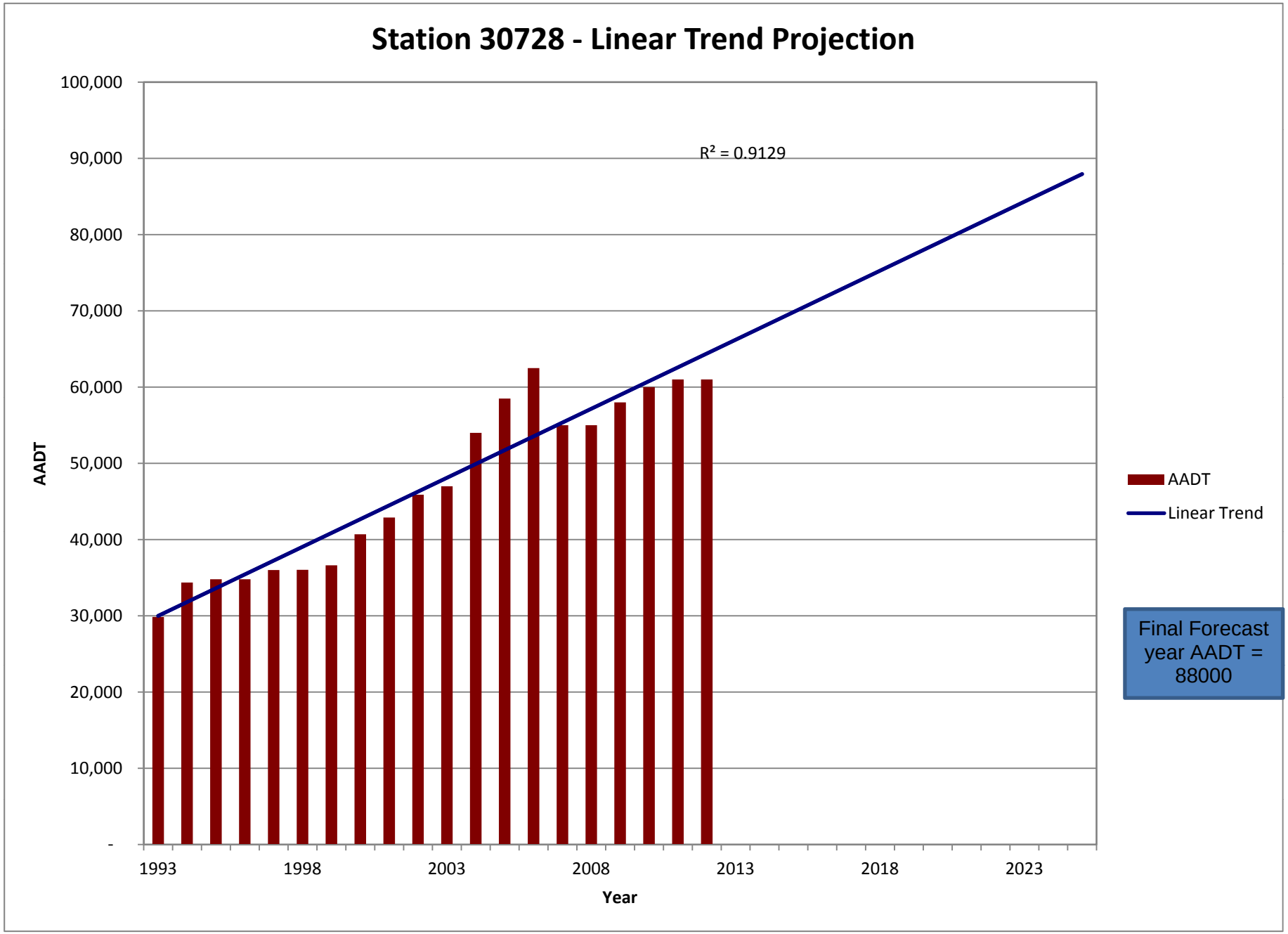

Station 30074 - Exponential Trend Projection
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.8406
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Exponential Trend
Final Forecast year AADT = 417000

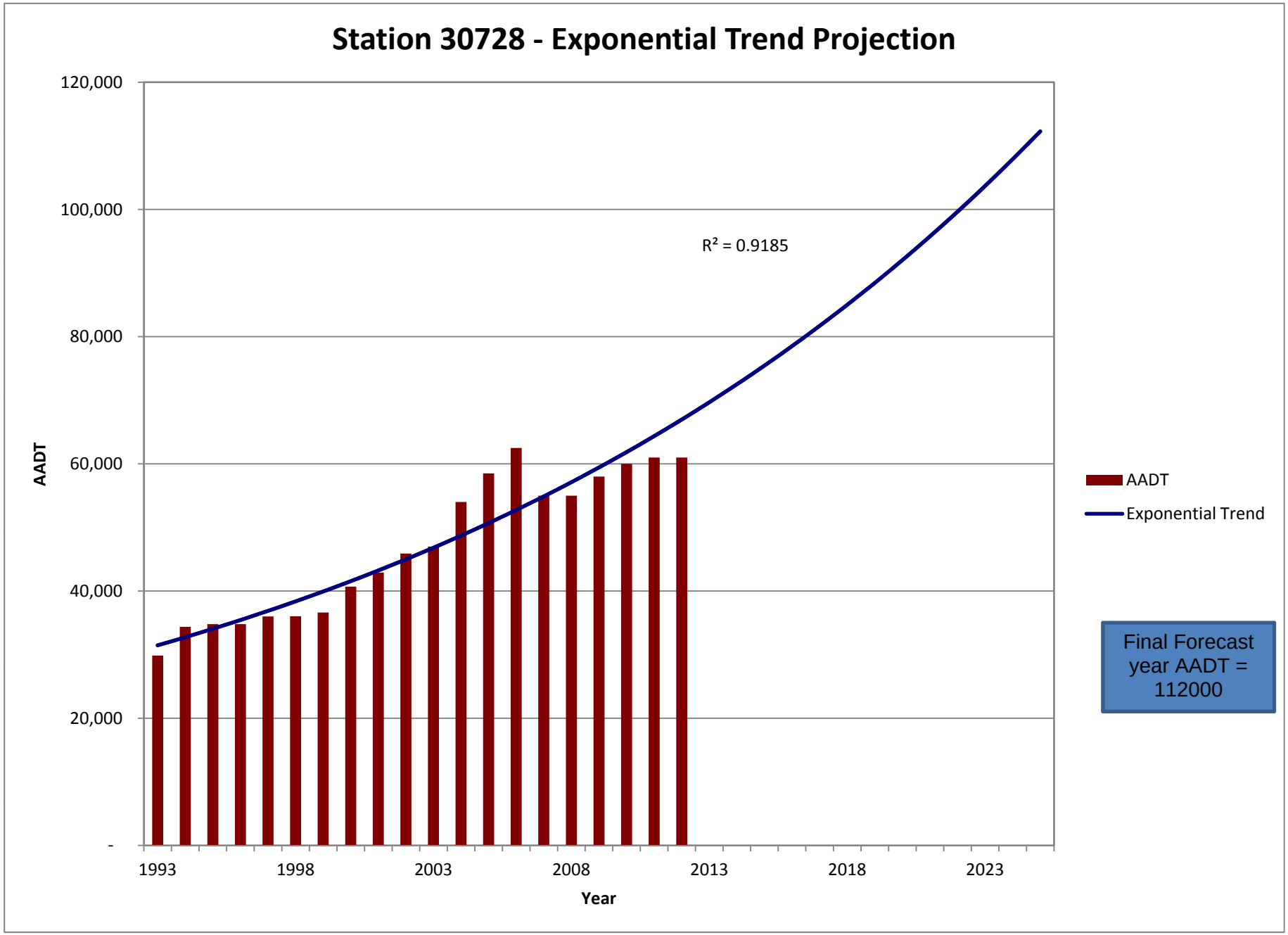

Station 30092 - Logarithmic Trend Projection
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
Year
R² = 0.8867
AADT
Logarithmic Trend
Final Forecast year AADT = 269000

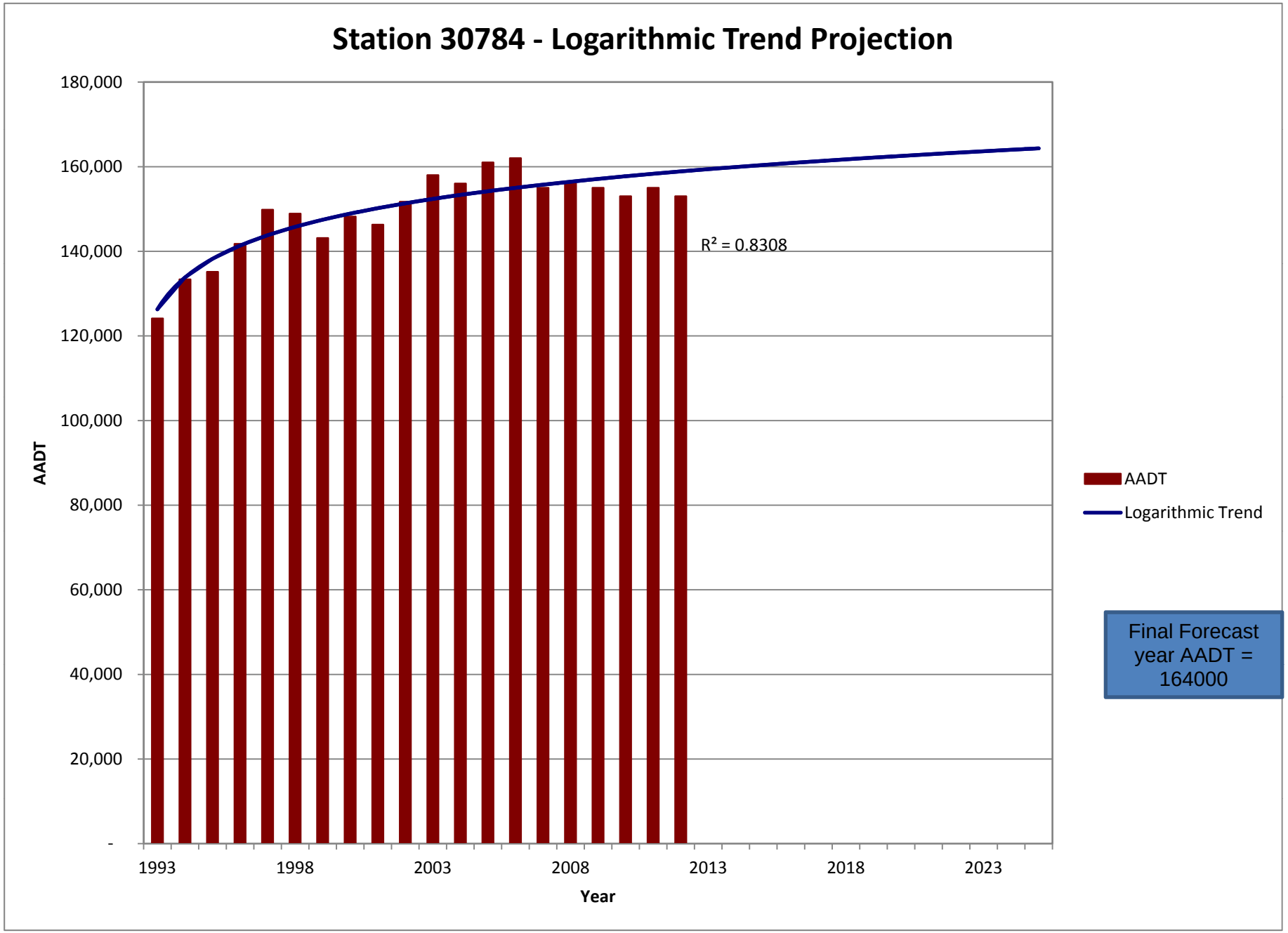

Station 30092 - Linear Trend Projection
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.8247
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Linear Trend
Final Forecast year AADT = 326000

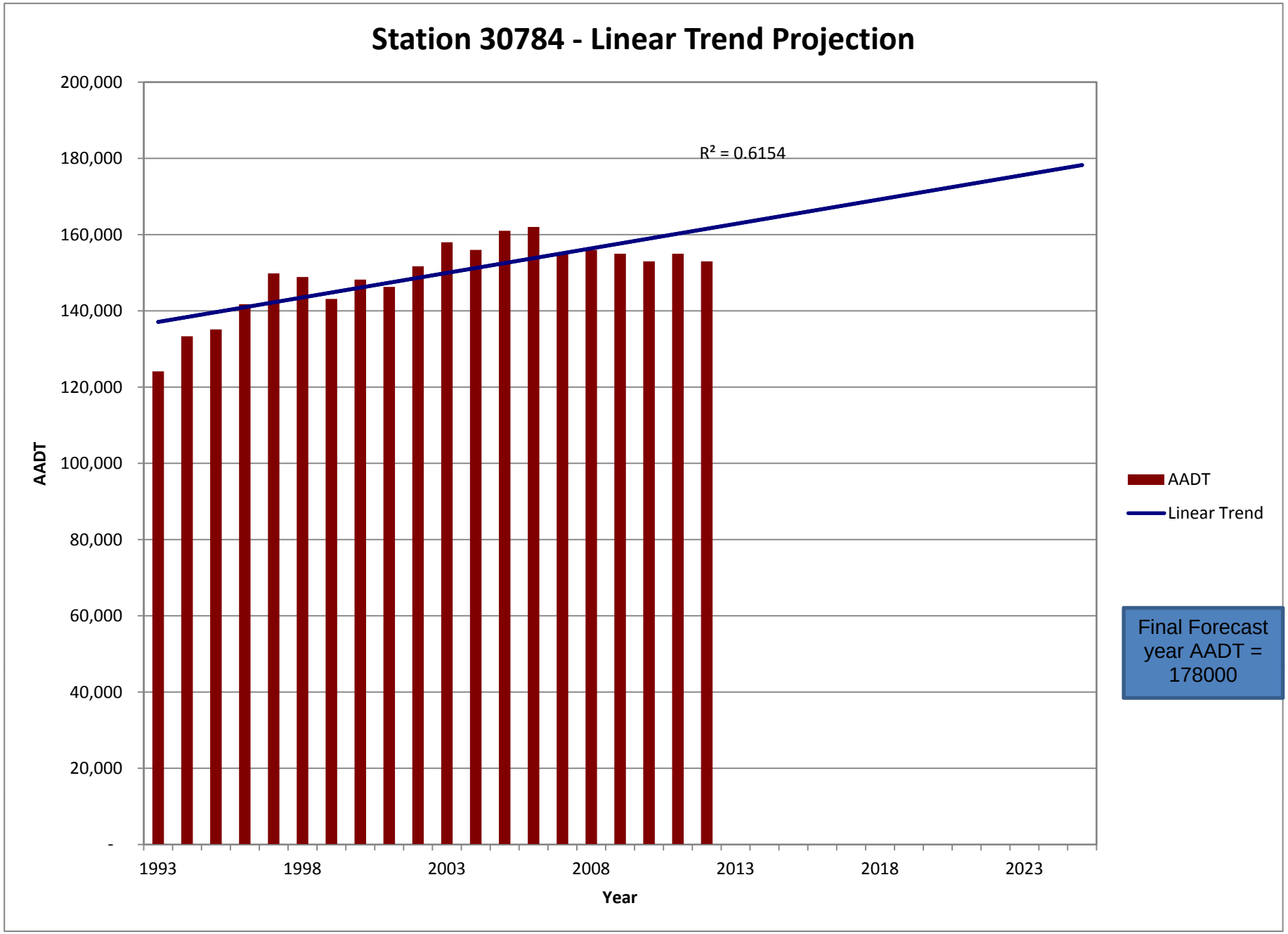

Station 30092 - Exponential Trend Projection
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.8157
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Exponential Trend
Final Forecast year AADT = 361000


Station 30728 - Logarithmic Trend Projection
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
Year
R² = 0.7897
AADT
Logarithmic Trend
Final Forecast year AADT = 64000


Station 30728 - Linear Trend Projection
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
AADT
R² = 0.9129
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Linear Trend
Final Forecast year AADT = 88000


Station 30728 - Exponential Trend Projection
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
R² = 0.9185
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Exponential Trend
Final Forecast year AADT = 112000


Station 30784 - Logarithmic Trend Projection
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
Year
R² = 0.8308
AADT
Logarithmic Trend
Final Forecast year AADT = 164000


Station 30784 - Linear Trend Projection
200,000
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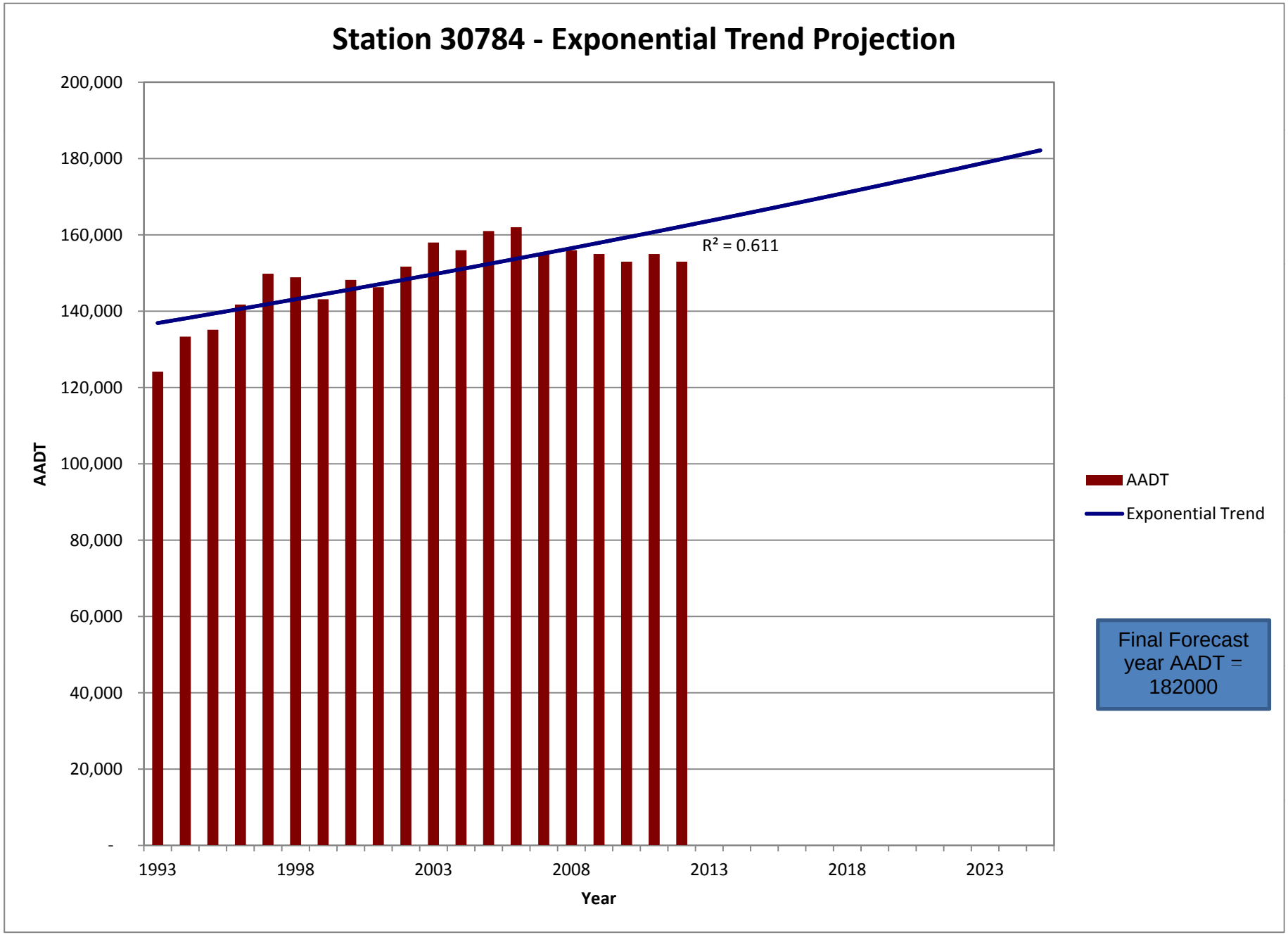
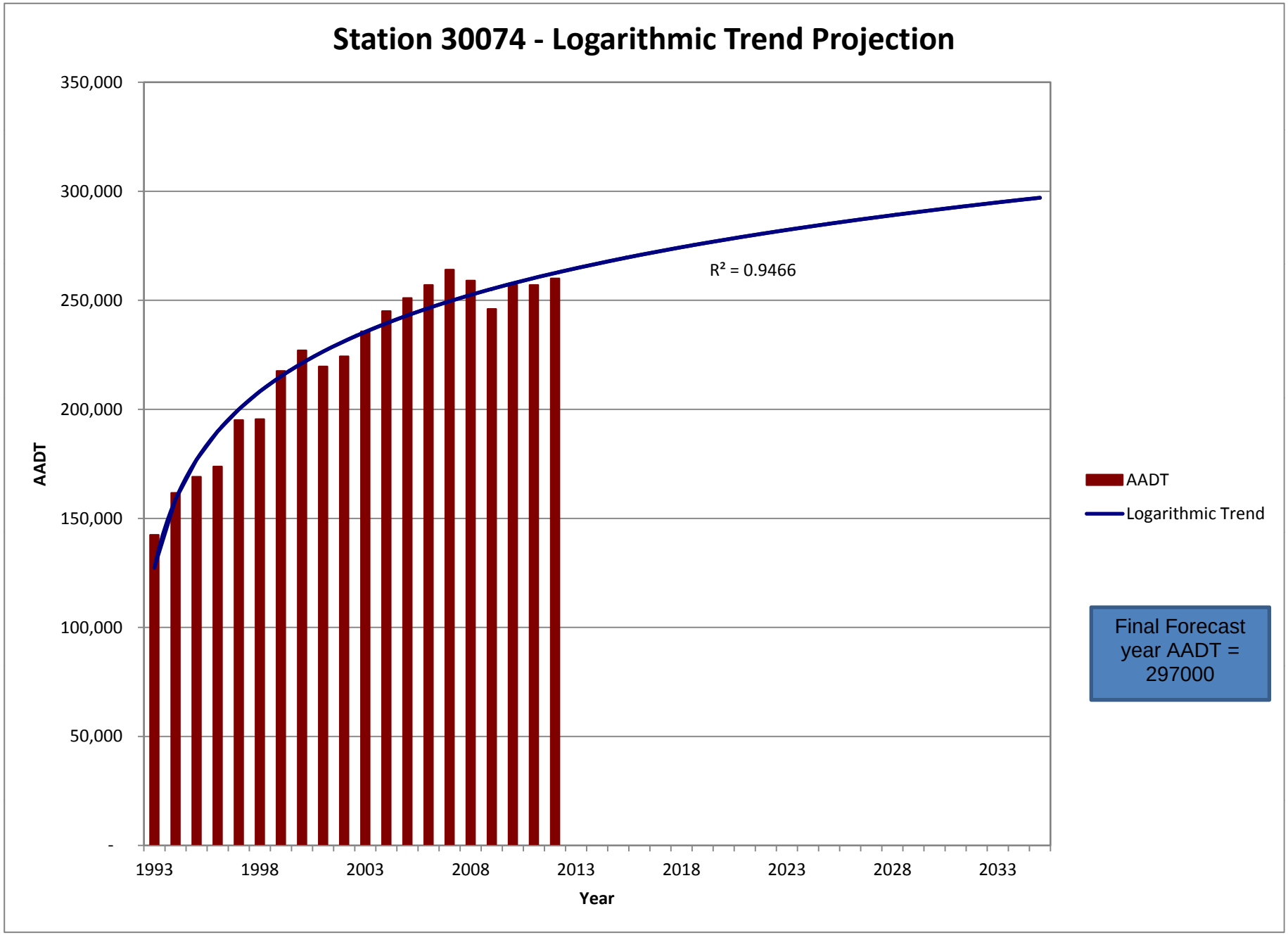
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
R² = 0.6154
1993
1998
2003
2008
2013
2018
2023
Year
AADT
Linear Trend
Final Forecast year AADT = 178000


Station 30784 - Exponential Trend Projection
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
Year
R² = 0.611
AADT
Exponential Trend
Final Forecast year AADT = 182000

APPENDIX I

HISTORICAL TREND PROJECTIONS – YEAR 2035


Station 30074 - Logarithmic Trend Projection
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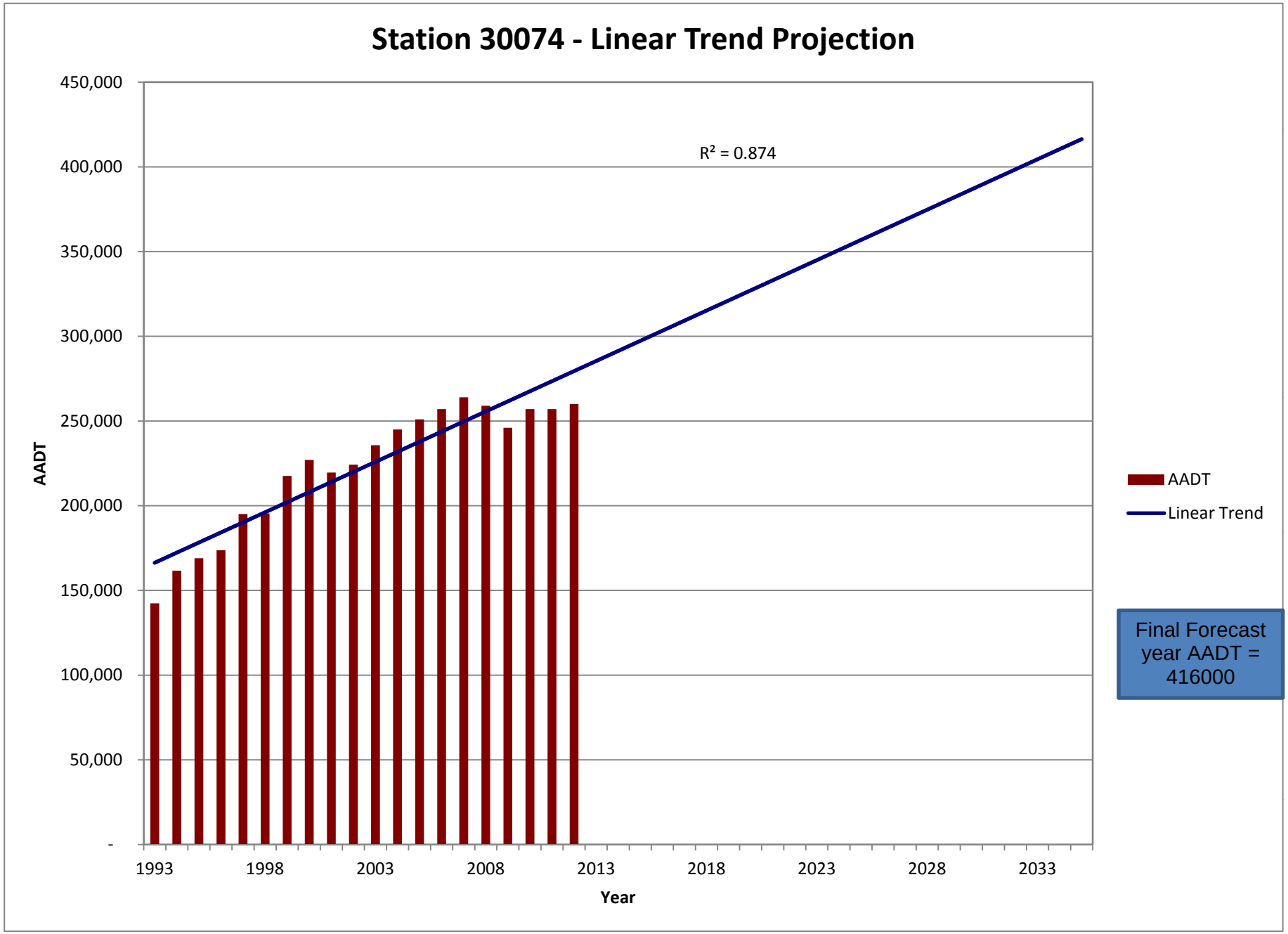
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
R² = 0.9466
AADT
Logarithmic Trend
Final Forecast year AADT = 297000


Station 30074 - Linear Trend Projection
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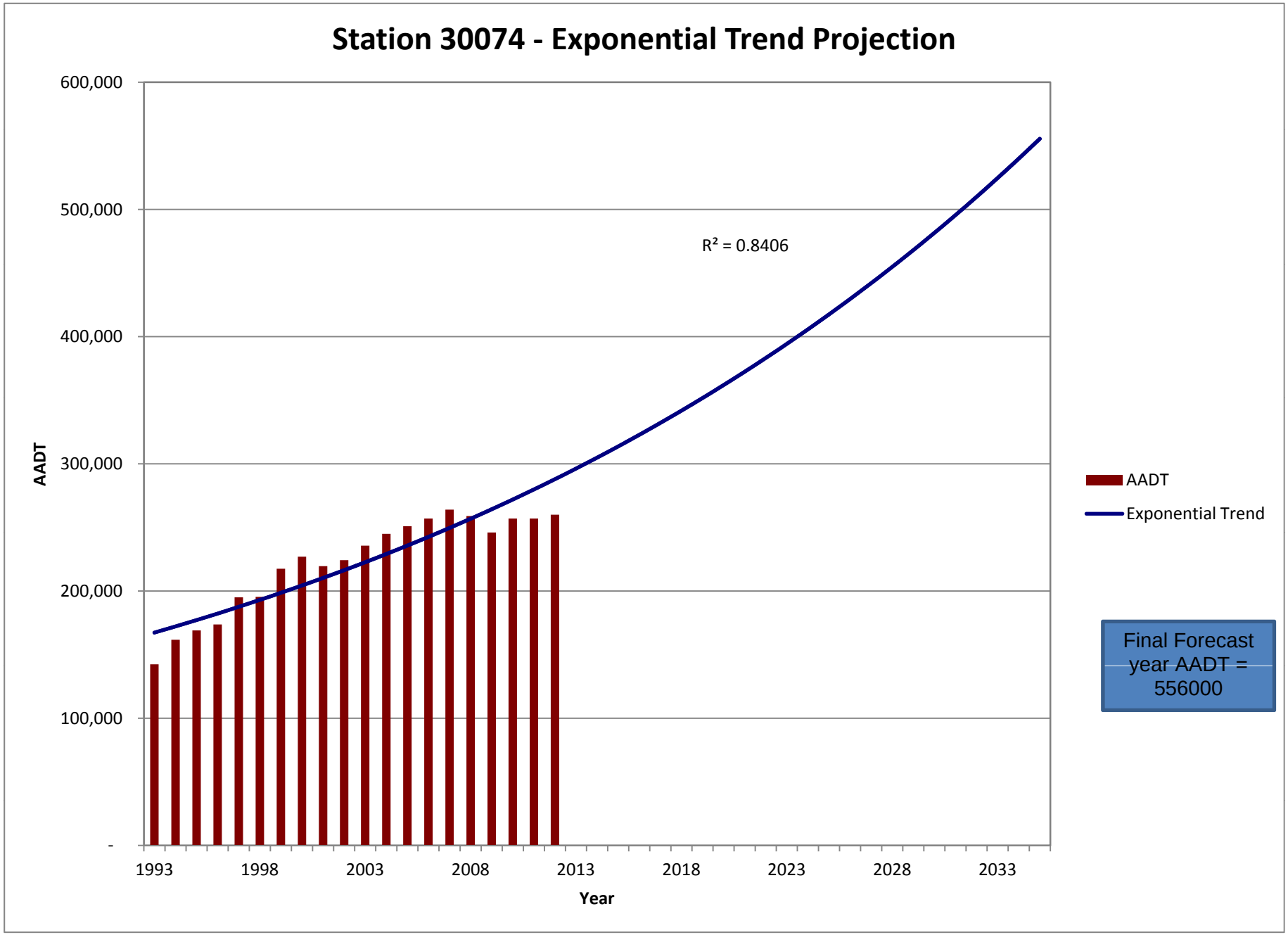
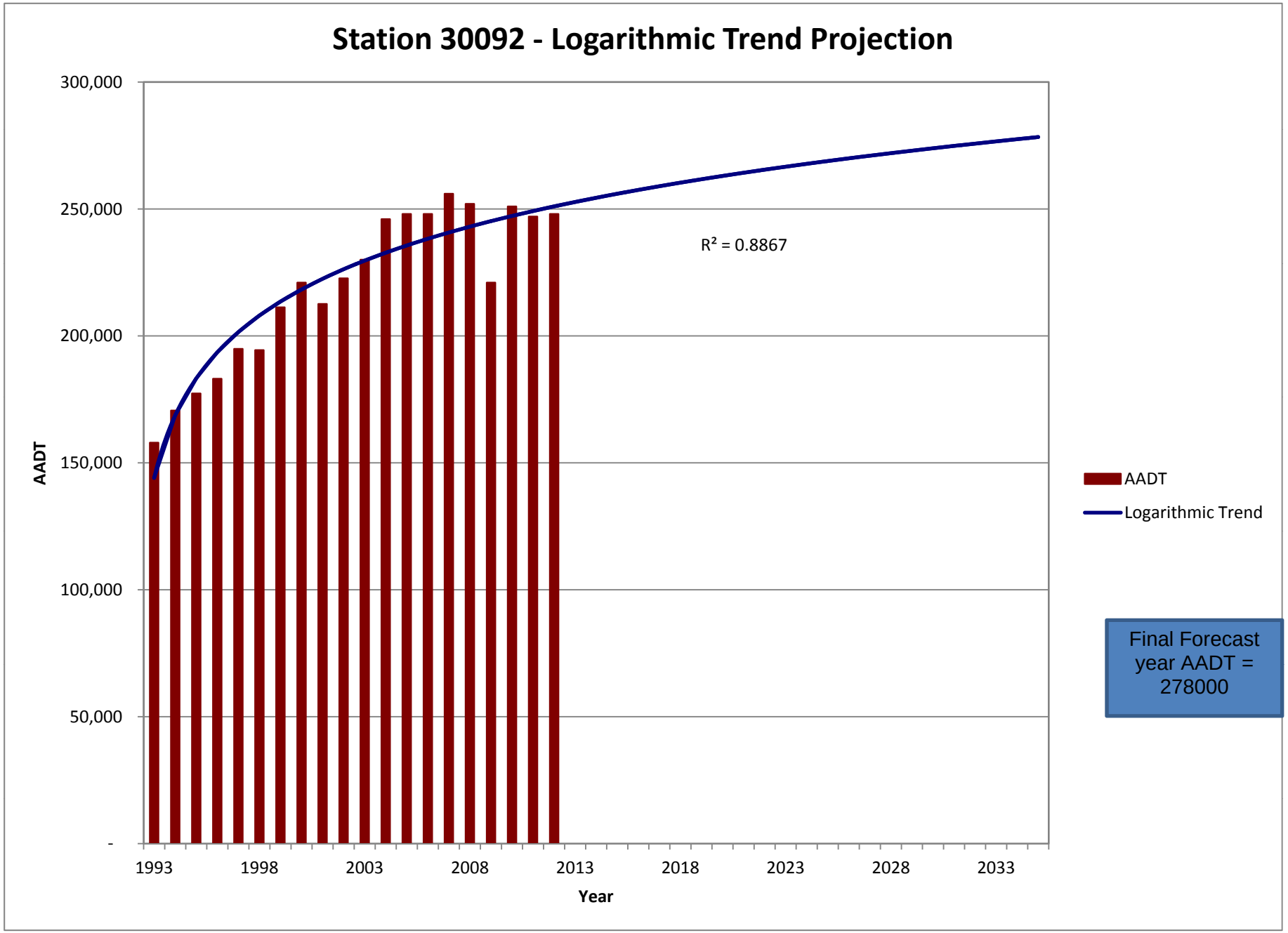
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.874
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Linear Trend
Final Forecast year AADT = 416000


Station 30074 - Exponential Trend Projection
600,000
500,000
400,000
300,000
200,000
100,000
-
AADT
R² = 0.8406
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Exponential Trend
Final Forecast year AADT = 556000


Station 30092 - Logarithmic Trend Projection
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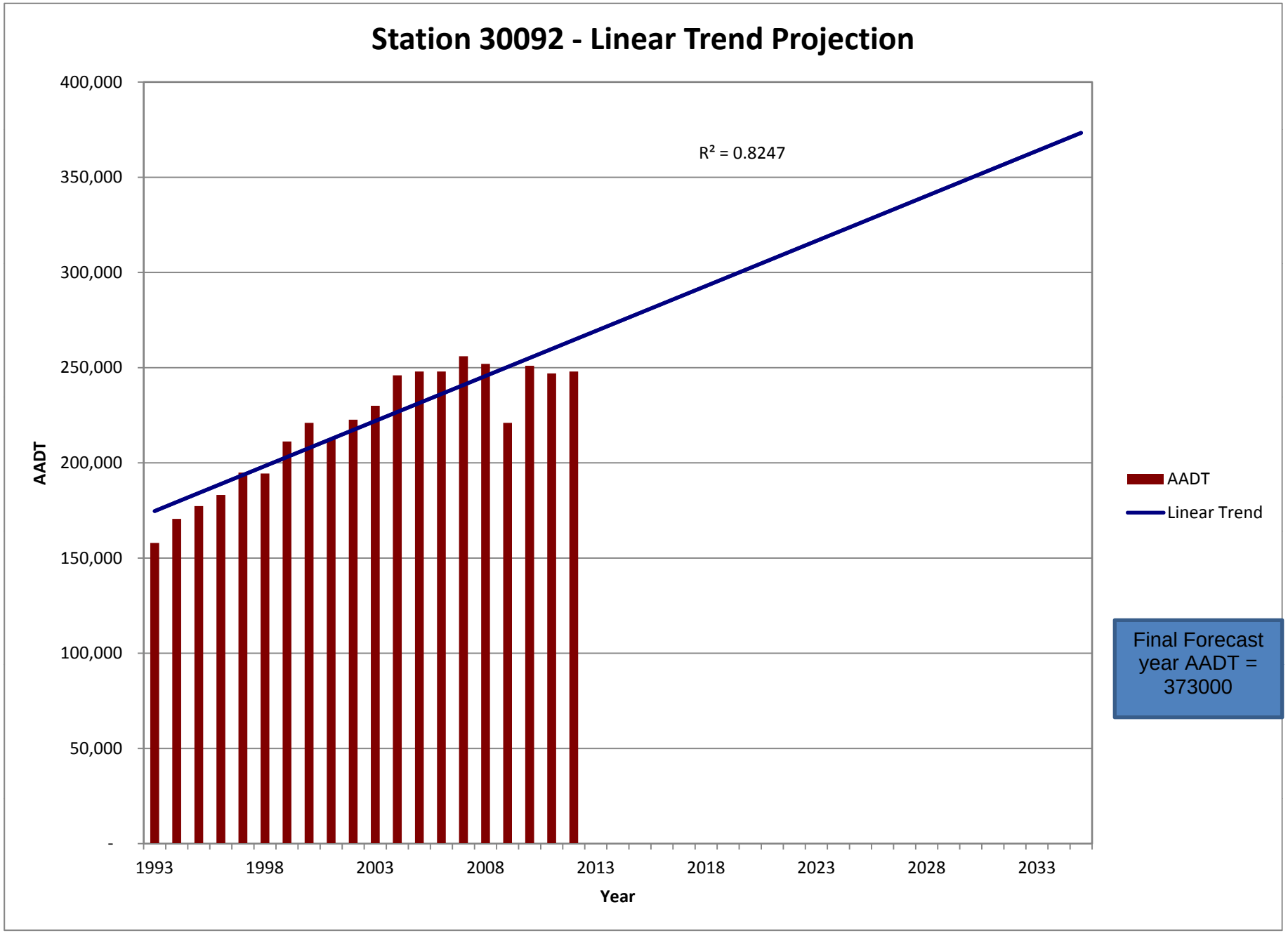
250,000
200,000
150,000
100,000
50,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
R² = 0.8867
AADT
Logarithmic Trend
Final Forecast year AADT = 278000


Station 30092 - Linear Trend Projection
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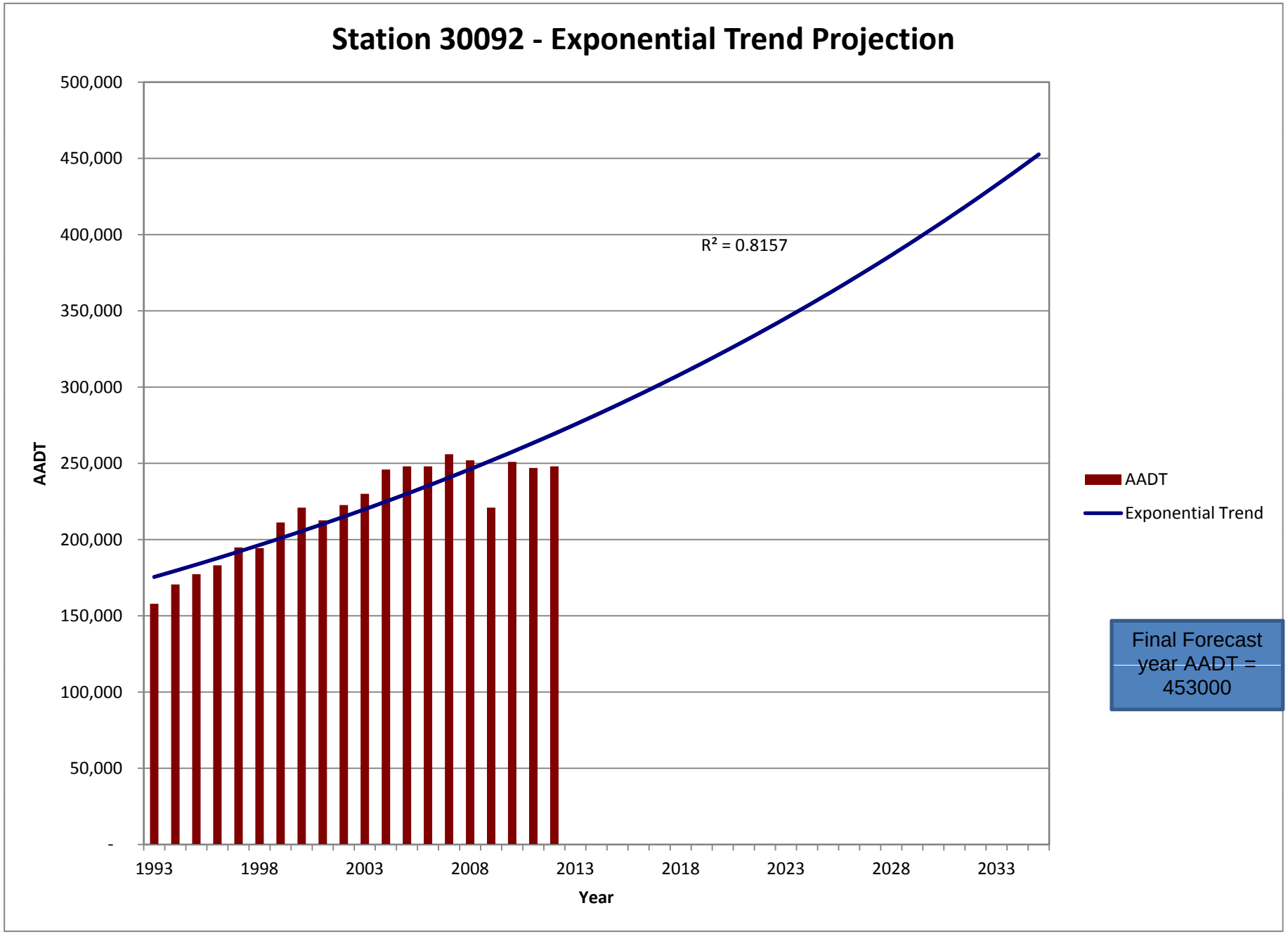
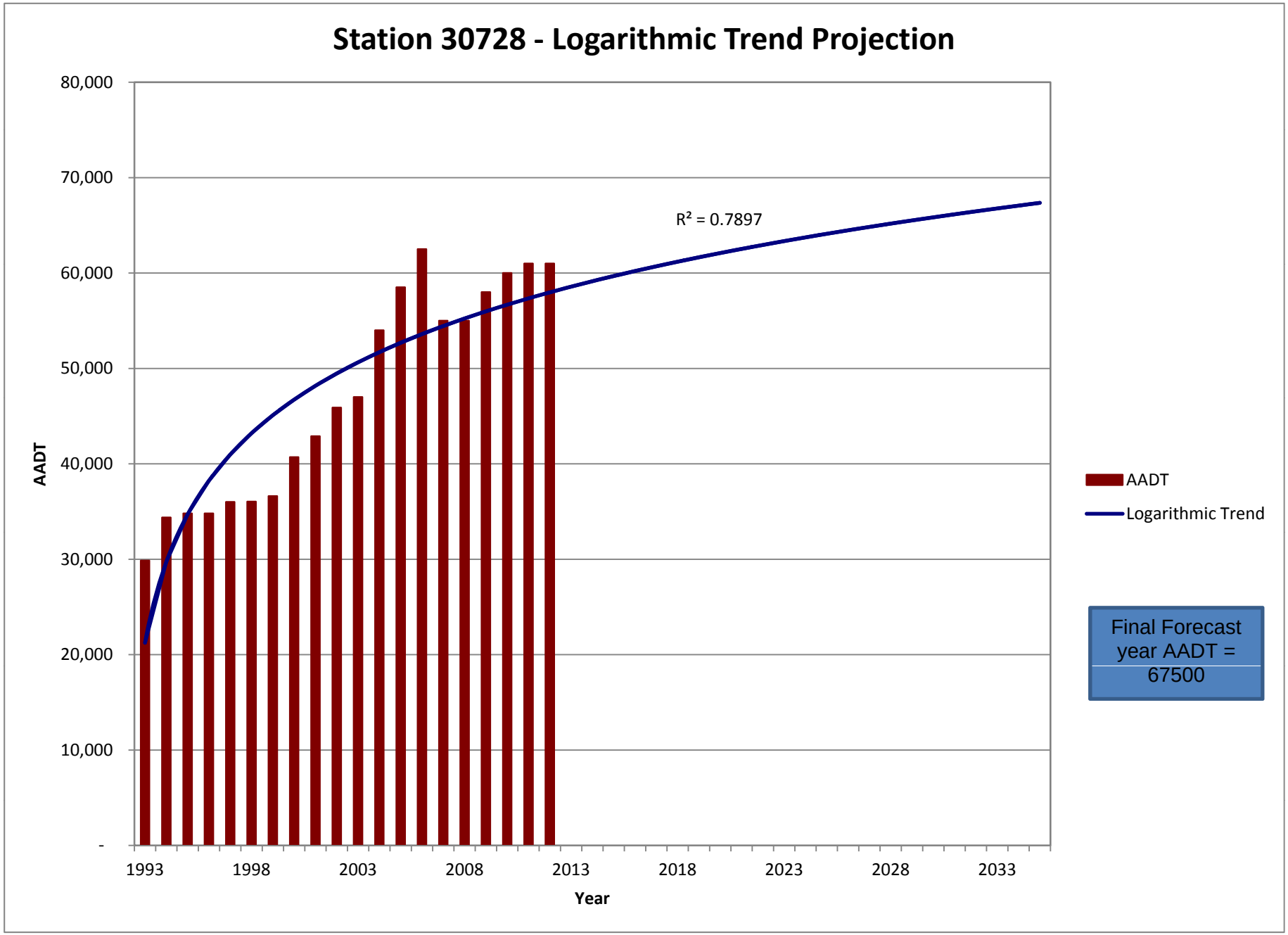
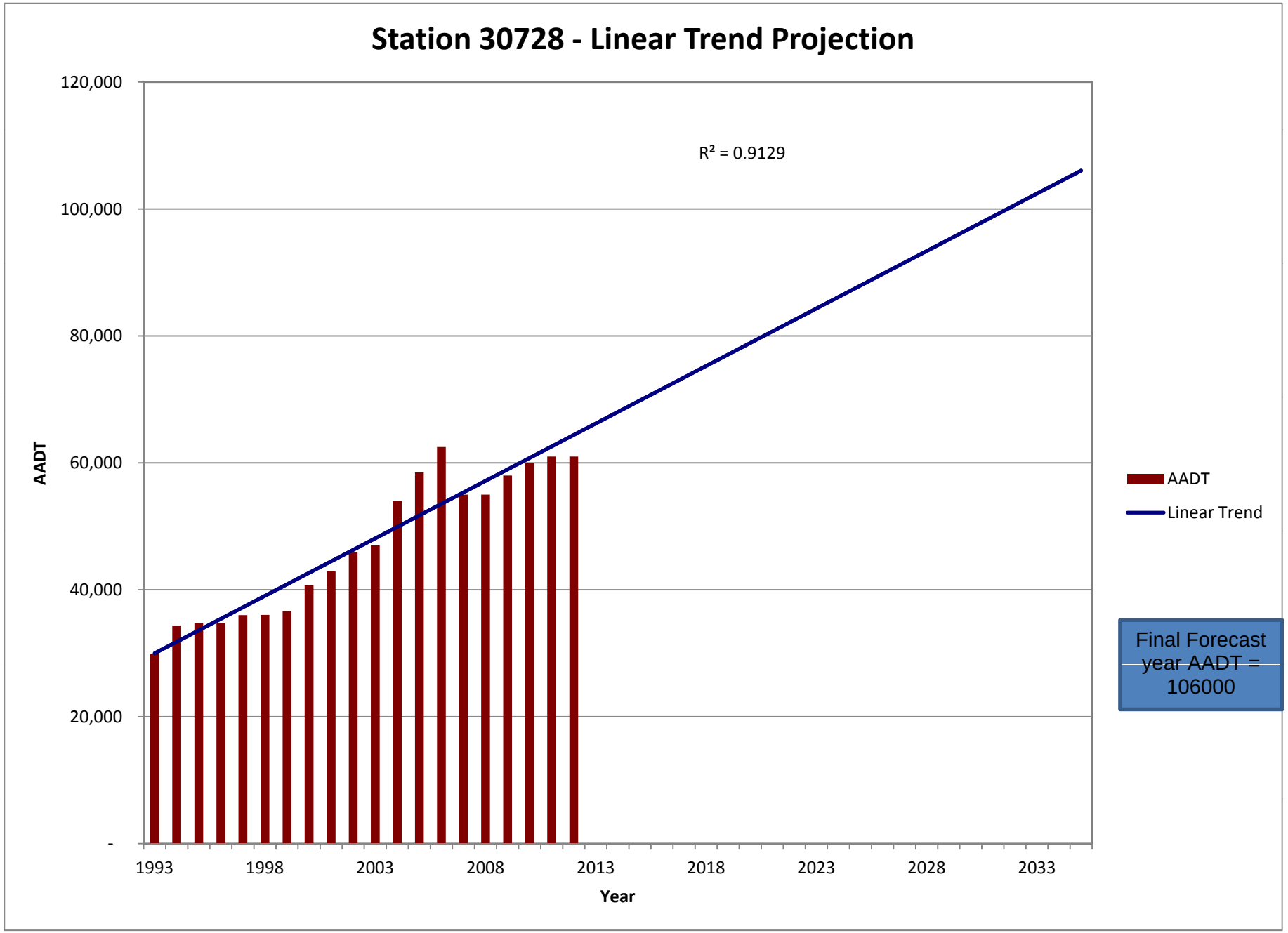
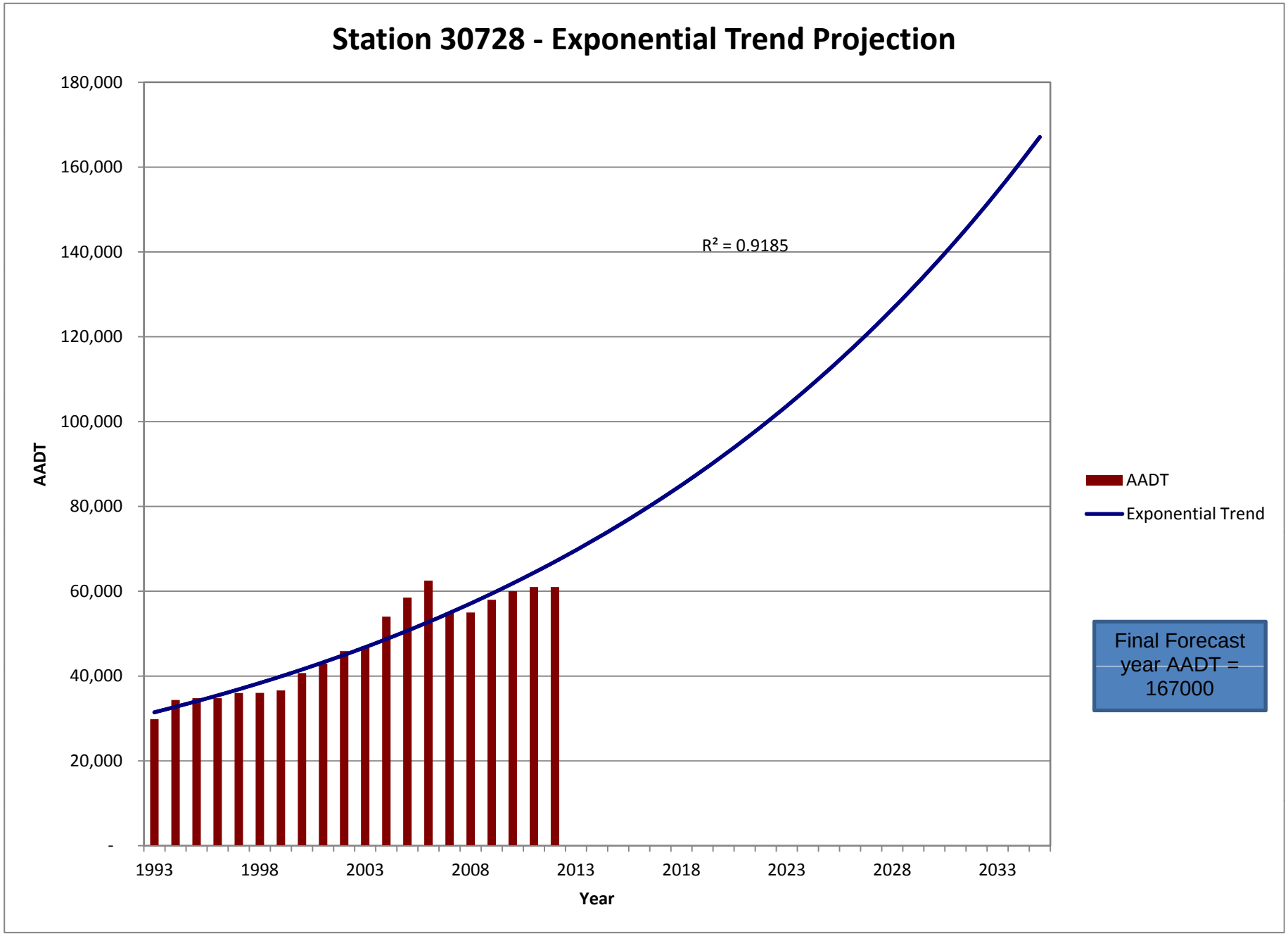
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.8247
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Linear Trend
Final Forecast year AADT = 373000


Station 30092 - Exponential Trend Projection
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.8157
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Exponential Trend
Final Forecast year AADT = 453000


Station 30728 - Logarithmic Trend Projection
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
R² = 0.7897
AADT
Logarithmic Trend
Final Forecast year AADT = 67500


Station 30728 - Linear Trend Projection
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
R² = 0.9129
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Linear Trend
Final Forecast year AADT = 106000


Station 30728 - Exponential Trend Projection
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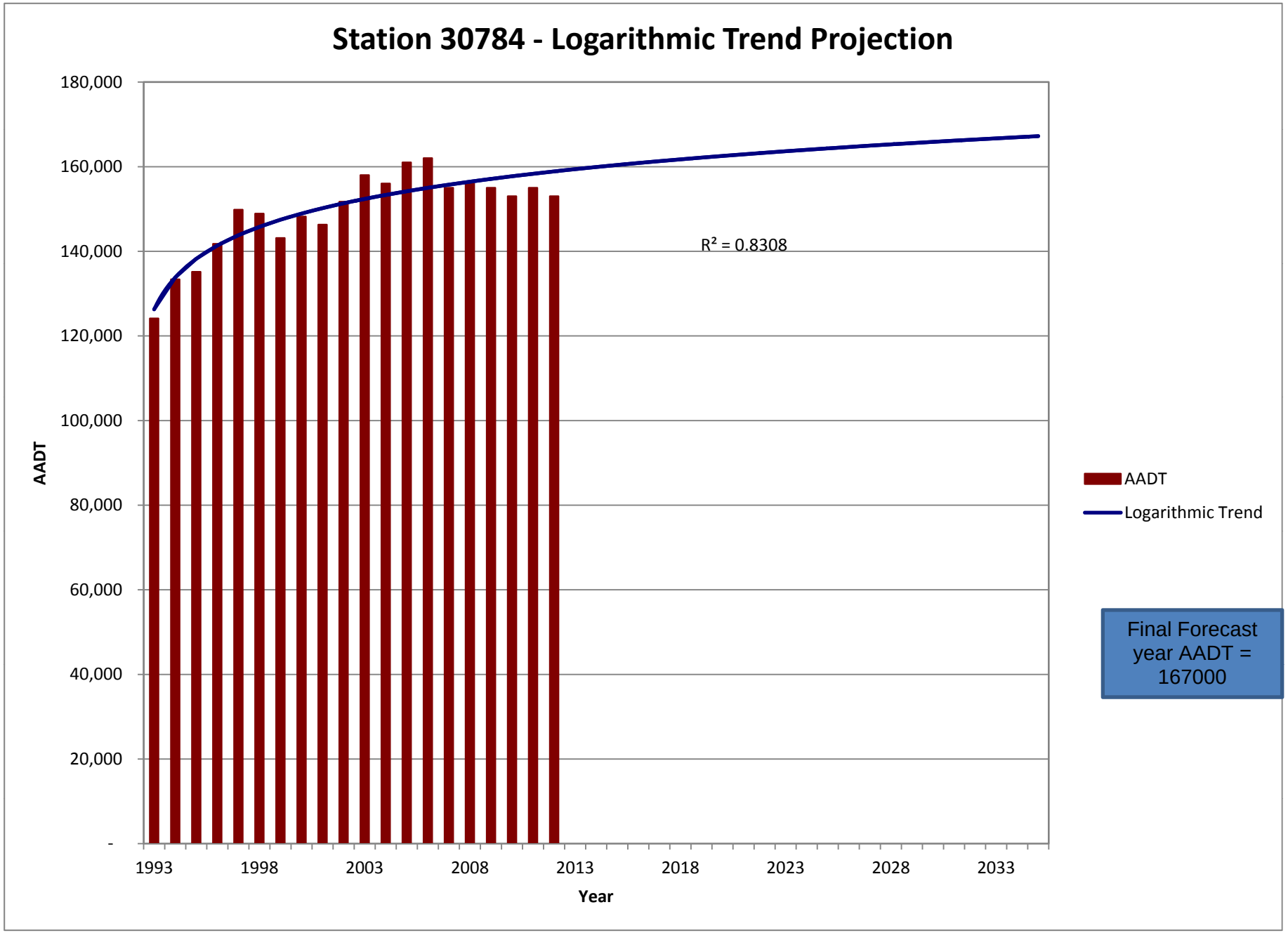
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
R² = 0.9185
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Exponential Trend
Final Forecast year AADT = 167000


Station 30784 - Logarithmic Trend Projection
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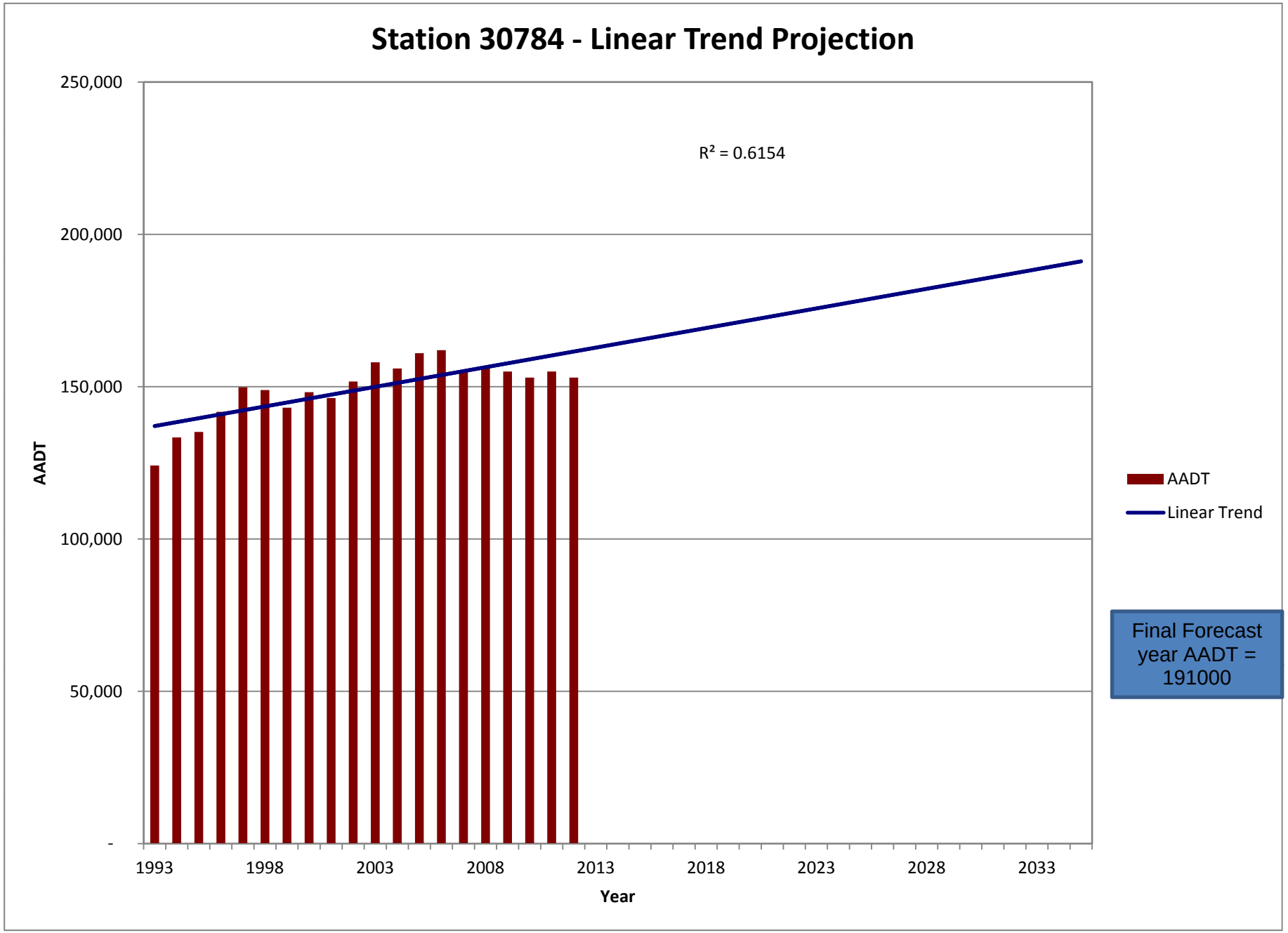
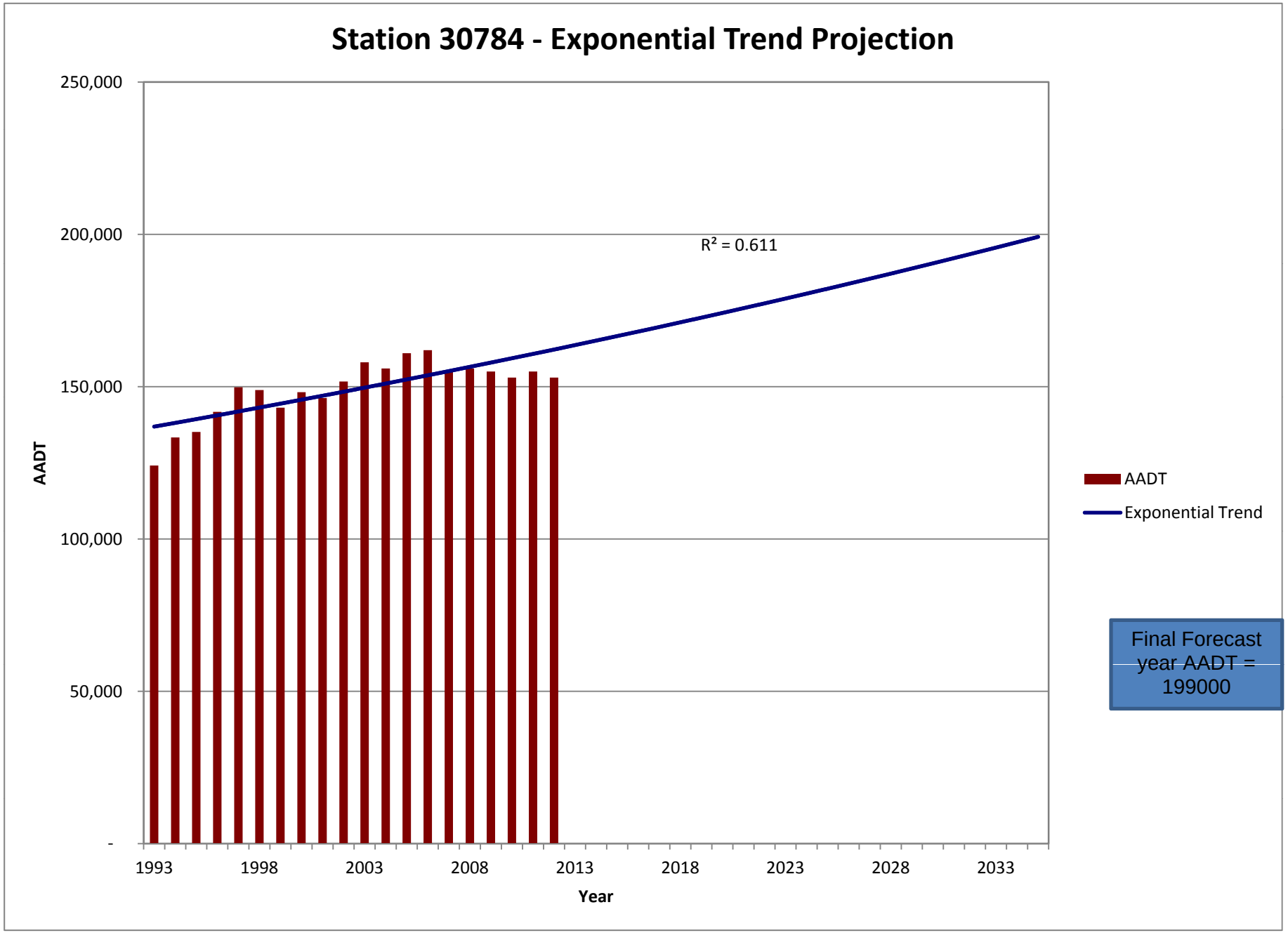
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
AADT
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
R² = 0.8308
AADT
Logarithmic Trend
Final Forecast year AADT = 167000


Station 30784 - Linear Trend Projection
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.6154
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Linear Trend
Final Forecast year AADT = 191000


Station 30784 - Exponential Trend Projection
250,000
200,000
150,000
100,000
50,000
-
AADT
R² = 0.611
1993
1998
2003
2008
2013
2018
2023
2028
2033
Year
AADT
Exponential Trend
Final Forecast year AADT = 199000

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