Area Designation Recommendations for the 2015 Ozone NAAQS for Clark County, Nevada

Prepared by:

Department of Air Quality
Clark County, Nevada

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ACRONYMS AND ABBREVIATIONS

Acronyms

AVMT	annual vehicle miles traveled
AERR	Air Emissions Reporting Requirements
CAA	Clean Air Act
CAMS	Continuous Ambient Monitoring Station
CDP	Census Designated Places
DAQ	Clark County Department of Air Quality
EPA	U.S. Environmental Protection Agency
HA	hydrographic area
HYSPLIT	Hybrid Single-Particle Lagrangian Integrated Trajectory
MDA8	maximum daily 8-hour average ozone concentration
MSA	Metropolitan Statistical Area
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventories
SNPLMA	Southern Nevada Public Lands Management Act
VOC	volatile organic compound

Abbreviations

NO_x	nitrogen oxides
O_3	ozone
tpy	tons per year

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) revised the National Ambient Air Quality Standards (NAAQS) for ozone (O_3) on October 1, 2015 (*Federal Register*, vol. 73, p. 16436). The primary ozone standard was lowered from 0.075 to 0.070 parts per million, or 70 parts per billion. The revised secondary standard is identical to the revised primary standard. Section 107(d) of the Clean Air Act (CAA) governs the process for area designations following the establishment of new or revised NAAQS. Since the primary and secondary ozone NAAQS are identical, EPA expects that each area will have the same designation and boundary for both standards.

Under CAA Section 107(d), states must submit recommendations on area designations to EPA not later than one year after the promulgation of a new or revised standard. If, after careful consideration, EPA decides to promulgate a designation that deviates from a state recommendation, the agency must notify the state at least 120 days prior to promulgating the final designation and provide the state the opportunity to demonstrate why EPA's recommendation is inappropriate. The CAA requires EPA to complete the designation process within two years of promulgation of a new or revised NAAQS unless the Administrator has insufficient information to make these decisions; in such cases, EPA may take up to an additional year to make the designations.

To support nonattainment area (NAA) boundary recommendations and final boundary determinations, EPA recommends evaluating five factors:

1. Air quality data
2. Emissions and emissions-related data
3. Meteorology
4. Geography/topography
5. Jurisdictional boundaries.

The Clark County Department of Air Quality (DAQ) recommends that parts of Clark County be designated as an NAA for the 2015 revised 8-hour NAAQS. This recommendation is based on a 5-factor analysis that indicates parts of Clark County are not in compliance with the NAAQS.

DAQ recommends that hydrographical areas (HAs) 164A, 165, and 212 be designated as NAAs. These HAs encompass Clark County's urbanized area, traffic and commuting patterns, and most industrial and commercial activities. HA 164A and 165 are included because they are in the major ozone transport corridor from California. Table 1-1 details, and Figure 1-1 shows, the recommended boundaries.

Table 1-1. Recommended Nonattainment Area

Basin	Size (sq mi)	Size (acres)	Hydrographic Basin/Sub-Basin Name
164A	253	161,920	Ivanpah Valley/Northern Part
165	96	61,440	Jean Lake Valley
212	1,564	1,000,960	Las Vegas Valley

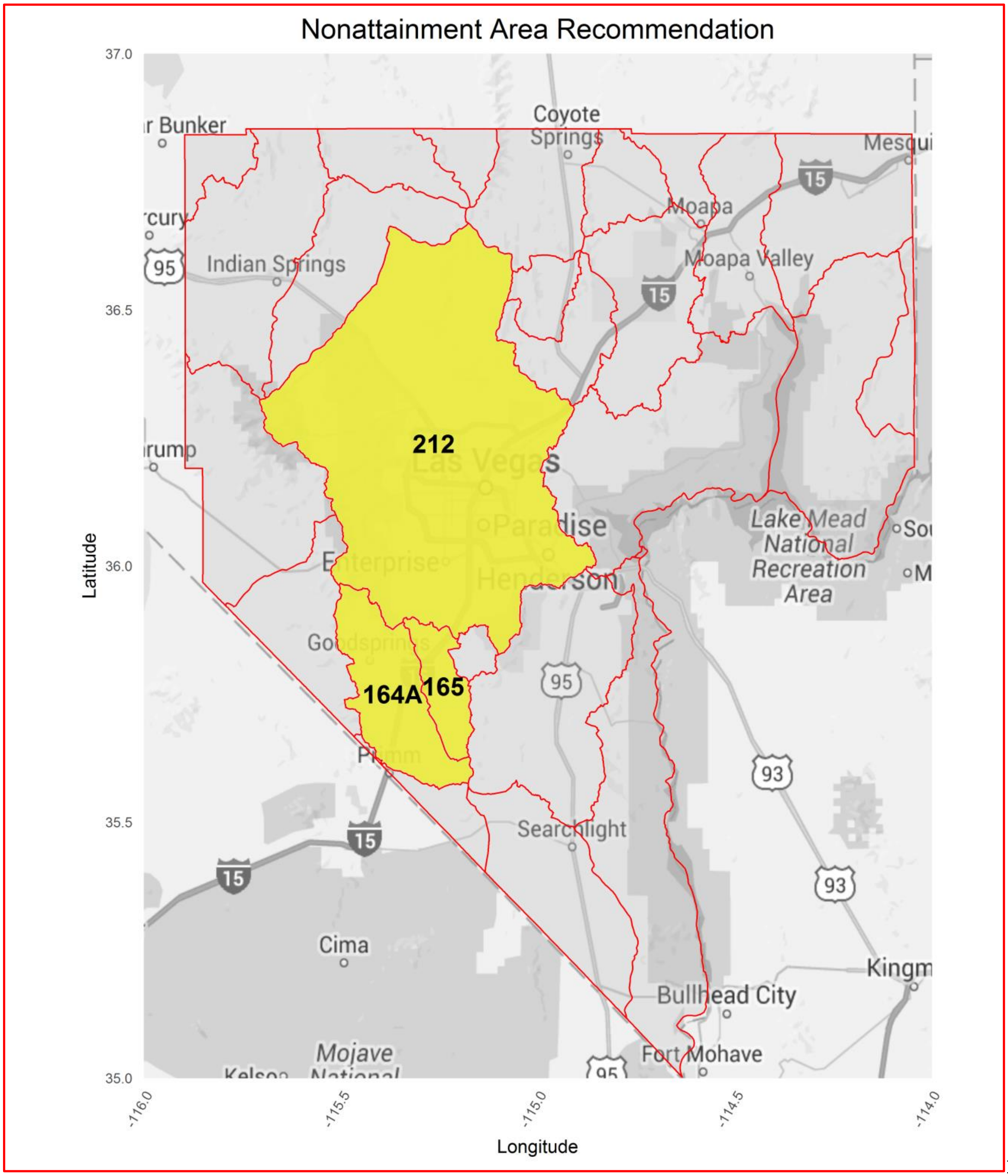

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Figure 1-1. Clark County Nonattainment Boundary.

2.0 AIR QUALITY ANALYSIS

2.1 MONITORING NETWORK

The current ozone ambient air monitoring network in Clark County (Table 2-1) has seven stations located inside the Las Vegas Valley and five (Jean, Apex, Boulder City, Mesquite, and Indian Springs) located outside the valley. In addition, the Spring Mountain Youth Camp (CAMS 7771) is operated as a special purpose monitoring site, and the Las Vegas Paiute monitor (CAMS 8000) is operated by the Paiute tribe. The Las Vegas Paiute monitor is not part of DAQ's ozone monitoring network; it is considered non-regulatory, and the data cannot be used for NAAQS purposes.

Table 2-1. Monitoring Stations in Clark County

CAMS	EPA Site	Site Description	Street Address	City
22	32-003-0022	Apex	12101 US Hwy 93	Apex
23	32-003-0023	Mesquite	465 East Old Mill Rd	Mesquite
43	32-003-0043	Paul Meyer	4525 New Forest Dr	Las Vegas
71	32-003-0071	Walter Johnson	7701 Ducharme Dr	Las Vegas
73	32-003-0073	Palo Verde	126 S. Pavilion Center Dr	Las Vegas
75	32-003-0075	Joe Neal	6076 Rebecca	Las Vegas
298	32-003-0298	Green Valley	298 North Arroyo Grande	Henderson
540	32-003-0540	Jerome Mack	4250 Karen Ave	Las Vegas
601	32-003-0601	Boulder City	1005 Industrial Rd	Boulder City
1019	32-003-1019	Jean	1965 State Hwy 161	Jean
2002	32-003-2002	JD Smith	1301 East Tonopah	North Las Vegas
7771	32-003-7771	SM Youth Camp	Ries Rd	Las Vegas
7772	32-003-7772	Indian Springs	668 Gretta Ln	Indian Springs
8000	32-003-8000	Las Vegas Paiute	Paiute Way	Las Vegas

Figure 2-1 shows DAQ's current ozone monitoring network (CAMS numbers as reference), and Table 2-2 lists the current three-year average (2013–2015) of the fourth-highest maximum daily 8-hour average ozone concentrations (MDA8) for all monitoring sites in DAQ's jurisdiction.

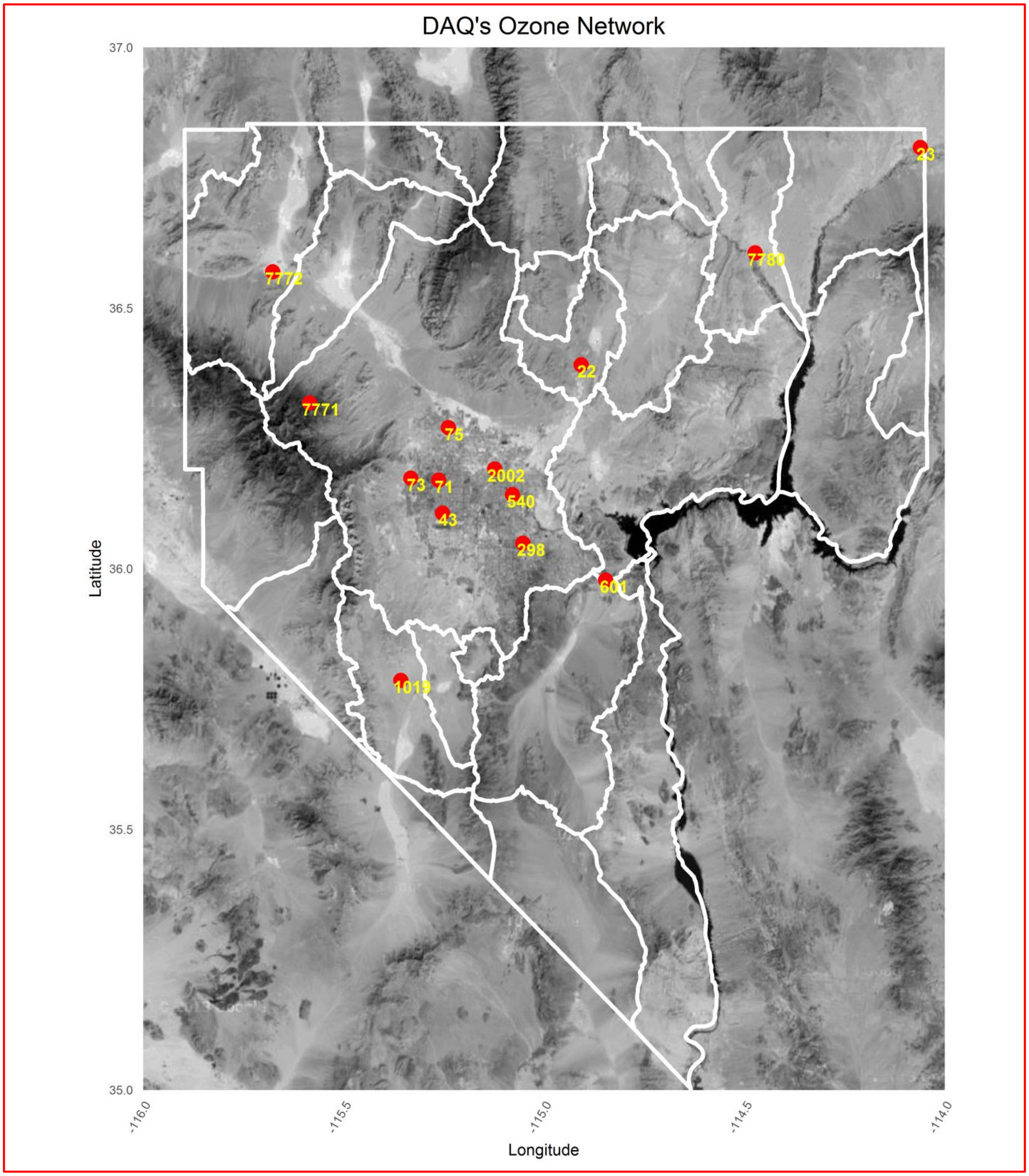


Figure 2-1. DAQ Ozone Monitoring Network.

Table 2-2. 3-Year Average of Fourth-Highest MDA8 and Design Values[1]

Monitoring Site	Air Quality System #	Fourth-Highest Average			Design Value	Valid Design Value
		2013	2014	2015		
Apex	32-003-0022	73	76	72	**73**	**Y**
Mesquite	32-003-0023	67	65	65	**65**	**Y**
Paul Meyer	32-003-0043	75	77	73	**75**	**Y**
Walter Johnson	32-003-0071	74	74	68	**72**	**Y**
Palo Verde	32-003-0073	74	77	72	**74**	**Y**
Joe Neal	32-003-0075	76	79	71	**75**	**Y**
Green Valley	32-003-0298	-	-	70	**70**	**N**
Jerome Mack	32-003-0540	69	73	69	**70**	**Y**
Boulder City	32-003-0601	71	73	68	**70**	**Y**
Jean	32-003-1019	75	74	69	**72**	**Y**
JD Smith	32-003-2002	72	75	74	**73**	**Y**
Indian Springs	32-003-7772	-	-	70	**70**	**N**
Logandale	32-003-7780	-	64	66	**65**	**N**

[1] Data downloaded from EPA Air Quality System database on March 14, 2016.

According to the EPA Air Quality System Design Value Report, three monitors do not have valid design values. The violating monitors are located primarily within the urbanized areas of Clark County. (The Logandale monitor was a special purpose monitor, and was shut down at the end of 2015.)

The western side of the valley experiences the highest readings and the most frequent high readings, although few sources are located there. The eastern side of the valley experiences the lowest concentrations and fewest exceedances while containing the greatest number of sources.

Figure 2-2 shows the locations of the monitoring stations and their associated design values.

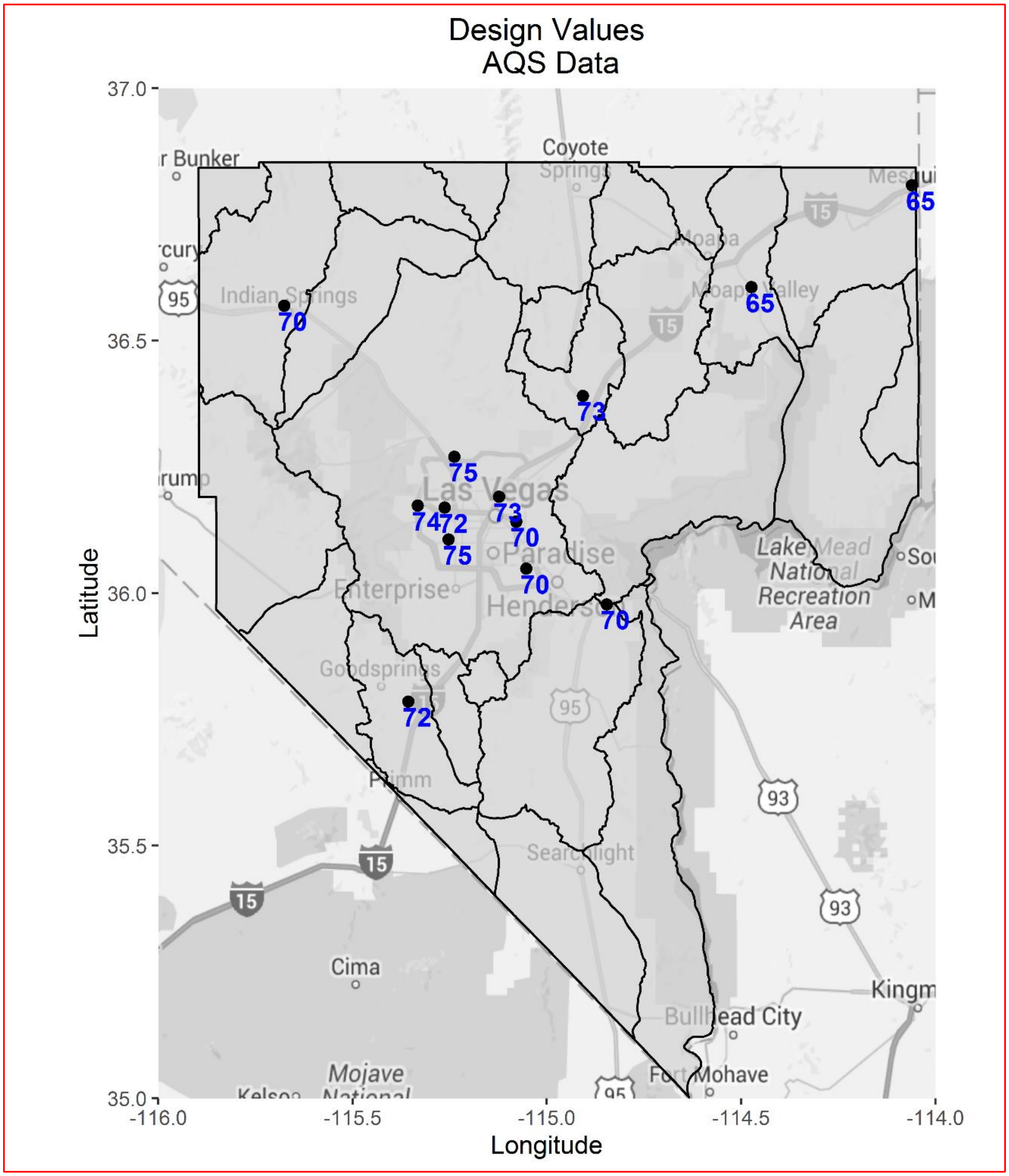


Figure 2-2. Clark County Monitors and Associated Design Values.

Figure 2-3 provides historical trend data for the monitors in the recommended NAA (urbanized areas) and for Jean (the DAQ background site). Figure 2-4 shows the 10-year design value data for Clark County.

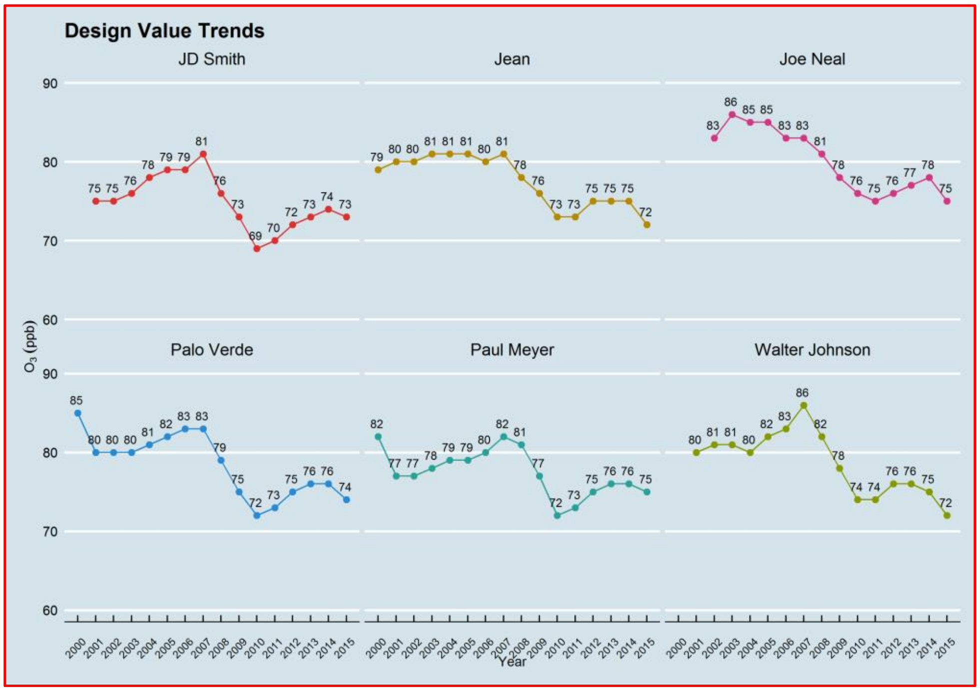


Figure 2-3. 15-Year Trend.

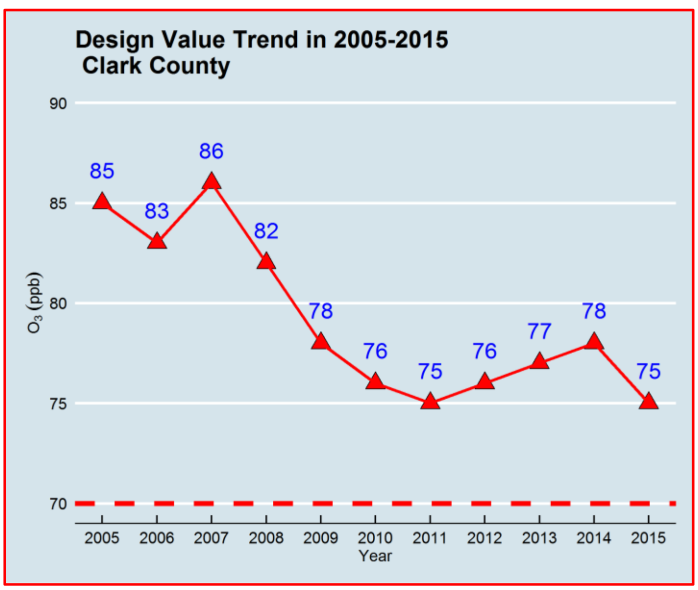


Figure 2-4. Design Value History.

Figure 2-5 illustrates ozone density in Clark County. The highest density is over the Las Vegas Valley (HA 212), within the recommended NAA. Design values from 2015 were used to generate the map.

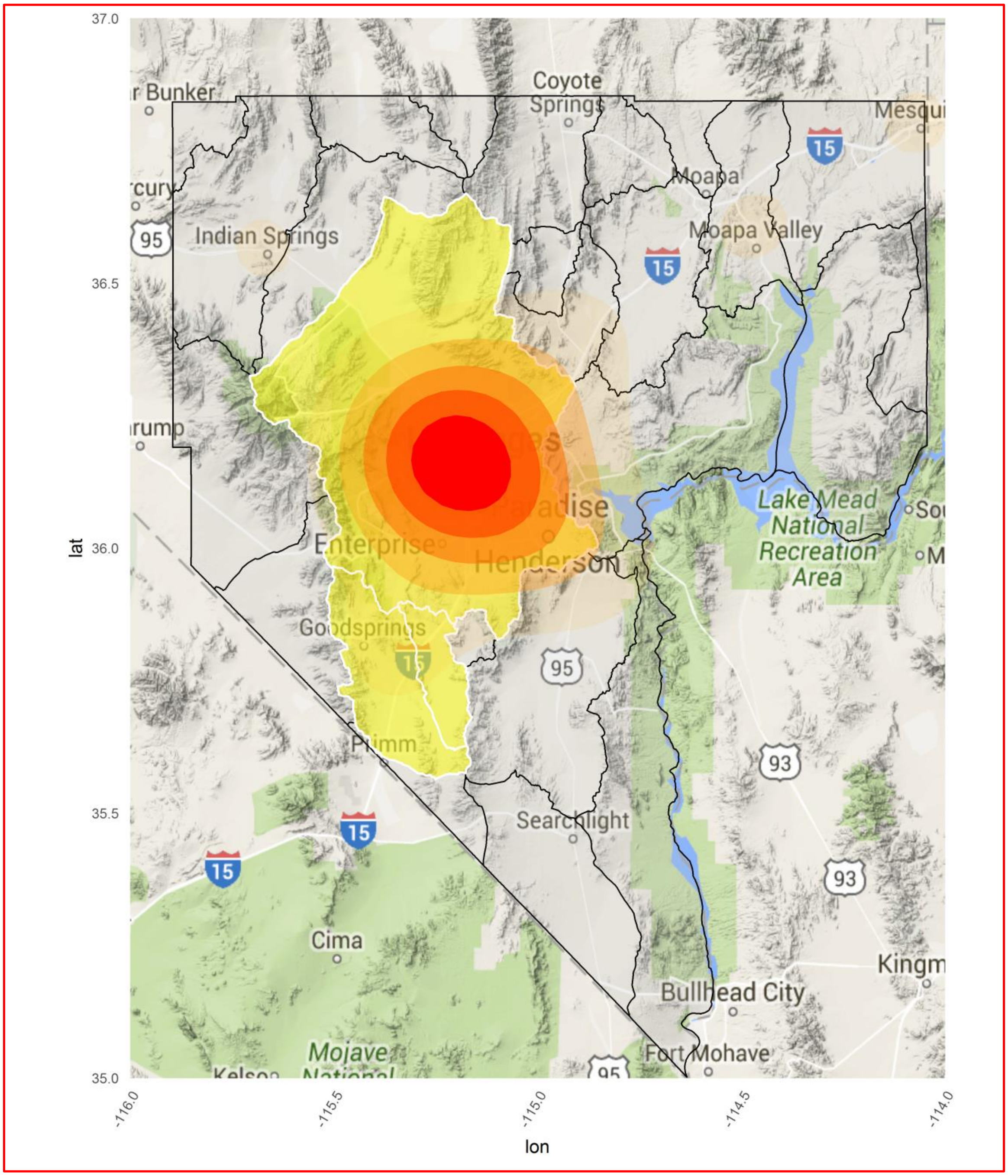


Figure 2-5. Ozone Density Map.

2.2 CONCLUSION

An analysis of air quality data from 2013 to 2015, and the locations of the monitoring sites, both support the configuration of the recommended 8-hour ozone nonattainment boundary. All of the ozone monitors that recorded design values higher than the NAAQS are located within the recommended NAAs. The other monitors (Mesquite, Boulder City, Indian Springs) are located in attainment/unclassifiable HAs. If future monitoring locations indicate that additional HAs are in violation of the revised ozone standard, the existing nonattainment boundary will be reevaluated and expanded as necessary. The next section, “Emissions and Emissions Related Data,” discusses the Apex monitoring station.

3.0 EMISSIONS AND EMISSIONS-RELATED DATA

DAQ submits emission inventory data for point, nonpoint, on-road, and non-road sources to EPA through the Air Emissions Reporting Requirements (AERR) program. Most of the point source data is based on information submitted by sources. Nonpoint emissions are estimated using population data. On-road and non-road emissions are calculated using EPA's Motor Vehicle Emission Simulator (MOVES) model. Biogenic emissions are based on EPA default values.

EPA includes this emissions data in the National Emissions Inventory (NEI),[1] which contains information not only for criteria pollutants, but also for hazardous air pollutants, some of which are volatile organic compounds (VOCs). The following sections focus on nitrogen oxides (NO_x) and VOCs, which are considered precursors for ozone. Table 3-1 provides NO_x and VOC data from the 2011 NEI for four major source categories: stationary, on-road, non-road, and biogenics. The stationary source group includes point and nonpoint sources.

Table 3-1. 2011 NO_x and VOC Emissions (tpy)

Source Category	NO_x	VOC
Stationary Sources	8,542	16,592
On-road	28,965	12,176
Non-road	13,654	8,838
Biogenics	555	146,405
TOTAL	**51,716**	**184,011**

Figure 3-1 shows the source apportionment for NO_x and VOCs between four categories: biogenics, non-road, on-road, and stationary source emissions. Their individual contributions to the total are expressed in percentages.

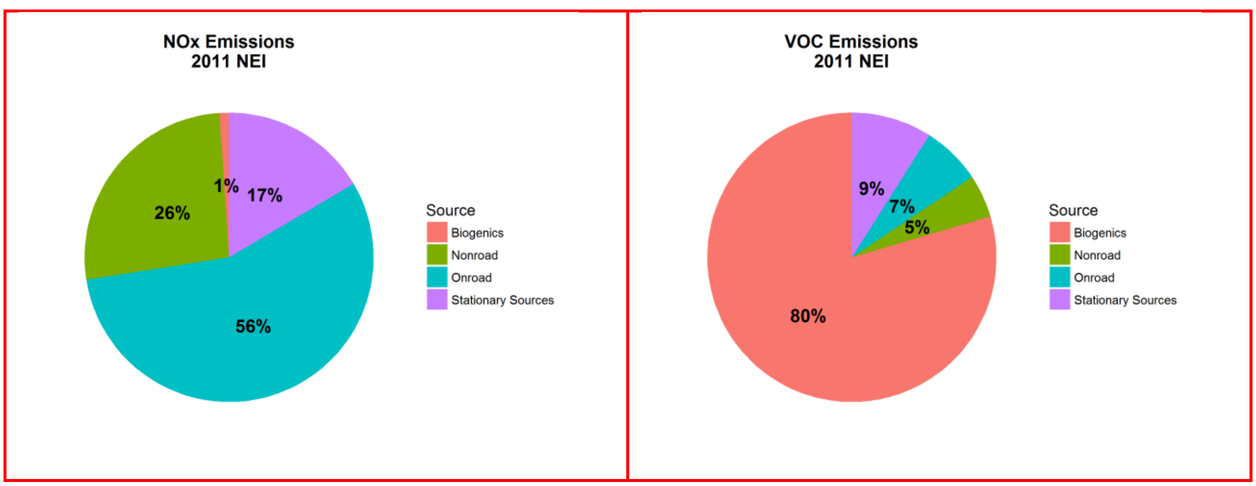


Figure 3-1. NO_x and VOC Source Apportionment.

[1] https://www.epa.gov/air-emissions-inventories.

3.1 EMISSIONS AND SOURCE CATEGORIES

Tables 3-2 and 3-3 list Tier 1 (major source categories identified by EPA) NO_x and VOC emission data for 2011. Vehicles (on-road and non-road) make up the two highest categories of NO_x emissions and account for about 82% of total 2011 NO_x emissions in Clark County.

Table 3-2. Tier 1 NO_x Emissions, 2011

Tier 1 Name	tpy	% of Total
Highway vehicles	28,965.46	56.01%
Off-highway	13,653.92	26.40%
Fuel comb. – elec. util.	3,788.70	7.33%
Fuel comb. – other	2,173.89	4.20%
Other industrial processes	1,484.25	2.87%
Fuel comb. – industrial	986.63	1.91%
Biogenics	554.68	1.07%
Waste disposal & recycling	34.63	0.07%
Miscellaneous	33.45	0.06%
Storage & transport	20.54	0.04%
Petroleum & related industries	19.38	0.04%
Solvent utilization	0.36	0.00%
Metals processing	0.20	0.00%
TOTAL	**51,716.09**	**100.00%**

Table 3-3. Tier 1 VOC Emissions, 2011

Tier 1 Name	tpy	% of Total
Biogenics	146,405.00	79.56%
Solvent utilization	12,675.41	6.89%
Highway vehicles	12,175.92	6.62%
Off highway	8,838.12	4.80%
Storage & transport	1,899.92	1.03%
Fuel comb. – other	608.74	0.33%
Other industrial processes	497.77	0.27%
Miscellaneous	340.28	0.18%
Waste disposal & recycling	313.08	0.17%
Fuel comb. – elec. util.	227.02	0.12%
Fuel comb. – industrial	13.29	0.01%
Petroleum & related industries	11.26	0.01%
Metals processing	4.76	0.00%
TOTAL	**184,010.58**	**100.00%**

Figure 3-2 depicts the top NO_x emission categories. The largest sources of NO_x emissions are the on-road and non-road categories, with a contribution of 56% and 26%, respectively; all other categories contribute less than 10% of the total. Urbanized land use in Clark County is concentrated in the Las Vegas Valley (HA 212); therefore, the highest area- and mobile-source emissions are generated there, creating the greatest ozone impact on human health.

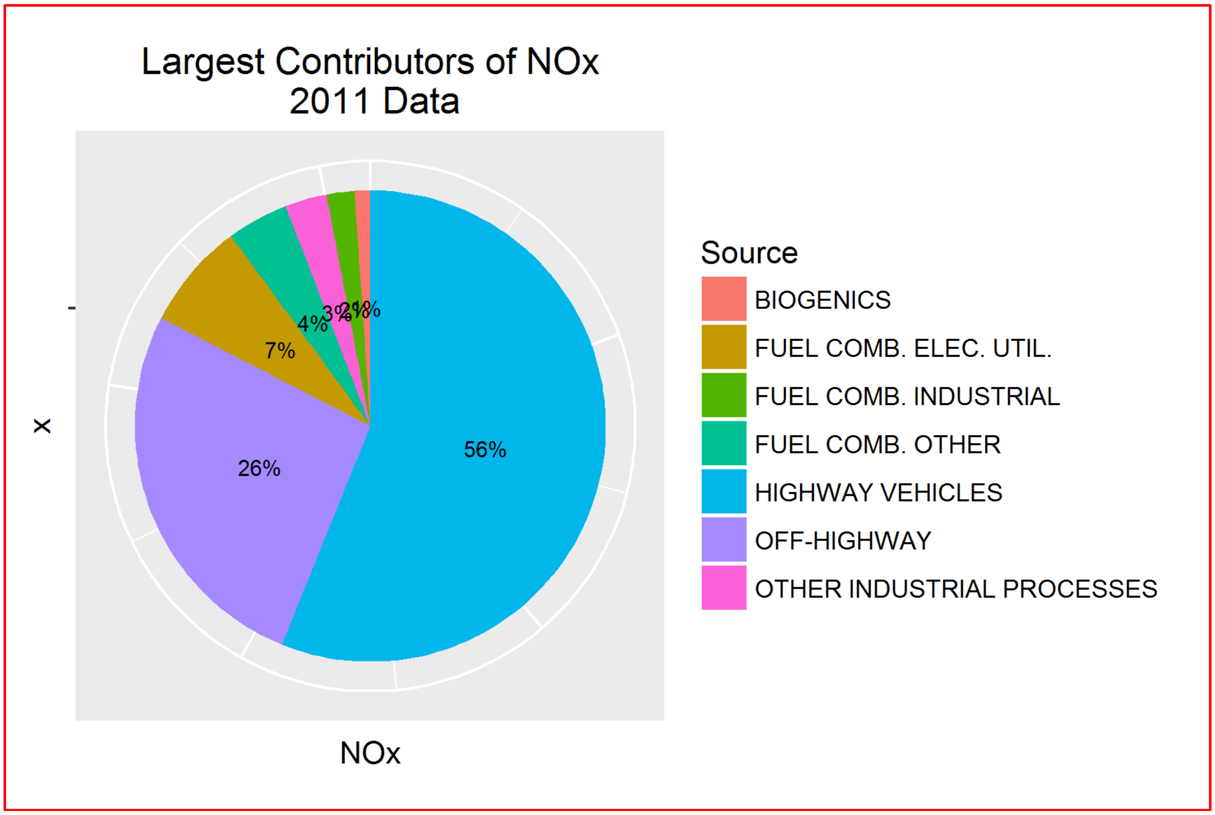


Figure 3-2. Top NO_x Contributors.

Figure 3-3 depicts the top six source categories of VOC emitters; the other categories (not shown) have an impact of less than 0.5% of the total. The largest VOC source, by far, is biogenic emissions (80%).

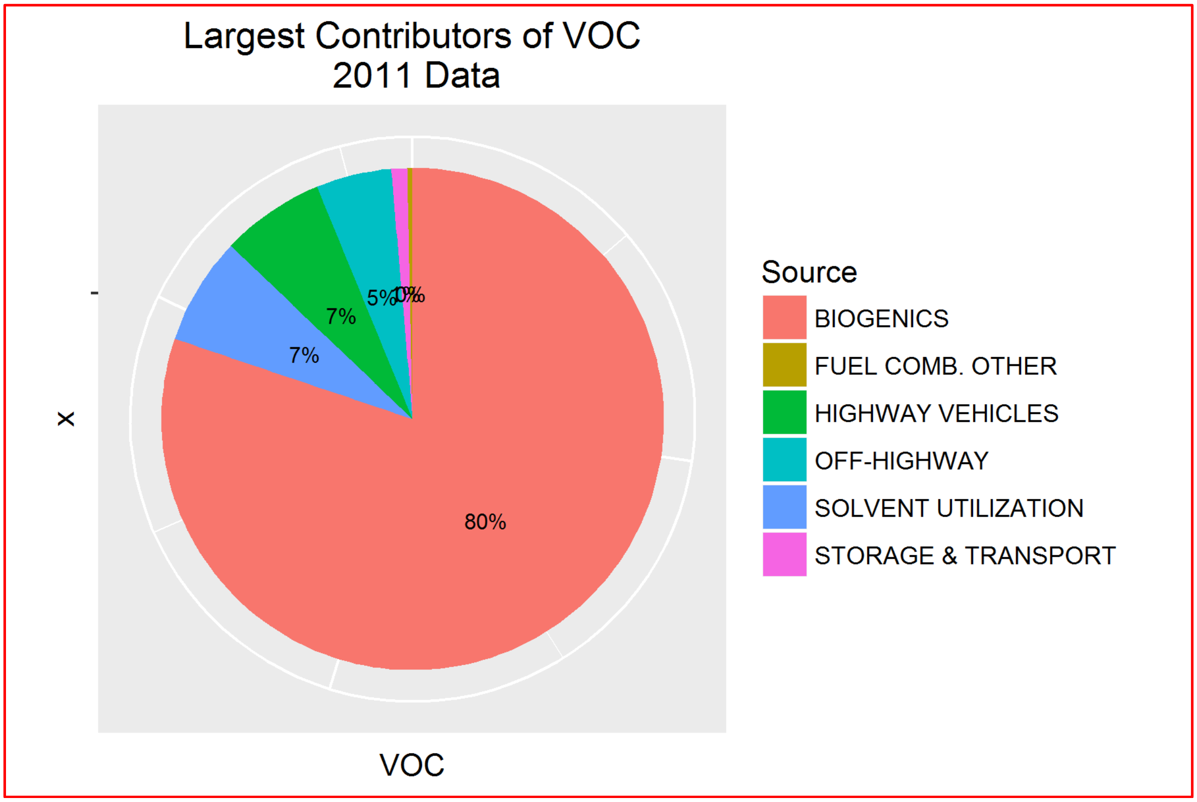


Figure 3-3. Top VOC Contributors.

Figure 3-4 shows the locations of the NO_x point sources in Clark County. The majority of point sources are located in HA 212, the Las Vegas Valley. Figure 3-5 shows VOC point sources, the majority of which are emitted in the Las Vegas Valley. These figures were generated using DAQ's 2014 AERR submittal, which showed a total of 19,226 tpy of NO_x emissions and 656 tpy of VOC emissions for point sources.

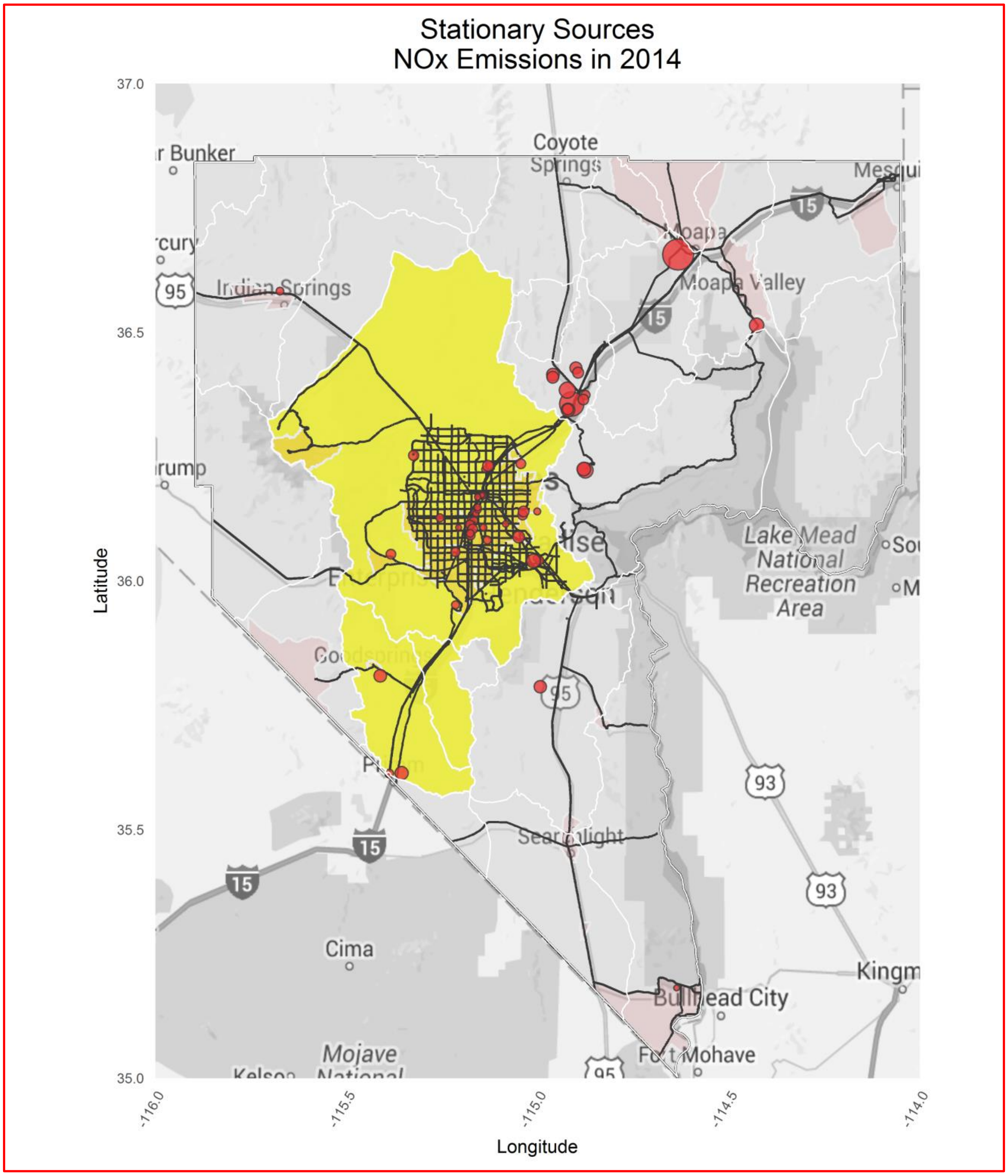


Figure 3-4. Locations of NO_x Sources in Clark County (2014).

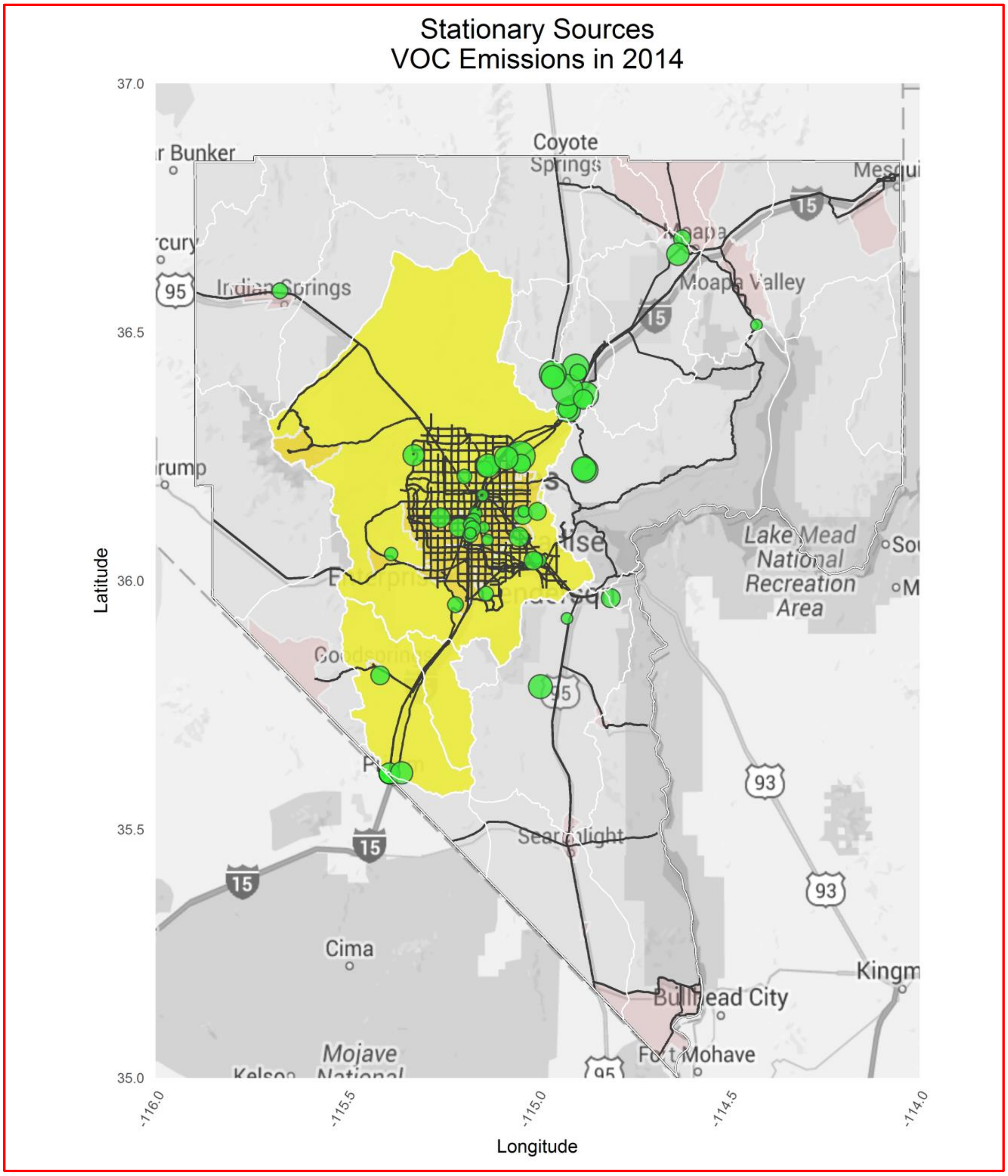


Figure 3-5. Locations of VOC Sources in Clark County (2014).

In June 2013, Nevada's governor signed a law accelerating the retirement of the Reid Gardner Generating Station. Three of the plant's four units closed in 2014, and the remaining unit will close in 2017. According to EPA's Air Markets Program Data,[2] 2015 NO_x emissions for Reid Gardner were 524 tpy, down from 3,667 tpy in 2014. These reductions are due to the closure of

[2] http://ampd.epa.gov/ampd

Units 1, 2 and 3. The 2015 emissions are solely from Unit 4, which is scheduled to shut down by December 2017.

3.2 FUTURE ECONOMIC DEVELOPMENT AND EXPANSION

Future economic development and expansion in Clark County will take place mostly in the Las Vegas Valley (HA 212). This urbanized area has the infrastructure to support economic growth in Clark County. Table 3-4 summarizes projected 2015 and 2022 NO_x and VOC emissions in tons per day. NO_x emissions are projected to decrease significantly, while overall daily VOC emissions are projected to decrease only slightly.

Table 3-4. Emission Projections in Tons per Day

Source	NO_x		VOC	
	2015	2022	2015	2022
Point	31.54	31.73	1.61	1.74
Nonpoint	5.64	5.9	66.21	76.15
On-road	34.69	23.15	45.32	36.71
Non-road	30.1	19.51	32.29	29.73
Biogenic	5	5	132	132
Total	**106.97**	**85.29**	**277.43**	**276.33**

Source: *Ozone Redesignation Request and Maintenance Plan: Clark County, Nevada* (DAQ 2011), pp. 6-5 and 6-7.

Point source emissions are a significant contributor to overall NO_x emissions, but a very small fraction of overall VOC emissions. Point source NO_x emissions are estimated to increase between 2015 and 2022. VOC emissions are projected to decrease slightly during the same period.

Area-source VOC emissions are projected to significantly increase between 2015 and 2022, since they are primarily associated with population increases and most area sources are uncontrolled. NO_x emissions are projected to increase slightly over the same period.

On-road mobile sources are a significant contributor to all ozone precursor inventories, but their contribution will decrease over time despite large increases in activity as older vehicles are replaced by new ones that meet much stricter federal emissions standards.

Non-road mobile sources are also a significant contributor to all ozone precursor inventories, but their contribution is also decreasing over time on both an absolute and relative basis. Activity will be increasing, but most non-road sources are now covered under federal non-road engine and equipment standards that phase in over time.

3.3 GROWTH RATES AND PATTERNS

Ninety percent of the land in Clark County is under federal control (DCP 2013) therefore, most population growth is expected to occur in the Las Vegas Valley. Figure 3-6 shows land ownership within Clark County and the surrounding areas.

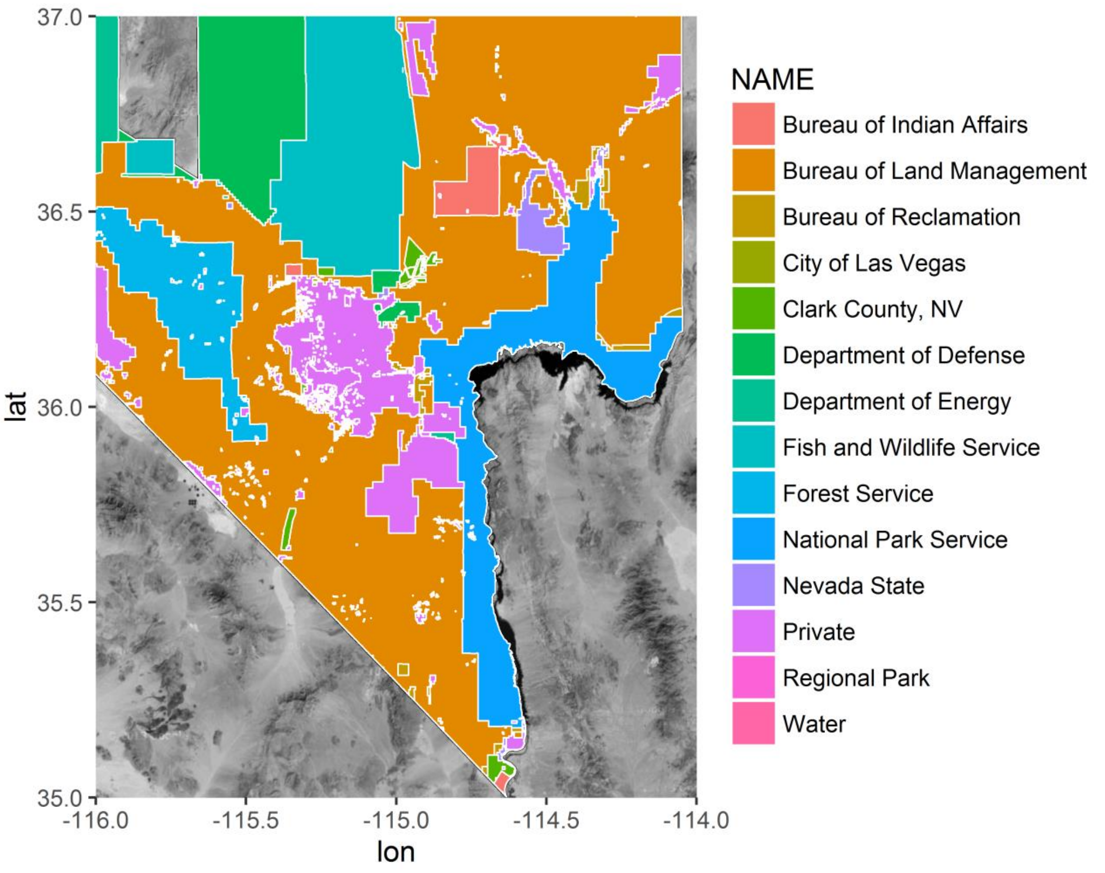


Figure 3-6. Land Ownership in Clark County.

The Southern Nevada Public Lands Management Act (SNPLMA) limits the amount of federal land that may be sold to private interests and requires an act of Congress to expand or change the boundary. This limit means less than 10% of the land in the county is privately held. The development of privately held land is further limited by the Multiple Species Habitat Conservation Plan Incidental Take Permit from the U.S. Fish and Wildlife Service, which limits private development throughout the county. Due to existing county ordinances and agreements, much of any new industrial development will occur in the Apex Valley, northeast of the Las Vegas Valley. Little if any residential development can take place in Apex.

3.4 POPULATION

The total population of Nevada is 2,700,551, with a population density of 24 people/mi^2 (U.S. Census Bureau 2010). The population of Clark County is 1,951,269, the majority of which live in the Las Vegas Valley, which has a population density of 247 people/mi^2. The 2015 population estimates in Table 3-5 show that 97% of the county's population lives in the Las Vegas Valley (HA 212); Table 3-6 shows the comparison to city populations only.

Table 3-5. Population Estimates for 2015

Place / Community	Population	% of Total
CLARK COUNTY	2,147,641	100%
Cities	1,193,796	
Unincorporated Areas	953,845	
LAS VEGAS VALLEY URBAN AREA	2,080,254	97%
Cities	1,158,485	
Unincorporated Areas	921,769	
OUTLYING AREAS	67,387	3%
Cities	35,310	
Unincorporated Areas	32,076	

Source: "Clark County, Nevada 2015 Population Estimate: Population by Place" (DCP 2015).

Table 3-6. City Population

Place/Community	Population
City of Las Vegas	628,711
City of Henderson	291,432
City of North Las Vegas	238,342
City of Mesquite	19,299
City of Boulder City	16,011

Source: DCP 2015.

Population density within the Las Vegas metropolitan area varies substantially. Some densities in the city will increase as vacant areas are filled in, but most increases are anticipated to be on the periphery of the metropolitan area. The recommended NAA boundary encompasses all the anticipated expansion of the populated area, and includes all the anticipated emissions and pollutant exposures projected for new neighborhoods.

Table 3-7 gives the population breakdown for the unincorporated areas of Clark County, both within and outside the Las Vegas Valley. The total population of the unincorporated areas in HA 212 is 921,768 people; the population of the outlying areas is only 32,076 people.

Table 3-7. Unincorporated Area Population

Areas	Place/Community	Population
Unincorporated Areas in the Las Vegas Valley	Enterprise	186,056
	Lone Mountain	17,060
	Nellis AFB	5,949
	Paradise	195,224
	Sloan	121
	Spring Valley	200,436
	Summerlin South	28,654
	Sunrise Manor	209,308
	Whitney	42,184
	Winchester	33,180
	Urban “County Islands”	3,596
Unincorporated Outlying Areas	Blue Diamond	539
	Bunkerville	1,111
	Cal-Nev-Ari	157
	Corn Creek	53
	Fort Mojave Reservation	385
	Goodsprings	211
	Indian Springs	1,251
	Jean	175
	Laughlin	9,301
	Lower Kyle Canyon Road	203
	Moapa / Moapa Reservation	1,380
	Moapa Valley – Logandale	3,090
	Moapa Valley – Overton	3,780
	Moapa Valley – Remainder	91
	Mountain Springs	98
	Mt. Charleston	661
	Nelson	30
	Primm	649
	Red Rock	123

Areas	Place/Community	Population
	Sandy Valley	1,855
	Searchlight	352
	Spring Mountains	122
	Other Outlying Areas	6,461

Source: DCP 2015.

Table 3-8 shows the Census Designated Places (CDP) data—the concentration of population identified by the U.S. Census Bureau. The data shows land area and average population/mi^2.

Table 3-8. Population Density in Clark County

County Subdivision Place	Land Area in Square Miles	Total Population	
		Number	Avg/Sq Mi
Clark County	7,891.43	1,951,269	247.3
Clark CCD	7,414.99	179,324	24.2
Blue Diamond CDP	7.22	290	40.2
Boulder City city (part)	169.94	2	0.0
Bunkerville CDP	42.78	1,303	30.5
Cal-Nev-Ari CDP	2.27	244	107.6
Enterprise CDP (part)	18.35	44,120	2,404.5
Goodsprings CDP	1.43	229	160.1
Henderson city (part)	27.69	32,688	1,180.4
Indian Springs CDP	18.01	991	55.0
Las Vegas city (part)	29.18	12,202	418.2
Laughlin CDP	88.04	7,323	83.2
Mesquite city	31.89	15,276	478.9
Moapa Town CDP	150.82	1,025	6.8
Moapa Valley CDP	43.67	6,924	158.5
Mount Charleston CDP	29.29	357	12.2
Nelson CDP	4.80	37	7.7
North Las Vegas city (part)	40.46	128	3.2
Sandy Valley CDP	56.00	2,051	36.6
Searchlight CDP	13.13	539	41.0
Summerlin South CDP (part)	8.59	16,800	1,956.7
Sunrise Manor CDP (part)	7.91	9,468	1,196.7
Boulder City city (part)	38.58	15,021	389.3
Enterprise CDP (part)	28.16	64,361	2,285.2
Henderson city (part)	80.04	225,041	2,811.7
Las Vegas city (part)	106.64	571,554	5,359.8
Nellis AFB CDP	2.71	3,187	1,176.0

County Subdivision Place	Land Area in Square Miles	Total Population	
		Number	Avg/Sq Mi
North Las Vegas city (part)	60.89	216,833	3,561.2
Paradise CDP	46.72	223,167	4,777.0
Spring Valley CDP	33.23	178,395	5,369.1
Summerlin South CDP (part)	1.06	7,285	6,881.5
Sunrise Manor CDP (part)	25.44	179,904	7,071.5
Whitney CDP	6.74	38,585	5,726.7
Winchester CDP	4.34	27,978	6,444.2

Source: *Nevada: 2010—Summary Population and Housing Characteristics*, p. 65 (Table 15) (U.S. Census Bureau 2012).

Figure 3-7 shows the population density in Clark County. The densest areas are located in HA 212 (the Las Vegas Valley), with the outlying areas very sparsely populated. Several HAs have no population, such as 213, 215, 216, 217, and 223.

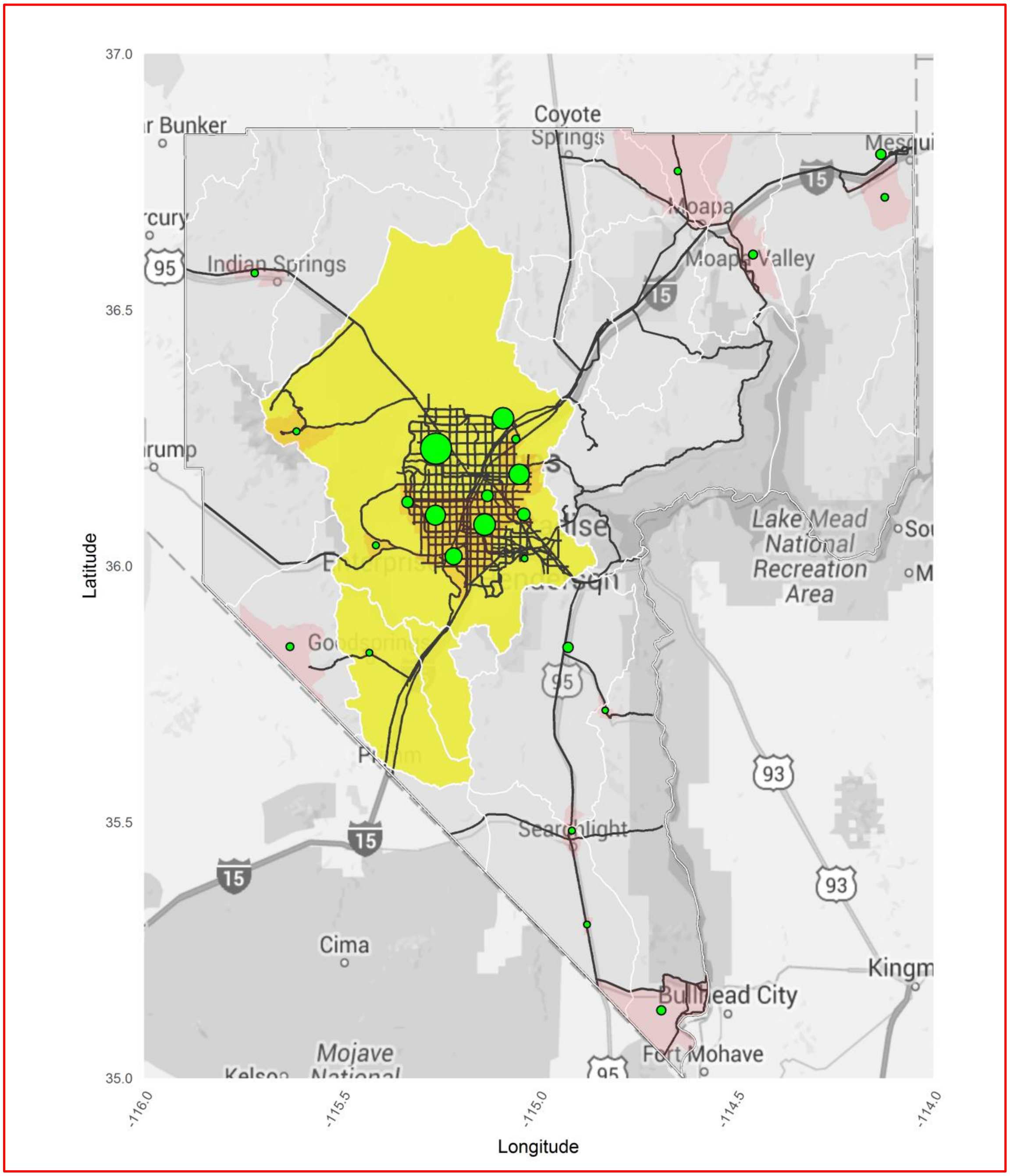


Figure 3-7. Population Density in Clark County.

The same pattern can be seen in Figure 3-8, which depicts the average population per square mile. The highest average population areas are located around the Las Vegas Strip.

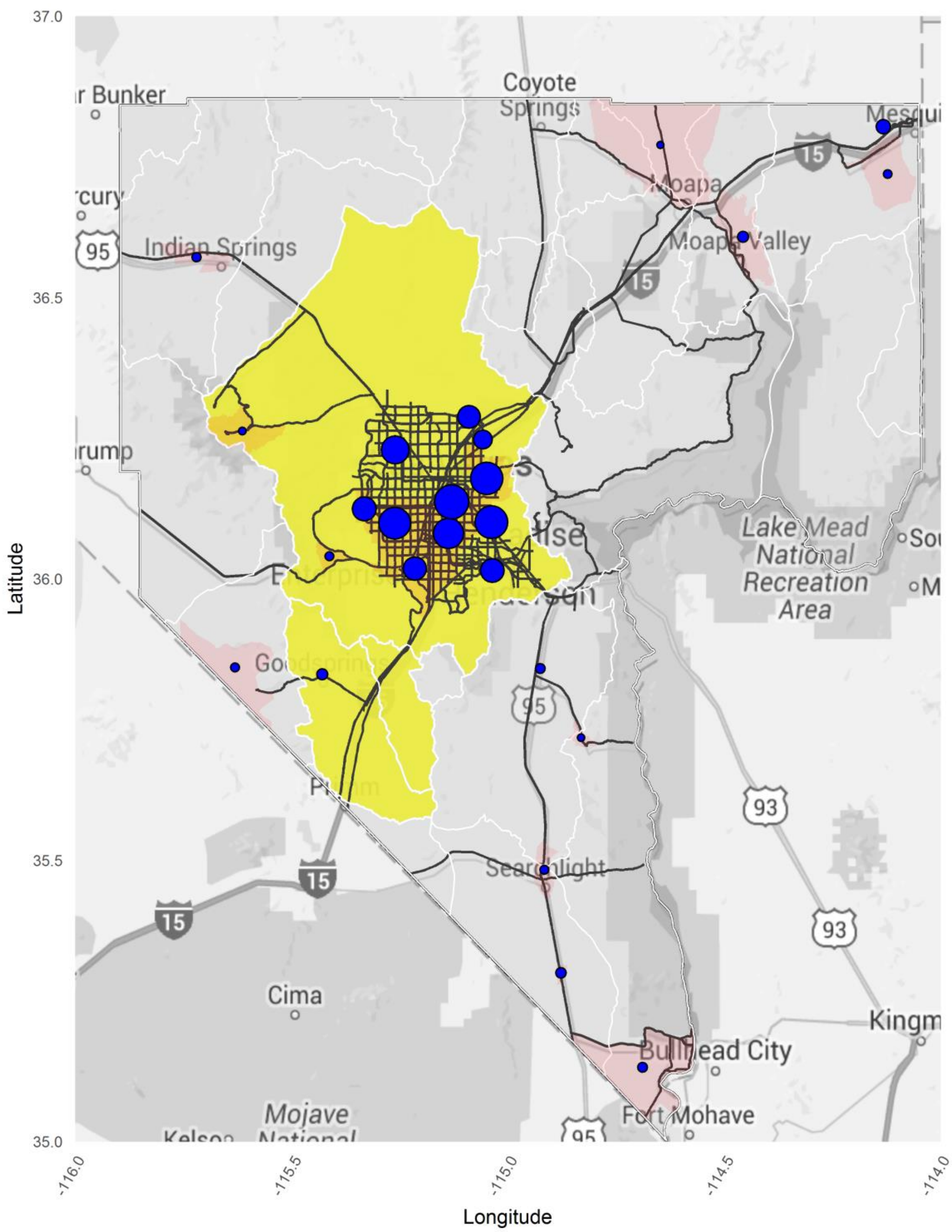


Figure 3-8. Average population per square mile.

Table 3-9 lays out expected population growth in Clark County between 2015 and 2035, showing that population is estimated to grow by about 600,000 by 2035. Table 3-10 shows the accompanying growth in developed acres.

Table 3-9. Estimated Population Projections for Clark County

Year	Clark County Population
2015	2,148,000
2020	2,307,000
2025	2,436,000
2030	2,574,000
2035	2,716,000

Source: *Population Forecasts: Long-Term Projections for Clark County, Nevada 2015-2050* (Tra 2015).

Table 3-10. Developed Acres Forecast, 2005-2030

Time Period	Forecast Growth Acres		
	Residential	Nonresidential[1]	Total
2006-2010	15,558	16,214	31,771
2010-2015	16,212	15,092	31,304
2015-2020	16,565	15,664	32,229
2020-2025	9,900	9,900	19,800
2025-2030	4,900	4,972	9,872
Total	**63,136**	**61,841**	**124,977**

Source: *Regional Transportation Plan 2006-2030* (RTC 2008).
[1] Includes open space.

Table 3-11 shows forecasts for population and dwelling units. The majority of growth will likely occur on the fringes of the currently developed urban area of the Las Vegas Valley, where the greatest amount of privately held vacant land is located. The largest areas of undeveloped, privately held vacant land are in the northwest, northeast, and southwest parts of the SNPLMA disposal boundary. Because of these factors, the primary ozone impact on human health occurs and will continue to occur in HA 212.

Table 3-11. Population and Dwelling Unit Forecast, 2005-2030

	2005	2008	2013	2020	2030
Population	1,769,532	2,022,523	2,431,048	2,877,544	3,230,493
Dwelling units	686,226	780,260	938,335	1,120,702	1,233,422

Source: *Regional Transportation Plan 2006-2030* (RTC 2008).

Figure 3-9 depicts population density using the data in Table 3-7. The densest population area is the Las Vegas Valley; outlying areas, such as Mesquite, Indian Springs, Moapa, and Laughlin, show far less density. Figure 3-10 depicts the county's projected population growth from 2010–2035, with the largest growth occurring in the outmost areas around the Las Vegas Valley.

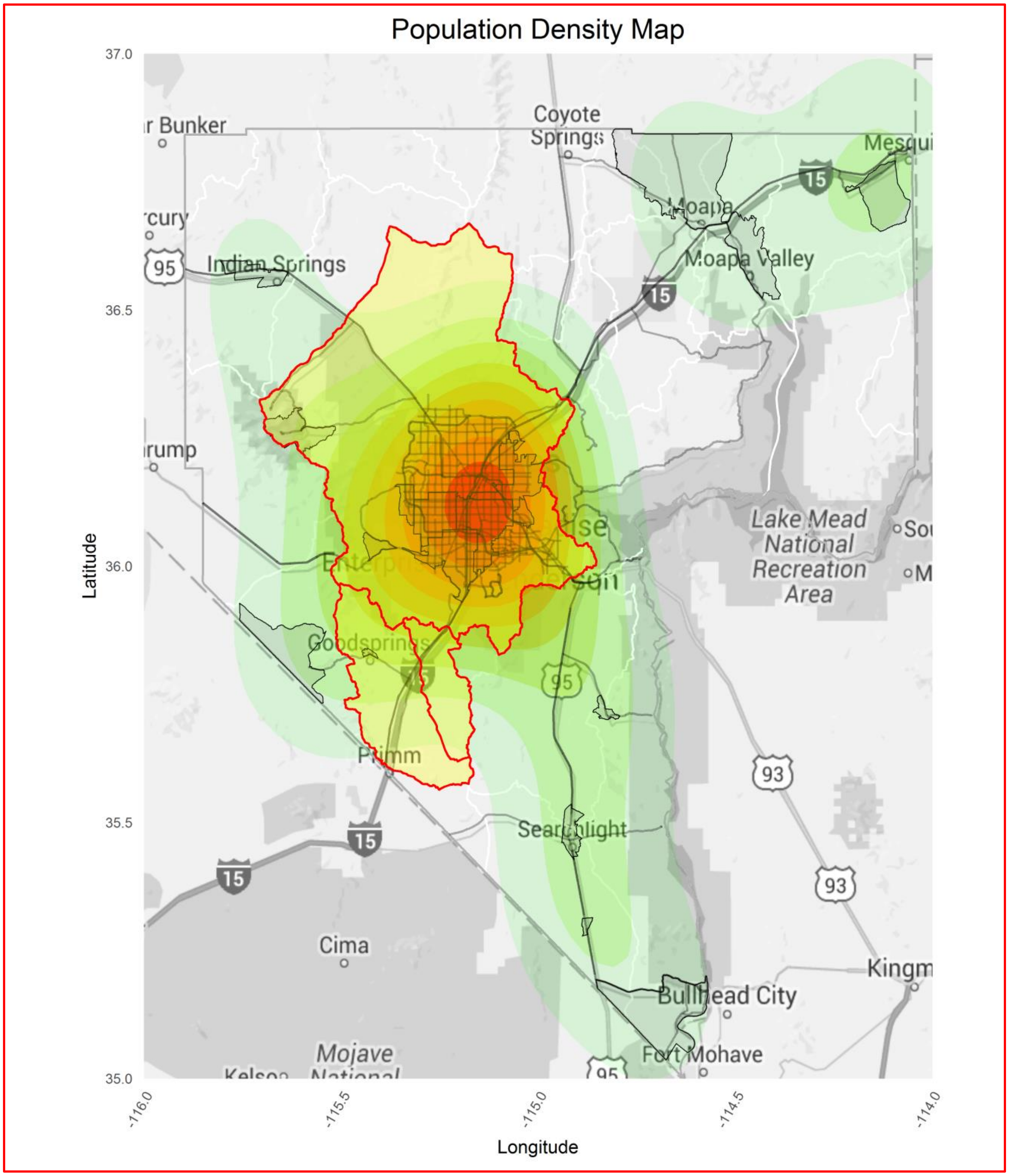


Figure 3-9. Population Density.

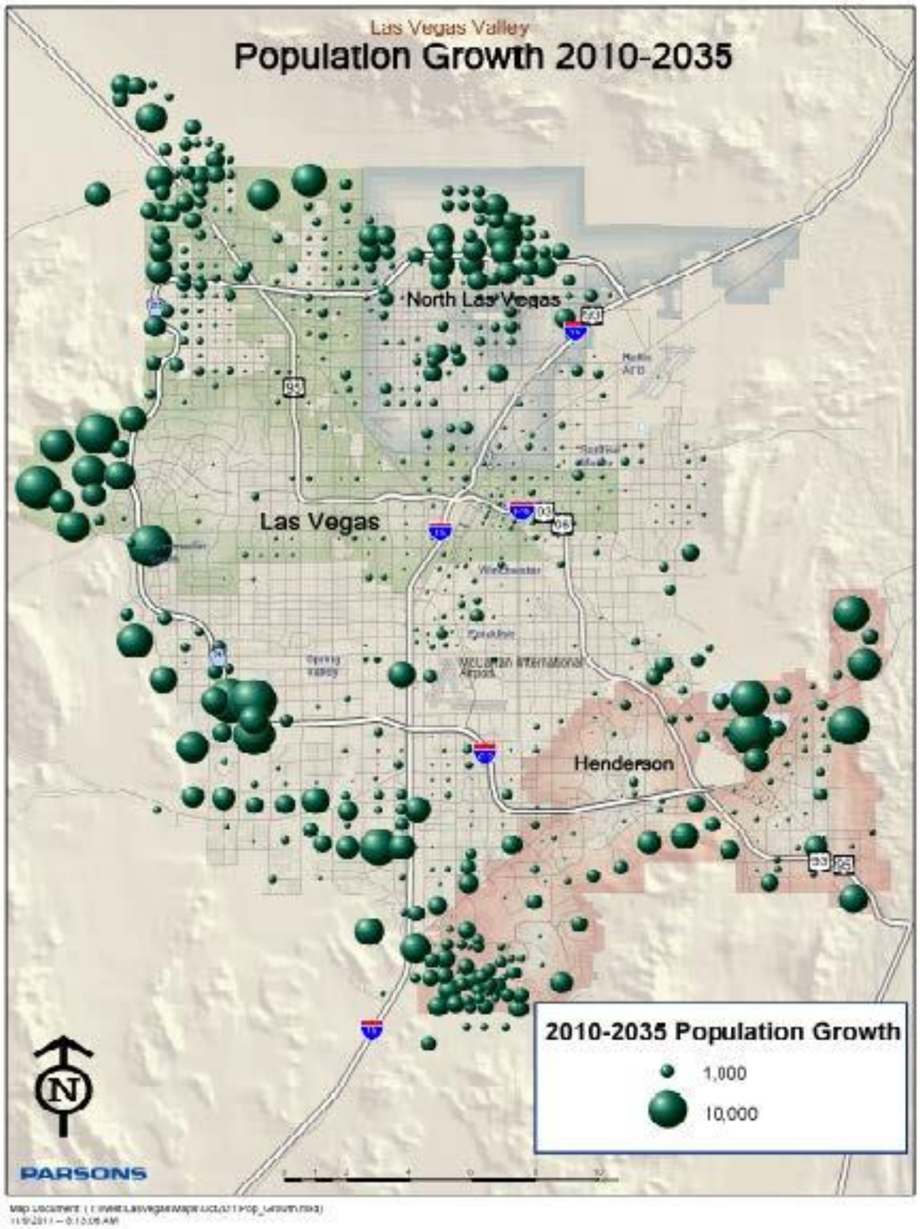


Figure 3-10. Clark County Population Projections, 2010-2035.

3.5 TRAFFIC AND COMMUTING PATTERNS

Figure 3-11 shows the road network in Clark County: major arterials are marked in red, minor arterials in blue, and other surface streets in black. The majority of the network is located in the recommended NAA, with a sparse network in the rural areas of Clark County.

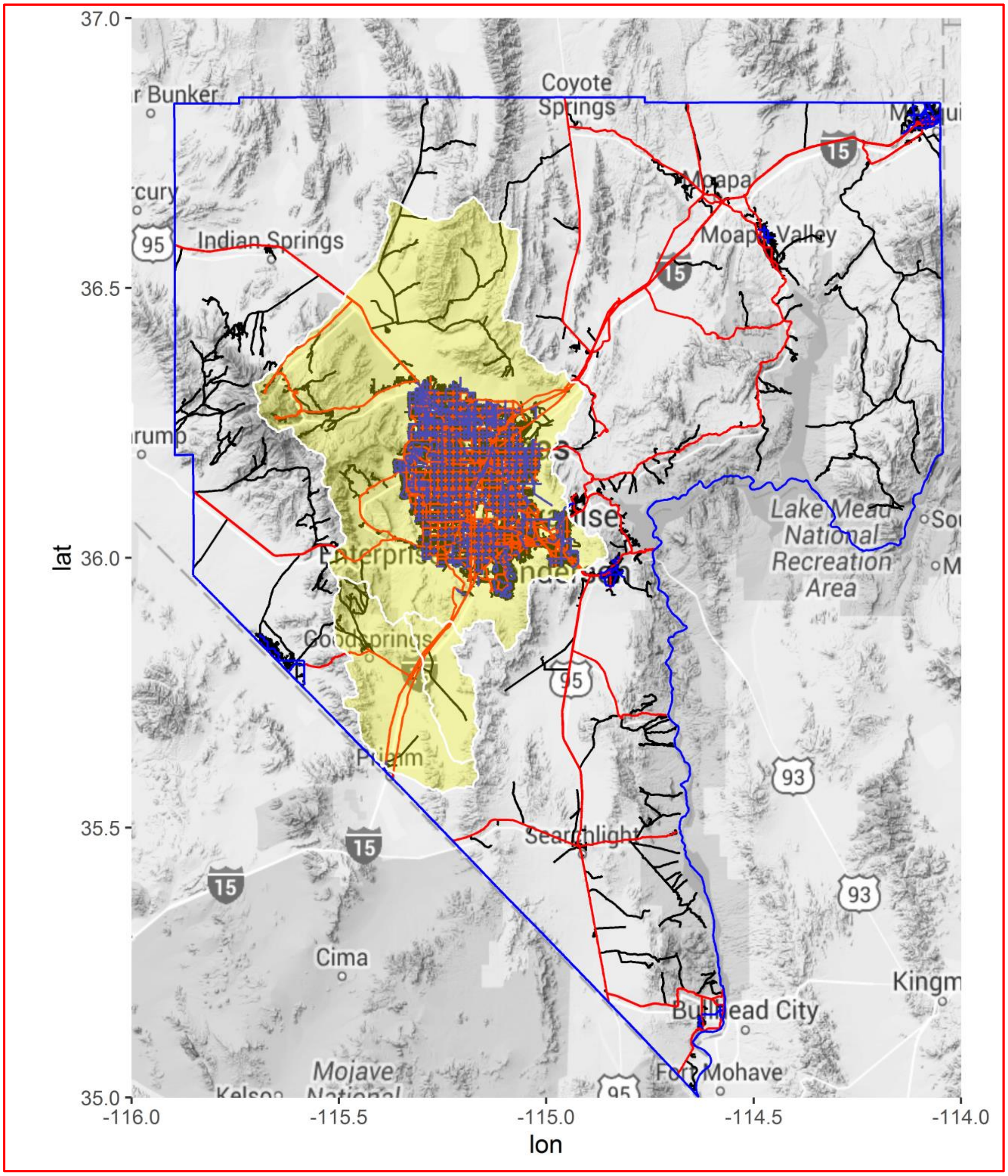


Figure 3-11. Road Network in Clark County.

Las Vegas has been one of the fastest-growing urban areas in the nation since the mid-1980s, and traffic volumes have increased every year. Figure 3-12 shows the roadway network in the Las Vegas core area; major arterials are marked in red, minor arterials in blue, and other surface streets in black.

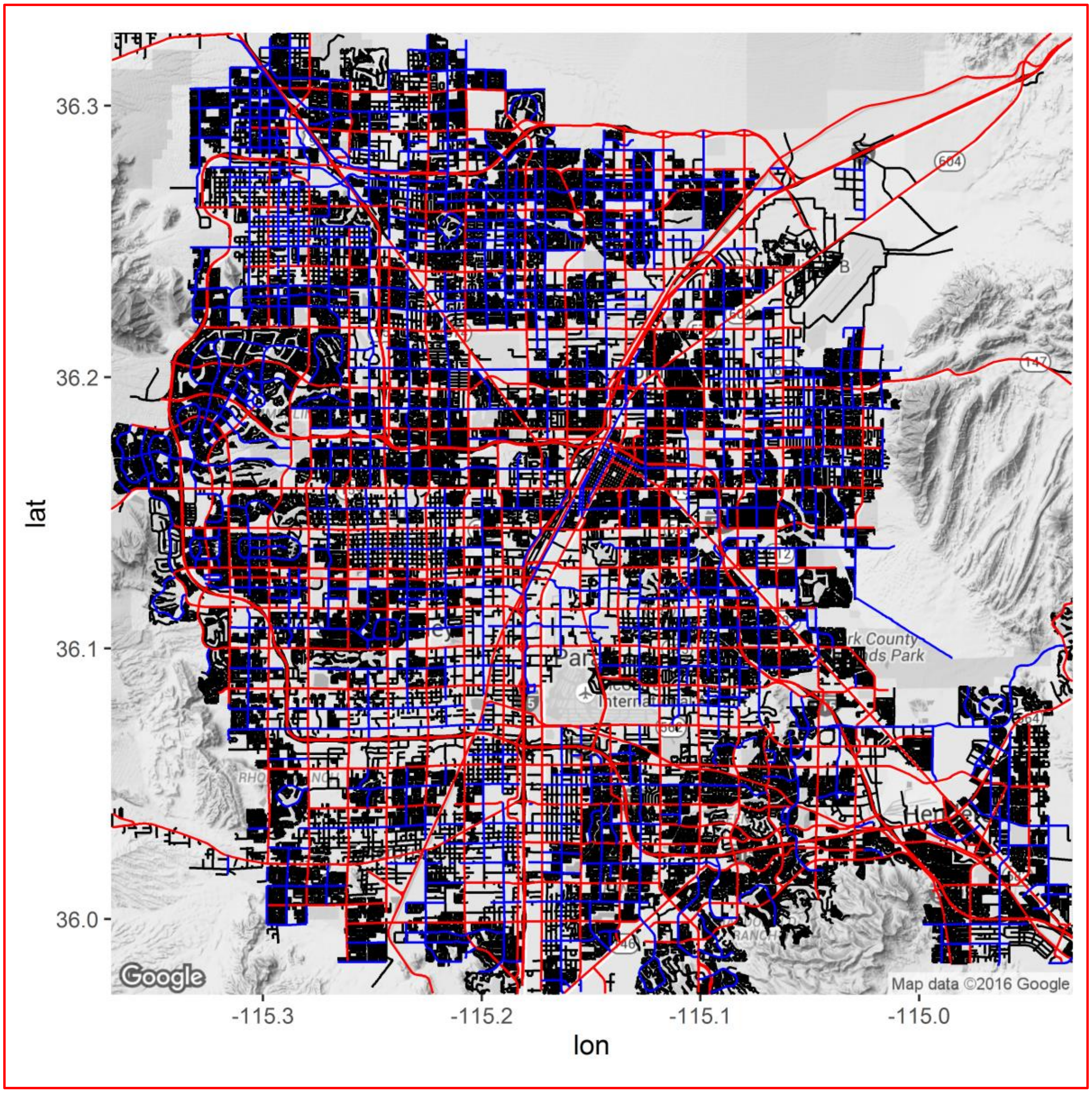


Figure 3-12. Las Vegas Valley Road Network.

Table 3-12 estimates total number of daily vehicle miles traveled between 2008–2030, and Table 3-13 estimates average weekday vehicle trips through 2030. Both vehicle miles traveled and average weekday vehicle trips are estimated to increase by 60 percent or more by 2030, reflecting continued population and employment growth projections for the Las Vegas Valley.

Table 3-12. Daily Vehicle Miles Traveled, 2008-2030

Road Type	2008	2010	2020	2030
External links	607,755	631,693	789,029	957,758
System-to-system ramps	341,568	356,470	535,554	596,490
Minor roads	5,439,127	6,100,189	8,695,678	10,596,263
Major roads	15,356,117	16,623,022	19,182,320	20,900,273
Ramps	1,234,124	1,355,581	1,716,600	1,885,604
Interstates	10,529,327	11,359,075	15,700,354	19,148,610
Freeways	4,567,426	5,395,363	7,464,694	8,208,423
Expressways/beltways	198,762	193,598	7,652	12,316
Collectors	3,310,084	3,498,212	4,146,492	4,682,685
Centroid connectors	3,255,261	3,581,532	4,693,489	5,448,182
Local roads	15,271	15,632	15,818	16,854
HOV	243,363	486,752	1,160,461	1,173,322
Total	**45,098,185**	**49,597,119**	**64,108,141**	**73,626,781**

Source: *Regional Transportation Plan 2006-2030* (RTC 2008).

Table 3-13. Average Vehicle Trips in the Las Vegas Valley, 2005-2030

Trip Purpose	Average Weekday Vehicle Trips					
	2005	2006	2008	2010	2020	2030
Auto trips	4,465,602	4,696,208	5,156,575	5,616,529	6,798,258	7,499,605
External trips	159,738	171,941	191,504	199,445	239,153	278,860
Truck trips	183,137	183,184	209,974	227,865	299,642	340,631
Taxi trips	192,944	197,681	207,155	216,630	285,565	363,664
Total vehicle trips	**5,001,421**	**5,249,014**	**5,765,208**	**6,260,470**	**7,622,618**	**8,482,760**

Source: *Regional Transportation Plan 2006-2030* (RTC 2008).

In 2014, the Nevada Department of Transportation estimated the total annual vehicle miles traveled (AVMT) for Clark County at 17,414,363,343. Table 3-14 shows the breakdown of the functional road classes in Clark County, with associated AVMT and miles.

Table 3-14. Functional Classes

FUNCTIONAL CLASS (FC)	% AVMT	AVMT	MILES
Principal Arterial - Interstate - Rural	4%	756,080,893	80
Principal Arterial - Interstate -SU	0%	51,321,548	8
Principal Arterial - Interstate - Urban	16%	2,811,956,692	67
Principal Arterial - Other Freeways & Expressways - Urban	8%	1,346,116,589	37
Principal Arterial - Other - Rural	2%	386,945,833	164
Principal Arterial - Other - SU	0%	48,001,693	5
Principal Arterial - Other - Urban	11%	1,905,039,889	167
Minor Arterial - Other- Rural	0%	14,171,855	9
Minor Arterial - SU	0%	84,536,044	42
Minor Arterial - Urban	21%	3,571,673,728	532
Major Collector - Rural	0%	74,844,471	188
Minor Collector - Rural	0%	14,680,720	67
Minor Collector - SU	0%	28,611,566	63
Minor Collector - Urban	8%	1,440,480,235	585
Local - Rural	0%	47,196,843	507
Local - Urban	28%	4,832,727,743	5,471
Clark County Total	**100%**	**17,414,386,343**	**7,994**

Source: *Annual Vehicle Miles of Travel: 2014 HPMS Data* (NDOT 2015).

Figure 3-13 displays the 10 largest AVMT roads in Clark County in 2014, according to the Nevada Department of Transportation (NDOT 2015). All the busiest roads are in the Las Vegas Valley.

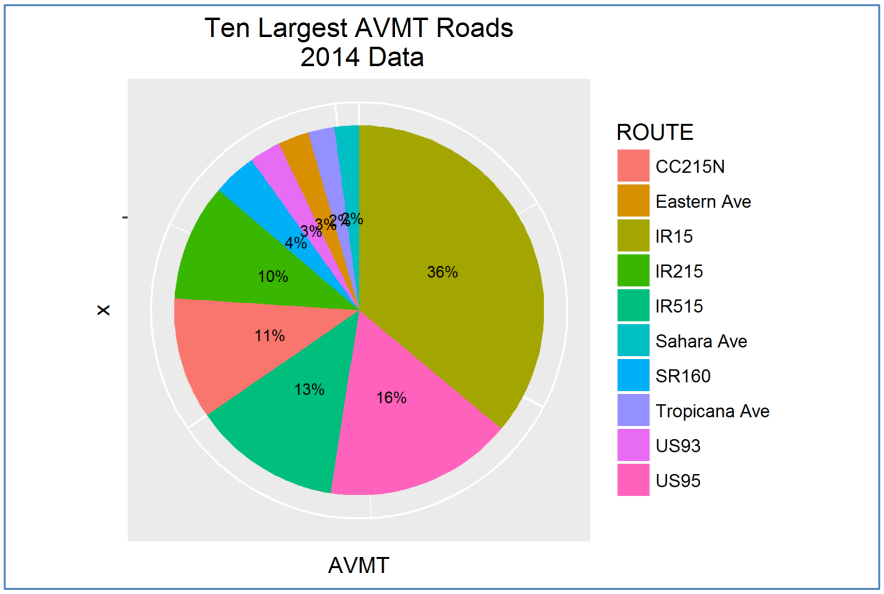


Figure 3-13. Busiest roads.

Since 88% of all AVMT in Clark County are driven in Las Vegas, and more than 95% of the county's population lives within the urban core of the Las Vegas Valley, understanding trip purpose is useful in addressing commuting patterns. According to Table 3-15, total resident trips comprise over 91% of the Average Weekday Person Trips taken in the Las Vegas Valley; visitor trips comprise the rest. Based on trip purpose data, the commuting pattern is 13% home to work, 7% home to school, 37% home to other, 26% non-home-based trips, and 0.22% residence air trips. Vehicle trips inside the Las Vegas Valley are distributed fairly well along the roadway network.

Table 3-15. Person-trips in the Las Vegas Valley, 2015-2035

Trip Purpose	Average Weekday Person Trips			
	2015	2020	2030	2035
Home-based work	1,024,340	1,105,042	1,285,153	1,365,213
Home-based school	578,575	634,089	726,117	746,638
Home-based	622,598	679,966	770,419	787,162
Other home-based	2,978,579	3,253,038	3,685,774	3,765,874
Non-home-based	2,125,615	2,316,788	2,641,640	2,722,278
Residence air	17,072	18,622	20,389	20,949
Total resident trips	7,346,778	8,007,546	9,129,492	9,408,113
Multi-day visitor trips	586,099	610,211	693,635	724,205
Visitor airport-based trips	113,322	125,472	193,764	205,781
Total visitor trips	699,422	735,683	887,399	929,986
Total person trips	8,046,199	8,743,228	10,016,892	10,338,099

3.6 APEX VALLEY (HA 216)

3.6.1 Emissions-Related Data

The Apex Valley is the major business park in Clark County. The Apex monitoring station is surrounded by 10 stationary sources; the primary objective of the Apex site is "to monitor the ambient impacts of emissions from nearby processing facilities and power plants…"(DAQ 2016). Figure 3-14 shows the surrounding point sources in relation to the Apex monitoring station ("**AP**"). The blue lines mark the major roads in Apex. The biggest stationary source in the Apex complex operates about a mile south of the monitor, which is located on its property. Since the site is generally downwind from Las Vegas, it serves as an indicator of pollutant transport flow out of the Las Vegas Valley.

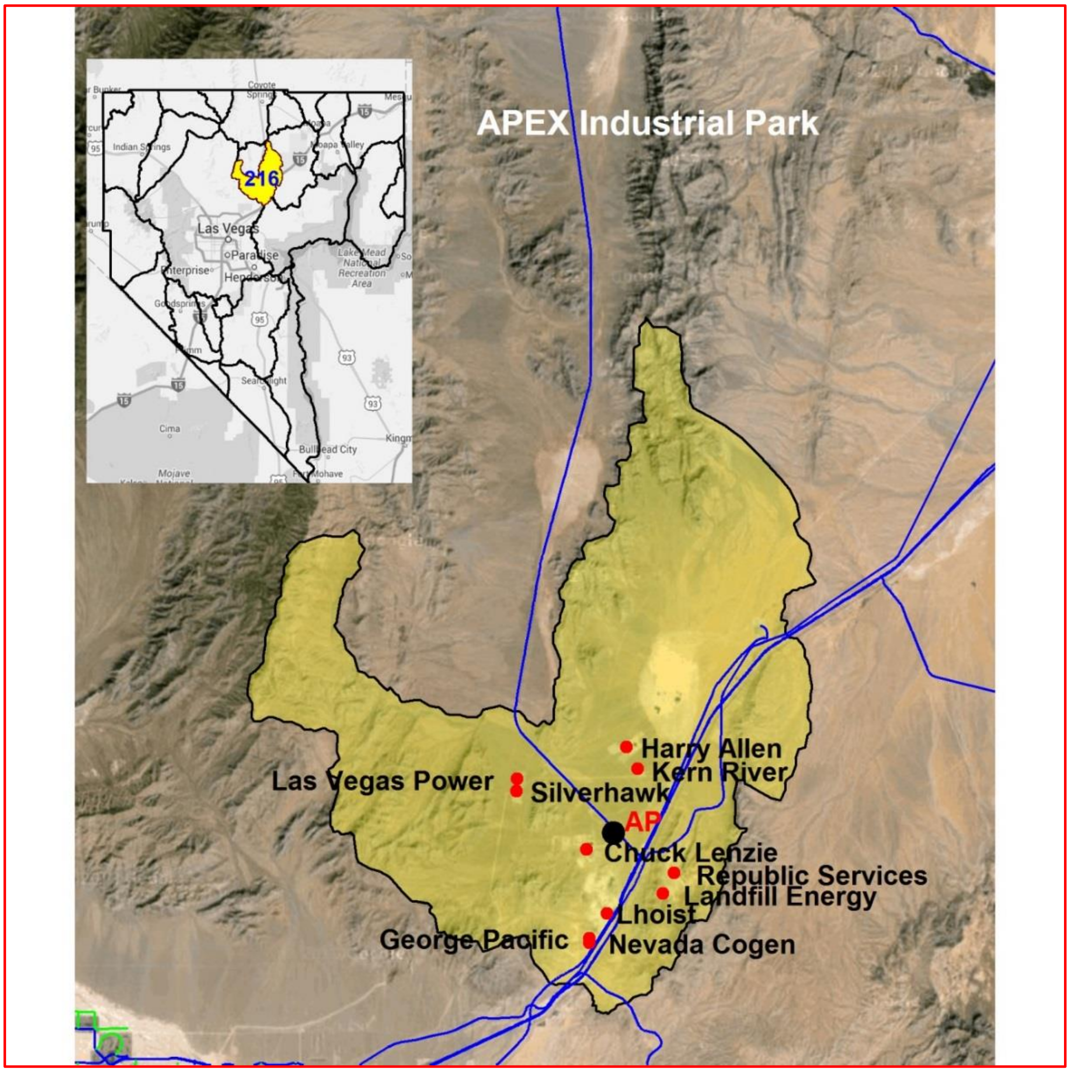


Figure 3-14. Apex Valley.

DAQ has monitored ozone levels in Apex for a number of years, and the data indicate lower ozone levels than in the Las Vegas Valley. Ozone levels in Apex may rise when Clark County is affected by regional ozone transport episodes, stagnant air, recirculation of air masses, or exceptional events, such as stratospheric ozone intrusions or wildfires.

Table 3-16 includes the combined 2011 NO_x and VOC emissions data for all stationary sources in Apex. The contribution of Apex sources to 2011 NO_x and VOC emissions are estimated at 1,846 tpy (4% of county total) and 177 tpy (0.11% of county total) respectively, as shown in Table 3-17.

Table 3-16. Emissions Inventory for Apex

2011 NEI	NO_x	VOC
Lhoist North America and Granite Const. (Apex)	1,200	6
Nevada Cogeneration Associates #1	108	10
Republic Services Dumpco	61	9
Nevada Power Company (Harry Allen)	44	25
Georgia Pacific	33	7
Nevada Power (Chuck Lenzie)	227	71
Las Vegas Power Company-Apex Generating Station	71	6
Nevada Power Silverhawk	70	36
Kern River - Dry Lake-Apex	32	6
CC Landfill Energy LLC	0	1
TOTAL	**1,846**	**177**

Table 3-17. Emissions in Apex Valley

	NOx		VOC	
	tpy	% of Total	tpy	% of Total
POINT SOURCES	8,542	17%	16,592	9%
MOBILE	42,619	82%	21,014	11%
BIOGENICS	555	1%	146,405	80%
Total in Clark County	**51,716**	**100%**	**184,011**	**100%**
APEX	**1,846**	**4%**	**177**	**0.11%**

The Apex Valley has no population, and the workforce at the facilities commute mostly from Las Vegas along I-15.

3.6.2 Forward Trajectories

Figure 3-15 depicts forward trajectories from the Apex industrial park for May through September 2015; trajectories are taken every third day. The figure shows that the Apex complex does not impact the Las Vegas Valley.

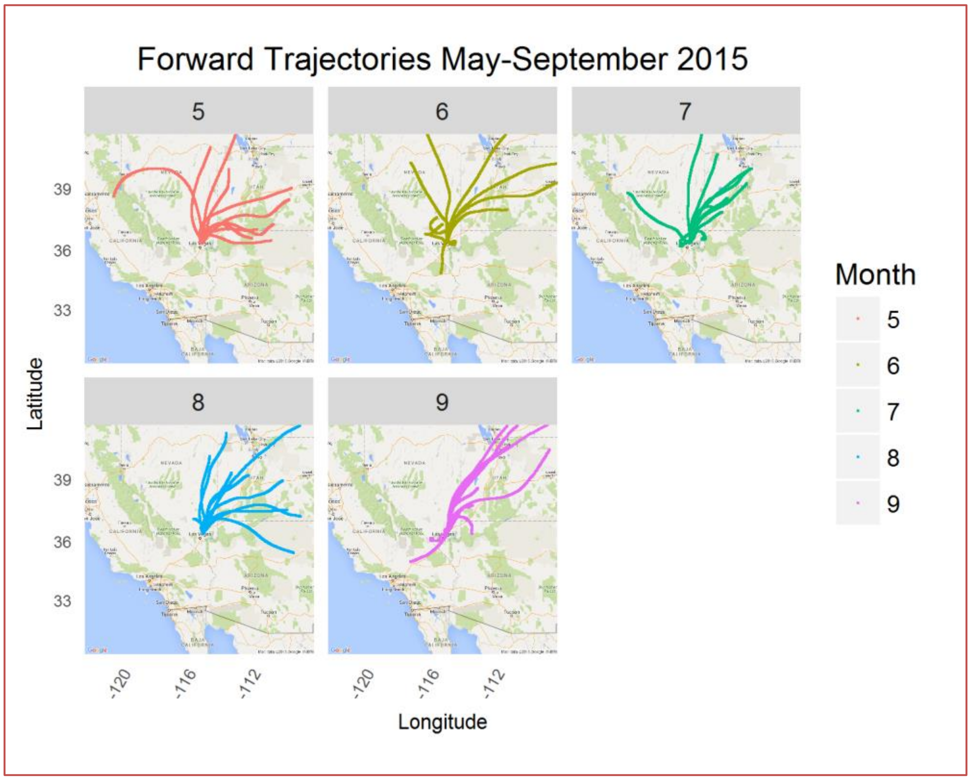


Figure 3-15. Forward Trajectories from Apex.

3.6.3 Backward Trajectories

The Apex monitor exceeded the new NAAQS several times during 2013–2015, as Table 3-18 lists. Backward trajectories were created using the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model. Figure 3-16 shows the 24-hour HYSPLIT back trajectories for the exceedance days. The red dots designate an elevation of 100 m, the blue dots 500 m, and the green dots 1,000 m.

Some days in 2014 might have been impacted by a combination of stagnant air and a fire smoldering on tribal lands that led to local ozone production due to recirculation of the air masses. However, the elevated ozone levels were caused by regional transport, mostly from Southern California, the California Central Valley and even Baja California.

Table 3-18. Exceedance Days at Apex

Date	O_3	Date	O_3
20130430	74	20140605	80
20130504	73	20140606	77
20130505	73	20140607	76
20130514	71	20140611	72
20130521	71	20150603	72
20130525	72	20150604	74
20130621	78	20150618	83
20140601	77	20150622	72
20140604	74	20150727	75

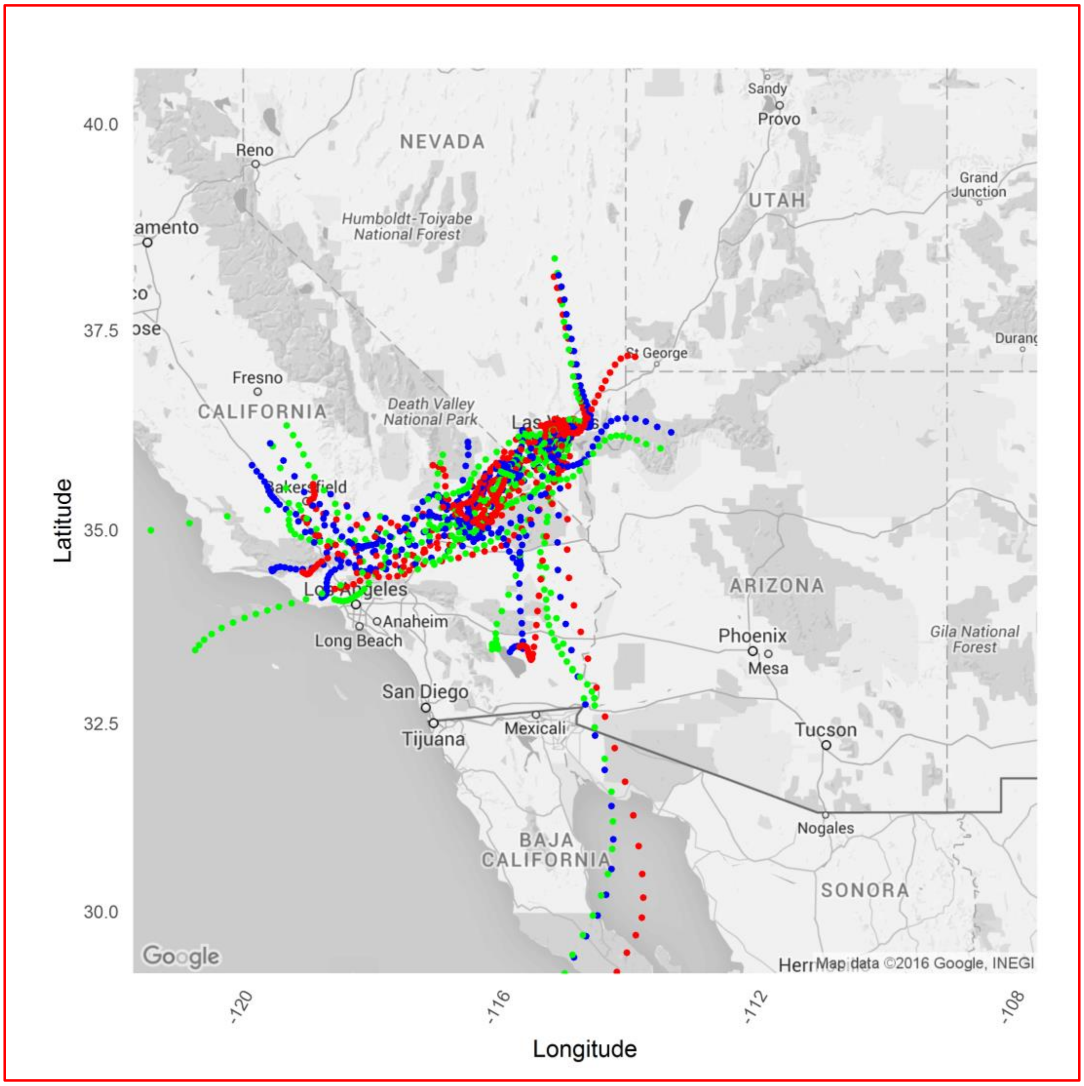


Figure 3-16. Compilation of All Back Trajectories.

3.7 CONCLUSIONS

The stationary sources in areas of the county other than the recommended NAA account for a small percent of the total NO_x emissions inventory and an even smaller percent of the VOC emissions inventory in the Las Vegas Metropolitan Statistical Area (MSA). The recommended NAA includes the vast majority of emissions sources in the county and the major transport corridors that cause or contribute to ozone exceedances. The other HAs have few sources and are separated from the recommended NAA by topography.

There is a significant difference in the population density and degree of urbanization between the nonattainment and unclassifiable/attainment areas. The recommended NAA appropriately includes the densely populated portions of the Las Vegas MSA, along with a large area possibly subject to commercial growth owing to the expansion of population and commerce. The recommended excluded areas are mostly uninhabited; they have little commercial development, have almost no stationary sources, and are separated from the recommended NAA by mountains, distance, and vast stretches of vacant desert.

The 5-factor analysis shows that the recommended NAA contains most roadways and traffic in the Las Vegas MSA. The areas recommended for NAA exclusion are mostly rural, with little traffic compared to the urban portions of the Las Vegas MSA. Nearly all the routes outside the recommended NAA carry fewer than 25,000 vehicles per day each, far below traffic levels in the urban areas of the Las Vegas MSA. The region's traffic and commuting patterns demonstrate that the vast majority of vehicle trips occur within the recommended nonattainment boundary; average daily traffic diminishes rapidly beyond the core area. Commuting information also indicates that work trips into the region are minimal compared to traffic volumes within the recommended boundary. Traffic outside the recommended NAA is low by comparison, and the landscape is rural, with small pockets of development: this traffic and commuting information supports the recommended nonattainment designation. If future traffic and commuting information indicates that additional HAs should be included in the NAA, the existing nonattainment boundary will be reevaluated and expanded as necessary.

The 5-factor analysis shows that the Las Vegas MSA is experiencing significant growth; however, the recommended NAA includes most of the population growth, i.e., the Las Vegas Valley (HA 212). The recommended NAA contains all the areas of expected growth and development.

Clark County's population density/degree of urbanization information illustrates that further urbanization, and the associated activities that can result in emissions of ozone precursors, is concentrated in the proposed nonattainment boundary. Urbanization diminishes rapidly beyond the central portion of the proposed NAA. The population/urbanization information supports the recommended nonattainment designation. If future urbanization indicates that additional counties or regions should be included in the NAA, the existing nonattainment boundary will be reevaluated and expanded as necessary.

Clark County's rates and patterns of growth illustrate that the vast majority of increased population and urbanization will occur within the proposed nonattainment boundary. Population density and developed areas diminish rapidly from the core area, and this is not projected to change. Due to the ownership of the surrounding lands (mostly federal agencies), growth outside the core will most likely not occur.

Although the Apex Valley is the major business park in Clark County, it has no population. The Apex monitoring station is surrounded by 10 stationary sources; its primary objective is to monitor the ambient impacts of emissions from nearby processing facilities and power plants (DAQ 2016, p. 13). A major stationary source (Lhoist) operates approximately a mile south of the monitor, which is located on Lhoist property. DAQ has monitored ozone levels in Apex for a number of years, and overall the data indicate lower ozone levels than in the Las Vegas Valley. Ozone levels might climb higher than in other areas when Clark County is affected by regional ozone transport episodes or exceptional events, such as stratospheric ozone intrusions and wildfires. The contributions of Apex sources to 2011 NO_x and VOC emissions are estimated at 1,846 tpy (4% of the county total) and 177 tpy (0.11% of the county total), respectively.

Based on an analysis of emissions and the emissions-related data factor, DAQ has determined the recommended NAA is appropriate, and that the inclusion of Apex in the ozone nonattainment area is not appropriate since precursor emissions are low (2,700 tpy NO_x and VOC combined), the Apex monitoring station is impacted by a variety of stationary sources, the station is located on a source's property, and Apex is sparsely populated.

If future emissions growth indicates that additional HAs should be included in the NAA, the existing nonattainment boundary will be reevaluated and expanded as necessary.

4.0 METEOROLOGY

4.1 DESCRIPTION

This section summarizes local meteorology and regional-scale systems affecting Clark County ozone air quality. Although located in the Mojave Desert, Clark County has four well-defined seasons. Summers display the classic characteristics of the desert Southwest: daily high temperatures in the lower elevations often exceed 100º F, with lows in the 70s. The summer heat is usually tempered by low relative humidity, which may increase for several weeks during July and August in association with moist monsoonal wind flows from the south. Average annual rainfall in the Las Vegas Valley, as measured at McCarran International Airport, is approximately 4.19 inches.

Meteorology is the single most important factor affecting ozone in Clark County, and meteorology is significantly affected by terrain. Mountain ranges in Clark County create circulations that tend to magnify the influence of local emissions on air quality, especially in the Las Vegas Valley. Although the terrain and circulations do not prevent transport into or away from the Las Vegas Valley, these factors tend to define a natural airshed. The airshed boundaries of the Las Vegas Valley provide a geographical focus for air quality analyses and control strategies. Light winds, a deep layer of thermally-driven flows, local vertical recirculation, cloud-free skies, and warm temperatures are key ingredients for high ozone at the valley surface.

4.1.1 Local Influences

At night in Clark County, local drainage flows dominate in the lower elevations (Figure 4-1). Within the Las Vegas Valley, the flow appears to follow the longitudinal axis of the valley toward Lake Mead. The surface flow pattern during the stable nighttime period is clearly decoupled from stronger winds aloft, as seen from measurements at higher elevations around the valley. By mid-morning, drainage flows cease and, due to solar-induced terrain heating, shift to an upslope flow (Figure 4-2), most frequently to the west and northwest. By mid-afternoon and continuing into evening, a rather uniform, moderately strong southwest wind field prevails as flows at all levels become strongly coupled. There is an overall flux into the valley from the southwest.

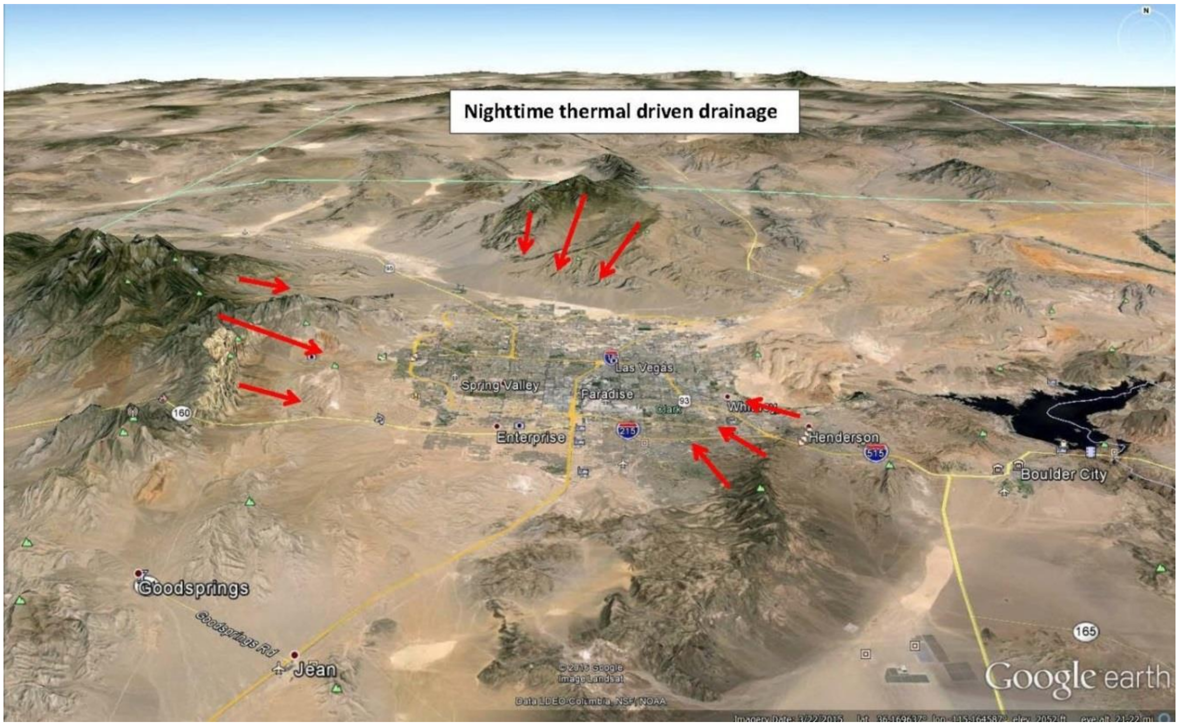


Figure 4-1. Nighttime Flows.

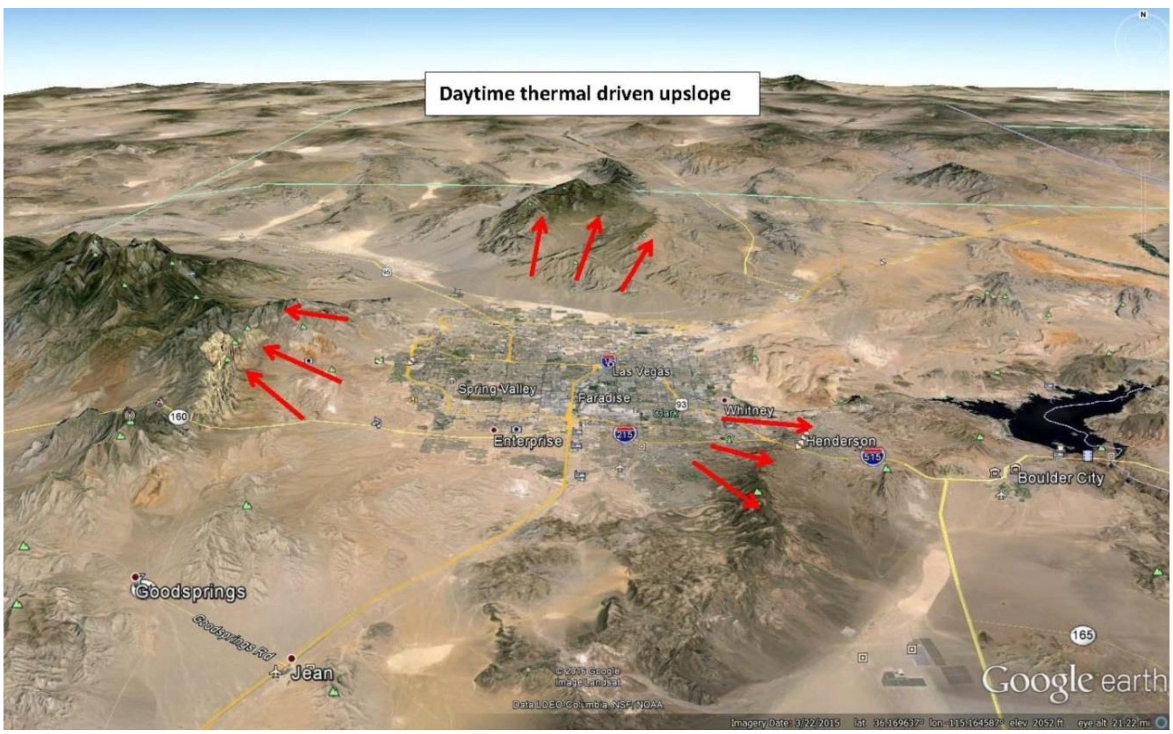


Figure 4-2. Daytime Flows.

Wind roses for the Palo Verde (Figures 4-3 and 4-4), Jean (Figures 4-5 and 4-6), and Joe Neal (Figures 4-7 and 4-8) air quality monitoring sites show distinct diurnal variations (top panels show nighttime winds; bottom panels show daytime winds). Palo Verde and Joe Neal have some of the highest ozone concentrations; Jean is the background site.

The winds at Palo Verde are dominated by local terrain-driven features. During the day, winds are primarily up-valley (from the southeast). At night, the prevailing wind is more westerly due to a strong downslope flow influence from the ridges that define the western boundary of the Las Vegas Valley; this influence is reinforced by the prevailing southwest regional winds. The observed winds at Jean are very different from those in the Las Vegas Valley: in Jean, winds at night are primarily from the west, but are southerly during the daytime hours. The winds at Joe Neal follow the transport corridor from the southeast toward the northwest.

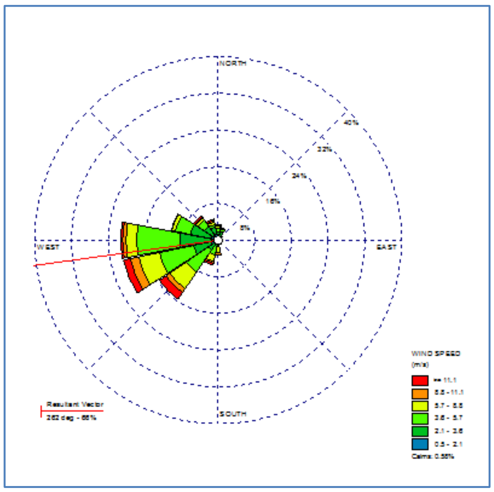


Figure 4-3. Nighttime Wind Rose for Palo Verde.

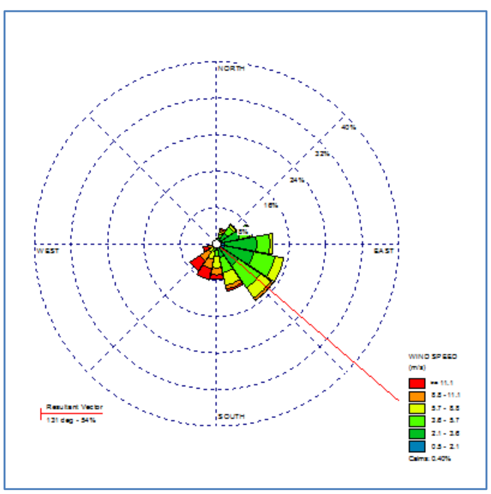


Figure 4-4. Daytime Wind Rose for Palo Verde.

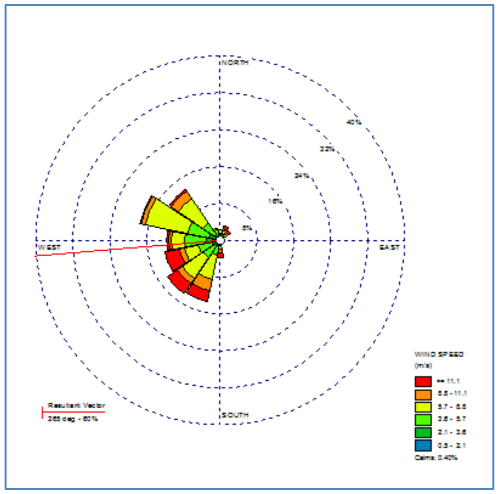


Figure 4-5. Nighttime Wind Rose for Jean.

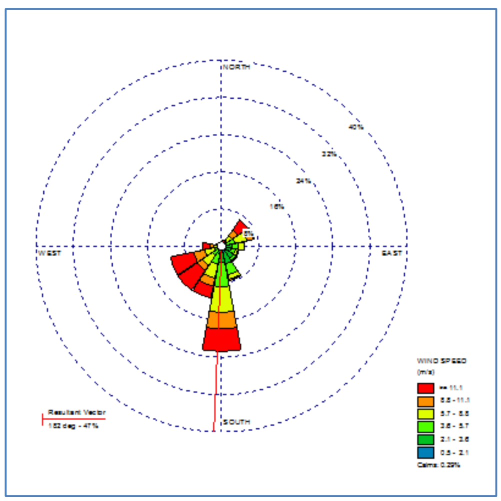


Figure 4-6. Daytime Wind Rose for Jean.

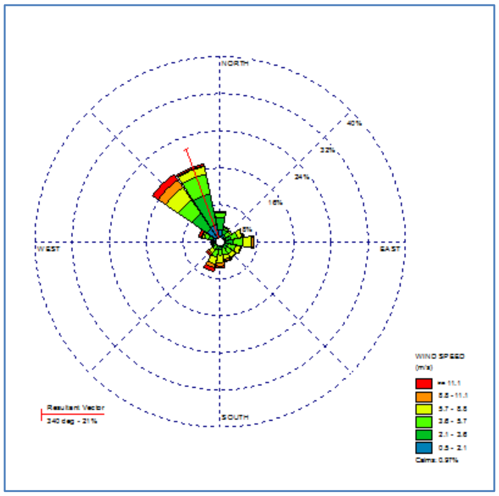


Figure 4-7. Nighttime Wind Rose for Joe Neal.

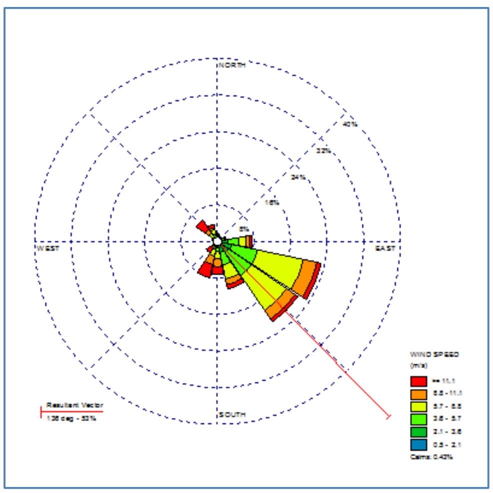


Figure 4-8. Daytime Wind Rose for Joe Neal.

4.1.2 Regional Transport

The prevailing southwest regional winds in southern Nevada during the summer months are important in defining the transport routes of pollutants into southern Nevada, and therefore in determining area designations under the revised 2015 ozone NAAQS.

An ozone characterization study in January 2006 identified five synoptic-scale weather patterns affecting ozone concentrations in southern Nevada:

1. Pacific Trough (PT)
2. Interior Trough (IT)
3. Pacific Ridge (PR)

4. Interior Ridge (IR)
5. Flat Ridge (FR).

The premise of the classification scheme is that synoptic-scale weather patterns, as depicted by the 500 mb constant pressure patterns, affect the onset and duration of elevated ozone concentrations in the Las Vegas Valley and surrounding areas. These synoptic weather patterns are instructive on the role of pollutant transport into southern Nevada, and are frequently the dominating cause of elevated ozone concentrations.

According to historical data collected at McCarran International Airport,[3] the highest average wind speeds in Clark County occur in the early spring (April–May), the same months that ozone concentrations often increase rapidly. Figure 4-9 shows average wind speeds.

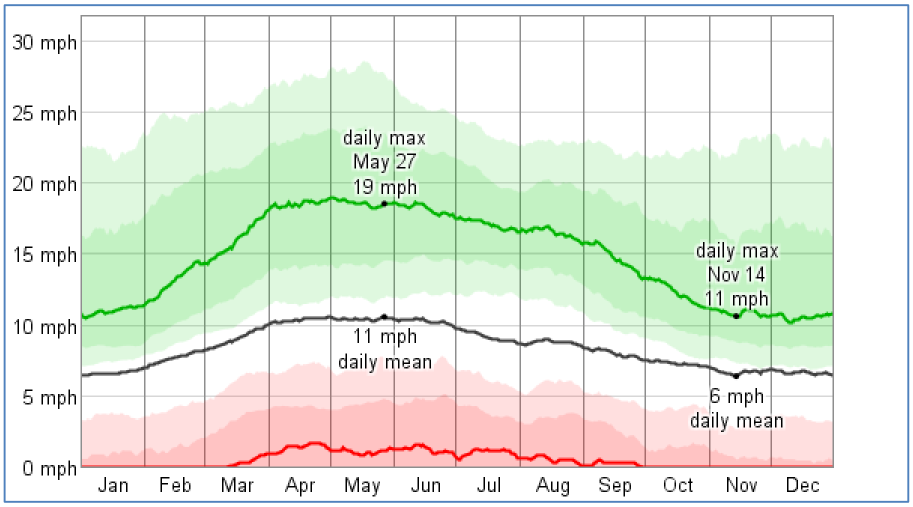


Figure 4-9. Average Wind Speeds at McCarran (1989-2012).

The same data shows that these winds mostly come from the south-southwest (Figure 4-10).

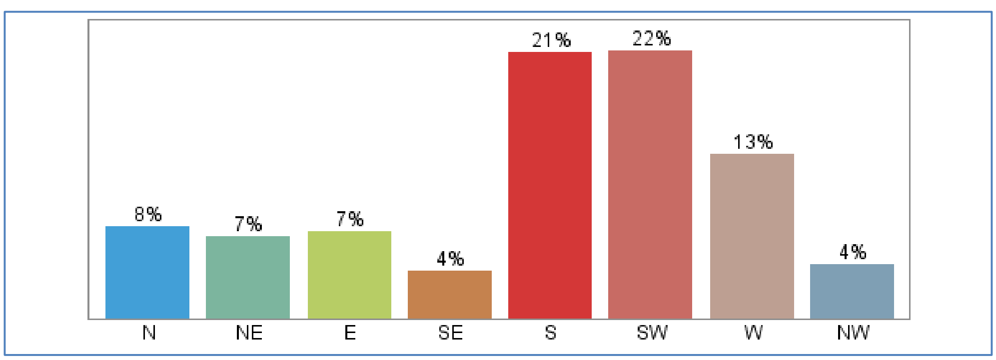


Figure 4-10. Wind Directions in Clark County.

The northwest quadrant of the Las Vegas Valley typically experiences the highest ozone levels during the days Clark County experiences elevated ozone concentrations.

[3] http://weatherspark.com/averages/30697/Las-Vegas-Nevada-United-States.

Several studies directed by DAQ confirmed transport of pollutants from Southern California into Clark County, contributing to widespread exceedances throughout the Clark County network. The predominant airflow enters from the south (following I-15) and exits to the northwest (following U.S. Highway 95).

HYSPLIT analyses on the four highest ozone days in each year from 2013 to 2015 in Clark County show that the back trajectory points for the prior 24 hours originate from the high ozone and emissions source areas in Southern California. Other days the air parcels are recirculated (due to stagnant air or low wind speeds) into the Las Vegas Valley, creating high ozone concentrations. Table 4-1 shows the 4 highest ozone days for 2013, 2014, and 2015; Figures 4-11, 4-12, and 4-13 show the back trajectories for those days.

Table 4-1. Highest Ozone Days, 2013 – 2015.

2013	Value	2014	Value	2015	Value
3-Jul	87	5-Jun	87	18-Jun	83
4-May	84	7-Jun	85	11-Jun	77
21-Jun	78	6-Jun	83	4-Jun	76
25-May	76	1-Jun	79	27-Jul	75

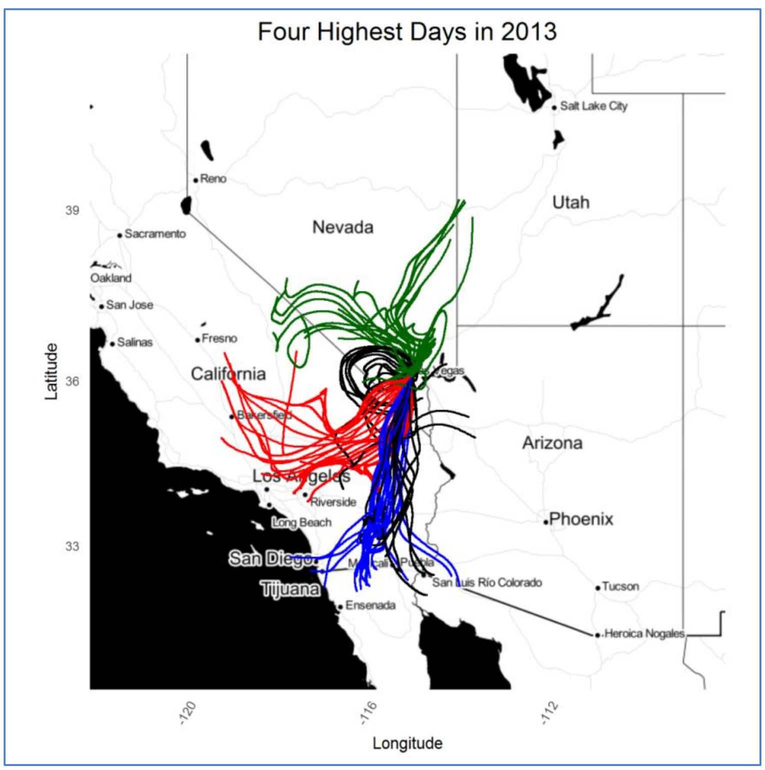


Figure 4-11. Back Trajectories for 2013.

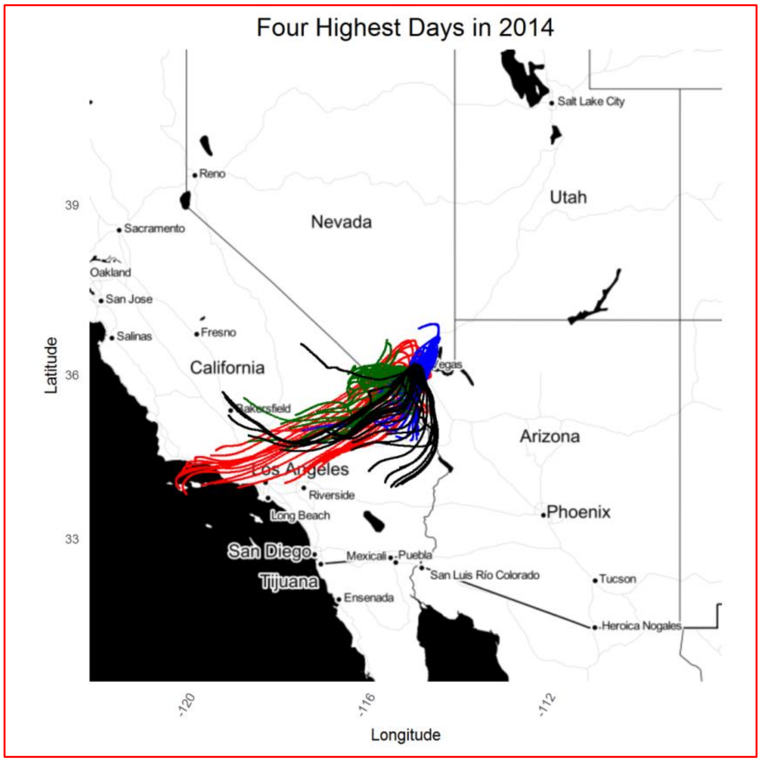


Figure 4-12. Back Trajectories for 2014.

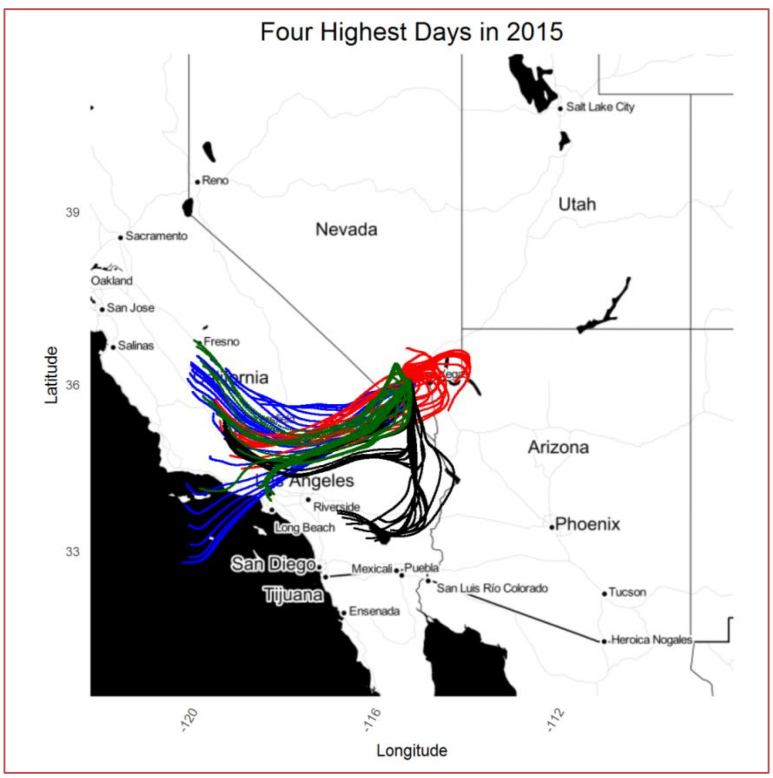


Figure 4-13. Back Trajectories for 2015.

Figures 4-14, 4-15, and 4-16 show ozone density frequency from the back trajectories for the ozone season in 2013, 2014, and 2015 (the frequencies are the percent of trajectories going through each grid square). The Joe Neal monitoring station was used as the receptor; 24-hour back trajectories at 10 m were used to create the original back trajectories. The graph shows a prevalence of both long-range and short-range transport from upwind areas, in addition to local contributions. The highest density frequencies occur in and around the recommended NAA.

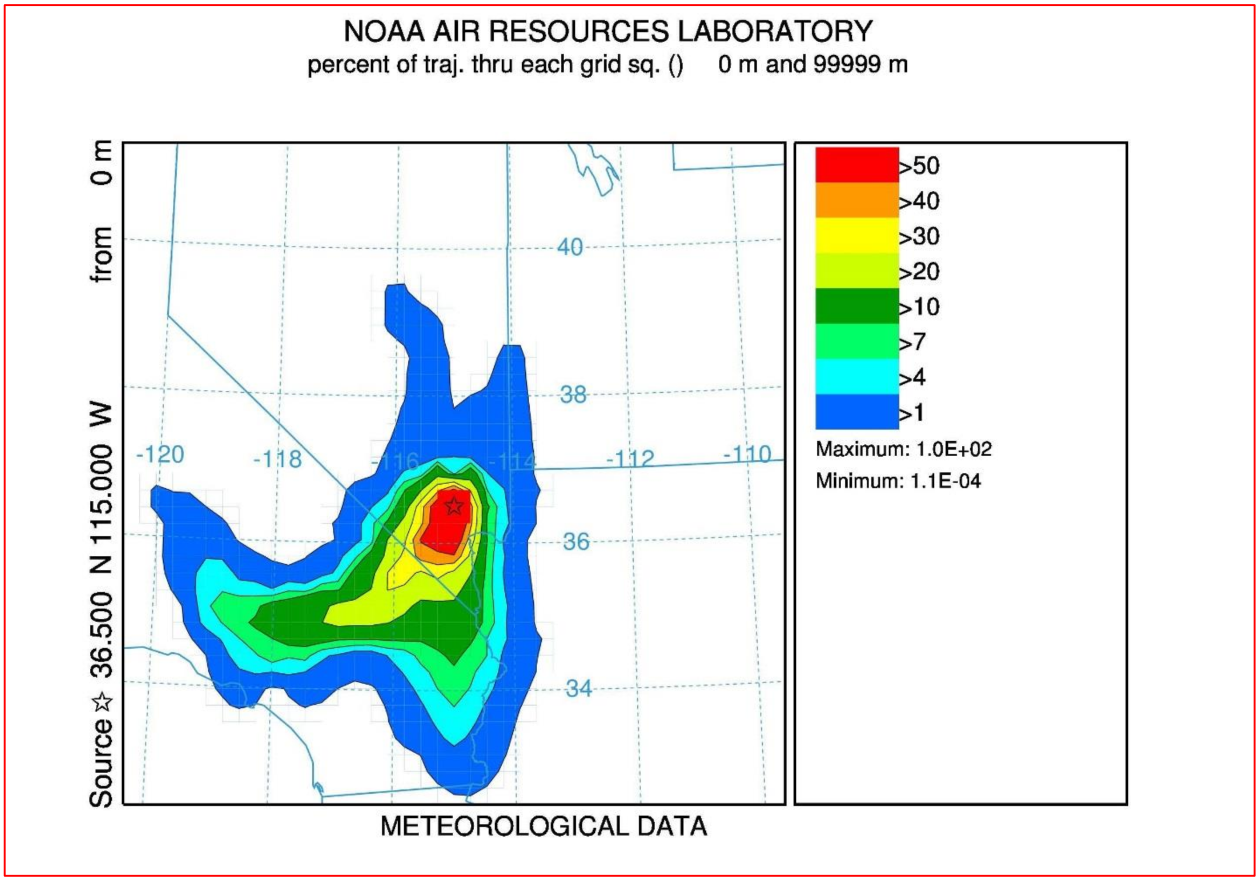


Figure 4-14. Density Frequency for 2013 Ozone Season.

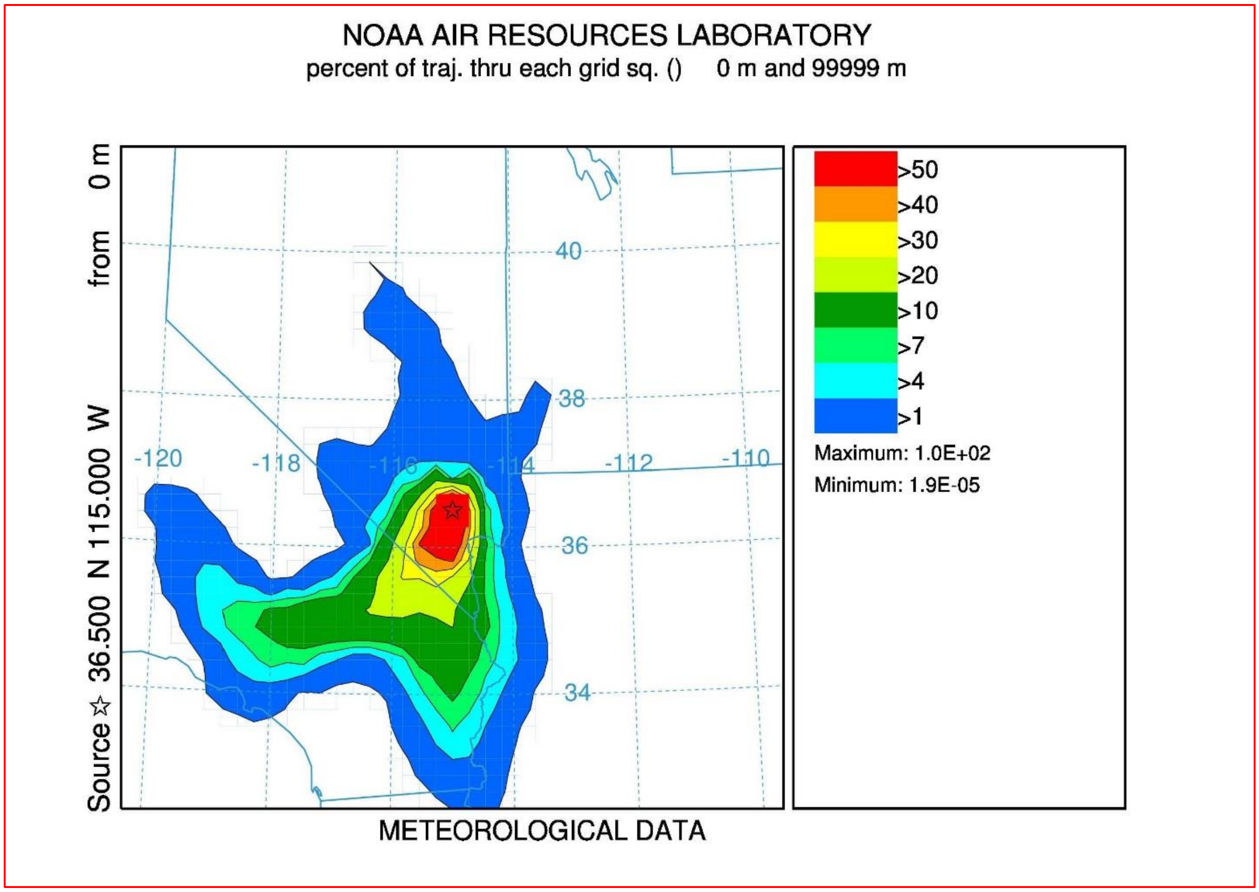


Figure 4-15. Density Frequency for 2014 ozone season.

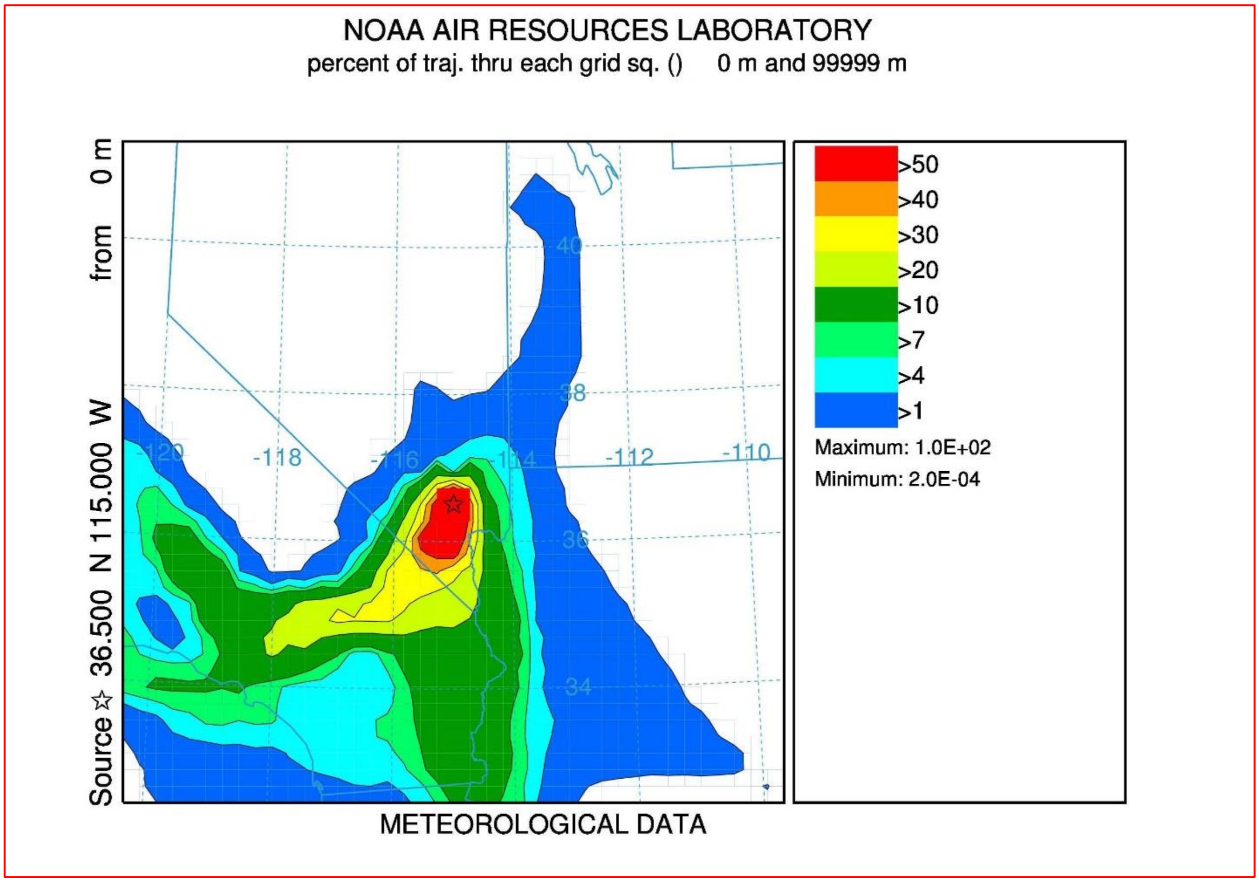


Figure 4-16. Density Frequency for 2015 ozone season.

4.2 EPA HYSPLIT ANALYSIS

In its own HYSPLIT analysis (https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data), EPA assessed potential source-receptor relationships using comparisons between emissions, wind speed, and wind direction data. This assessment involved modeling air parcel trajectories to help understand complex transport situations. The HYSPLIT modeling system can show the paths traveled by air parcels to a violating monitor. EPA provided back trajectories in the Ozone Mapping Tool for violating monitors on each day of high ozone concentration (i.e., MDA8 values that exceed the NAAQS) at those monitors. Figure 4-17 shows the EPA HYSPLIT results for all violating monitors in Clark County. Most trajectories originate in areas in California; these areas have high ozone concentrations (multiple areas violate the NAAQS) and a high concentration of large and small point sources.

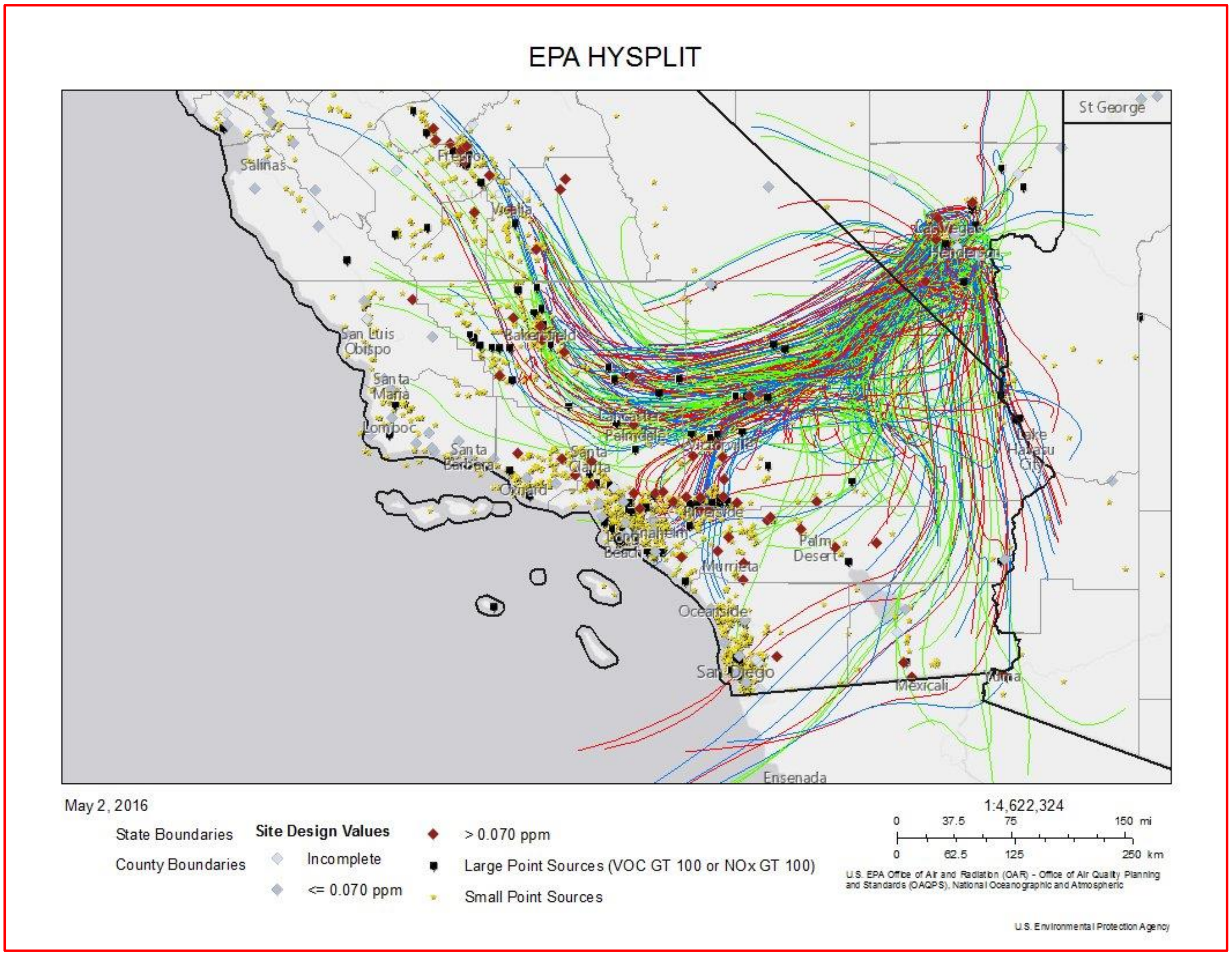


Figure 4-17. EPA HYSPLIT Results.

4.3 CONCLUSION

Slope and valley wind systems are local, thermally-driven flow circulations that form in complex terrain areas. These processes directly affect pollutant transport and dispersion. Both local contributions and regional transport dominate high ozone days in Clark County.

Technical studies indicate that the primary transport routes of ozone and ozone precursor pollutants are from upwind areas to the west and southwest of the Las Vegas Valley. HYSPLIT back trajectories and density frequencies show impacts from transport (long-range and short-range), along with local impacts. These weather patterns support the validity of the recommended NAA boundaries.

5.0 GEOGRAPHY/TOPOGRAPHY

5.1 DESCRIPTION

Located in southern Nevada, Clark County consists of 8,091 square miles characterized by basin and range topography. It is one of the nation's largest counties, with an area bigger than the states of Connecticut and Delaware combined. The Las Vegas Valley sits in a broad desert basin that is surrounded by mountains rising from 2,000 feet to over 10,000 feet above the valley floor. The relief map in Figure 5-1 illustrates the basins and mountain ranges surrounding the valley. Terrain within the Las Vegas Valley rises significantly, from approximately 1,200 feet at Lake Mead to 2,000 feet in downtown Las Vegas to over 2,800 feet in the suburbs on the west side of the valley near the Spring Mountain Range.

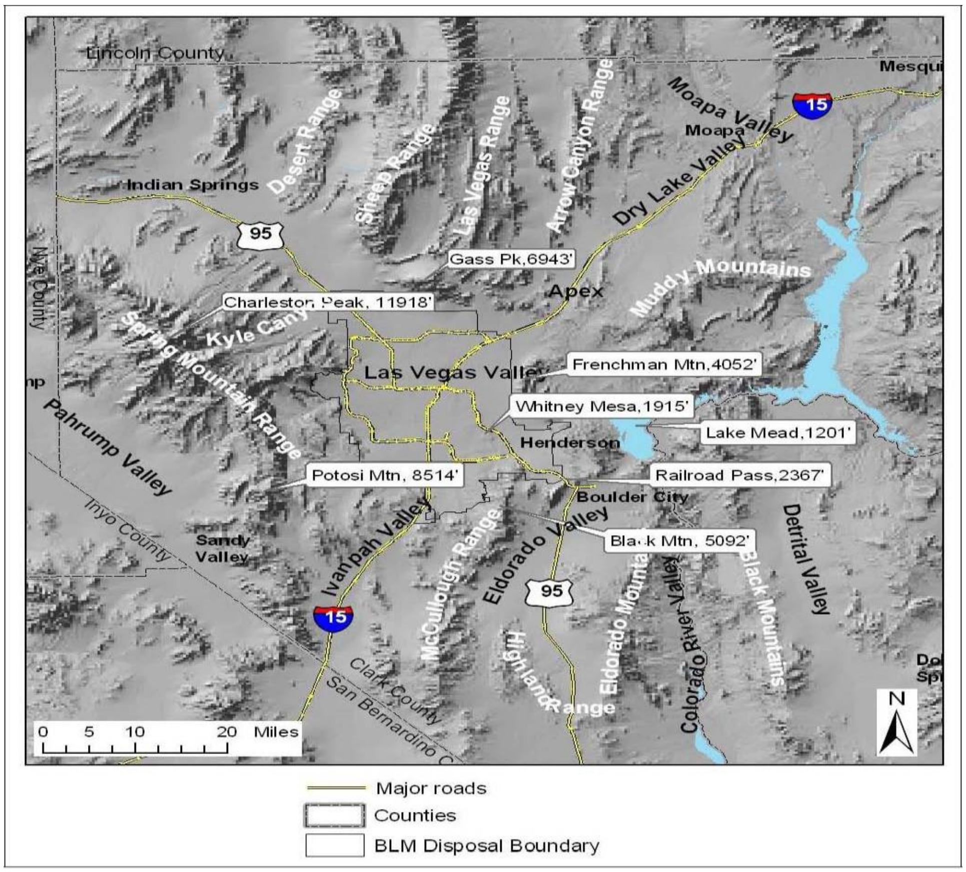


Figure 5-1. Mountain Ranges and Basins Surrounding the Las Vegas Valley.

Different ranges on the west and east of the Las Vegas Valley create a bowl-like environment where pollutants can get trapped. The Las Vegas Valley is defined by high mountains to the west and east, and low valley areas (Figures 5-2 and 5-3) to the south, northwest, and northeast.

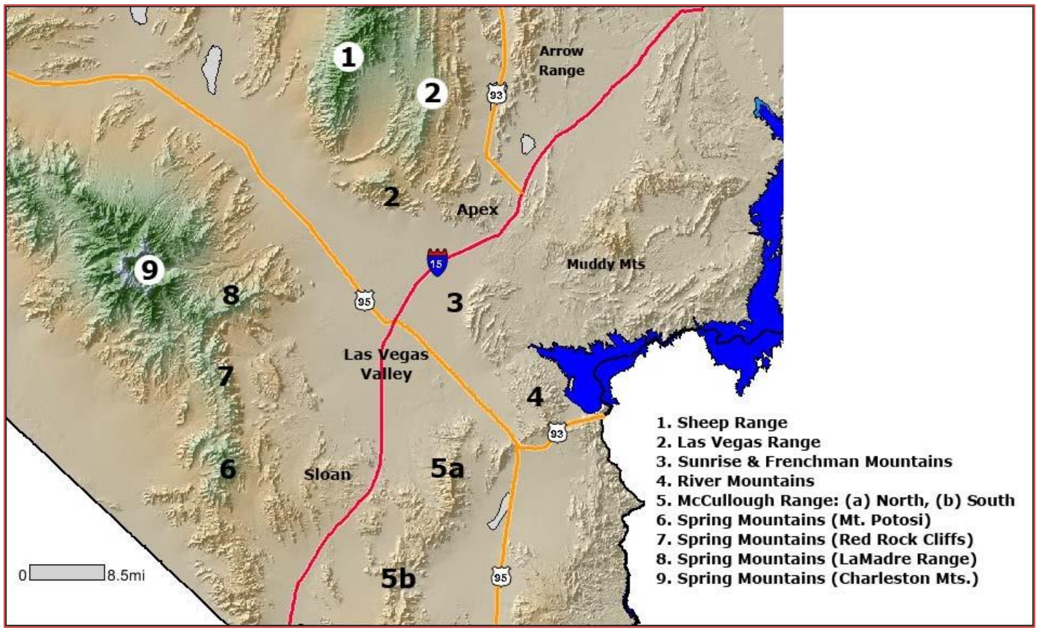


Figure 5-2. Mountain Ranges Around Clark County.

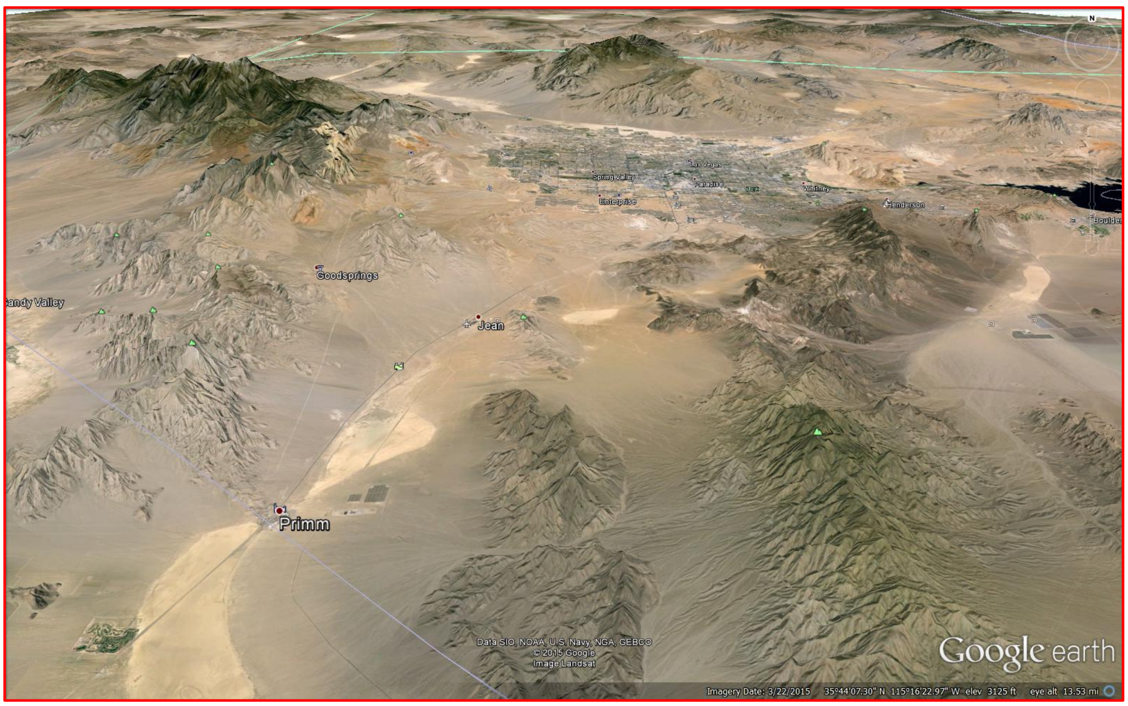
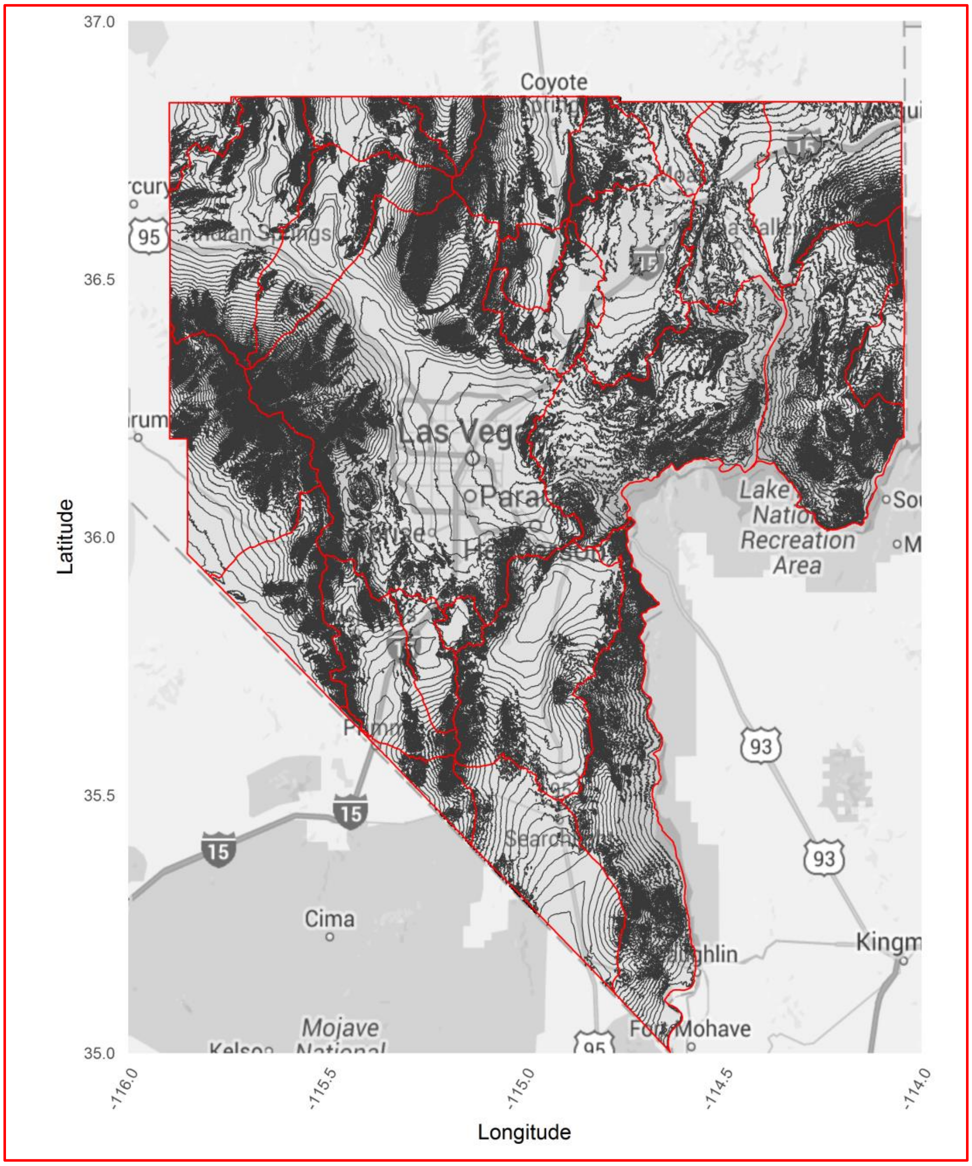


Figure 5-3. 3-D View of Clark County.

Figure 5-4 is a relief map of Clark County: the red lines are HA boundaries. The Las Vegas Valley is in a "bowl," or basin, with the primary drainage path flowing from the south to the northwest. These features often create stagnant air and inversions that might cause elevated ozone. Other areas in Clark County are generally mountainous, or desert valleys of some kind.



Note: Red lines are HA boundaries.

Figure 5-4. Relief Map of Clark County.

Several studies directed by DAQ confirmed transport of pollutants from Southern California into Clark County, although the contribution from local versus transported ozone is difficult to quantify. Figures 5-5 and 5-6 show wind and pollution roses for the 2013–2015 exceedance days at Joe Neal. The red line in Figure 5-5 is U.S. Highway 95 (from the northwest) connecting with I-15 (going south). The transport corridor (Figure 5-7) seems to follow I-15 from the south before turning towards the northwest, which supports the DAQ study results.

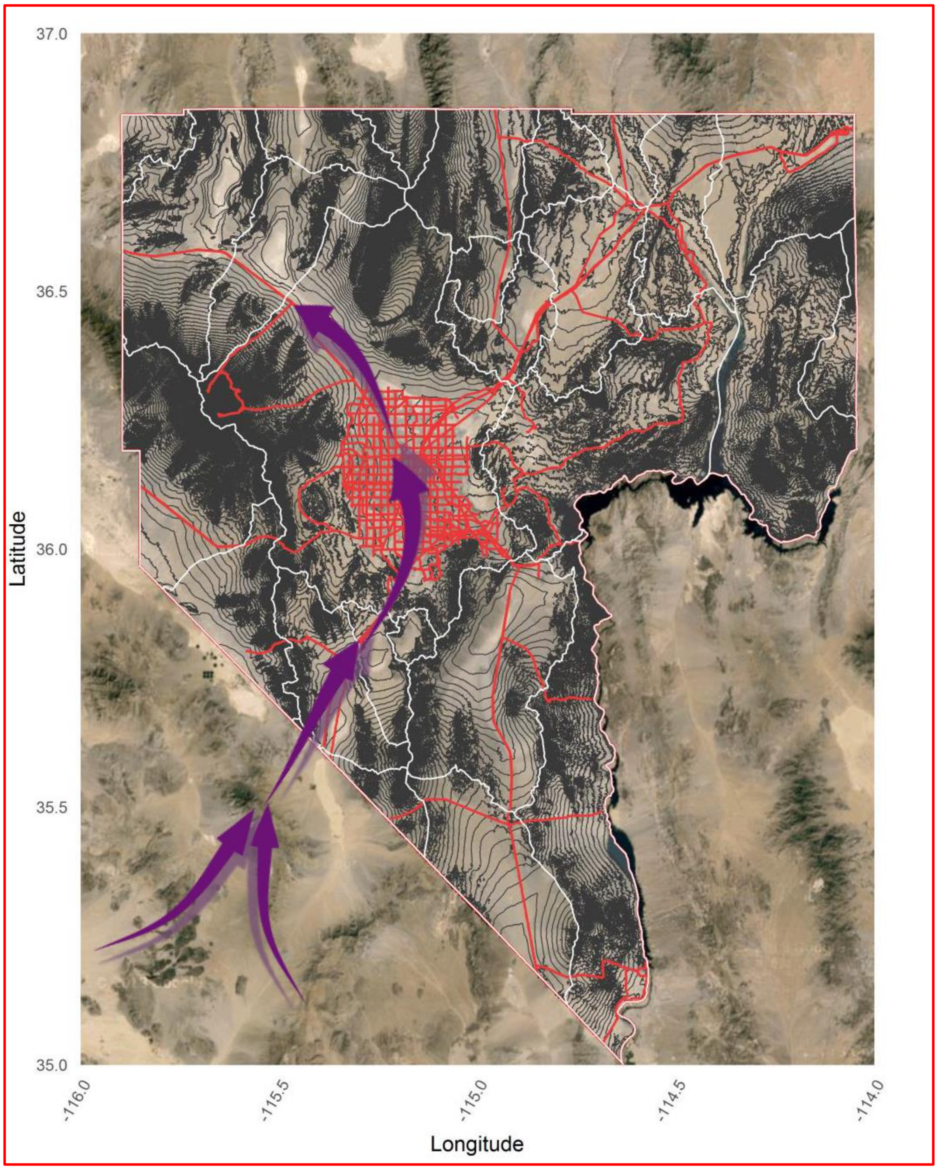


Figure 5-5. Transport Corridor in Clark County.

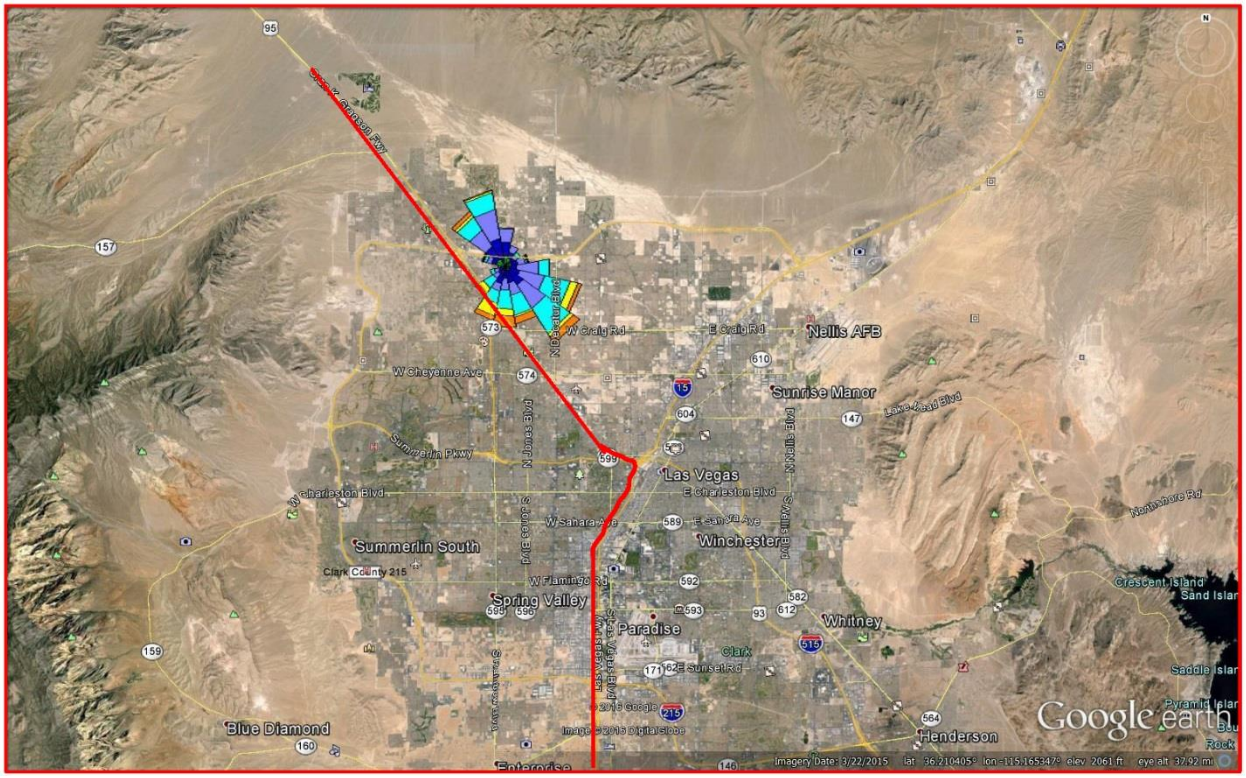


Figure 5-6. Wind Direction at Joe Neal.

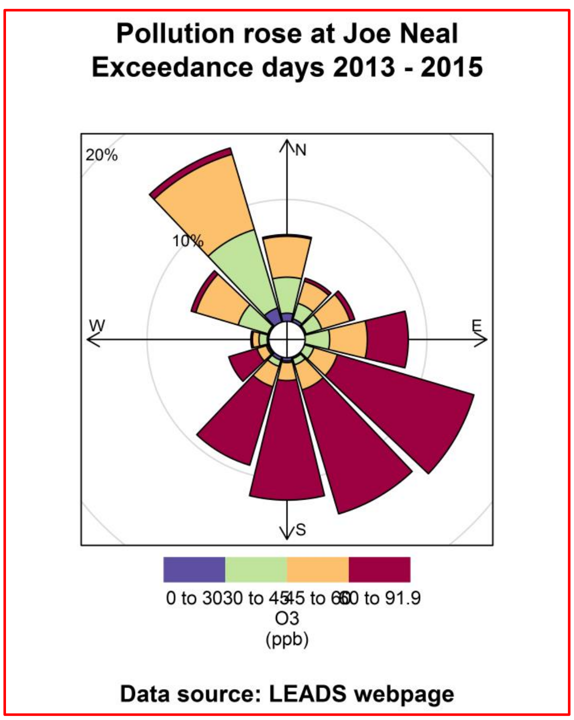


Figure 5-7. Pollution Rose for Joe Neal.

As part of the rulemaking for the Cross-State Air Pollutions Rule, EPA modeled the 2017 ozone contribution. The results show the contributions from states to an upwind or downwind monitor. Figure 5-8 shows the contributions of several sources to Clark County ozone monitors.

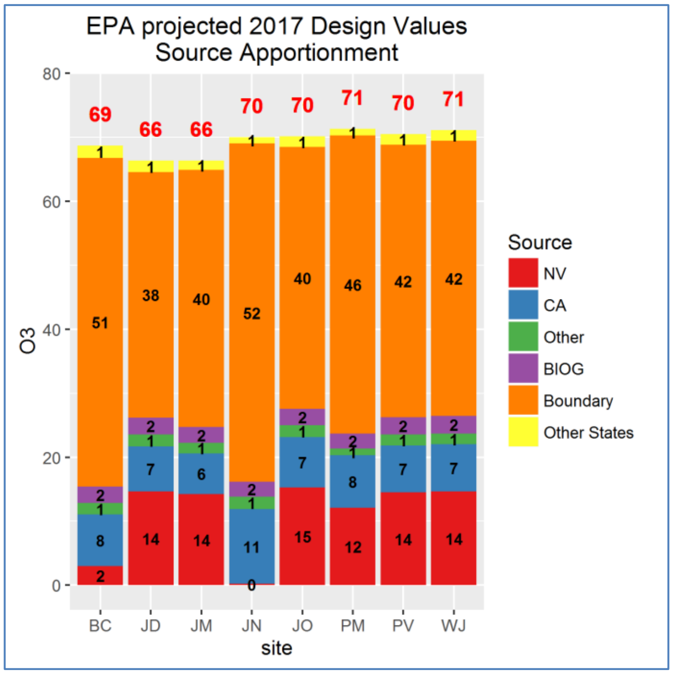


Figure 5-8. EPA Source Apportionment.

The results clearly show that Clark County is heavily impacted by sources outside Nevada, with the boundary conditions being the biggest contributor. Boundary conditions represent pollutant transport from sources outside the modeled region or area.

5.2 CONCLUSION

The regional bowl-like topography of the Las Vegas Valley supports the recommended NAA designation. The valleys in Clark County act like canyons or corridors that transport pollution from the south to the northwest; they occasionally create stagnant air due to inversions, which can create elevated ozone concentrations.

6.0 JURISDICTIONAL BOUNDARIES

Figure 6-1 depicts land ownership within Clark County and surrounding areas. Federal agencies control most of the land: the U.S. Bureau of Land Management has the largest holdings, including the Red Rock National Conservation Area west of Las Vegas. Most of the Spring Mountain Range, including Mt. Charleston, is within the boundaries of the Toiyabe National Forest, administered by the U.S. Forest Service. The National Park Service administers the Lake Mead Recreational Area; the Fish and Wildlife Service administers the wildlife refuge in the Sheep Mountains; and the U.S. Department of Defense administers Nellis Air Force Base, Creech Air Force Base, and other facilities. Less than 10 percent of the county is privately owned land. Federal, state, and tribal lands create barriers to contiguous expansion of the urbanized core in the Las Vegas Valley.

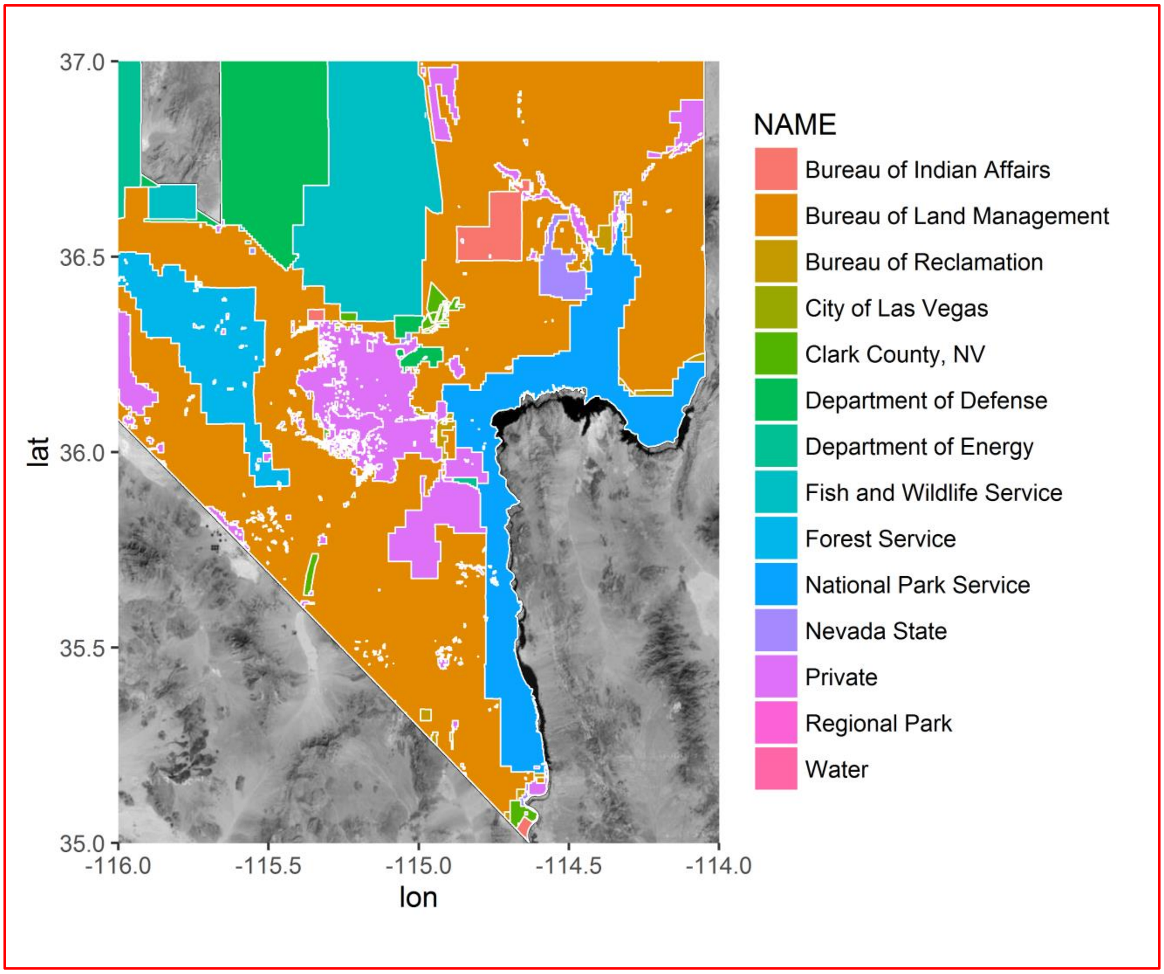


Figure 6-1. Land Ownership in Clark County and Surrounding Areas.

The Clark County-recommended NAA coincides with the jurisdictional boundary of the air quality management authorities in Nevada and Clark County. Pursuant to Nevada Revised Statutes §445B.500, the governor has delegated regulatory authority for air quality management to the Clark County Board of County Commissioners, to be administered by DAQ. However, tribal lands are not within the jurisdiction of the state or Clark County.

HAs represent natural and man-made stream drainage areas or basins. Figure 6-2 shows the HAs within Clark County, excluding the portions of HAs outside the Nevada boundary. These HAs are used as air quality management areas in Nevada.

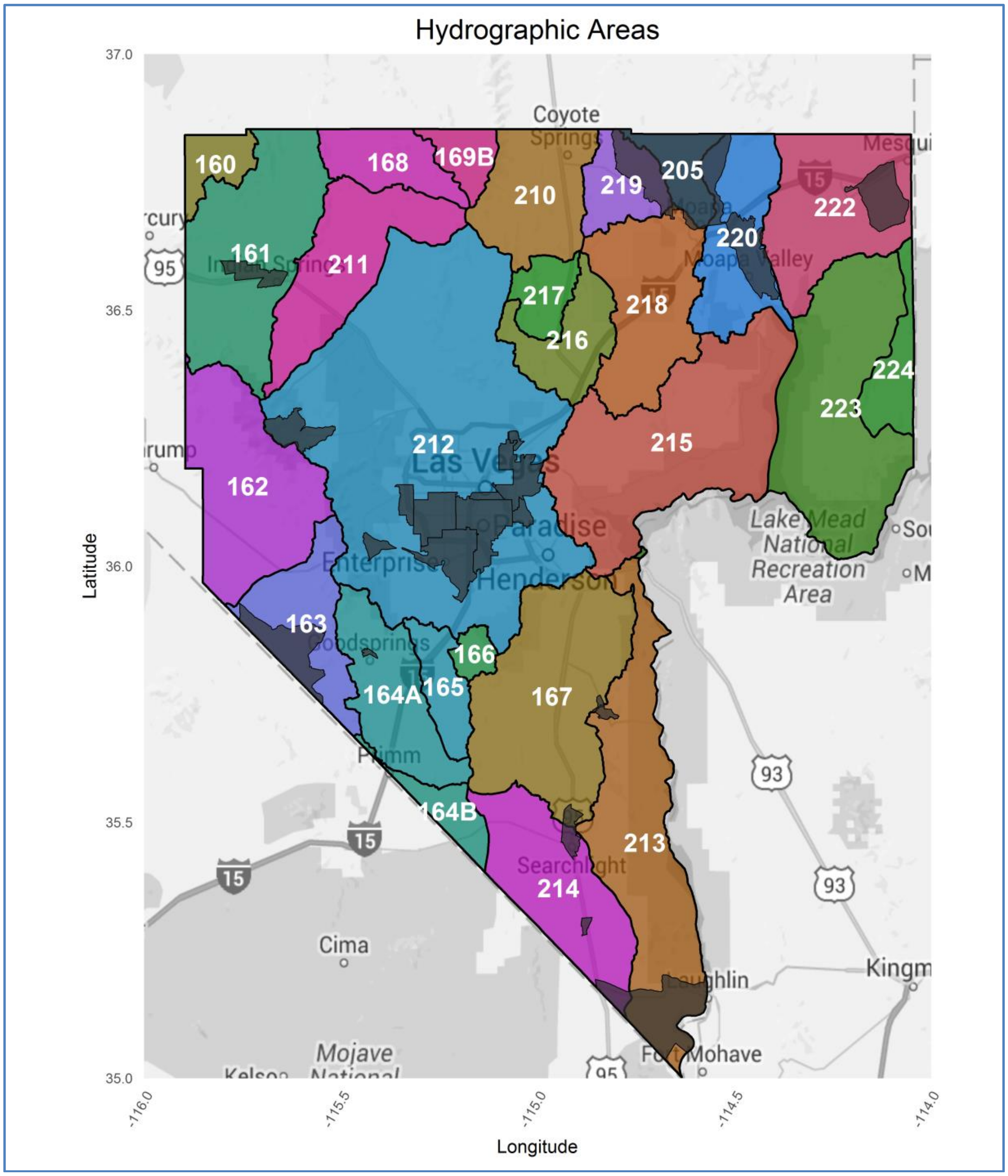


Figure 6-2. Hydrographic Areas in Clark County.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

Based on EPA's suggested 5-factor analysis, DAQ recommends that EPA designate the following areas of Clark County as nonattainment for the 2015 8-hour ozone NAAQS: the northern part of the Ivanpah Valley, HA 164A; Jean Lake Valley, HA 165; and the Las Vegas Valley, HA 212. The rest of the HAs in Clark County are rural, sparsely populated, have insignificant sources of ozone precursors, and are geographically isolated from the recommended NAA.

7.1.1 Factor 1: Air Quality Analysis

An analysis of air quality data from 2013 to 2015 and the locations of seven stations monitoring sites located inside in the Las Vegas Valley support the configuration of the recommended 8-hour ozone nonattainment boundary. Design values decrease rapidly in the valley toward the east, and approximate background levels at Mesquite.

Other monitors in the monitoring network (e.g., Mesquite, Boulder City, Indian Springs) are located in recommended attainment/unclassifiable HAs. If future monitoring locations indicate that additional HAs are in violation of the revised ozone standard, the existing nonattainment boundary will be reevaluated and expanded as necessary.

7.1.2 Factor 2: Emissions and Emissions-Related Data

Information on Clark County's population density and degree of urbanization illustrates that urbanization (and associated activities that can result in ozone precursor emissions) is concentrated within the recommended nonattainment boundary. Urbanization diminishes rapidly beyond the central portion of the recommended NAA. Population in the surrounding HAs is low by comparison, and the landscape is rural, with small pockets of development; therefore, the population/urbanization information supports the recommended NAA. If future urbanization indicates that additional counties or regions should be included in the NAA, the existing nonattainment boundary will be reevaluated and expanded as necessary.

The region's traffic and commuting patterns demonstrate that the vast majority of vehicle trips occur within the recommended nonattainment boundary. Average daily traffic diminishes rapidly beyond the core area. Commuting information also indicates that work trips into the region are minimal when compared to traffic volumes in the recommended boundary. Vehicular traffic in the surrounding HAs is low by comparison, and the landscape is rural, with small pockets of development; therefore, the traffic and commuting information supports the recommended nonattainment designation. If future traffic and commuting information indicates that additional HAs should be included in the NAA, the existing nonattainment boundary will be reevaluated and expanded as necessary.

Clark County's growth rates and patterns illustrate that the vast majority of population and urbanization increases will occur within the recommended nonattainment boundary. Population density and developed areas diminish rapidly beyond the core area. Due to the ownership of surrounding lands (mostly federal agencies), growth outside the core is unlikely.

Based on the analysis of emissions and the emissions-related data factor, DAQ has determined that the recommended NAA is appropriate and that the inclusion of Apex in the ozone NAA is not appropriate, since precursor emissions there are low (approximately 2,700 tpy of NO_x and VOCs combined), the Apex monitoring station is impacted by a variety of stationary sources, the station is located on one a source's property, and the Apex Valley has no population.

Precursor emissions outside the recommended ozone NAA are substantially less than those within: emissions in HAs outside the recommended NAA are either very small by comparison, or at substantial distances from high-concentration monitors. Apex is in a separate airshed, so its emissions do not significantly contribute to ozone concentrations in the recommended NAA. The monitor in Apex should be designated as a non-regulatory or source-oriented monitor, as DAQ's monitoring network plan describes. If future emissions growth indicates that additional HAs should be included in the NAA, the existing nonattainment boundary will be reevaluated and expanded as necessary.

7.1.3 Factor 3: Meteorology

With respect to recommendations on area designations, weather patterns demonstrate the validity of proposed boundaries. Technical studies indicate these areas are the primary transport routes of ozone and ozone precursor pollutants from upwind areas to the west and southwest of the Las Vegas Valley. By focusing on meteorological processes and the location of point and area sources of pollutants within Clark County, technical studies demonstrate that the proposed NAA boundaries are appropriate.

7.1.4 Factor 4: Geography

The Las Vegas area's surrounding mountains are the Spring Mountain Range to the west; the Desert, Sheep, and Las Vegas Ranges to the north; the Arrow Canyon and Muddy Mountain Ranges to the east and northeast; and the Black Mountains, Eldorado Mountains, and McCullough Range to the south.

The regional bowl-like topography supports the proposed NAA recommendation. The valleys in Clark County act like canyons or corridors that transport pollution from the south to the northwest, and occasionally create stagnant air due to inversions in the valley.

7.1.5 Factor 5: Jurisdictional Boundaries

The Clark County airsheds are administered by DAQ. The urban areas of Las Vegas, and the surrounding areas of potential growth, lie within the boundaries of the recommended NAA, with the exception of federal land within the same jurisdiction.

7.1.6 Summary

In summary, the 5-factor analysis shows that almost all activities in Clark County are concentrated in the Las Vegas Valley. Figure 7-1 shows population data (density shown by blue contour lines, ozone density (marked in red contours), NO_x and VOC sources (shown in red and green markers), and the road network. The highest concentrations and most activities are located in the proposed NAA (the HAs shaded in yellow).

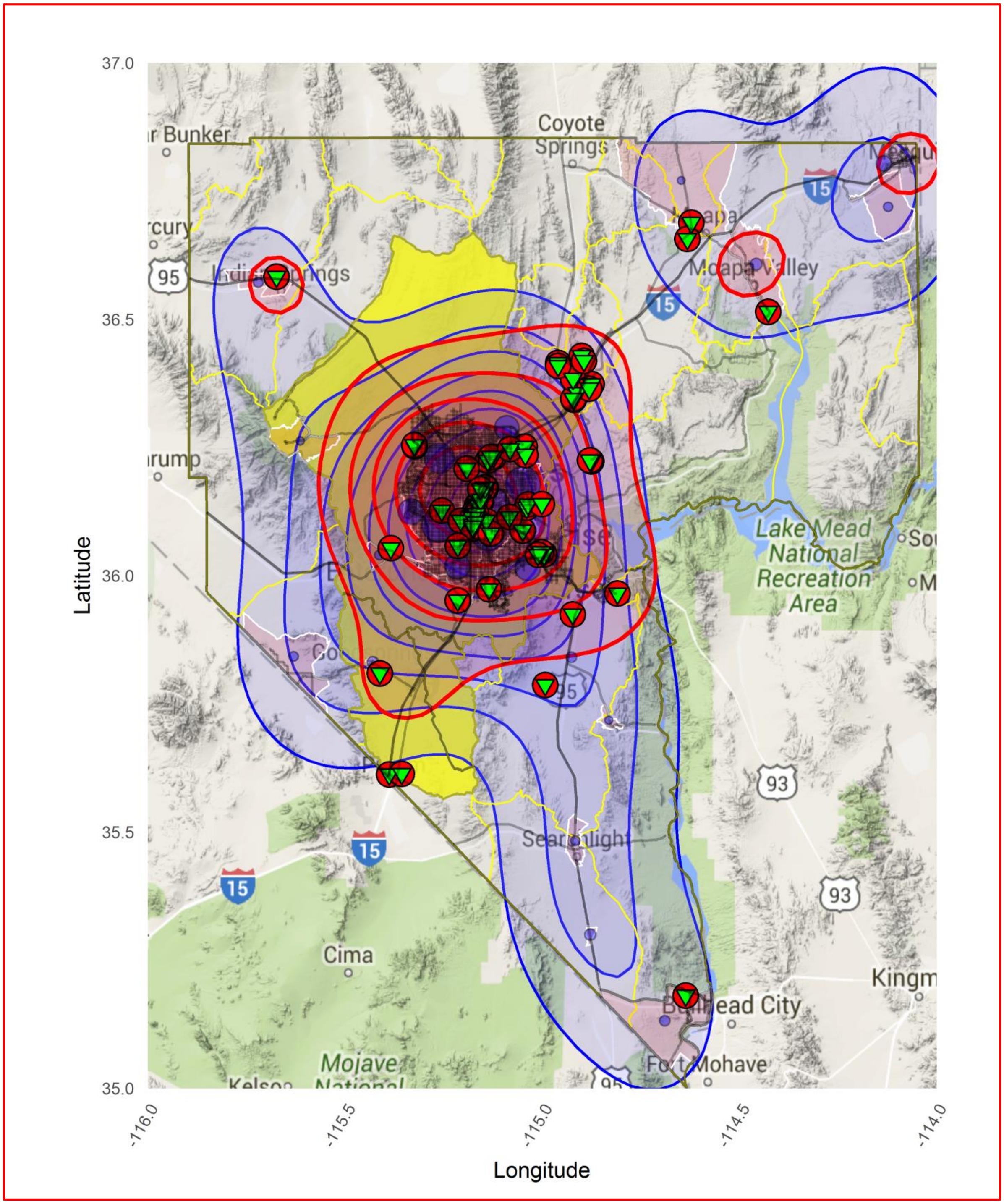


Figure 7-1. Summary Map.

7.2 RECOMMENDED 8-HOUR OZONE NAAQS NONATTAINMENT BOUNDARY

The recommended NAA is smaller than the boundary of Clark County. However, this boundary meets the definition in Section 107(d)(1)(A)(i) of the Clean Air Act and addresses the criteria identified in EPA's February 2016 guidance.

Considering the examination of all five factors, DAQ recommends the NAA specified in Figure 7-2. It consists of the following HAs:

164A – Ivanpah Valley, northern part

165 – Jean Lake Valley

212 – Las Vegas Valley.

The Ivanpah Valley should be included in the NAA because of transport; prevailing wind direction and high ozone readings at Jean are evidence of transport from Southern California, since no stationary sources are located in that HA.

The Las Vegas Valley must be included because it contains most of the ozone precursors, the highest ozone concentrations, evidence of local ozone generation, and the primary potential for population exposure.

The remaining HAs in Clark County should not be included in the NAA for the following reasons:

- They are sparsely populated, with less than 2 percent of the total county population.
- There is no evidence these areas will impact the recommended NAA.
- Geographic and topographic features separate these areas from the recommended NAA.

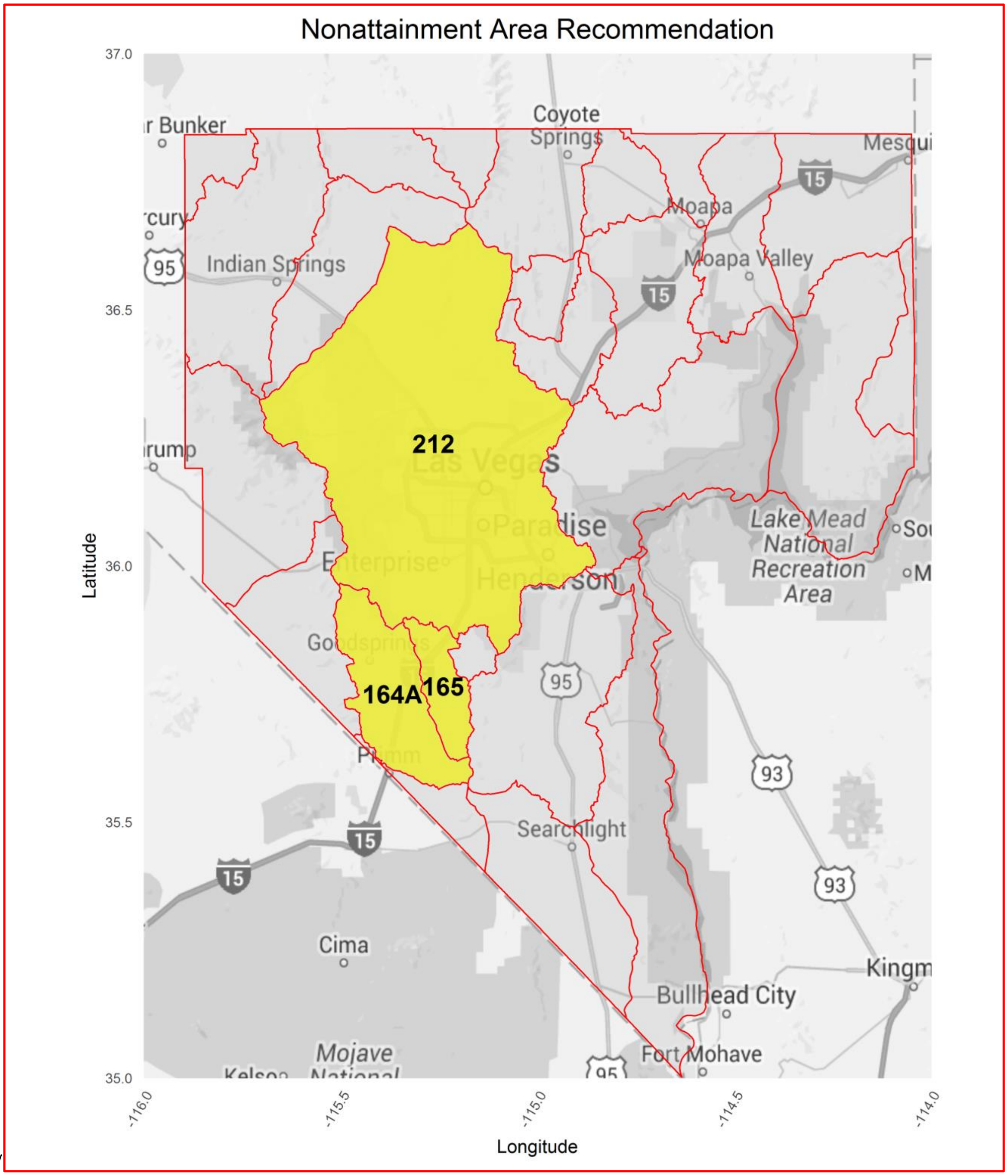


Figure 7-2. Recommended Nonattainment Area.

8.0 REFERENCES

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9.0 APPENDIX A – AQS DESIGN VALUE REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: HJA

DESIGN VALUE REPORT

Report Request ID: 1423743 Report Code: AMP480 Mar. 14, 2016

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	32	003									

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	44201		

SELECTED OPTIONS

Option Type	Option Value
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
WORKFILE DELIMITER	,
USER SITE METADATA	STREET ADDRESS
MERGE PDF FILES	YES
QUARTERLY DATA IN WORKFILE	NO
AGENCY ROLE	PQAO

DATE CRITERIA

Start Date	End Date
2015	2015

APPLICABLE STANDARDS

Standard Description
Ozone 8-Hour 2008

Selection Criteria Page 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Mar. 14, 2016

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-Hour 2008
Statistic: Annual 4th Maximum **Level:** .075

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State: Nevada

Site ID	Poc	STREET ADDRESS	2015 Valid Days	2015 Percent Complete	2015 4th Max	2015 Cert& Eval	2014 Valid Days	2014 Percent Complete	2014 4th Max	2014 Cert& Eval	2013 Valid Days	2013 Percent Complete	2013 4th Max	2013 Cert& Eval	3 - Year Percent Complete	Design Value	D. V. Validity
32-003-0022	1	NE OF CITY-12101 HWY 93/I15	268	73	.072 *	S	189	52	.076 *		182	50	.073*		58	.073	N
32-003-0023	1	465 E. OLD MILL ROAD, MESQUITE, NV	267	73	.065 *		182	50	.065 *		179	49	.067*		57	.065	N
32-003-0043	1	4525 NEW FOREST DRIVE	358	98	.073	S	292	80	.077	S	360	99	.075	S	92	.075	Y
32-003-0071	1	7701 DUCHARME AVE	325	89	.068	S	294	81	.074	S	359	98	.074	S	89	.072	N
32-003-0073	1	333 PAVILION CENTER DRIVE	360	99	.072	S	362	99	.077	S	362	99	.074	S	99	.074	Y
32-003-0075	1	6651 W. AZURE AVE	361	99	.071	S	356	98	.079	S	365	100	.076	S	99	.075	Y
32-003-0298	1	298 ARROYO GRANDE	209	57	.070 *	S									19	.070	N
32-003-0538	2	5483 CLUBHOUSE DR-WINTERWOOD, LAS VEGAS					271	74	.068 *	S	364	100	.071	S	58	.069	N
32-003-0540	1	4250 Karen Ave	358	98	.069	S	358	98	.073	S	358	98	.069	S	98	.070	Y
32-003-0601	1	1005 INDUSTRIAL ROAD	329	90	.068	S	356	98	.073	S	357	98	.071	S	95	.070	Y
32-003-1019	1	1965 State Hwy 161, Jean, NV	359	98	.069	S	343	94	.074	S	363	99	.075	S	97	.072	Y
32-003-2002	1	1301B EAST TONOPAH	348	95	.073	S	354	97	.075	S	363	99	.072	S	97	.073	Y
32-003-7772	1	668 Gretta Ln, Indian Springs	270	74	.070 *	S	195	53	.070 *	S					42	.070	N
32-003-7780	4	3570 Lyman Street	194	53	.066 *	S	161	44	.064 *	S					32	.065	N

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Page 1 of 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Mar. 14, 2016

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the state's certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Page 2 of 2