Appendix A

Technical Support Document

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ACRONYMS AND ABBREVIATIONS

Acronyms

ADT	average daily traffic
AQR	Clark County Air Quality Regulation
BLM	Bureau of Land Management
CBER	Center for Business and Economic Research
CERR	Consolidated Emissions Reporting Rule
CFR	Code of Federal Regulations
DCP	Clark County Department of Comprehensive Planning
DRI	Desert Research Institute
EGAS	Economic Growth Analysis System
EI	emission inventory
EIA	Energy Information Administration
EIIP	Emission Inventory Improvement Program
EPA	U.S. Environmental Protection Agency
EQM	Environmental Quality Management, Inc
ERC	Emission Reduction Credit
FHWA	Federal Highway Administration
GILIS	Geographic Integrated Land-use Information System
HA	hydrographic area
HPMS	Highway Performance Monitoring System
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MAR	Milestone Achievement Report
NAAQS	National Ambient Air Quality Standards
NDEP	Nevada Division of Environmental Protection
NEI	National Emissions Inventory
RE	rule effectiveness
RP	rule penetration
RTC	Regional Transportation Commission of Southern Nevada
RVP	Reid vapor pressure
SCC	Source Classification Code
SIP	state implementation plan
UNLV	University of Nevada, Las Vegas
VMT	vehicle miles traveled

Abbreviations

$\mu g/m^3$	micrograms per cubic meter
mph	miles per hour
PM_{10}	particulate matter less than 10 micron
ppm	parts per million
psi	pounds per square inch

tpd	tons per day
tpy	tons per year

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has determined that particulate matter less than 10 microns in diameter (PM_{10})—which can make its way deep into the lungs when inhaled—presents a hazard to public health when concentrations exceed certain levels. EPA has therefore set the PM_{10} National Ambient Air Quality Standard (NAAQS) at a 24-hour average of 150 micrograms per cubic meter ($\mu g/m^3$).

This document provides the technical data underpinning Clark County's request for EPA to redesignate the Clark County, Nevada, PM_{10} nonattainment area to attainment status.

1.1 Nonattainment Area

More than 80 percent of the land in Nevada is under federal jurisdiction, most of it managed by the Bureau of Land Management (BLM). In 1998, Congress passed the Southern Nevada Public Land Management Act, which allowed BLM to sell, trade, or lease public land within a specific area around Las Vegas. This area comprises 327,047 acres and is known as the BLM disposal area. All lands controlled by the federal government outside this area remain in a native or managed state, and the boundary can only be changed by an act of Congress.

The PM_{10} nonattainment area established by EPA, which is the same as Hydrographic Area 212 (HA 212), is roughly 1,500 square miles (Figure 1-1). The nonattainment area includes all of the BLM disposal area. Since the BLM disposal area contains nearly all the anthropogenic sources within the nonattainment area, it was used for demonstrating attainment in the federally approved PM_{10} state implementation plan (SIP) and, therefore, in this redesignation request and maintenance plan.

1.2 Design Value and Day

The design value (in $\mu g/m^3$) is the concentration derived from a statistical approach to monitoring data that describes the air quality status of a given area during a specific period relative to the NAAQS. When a design value is related to a comprehensive emissions inventory (EI) for the same period, future concentrations can be predicted through emissions forecasts.

Using the *PM_{10} SIP Development Guideline* (EPA 1987), Clark County derived the 24-hour PM_{10} design value for the BLM disposal area for the baseline year (2008). Clark County analyzed data from the nine PM_{10} monitoring sites that operated from 2008 through 2010 and ranked the four highest values from each site for the entire three-year period (Table 1-1).

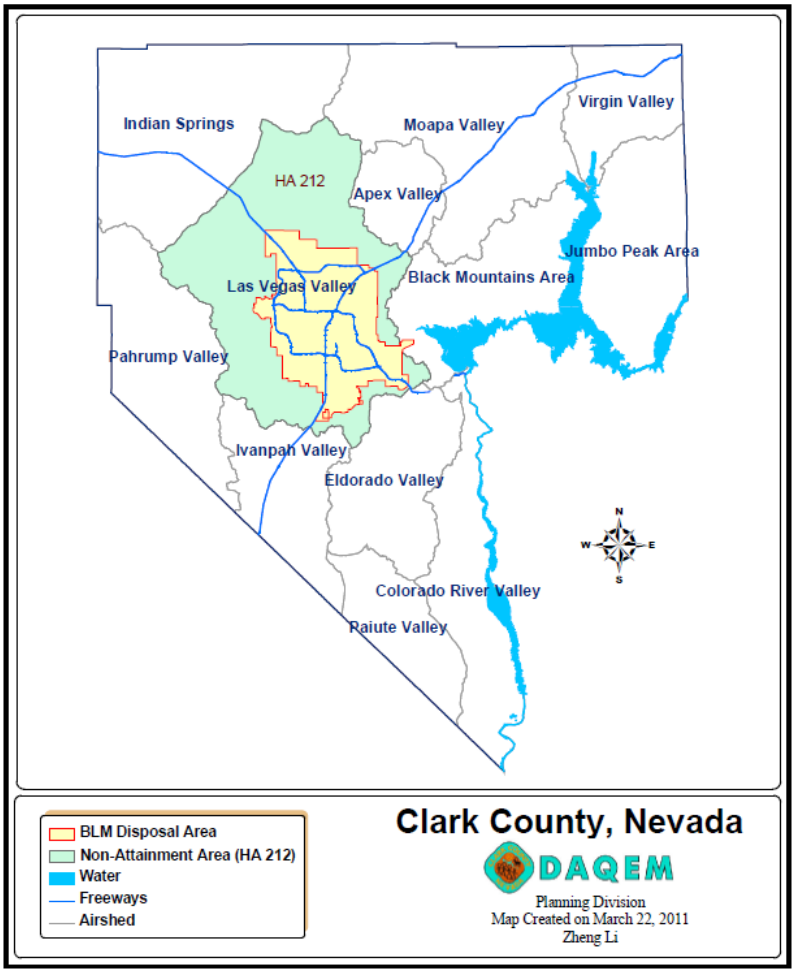

Figure 1-1. Clark County, HA 212, and BLM Disposal Area.

Table 1-1. Design Values for 2008–2010 (µg/m^3)

Site ID	Site Name	1st High	2nd High	3rd High	4th High	Design Value
0020	E. Craig Road	123	102	98	96	98
0043	Paul Meyer	84	76	70	66	66
0072	Lone Mountain	70	69	59	58	59
0298	Green Valley	144	81	80	78	80
2002	J.D. Smith	109	91	82	78	78
0073	Palo Verde	57	54	52	51	51
0075	Joe Neal	120	96	95	84	84
1021	Orr	85	75	71	70	71
0561	Sunrise Acres	106	103	86	81	81

The data analysis identified two exceptional events during the baseline year: on February 13 and May 21, 2008, Clark County experienced high-wind events that caused violations of the 24-hour PM_{10} NAAQS. Sustained winds of 25 miles per hour (mph), and gusts of 40 mph, are the established thresholds for exceptional high-wind events in Clark County; winds above these values overwhelm Best Available Control Measures. Wind speeds during both events in 2008 were higher than the established thresholds. However, since PM_{10} emissions were not reasonably controllable during these two events, the exceedances were not reasonably preventable and the events were flagged in EPA's Air Quality System (AQS). Clark County submitted two exceptional event documentation packages to EPA Region 9 for concurrence, requesting that these days be excluded from regulatory consideration.

The two event days were thus not considered in the design value calculations. Clark County ranked the remaining high values from each of the nine sites for the three-year period (Table 1-1). The highest value from the list, 98 $\mu g/m^3$, was taken as the design value; the date of that value, April 15, 2008, was chosen as the design day.

Table 1-2 summarizes emissions on the design day for the BLM disposal area, while Table 1-3 shows emissions for the nonattainment area. The tables include emissions for the base year (2008), the interim year (2015), and the future year (2023) in tons per day (tpd).

Table 1-2. BLM Disposal Area Design Day Emissions (tpd)

Source	2008	2015	2023
Point Source Emissions	2.19	2.60	2.88
Nonpoint Source Emissions:			
– Fuel combustion	1.23	1.29	1.38
– Residential wood combustion	1.89	1.90	1.92
– Locomotive	0.06	0.06	0.05
– Paved road	30.85	38.04	48.78
– Unpaved road	5.84	6.51	7.49
– Commercial cooking	2.19	2.52	2.83
– Mineral processing (concrete, gypsum)	0.28	0.34	0.40
– Mineral processing (stone)	0.15	0.18	0.21
– Asphalt	0.33	0.37	0.40
– Wind erosion (construction)	183.97	217.70	249.21
– Construction	30.93	37.69	41.22
– Sand & gravel	0.42	0.51	0.60
– Open burning	0.02	0.02	0.02
– Wind erosion (vacant lands)	439.05	288.16	122.77
– Structural fires	0.02	0.02	0.03
– Vehicle fires	0.03	0.03	0.04
Subtotal	*697.23*	*595.34*	*477.36*

Source	2008	2015	2023
On-road Emissions	3.08	2.52	2.75
Non-road Emissions	3.74	2.95	1.94
Emission Reduction Credits	0.31	0.31	0.31
TOTAL	**706.55**	**603.72**	**485.24**

Table 1-3. Las Vegas Valley Nonattainment Area Design Day Emissions (tpd)

Source	2008	2015	2023
Point Source Emissions	2.25	2.66	2.94
Nonpoint Source Emissions:			
– Fuel combustion	1.23	1.29	1.38
– Residential wood combustion	1.89	1.91	1.93
– Locomotive	0.06	0.07	0.06
– Paved road	31.06	38.34	49.20
– Unpaved road	6.76	7.54	8.68
– Commercial cooking	2.20	2.52	2.84
– Mineral processing (concrete, gypsum)	0.28	0.34	0.40
– Mineral processing (stone)	0.15	0.18	0.22
– Asphalt	0.33	0.37	0.41
– Wind erosion (construction)	184.55	218.40	250.00
– Construction	31.02	37.80	41.34
– Sand & gravel	0.42	0.51	0.60
– Open burning	0.02	0.02	0.02
– Wind erosion (vacant lands)	3,630.12	3,478.81	3,312.96
– Structural fires	0.02	0.02	0.03
– Vehicle fires	0.03	0.03	0.04
Subtotal	*3,890.13*	*3,788.15*	*3,670.09*
On-road Emissions	3.16	2.56	2.78
Non-road Emissions	3.75	2.96	1.94
Emission Reduction Credits	0.31	0.31	0.31
TOTAL	**3,899.60**	**3,796.64**	**3,678.06**

1.3 Document Organization

Section 2 of this document details the population projection methodology. This section describes projection calculations and includes detailed tables describing population estimates for the nonattainment and BLM disposal areas.

Section 3 provides the point source EI, which includes all Title V major stationary sources and any minor stationary sources clustered together closely enough to be considered potential hot spots of emissions within the BLM disposal area.

Section 4 provides a summary of the methodology used to generate the nonpoint source EI. Clark County primarily relied upon the methodologies in EPA's Emission Inventory Improvement Program (EIIP) guidance documents (EPA 1997) to calculate emissions for 16 nonpoint source categories.

Section 5 delineates the methods, data, and assumptions used to estimate fugitive nonpoint source emissions in Clark County. These are the most significant sources of PM_{10} in the nonattainment area and include emissions from construction, wind erosion, and unpaved roads.

Section 6 details the methodologies used to calculate emissions from locomotives, also considered a nonpoint source.

Section 7 describes the methodologies used to calculate emissions from the remaining nonpoint sources in the plan: fuel combustion; commercial cooking; residential wood combustion; mineral, asphalt, sand, and gravel processing; open burning; and structural and vehicle fires.

Section 8 delineates the development of the paved road and on-road EIs, along with the use of the MOVES model.

Section 9 describes the non-road emissions and EI methodologies.

Section 10 addresses emission reduction credits (ERCs).

2.0 POPULATION PROJECTIONS

In general, growth factors from version 5.0 of the Economic Growth Analysis System (EGAS) were used to estimate future-year emissions; however, population projections were also used to estimate future-year emissions or activity throughput when applicable. Table 2-1 shows the 2008 baseline Clark County population data.

Table 2-1. Clark County Population Data for 2008

Geographic Area	Population
– Unincorporated Clark County	– 861,544
– City of Las Vegas	– 599,087
– City of North Las Vegas	– 216,672
– City of Henderson	– 272,063
– Boulder City (outside HA 212)	– 16,840
– Mesquite (outside HA 212)	– 19,939
Clark County Total:	**1,986,145**

The most current Clark County population forecast available was developed by the Center for Business and Economic Research (CBER) at the University of Nevada, Las Vegas (UNLV) and based on 2008 population data (Clark County Department of Comprehensive Planning (DCP) 2009). To better reflect local conditions, mid-year (2015) and future-year (2023) population estimates were based on 2010 U.S. Census population data (DCP 2010a) using CBER's projected growth rates (DCP 2009). Table 2-2 shows 2009 population projections from CBER for all of Clark County.

Table 2-2. 2009 Population Projections

Year	Population Projection	% Change from 2010
2008	1,986,145	--
2010	2,039,000	--
2015	2,214,000	8.6
2020	2,418,000	18.6
2022	2,504,000	22.8
2023	2,549,000	25.0
2025	2,639,000	29.4
2030	2,876,000	41.0

Source: CBER (2010).

DCP's original population projections covered all of Clark County. Since EIs were developed for the HA 212 and BLM disposal areas, DCP's population projections were adjusted for these areas. Table 2-3 shows the DCP population estimates for the valley's urban areas, i.e., the unincorporated areas and municipalities within HA 212 (DCP 2010a). Estimates for 2008 were taken from historical population records (DCP 2010b).

Table 2-3. Population Estimates for HA 212

Year	Unincorporated County	Municipalities
2008	828,615	1,087,822
2010	857,925	1,108,025

In addition to municipal and unincorporated county areas, there is also a minor population contribution from "Outlying Areas" that, for the most part, comes from residents outside the BLM disposal area but inside the nonattainment area. Table 2-3 shows the population totals for these areas.

Table 2-4. Outlying Area Population Estimates

Outlying Area	Within HA 212	Within BLM disposal area	HA 212 Pop.		BLM Disposal Area Pop.	
			2008	2010	2008	2010
Blue Diamond	x		471	473	0	0
Calico Basin[1]	x		109	109	0	0
Corn Creek	x		109	109	0	0
Lower Kyle Canyon Rd[2]	x	x	296	247	148	124
Mt. Charleston	x		1,128	1,105	0	0
Mountain Springs[3]	x		51	52	0	0
Red Rock	x		126	125	0	0
Remaining outlying areas[4]	x		3,045	3,221	0	0
		Total	**5,335**	**5,441**	**148**	**124**

[1]Population estimates unavailable for 2008 and 2010; assumed population was unchanged from last available estimate (2000).
[2]Population estimate based on visual comparison of Google and Geographic Information System maps; assumed approximately half the population lives within the BLM disposal area.
[3]Population estimates based on visual comparison of Google and Geographic Information System maps; assumed that approximately half the population lives within HA 212.
[4]Assumed approximately half the population lived within HA 212 but outside the BLM disposal area, half lived outside HA 212 but within Clark County.

Population estimates for the HA 212 and BLM disposal areas were calculated using the following criteria:

- The population of HA 212 consists of the sum of the populations of the cities of Henderson, Las Vegas, and North Las Vegas; the unincorporated populations within the Las Vegas Valley (Enterprise, Lone Mountain, Nellis AFB, Paradise, Sloan, Spring Valley, Summerlin South, Sunrise Manor, Whitney, Winchester, and other nonclassified areas within the valley); and the outlying area populations within the nonattainment area (Blue Diamond, Calico Basin, Corn Creek, Lower Kyle Canyon Road, Mt. Charleston, Mountain Springs, and other nonclassified outlying areas).

- The population of the BLM disposal area is the same as the HA 212 population minus the outlying area populations within the nonattainment area, but including approximately half the Lower Kyle Canyon Road populace.

Table 2-5 shows the 2008 and 2010 population estimates for HA 212 and the BLM disposal area.

Table 2-5. Population Estimate Calculations

Year	HA 212	BLM Disposal Area
2008	828,615 + 1,087,822 + 5,335 = **1,921,772**	1,921,772 – 5,335 + 148 = **1,916,585**
2010	857,925 + 1,108,025 + 5,441 = **1,971,391**	1,971,391 – 5,441 + 124 = **1,966,074**

The 2015 and 2023 populations were projected using the 2010 estimates described in Table 2-5, and the change percentages described in Table 2-2.

Table 2-6. 2008, 2015, and 2023 Population Projections

Year	HA 212	BLM Disposal Area
2008	1,921,772	1,916,585
2015	2,140,588	2,134,815
2023	2,464,480	2,457,834

Specific population data for the state, counties, and municipalities were used to calculate emissions for certain source categories.

3.0 POINT SOURCE EMISSIONS

3.1 Methodology

Clark County's point source inventory includes all airport and Title V major stationary sources inside the county, as well as minor stationary sources clustered together closely enough to be considered potential hot spots of emissions within the BLM disposal area. All point source emissions inventories for 2008 were obtained from reports submitted by the individual sources and reflect actual emissions for that calendar year. This information was quality assured/quality controlled by Clark County Department of Air Quality staff.

Staff used the Clark County Department of Air Quality database to develop the point source emissions inventory for the base year (2008). Projections were estimated for 2015 and 2023 using EGAS growth factors, with the exception of Nellis Air Force Base (AFB) emissions, where linear regression was utilized.

3.2 Emissions Summary

Table 3-1 details the 2008, 2015, and 2023 projected emissions calculations for the point source sector in Clark County; Table 3-2 summarizes emissions in HA 212 and the BLM disposal area for the baseline year. Unless otherwise indicated, all emissions are listed in tons per year (tpy).

Table 3-1. Individual Point Source Emissions for HA 212

Facility Name	Facility ID No.	Emission Units	SCC	2008 Actual Emissions	2015 EGAS GF	2015 Projected Emissions	2023 EGAS GF	2023 Projected Emissions
Projections Using EGAS								
Chemical Lime (Henderson)	0005	01	30501615	11.91	1.218102	14.51	1.434024	17.08
NV Energy (Clark Station)	0007	04	20100201	0.30	0.887396	0.27	0.687823	0.21
		05		6.40		5.68		4.40
		06		11.10		9.85		7.63
		07		10.30		9.14		7.08
		08		15.10		13.40		10.39
		12	38500101	30.90	1.045699	32.31	1.341398	41.45
		13	30501115	0	1.218102	0	1.434024	0
		21	20200102	2.00E-03	1.095144	2.19E-03	1.223355	2.45E-03
		22		0		0		0
		27	20200201	0.03	1.079810	0.03	1.268099	0.04
		28		0.02		0.02		0.03
		29		0.03		0.03		0.04
		30		0.01		0.01		0.01
		31		0.15		0.16		0.19
		32		0.05		0.05		0.06
		33		0.01		0.01		0.01
		34		0.15		0.16		0.19
		35		0.33		0.36		0.42
		36		0.40		0.43		0.51
		37		0.35		0.38		0.44
		38		0.35		0.38		0.44
		45	20200102	1.00E-03	1.095144	1.10E-03	1.223355	1.22E-03
		46		0		0		0
NV Energy (Sunrise Station)	0008	8-01	20100201	0.20	0.887396	0.18	0.687823	0.14
		8-02	20200102	1.00E-03	1.095144	1.10E-03	1.223355	1.22E-03
Wells Cargo	0012	01	30500257	4.48	1.218102	5.46	1.434024	6.42
		02	30500206	0		0		0

Facility Name	Facility ID No.	Emission Units	SCC	2008 Actual Emissions	2015 EGAS GF	2015 Projected Emissions	2023 EGAS GF	2023 Projected Emissions
Projections Using EGAS								
		03	30500298	28.18		34.33		40.41
Kinder Morgan	0013	B10	30600904	0.018	0.952169	0.02	1.016021	0.02
		D02	20200102	2.50E-03	1.095144	2.74E-03	1.223355	3.06E-03
		SR04	10200602	0.02	1.079810	0.02	1.268099	0.03
Titanium Metals Corp.	0019	A01	30301299	35.43	1.045699	37.05	1.341398	47.53
		B06	10201402	0.83	1.177388	0.97	1.340869	1.11
		B09	10200602	0.04	1.079810	0.04	1.268099	0.05
		B10	30301299	0.03	1.045699	0.03	1.341398	0.04
		C05	30301201	0.02		0.02		0.02
		D02E	30301202	0		0		0
		D02W	30301299	0		0		0
		E03	20200104	1.00E-04	1.095144	1.10E-04	1.223355	1.22E-04
		G02		1.00E-04		1.10E-04		1.22E-04
		G10		5.00E-05		5.48E-05		6.12E-05
		M11	30399999	0	1.045699	0	1.341398	0
Planet Hollywood	0026	01	10300603	3.75	1.193438	4.48	1.436069	5.39
Circus Circus	0047	1		3.40	1.193438	4.06	1.436069	4.88
Flamingo Las Vegas (257)	0073	1		3.15	1.193438	3.76	1.436069	4.52
Monte Carlo Hotel and Casino (825)	0074	1		1.97	1.193438	2.35	1.436069	2.83
Lasco Bathware	0075	01	30800799	0.02	1.261714	0.02	1.573714	0.03
Four Queens Hotel and Casi-no	0076	1	10300603	0.29	1.193438	0.35	1.436069	0.42
Fremont Hotel	0077	1		0.44		0.53		0.63
Golden Nugget	0081	1		0.88		1.05		1.26
Horseshoe Club	0085	1		2.07		2.47		2.97
Riviera Hotel and Casino	0086	1		4.68		5.59		6.72
Tronox	0095	A01	20300101	4.00E-03	1.049342	4.20E-03	1.098714	4.39E-03
		A02		0.01		0.01		0.01
		A03		0.01		0.01		0.01

Facility Name	Facility ID No.	Emission Units	SCC	2008 Actual Emissions	2015 EGAS GF	2015 Projected Emissions	2023 EGAS GF	2023 Projected Emissions
Projections Using EGAS								
		A04		0.02		0.02		0.02
		A05	10300602	0.49	1.193438	0.58	1.436069	0.70
		A07		0.04		0.05		0.06
		A08	30107002	0.23	1.213235	0.28	1.483456	0.34
		A09		0.26		0.32		0.39
		A10		1.70		2.06		2.52
		A13		0.58		0.70		0.86
		A15		2.37		2.88		3.52
		A16		0.65		0.79		0.96
		A17		0.97		1.18		1.44
McCarran International Airport	108	01	28888801	27.10	1.027504	27.85	1.129443	30.61
		02	27502011	54.12	1.291476	69.89	1.557839	84.30
		03	28888802	54.21	1.225159	66.42	1.447471	78.47
		04	30502501	38.57	1.218102	46.98	1.434024	55.31
Sahara Hotel and Casino	0133	1	10300603	0.06	1.193438	0.07	1.436069	0.09
Tropicana Hotel and Casino	153	1	10300603	1.21	1.193438	1.44	1.436069	1.74
Plaza Hotel	155	1	10300603	1.20	1.193438	1.43	1.436069	1.72
Ballys Hotel and Casino (257)	0256	1	10300603	3.94	1.193438	4.70	1.436069	5.66
Harrah's Las Vegas	0257	1	10300603	3.93	1.193438	4.69	1.436069	5.64
Caesars Palace (257)	0276	1	10300603	3.59	1.193438	4.28	1.436069	5.16
Mirage Hotel and Casino	0282	1	10300603	4.76	1.193438	5.68	1.436069	6.84
Catalina Plastic and Coating	0323	01	40201399	0.03	1.187500	0.04	1.444444	0.04
Las Vegas Cogeneration	0329	01	20100201	5.36	0.887396	4.76	0.687823	3.69
		02	38500101	1.04	1.045699	1.09	1.341398	1.40
		03	20100201	5.95	0.887396	5.28	0.687823	4.09
		04		5.86		5.20		4.03
		05		5.29		4.69		3.64
		06		5.36		4.76		3.69
		07	38500101	4.84	1.045699	5.06	1.341398	6.49
		08	10100602	0.01	0.887396	0.01	0.687823	0.01

Facility Name	Facility ID No.	Emission Units	SCC	2008 Actual Emissions	2015 EGAS GF	2015 Projected Emissions	2023 EGAS GF	2023 Projected Emissions
Projections Using EGAS								
		09		0	0.887396	0	0.687823	0
		10	20100102	0	0.138417	0	0.113169	0
		11		0		0		0
Aggregate industries	0372	01	20100102	0.11	0.138417	0.02	1.223355	0.13
		02	30500242	0.65	1.218102	0.79	1.434024	0.93
		03	30500208	0.02	1.218102	0.03	1.434024	0.03
		04		0.04		0.04		0.05
		05		0.02		0.02		0.03
		06	10300602	0	1.193438	0	1.436069	0
		07	20100102	1.00	0.138417	0.14	0.113169	0.11
		08	10300602	0	1.193438	0	1.436069	0
		09	20100102	0	0.138417	0	0.113169	0
		10	10300602	0	1.193438	0	1.436069	0
		11	30502514	1.52	1.218102	1.85	1.434024	2.18
		12	30502508	0	1.218102	0	1.434024	0
		13	30502599	59.82	1.218102	72.87	1.434024	85.78
Saguaro Power Company	0393	01	20100201	6.22	0.887396	5.52	0.687823	4.28
		02		6.00		5.33		4.13
		03	20100102	0.04	0.138417	0.01	0.113169	4.53E-03
		04		0.05		0.01		0.01
		05	10100601	2.68	0.887396	2.38	0.687823	1.84
		06	10100602	0.71		0.63		0.49
		07	20100102	0	0.138417	0	0.113169	0
		09	38500101	0.69	1.045699	0.72	1.341398	0.93
City of Las Vegas (WPCF)	0402	01	20200102	0	1.095144	0	1.223355	0
		02		0		0		0
		03	20200202	0	1.079810	0	1.268099	0
		04	50100789	0	1.183210	0	1.339753	0
		05		0		0		0
		06	50100799	0	1.183210	0	1.339753	0

Facility Name	Facility ID No.	Emission Units	SCC	2008 Actual Emissions	2015 EGAS GF	2015 Projected Emissions	2023 EGAS GF	2023 Projected Emissions
Projections Using EGAS								
		07		0		0		0
		08		2.87		3.40		3.85
Nevada Sunpeak Partnership	0423	01	20100201	0.19	0.887396	0.17	0.687823	0.13
		02		0.28		0.25		0.19
		03		0.16		0.14		0.11
Fitzgeralds	0434	1	10300603	0.29	1.193438	0.35	1.436069	0.42
Masterbrand Cabinets	0482	01	40201901	0.51	1.085366	0.55	1.504878	0.77
Nevada Ready Mix (Lone Mtn.)	0512	1	30502599	40.4	1.218102	49.21	1.434024	57.93
Stratosphere Hotel and Casi-no	0564	1	10300603	2.41	1.193438	2.88	1.436069	3.46
Las Vegas Club	0603	1	10300603	0.68	1.193438	0.81	1.436069	0.98
Excalibur Hotel and Casino (825)	0609	1	10300603	2.45	1.193438	2.92	1.436069	3.52
Bills Gambling Hall (257)	0611	1	10300603	0.31	1.193438	0.37	1.436069	0.45
Imperial Palace (257)	0613	1	10300603	0.46	1.193438	0.55	1.436069	0.66
Venetian Hotel	0697	1	10300603	6.89	1.193438	8.22	1.436069	9.89
Mandalay Bay/ Four Seasons (825)	0737	1	10300603	6.96	1.193438	8.31	1.436069	10.00
Paris Hotel and Casino (257)	0749	1	10300603	1.46	1.193438	1.74	1.436069	2.10
Bellagio/Boardwalk (825)	0756	1	10300603	5.01	1.193438	5.98	1.436069	7.19
MGM Grand/NY NY	0825	1	10300603	7.25	1.193438	8.65	1.436069	10.41
LV Valley Water Dist. (Camp-bell)	0837	1	10300603	0.06	1.193438	0.07	1.436069	0.09
Luxor Hotel and Casino (825)	0856	1	10300603	4.39	1.193438	5.24	1.436069	6.30
Republic Services (Sunrise)	15033	01	50300601	0.96	1.219723	1.17	1.449384	1.39
North Las Vegas Airport	24001	01	27502011	22.30	1.291476	28.79	1.557839	34.73
Henderson Executive Airport	24002	01	27502011	10.96	1.291476	14.15	1.557839	17.07
		02	28888801	0.19	1.027504	0.19	1.129443	0.21
		03	40400498	0	1.122680	0	1.244002	0
NV Energy Clark (state fac.)	AP49110398	01	10100602	0	0.887396	0	0.687823	0

Facility Name	Facility ID No.	Emission Units	SCC	2008 Actual Emissions	2015 EGAS GF	2015 Projected Emissions	2023 EGAS GF	2023 Projected Emissions
Projections Using EGAS								
		02		0		0		0
		03		0		0		0
NV Energy Sunrise (state fac.)	AP49110399	01	10100602	64.55	0.887396	57.28	0.687823	44.40
Projected facility	PRJEGU13	#1	20100201	0	n/a	14.86	n/a	14.86
		#2		0	n/a	14.86	n/a	14.86
		#3		0	n/a	14.86	n/a	14.86
		#4		0	n/a	14.86	n/a	14.86
			TOTAL (tpy)	673.10		814.34		906.12
			TOTAL (tpd)	1.84		2.23		2.48
Projections Provided by Sources								
Nellis AFB	0114	2	127.20	27501015	n/a	135.20	n/a	144.33
			TOTAL (tpy)	127.20		135.20		144.33
			TOTAL (tpd)	0.35		0.37		0.40
			Total Emissions (tpy)	**800.30**		**949.54**		**1,050.45**
			Total Emissions (tpd)	**2.19**		**2.60**		**2.88**

Note: GF = growth factor; SCC = Source Classification Code.

Table 3-2. Emissions Summary

Facility Name	Facility	SCC	Emission Units	2008 Actual Emissions
Point Source Emissions within HA 212 but outside BLM Disposal Area				
Certain teed	4	30504021	1	15.45
		20200401	B8	0
		30501513	E11	3
		30501502	F1	0
			F2	
			F3	
			F4	
			G1	0.63
			G1a	0
			G1b	
			G1c	
		30501599	J2	
		30501520	J3	3.78
		20200102	L3	0.07
			TOTAL (tpy)	22.93
			TOTAL (tpd)	0.06
Emissions Within BLM Disposal Area				
			TOTAL (tpy)	800.30
			TOTAL (tpd)	2.19
			Total Emissions (tpy)	**823.23**
			Total Emissions (tpd)	**2.25**

4.0 NONPOINT SOURCE EMISSIONS OVERVIEW

4.1 Nonpoint Source Sectors

Nonpoint sources collectively represent individual point or specific mobile sources that have not been otherwise inventoried. Nonpoint sources are typically either too numerous, too small, or too difficult to inventory using methodologies for point or mobile sources.

When developing EIs, the basic unit for storing emissions is the source classification code (SCC). EPA has developed methodologies for estimating emissions for a number of SCC sectors, as detailed in the EIIP. EPA currently maintains a database of 1,249 active nonpoint SCCs; 57 of these were identified as significant in Clark County.

For the 2008 National Emissions Inventory (NEI), EPA developed a series of default EIs for nonpoint SCC sectors, including those identified in the EIIP, and for individual nonpoint source SCCs. The Clark County nonpoint source EI includes PM_{10} emissions from all SCC sectors except:

- Anthracite coal, which is primarily used for residential and commercial space heating and is mostly mined in eastern Pennsylvania. Since Clark County residents and businesses have relatively low heating requirements, and the mines are so distant, it was assumed that emissions from burning anthracite coal were not significant. The coal used by industry within Clark County was assumed to be bituminous.

- Animal husbandry and fertilizer application, since the agriculture industry in Clark County is minor and emissions from these sectors are insignificant.

EPA provided state and local agencies submitting 2008 NEI data with an additional list of 18 nonpoint source sectors, categories, or SCCs for which the agencies had to provide estimates if they deemed the emissions significant. The Clark County nonpoint source EI includes PM_{10} emissions from sources in all 18 section of the list except the following:

- Clark County's water resources are limited and agriculture is minor, so emissions from agricultural tiling and grain elevators were deemed insignificant and not included.

- After accounting for fuel combustion, emissions from human and animal cremation were deemed insignificant and not included.

- No cotton is grown in Clark County, so cotton ginning emissions were not included.

- Emissions from dental preparation and use, drum and barrel reclamation, general laboratory activities, hospital sterilization, lamp (fluorescent) recycling, and lamp breakage were deemed insignificant and not included.

After accounting for nonpoint SCC sector emissions sources, 16 sectors were identified as significant sources of PM_{10} emissions tracked by EPA.

4.2 Methodology

The methods used to calculate nonpoint source sector emissions were primarily based on EIIP guidance (EPA 1997). Emissions were quantified using the product of a source's activity throughput (as defined in Title 40, Part 51.50 of the Code of Federal Regulations (40 CFR 51.50)), EF, and control efficiency (when applicable). This section provides detailed information on these variables, along with the methods used to calculate significant fugitive nonpoint source emissions.

Multiple sources of activity throughput exist for several nonpoint source sectors in the nonattainment area. One example is local population data for baseline and projected years, described in Section 2. Table 4-1 lists the methodology and throughput for each nonpoint source sector identified.

Table 4-1. Methodology and Data Sources for Nonpoint Sectors

Nonpoint Source Sector	Methodology	Data Source
Fuel combustion	EIIP, Vol. 3, Area Source Method Abstracts: • *Residential and Commercial/Institutional Natural Gas and Liquefied Petroleum Gas (LPG) Combustion* • *Residential and Commercial/Institutional Coal Combustion* • *Residential and Commercial/Institutional Fuel Oil and Kerosene Combustion*	• Nevada counties population data (Hardcastle 2008) • Fuel consumption data (EIA 2009) • Temperature data (Weather Underground 2011) • Industrial and commercial employment data (BLS 2011)
Residential wood combustion	Residential wood burning (Pechan 2008)	• County housing, occupied units (U.S. Census Bureau 2000) • Clark County population data (DCP 2010a)
Locomotive	Locomotive EFs (EPA 2009a)	Locomotive data (Section 6)
Paved road	AP-42, Vol. 1, Ch. 13.2.1	• Silt content (DAQEM 2001, App. B) • Vehicle miles traveled (RTC 2008) • Vehicle weight (DAQEM 2006) • EF (EPA 1995)
Unpaved road	AP-42, Vol. 1, Ch. 13.2.2	• Silt content (DRI 1997) • Vehicle weight (EPA 1995) • Moisture content (DAQEM 2001, App. B) • Unpaved road lengths (EQM 2006) • Average daily traffic counts (EQM 2006)
Commercial cooking	Commercial cooking (Pechan 2008)	County population data (DCP 2010a)
Mineral processing (concrete, gypsum)	AP-42, Vol. 1, Ch. 11.12 & 11.16	Process throughput, EFs, control efficiencies
Mineral processing (stone)	AP-42, Vol. 1, Ch. 11.19.2	Process throughput, EFs, control efficiencies
Asphalt	AP-42, Vol. 1, Ch. 11.1	Process throughput, emission factors, control efficiencies
Wind erosion (construction)	PM_{10} MAR	• Wind speed data (NCDC 2009) • Overall control efficiency • Emission rates (Clark County 2007)

Nonpoint Source Sector	Methodology	Data Source
Construction	PM_{10} SIP, App. B	• Land area (DAQEM 2007, DOA 2011, RFCD 2011) • Overall control efficiency • EFs (MRI 1996) • Duration (AQ database)
Sand & gravel	AP-42, Vol. 1, Ch. 11.19.1	Process throughput, EFs, and control efficiencies
Open burning	EIIP, Vol. 3, Ch. 16	• U.S. population data (U.S. Census Bureau 2011) • Average per capita waste generated (EPA 2008a) • Tracking of open burn permits (DAQ database)
Wind erosion (vacant lands)	PM_{10} SIP, App. B; PM_{10} MAR, App. E & R	• Land area(s) (AQ database) • EFs
Structure fires	EIIP, Vol. 3, Ch. 18	• Annual no. structural fires (local fire depts.) • County open burning incidents (AQ database)
Vehicle fires	EIIP, Vol. 3, *Area Source Method Abstracts*, "Vehicle Fires"	• Annual highway vehicle fires (local fire depts.) • Annual other vehicle fires (local fire depts.)

Note: DOA = Clark County Dept. of Aviation; DRI = Desert Research Institute; EF = emission factor; EIA = Energy Information Administration; EQM = Environmental Quality Management, Inc.; MRI = Midwest Research Institute; NCDC = National Climatic Data Center; RFCD = Regional Flood Control District; RTC = Regional Transportation Commission of Southern Nevada.

4.3 Source Overlap

Permitted point sources (e.g., stationary sources) often include fuel combustion and other types of nonpoint source emissions. In the NEI, EPA provided a list of nonpoint source sectors that could include point source emissions overlap (EPA 2008b).

To prevent double-counting, nonpoint source SCCs were compared with all the SCCs that made up the point source EI in the maintenance plan. Overlaps were corrected by subtracting the point source emissions that could also be categorized under a nonpoint source from nonpoint source emissions. In some cases, the permitted emissions in the point source inventory exceeded the estimated emissions from the nonpoint source inventory. If the overlap exceeded the nonpoint source emissions estimate, zero emissions were assigned to that SCC. Tables 4-2 and 4-3 identify the overlapping point source SCCs and the net overlap with the nonpoint source annual EI.

Table 4-2. Overlapping Point Source Emissions

Nonpoint Source (SCC)	Overlapping Point Sources (SCC)	PM_{10} (tons)
2102002000	30504033	7.48
Industrial	30501604	0.00
Coal		
	Total	**7.48**
2102004000	20200101	0.03
Industrial	20200102	1.82
Distillate Oil	20200104	0.00
	30500208	0.08
	Total	**1.93**
2102006000	10200602	0.06
Industrial	10200603	0.08
Natural Gas	20200201	1.88
	20200202	0.26
	30500257	4.48
	30501520	10.63
	30500242	0.65
	30501604	85.26
	Total	**103.30**
2103004000	20300101	0.04
	Total	**0.04**
2103006000	10300602	0.55
Commercial	10300603	82.75
Natural Gas	10500206	0.03
	20300202	7.45
	20300203	0.00
	Total	**90.78**
2306010000	20201001	28.18
Asphalt		
	Total	**28.18**

Source: Clark County 2008 Consolidated Emissions Reporting Rule (CERR) submittal.

Table 4-3. Point and Nonpoint Source Emissions Overlap

Overlapping Sources		2008 Point Source Emissions (tpy)
Nonpoint Source Category	**Point Source SCC**	
SCC 2102006000: Fuel Combustion (Natural Gas) Industrial	10200602	0.06
	10200603	0.08
	20200201	1.88
	20200202	0.26
	30500257	4.48
	30501520	10.63
	30500242	0.65
	30501604	85.26
SCC 2103006000: Fuel Combustion (Natural Gas) Commercial	10300602	0.55
	10300603	82.75
	10500206	0.03
	20300202	7.45
	20300203	0.00
SCC 2102004000: Fuel Combustion (Distillate Oil) Industrial	20200101	0.03
	20200102	1.82
	20200104	0.00
	30500208	0.08
SCC 2103004000: Fuel Combustion (Distillate Oil) Commercial	20300101	0.04
SCC 2102007000: Fuel Combustion (LP) Industrial	20201001	0.00
SCC 2102002000: Fuel Combustion (Bituminous Coal) Industrial	30504033	7.48
	30501604	0.00

Some of the overlapping point and nonpoint emissions totals were noticeably different: for example, the permitted point source fuel combustion of natural gas at industrial sources totaled 103.30 tpy, yet the estimated nonpoint source emissions for fuel combustion of natural gas at industrial sources totaled 24.88 tpy.

There are several possible explanations for this discrepancy. Emissions estimates for point sources are based on a bottom-up approach that relies on actual throughput values, rather than the top-down approach used to estimate nonpoint source emissions. In the top-down approach, statewide fuel consumption is based on EIA data that partitions consumption estimates among residential, commercial, and industrial sources. EIA may not have not accurately partitioned natural gas among Nevada sectors. Another possible explanation is that the population-based method used to estimate Clark County's share of statewide fuel consumption may be inaccurate. The EFs and controls used to estimate emissions in stationary source permits may also differ from those used to estimate nonpoint source emissions. In any case, large discrepancies between overlapping point and nonpoint source emissions are the exception rather than the rule.

4.4 Temporal Profiles

Design-day emissions were estimated using EPA temporal activity profiles, which provide daily, weekly, and monthly information at the SCC level (EPA 2002). Table 4-4 lists each nonpoint source sector's percentage of activity during the design day. The totals reflect the product of the source's activity in April and the average amount of activity that occurs on Wednesdays, the weekday corresponding to the design day.

Table 4-4. Design Day Temporal Profiles

Nonpoint Source Sector	SCC	Activity in April	Activity on Wednesdays	Activity During Design Day
Fuel combustion	2102002000	100.0%	103.0%	103.0%
	2102004000	100.0%	103.0%	103.0%
	2102005000	100.0%	103.0%	103.0%
	2102006000	100.0%	103.0%	103.0%
	2102007000	100.0%	103.0%	103.0%
	2102011000	100.0%	103.0%	103.0%
	2103002000	99.7%	103.0%	102.7%
	2103004000	99.7%	103.0%	102.7%
	2103005000	99.7%	103.0%	102.7%
	2103006000	99.7%	103.0%	102.7%
	2103007000	100.0%	103.0%	103.0%
	2103011000	100.0%	103.0%	103.0%
	2104002000	89.8%	100.0%	89.8%
	2104004000	89.8%	100.0%	89.8%
	2104005000	89.8%	100.0%	89.8%
	2104006000	89.8%	100.0%	89.8%
	2104007000	100.0%	100.0%	100.0%
	2104011000	100.0%	100.0%	100.0%
Residential wood combustion	2104008100	89.8%	100.0%	89.8%
	2104008210	89.8%	100.0%	89.8%
	2104008220	100.0%	100.0%	100.0%
	2104008230	89.8%	100.0%	89.8%
	2104008310	89.8%	100.0%	89.8%
	2104008320	100.0%	100.0%	100.0%
	2104008330	89.8%	100.0%	89.8%
	2104008400	89.8%	100.0%	89.8%
	2104008610	89.8%	100.0%	89.8%
	2104009000	89.8%	100.0%	89.8%
Locomotive	2285002006	100.0%	100.0%	100.0%
	2285002007	100.0%	100.0%	100.0%
	2285002008	98.2%	100.0%	98.2%
	2285002009	94.9%	100.0%	94.9%

Nonpoint Source Sector	SCC	Activity in April	Activity on Wednesdays	Activity During Design Day
	2285002010	98.5%	100.0%	98.5%
Paved road	2294000000	98.5%	98.5%	98.5%
Unpaved road	2296005000	100.0%	100.0%	100.0%
	2296010000	100.0%	100.0%	100.0%
Commercial cooking	2302002100	100.0%	100.0%	100.0%
	2302002200	100.0%	100.0%	100.0%
	2302003000	100.0%	100.0%	100.0%
	2302003100	100.0%	100.0%	100.0%
	2302003200	100.0%	100.0%	100.0%
Mineral processing (concrete, gypsum)	2305070000	100.0%	100.0%	100.0%
Mineral processing (stone)	2305080000	100.0%	100.0%	100.0%
Asphalt	2306010000	100.0%	100.0%	100.0%
Wind erosion (construction)	2311000100	N/A	N/A	N/A
Construction	2311010000	100.0%	100.0%	100.0%
	2311020000	100.0%	100.0%	100.0%
	2311030000	100.0%	100.0%	100.0%
Sand & gravel	2325030000	100.0%	100.0%	100.0%
Open burning	2610000100	100.0%	100.0%	100.0%
	2610000300	100.0%	100.0%	100.0%
	2610000400	100.0%	100.0%	100.0%
	2810035000	100.0%	100.0%	100.0%
	2810090000	100.0%	100.0%	100.0%
Wind erosion (vacant lands)	2730100000	N/A	N/A	N/A
Structure fires	2810030000	72.0%	84.0%	60.5%
Vehicle fires	2810090000	72.0%	84.0%	60.5%

EPA's temporal profiles are based on national averages, which are reasonably representative for most nonpoint sources. Whenever available, however, state or local data were used to estimate activity: e.g., EIA state-specific data for natural gas consumption were used when estimating emissions from residential, commercial, and industrial sources for the fuel combustion nonpoint sector (EIA 2010a).

4.5 Rule Effectiveness and Rule Penetration

Volume 73, page 76555 of the *Federal Register* (73 FR 76555) defines rule effectiveness (RE) as "a rating of how well a regulatory program achieves all possible emissions reductions. This rating reflects the assumption that controls typically are not 100 percent effective because of equipment downtime, upsets, decreases in control efficiencies, and other deficiencies in emission estimates."

The same page defines rule penetration (RP) as "the percentage of a nonpoint source category covered by an applicable regulation."

RE and RP values generally do not apply to nonpoint sources because of a lack of control devices subject to rule requirements. Table 4-5 lists the few nonpoint sources with RE and RP values less than 100 percent; it shows the controls associated with a subcategory of residential wood combustion devices and with the construction sector. The table included rules related to fuel usage and emission unit manufacture if they are referenced in the Clark County Air Quality Regulations (AQRs) or EPA documents. The RE and RP values of these rules were assumed to be 100 percent. Table 4-6 includes more detailed RE, RP, and control efficiency information for all of the inventoried nonpoint sectors.

Table 4-5. RE and RP for Nonpoint Sources

Nonpoint Sector	SCC	RE %	RP %
Fuel combustion[1]	2102004000	100	100
	2102011000	100	100
	2103004000	100	100
	2103011000	100	100
	2104004000	100	100
Residential wood combustion[2]	2104008000	100	100
	2104008100	100	100
	2104008210	100	100
	2104008220	100	100
	2104008230	100	100
	2104008310	90	100
	2104008320	90	100
	2104008330	90	100
Fuel combustion	2104011000	100	100
Locomotive[3]	2285002006	100	100
	2285002007	100	100
	2285002008	100	100
	2285002009	100	100
	2285002010	100	100
Wind erosion from construction activities	2311000100	80	98
Residential construction	2311010000	80	98
Non-residential construction	2311020000	80	98
Road construction	2311030000	80	98

Source: EPA 2005.
[1]The sulfur content of fuel oil combusted within Clark County is regulated under AQR Section 29. No other PM_{10} controls were identified.
[2]Assumed any and all controls occur at the manufacturer and are 100%, and that control equipment is installed by the manufacturer and additional emissions are a result of RE or RP values below 100%.
[3]Assumed 40 CFR 1033.901 standards are being met with approximately 100% capture and control efficiency.

Table 4-6. RE, RP, and Capture & Control Efficiencies

Sector	SCC	RE	RP	Control Device	Capture Eff.[1]	Control Eff.[2]	Total PM_{10} Controls[3]	Comments
Fuel combustion	2102002000	N/A	N/A	No[4]	N/A	N/A	N/A	Assumed that stoker-fired systems represent coal combustion units in Las Vegas. PM_{10} EF does not depend on ash content of fired coal, which is subject to permit conditions (AP-42, Table 1.1-11).
	2102004000	100%	100%	Yes	100%	100%	100%	AQR Section 29 regulates the sulfur content of fuel combusted in Clark County.
	2102005000	N/A	N/A	No	N/A	N/A	N/A	No identifiable use of residual oil within Clark County (AP-42, Table 1.3-6).
	2102006000	N/A	N/A	No	N/A	N/A	N/A	No PM_{10} controls identified (AP-42 Tables 1.4-1, -2).
	2102007000	N/A	N/A	No	N/A	N/A	N/A	No PM_{10} controls identified (AP-42 Table 1.5-1).
	2102011000	100%	100%	Yes	100%	100%	100%	Distillate oils include kerosene and diesel fuels.
	2103002000	N/A	N/A	No	N/A	N/A	N/A	No identifiable emissions in Clark County associated with burning coal in the residential or commercial sectors.
	2103004000	100%	100%	Yes	100%	100%	100%	Section 29 regulates the sulfur content of fuel combusted in Clark County.
	2103005000	N/A	N/A	No	N/A	N/A	N/A	No identifiable use of residual oil within Clark County.
	2103006000	N/A	N/A	No	N/A	N/A	N/A	No controls identified (AP-42 Tables 1.4-1, -2).
	2103007000	N/A	N/A	No	N/A	N/A	N/A	No controls identified (AP-42 Table 1.5-1).
	2103011000	100%	100%	Yes	100%	100%	100%	Section 29 regulates the sulfur content of fuel combusted in Clark County.
	2104002000	N/A	N/A	No	N/A	N/A	N/A	Assumed that stoker-fired systems represent coal combustion units in Las Vegas. PM_{10} EF does not depend on ash content of fired coal, which is subject to permit conditions.
	2104004000	100%	100%	Yes	100%	100%	100%	Section 29 regulates the sulfur content of fuel combusted in Clark County.
	2104005000	N/A	N/A	No	N/A	N/A	N/A	No identifiable use of residual oil within Clark County.
	2104006000	N/A	N/A	No	N/A	N/A	N/A	No controls identified (AP-42 Tables 1.4-1, -2).
	2104007000	N/A	N/A	No	N/A	N/A	N/A	No controls identified (AP-42 Table 1.5-1).
Residential wood burning	2104008100	100%	100%	Yes	100%	100%	100%	Assumed all controls occur at the manufacturer level and are 100 percent.
	2104008210	100%	100%	Yes	100%	100%	100%	From EPA (2005).
	2104008220	100%	100%	Yes	100%	100%	100%	From EPA (2005).

Sector	SCC	RE	RP	Control Device	Capture Eff.[1]	Control Eff.[2]	Total PM_{10} Controls[3]	Comments
	2104008230	100%	100%	Yes	100%	100%	100%	From EPA (2005).
	2104008310	90%	100%	Yes	100%	100%	90%	Assumed control equipment is installed by manufacturer and any additional emissions are a result of RE or RP values below 100 percent.
	2104008320	90%	100%	Yes	100%	100%	90%	From EPA (2005).
	2104008330	90%	100%	Yes	100%	100%	90%	From EPA (2005).
	2104008400	N/A	N/A	No	N/A	N/A	N/A	No AQRs or identified controls for these devices.
	2104008610	N/A	N/A	No	N/A	N/A	N/A	
	2104009000	N/A	N/A	No	N/A	N/A	N/A	
Fuel combustion	2104011000	100%	100%	Yes	100%	100%	100%	Section 29 regulates sulfur content of fuel combusted in Clark County.
Locomotive	2285002006	100%	100%	Yes	100%	100%	100%	40 CFR 1033.901 requires manufacturers to meet tiered standards that depend on the manufacture year. Assumed that standards are met with ~100% capture and control efficiency that all controls occur at the manufacturer, and that controls are 100%. Locomotives built before 1973 are exempt, but Union Pacific has upgraded all its locomotives to Tier 2.
	2285002007	100%	100%	Yes	100%	100%	100%	
	2285002008	100%	100%	Yes	100%	100%	100%	
	2285002009	100%	100%	Yes	100%	100%	100%	
	2285002010	100%	100%	Yes	100%	100%	100%	
Paved road	2294000000	N/A	N/A	No	N/A	N/A	N/A	Estimates based on AP-42 calculations. Since emissions are fugitive dust, no capture efficiency was assigned.
Unpaved road	2296005000	N/A	N/A	No	N/A	N/A	N/A	From EQM (2006), p. 8-2.
	2296010000	N/A	N/A	No	N/A	N/A	N/A	Fugitive dust.
Commercial cooking	2302002100	N/A	N/A	No	N/A	N/A	N/A	Clark County does not regulate charbroiler emissions, so equipment capture and control efficiencies were not estimated.
	2302002200	N/A	N/A	No	N/A	N/A	N/A	
	2302003000	N/A	N/A	No	N/A	N/A	N/A	Assumed that any controls associated with frying food occur at the manufacturer level and are 100%.
	2302003100	N/A	N/A	No	N/A	N/A	N/A	
	2302003200	N/A	N/A	No	N/A	N/A	N/A	

Sector	SCC	RE	RP	Control Device	Capture Eff.[1]	Control Eff.[2]	Total PM_{10} Controls[3]	Comments
Mineral processing (concrete, gypsum)	2305070000	N/A	N/A	N/A	N/A	N/A	N/A	Emissions based on actual emissions from permitted facilities. A control efficiency was not included because one or more may be present, depending on the size of the plant and the type of process. AQ applies a 90.9% control efficiency for the application of water to aggregate that produces a 2.5% moisture content, and a 95% control efficiency when a belt feeder is partially enclosed.
Mineral processing (stone)	2305080000	N/A	N/A	N/A	N/A	N/A	N/A	Emissions based on actual emissions from permitted facilities. AQ applies a 90% control efficiency when water is used during the stonecutting process.
Asphalt	2306010000	N/A	N/A	N/A	N/A	N/A	N/A	Emissions based on actual emissions from permitted facilities. AQ applies an 81.5% control efficiency for the application of water to aggregate that produces a 1.5% moisture content; a 95% control efficiency when a belt feeder or truck loadout is partially enclosed; and a 99% control efficiency when a baghouse is used at a silo.
Wind erosion from construction (total)	2311000100	80%	98%	Yes	N/A	91%	71%	Fugitive dust.
Residential construction	2311010000	80%	98%	Yes	N/A	87%	68%	From DAQEM (2003), pp. 6-7.
Non-residential construction	2311020000	80%	98%	Yes	N/A	87%	68%	Fugitive dust.
Road construction	2311030000	80%	98%	Yes	N/A	87%	68%	Fugitive dust.
Sand & gravel	2325030000	N/A	N/A	N/A	N/A	N/A	N/A	Emissions based on actual emissions from permitted facilities. AQ applies a 90.9% control efficiency for the application of water to aggregate that produces a 2.5% moisture content, and a 95% control efficiency when a belt feeder is partially enclosed.
Open burning	2610000100	N/A	N/A	No	N/A	N/A	N/A	No known controls.
	2610000300	N/A	N/A	No	N/A	N/A	N/A	No known controls.
	2610000400	N/A	N/A	No	N/A	N/A	N/A	No known controls.
Wind erosion (vacant lands)	2730100000	N/A	N/A	No	N/A	N/A	N/A	Vacant land emissions likely occur only at threshold wind speeds and depend on the type of land.
Structural fires	2810030000	N/A	N/A	No	N/A	N/A	N/A	Fires are not controlled.
Open burning	2810035000	N/A	N/A	No	N/A	N/A	N/A	No known controls.

Sector	SCC	RE	RP	Control Device	Capture Eff.[1]	Control Eff.[2]	Total PM_{10} Controls[3]	Comments
Vehicle fires	2810050000	N/A	N/A	No	N/A	N/A	N/A	Fires are not controlled.
Open burning	2810090000	N/A	N/A	No	N/A	N/A	N/A	No known controls.

[1]"Capture efficiency" is the weight per unit time of a pollutant entering a capture system and delivered to a control device divided by the weight per unit time of the total amount of the pollutant generated by the source.
[2]"Control efficiency" is the weight per unit time of a pollutant entering a capture system and delivered to a control device divided by the weight per unit time of the total amount of the pollutant generated by the source.
[3]When controls exist but do not impact emissions calculations; they are listed as "N/A."
[4]AP-42 indicates that any add-on controls associated with fuel combustion are narrowly tailored toward controlling NO_x emissions, so any capture and control efficiencies associated with add-on controls were assumed to be negligible for PM_{10}.

4.6 Growth Factors Used to Project Emissions

Projected emissions in this PM_{10} maintenance plan are generally based on growth factors generated by EGAS, version 5.0; however, EGAS may overestimate emissions growth. A draft EPA paper (Chappell 2006) suggests EGAS factors may overstate future-year emissions in regulatory impact analyses, and EPA has commented in several *Federal Register* entries that EGAS growth factors may overstate future-year emissions. Clark County still used EGAS growth factors to project 2023 nonpoint source emissions, with the following exceptions:

1. EGAS factors were not used where more accurate EIA fuel consumption projections were available. EIA forecasts for the consumption of natural gas, distillate fuel oil, residual fuel oil, and LPG were used to project emissions for the fuel combustion sector (EIA 2009).

2. Projected Union Pacific growth factors (Germer 2010) and EPA EFs (EPA 2009a), rather than EGAS factors, were used to estimate locomotive emissions. EPA's projected EFs showed more of a downward trend based on regulations mandating stricter controls for future years that EGAS did not take into account.

3. EGAS factors were not used to project emissions for the paved road sector. Instead, projected growth was based on more accurate vehicle miles traveled (VMT) projections from the RTC.

4. EGAS factors were not used to project emissions for the construction, wind erosion, and unpaved road sectors. Growth in these sectors was linked to projected population changes in the BLM disposal and nonattainment areas.

4.7 Emissions Summary

The following tables provide the estimated design-day emissions from nonpoint source sectors. Emissions are listed for the 2008 baseline year, the 2015 midpoint year, and the 2023 horizon year. Totals account for the overlap of point and nonpoint sources.

Table 4-7. Nonpoint Sector Design Day Emissions—BLM Disposal Area

Nonpoint Source Sector	Design Day Emissions (tpd)		
	2008	2015	2023
Fuel combustion	1.23	1.29	1.38
Residential wood combustion	1.89	1.90	1.92
Locomotive	0.06	0.06	0.05
Paved road	30.85	38.04	48.78
Unpaved road	5.84	6.51	7.49
Commercial cooking	2.19	2.52	2.83
Mineral processing (concrete, gypsum)	0.28	0.34	0.40
Mineral processing (stone)	0.15	0.18	0.21
Asphalt	0.33	0.37	0.40
Wind erosion (construction)	183.97	217.70	249.21
Construction	30.93	37.69	41.22
Sand & gravel	0.42	0.51	0.60
Open burning	0.02	0.02	0.02
Wind erosion (vacant lands)	439.05	288.16	122.77
Structural fires	0.02	0.02	0.03
Vehicle fires	0.03	0.03	0.04
TOTAL	**697.23**	**595.34**	**477.36**

Table 4-8. Nonpoint Sector Design Day Emissions—HA 212

Nonpoint Sector	Design Day Emissions (tpd)		
	2008	2015	2023
Fuel combustion	1.23	1.29	1.38
Residential wood combustion	1.89	1.91	1.93
Locomotive	0.06	0.07	0.06
Paved road	31.06	38.34	49.20
Unpaved road	6.76	7.54	8.68
Commercial cooking	2.20	2.52	2.84
Mineral processing (concrete, gypsum)	0.28	0.34	0.40
Mineral processing (stone)	0.15	0.18	0.22
Asphalt	0.33	0.37	0.41
Wind erosion (construction)	184.55	218.40	250.00
Construction	31.02	37.80	41.34
Sand & gravel	0.42	0.51	0.60
Open burning	0.02	0.02	0.02
Wind erosion (vacant lands)	3,630.12	3,478.81	3,312.96
Structural fires	0.02	0.02	0.03
Vehicle fires	0.03	0.03	0.04
TOTAL	**3,890.13**	**3,788.15**	**3,670.09**

Table 4-9. Nonpoint Sector Annual Emissions—BLM disposal area

Nonpoint Sector	Annual Emissions (tpy)		
	2008	2015	2023
Fuel combustion	445.77	467.21	498.15
Residential wood combustion	758.69	764.63	774.59
Locomotive	20.97	23.78	20.64
Paved road	11,152.75	13,198.07	15,108.25
Unpaved road	2,135.69	2,381.96	2,742.37
Commercial cooking	802.26	921.09	1,036.77
Mineral processing (concrete, gypsum)	101.03	123.07	144.88
Mineral processing (stone)	54.82	66.78	78.61
Asphalt	121.30	134.94	147.83
Wind erosion (construction)	19,550.11	23,135.44	26,483.86
Construction	11,318.05	13,793.38	15,085.35
Sand & gravel	152.56	185.84	218.78
Open burning	5.65	6.75	7.54
Wind erosion (vacant lands)	88,841.76	64,874.96	38,233.48
Structural fires	12.45	15.01	17.52
Vehicle fires	17.23	20.40	23.35
TOTAL	**135,491.11**	**120,113.31**	**100,621.98**

Table 4-10. Nonpoint Sector Annual Emissions—HA 212

Nonpoint Sector	Annual Emissions (tpy)		
	2008	2015	2023
Fuel combustion	446.98	468.48	499.50
Residential wood combustion	760.75	766.70	776.68
Locomotive	21.03	23.85	20.69
Paved road	11,227.01	13,285.95	15,208.85
Unpaved road	2,473.36	2,758.56	3,175.95
Commercial cooking	804.43	923.58	1,039.58
Mineral processing (concrete, gypsum)	101.31	123.40	145.28
Mineral processing (stone)	54.97	66.96	78.83
Asphalt	121.63	135.31	148.23
Wind erosion (construction)	19,612.18	23,208.89	26,567.94
Construction	11,350.73	13,833.10	15,128.90
Sand & gravel	152.98	186.34	219.37
Open burning	5.67	6.77	7.56
Wind erosion (vacant lands)	644,062.04	620,028.71	593,313.55
Structural fires	12.48	15.06	17.57
Vehicle fires	17.28	20.45	23.41
TOTAL	**691,224.81**	**675,852.11**	**656,371.90**

Table 4-11. Design Day Emissions in HA 212 (tpd)

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Fuel combustion	2102002000	Stationary Fuel Comb/Industrial/ Bituminous/Subbituminous Coal/ Total: All Boiler Types	0.84	0.89	0.96
	2102004000	Stationary Fuel Comb/Industrial/ Distillate Oil/Total: Boilers and IC Engines	0.18	0.19	0.20
	2102005000	Stationary Fuel Comb/Industrial/ Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2102006000	Stationary Fuel Comb/Industrial/ Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2102007000	Stationary Fuel Comb/Industrial/ Liquefied Petroleum Gas/Total: All Boiler Types	0.00	0.00	0.00
	2102011000	Stationary Fuel Comb/Industrial/ Kerosene/Total: All Boiler Types	0.00	0.00	0.00
	2103002000	Stationary Fuel Comb/Commercial/Institutional/ Bituminous/Sub-bituminous Coal/Total: All Boiler Types	0.00	0.00	0.00
	2103004000	Stationary Fuel Comb/Commercial/Institutional/Distillate Oil/Total: Boilers and IC Engines	0.03	0.03	0.03
	2103005000	Stationary Fuel Comb/Commercial/Institutional/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2103006000	Stationary Fuel Comb/Commercial/Institutional/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2103007000	Stationary Fuel Comb/Commercial/Institutional/Liquefied Petroleum Gas/Total: All Combustor Types	0.01	0.01	0.01
	2103011000	Stationary Fuel Comb/Commercial/Institutional/Kerosene/Total: All Combustor Types	0.00	0.00	0.00
	2104002000	Stationary Fuel Comb/Residential/ Bituminous/Subbituminous Coal/ Total: All Combustor Types	0.00	0.00	0.00
	2104004000	Stationary Fuel Comb/Residential/Distillate Oil/Total: All Combustor Types	0.00	0.00	0.00
	2104005000	Stationary Fuel Comb/Residential/ Residual Oil/Total: All Combustor Types	0.00	0.00	0.00
	2104006000	Stationary Fuel Comb/Residential/ Natural Gas/Total: All Combustor Types	0.17	0.17	0.17
	2104007000	Stationary Fuel Comb/Residential/ Liquefied Petroleum Gas/Total: All Combustor Types	0.01	0.01	0.01
Residential wood burning	2104008100	Stationary Fuel Comb/Residential/Wood/Fireplace: General	0.49	0.50	0.50
	2104008210	Stationary Fuel Comb/Residential/Wood/Woodstove: Fireplace Inserts; Non-EPA Certified	0.53	0.53	0.54
	2104008220	Stationary Fuel Comb/Residential/Wood/Woodstove: Fireplace Inserts; EPA-Certified; Non-Catalytic	0.12	0.12	0.12

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
	2104008230	Stationary Fuel Comb/Residential/Wood/Woodstove: Fireplace Inserts; EPA-Certified; Catalytic	0.04	0.04	0.04
	2104008310	Stationary Fuel Comb/Residential/Wood/Woodstove: Freestanding, Non-EPA Certified	0.48	0.49	0.49
	2104008320	Stationary Fuel Comb/Residential/Wood/Woodstove: Freestanding, EPA-certified, Non-Catalytic	0.11	0.11	0.11
	2104008330	Stationary Fuel Comb/Residential/Wood/Woodstove: Freestanding, EPA-certified, Catalytic	0.03	0.03	0.04
	2104008400	Stationary Fuel Comb/Residential/Wood/Woodstove: Pellet-fired, General (freestanding or FP insert)	0.01	0.01	0.01
	2104008610	Stationary Fuel Comb/Residential/Wood/Hydronic heater: Outdoor	0.00	0.00	0.00
	2104009000	Stationary Fuel Comb/Residential/Firelog/Total: All Combustor Types	0.07	0.07	0.07
Fuel combustion	2104011000	Stationary Fuel Comb/Residential/Kerosene/Total: All Heater Types	0.00	0.00	0.00
Locomotive	2285002006	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class I Operations	0.06	0.07	0.06
	2285002007	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class II/III Operations	0.00	0.00	0.00
	2285002008	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Passenger Trains (Amtrak)	0.00	0.00	0.00
	2285002009	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Commuter Lines	0.00	0.00	0.00
	2285002010	Mobile Sources/Railroad Equipment/Diesel/Yard Locomotives	0.00	0.00	0.00
Paved road	2294000000	Mobile Sources/Paved Roads/All Paved Roads/Total: Fugitives	31.06	38.34	49.20
Unpaved road	2296005000	Mobile Sources/Unpaved Roads/Public Unpaved Roads/Total: Fugitives	1.10	1.23	1.41
	2296010000	Mobile Sources/Unpaved Roads/Industrial Unpaved Roads/Total: Fugitives	5.66	6.31	7.27
Commercial cooking	2302002100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Char-broiling/ Conveyorized Charbroiling	0.24	0.27	0.31
	2302002200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Char-broiling/ Under-fired Charbroiling	1.60	1.84	2.07
	2302003000	Industrial Processes/Food & Kindred Products/Commercial Cooking - Fry-ing/Deep Fat Frying	0.00	0.00	0.00
	2302003100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Fry-ing/Flat Griddle Frying	0.35	0.41	0.46
	2302003200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Clamshell Griddle Frying	0.00	0.00	0.01

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Mineral processing (concrete, gypsum)	2305070000	Industrial Processes/Mineral Processes/Concrete, Gypsum, Plaster Products/Total	0.28	0.34	0.40
Mineral processing (stone)	2305080000	Industrial Processes/Mineral Processes/Cut Stone & Stone Products/Total	0.15	0.18	0.22
Asphalt	2306010000	Industrial Processes/Petroleum Refining/Asphalt Paving/Roofing Materials/Total	0.33	0.37	0.41
Wind erosion from construction (total)	2311000100	Industrial Processes/Construction: SIC[1] 15-17/All Processes/Wind Erosion	184.55	218.40	250.00
Residential construction	2311010000	Industrial Processes/Construction: SIC 15 - 17/Residential/Total	11.26	13.69	15.01
Nonresidential construction	2311020000	Industrial Processes/Construction: SIC 15 - 17/Industrial/Commercial/Institutional/Total	17.96	21.94	23.94
Road construction	2311030000	Industrial Processes/Construction: SIC 15 - 17/Road Construction/Total	1.79	2.17	2.38
Sand & gravel	2325030000	Industrial Processes/Mining & Quarrying/Sand & Gravel/Total	0.42	0.51	0.60
Open burning	2610000100	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Leaf Species Unspecified	0.00	0.00	0.00
	2610000300	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Weed Species Unspecified (including Grass)	0.00	0.00	0.00
	2610000400	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Brush Species Unspecified	0.00	0.00	0.00
Wind erosion (vacant lands)	2730100000	Natural Sources/Geogenic/Wind Erosion/Total	3,630.12	3,478.81	3,312.96
Structural fires	2810030000	Miscellaneous Area Sources/Other Combustion/Structure Fires/Unspecified	0.02	0.02	0.03
Open burning	2810035000	Miscellaneous Area Sources/Other Combustion/Firefighting Training/Total	0.00	0.00	0.00
Vehicle fires	2810050000	Miscellaneous Area Sources/Other Combustion/Motor Vehicle Fires/Unspecified	0.03	0.03	0.04
Open burning	2810090000	Miscellaneous Area Sources/Other Combustion/Open Fire/Not categorized	0.02	0.02	0.02
		TOTAL	**3,890.13**	**3,788.15**	**3,670.09**

[1]SIC = Standard Industrial Code.

Table 4-12. Design Day Emissions in the BLM Disposal Area (tpd)

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Fuel combustion	2102002000	Stationary Fuel Comb/Industrial/Bituminous/Subbituminous Coal/Total: All Boiler Types	0.84	0.88	0.96
	2102004000	Stationary Fuel Comb/Industrial/Distillate Oil/Total: Boilers and IC Engines	0.18	0.19	0.20
	2102005000	Stationary Fuel Comb/Industrial/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2102006000	Stationary Fuel Comb/Industrial/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2102007000	Stationary Fuel Comb/Industrial/Liquefied Petroleum Gas/Total: All Boiler Types	0.00	0.00	0.00
	2102011000	Stationary Fuel Comb/Industrial/Kerosene/Total: All Boiler Types	0.00	0.00	0.00
	2103002000	Stationary Fuel Comb/Commercial/Institutional/Bituminous/Sub-bituminous Coal/Total: All Boiler Types	0.00	0.00	0.00
	2103004000	Stationary Fuel Comb/Commercial/Institutional/Distillate Oil/Total: Boilers and IC Engines	0.03	0.03	0.03
	2103005000	Stationary Fuel Comb/Commercial/Institutional/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2103006000	Stationary Fuel Comb/Commercial/Institutional/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2103007000	Stationary Fuel Comb/Commercial/Institutional/Liquefied Petroleum Gas/Total: All Combustor Types	0.01	0.01	0.01
	2103011000	Stationary Fuel Comb/Commercial/Institutional/Kerosene/Total: All Combustor Types	0.00	0.00	0.00
	2104002000	Stationary Fuel Comb/Residential/Bituminous/Subbituminous Coal/Total: All Combustor Types	0.00	0.00	0.00
	2104004000	Stationary Fuel Comb/Residential/Distillate Oil/Total: All Combustor Types	0.00	0.00	0.00
	2104005000	Stationary Fuel Comb/Residential/Residual Oil/Total: All Combustor Types	0.00	0.00	0.00
	2104006000	Stationary Fuel Comb/Residential/Natural Gas/Total: All Combustor Types	0.17	0.17	0.17
	2104007000	Stationary Fuel Comb/Residential/Liquefied Petroleum Gas/Total: All Combustor Types	0.01	0.01	0.01
Residential wood burning	2104008100	Stationary Fuel Comb/Residential/Wood/Fireplace: general	0.49	0.50	0.50
	2104008210	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; non-EPA certified	0.53	0.53	0.54

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
	2104008220	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; non-catalytic	0.12	0.12	0.12
	2104008230	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; catalytic	0.04	0.04	0.04
	2104008310	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, non-EPA certified	0.48	0.48	0.49
	2104008320	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, EPA-certified, non-catalytic	0.11	0.11	0.11
	2104008330	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, EPA-certified, catalytic	0.03	0.03	0.03
	2104008400	Stationary Fuel Comb/Residential/Wood/Woodstove: pellet-fired, general (freestanding or fireplace insert)	0.01	0.01	0.01
	2104008610	Stationary Fuel Comb/ Residential/Wood/Hydronic heater: outdoor	0.00	0.00	0.00
	2104009000	Stationary Fuel Comb/Residential/Firelog/Total: All Combustor Types	0.07	0.07	0.07
Fuel combustion	2104011000	Stationary Fuel Comb/Residential/Kerosene/Total: All Heater Types	0.00	0.00	0.00
Locomotive	2285002006	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class I Operations	0.06	0.06	0.05
	2285002007	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class II/ III Operations	0.00	0.00	0.00
	2285002008	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Passenger Trains (Amtrak)	0.00	0.00	0.00
	2285002009	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Commuter Lines	0.00	0.00	0.00
	2285002010	Mobile Sources/Railroad Equipment/Diesel/Yard Locomotives	0.00	0.00	0.00
Paved road	2294000000	Mobile Sources/Paved Roads/All Paved Roads/Total: Fugitives	30.85	38.04	48.78
Unpaved road	2296005000	Mobile Sources/Unpaved Roads/Public Unpaved Roads/Total: Fugitives	0.28	0.32	0.36
	2296010000	Mobile Sources/Unpaved Roads/Industrial Unpaved Roads/Total: Fugitives	5.55	6.19	7.13
Commercial cooking	2302002100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Char-broiling/Conveyorized Charbroiling	0.24	0.27	0.31
	2302002200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Char-broiling/Under-fired Charbroiling	1.60	1.83	2.06
	2302003000	Industrial Processes/Food & Kindred Products/Commercial Cooking - Fry-ing/Deep Fat Frying	0.00	0.00	0.00

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
	2302003100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/Flat Griddle Frying	0.35	0.41	0.46
	2302003200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/Clamshell Griddle Frying	0.00	0.00	0.01
Mineral processing (concrete, gypsum)	2305070000	Industrial Processes/Mineral Processes/Concrete, Gypsum, Plaster Products/Total	0.28	0.34	0.40
Mineral processing (stone)	2305080000	Industrial Processes/Mineral Processes/Cut Stone & Stone Products/Total	0.15	0.18	0.21
Asphalt	2306010000	Industrial Processes/Petroleum Refining/Asphalt Paving/Roofing Materials/Total	0.33	0.37	0.40
Wind erosion from construction (total)	2311000100	Industrial Processes/Construction: SIC[1] 15 - 17/All Processes/Wind Erosion	183.97	217.70	249.21
Residential construction	2311010000	Industrial Processes/Construction: SIC 15 - 17/Residential/Total	11.25	13.68	15.00
Non-residential construction	2311020000	Industrial Processes/Construction: SIC 15 - 17/Industrial/Commercial/Institutional/Total	17.88	21.84	23.84
Road construction	2311030000	Industrial Processes/Construction: SIC 15 - 17/Road Construction/Total	1.79	2.17	2.38
Sand & gravel	2325030000	Industrial Processes/Mining & Quarrying/Sand & Gravel/Total	0.42	0.51	0.60
Open burning	2610000100	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Leaf Species Unspecified	0.00	0.00	0.00
	2610000300	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Weed Species Unspecified (including Grass)	0.00	0.00	0.00
	2610000400	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Brush Species Unspecified	0.00	0.00	0.00
Wind erosion (vacant lands)	2730100000	Natural Sources/Geogenic/Wind Erosion/Total	439.05	288.16	122.77
Structural fires	2810030000	Miscellaneous Area Sources/Other Combustion/Structure Fires/Unspecified	0.02	0.02	0.03
Open burning	2810035000	Miscellaneous Area Sources/Other Combustion/Firefighting Training/Total	0.00	0.00	0.00
Vehicle fires	2810050000	Miscellaneous Area Sources/Other Combustion/Motor Vehicle Fires/Unspecified	0.03	0.03	0.04
Open burning	2810090000	Miscellaneous Area Sources/Other Combustion/Open Fire/Not categorized	0.02	0.02	0.02
		TOTAL	**697.23**	**595.34**	**477.36**

Table 4-13. Annual PM_{10} Emissions in HA 212 (tons)

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Fuel combustion	2102002000	Stationary Fuel Comb/Industrial/Bituminous/Subbituminous Coal/Total: All Boiler Types	299.02	314.89	340.37
	2102004000	Stationary Fuel Comb/Industrial/Distillate Oil/Total: Boilers and IC Engines	64.05	66.29	70.00
	2102005000	Stationary Fuel Comb/Industrial/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2102006000	Stationary Fuel Comb/Industrial/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2102007000	Stationary Fuel Comb/Industrial/Liquefied Petroleum Gas/ Total: All Boiler Types	1.38	1.52	1.66
	2102011000	Stationary Fuel Comb/Industrial/Kerosene/Total: All Boiler Types	0.01	0.01	0.02
	2103002000	Stationary Fuel Comb/Commercial/Institutional/Bituminous/Subbituminous Coal/Total: All Boiler Types	0.00	0.00	0.00
	2103004000	Stationary Fuel Comb/Commercial/Institutional/Distillate Oil/Total: Boilers and IC Engines	9.16	9.48	10.01
	2103005000	Stationary Fuel Comb/Commercial/Institutional/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2103006000	Stationary Fuel Comb/Commercial/Institutional/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2103007000	Stationary Fuel Comb/Commercial/Institutional/Liquefied Petroleum Gas/Total: All Combustor Types	2.10	2.31	2.52
	2103011000	Stationary Fuel Comb/Commercial/Institutional/ Kerosene/Total: All Combustor Types	0.12	0.12	0.13
	2104002000	Stationary Fuel Comb/Residential/Bituminous/Subbituminous Coal/Total: All Combustor Types	0.00	0.00	0.00
	2104004000	Stationary Fuel Comb/Residential/Distillate Oil/Total: All Combustor Types	0.66	0.68	0.72
	2104005000	Stationary Fuel Comb/Residential/Residual Oil/Total: All Combustor Types	0.00	0.00	0.00
	2104006000	Stationary Fuel Comb/Residential/Natural Gas/Total: All Combustor Types	67.77	70.20	70.83

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
	2104007000	Stationary Fuel Comb/Residential/Liquefied Petroleum Gas/Total: All Combustor Types	2.67	2.94	3.20
Residential wood burning	2104008100	Stationary Fuel Comb/Residential/Wood/Fireplace: general	200.87	202.44	205.08
	2104008210	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; non-EPA certified	215.39	217.07	219.90
	2104008220	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; non-catalytic	44.25	44.59	45.17
	2104008230	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; catalytic	15.35	15.47	15.67
	2104008310	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, non-EPA certified	196.16	197.70	200.27
	2104008320	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, EPA-certified, non-catalytic	40.29	40.60	41.13
	2104008330	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, EPA-certified, catalytic	13.97	14.08	14.27
	2104008400	Stationary Fuel Comb/Residential/Wood/Woodstove: pellet-fired, general (freestanding or FP insert)	5.90	5.95	6.03
	2104008610	Stationary Fuel Comb/Residential/Wood/Hydronic heater: outdoor	0.02	0.02	0.02
	2104009000	Stationary Fuel Comb/Residential/Firelog/Total: All Combustor Types	28.55	28.78	29.15
Fuel combustion	2104011000	Stationary Fuel Comb/Residential/Kerosene/Total: All Heater Types	0.04	0.04	0.03
Locomotive	2285002006	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class I Operations	21.03	23.85	20.69
	2285002007	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class II/ III Operations	0.00	0.00	0.00
	2285002008	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Passenger Trains (Amtrak)	0.00	0.00	0.00
	2285002009	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Commuter Lines	0.00	0.00	0.00
	2285002010	Mobile Sources/Railroad Equipment/Diesel/Yard Locomotives	0.00	0.00	0.00

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Paved road	2294000000	Mobile Sources/Paved Roads/All Paved Roads/Total: Fugitives	11,227.01	13,285.95	15,208.85
Unpaved road	2296005000	Mobile Sources/Unpaved Roads/Public Unpaved Roads/Total: Fugitives	402.22	448.60	516.48
	2296010000	Mobile Sources/Unpaved Roads/Industrial Unpaved Roads/Total: Fugitives	2,071.14	2,309.96	2,659.48
Commercial cooking	2302002100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Charbroiling/Conveyorized Charbroiling	87.65	100.63	113.27
	2302002200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Charbroiling/Under-fired Charbroiling	585.72	672.48	756.94
	2302003000	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Deep Fat Frying	0.00	0.00	0.00
	2302003100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Flat Griddle Frying	129.64	148.84	167.54
	2302003200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Clamshell Griddle Frying	1.42	1.63	1.84
Mineral processing (concrete, gypsum)	2305070000	Industrial Processes/Mineral Processes/Concrete, Gypsum, Plaster Products/ Total	101.31	123.40	145.28
Mineral processing (stone)	2305080000	Industrial Processes/Mineral Processes/Cut Stone & Stone Products/Total	54.97	66.96	78.83
Asphalt	2306010000	Industrial Processes/Petroleum Refining/Asphalt Paving/Roofing Materials/ Total	121.63	135.31	148.23
Wind erosion from construction (total)	2311000100	Industrial Processes/Construction: SIC[1] 15 - 17/All Processes/Wind Erosion	19,612.18	23,208.89	26,567.94
Residential construction	2311010000	Industrial Processes/Construction: SIC 15 - 17/Residential/Total	4,121.69	5,009.66	5,493.62
Non-residential construction	2311020000	Industrial Processes/Construction: SIC 15 - 17/Industrial/Commercial/Institutional/Total	6,574.90	8,028.38	8,763.40
Road construction	2311030000	Industrial Processes/Construction: SIC 15 - 17/Road Construction/Total	654.14	795.07	871.88
Sand & gravel	2325030000	Industrial Processes/Mining & Quarrying/Sand & Gravel/Total	152.98	186.34	219.37

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Open burning	2610000100	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Leaf Species Unspecified	0.01	0.01	0.01
	2610000300	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Weed Species Unspecified (including Grass)	0.00	0.00	0.00
	2610000400	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Brush Species Unspecified	0.01	0.01	0.01
Wind erosion (vacant lands)	2730100000	Natural Sources/Geogenic/Wind Erosion/Total	644,062.04	620,028.71	593,313.55
Structural fires	2810030000	Miscellaneous Area Sources/Other Combustion/Structure Fires/Unspecified	12.48	15.06	17.57
Open burning	2810035000	Miscellaneous Area Sources/Other Combustion/Firefighting Training/Total	0.05	0.06	0.07
Vehicle fires	2810050000	Miscellaneous Area Sources/Other Combustion/Motor Vehicle Fires/Unspecified	17.28	20.45	23.41
Open burning	2810090000	Miscellaneous Area Sources/Other Combustion/Open Fire/Not categorized	5.60	6.69	7.48
		TOTAL	**691,224.81**	**675,852.11**	**656,371.90**

Table 4-14. Annual PM_{10} Emissions in BLM Disposal Area (tons)

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Fuel combustion	2102002000	Stationary Fuel Comb/Industrial/Bituminous/Subbituminous Coal/Total: All Boiler Types	298.22	314.04	339.45
	2102004000	Stationary Fuel Comb/Industrial/Distillate Oil/Total: Boilers and IC Engines	63.88	66.11	69.81
	2102005000	Stationary Fuel Comb/Industrial/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2102006000	Stationary Fuel Comb/Industrial/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2102007000	Stationary Fuel Comb/Industrial/Liquefied Petroleum Gas/Total: All Boiler Types	1.38	1.52	1.65
	2102011000	Stationary Fuel Comb/Industrial/Kerosene/Total: All Boiler Types	0.01	0.01	0.02
	2103002000	Stationary Fuel Comb/Commercial/Institutional/Bituminous/Subbituminous Coal/Total: All Boiler Types	0.00	0.00	0.00
	2103004000	Stationary Fuel Comb/Commercial/Institutional/Distillate Oil/Total: Boilers and IC Engines	9.14	9.46	9.99
	2103005000	Stationary Fuel Comb/Commercial/Institutional/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00
	2103006000	Stationary Fuel Comb/Commercial/Institutional/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00
	2103007000	Stationary Fuel Comb/Commercial/Institutional/Liquefied Petroleum Gas/Total: All Combustor Types	2.09	2.30	2.51
	2103011000	Stationary Fuel Comb/Commercial/Institutional/Kerosene/Total: All Combustor Types	0.12	0.12	0.13
	2104002000	Stationary Fuel Comb/Residential/Bituminous/Subbituminous Coal/Total: All Combustor Types	0.00	0.00	0.00
	2104004000	Stationary Fuel Comb/Residential/Distillate Oil/Total: All Combustor Types	0.66	0.68	0.72
	2104005000	Stationary Fuel Comb/Residential/Residual Oil/Total: All Combustor Types	0.00	0.00	0.00
	2104006000	Stationary Fuel Comb/Residential/Natural Gas/Total: All Combustor Types	67.59	70.01	70.64

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
	2104007000	Stationary Fuel Comb/Residential/Liquefied Petroleum Gas/ Total: All Combustor Types	2.66	2.93	3.20
Residential wood burning	2104008100	Stationary Fuel Comb/Residential/Wood/Fireplace: general	200.33	201.90	204.53
	2104008210	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; non-EPA certified	214.80	216.49	219.30
	2104008220	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; non-catalytic	44.13	44.47	45.05
	2104008230	Stationary Fuel Comb/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; catalytic	15.30	15.42	15.63
	2104008310	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, non-EPA certified	195.63	197.16	199.73
	2104008320	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, EPA-certified, non-catalytic	40.18	40.49	41.02
	2104008330	Stationary Fuel Comb/Residential/Wood/Woodstove: freestanding, EPA-certified, catalytic	13.94	14.05	14.23
	2104008400	Stationary Fuel Comb/Residential/Wood/Woodstove: pellet-fired, general (freestanding or FP insert)	5.89	5.93	6.01
	2104008610	Stationary Fuel Comb/Residential/Wood/Hydronic heater: outdoor	0.02	0.02	0.02
	2104009000	Stationary Fuel Comb/Residential/Firelog/Total: All Combustor Types	28.48	28.70	29.07
Fuel combustion	2104011000	Stationary Fuel Comb/Residential/Kerosene/Total: All Heater Types	0.04	0.04	0.03
Locomotive	2285002006	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class I Operations	20.97	23.78	20.64
	2285002007	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Class II/III Operations	0.00	0.00	0.00
	2285002008	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Passenger Trains (Amtrak)	0.00	0.00	0.00
	2285002009	Mobile Sources/Railroad Equipment/Diesel/Line Haul Locomotives: Commuter Lines	0.00	0.00	0.00
	2285002010	Mobile Sources/Railroad Equipment/Diesel/Yard Locomotives	0.00	0.00	0.00

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
Paved road	2294000000	Mobile Sources/Paved Roads/All Paved Roads/Total: Fugitives	11,152.75	13,198.07	15,108.25
Unpaved road	2296005000	Mobile Sources/Unpaved Roads/Public Unpaved Roads/Total: Fugitives	103.39	115.31	132.76
	2296010000	Mobile Sources/Unpaved Roads/Industrial Unpaved Roads/Total: Fugitives	2,032.30	2,266.64	2,609.61
Commercial cooking	2302002100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Charbroiling/Conveyorized Charbroiling	87.41	100.36	112.97
	2302002200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Charbroiling/Under-fired Charbroiling	584.14	670.66	754.89
	2302003000	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Deep Fat Frying	0.00	0.00	0.00
	2302003100	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Flat Griddle Frying	129.29	148.44	167.08
	2302003200	Industrial Processes/Food & Kindred Products/Commercial Cooking - Frying/ Clamshell Griddle Frying	1.42	1.63	1.83
Mineral processing (concrete, gypsum)	2305070000	Industrial Processes/Mineral Processes/Concrete, Gypsum, Plaster Products/ Total	101.03	123.07	144.88
Mineral processing (stone)	2305080000	Industrial Processes/Mineral Processes/Cut Stone & Stone Products/Total	54.82	66.78	78.61
Asphalt	2306010000	Industrial Processes/Petroleum Refining/Asphalt Paving/Roofing Materials/ Total	121.30	134.94	147.83
Wind erosion from construction (total)	2311000100	Industrial Processes/Construction: SIC 15[1] - 17/All Processes/Wind Erosion	19,550.11	23,135.44	26,483.86
Residential construction	2311010000	Industrial Processes/Construction: SIC 15 - 17/Residential/Total	4,119.06	5,006.46	5,490.12
Non-residential construction	2311020000	Industrial Processes/Construction: SIC 15 - 17/Industrial/Commercial/ Institutional/Total	6,545.24	7,992.33	8,723.87
Road construction	2311030000	Industrial Processes/Construction: SIC 15 - 17/Road Construction/Total	653.75	794.59	871.36
Sand & gravel	2325030000	Industrial Processes/Mining & Quarrying/Sand & Gravel/Total	152.56	185.84	218.78
Open burning	2610000100	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Leaf Species Unspecified	0.01	0.01	0.01

Nonpoint Sector	SCC	SCC Description	2008	2015	2023
	2610000300	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Weed Species Unspecified (including Grass)	0.00	0.00	0.00
	2610000400	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/Yard Waste - Brush Species Unspecified	0.01	0.01	0.01
Wind erosion (vacant lands)	2730100000	Natural Sources/Geogenic/Wind Erosion/Total	88,841.76	64,874.96	38,233.48
Structural fires	2810030000	Miscellaneous Area Sources/Other Combustion/Structure Fires/Unspecified	12.45	15.01	17.52
Open burning	2810035000	Miscellaneous Area Sources/Other Combustion/Firefighting Training/Total	0.05	0.06	0.07
Vehicle fires	2810050000	Miscellaneous Area Sources/Other Combustion/Motor Vehicle Fires/Unspecified	17.23	20.40	23.35
Open burning	2810090000	Miscellaneous Area Sources/Other Combustion/Open Fire/Not categorized	5.59	6.67	7.46
		TOTAL	**135,491.11**	**120,113.31**	**100,621.98**

5.0 FUGITIVE NONPOINT SOURCE EMISSIONS

5.1 Construction

5.1.1 Background

From the mid-1980s to the mid-2000s, Clark County led the nation in population growth and construction. Around 2004, Clark County began to see a sizeable bubble that roughly paralleled construction employment (Figure 5-1). However, commercial and residential construction activities have declined significantly since 2007 (U.S. Census Bureau 2011).

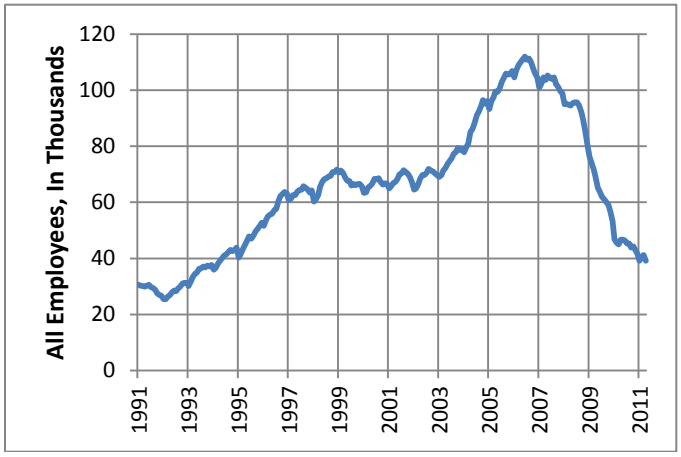

Figure 5-1. Construction Employment in Las Vegas-Paradise Metropolitan Statistical Area.

Emissions from construction activities are influenced by several factors, which can be categorized as aggravating or mitigating. These include:

- Rate of construction activity.
- Duration of construction.
- Type of construction (residential, commercial, or road).
- Controls implemented.
- Extent of enforcement activity.
- Type of soil impacted (e.g., sandy loam, silt).
- Meteorological conditions.

The two variables with the greatest mitigating influence were the implementation of controls and the increase of enforcement activity. Controls were implemented largely through Section 94 of the AQRs.

5.1.2 Emissions Inventory Development

To build a construction EI, construction activity emissions were split into the following categories: residential, nonresidential, road (including track-out), and wind erosion. Table 5-1 lists PM_{10} emissions totals for each of the categories on the design day (April 15, 2008). Figure 5-2 depicts the values listed in Table 5-1 in a pie chart.

Table 5-1. Design Day Construction Activities Emissions in BLM Disposal Area (tpy)

SCC	Emission Source	PM_{10}
2311010000	Residential	11.25
2311020000	Non-residential	17.88
2311030000	Road	1.79
2311000100	Wind erosion	183.97

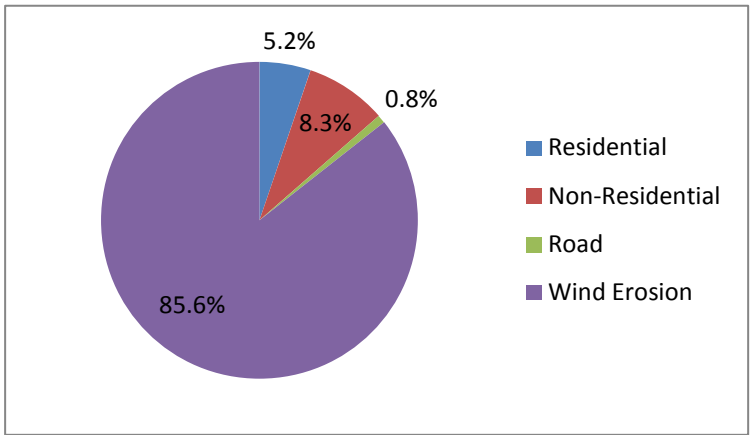

Figure 5-2. Design Day Construction Activities Emissions in BLM Disposal Area.

Wind erosion emissions comprised more than 80 percent of the construction activity emissions on the design day. The average wind speed that day was 18.7 mph, with a standard deviation of 4.1 mph (NWS 2011). Peak measured wind speed was 25.3 mph.

To determine the relative impact of wind erosion emissions on the design day, meteorological data were used to calculate the relative contribution of wind erosion on each day in 2008. Over the course of a year, the largest contributor to construction activity emissions was wind erosion; however, its contribution over a year is less than its contribution on the design day. Figure 5-3 illustrates the breakdown, using the annualized data in Table 5-2.

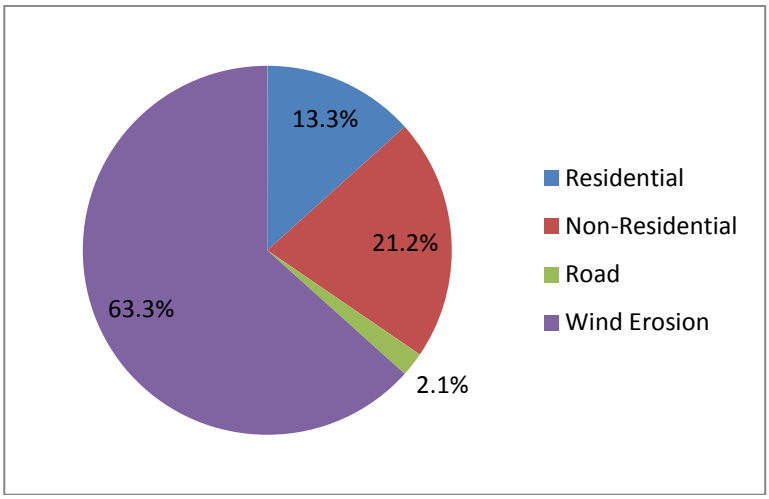

Figure 5-3. Annual Averaged 2008 Construction Activities Emissions in BLM Disposal Area.

Table 5-2. Annual Averaged 2008 Construction Activities Emissions within BLM Disposal Area (tpd)

Emission Source	SCC	PM_{10} Emissions
Residential	2311010000	11.25
Non-residential	2311020000	17.88
Road	2311030000	1.79
Wind erosion	2311000100	53.42

The values in Tables 5-1 and 5-2 show that wind erosion emissions on the design day were approximately 3.4 times greater than average annual emissions. Figure 5-3 also indicates that, on average, emissions from the residential, nonresidential, and road construction categories are significant (36.7 percent).

Average annual wind erosion emissions from construction activities represent approximately 26 percent of the nonpoint emissions budget within the BLM disposal area on the design day (183.97 of 697.23 tons). When emissions from the residential, nonresidential, and road construction categories are added, the overall contribution of construction activities emissions is approximately 31 percent (214.89 of 697.23 tons).

5.1.3 Methodology

PM_{10} emissions from residential, nonresidential, and road construction activities are equal to the product of construction area, construction duration, EF, and overall control efficiency. Sections 5.1.3.1–5.1.3.4 explains each of these variables, and Sections 5.1.4–5.1.8 detail the methodologies used to calculate emissions for each of the construction categories shown in Figure 5-3. Appendix B of the PM_{10} SIP (pp. B-24, B-58) describes EFs and construction activity duration.

5.1.3.1 *Construction Area*

Construction area values were based on data acquired from the Clark County Department of Air Quality dust control permit database. It was assumed that the acreage associated with dust control permits issued during 2008 reasonably represented the construction area during that year. Table 5-3 provides the areas and sources of data.

Table 5-3. Construction Area (2008)

Construction Type	Acreage within BLM Disposal Area	Acreage within HA 212	Source
Airport	378	378	DOA
Commercial	5,702	5,768	AQ dust control permits
Flood detention	38	38	RFCD
Highway (road)	351	351	Municipal public works agencies
Public parks	105	105	AQ database
Schools	412	412	AQ database
Public works	4,791	4,793	AQ database
Residential	8,149	8,154	AQ database
Underground utilities	1,392	1,396	AQ database
Miscellaneous	3,684	3,706	AQ database
TOTAL	**25,001**	**25,101**	

5.1.3.2 *Duration of Construction Activity*

Historically, the actual duration of individual construction projects has not been tracked. Therefore, estimates of the average construction duration in each construction category have been based on the empirical observations of Clark County Department of Air Quality enforcement officers, which range from 1–12 months per year (Tables 5-5, 5-8, and 5-10).

5.1.3.3 *Emission Factors*

Clark County uses two EFs to estimate emissions from construction types. The first is a 0.265 ton/acre/month factor used to estimate construction emissions from residential, commercial/industrial, public-park, school, and other projects. This EF is based on the average of two factors (0.11 ton/acre/month and 0.42 ton/acre/month) established in MRI (1996). The second factor is the 0.42 ton/acre/month factor established in MRI (1996), which was used to estimate emissions from airports, flood detention basins, roadways (collector size and larger), and underground utility projects.

The 0.11 ton/acre/month value (used to generate the 0.265 ton/acre/month EF) represents the geometric mean of uncontrolled emissions tested at seven construction sites in Las Vegas and in Coachella Valley, South Coast, and San Joaquin Valley, California. The 0.42 ton/acre/month EF was developed on construction sites where there were "active large-scale earthmoving operations," which MRI (1996) indicates are to be used under "worst-case conditions."

5.1.3.4 *Overall Control Efficiency*

The overall control efficiency of a source is the product of the expected control efficiency, RP, and RE. This value applies to residential, nonresidential, and road construction activities. Table 5-4 lists the variables used to calculate the overall control efficiency. The paragraphs that follow describe the factors that went into this estimate.

Table 5-4. Overall Control Efficiency

Parameter	Percentage
Emission reduction from control efficiency	87 percent
RP	98 percent
RE	80 percent
Overall reduction	68 percent

Efficiency of the Control(s) Expected to be Used. The PM_{10} SIP provides the rationale for assigning a control efficiency of 87 percent to construction sites in the nonattainment area (DAQEM 2001, pp. L-4, L-5). Several studies were conducted to determine the effectiveness of watering as a control at construction sites. Although EPA (1988a) found that using water provided 50 percent control efficiency, the report did not consider wind speed, soil types, or construction activities.

In a later report (EPA 1988b), EPA developed an equation to predict control efficiencies based on wind speed. For Las Vegas Valley meteorological conditions, this equation predicted a control efficiency of 83 percent. Fitz (2000) tested the equation's predictions and demonstrated a reduction of 90 percent at a wind speed of 13 meters per second, although Fitz may have achieved a higher control rate than predicted because water was applied at a rate of 1.4 gal/hr/yd^2. Because the equation was verified in an independent study and EPA (1988a) did not provide detail on variables, the 83 percent emissions reduction rate was determined to be the best estimate for construction activities.

None of the studies above included tackifiers or surfactants. Wind tunnel studies conducted by UNLV showed that dust suppressants can have at least a 91 percent effectiveness on vacant disturbed land in the BLM disposal area (DAQEM 2001, Appendix C), and this rate was applied to soil not being actively disturbed on construction sites. Averaging the 91 percent reduction rate for undisturbed soils at construction sites and the 83 percent reduction rate for construction activities provided an emission reduction rate of 87 percent for overall construction activities.

The best management practices for construction adopted by Clark County, which include tackifier and surfactant use, effective water application, and an overall strengthening of dust control requirements, may produce an even higher rate of emission reductions.

Rule Penetration. EPA defines RP as "the percentage of a nonpoint source category covered by an applicable regulation" (73 FR 76555). AQR Section 94, which regulates construction activities, requires dust control permits for construction sites 0.25 acre or larger. A review conducted when the PM_{10} SIP was submitted showed that smaller sites comprised less than 1.5 percent of all

construction permits. Based on this review, an RP of 98 percent was assumed for construction activities.

Rule Effectiveness. EPA defines RE as "a rating of how well a regulatory program achieves all possible emissions reductions. This rating reflects the assumption that controls typically are not 100 percent effective because of equipment downtime, upsets, decreases in control efficiencies, and other deficiencies in emission estimates. Rule effectiveness adjusts the control efficiency from what could be realized under ideal conditions to what is actually emitted in practice due to less than ideal conditions" (73 FR 76555).

EPA 1991 states: "For the purpose of base year and projection year emission inventories under the CAAA, EPA will allow the use of an 80 percent default value for rule effectiveness, but will also give states the option to derive local category-specific RE factors." Clark County used this default value in the PM_{10} SIP and the PM_{10} maintenance plan.

5.1.4 Types of Construction Emissions

Construction emissions can be partitioned into four categories: residential, nonresidential, road, and wind erosion. Emissions are calculated independently using the methodologies described below. Track-out emissions, generated when vehicles traveling on paved roads kick up dried soil left behind by vehicles leaving construction sites, are also calculated independently but included in the road emissions category.

5.1.4.1 *Residential*

These include emissions from construction of single and multi-unit buildings, and from local road development. Local road-building emissions were placed in this category because the land clearing and site preparation activities involved, such as scraping and grading, are performed in conjunction with residential construction.

In the 2008 NEI, EPA used a top-down methodology to estimate residential construction emissions for all air agency-controlled areas in the U.S. Clark County ranked second nationally; only Maricopa County, Arizona, was estimated to have higher countywide residential construction emissions.

Clark County used a bottom-up approach to estimate residential construction emissions for the PM_{10} maintenance plan to obtain more accurate results. This approach focused on using data from a local dust permit database to quantify the total area disturbed by construction activities instead of relying on regional data. Estimating emissions this way tailored the results more closely to local conditions. It was assumed that the acreage associated with dust control permits issued during 2008 represented the acreage on which actual construction took place that year.

The following equation was used to calculate residential, nonresidential, and road construction emissions:

(Eq. 5-1) $$E = C \bullet D \bullet EF \bullet CE$$

where:

E = emissions (ton/yr)
C = construction area (acres)
D = duration of construction (mo/yr)
EF = emission factor (ton/acre/mo)
CE = overall control efficiency

Table 5-5 summarizes the variables used to estimate residential construction emissions.

Table 5-5. Data Used to Estimate Residential Construction Emissions (2008)

Construction Type	Area (acres)	Duration (mo/yr)	EF (ton/acre/mo)	Overall Efficiency
Residential	8,149	6	0.265	68%

5.1.4.2 *Nonresidential*

Equation 5-1 was also used to calculate nonresidential construction emissions, which comprise those from airports, commercial/industrial facilities, flood detention facilities, public parks, schools, public works projects, underground utilities, and miscellaneous construction projects.

As with residential construction emissions, the bottom-up methodology was used to estimate nonresidential construction emissions. Clark County used data from other local agencies to supplement its permit database. It was assumed that the acreage associated with dust control permits issued during 2008 represented the acreage on which actual construction took place that year. The DOA provided the airport construction estimates in Table 5-6; the RFCD provided the flood detention estimates in Table 5-7.

Table 5-6. 2008 Airport Construction

Project	Project No.	Footprint (acres)
McCarran Airport		
Fire Station Relocation (EM)	2171	1.5
Runway 7R/25L/Twy "A" Rehabilitation (EM)	2276-1	271
Sunset/Bermuda signal and Gold Garage exit lanes (EM)	2304	7
Relocation of US Airways to CB3 (JF)	2309	0
ARFF Parking Area Replacement (JF)	2321	2
UMC Demo (CC)	2324	4.19
T2 HVAC Renovation and Sterilizer (TD)	2325	0
T3 Burnham Power Project (NTP 08/01/08) (DM)	2330	1.5
Frank Sinatra Power Project (NTP 10/08/08) (DM)	2331	4
Concourse 1213 Bottleneck Power Project (DM)	2331-2	
C Trams Bridges Repair (LS)	2332	0
Conduit Run for Administration Building (MQ/TD)	2343	1
"C" Concessions Grease Interceptor (DE)	2352	0.1
New Economy Lot, Detention Basin, ESB (CC)	CE-201	4.94
Terminal 3 Projects (TD)	2152, 2270, 2270-1, 2271, 2272, 2291, 2323, 2331-2	70
CB2 Great Steak and Potato (LG)	TI 762	0.25
CB4 Great Steak and Potato (LG)	TI 762	0.25
360 Degree Burrito (LG)	TI 810	0.25
Bonfire and Dewars (LG)	TI 893	0.25
	McCarran Total	**368.23**
Henderson Executive Airport		
Itinerant Apron (BR)	2338	9
	HEA Total	**9**
North Las Vegas Airport		
Construct Projects 2244, 2294, and 2295 (EM)	CE-200	1
Clark County Dept. of Air Quality @ NLVA (CC)	TI 981	0.06
	NLV Total	**1.06**
Other		
Overton Fuel Tank - Phase 2 (CC)	2285	0.05
MRACC FIDS (LS)	2328	0
Overton Access Road (CC)	2339	0.18
MRACC Billboards @ 7135 Gilespie (BR)	TI 1082	0.32
	Other Total	**0.55**
	TOTAL	**378.29**

Source: DOA data.

Table 5-7. RFCD Projects Completed in 2008

Project	Completion Date	Construction Cost	Est. Length	Est. Acreage
Blue Diamond Wash South Rainbow, Pebble - Raven and Wigwam - Ford	1/1/08		2,059	0.95
Hickam Avenue Storm Drain, Local Drainage Project	4/1/08		3,800	1.31
Gowan North Channel - El Capitan Way to the Western Beltway	5/1/08		3,960	1.82
Rancho Detention Basin, Phase II/5	5/1/08			25.54
Duck Creek, Eldorado Lane to Spencer Street	9/1/08		2,640	1.21
Lower Blue Diamond Detention Basin Outfall	11/1/08	$1.5M	1,320	0.61
Muddy River, Gubler Avenue Bridge[1]	8/1/08			
Pittman Wash – Burns[2]	7/1/08		2,640	1.21
Gowan Lone Mountain System - Branch 4	10/1/08	$3.4M	1,760	0.81
Gowan Lone Mountain System - Cliff Shadows Park	10/1/08	$1.8M	1,056	0.48
Oakey Blvd and Tenaya Way storm drain, local drainage project	12/1/08	$0.6M	2,640	1.21
Peak Drive System, Jones Blvd to Michael Way	9/1/08	$4.5M	1,760	0.81
Range Wash - Lamb Blvd Storm Drain	10/1/08	$6.4M	5,280	2.42
			TOTAL	38.38

Source: RFCD data.
[1]Outside the Las Vegas Valley nonattainment area.
[2]Assumed to be adjacent to Pioneer Detention Basin.

Table 5-8 shows the variables used to estimate nonresidential construction emissions; commercial development includes construction at industrial sites.

Table 5-8. Data Used to Estimate Nonresidential Construction Emissions (2008)

Construction Type	Area (acres)	Duration (mo/yr)	EF (ton/acre/mo)	Overall Efficiency
Airport	378	12	0.42	68%
Commercial	5,702	3	0.265	68%
Flood detention	38	12	0.42	68%
Public parks	105	6	0.265	68%
Schools	412	12	0.265	68%
Public works	4,791	3	0.42	68%
Underground utilities	1,392	1	0.42	68%
Miscellaneous	3,684	6	0.265	68%
TOTAL ACREAGE	**16,501**			

5.1.4.3 *Road*

Equation 5-1 was also used to calculate road construction emissions. As with residential and nonresidential construction, the bottom-up methodology was used to estimate road construction emissions. Clark County used data from NDOT and the public works departments of Clark County, the City of Las Vegas, the City of Henderson, and the City of North Las Vegas (Table 5-9).

Table 5-9. Public Road Construction in 2008

Entity	Area (acres)	Lane-miles
Clark County	54	37.3
City of Las Vegas	70	48.0
City of Henderson	18	12.1
City of North Las Vegas	5	3.6
NDOT	204	140.5
TOTAL	**351**	**241.5**

Note: Residential construction emissions include emissions from local road construction.

Table 5-10 shows the variables used to estimate emissions; the construction area is the estimated acreage within the BLM disposal area. Track-out emissions were included in the road construction emissions category; those calculations are described in Section 5.1.4.4.

Table 5-10. Data Used to Estimate Road Construction Emissions (2008)

Construction Type	Area (acres)	Duration (mo/yr)	EF (ton/acre/mo)	Overall Efficiency
Road	351	12	0.42	68%

5.1.4.4 *Track-Out*

Track-out emissions are generated when vehicles traveling on paved roads kick up the dried soil left behind by vehicles leaving construction sites. It was assumed that track-out occurs at the access points where vehicles normally leave construction sites. It was also assumed that all construction sites averaged 3 access points per 30 acres of construction area, except for airport, flood detention, and residential projects, which were assumed to have only 1 access point per 30 acres of construction area. Empirical observations indicated that little to no track-out occurs at underground utility construction areas, since these sites are typically too far removed from paved roads or the vehicles at the sites remain on paved surfaces (DAQEM 2001, p. B-46). Table 5-11 shows the number of access points by construction type.

Table 5-11. Number of Access Points

Construction Type	SCC	Access Pts. / Acre	2008		2015		2023	
			BLM Disposal Area	HA 212	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212
Airport	2311020000	0.03	12.61	12.61	15.33	15.33	16.81	16.81
Commercial	2311020000	0.10	570.15	576.77	692.98	701.03	759.93	768.75
Flood detention	2311020000	0.03	1.28	1.28	1.55	1.55	1.70	1.70
Highway	2311030000	0.10	35.12	35.12	42.69	42.69	46.81	46.81
Public parks	2311020000	0.10	10.45	10.45	12.70	12.70	13.93	13.93
Schools	2311020000	0.10	41.22	41.22	50.10	50.10	54.94	54.94
Public works	2311020000	0.10	479.07	479.32	582.28	582.58	638.53	638.87
Residential homes	2311010000	0.03	271.62	271.79	330.14	330.35	362.03	362.26
Underground utilities	2311020000	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Construction Type	SCC	Access Pts. / Acre	2008		2015		2023	
			BLM Disposal Area	HA 212	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212
Miscellaneous	2311020000	0.10	368.37	370.63	447.73	450.48	490.98	494.00
Source: DAQEM (2001), Table B-72.								

The average track-out length was assumed to be 150 feet, and the access points to paved roads were assumed to all be located on collector roads. The average daily traffic (ADT) count on urban collector roads was assumed to be representative. This value is based on the annual VMT of urban collector roads in 2008 (986,200,000 miles per year) and the combined length of these roads (280 miles) (NDOT 2008, p. 2). The resulting value is 9,650 vehicles per day for urban collector roads in the BLM disposal area. Table 5-12 shows future-year ADT counts based on projected population data.

Table 5-12. Collector Road ADT Counts

Area	Population			ADT		
	2008	2015	2023	2008	2015	2023
BLM disposal area	1,916,585	2,137,585	2,461,022	9,650	10,762	12,391
HA 212	1,921,772	2,143,366	2,467,678	9,650	10,762	12,391

The silt loading value of track-out (0.49 g/m^2) was the product of a scaling factor and the estimated average silt loading of urban collector roads in the BLM disposal area. It was based on sampling results from urban collector roads (DAQEM 2001, p. B-46). The scaling factor (3.29) represented the average increase in the amount of silt loading at track-out sites compared to baseline levels (Dames & Moore 2000). The final silt loading value was estimated at 1.61 g/VMT.

Once the silt loading value was calculated, it was incorporated into the paved road equation (Eq. 8-1) to obtain an EF of 1.21 g/VMT. Equation 5-2 was then used to calculate track-out emissions.

(Eq. 5-2) $$E = A \bullet C \bullet ADT \bullet L \bullet EF \bullet D \bullet C_1$$

where

E = emissions (ton/yr)
A = access points (no. points/acre)
C = construction area (acres)
ADT = average ADT count of urban collector road (vehicles/day)
L = length of track-out (ft)
EF = emission factor (g/VMT)
D = duration of construction (mo/yr)
C_1 = (30.5 day/mo) / (5,280 ft/mi) / (453.6 g/lb) / (2,000 lb/ton)

Table 5-13 shows the estimated track-out emissions for each construction type.

Table 5-13. Emissions from Track-Out (tpd)

Construction Type	SCC	2008		2015		2023	
		BLM Disposal Area	HA 212	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212
Airport	2311020000	0.00	0.00	0.01	0.01	0.01	0.01
Commercial	2311020000	0.05	0.05	0.06	0.06	0.07	0.07
Flood detention	2311020000	0.00	0.00	0.00	0.00	0.00	0.00
Highway	2311030000	0.01	0.01	0.02	0.02	0.02	0.02
Public parks	2311020000	0.00	0.00	0.00	0.00	0.00	0.00
Schools	2311020000	0.02	0.02	0.02	0.02	0.02	0.02
Public works	2311020000	0.04	0.04	0.05	0.05	0.06	0.06
Residential homes	2311010000	0.05	0.05	0.06	0.06	0.07	0.07
Underground utilities	2311020000	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous	2311020000	0.07	0.07	0.08	0.08	0.09	0.09
TOTAL		**0.25**	**0.25**	**0.30**	**0.30**	**0.33**	**0.33**

5.1.4.5 *Wind Erosion*

To determine the effective construction area impacted by wind erosion, each construction project was normalized based on expected duration of construction. Equation 5-3 was then used to calculate this effective area.

(Eq. 5-3) $$C_{eff} = C \bullet D \bullet C_2$$

where

C_{eff} = effective construction area (acres)
C = construction area (acres)
D = duration of construction (mo/yr)
C_2 = (yr/12 mo)

Table 5-14 shows the annual total construction area for each construction type in the nonattainment area.

Table 5-14. Acres under Construction in 2008

Construction Type	BLM Disposal Area	HA 212	Source
Airport	378.29	378.29	DOA
Commercial	5,701.50	5,767.70	AQ permit database
Flood detention	38.38	38.38	RFCD
Highway	351.21	351.21	NDOT; Clark, Henderson, NLV, LV public works depts.
Public parks	104.50	104.50	AQ database

Construction Type	BLM Disposal Area	HA 212	Source
Schools	412.20	412.20	AQ database
Public works	4,790.70	4,793.20	AQ database
Residential homes	8,148.60	8,153.80	AQ database
Underground utilities	1,392.10	1,395.90	AQ database
Miscellaneous	3,683.70	3,706.30	AQ database
TOTAL	**25,001.18**	**25,101.48**	

Table 5-15 shows the construction duration for each construction type. The table includes the calculated effective construction areas derived from Equation 5-3.

Table 5-15. Duration of Construction and Effective Construction Acreages

Construction Type	Avg. Time of Active Construction (mo/yr)	Effective Construction Acres in BLM Disposal Area	Effective Construction Acres in HA 212
Airport	12	378.3	378.3
Commercial	3	1,425.40	1,441.90
Flood detention	12	38.4	38.4
Highway	12	351.2	351.2
Public parks	6	52.3	52.3
Schools	12	412.2	412.2
Public works	3	1,197.70	1,198.30
Residential homes	6	4,074.30	4,076.90
Underground utilities	1	116	116.3
Miscellaneous	6	1,841.90	1,853.20
TOTAL		**9,887.50**	**9,918.90**

Note: The effective construction area accounts for duration times of various construction activities; e.g., since the duration time of underground utilities is one month, the total amount of annual underground utility construction activity acreage was multiplied by 1/12.

To calculate wind erosion emissions, the contributions from disturbed stable and disturbed unstable lands must be determined. Therefore, the effective construction areas for each construction category in Tables 5-14 and 5-15 were partitioned into disturbed stable and disturbed unstable lands based on the overall control efficiency of construction areas in Table 5-4. Table 5-16 provides the distribution for baseline and projected years.

Table 5-16. Distribution of Disturbed Stable and Unstable Construction Areas (acres)

Construction Type	2008				2015				2023			
	BLM Disposal Area		HA 212		BLM Disposal Area		HA 212		BLM Disposal Area		HA 212	
	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
Airport	120.3	258.0	120.3	258.0	142.3	305.3	142.3	305.3	162.9	349.5	162.9	349.5
Commercial	453.2	972.2	458.4	983.5	536.3	1,150.5	542.5	1,163.9	613.9	1,317.0	621.0	1,332.3
Flood detention	12.2	26.2	12.2	26.2	14.4	31.0	14.4	31.0	16.5	35.5	16.5	35.5
Highway	111.7	239.6	111.7	239.6	132.1	283.5	132.1	283.5	151.3	324.5	151.3	324.5
Public parks	16.6	35.6	16.6	35.6	19.7	42.2	19.7	42.2	22.5	48.3	22.5	48.3
Schools	131.1	281.2	131.1	281.2	155.1	332.7	155.1	332.7	177.5	380.9	177.5	380.9
Public works	380.8	816.9	381.0	817.3	450.6	966.7	450.8	967.2	515.8	1,106.6	516.1	1,107.2
Residential homes	1,295.3	2,779.0	1,296.1	2,780.8	1,532.9	3,288.6	1,533.8	3,290.7	1,754.7	3,764.6	1,755.8	3,767.0
Underground utilities	36.9	79.1	37.0	79.3	43.7	93.6	43.8	93.9	50.0	107.2	50.1	107.5
Miscellaneous	585.6	1,256.3	589.2	1,264.0	693.0	1,486.7	697.2	1,495.8	793.2	1,701.9	798.1	1,712.3

The disturbed unstable and disturbed stable EFs (0.0505 and 0.0037 tons/acre/day, respectively) were based on design-day meteorology and wind erosion equations developed by UNLV through wind-tunnel testing (DAQEM 2007).

It was assumed that disturbed unstable lands had infinite reservoirs of particulate matter (DAQEM 2007, p. 4-11). For disturbed stable lands, it was assumed that emissions occurred only in the first hour of the average hourly wind velocity in each category and that the relatively small particle reservoirs were recharged every 24 hours (DAQEM 2007, p. 4-15). Therefore, emissions were assumed to occur for only one hour in a 24-hour period.

Tables 5-17 and 5-18 provide the EFs used to determine wind erosion emissions from disturbed unstable and disturbed stable lands. These factors vary depending on average wind speed.

Table 5-17. PM_{10} Disturbed Unstable EF

Wind Speed (mph)	No. Hours in Range	No. Days in Range	EF (ton/acre/hr)	DU Composite EF (ton/acre)
10–14.9	2	1	0.00145	0.0029
15–19.9	10	1	0.00144	0.0144
20–24.9	9	1	0.00222	0.01998
25–29.9	2	1	0.00661	0.01322
30–34.9	0	0	0.03	0
34–39.9	0	0	0.0167	0
40–44.9	0	0	0.0368	0
45–49.9	0	0	0.0271	0
50–54.9	0	0	0.0286	0
			Total	**0.0505**

Notes: DU = disturbed unstable vacant land.
EFs for disturbed stable and disturbed unstable vacant lands were revised in 2010.

Table 5-18. PM_{10} Disturbed Stable EF

Wind Speed (mph)	No. Days in Range	EF (ton/acre/day)	Highest Wind Speed Category	DS Composite EF (ton/acre)
10–14.9	1	0.00141	0	0
15–19.9	1	0.00177	0	0
20–24.9	1	0.00159	0	0
25–29.9	1	0.00374	1	0.00374
30–34.9	0	0.0114	0	0
34–39.9	0	0.00787	0	0
40–44.9	0	0.0135	0	0
45–49.9	0	0.0086	0	0

Notes: DS = disturbed stable vacant land.
EFs for disturbed stable and disturbed unstable vacant lands were revised in 2010.
It is assumed there is a one-hour reservoir of PM_{10} on disturbed stable lands, and that it is emitted at the highest wind speeds.

Equation 5-4 was used to calculate wind erosion emissions. Emissions were based on wind speed and type of construction activity.

(Eq. 5-4) $$E = \Sigma (C_{eff} \bullet CE \bullet EF_{ds}) + \Sigma (C_{eff} \bullet (1 - CE) \bullet EF_{du})$$

where

E = emissions (tons/yr)
C_{eff} = effective construction area (acres)
CE = overall control efficiency
EF_{du} = disturbed unstable wind erosion emission factor (ton/acre/day)
EF_{ds} = disturbed stable wind erosion emission factor (ton/acre/day)

Emission estimates for 2015 and 2023 were based on EGAS projection factors (Table 5-19).

Table 5-19. EGAS Projection Factors

Emission Source	SCC	2015[1]	2023[1]
Wind erosion	2311000100	1.18	1.35
Residential construction	2311010000	1.22	1.33
Nonresidential construction	2311020000	1.22	1.33
Road construction	2311030000	1.22	1.33

Source: EPA (2006b).
[1]Default REMI 6.0 SCC configuration, base year 2008.

Table 5-20 summarizes the baseline and projected wind erosion emissions for each construction type in the BLM disposal (nonattainment) area.

Table 5-20. Design-Day Wind Erosion Emissions from Construction Activities (tpd)

Construction Type	2008				2015				2023			
	BLM Disposal Area		HA 212		BLM Disposal Area		HA 212		BLM Disposal Area		HA 212	
	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled	Uncontrolled	Controlled
Airport	6.07	0.97	6.07	0.97	7.19	1.14	7.19	1.14	8.23	1.31	8.23	1.31
Commercial	22.88	3.64	23.15	3.68	27.08	4.30	27.40	4.35	31.00	4.93	31.36	4.98
Flood detention	0.62	0.10	0.62	0.10	0.73	0.12	0.73	0.12	0.83	0.13	0.83	0.13
Highway	5.64	0.90	5.64	0.90	6.67	1.06	6.67	1.06	7.64	1.21	7.64	1.21
Public parks	0.84	0.13	0.84	0.13	0.99	0.16	0.99	0.16	1.14	0.18	1.14	0.18
Schools	6.62	1.05	6.62	1.05	7.83	1.24	7.83	1.24	8.96	1.42	8.96	1.42
Public works	19.23	3.06	19.24	3.06	22.75	3.62	22.77	3.62	26.05	4.14	26.06	4.14
Residential homes	65.41	10.39	65.45	10.40	77.41	12.30	77.46	12.31	88.61	14.08	88.67	14.09
Underground utilities	1.86	0.30	1.87	0.30	2.20	0.35	2.21	0.35	2.52	0.40	2.53	0.40
Miscellaneous	29.57	4.70	29.75	4.73	34.99	5.56	35.21	5.59	40.06	6.36	40.30	6.40
Subtotal	158.74	25.22	159.25	25.30	187.86	29.85	188.45	29.94	215.05	34.17	215.73	34.28
TOTAL	**183.97**		**184.55**		**217.70**		**218.40**		**249.21**		**250.00**	

The resulting wind erosion emission estimates are likely conservative for several reasons. First, the methodology assigns a controlled emission rate to areas where the ground can be covered by asphalt, concrete, vegetation, and other substances. Second, uniform control reductions were assumed in all construction categories. Lastly, the meteorological data were not fully incorporated.

5.1.5 Emissions Summary

Table 5-21 summarizes the baseline and projected emissions for each construction type in the BLM disposal (nonattainment) area, taking into account the temporal profiles in Section 4.4.

Table 5-21. Design-Day Emissions from Construction Activities (tpd)

Construction Type	2008		2015		2023	
	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212
Residential	11.25	11.26	13.68	13.69	15.00	15.01
Non-Residential	17.88	17.96	21.84	21.94	23.84	23.94
Road	1.79	1.79	2.17	2.17	2.38	2.38
Wind Erosion	183.97	184.55	217.70	218.40	249.21	250.00
TOTALS	**214.89**	**215.56**	**255.39**	**256.19**	**290.43**	**291.34**

5.2 Wind Erosion from Vacant Lands

5.2.1 Methodology

The most accurate source of information on the estimated acreage of undeveloped/vacant land and developed land in Clark County is the DCP's Geographically Integrated Land Use Information System (GILIS). GILIS contains all the information from the Clark County Assessor's parcel database, as well as additional information compiled by the DCP. Separate data queries were conducted for HA 212 and the BLM disposal area in 2008 by GILIS source code, and in some instances GILIS use code, to determine whether to classify a parcel as "vacant" or "developed."

GILIS source codes were assessed to determine which applied to vacant land and which could be applied to developed areas to estimate windblown particulate emissions. Two levels of codes were used, source code and use code; the source code is the primary GILIS code, and the use codes further define the source codes. Tables 5-22 and 5-23 show the resulting classifications for the BLM disposal area. The use codes are contained in the source codes for all classifications except agricultural, which Table 5-23 subdivides.

Table 5-22. GILIS Source Codes and Associated Parcel Classification

Source Code	Parcel Classification
000 (Vacant)	Vacant
100 (Residential)	Developed
200 (Industrial)	Developed
300 (Commercial)	Developed
400 (Community Facilities)	Developed
500 (Agricultural, Ranching, Wildlife, and Natural Resources)	See Table 5-19
600 (Transportation, Communication, and Utilities)	Developed
700 (Minor Improvements)	Vacant

Table 5-23. Agricultural Parcel Classifications

Source Code	Use Code	Parcel Classification
500	10 (Agriculture)	Vacant
500	20 (Ranching)	Developed
500	21 (Agricultural Residential)	Vacant
500	30 (Wildlife)	Vacant

The area encompassed by the BLM disposal boundary is approximately 330,740 acres, 277,748 of which have assigned source codes in the GILIS data set. The remaining 52,989 acres consist primarily of developed public rights-of-way; these are mostly paved roads, so the land was classified as "developed." Table 5-24 provides a detailed breakdown of BLM disposal area acreage by GILIS source code and classification.

Table 5-24. BLM Disposal Area Acreage by GILIS and Parcel Classification

Source Code	Use Code	Vacant or Developed	Acres
000 (Vacant)	All	Vacant	119,985.17
100 (Residential)	All	Developed	95,511.59
200 (Industrial)	All	Developed	7,761.23
300 (Commercial)	All	Developed	30,165.98
400 (Community Facilities)	All	Developed	13,320.52
500 (Agricultural)	10, 21, 30	Vacant	296.28
500 (Agricultural)	20	Developed	139.57
600 (Transportation, Communication, Utilities)	All	Developed	6,709.75
700 (Minor Improvements)	All	Vacant	3,858.26
Remainder GILIS Uncoded		Developed	52,988.93
Total Vacant Land (000, 500-10, 500-21, 500-30, 700)			**124,139.71**
Total Developed Land (100, 200, 300, 400, 500-20, 600, Uncoded)			**206,597.57**

HA 212 encompasses approximately 988,046 acres, 931,187 of which have assigned source codes in the GILIS data set. The remaining 56,858 acres consist primarily of developed public rights-of-way; DCP confirmed these are mostly paved roads, so the land was classified as "developed." Table 5-25 breaks down HA 212 acreage by GILIS source code and classification.

Table 5-25. HA 212 Acreage by GILIS and Parcel Classifications

Source Code	Use Code	Vacant or Developed	Acres
000 (Vacant)	All	Vacant	754,253.45
100 (Residential)	All	Developed	96,757.65
200 (Industrial)	All	Developed	8,141.90
300 (Commercial)	All	Developed	31,781.14
400 (Community Facilities)	All	Developed	17,963.30
500 (Agricultural)	10, 21, 30	Vacant	296.28
500 (Agricultural)	20	Developed	154.03
600 (Transportation, Communication, Utilities)	All	Developed	12,846.51
700 (Minor Improvements)	All	Vacant	8,993.03
Remainder GILIS Uncoded		Developed	56,858.53
Total Vacant Land (000, 500-10, 500-21, 500-30, 700)			**763,542.76**
Total Developed Land (100, 200, 300, 400, 500-20, 600, Uncoded)			**224,503.06**

Table 5-26 summarizes the amount of vacant and developed land within the BLM disposal area and HA 212.

Table 5-26. Vacant and Developed Areas in the PM_{10} Nonattainment Area (acres)

Land Type	HA 212	BLM Disposal Area
Vacant	763,542.76	124,139.71
Developed	224,503.06	206,597.57
Total	**988,045.82**	**330,737.28**

To assure the quality of information in Table 5-26, the GILIS data was mapped and overlaid with 2008 aerial photos to identify any areas where GILIS classifications deviated significantly from those in Tables 5-22 and 5-23. Two areas with significant deviations were identified in the BLM disposal area; Table 5-27 identifies the parcel numbers, GILIS source codes, Clark County parcel classifications, and acreages associated with them.

Table 5-27. Adjusted Parcel Classifications for BLM Disposal Area

Parcel No.	GILIS Source Code	Parcel Classification	Acreage
12332501001	400	Vacant	200.12
12332701001	400	Vacant	198.27
19121000001	400	Vacant	327.16
19121000002	400	Vacant	321.98
		Adjusted Acreage	**1,047.53**

One area with significant deviations was identified in HA 212, outside the BLM disposal area. Table 5-28 lists the parcel numbers, GILIS source codes, Clark County parcel classifications, and acreage associated with this area.

Table 5-28. Adjusted Parcel Classifications for HA 212

Parcel No.	GILIS Source Code	Parcel Classification	Acreage
14002701001	400	Vacant	206.35
14011501001	400	Vacant	166.06
14012000001	400	Vacant	640.15
14011701001	400	Vacant	165.67
14002501001	400	Vacant	31.44
14002501002	400	Vacant	92.45
14001000001	400	Vacant	618.52
		Adjusted Acreage	1,920.64
		BLM Disposal Area Adjusted Acreage	1,047.53
		Total Adjusted Acreage for HA 212	**2,968.17**

Table 5-27 shows that approximately 1,047 acres with GILIS source code classification number 400 were actually vacant. Table 5-28 shows that an additional 1,921 acres outside the BLM disposal area with GILIS source code 400 were also vacant. The totals in these two tables were used to correct the vacant and developed acre totals in Table 5-26. Table 5-29 provides the results.

Table 5-29. Adjusted Vacant and Developed Acreage in the PM_{10} Nonattainment Area

Land Type	HA 212	BLM Disposal Area
Vacant	766,510.93	125,187.24
Developed	221,534.89	205,550.04
Total	**988,045.82**	**330,737.28**

In 2004, Clark County Department of Clark County hired EQM to develop a soil inventory of the BLM disposal area and HA 212 using satellite imagery. Clark County also worked with DCP to develop an inventory of developed and undeveloped land areas using GILIS data. Differences in cumulative area between the two methods can be attributed to the different methods used.

The GILIS parcel data developed by DCP tracks the developed or undeveloped status of a parcel, but provides no information on surface condition. The EQM study concentrated on undeveloped land because developed land contributes little to fugitive dust emissions. EQM used state-of-the-art remote sensing imagery analysis to classify the surfaces of undeveloped land into three categories: native desert, disturbed stable, and disturbed unstable (EQM 2006). These classifications correlated to the native desert, stable, and unstable categories in the PM_{10} SIP.

EQM's approach involved developing multiband spectral signatures for each land surface classification. Two separate signatures were needed to account for all native desert areas: one for areas dominated by vegetation, and another for areas dominated by washes, drainage, and desert paving. EQM included wash and drainage areas in total native desert acreage when calculating the EI, and applied the same EF to both types of areas.

EQM's report added another classification, barren/shadow, for areas in shadow during image development. Non-erodible mountainous areas on the periphery accounted primarily for this signature inside HA 212 but outside the BLM disposal area. However, the study also found some of these signatures within the BLM disposal area (from tall buildings). Estimates of the emission rates for barren/shadow areas, including mountainous areas and tall buildings on developed land, ranged from low to nonexistent; therefore, the EF for native desert areas was applied to the nonurban, undeveloped barren/shadow classification areas within HA 212.

EQM (2006) developed additional spectral signatures for urban, concrete, and urban vegetation areas that were used to eliminate developed urban areas from the assessment of open area and vacant land. After developing a complete set of spectral signatures to characterize all surface classifications in HA 212, EQM analyzed the multispectral imagery to classify the entire area within HA 212 (Table 5-30).

Table 5-30. Vacant Land Classifications by Percentage (2008)

Classification	Percentage of Total Area
Native desert land (includes wash/drainage)	75.20
Disturbed stable vacant land	16.70
Disturbed unstable vacant land	8.10

The percentages from Table 5-30 were used to calculate acres of native desert, disturbed stable land, and disturbed unstable land for the 2008 base year (Table 5-31).

Table 5-31. Vacant Land Classifications by Geographic Area (2008)

Land Type	HA 212 (acres)	BLM Disposal Area (acres)
Total vacant	766,510.93	125,187.24
Native desert	576,416.22	94,140.80
Disturbed stable	128,007.32	20,906.27
Disturbed unstable	62,087.38	10,140.17

Table 5-32 shows the baseline and projected wind erosion annual emissions for construction and vacant land in the BLM disposal area.

Table 5-32. Annual Wind Erosion Emissions from Construction and Vacant Land (tpy)

Category	2008		2015		2023	
	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212	BLM Disposal Area	HA 212
All construction	19,550.11	19,612.18	23,135.44	23,208.89	26,483.86	26,567.94
Vacant land & construction	108,391.87	19,612.18	88,010.4	643,237.6	64,717.34	619,881.49
Vacant land	88,841.76	663,674.22	64,874.96	620,028.71	38,233.48	593,313.55

Wind erosion emissions are also a significant source of construction activity emissions, but the latter are accounted for in the vacant lands inventory. To prevent double-counting, vacant land emissions were reduced by the amount of wind erosion emissions from construction activities.

To calculate vacant land emissions, local EFs were developed based on a series of wind-tunnel studies conducted by UNLV. These factors were used to calculate wind erosion emissions from both construction activities and vacant lands (Tables 5-17 and 5-18 above).

In addition to the disturbed stable and disturbed unstable EFs, a native desert EF was developed. Data from wind-tunnel testing showed that soil surface conditions had more influence on the windblown particulate emission rate than soil classification or erodibility (DAQEM 2007, p. 4-7). A crustal-type surface will naturally form in undisturbed native desert environments.

Wind-tunnel testing results indicated these native-land crustal surfaces emit only negligible emissions when wind speeds are less than 25 mph. Table 5-33 shows the sustained wind and spike EFs developed for wind speeds exceeding that threshold. Table 5-34 summarizes the composite design-day EFs for vacant land.

Table 5-33. PM_{10} Native Desert Emission Factor (EF)

Wind Speed (mph)	No. Days in Range	Sustained Winds EF (ton/acre/hr)	Spike EF (ton/acre)	ND Composite EF (ton/acre)
15 – 19.9	144	N/A	N/A	N/A
20 – 24.9	91	N/A	N/A	N/A
25 – 29.9	31	0.00257	0.000361	0.090861
30 – 34.9	9	0.00316	0.000468	0.032652
35 – 39.9	1	0.00299	0.000815	0.003805
			Annual Total	**0.127318**
			Daily Total	**0.0003479**

Table 5-34. Design Day Wind Erosion EFs for Vacant Land

Category	EF (ton/acre)
Native desert	0.000348
Disturbed unstable	0.050500
Disturbed stable	0.003740

5.2.2 Emissions Summary

DCP provided both a 30-year average vacant land consumption rate and projected population growth rates, which were used to establish projected vacant land consumption for the projected years (Table 5-35).

Table 5-35. Vacant Land Consumption for Projected Years

Parameter	Value
30-year average vacant land consumption rate, 1980–2010 (acres/yr)[1]	4,395
20-year average population growth rate within HA 212, 1990–2010 (persons/yr)	55,480
Projected population growth rate within HA 212, 2011–2023 (persons/yr)[1]	42,450
Projected vacant land consumption rate in BLM disposal area, 2011–2023 (acres/yr)	3,363
Projected vacant land consumption rate in HA 212, 2011–2023 (acres/yr)	3,372
Projected vacant land consumption in BLM disposal area, 2015 (acres)[2]	23,540
Projected vacant land consumption in BLM disposal area, 2023 (acres)[2]	50,442
Projected vacant land consumption in HA 212, 2015 (acres)[2]	23,603
Projected vacant land consumption in HA 212, 2023 (acres)[2]	50,578

[1]Provided by DCP.
[2]Includes 20% right-of-way consumption.

Table 5-36 shows the baseline and projected wind erosion emissions for vacant lands in the BLM disposal (nonattainment) area. The emissions totals in this table are different than the totals from wind erosion due to construction activities. Emissions take into account the temporal profiles described in Section 4.4.

Table 5-36. Design Day Wind Erosion Emissions from Vacant Land

Vacant Land Category	2008		2015		2023	
	acres	tpd	acres	tpd	acres	tpd
BLM Disposal Area						
• Native desert	94,141	32.75	76,439	26.59	56,208	19.55
• Disturbed stable	20,906	78.19	16,975	63.49	12,482	46.68
• Disturbed unstable	10,140	512.08	8,233	415.79	6,054	305.75
Total	**125,187**	**439.05**	**101,648**	**288.16**	**74,745**	**122.77**
HA 212						
• Native desert	576,416	200.51	558,667	194.34	538,381	187.28

Vacant Land Category	2008		2015		2023	
	acres	tpd	acres	tpd	acres	tpd
• Disturbed stable	128,007	478.75	124,066	464.01	119,561	447.16
• Disturbed unstable	62,087	3,135.41	60,176	3,038.86	57,991	2,928.52
Total	**766,511**	**3,630.12**	**742,908**	**3,478.81**	**715,932**	**3,312.96**

5.3 Unpaved Roads

5.3.1 Methodology

The calculation of unpaved road emissions relies on the methodology in EPA's AP-42 compilation of air pollutant emission factors (EPA 1995). In 2006, EPA replaced the AP-42 equation used to calculate unpaved road emissions in the PM_{10} SIP and PM_{10} MAR with the following two equations:

(Eq. 5-5) $$E = 1.5(s/12)^{0.9}(W/3)^{0.45}$$ (industrial roads)

(Eq. 5-6) $$E = [1.5(s/12)^{0.9}(S/30)^{0.5}]/(M/0.5)^{0.2}$$ (public roads)

where

E = site-specific emission factor (lbs/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)

Surface material silt content was given an average value of 16 percent based on an analysis of unpaved road grab samples from various parts of the Las Vegas Valley (DRI 1997). The 3-ton default value in the equation was used for mean vehicle weight. The surface material moisture content ("M") was assumed to be 0.2 percent, the same value used in the PM_{10} SIP and PM_{10} MAR. The mean vehicle speed of traffic on public unpaved roads was assumed to be 30 mph.

Putting these values into Equation 5-5 produced an EF of 1.94 lbs/VMT for private unpaved roads and an EF of 2.88 lbs/VMT for public unpaved roads. These values were then incorporated into the following equation.

(Eq. 5-7) Unpaved Road Emissions = $E \bullet L \bullet ADT$

where

E = site-specific emission factor (lbs/VMT)
L = length (mi)
ADT = average daily traffic count (VMT/day)

All emissions from unpaved roads were assumed to be uncontrolled. Table 5-37 lists the SCCs and descriptions for unpaved roads. Table 5-38 provides the EGAS growth factors for the SCCs used to project future-year emissions

Table 5-37. Road Paving Emissions SCC Description

SCC	SCC Level 1	SCC Level 2	SCC Level 3	SCC Level 4
2296005000	Mobile sources	Unpaved roads	Public unpaved roads	Total: Fugitives
2296010000	Mobile sources	Unpaved roads	Industrial unpaved roads	Total: Fugitives

Table 5-38. EGAS Projection Factors

SCC[1]	2015	2023
2296005000	1.18	1.35
2296010000	1.18	1.35

[1]Default REMI 6.0 SCC Configuration (base year 2008).

5.3.2 ADT Count and Road Length

The ADT count estimate for all private unpaved roads is 36.4 vehicles per day (DAQEM 2007, p. 4-20). This value was applied to all private and public unpaved roads. The following sections describe the methodology used to determine the lengths of unpaved roads in the nonattainment and BLM disposal areas.

5.3.2.1 *Private Unpaved Roads*

EQM's report characterized private unpaved roads as roadways that were at least 22 feet wide and were not maintained by any kind of governmental authority. Unpaved roadways under BLM control were considered public, and pathways used as hiking trails or for off-road vehicle recreation were not considered roadways. Using these criteria, EQM identified 158 miles of unpaved roads within the BLM disposal boundary. Analysis of aerial photography showed the absence of roads well before the boundary of the photography was reached; therefore, it was concluded that the roads identified represented the entire nonattainment area (EQM 2006, p. 7-1).

After additional analysis, Clark County used a figure of 157 miles in the PM_{10} MAR. Because of the downturn in residential construction that began in 2007 and has continued through 2011, it was assumed the private unpaved road network changed little between 2007, when the PM_{10} MAR was submitted, and 2008, the baseline year for the PM_{10} maintenance plan. Therefore, the maintenance plan used the same length as the PM_{10} MAR for private unpaved roads.

EQM's report noted that many private unpaved roads were located in residential development areas where graders, haulers, and other industrial vehicles operated during construction (EQM 2006, p. 4-1). This was a primary reason for using the industrial road EF equation (Eq. 5-5) for these roads, rather than the public road EF equation (Eq. 5-6).

5.3.2.2 *Public Unpaved Roads*

To determine the extent of public unpaved roads in the nonattainment area, two types were evaluated: those located on BLM land and those not located on BLM land.

Roads Located on BLM Land. Between 1866 and 1976, a number of roads were established through federal lands in Clark County based on Revised Statutes (R.S.) 2477 (43 U.S.C. 932). The statute, originally part of the Mining Act of 1866, was intended to help develop and settle the West by promoting transportation across federal lands. It required no formal action, and granted to counties and states a right-of-way across federal land when a roadway was constructed.

The Federal Land Policy and Management Act of 1976 repealed R.S. 2477, but preserved rights-of-way valid on the date the legislation was approved—October 21, 1976 (43 U.S.C. 1761). Under this grandfathering provision, the Clark County Board of County Commissioners designated rights-of-way on many BLM roads in Clark County. Unpaved BLM roads are not considered private, so they were not included in the inventory of private unpaved roads.

Nearly all R.S. 2477 roads are on BLM land, and therefore outside the BLM disposal boundary. Given the relatively small contribution of this land to the overall EI for Clark County, these roads are not considered significant sources of PM_{10} emissions (EQM 2006, p. 1-4). Table 5-39 describes current proposed R.S. 2477 roads.

Table 5-39. R.S. 2477 Roads Within HA 212

Road Name	BLM Designation	Location	Length (mi)	Status	ADT
Calico Basin Road	A381C	Calico Basin	0.77	Paved	
Bonnie Springs Road	831Q	Bonnie Springs	1.30	Paved	
Harris Spring Road	A39F	Kyle Canyon	6.57	Unpaved	36.4
Harris Spring Cut-Off Road	A39A	Kyle Canyon	1.98	Unpaved	36.4
Angels Peak Road ("Lucky Strike" in Google Earth)	A52E	Angels Peak	2.99	Paved	
Angels Peak Road - NV Power ("Ries Road" in Google Earth)	A52F	Angels Peak	0.20	Paved	
Corn Creek Road	22D	Corn Creek	3.89	Unclear	36.4
Potosi Road	A538	Mtn Springs	3.11	Unclear	36.4
		Total Unpaved Miles	**15.55**		
		Total VMT/Day	**566.02**		

Roads Not Located on BLM Land. By June 2003, local governments had paved all public unpaved roads in the nonattainment area with ADT counts of 150 or more; by March 2004, they had paved all public unpaved roads with ADT counts of 100 or more (RTC 2008). This satisfied a PM_{10} SIP contingency measure requiring the paving or stabilization of all unpaved roads with ADT counts of 100 or more (DAQEM 2001, p. 4-117).

To determine the extent of public unpaved roads in the BLM disposal area with ADT counts of less than 100, Clark County contacted public works agencies from the City of Las Vegas, City of North

Las Vegas, City of Henderson, and Clark County (Table 5-40). Only the City of Las Vegas reported public unpaved roads still within its boundaries.

Table 5-40. Unpaved Public Roads within BLM Disposal Area

Entity	Length	ADT Count
Clark County	0	0
City of Las Vegas[1]	5.4	36.4
City of Henderson	0	0
City of North Las Vegas	0	0
Total Miles	**5.40**	
Total VMT/day	**196.56**	

[1]All unpaved roads are in the vicinity of Kyle Canyon Rd.

5.3.3 Emissions Summary

Table 5-41 shows the total design-day and annual emissions from unpaved roads in the BLM disposal area and the nonattainment area. Horizon-year emissions were based on projected population growth rather than EGAS growth factors.

Table 5-41. Nonattainment and BLM Disposal Areas—Design Day & Projected Emissions (tpd)

Unpaved Road Type	HA 212			BLM Disposal Area		
	2008	2015	2023	2008	2015	2023
Public	1.10	1.22	1.41	0.28	0.32	0.36
Industrial	5.66	6.29	7.25	5.55	6.18	7.11
TOTAL	**6.76**	**7.52**	**8.65**	**5.84**	**6.49**	**7.47**

6.0 LOCOMOTIVE EMISSIONS

6.1 Methodology

EPA classifies locomotive emissions as a nonpoint source. However, because they can also be considered a non-road mobile emissions source, they are discussed separately in this section.

The sole proprietor of railroad track in Clark County is the Union Pacific Railroad (AAR 2010). Their Clark County track is divided into the following four line-haul subdivisions:

1. The BMI route, which runs from Boulder Junction to Henderson, Nevada.
2. The Caliente route, which runs from Milford, Utah, to Las Vegas.
3. The Cima route, which runs from Las Vegas to Yermo, California.
4. The Lake Mead route, which runs from Moapa to Lake Mead, Nevada.

In 2008, Union Pacific operated approximately 148 miles of track in the county. The locomotives that ran on those tracks burned a reported 3,869,158 gallons of diesel fuel and hauled a reported 3,213,586,100 gross tons. Table 6-1 details the subdivision and segment information for Clark County; the total tonnage accounts for trains entering and leaving Clark County.

Table 6-1. Railroad Line-Haul Data (2008)

Subdivision & Segment	Track Type	County Begin MP	County End MP	Track (mi)	Tonnage Increase MP	Tonnage Decrease MP	Annual Avg. (MGT/mi)	Total Gross Tons	Estimated Total Diesel Consumed (gal)	Train Counts
BMI: 6044-0	SIMN	0	10.86	10.86	0.62	0.72	1.34	14,552,400	17,521	1
Caliente: 6055-0	No. 1	332.5	335.29	2.79	0	18.41	18.41	51,363,900	61,842	4
Caliente: 6055-0	No. 2	332.5	335.29	2.79	10.78	0	10.78	30,076,200	36,212	5
Caliente: 6055-0	SIMN	335.29	336.1	0.81	10.78	18.41	29.19	23,643,900	28,467	13
Caliente: 6065-0	SIMN	336.1	384.39	48.29	10.29	18.53	28.82	1,391,717,800	1,675,628	13
Caliente: 6069-0	SIMN	384.39	395.18	10.79	11.04	20.98	32.02	345,495,800	415,977	15
Cima: 6050-0	SIMN	287.95	326.38	38.43	10.78	18.41	29.19	1,121,771,700	1,350,613	13
Cima: 6050-0	No. 1	326.38	327.1	0.72	0	18.41	18.41	13,255,200	15,959	7
Cima: 6050-0	No. 2	326.38	327.1	0.72	10.78	0	10.78	7,761,600	9,345	6
Cima: 6051-0	No. 2	327.1	332.5	5.4	10.78	0	10.78	58,212,000	70,087	6
Cima: 6051-0	No. 1	327.1	332.5	5.4	0	18.41	18.41	99,414,000	119,694	7
Cima: 6055-0	No. 2	332.5	334.3	1.8	10.78	0	10.78	19,404,000	23,362	5
Cima: 6055-0	No. 1	332.5	334.3	1.8	0	18.41	18.41	33,138,000	39,898	4

Subdivision & Segment	Track Type	County Begin MP	County End MP	Track (mi)	Tonnage Increase MP	Tonnage Decrease MP	Annual Avg. (MGT/mi)	Total Gross Tons	Estimated Total Diesel Consumed (gal)	Train Counts
Lake Mead: 6061-0	SIMN	0	17.18	17.18	0.07	0.15	0.22	3,779,600	4,551	1
TOTAL				**147.78**			**237.54**	**3,213,586,100**	**3,869,158**	

Source: Germer 2010.
Note: MP = milepost; MGT = million gross tons; C factor (gal/1,000 gross ton-miles) = 1.204.

Diesel exhaust is the primary source of PM_{10} from locomotives; therefore, diesel consumption had to be projected for 2015 and 2023 to estimate PM_{10} emissions for those years. Since diesel consumption is correlated with the weight of freight hauled, an estimate of PM_{10} emissions was derived based on projected future growth of freight demand.

In 2005, the Federal Highway Administration (FHWA) published a report that included a review of several studies projecting future growth in domestic freight demand. The report included the following estimates (FHWA 2005, Table 2-5):

- Bureau of Transportation Statistics: 0.2 percent.
- American Association of State Highway and Transportation Officials: 1.9 percent.
- American Trucking Association: 1.7 percent.
- ICF Consulting, Inc.: 2.0 percent.

The average of these estimates is 1.5 percent, the value used was used to estimate the growth of freight demand within the nonattainment area. The estimated total freight to be hauled in the nonattainment area in 2015 is 3,554,301,786 gross tons; in 2023, it is 3,931,141,346 gross tons.

Union Pacific established a conversion (C) factor of 1.204 gallons per 1,000 gross ton-miles that represented the average fuel consumption rate for locomotive traffic in 2008 (Germer 2010). The average is based on system-wide data from the 23 states in which the railroad operates, and Clark County assumed the C would be approximately the same in 2015 and 2023.

Using the Union Pacific locomotive mileage data, the C factor, and the weight of freight hauled, it was determined that the amount of fuel consumed in 2008 was 3,869,158 gallons (Germer 2010). To determine emissions, the PM_{10} EFs in Table 6-2 were applied.

Table 6-2. EFs for Line-Haul Locomotives

Year	PM_{10}	
	g/gal	lb/1,000 gal
2006	6.4	14.1
2007	6.3	13.9
2008	5.1	11.2
2009	4.9	10.8

Year	PM_{10}	
	g/gal	lb/1,000 gal
2010	4.7	10.4
2011	4.4	9.7
2012	4.1	9.0
2013	3.8	8.4
2014	3.6	7.9
2015	3.4	7.5
2016	3.1	6.8
2017	2.9	6.4
2018	2.7	5.9
2019	2.5	5.5
2020	2.3	5.1
2021	2.2	4.8
2022	2.0	4.4
2023	1.9	4.2

Source: EPA 2009a, Table 6.

6.2 Additional Rail Traffic

In addition to freight rail traffic, proposals are circulating to build passenger railways between Las Vegas and California. Some proposed plans would require the construction of track, stations, and maintenance facilities. The combined PM_{10} emissions associated with fuel consumption and construction would be minor, and would not exceed the major stationary source or general conformity thresholds. However, they are included in the maintenance plan because they would likely be measurable and are reasonably foreseeable.

The only available emission estimates for a passenger project were in the final environmental impact statement (FEIS) for the DesertXPress (FRA 2011, p. F-L-874). According to the FEIS, 0.02 tpd of PM_{10} would be emitted from fuel consumption in 2013 and 0.04 tpd in 2030.

Clark County construction emission estimates were based on those in Appendix F-L of the FEIS (FRA 2011). Since construction emissions are temporary, any near-term construction will not have an impact on horizon-year emissions inventories. If construction began in 2012, the emissions would only impact the 2015 mid-year estimate. Table 6-3 shows the emissions expected during construction, which were included in the "nonresidential construction emissions" category.

Table 6-3. Construction Emissions from Additional Rail Traffic

Year	Estimated Year of Construction	PM_{10} Emissions (tons per year)	PM_{10} Emissions (tons per day)
1	2012	40.0	0.11
2	2013	62.0	0.17
3	2014	61.0	0.17
4	2015	37.0	0.10

6.3 Emissions Summary

Emission estimates from railroad traffic on Union Pacific track and proposed additional (passenger) rail traffic were derived for all Clark County; therefore, they are likely conservative. Tables 6-4 and 6-5 summarize these estimates, which take into account the temporal profiles in Section 4.4.

Table 6-3. Locomotive Emissions within BLM Disposal Area

SCC	Level 4 SCC Description	PM_{10} Emissions (tpd)			PM_{10} Emissions (tpy)		
		2008	2015	2023	2008	2015	2023
2285002006	Line Haul Locomotives: Class I Operations	0.06	0.07	0.06	20.97	23.78	20.64
2285002007	Line Haul Locomotives: Class II/III Operations	0.00	0.00	0.00	0.00	0.00	0.00
2285002008	Line Haul Locomotives: Passenger Trains (Amtrak)	0.00	0.00	0.00	0.00	0.00	0.00
2285002009	Line Haul Locomotives: Commuter Lines	0.00	0.00	0.00	0.00	0.00	0.00
2285002010	Yard Locomotives Railway Maintenance	0.00	0.00	0.00	0.00	0.00	0.00

Table 6-4. Locomotive Emissions within HA 212

SCC	Level 4 SCC Description	PM_{10} Emissions (tpd)			PM_{10} Emissions (tpy)		
		2008	2015	2023	2008	2015	2023
2285002006	Line Haul Locomotives: Class I Operations	0.06	0.06	0.05	21.03	23.85	20.69
2285002007	Line Haul Locomotives: Class II/III Operations	0.00	0.00	0.00	0.00	0.00	0.00
2285002008	Line Haul Locomotives: Passenger Trains (Amtrak)	0.00	0.00	0.00	0.00	0.00	0.00
2285002009	Line Haul Locomotives: Commuter Lines	0.00	0.00	0.00	0.00	0.00	0.00
2285002010	Yard Locomotives Railway Maintenance	0.00	0.00	0.00	0.00	0.00	0.00

7.0 OTHER NONPOINT SOURCE EMISSIONS

This section provides design day and projected emissions for the following nonpoint sources of PM_{10}: fuel combustion, commercial cooking, residential wood combustion, mineral processing of asphalt and sand & gravel, open burning, and structural and vehicle fires. Both open burning and structural and vehicle fires are not significant emissions sources, but are inventoried because they are typically tracked by EPA.

7.1 Fuel Combustion

7.1.1 Background

The fuel combustion sector encompasses 18 SCCs, each of which has a unique use (residential, commercial, or industrial) and fuel type (coal, distillate oil, residual oil, natural gas, liquefied petroleum gas, and kerosene). Table 7-1 lists these SCC descriptions.

Table 7-1. Fuel Combustion SCCs

SCC	SCC Level 1	SCC Level 2	SCC Level 3	SCC Level 4
2102002000	Stationary Source Fuel Combustion	Industrial	Bituminous/Subbituminous Coal	Total: All Boiler Types
2102004000			Distillate Oil	Total: Boilers and IC Engines
2102005000			Residual Oil	Total: All Boiler Types
2102006000			Natural Gas	Total: Boilers and IC Engines
2102007000			LPG	Total: All Boiler Types
2102011000			Kerosene	Total: All Boiler Types
2103002000		Commercial/ Institutional	Bituminous/ Subbituminous Coal	Total: All Boiler Types
2103004000			Distillate Oil	Total: Boilers and IC Engines
2103005000			Residual Oil	Total: All Boiler Types
2103006000			Natural Gas	Total: Boilers and IC Engines
2103007000			LPG	Total: All Boiler Types
2103011000			Kerosene	Total: All Boiler Types
2104002000		Residential	Bituminous/ Subbituminous Coal	Total: All Boiler Types
2104004000			Distillate Oil	Total: Boilers and IC Engines
2104005000			Residual Oil	Total: All Boiler Types
2104006000			Natural Gas	Total: Boilers and IC Engines
2104007000			LPG	Total: All Boiler Types
2104011000			Kerosene	Total: All Boiler Types

7.1.2 Methodology

Fuel combustion emissions are generally based on the product of an EPA emission factor and a consumption (i.e., throughput or activity) value. Table 7-2 lists the EFs used to calculate emissions for each fuel combustion SCC.

Table 7-2. PM_{10} EFs

SCC	SCC Level 3	Units	EF	Source
2102002000	Bituminous/ Subbituminous Coal	lb/ton	6.2	AP-42 Tables 1.1-3, -4, -11, -19; EIA 2000
2102004000	Distillate Oil	lb/10^3 gal	2.0	AP-42 Tables 1.3-1, -3, -6, -11, -12, -14, -17; 2005 CERR
2102005000	Residual Oil	lb/10^3 gal	--	No known residual oil use in Clark County
2102006000	Natural Gas	lb/10^6 scf	7.6	WebFIRE; AP-42 Tables 1.4-1, -2
2102007000	LPG	lb/10^3 gal	0.5	AP-42 Table 1.5-1
2102011000	Kerosene	lb/10^3 gal	2.0	AP-42 Table 1.3-3, -14
2103002000	Bituminous/ Subbituminous Coal	lb/ton	6.2	AP-42 Tables 1.1-3, -4, -11, -19; EIA 2000
2103004000	Distillate Oil	lb/10^3 gal	2.0	AP-42 Tables 1.3-1, -3, -7, -11, -12, -14, -17; 2005 CERR
2103005000	Residual Oil	lb/10^3 gal	--	No known residual oil use in Clark County
2103006000	Natural Gas	lb/10^6 scf	7.6	WebFIRE; AP-42 Tables 1.4-1, -2
2103007000	LPG	lb/10^3 gal	0.5	WebFIRE
2103011000	Kerosene	lb/10^3 gal	2.0	AP-42 Tables 1.4-1, -2
2104002000	Bituminous/ Subbituminous Coal	lb/ton	6.2	AP-42 Tables 1.1-3, -4, -11, -19; EIA 2000
2104004000	Distillate Oil[1]	lb/10^3 gal	0.4	AP-42 Tables 1.3-1, -14; 2005 CERR; WebFIRE
2104005000	Residual Oil	lb/10^3 gal	--	No known residual oil use in Clark County
2104006000	Natural Gas	lb/10^6 scf	7.6	WebFIRE; AP-42 Tables 1.4-1, -2
2104007000	LPG[1]	lb/10^3 gal	0.5	AP-42 Table 1.5-1
2104011000	Kerosene	lb/10^3 gal	0.4	AP-42 Tables 1.4-1, -2

[1]Assumed residential boiler emissions were comparable to commercial.

The only readily available fuel consumption data for fuel combustion SCCs is the EIA's annual statewide data, published in its *Annual Energy Outlook* (Table 7-3).

Table 7-3. Annual Statewide Fuel Consumption (2008)

Fuel Type	Consumer	Consumption	Units
Natural Gas	Residential	38,665	million ft^3
	Commercial	28,920	million ft^3
	Industrial	12,888	million ft^3
Coal	Residential	0	1,000 short tons
	Commercial	0	1,000 short tons
	Industrial	201	1,000 short tons
Distillate Oil	Residential	169	1,000 barrels
	Commercial	306	1,000 barrels
	Industrial	3,193	1,000 barrels
Residual Oil	Residential	0	1,000 barrels

Fuel Type	Consumer	Consumption	Units
	Commercial	0	1,000 barrels
	Industrial	0	1,000 barrels
LPG	Residential	551	1,000 barrels
	Commercial	279	1,000 barrels
	Industrial	268	1,000 barrels
Kerosene	Residential	11	1,000 barrels
	Commercial	4	1,000 barrels
	Industrial	1	1,000 barrels

Source: EIA (2010a).

Natural gas consumption design-day values were derived from the monthly figures listed in Table 7-4. Other design-day fuel consumption values were based on the annual data in Table 7-3.

Table 7-4. Monthly Statewide Natural Gas Consumption (2008)

Date	Residential Consumption	Deliveries to Commercial Consumers[1]	Industrial Consumption
		(million cubic feet)	
1/15/08	8,262	4,223	1,255
2/15/08	6,795	3,718	1,121
3/15/08	4,415	2,942	1,166
4/15/08	**2,774**	**2,340**	**1,179**
5/15/08	1,956	2,034	1,022
6/15/08	1,620	1,778	935
7/15/08	1,261	1,569	982
8/15/08	1,142	1,529	971
9/15/08	1,226	1,627	995
10/15/08	1,683	1,937	1,087
11/15/08	2,491	2,221	1,006
12/15/08	5,038	3,001	1,169
Avg daily consumption, April 2008	**7.2%**	**8.1%**	**9.2%**

[1] Includes vehicle fuel through 1996.

To extract county-level consumption data, correlations were established based on temperature (for residential fuel combustion) and on economic data (for commercial and industrial fuel combustion). Since residential fuel combustion is primarily used for heating, it was assumed that fuel consumption would be approximately correlated with temperature in a given area. i.e., residences in areas with low temperatures would consume more fuel than residences in areas with high temperatures.

One measure of temperature is the heating degree day (HDD). An HDD is the difference between 65ºF and the temperature data of a given area; differences less than or equal to zero are designated as zero. Table 7-5 provides the average HDDs for Clark County in 2008.

Table 7-5. Clark County Heating Degree Days (2008)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	25	21	1	2	4	0	0	0	0	0	0	6
2	19	20	11	0	1	0	0	0	0	0	0	8
3	18	16	14	0	0	0	0	0	0	0	0	10
4	12	21	9	0	0	0	0	0	0	0	1	14
5	12	22	11	0	0	0	0	0	0	0	9	13
6	12	22	14	0	0	0	0	0	0	0	11	14
7	17	18	10	0	0	0	0	0	0	0	5	14
8	22	12	2	4	0	0	0	0	0	0	3	16
9	18	10	3	4	0	0	0	0	0	0	7	15
10	17	9	5	2	0	0	0	0	0	0	9	16
11	15	8	1	1	0	0	0	0	0	10	8	11
12	17	6	0	0	0	0	0	0	0	11	3	13
13	13	5	0	0	0	0	0	0	0	6	0	13
14	14	19	2	0	0	0	0	0	0	1	0	23
15	16	14	9	0	0	0	0	0	0	0	2	24
16	27	15	15	3	0	0	0	0	0	0	1	22
17	28	12	8	4	0	0	0	0	0	0	0	29
18	22	14	5	0	0	0	0	0	0	0	0	26
19	22	10	0	0	0	0	0	0	0	0	2	26
20	21	10	0	0	0	0	0	0	0	0	4	26
21	16	13	0	1	0	0	0	0	0	0	5	23
22	17	10	0	0	0	0	0	0	0	0	8	16
23	19	13	3	0	5	0	0	0	0	1	8	20
24	18	9	1	0	6	0	0	0	0	0	6	25
25	18	10	0	0	1	0	0	0	0	0	3	18
26	17	8	0	0	0	0	0	0	0	0	9	25
27	16	7	0	0	0	0	0	0	0	0	9	29
28	17	3	0	0	0	0	0	0	0	0	8	26
29	24	2	0	0	0	0	0	0	0	0	5	21
30	23	N/A	4	0	0	0	0	0	0	0	5	18
31	26	N/A	7	N/A	0	N/A	0	0	N/A	0	N/A	17
Sum	**578**	**359**	**135**	**21**	**17**	**0**	**0**	**0**	**0**	**29**	**131**	**577**

Source: Weather Underground, Inc. and DRI's Western Regional Climate Center.

Table 7-5 shows Clark County had 1,847 HDDs in 2008. The average temperature in Clark County is higher than in the rest of the state, so the annual number of HDDs for all other counties in the state is also higher than average.

Since countywide population data are available, it was possible to weight the HDD data by population to estimate countywide fuel consumption based on statewide consumption data. Table 7-6 provides the weighted products for each county. Residential fuel consumption for Clark County could then be equated with the product of statewide consumption data and the weighted ratio (HDD ● population) of Clark County and the state of Nevada (Table 7-6).

Table 7-6. HDD Population for Residential Fuel Consumption (2008)

FIPS County Code	County	Meteorological Station	HDD	Population	HDD Population
32001	Churchill	Fallon Experiment Station	5,146	27,190	139,919,740
32003	Clark	Las Vegas WSO Airport	1,847	1,986,146	3,668,411,662
32005	Douglas	Minden	5,968	52,386	312,639,648
32007	Elko	Elko WB Airport	6,850	50,434	345,472,900
32009	Esmeralda	Goldfield	5,661	1,236	6,996,996
32011	Eureka	Eureka	7,267	1,458	10,595,286
32013	Humboldt	Winnemucca WSO Airport	6,353	18,052	114,684,356
32015	Lander	Battle Mountain 4 SE	6,338	5,747	36,424,486
32017	Lincoln	Pioche	5,768	4,184	24,133,312
32019	Lyon	Yerington	5,572	55,903	311,491,516
32021	Mineral	Hawthorne	4,850	4,377	21,228,450
32023	Nye	Tonopah Airport	5,337	46,308	247,145,796
32027	Pershing	Lovelock FAA Airport	5,263	7,075	37,235,725
32029	Storey	Virginia City	6,098	4,293	26,178,714
32031	Washoe	Reno WSFO Airport	4,756	418,061	1,988,298,116
32033	White Pine	Ely WBO	7,277	9,590	69,786,430
32510	Carson City	Carson City	5,796	57,723	334,562,508
				TOTAL	**7,695,205,641**

Note: FAA = Federal Aviation Administration, SE = southeast, WSO = Weather Service Office, WSFO = Weather Service Forecast Office, WB = Weather Bureau, WBO = Weather Bureau Office.

To extract county-level fuel consumption data from statewide consumption data for commercial and industrial fuel combustion, a correlation was established based on commercial and industrial employment information. Table 7-7 provides county-level and statewide employment data acquired from the North American Industry Classification System (OMB 2007).

Table 7-7. Commercial and Industrial Employment

Sector Code	Description	Employees in Nevada	Employees in Clark County
Industrial Employment			
22	Utilities	7,500	3,750
31	Manufacturing	49,624	25,268
	Totals:	**57,124**	**29,018**
		Clark County to State Ratio:	**0.51**
Commercial Employment			
42	Wholesale trade	40,268	25,496
44	Retail trade	144,179	103,002
51	Information	16,900	11,360
52	Finance & insurance	41,369	31,208
53	Real estate & rental & leasing	31,144	25,139
54	Professional, scientific & technical services	60,753	46,003
55	Management of companies & enterprises	16,592	14,396
56	Admin, support, waste mgmt, remediation services	108,078	66,753
61	Educational services	8,713	6,883
62	Health care and social assistance	94,120	64,509
71	Arts, entertainment & recreation	30,728	20,954
72	Accommodation & food services	319,477	260,723
81	Other services (except public administration)	35,004	24,475
95	Auxiliaries (except corporate, subsidiary and regional management)	0	0
99	Unclassified establishments	124	105
	TOTALS:	**947,449**	**701,006**
		Clark County to State Ratio:	**0.74**

Table 7-8 summarizes the estimated amounts of fuel consumption within Clark County using a temperature-related correlation for residential fuel combustion and an employment-related correlation for commercial and industrial fuel combustion.

Table 7-8. Annual Clark County Fuel Consumption (2008)

Fuel Type	Area	Residential	Commercial	Industrial	Units
Coal	Clark County	0	0	102	1000 short tons
Distillate oil	Clark County	3384	9509	68123	1000 gal
Residual	Clark County	0	0	0	1000 gal
Natural gas	Clark County	18432	21398	6547	million ft^3
LPG	Clark County	11032	8670	5718	1000 gal
Kerosene	Clark County	220	124	11	1000 gal

7.1.3 Emission Projections

Emission projections for residential, commercial, and industrial fuel combustion were based on EIA forecasts (EIA 2010b). Table 7-9 indicates that most natural gas is consumed to generate electrical power, but emissions associated with power plants were not included in the nonpoint source EI because they are point sources. There was extensive overlap between point and nonpoint source natural gas consumption for the commercial and industrial sectors (Section 4.3).

Table 7-9. Natural Gas Consumption by Sector 2007-2030

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Consumption (trillion cubic feet)												
Residential	4.70	4.87	4.77	4.81	4.66	4.66	4.67	4.69	4.71	4.74	4.75	4.77
Commercial	3.01	3.12	3.07	3.20	3.18	3.19	3.18	3.21	3.23	3.25	3.27	3.29
Industrial[1]	6.62	6.65	5.95	6.05	6.22	6.52	6.73	6.86	6.88	6.91	6.93	6.98
Electric power[2]	6.84	6.66	6.86	6.55	6.11	5.68	5.04	4.82	5.18	5.23	5.38	5.46
Transportation[3]	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06	0.07
Pipeline fuel	0.62	0.63	0.61	0.62	0.60	0.60	0.58	0.59	0.60	0.60	0.60	0.61
Lease and plant fuel[4]	1.18	1.28	1.29	1.25	1.18	1.13	1.07	1.07	1.08	1.07	1.07	1.08
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Consumption (trillion cubic feet)												
Residential	4.79	4.83	4.83	4.84	4.85	4.89	4.89	4.91	4.91	4.92	4.90	4.89
Commercial	3.32	3.33	3.35	3.37	3.39	3.42	3.45	3.48	3.50	3.52	3.54	3.55
Industrial[1]	7.01	7.03	7.01	6.98	6.95	6.96	6.94	6.88	6.86	6.81	6.78	6.74
Electric power[2]	5.56	5.66	5.60	5.71	5.89	6.23	6.28	6.57	6.70	6.88	6.99	7.04
Transportation[3]	0.07	0.08	0.09	0.09	0.10	0.11	0.11	0.12	0.13	0.14	0.14	0.15
Pipeline fuel	0.61	0.62	0.61	0.62	0.65	0.69	0.70	0.70	0.71	0.71	0.71	0.72
Lease and plant fuel[4]	1.09	1.09	1.09	1.10	1.14	1.19	1.19	1.21	1.22	1.22	1.23	1.23

Source: EIA (2010b), Table A1.
[1]Includes energy for combined heat and power plants, except those whose primary business is to sell electricity, or electricity and heat, to the public.
[2]Includes consumption of energy by electricity-only and combined heat and power plants whose primary business is to sell electricity, or electricity and heat, to the public. Includes small power producers and exempt wholesale generators.
[3]Compressed natural gas used as vehicle fuel.
[4]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.

The data in Table 7-10, also from the EIA, provides consumption projections for liquefied petroleum gas, distillate fuel oil, and residual fuel oil. These national estimates were used instead of the default EGAS projection factors for those categories to project emissions; EGAS values were used only to project emissions for coal and kerosene consumption.

Table 7-10. Liquid Fuel Consumption 2007–2026

Fuel	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Consumption by Fuel (million barrels per day)										
LPGs	2.09	1.95	1.91	1.97	2.01	2.07	2.09	2.11	**2.15**	2.20
E85[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.06
Motor gasoline[2]	9.29	8.99	9.00	9.22	9.44	9.46	9.43	9.40	9.37	9.29
Jet fuel[3]	1.62	1.54	1.39	1.51	1.50	1.52	1.53	1.55	1.57	1.59
Distillate fuel oil[4]	4.20	3.95	3.62	3.72	3.84	3.96	4.03	4.06	**4.08**	4.11
• Diesel	3.47	3.44	3.16	3.16	3.29	3.41	3.49	3.53	3.56	3.59
Residual fuel oil	0.72	0.62	0.57	0.63	0.66	0.66	0.66	0.65	**0.66**	0.65
Other[5]	2.74	2.47	2.21	2.20	2.31	2.36	2.36	2.36	2.35	2.32
	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Consumption by Fuel (million barrels per day)										
LPGs	2.25	2.30	2.37	2.37	2.37	2.35	**2.34**	2.34	2.33	2.32
E85[1]	0.08	0.10	0.14	0.18	0.24	0.43	0.38	0.35	0.36	0.40
Motor gasoline[2]	9.30	9.24	9.25	9.24	9.23	9.12	9.20	9.27	9.32	9.33
Jet fuel[3]	1.62	1.64	1.66	1.68	1.70	1.71	1.72	1.74	1.75	1.76
Distillate fuel oil[4]	4.13	4.16	4.20	4.24	4.26	4.28	**4.31**	4.35	4.41	4.45
• Diesel	3.62	3.66	3.71	3.75	3.77	3.80	3.83	3.88	3.93	3.99
Residual fuel oil	0.66	0.66	0.66	0.66	0.66	0.66	**0.66**	0.66	0.66	0.67
Other[5]	2.29	2.23	2.19	2.19	2.18	2.17	2.17	2.16	2.17	2.18

Source: EIA (2010b), Table A1.
[1]E85 refers to a blend of 85% ethanol (renewable) and 15% motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally; the annual average ethanol content of 74% was used for this forecast.
[2]Includes ethanol and ethers blended into gasoline.
[3]Includes only kerosene type.
[4]Includes distillate fuel oil and kerosene from petroleum and biomass feedstocks.
[5]Includes aviation gasoline, petrochemical feedstocks, lubricants, waxes, asphalt, road oil, still gas, special naphthas, petroleum coke, crude oil product supplied, methanol, and miscellaneous petroleum products.

7.1.4 Emissions Summary

Table 7-11 summarizes design-day fuel combustion emissions. The emissions reflect point source overlaps, so for some SCCs (e.g., commercial and industrial natural gas combustion), emissions were lower than expected. Emission values take into account the temporal profiles described in Section 4.4 and the factors used to project emissions discussed in Section 7.1.3.

Table 7-11. Fuel Combustion Sector Design Day and Projected Emissions (tpd)

SCC	Description	HA 212			BLM Disposal Area		
		2008	2015	2023	2008	2015	2023
2102002000	Stationary Fuel Comb/ Industrial//Bituminous/Subbituminous Coal//Total: All Boiler Types	0.84	0.88	0.96	0.84	0.88	0.96
2102004000	Stationary Fuel Comb/Industrial//Distillate Oil/Total: Boilers and IC Engines	0.18	0.19	0.20	0.18	0.19	0.20
2102005000	Stationary Fuel Comb/Industrial/ Residual Oil/Total: All Boiler Types	0.00	0.00	0.00	0.00	0.00	0.00
2102006000	Stationary Fuel Comb/Industrial/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00	0.00	0.00	0.00
2102007000	Stationary Fuel Comb/Industrial/LPG/Total: All Boiler Types	0.00	0.00	0.00	0.00	0.00	0.00
2102011000	Stationary Fuel Comb/Industrial/Kerosene/Total: All Boiler Types	0.00	0.00	0.00	0.00	0.00	0.00
2103002000	Stationary Fuel Comb/Commercial/Institutional/Bituminous/Subbituminous Coal/Total: All Boiler Types	0.00	0.00	0.00	0.00	0.00	0.00
2103004000	Stationary Fuel Comb/Commercial/Institutional/Distillate Oil/Total: Boilers and IC Engines	0.03	0.03	0.03	0.03	0.03	0.03
2103005000	Stationary Fuel Comb/Commercial/Institutional/Residual Oil/Total: All Boiler Types	0.00	0.00	0.00	0.00	0.00	0.00
2103006000	Stationary Fuel Comb/Commercial/Institutional/Natural Gas/Total: Boilers and IC Engines	0.00	0.00	0.00	0.00	0.00	0.00
2103007000	Stationary Fuel Comb/Commercial/Institutional/LPG/Total: All Combustor Types	0.01	0.01	0.01	0.01	0.01	0.01
2103011000	Stationary Fuel Comb/Commercial/Institutional/Kerosene/Total: All Combustor Types	0.00	0.00	0.00	0.00	0.00	0.00
2104002000	Stationary Fuel Comb/Residential/Bituminous/Subbituminous Coal/Total: All Combustor Types	0.00	0.00	0.00	0.00	0.00	0.00
2104004000	Stationary Fuel Comb/Residential/Distillate Oil/Total: All Combustor Types	0.00	0.00	0.00	0.00	0.00	0.00
2104005000	Stationary Fuel Comb/Residential/Residual Oil/Total: All Combustor Types	0.00	0.00	0.00	0.00	0.00	0.00
2104006000	Stationary Fuel Comb/Residential/Natural Gas/Total: All Combustor Types	0.17	0.17	0.17	0.17	0.17	0.17
2104007000	Stationary Fuel Comb/Residential/LPG/Total: All Combustor Types	0.01	0.01	0.01	0.01	0.01	0.01
2104011000	Stationary Fuel Comb/Residential/Kerosene/Total: All Heater Types	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	**1.23**	**1.29**	**1.38**	**1.23**	**1.29**	**1.38**

7.2 Commercial Cooking

7.2.1 Background

Commercial cooking emissions arise from the heating and burning of foods and oils during charbroiling and frying. They do not include emissions from fuel combustion during the cooking process, which are accounted for separately in the fuel combustion nonpoint source sector.

7.2.2 Methodology

Emissions from commercial cooking are generally the product of three variables: (1) the quantity of cooking equipment, based on type of equipment and eating establishment; (2) the weight of food cooked, by type of equipment and type of food; and (3) the EF.

Most of the available data on cooking equipment and eating establishments is based on countywide estimates. Once emissions for the county were calculated from that data, population ratios were used to estimate emissions for the nonattainment and BLM disposal areas.

7.2.2.1 *Quantity of Cooking Equipment*

Table 7-12 lists the estimated quantity of cooking equipment in the nonattainment area, based on type of equipment and eating establishment. Table values are the product of the average quantity of equipment by type of eating establishment (Table 7-13); the percentage of eating establishments housing certain types of equipment (Table 7-14); and the number of eating establishments within a geographic area (Table 7-15).

Table 7-12. Quantity of Equipment in Nonattainment Area

Equipment Type	Ethnic	Family	Fast Food	Seafood	Steak & Barbeque	Total
Chain-driven charbroilers	36	34	174	0	0	245
Underfired charbroilers	467	157	426	32	95	1,176
Deep-fat fryers	851	427	2,625	135	213	4,251
Flat griddles	752	336	649	22	128	1,888
Clamshell griddles	46	0	269	9	0	323

Table 7-13 shows the average quantity of equipment by type of eating establishment. These are national averages.

Table 7-13. Average Quantity of Equipment by Type of Eating Establishment[1]

Equipment Type	Ethnic	Family	Fast Food	Seafood	Steak & Bar-beque
Chain-driven charbroilers	1.62	1.71	1.07	0	0
Underfired charbroilers	1.54	1.29	1.58	1.1	1.63
Deep-fat fryers	1.63	2.34	3.1	2.47	2.42

Equipment Type	Ethnic	Family	Fast Food	Seafood	Steak & Bar-beque
Flat griddles	1.88	2.03	1.43	1.11	1.35
Clamshell griddles	1.8	0	2.09	1.5	0

Source: EPA 2006a, App. A, Table 3.
[1]Only for restaurant segments that have such equipment, as estimated in the source document.

Table 7-14 shows the percent of eating establishments housing different equipment types. These are also average national percentages.

Table 7-14. Percent of Eating Establishments with Cooking Equipment

Equipment Type	Ethnic	Family	Fast Food	Seafood	Steak & Barbeque
Chain-driven charbroilers	3.5	10.1	18.6	0	6.9
Underfired charbroilers	47.5	60.9	30.8	52.6	55.2
Deep-fat fryers	81.9	91.4	96.8	100	82.8
Flat griddles	62.7	82.9	51.9	36.8	89.7
Clamshell griddles	4	1.4	14.7	10.5	0

Source: EPA 2003.

Table 7-15 lists the number of eating establishments by SIC (Dun & Bradstreet 2009). National and countywide data was obtained from the U.S. Census Bureau (U.S. Census Bureau 2006a). In 2008, there were approximately 637,000 eating establishments nationwide; about 4,000 were located in Clark County. The estimated number of eating establishments within the BLM disposal (nonattainment) area were based on this population.

Table 7-15. Eating Establishments

Main SIC	SIC Code	SIC Description	# Businesses	Nationally	HA 212	BLM Dispos-al Area
SIC 5812-00	5812-0000	Eating places	138,380	N/A	N/A	N/A
SIC 5812-01 (Ethnic food)	5812-0100	Ethnic food restaurants	5,694	111,880	677	675
	5812-0101	American restaurant	13,305			
	5812-0102	Cajun restaurant	576			
	5812-0103	Chinese restaurant	28,557			
	5812-0104	French restaurant	1,123			
	5812-0105	German restaurant	336			
	5812-0106	Greek restaurant	1,031			
	5812-0107	Indian/Pakistan restaurant	1,819			
	5812-0108	Italian restaurant	13,028			
	5812-0109	Japanese restaurant	5,723			
	5812-0110	Korean restaurant	779			
	5812-0111	Lebanese restaurant	113			
	5812-0112	Mexican restaurant	25,569			
	5812-0113	Spanish restaurant	672			

Main SIC	SIC Code	SIC Description	# Businesses	Nationally	HA 212	BLM Disposal Area
	5812-0114	Sushi bar	2,316			
	5812-0115	Thai restaurant	3,930			
	5812-0116	Vietnamese restaurant	1,125			
	5812-0117	Pakistani restaurant	59			
SIC 5812-02	5812-0200	Ice cream, soft drink and soda fountain stands	1,720	N/A	N/A	N/A
	5812-0201	Concessionaire	1,673			
	5812-0202	Frozen yogurt stand	852			
	5812-0203	Ice cream stands or dairy bars	13,975			
	5812-0204	Snow cone stand	338			
	5812-0205	Soda fountain	162			
	5812-0206	Soft drink stand	437			
SIC 5812-03 (Fast food)	5812-0300	Fast food restaurants and stands	4,531	153,443	928	925
	5812-0301	Box lunch stand	98			
	5812-0302	Carry-out only (except pizza) restaurant	4,791			
	5812-0303	Chili stand	130			
	5812-0304	Coffee shop	18,782			
	5812-0305	Delicatessen (eating places)	10,931			
	5812-0306	Drive-in restaurant	5,857			
	5812-0307	Fast-food restaurant, chain	51,685			
	5812-0308	Fast-food restaurant, independent	3,586			
	5812-0309	Food bars	333			
	5812-0310	Grills (eating places)	14,523			
	5812-0311	Hamburger stand	1,385			
	5812-0312	Hot dog stand	1,834			
	5812-0313	Sandwiches and submarines shop	24,963			
	5812-0314	Snack bar	1,248			
	5812-0315	Snack shop	365			
SIC 5812-04	5812-0400	Lunchrooms and cafeterias	2,405	N/A	N/A	N/A
	5812-0401	Automat (eating places)	28			
	5812-0402	Cafeteria	2,266			
	5812-0403	Luncheonette	2,139			
	5812-0404	Lunchroom	41			
	5812-0405	Restaurant, lunch counter	544			
SIC 5812-05 (Family)	5812-0500	Family restaurants	10,479	34,990	212	211
	5812-0501	Restaurant, family: chain	15,760			
	5812-0502	Restaurant, family: independent	6,835			
SIC 5812-06	5812-0600	Pizza restaurants	37,654	N/A	N/A	N/A

Main SIC	SIC Code	SIC Description	# Businesses	Nationally	HA 212	BLM Disposal Area
	5812-0601	Pizzeria, chain	20,370			
	5812-0602	Pizzeria, independent	3,035			
SIC 5812-07 (Seafood)	5812-0700	Seafood restaurants	8,259	9,589	58	58
	5812-0701	Oyster bar	221			
	5812-0702	Seafood shack	584			
SIC 5812-08 (Steak & Barbecue)	5812-0800	Steak & barbecue restaurants	777	18,609	113	112
	5812-0801	Barbecue restaurant	9,158			
	5812-0802	Steak restaurant	7,655			
SIC 5812-99	5812-9901	Buffet (eating places)	3,137	N/A	N/A	N/A
	5812-9902	Cafe	24,859			
	5812-9903	Caterers	25,723			
	5812-9904	Chicken restaurant	4,020			
	5812-9905	Commissary restaurant	83			
	5812-9906	Contract food services	1,432			
	5812-9907	Diner	5,475			
	5812-9908	Dinner theater	193			
	5812-9909	Health food restaurant	267			
		TOTALS	**601,733**	**328,511**	**1,987**	**1,981**

7.2.2.2 *Quantity of Food Cooked*

Table 7-16 describes the predominant food types that are charbroiled and fried, and the annual average quantity that is cooked by the predominant cooking equipment.

Table 7-16. Average Quantity of Food Cooked by Equipment Type (tpy)

Equipment Type	Steak	Hamburger	Poultry (with skin)	Poultry (skinless)	Pork	Seafood	Other
Chain-driven charbroilers	6.1	20.7	3.8	6.9	1.5	3.1	0.0
Underfired charbroilers	4.7	7.0	3.7	4.7	3.8	3.7	1.1
Deep-fat fryers	4.7	7.1	9.5	5.4	1.5	4.1	7.1
Flat griddles	4.3	9.4	2.3	2.9	2.9	2.4	1.5
Clamshell griddles	2.4	34.2	2.9	2.8	3.1	16.4	0.0

Source: EPA 2006a, App. A, Table 1.

7.2.2.3 *Emission Factors*

EFs have been established for seven types of food: steak, hamburger, poultry with skin, poultry without skin, pork, seafood, and "other." They depend on the type of cooking equipment used and the type of fuel combusted (Table 7-17). EFs for cooking equipment types can differ for several reasons, including the different temperatures used in cooking processes.

Table 7-17. Cooking EFs

Equipment Type	Fuel Used	Meat/Food	PM_{10}
Chain-driven charbroilers	Natural Gas	Hamburger	14.8
Underfired charbroilers	Charcoal	Hamburger	15
		Hamburger	18.4
		Chicken	18.8
	Natural Gas	Hamburger	65.4
		Steak	34.4
		Chicken (whole)	21
		Seafood	6.6
Deep-fat fryers	Natural Gas	Potatoes	0
		Breaded Chicken	0
		Breaded Fish	0
Flat griddles	Electric	Hamburger	10
		Chicken (boneless)	0
		Seafood	0
Clamshell griddles	Electric	Hamburger	1.7

Source: EPA 2003.

7.2.3 Emissions Summary

The emissions in Table 7-18 are the product of the quantity of cooking equipment, the weight of food cooked, and an EF. The table categorizes 2008 commercial cooking emissions by equipment and food type. Total estimated PM_{10} emissions were 804.4 tons within the nonattainment area and 802.2 tons within the BLM disposal area.

Table 7-18. Commercial Cooking Emissions by Equipment and Food Type (2008)

SCC	Equipment	Food Type	HA 212 (tpy)	BLM Disposal Area (tpy)
2302002100	Chain-driven charbroilers	Steak	11.8	11.4
		Hamburger	39.9	38.6
		Poultry (with skin)	10.4	10.4
		Poultry (skinless)	18.9	18.9
		Pork	4.1	4.1
		Seafood	2.7	2.7
		Other	0.0	0.0
2302002200	Underfired charbroilers	Steak	100.4	100.4
		Hamburger	286.4	286.4
		Poultry (with skin)	49.0	49.0
		Poultry (skinless)	61.0	61.0
		Pork	50.4	50.4
		Seafood	15.3	15.3
		Other	23.2	23.2
2302003000	Deep-fat fryers	Steak	0.0	0.0
		Hamburger	0.0	0.0

SCC	Equipment	Food Type	HA 212 (tpy)	BLM Disposal Area (tpy)
		Poultry (with skin)	0.0	0.0
		Poultry (skinless)	0.0	0.0
		Pork	0.0	0.0
		Seafood	0.0	0.0
		Other	0.0	0.0
2302003100	Flat griddles	Steak	43.2	43.2
		Hamburger	43.2	43.2
		Poultry (with skin)	0.0	0.0
		Poultry (skinless)	0.0	0.0
		Pork	0.0	0.0
		Seafood	0.0	0.0
		Other	43.2	43.2
2302003200	Clamshell griddles	Steak	0.7	0.7
		Hamburger	0.7	0.7
		Poultry (with skin)	0.0	0.0
		Poultry (skinless)	0.0	0.0
		Pork	0.0	0.0
		Seafood	0.0	0.0
		Other	0.0	0.0
		TOTAL	**804.4**	**802.2**

Table 7-19 lists design-day and projected emissions for the nonattainment and BLM disposal areas by SCC. The EGAS projection factors for 2015 and 2023 are approximately 1.15 and 1.29, respectively; emissions take into account the temporal profiles described in Section 4.4.

Table 7-19. Commercial Cooking Sector Design Day and Projected Emissions (tpd)

SCC	Description	Emissions from Las Vegas Valley			Emissions from BLM Disposal Area		
		2008	2015	2023	2008	2015	2023
2302002100	Industrial Processes/Food and Kindred Products: SIC 20/Commercial Cooking - Charbroiling/Conveyorized Charbroiling	0.24	0.28	0.31	0.24	0.27	0.31
2302002200	Industrial Processes/Food and Kindred Products: SIC 20/Commercial Cooking - Charbroiling/Under-fired Charbroiling	1.60	1.84	2.07	1.60	1.84	2.07
2302003000	Industrial Processes/Food and Kindred Products: SIC 20/Commercial Cooking - Frying/Deep Fat Frying	0.00	0.00	0.00	0.00	0.00	0.00
2302003100	Industrial Processes/Food and Kindred Products: SIC 20/Commercial Cooking - Frying/Flat Griddle Frying	0.36	0.41	0.46	0.35	0.41	0.46
2302003200	Industrial Processes/Food and Kindred Products: SIC 20/Commercial Cooking - Frying/Clamshell Griddle Frying	0.00	0.00	0.01	0.00	0.00	0.01
	TOTAL	**2.20**	**2.53**	**2.88**	**2.19**	**2.52**	**2.88**

7.3 Residential Wood Combustion

7.3.1 Background

Annual residential wood combustion emissions per capita are lower in Clark County than in colder regions. Residential wood-burning emissions are inversely proportional to the temperature of a region: wood-burning essentially stops once the temperature rises significantly.

7.3.2 Methodology

The emissions estimate for residential wood combustion was based on a methodology developed for EPA by E.H. Pechan & Associates, Inc. (Huntley et al. 2008). Table 7-20 lists all the SCCs associated with residential wood combustion, although only a subset of the SCCs is included in the EI. Emissions estimates were not provided for all SCCs because some low-level SCCs are accounted for by higher-level SCCs. For example, SCC 2104008100 includes emissions from SCCs 2104008110, 2104008120, and 2104008130. Additionally, the emissions totals of some higher-level SCCs are duplicated by lower-level SCCs, e.g., the SCC associated with outdoor hydronic heating.

Table 7-20. SCCs for Residential Wood Combustion

SCC	Level 3	Level 4	Comment
2104008100	Wood	Fireplace: general	SCC selected by Pechan (2008).
2104008110		Fireplace: open	Conventional fireplace with open hearth.
2104008100		Fireplace: enclosed (or otherwise modified)	Enclosed with glass doors or other modifications to a conventional fire-place such as devices to boost effi-ciency (heat exchangers).
2104008130		Fireplace: qualified for EPA voluntary program	
2104008200		Woodstove: fireplace inserts; general	Fireplace inserts are similar to a free-standing woodstove, but sit inside a fireplace. Other types of inserts should use 2104008120.
2104008210		Woodstove: fireplace inserts; non-EPA certified	SCCs selected by Pechan (2008).
2104008220		Woodstove: fireplace inserts; EPA-certified; non-catalytic	
2104008230		Woodstove: fireplace inserts; EPA-certified; catalytic	
2104008300		Woodstove: freestanding, general	
2104008310		Woodstove: freestanding, non-EPA certified	SCCs selected by Pechan (2008).
2104008320		Woodstove: freestanding, EPA-certified, non-catalytic	
2104008330		Woodstove: freestanding, EPA-certified, catalytic	
2104008340		Woodstove: freestanding, masonry heater	
2104008400		Woodstove: pellet-fired, general	SCC selected by Pechan (2008); in-cludes freestanding or fireplace insert.
2104008410		Woodstove: pellet-fired, non-EPA-certified	Freestanding or fireplace insert.
2104008420		Woodstove: pellet-fired, EPA-certified	Freestanding or fireplace insert.
2104008500		Furnace: indoor, general	
2104008510		Furnace: indoor, cordwood-fired, non-EPA certified	
2104008520		Furnace: Indoor, cordwood-fired, EPA-certified	
2104008530		Furnace: Indoor, pellet-fired, general	

SCC	Level 3	Level 4	Comment
2104008540		Furnace: Indoor, pellet-fired, non-EPA certified	
2104008550		Furnace: Indoor, pellet-fired, EPA-certified	
2104008600		Hydronic heater: general, all types	
2104008610		Hydronic heater: outdoor	SCC selected by Pechan (2008).
2104008620		Hydronic heater: indoor	
2104008630		Hydronic heater: pellet-fired	
2104008640		Hydronic heater: meets NESCAUM phase II standards	
2104008700		Outdoor wood burning device, NEC	Fire-pits, chimeas, etc.
2104009000	Fire log	Total: All combustor types	SCC selected by Pechan (2008).

The emissions from residential wood combustion are dependent on the amount of wood burned and the emission factors described in Table 7-21.

Table 7-21. Wood Burning Emission Factors by SCC

SCC	Level 4 Description	Factor (lb/ton)	Data Source
2104008100	Fireplace: general	23.60	EPA (2006a), p. A-147
2104008210	Woodstove: fireplace inserts; non-EPA certified	30.60	
2104008220	Woodstove: fireplace inserts; EPA-certified; non-catalytic	19.60	
2104008230	Woodstove: fireplace inserts; EPA-certified; catalytic	20.40	
2104008310	Woodstove: freestanding, non-EPA certified	30.60	
2104008320	Woodstove: freestanding, EPA-certified, non-catalytic	19.60	
2104008330	Woodstove: freestanding, EPA-certified, catalytic	20.40	
2104008400	Woodstove: pellet-fired, general	3.06	MARAMA (2004)
2104008610	Hydronic heater: outdoor	27.60	
2104009000	Residential Firelog Total: All Combustor Types	29.32	Environment Canada (2006)

The amount of wood burned depends on several variables: the number of occupied housing units within a geographic area; the average appliance profile (i.e., type of wood-burning device) of a geographic area; the average annual burn rate for each type of appliance within that geographic area; and the average density of wood burned within that geographic area. Each variable is discussed individually in the following sections.

7.3.2.1 *Occupied Housing Units*

Emission calculations depend on the number of occupied houses within an area. During the 2000 census, there were an estimated 559,799 housing units in Clark County, 512,253 of which were occupied (U.S. Census Bureau 2000). In 2008, there were an estimated 810,602 housing units within Clark County. The number of occupied units in 2008 was based on the same ratio of total versus occupied units during the 2000 census, which gave an estimate of 741,754 units.

7.3.2.2 *Appliance Profiles*

Appliance profiles were used to estimate the fraction of occupied housing units with each type of residential wood burning appliance. The fractions of occupied units within Clark County are described in Table 7-22. These values are based on regional census data from the American Housing Survey (U.S. Census Bureau 2006b) and are assumed to be representative of baseline and projected years (Huntley et al. 2008).

Table 7-22. Appliance Profiles

SCC	SCC Level 4	Burn Type	Fraction of Occupied Units with Appliance
2104008100	Fireplace: general	Main	0.00064
		Secondary	0.065
		Pleasure	0.019
2104009000	Residential Firelog Total: All Combustor Types	Main	0.00010
		Secondary	0.010
		Pleasure	0.0029
2104008210	Woodstove: fireplace inserts; non-EPA certified	Main	0.0019
		Secondary	0.039
		Pleasure	0
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Main	0.00076
		Secondary	0.016
		Pleasure	0
2104008230	Woodstove: fireplace inserts; EPA-certified; catalytic	Main	0.00025
		Secondary	0.0052
		Pleasure	0
2104008310	Woodstove: freestanding, non-EPA certified	Main	0.0082
		Secondary	0.014
		Pleasure	0
2104008320	Woodstove: freestanding, EPA-certified, non-catalytic	Main	0.0033
		Secondary	0.0055
		Pleasure	0
2104008330	Woodstove: freestanding, EPA-certified, catalytic	Main	0.0011
		Secondary	0.0018
		Pleasure	0

Table 7-23 shows the approximate number of pellet-fired woodstoves and hydronic heaters in Clark County during the baseline year (2008).

Table 7-23. Appliance Profiles for Pellet Stoves and Hydronic Heaters

SCC	Level 4	Burn Type	Data Source	No. of Appliances
2104008400	Woodstove: pellet-fired, general	Main	Sales data from Pellet Fuels Institute	3,482
2104008400	Woodstove: pellet-fired, general	Pleasure	Sales data from Pellet Fuels Institute	0
2104008400	Woodstove: pellet-fired, general	Secondary	Sales data from Pellet Fuels Institute	5,772

SCC	Level 4	Burn Type	Data Source	No. of Appliances
2104008610	Hydronic heater: outdoor	Main	2005 NESCAUM[1] data grown to 2007	1

[1]NESCAUM = Northeast States for Coordinated Air Use Management.

7.3.2.3 *Burn Rates*

The National Oceanic and Atmospheric Administration divides the U.S. into five climate zones based on a 30-year average of HDDs and CDDs. Almost all of Clark County is in climate zone 5, along with southeastern California, western Arizona, and the southern U.S. from Texas to Florida. Table 7-24 lists the average wood-burning rates for each type of wood-burning appliance in Clark County (Pechan 2008).

Table 7-24. Residential Wood-Burning Rates for Clark County

SCC	SCC Level 4	Burn Type	Cords Burned/Yr	Annual Burn Rate	Burn Unit	Data Source
2104008100	Fireplace: general	Main	0.59	0.59	Cords	Climate zone 5 adjustment[1]
		Secondary	0.33	0.33		
		Pleasure	0.07	0.07		EPA (2006a), p. A-147
2104008210	Woodstove: fireplace inserts; non-EPA certified	Main	0.99	0.99		Climate zone 5 adjustment
		Secondary	0.44	0.44		
		Pleasure	0.17	0.17		
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Main	0.78	0.78		
		Secondary	0.35	0.35		
		Pleasure	0.14	0.14		
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Main	0.78	0.78		
		Secondary	0.35	0.35		
		Pleasure	0.14	0.14		
2104008310	Woodstove: freestanding, non-EPA certified	Main	1.04	1.04		
		Secondary	0.54	0.54		
		Pleasure	0.18	0.18		
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Main	0.82	0.82		
		Secondary	0.43	0.43		
		Pleasure	0.14	0.14		
2104008330	Woodstove: freestanding, EPA certified, catalytic	Main	0.82	0.82		
		Secondary	0.43	0.43		
		Pleasure	0.14	0.14		
2104008400	Woodstove: pellet-fired, general	Main	1.15	1.15	Ton	
		Secondary	0	0		
		Pleasure	0	0		
2104008610	Hydronic heater: outdoor	Main	1.52	1.52		
		Secondary	0.79	0.79		
		Pleasure	0	0		

SCC	SCC Level 4	Burn Type	Cords Burned/Yr	Annual Burn Rate	Burn Unit	Data Source
2104009000	Residential Firelog Total: All Combustor Types	Main	0.11	0.42	Ton	
		Secondary	0.06	0.23		
		Pleasure	0.03	0.10		

[1]The national default (N) burn rates were adjusted by multiplying N by a ratio of the average heat used by homes (BTU per household) (EIA 2010b) and 1 (18.9/63.2 = 0.3).

7.3.2.4 *Wood Density*

Density data were also needed because most burn rate data are provided in units of cords. According to the 2005 Timber Products Output report generated by the U.S. Forest Service, the average wood density for Clark County is 25.69 lb/ft^3, or 1.03 tons per cord.

7.3.2.5 *Total Amount of Wood Burned*

Table 7-25 shows the total amount of wood burned by appliance and burn type. This number is the product of the appliance population, annual burn rate, and average wood density.

The appliance population is the product of the fraction of occupied units with appliances in Clark County (Table 7-22) and the number of occupied housing units in Clark County (Section 7.3.2.1). Table 7-24 lists annual burn rates and Section 7.3.2.4 specifies average wood density.

Table 7-25. Calculated Activity Data

SCC	Burn Type	Fraction of Occupied Units with Appliance	Appliance Population	Annual Burn Rate	Total Wood Burned	Burn Unit	Wood Burned (tons)
2104008100	Main	0.00064	473	0.59	281	Cords	289
	Pleasure	0.01869	13,865	0.07	957		983
	Secondary	0.06484	48,095	0.33	15,886		16,324
2104008210	Main	0.00189	1,403	0.99	1,384		1,422
	Pleasure	0.00000	0	0.17	0		0
	Secondary	0.03873	28,731	0.44	12,774		13,126
2104008220	Main	0.00076	567	0.78	444		456
	Pleasure	0.00000	0	0.14	0		0
	Secondary	0.01564	11,603	0.35	4,097		4,210
2104008230	Main	0.00025	189	0.78	148		152
	Pleasure	0.00000	0	0.14	0		0
	Secondary	0.00521	3,868	0.35	1,366		1,403
2104008310	Main	0.00818	6,066	1.04	6,279		6,452
	Pleasure	0.00000	0	0.18	0		0
	Secondary	0.01356	10,058	0.54	5,443		5,594
2104008320	Main	0.00330	2,450	0.82	2,014		2,069
	Pleasure	0.00000	0	0.14	0		0

SCC	Burn Type	Fraction of Occupied Units with Appliance	Appliance Population	Annual Burn Rate	Total Wood Burned	Burn Unit	Wood Burned (tons)
	Secondary	0.00548	4,062	0.43	1,745		1,793
2104008330	Main	0.00110	817	0.82	671		690
	Pleasure	0.00000	0	0.14	0		0
	Secondary	0.00183	1,354	0.43	582		598
2104009000	Main	0.00010	74	0.42	31	Ton	31
	Pleasure	0.00292	2,164	0.10	225		225
	Secondary	0.01012	7,506	0.23	1,757		1,757

Source: Pechan (2008).

7.3.3 Emissions Summary

Table 7-26 lists annual baseline emissions in the BLM disposal (nonattainment) area for the baseline year, including the approximate quantities of wood burned by SCC.

Table 7-26. Residential Wood Combustion Emissions in 2008

SCC	Tonnage of Wood Burned	HA-212 PM_{10} (tpy)	BLM Disposal Area PM_{10} (tpy)
2104008100	17,596	200.87	200.33
2104008210	14,548	215.39	214.80
2104008220	4,666	44.25	44.13
2104008230	1,555	15.35	15.30
2104008310	12,045	196.16	195.63
2104008320	3,862	40.29	40.18
2104008330	1,287	13.97	13.94
2104008400	3,988	5.90	5.89
2104008610	2	0.02	0.02
2104009000	2,013	28.55	28.48
	Total:	**760.78**	**758.73**

Table 7-27 shows design-day and projected emissions for the nonattainment and BLM disposal areas by SCC. The EGAS projection factors for years 2015 and 2023 are approximately 1.01 and 1.02, respectively. The emissions take into account the temporal profiles described in Section 4.4.

Table 7-27. Residential Wood Combustion Design Day and Projected Emissions (tpd)

SCC	Description	Las Vegas Valley			BLM Disposal Area		
		2008	2015	2023	2008	2015	2023
2104008100	Stationary Source Fuel Combustion/Residential/ Wood/Fireplace: general	0.49	0.50	0.50	0.49	0.50	0.50
2104008210	Stationary Source Fuel Combustion/Residential/ Wood/Woodstove: fireplace inserts; non-EPA certified	0.53	0.53	0.54	0.53	0.53	0.54

SCC	Description	Las Vegas Valley			BLM Disposal Area		
		2008	2015	2023	2008	2015	2023
2104008220	Stationary Source Fuel Combustion/Residential/ Wood/Woodstove: fireplace inserts; EPA-certified; non-catalytic	0.12	0.12	0.12	0.12	0.12	0.12
2104008230	Stationary Source Fuel Combustion/Residential/Wood/Woodstove: fireplace inserts; EPA-certified; catalytic	0.04	0.04	0.04	0.04	0.04	0.04
2104008310	Stationary Source Fuel Combustion/Residential/Wood/Woodstove: freestanding, non-EPA certified	0.48	0.49	0.49	0.48	0.49	0.49
2104008320	Stationary Source Fuel Combustion/Residential/Wood/Woodstove: freestanding, EPA-certified, non-catalytic	0.11	0.11	0.11	0.11	0.11	0.11
2104008330	Stationary Source Fuel Combustion/Residential/Wood/Woodstove: freestanding, EPA-certified, catalytic	0.03	0.03	0.04	0.03	0.03	0.04
2104008400	Stationary Source Fuel Combustion/Residential/Wood/Woodstove: pellet-fired, general (freestanding or FP insert)	0.01	0.01	0.01	0.01	0.01	0.01
2104008610	Stationary Source Fuel Combustion/Residential/Wood/Hydronic heater: outdoor	0.00	0.00	0.00	0.00	0.00	0.00
2104009000	Stationary Source Fuel Combustion/Residential/Firelog/Total: All Combustor Types	0.07	0.07	0.07	0.07	0.07	0.07
	TOTAL	**1.88**	**1.90**	**1.92**	**1.88**	**1.90**	**1.92**

7.4 Mineral Processing, Asphalt, and Sand and Gravel

Emissions from the mineral processing of concrete, gypsum, and stone, from asphalt processing, and from sand and gravel operations are based on permit data from minor point sources. Since point and nonpoint source SCCs do not correspond, Table 7-28 lists the SICs used to determine the population of minor point sources that fall under the nonpoint SCCs.

Table 7-28. Associated SICs

Description	SCC	Associated SICs
Mineral processing (concrete, gypsum)	2305070000	1442, 1446
Mineral processing (stone)	2305080000	3241, 3271, 3272, 3273, 3274, 3275, 3281
Asphalt	2306010000	2879, 5032, 5211
Sand and gravel	2325030000	2951

Table 7-29 shows design-day and projected emissions for the nonattainment and BLM disposal areas by SCC. The EGAS projection factors for 2015 and 2023 are approximately 1.22 and 1.43, respectively, for mineral processing of concrete and gypsum, mineral processing of stone, and sand and gravel operations sources. The EGAS projection factors for years 2015 and 2023 are approximately 1.11 and 1.22, respectively, for asphalt processing. The emissions take into account the temporal profiles described in Section 4.4.

Table 7-29. Mineral, Asphalt, and Sand and Gravel Processing Design-Day and Projected Emissions (tpd)

SCC	Description	HA 212			BLM disposal area		
		2008	2015	2023	2008	2015	2023
2305070000	Mineral processing (concrete, gypsum)	0.28	0.34	0.40	0.28	0.34	0.40
2305080000	Mineral processing (stone)	0.15	0.18	0.21	0.15	0.18	0.21
2306010000	Asphalt	0.33	0.37	0.40	0.33	0.37	0.40
2325030000	Sand and gravel	0.42	0.51	0.60	0.42	0.51	0.60
	TOTAL	**1.11**	**1.40**	**1.61**	**1.11**	**1.40**	**1.61**

7.5 Open Burning

7.5.1 Background

Emissions from the open burning sector are insignificant (0.02 tpd), but were inventoried because EPA commonly tracks them. Open burning includes emissions from burning yard or agricultural waste, burning for fire/military training purposes, and ceremonial burning. The Clark County Fire Department issues permits for open burning. Emissions are based on activity throughputs; various agencies track both number and type of burns. Table 7-30 lists tracked SCCs for open burning.

Table 7-30. Open Burning Emissions for 2008

SCC	SCC Level 1	SCC Level 2	SCC Level 3	SCC Level 4
2610000100	Waste Disposal, Treatment, and Recovery.	Open Burning.	All Categories	Yard Waste - Leaf Species Unspecified
2610000300			All Categories	Yard Waste - Weed Species Unspecified (including grass)
2610000400			All Categories	Yard Waste - Brush Species Unspecified
2810035000	Miscellaneous Area Sources.	Other Combustion.	Firefighting Training	Total
2810090000			Open Fire	Not categorized

Land-clearing sector emissions come from the purposeful burning of debris for construction of new buildings and highways. Clark County does not permit such burning, so emissions were assumed to be negligible (subject to RP data). Similar restrictions apply to burning household waste.

7.5.2 Methodology

To determine emissions from yard waste, it was assumed that per capita yard trimmings in Clark County's waste stream paralleled nationwide data. EPA (2009b) estimated a total of approximately 32.9 million tons of yard trimmings from municipal waste streams nationwide in 2008. EPA estimated the average per capita waste generated in the U.S. that year at 4.5 lb/day/person and the per capita waste recycled or composted at 1.5 lb/day/person (EPA 2009b).

Despite substantially higher per capita waste generation in Clark County (10 lb/day/person), it was assumed that per capita yard trimmings were roughly the same as the national average because of the desert environment and the likelihood that a disproportionate amount of waste was generated by

construction activities. Based on these data, yard trimmings generated in the county were estimated at approximately 0.4 lb/day/person (144 lb/year/person).

In 2008, there were five yard-burning incidents involving leaf burning (SCC 2610000100), two involving weed burning (SCC 2610000100), and ten involving brush burning (SCC 2610000100). Table 7-31 shows the EFs for these SCCs.

Table 7-31. EFs for Open Burning of Yard Waste (lbs/tons burned)

Type of Waste	PM_{10}	Source
Leaves	38	EPA (1995), Table 2.5-6
Weeds	15	EPA (1995), Table 2.5-5
Brush/forest residues	17	EPA (1995), Table 2.5-5

Burns associated with fire training and ceremonial burning primarily use wooden pallets. Emissions from fire training were estimated based on the frequency of burns (22 incidents during 2008) and an assumption that the amount of wood burned was equivalent to 10 pallets weighing 50 lbs each (NWPCA 2011). This is a conservative estimate, since a 50-lb pallet consists of both wood and moisture content; if moisture content decreases to 25 percent, the weight of a 45-lb pallet decreases to 33 lb. There was only one ceremonial burning incident in 2008, and it was assumed that the amount of wood burned was equivalent to 5 pallets of 50 lbs each.

Table 7-32 summarizes the open burning data tracked in 2008 by listing the type of burning that took place, the number of calls Clark County received per type of burn, and the approximate weight per burn. It was assumed that each general burn call resulted in the consumption of an entire year's worth of yard trimmings for an individual.

Table 7-32. Open Burning Data

Type of Open Burn	Number of Calls	Number of Pallets Burned	Approximate Weight per Burn (lb)
General burn	17	n/a	144
Fire training	22	10	500
Military	29	n/a	4,435
Ceremonial	1	5	250

Other combustion included open burnings conducted by the military. There were 29 such incidents during 2008 with an average net explosive weight of approximately 173 lbs. To estimate emissions, the 180-lb/ton PM_{10} EF for TNT was applied (EPA 1995, Table 6.3-1).

7.5.3 Emissions Summary

Table 7-33 shows design-day and projected emissions for the nonattainment and BLM disposal areas by SCC. The EGAS projection factors for years 2015 and 2023 are approximately 1.18 and 1.35, respectively. The emissions take into account the temporal profiles described in Section 4.4.

Table 7-33. Open Burning Design Day and Projected Emissions (tpd)

SCC	Description	HA 212			BLM disposal area		
		2008	2015	2023	2008	2015	2023
2610000100	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/ Yard Waste - Leaf Species Unspecified	0.00	0.00	0.00	0.00	0.00	0.00
2610000300	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/ Yard Waste - Weed Species Unspecified (including Grass)	0.00	0.00	0.00	0.00	0.00	0.00
2610000400	Waste Disposal, Treatment, and Recovery/Open Burning/All Categories/ Yard Waste - Brush Species Unspecified	0.00	0.00	0.00	0.00	0.00	0.00
2810035000	Miscellaneous Area Sources/Other Combustion/Firefighting Training/Total	0.00	0.00	0.00	0.00	0.00	0.00
2810090000	Miscellaneous Area Sources/Other Combustion/Open Fire/Not Categorized	0.02	0.02	0.02	0.02	0.02	0.02
	TOTAL	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

7.6 Structural and Vehicle Fires

7.6.1 Methodology

Emissions from structural and vehicle fires are insignificant (0.02 and 0.03 tpd), but were included because they are commonly tracked by EPA. Table 7-34 shows the pertinent SCCs.

Table 7-34. Emissions Summary by SCC

SCC	Level 1	Level 2	Level 3	Level 4
2810030000	Miscellaneous Area Sources	Other Combustion	Structure Fires	Unspecified
2810050000	Miscellaneous Area Sources	Other Combustion	Motor Vehicle Fires	Unspecified

Table 7-35 lists the number of structural and vehicle fires reported by the fire departments of Clark County, the City of Las Vegas, the City of Henderson, the City of North Las Vegas, and Boulder City. These departments track fire information for private dwellings, apartments, hotels, other residential structures, public assembly buildings (e.g., churches, clubs), schools and colleges, health care and penal institutions, stores and offices, industry utilities, labs, storage units, other structures, and various types of vehicles.

Table 7-35. Types and Annual Numbers of Fires in Clark County

Local Entity	Structural	Highway Vehicle	Other Vehicle
City of Las Vegas	539	309	40
City of Henderson	153	61	79
City of North Las Vegas	434	156	20
Boulder City	15	9	0
Nonmunicipal Clark County	937	681	74

Emissions from structural and vehicle fires were estimated from the number of fire incidents (Table 7-35); the EFs in Table 7-36; an assumption that the average vehicle contains approximately 500 lbs of combustible material (EPA 2000); and an assumption that the average amount of material burned in a residential fire is 1.15 tons (EPA 1997).

Table 7-36. EFs (lb/ton burned)

SCC	Description	Emission Factor	Source
2810030000	Structural Fires	10.8	EPA 1997 (Vol. 3, Ch. 18)
2810050000	Vehicle Fires	100	EPA 1997 (Vol. 3, Area Source Method Abstracts)

7.6.2 Emissions Summary

Table 7-37 shows design-day and projected emissions for the nonattainment and BLM disposal areas by SCC. The EGAS projection factors for 2015 and 2023 are approximately 1.21 and 1.41, respectively, for structural fires, and 1.18 and 1.35, respectively, for vehicle fires. Emissions take into account the temporal profiles described in Section 4.4.

Table 7-37. Structural and Vehicle Fire Design-Day and Projected Emissions (tpd)

SCC	Description	HA 212			BLM disposal area		
		2008	2015	2023	2008	2015	2023
2810030000	Miscellaneous Area Sources/ Other Combustion/ Structure Fires/ Unspecified	0.02	0.02	0.03	0.02	0.02	0.03
2810050000	Miscellaneous Area Sources/ Other Combustion/ Motor Vehicle Fires/ Unspecified	0.03	0.03	0.04	0.03	0.03	0.04
	TOTAL	**0.05**	**0.05**	**0.07**	**0.05**	**0.05**	**0.07**

8.0 ON-ROAD MOBILE EMISSIONS

Emissions Estimate AreasOnly BLM disposal area emissions were used in the rollback model to demonstrate attainment in this maintenance plan, although Clark County estimated paved road dust emissions for both HA 212 and the BLM disposal area on the design day of April 15, 2008. In addition, Clark County developed emissions inventory estimates for the base year (2008), mid-year (2015), and maintenance year (2023).

8.1 Paved Roads

Paved road dust emissions are determined by VMT and EF. The following sections describe the methods used to calculate these emissions.

8.1.1 Paved Road Emission Factor

AP-42 provides the following equation for estimating paved road dust emissions factors (EPA 1995, p. 13.2.1-4):

(Eq. 8-1) $$EF = k\,(sL)^{0.91} \bullet (W)^{1.02}$$

where

EF = particulate emission factor (having units matching the units of k)
k = particle size multiplier for particle size range and units of interest
sL = road surface silt loading (grams per square meter) (g/m2)
W = average weight (tons) of the vehicles traveling the road

AP-42 lists the particle size multiplier (k) for PM_{10} as 1.00 g/VMT (EPA 1995, Table 13.2.1-1). If measurable (> 0.254 mm [0.01 inch]) precipitation occurs over an averaging period, a precipitation correction term can be applied to Equation 8-1, but since there was no measurable precipitation in Clark County on the design day, no correction terms were applied. Clark County used data from the Nevada Department of Motor Vehicles to estimate the average weight of a vehicle traveling in the nonattainment area at 2.29 tons.

One major component of the equation is silt loading on paved road surfaces. To develop representative silt loading values for the equation, Clark County sampled 22 sites in 1999 and conducted quarterly sampling from 2002 through the first quarter of 2006 using the procedures outlined in AP-42 (EPA 1995, Appendix C.1). Silt loadings were collected on major arterials, minor arterials, collectors, and local roads, though not on freeways. The result was the largest body of silt loading data developed by any local air regulatory agency.

These data indicate that silt loading values have decreased since 2003, a trend that corresponds with the implementation of best construction practices in the *Construction Activities Dust Control Handbook* (DAQEM 2003). Consequently, Clark County did not include 1999 and 2002 silt loading values when determining the silt loading geometric mean by road type.

Table 8-1 provides average silt loading values by major road type. Silt loading data from quarterly sampling in 2003, 2004, 2005, and the first quarter of 2006 were used to calculate paved road dust emissions.

Table 8-1. Average Paved Road Silt Loading Values by Road Type

Road Type	Silt Loading Value (g/m^2)
Major arterial	0.29
Minor arterial	0.49
Collector	0.49
Local	1.65
Freeway	0.02[1]

[1]AP-42 default.

Once the silt loading values for each road type were determined, EFs were calculated for each sampled road using Equation 8-1. Table 8-2 lists the results. These EFs were then used to calculate paved road dust emissions for the nonattainment area.

Table 8-2. Average Paved Road EFs by Road Type

Road Type	EF (g/VMT)
Major arterial	0.761
Minor arterial	1.220
Collector	1.225
Local	3.671
Freeway	0.066

8.1.2 Vehicle Miles Traveled

VMT data were derived from RTC's Transportation Demand Model, a TransCAD model. The modeling area included the Las Vegas Valley, Boulder City, and the Apex industrial area. The newly updated TransCAD network also includes a southern stretch of I-15 from the Las Vegas Valley to the California/Nevada border.

TransCAD output data included link-level volumes (i.e., number of vehicles on each link); link lengths; roadway type for each link; and trip starts (origins) and ends (destinations) by traffic analysis zone. Link volumes were provided as a total for all vehicle classes, then the VMT for each link was calculated as the product of the link length and the volume. The output data included a roadway type designation for each link: interstate, other expressway/freeway, ramp, major arterial, minor arterial, collector, local, centroid connector, and external connector.

RTC performed TransCAD modeling for an average weekday. The model produced output for link-level daily volumes and volumes for seven time periods. Since Clark County used design-day total PM_{10} emissions in the rollback model, only daily volumes were used in this analysis. The RTC provided TransCAD output data for 2008 (base year), 2015 (mid year), and 2023 (future year).

Figure 8-1 is a map of the 2023 TransCAD network overlaid onto the 2008 network; the changes illustrated are mostly in the outskirts, with additional roadways posited in future years.

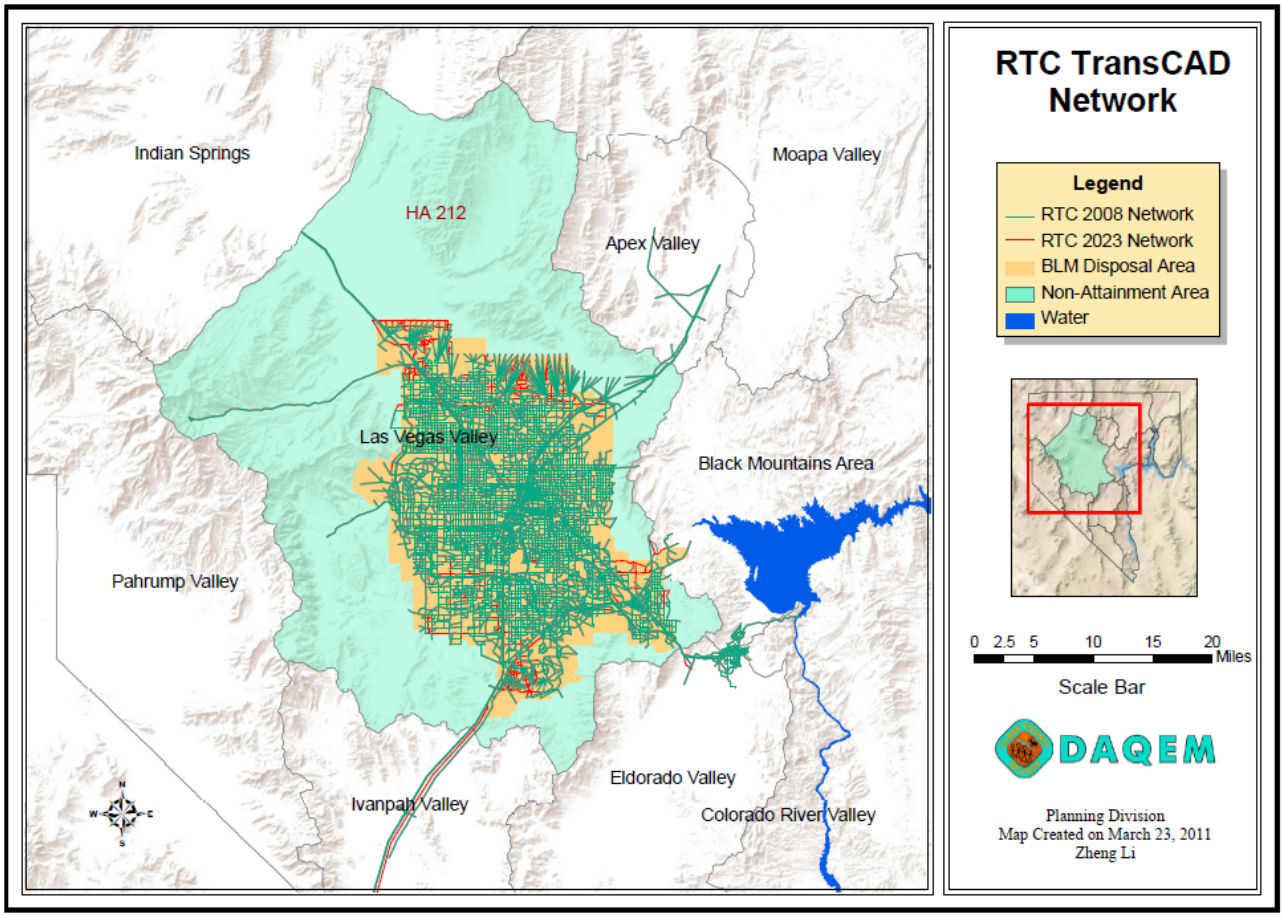

Figure 8-1. RTC Transportation Networks.

Figure 8-2 is a map of the current RTC network with the most congested roadways highlighted. These segments are along I-15 and Las Vegas Boulevard in the urban core, and on U.S. 95 from the curve at Rainbow Boulevard through the interchange with I-15. When these roadways are congested, more vehicles per mile travel at low speeds, resulting in higher emissions.

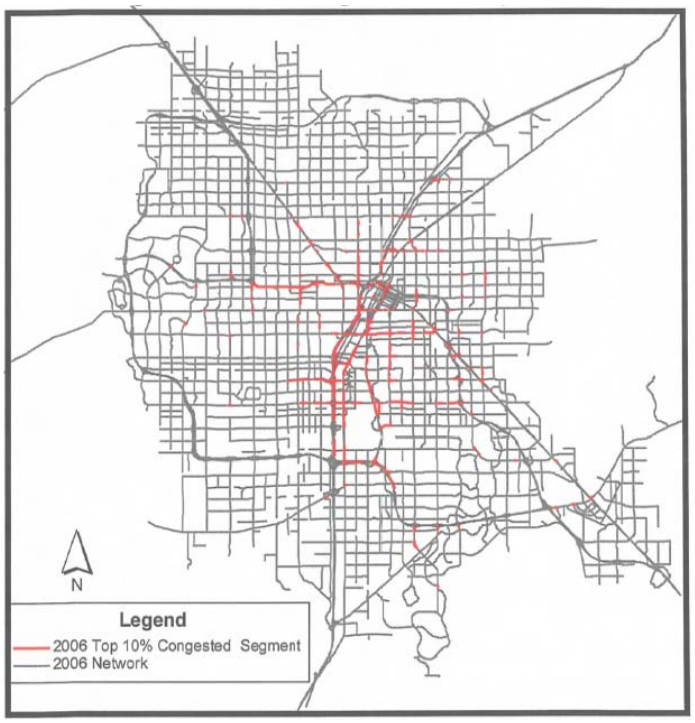

Figure 8-2. Most Congested Roadways in Las Vegas.

Two types of VMT adjustments provided by the RTC were applied. The first was to match link volumes to observed traffic counts by facility type. These adjustments varied by facility type (Table 8-3), but the same adjustments in each facility type were used for all years modeled.

The second adjustment was to bring the total traffic volume into agreement with the VMT reported through the FHWA Highway Performance Monitoring System (HPMS). This adjustment amounted to an increase of 9.9 percent applied to all roadway types for all years modeled.

Table 8-3. Adjustment Factors to Observed Traffic Counts by Facility Type

RTC Facility Type	Count Adjustment
External links	0.9891
System to system ramp	1.0250
Minor arterial	1.0862
Major arterial	0.9134
Service ramps	0.9869
Interstates	0.9091
Freeways	1.0524
Beltways, expressways	1.5628
Collectors	1.1053
Centroid	1.1053
Other local	1.1053

As Figure 8-1 illustrated, the RTC modeling area is larger than the PM_{10} nonattainment area. To calculate VMTs exactly within the nonattainment area, roadway segments outside the boundary were clipped. This process was performed again for the BLM disposal area to estimate VMTs within that boundary. Figure 8-3 shows the link segments corresponding to the two boundaries. Those in red are outside the nonattainment area, and those in purple are outside the BLM disposal area but inside the nonattainment area. The segments in green are inside the BLM disposal area.

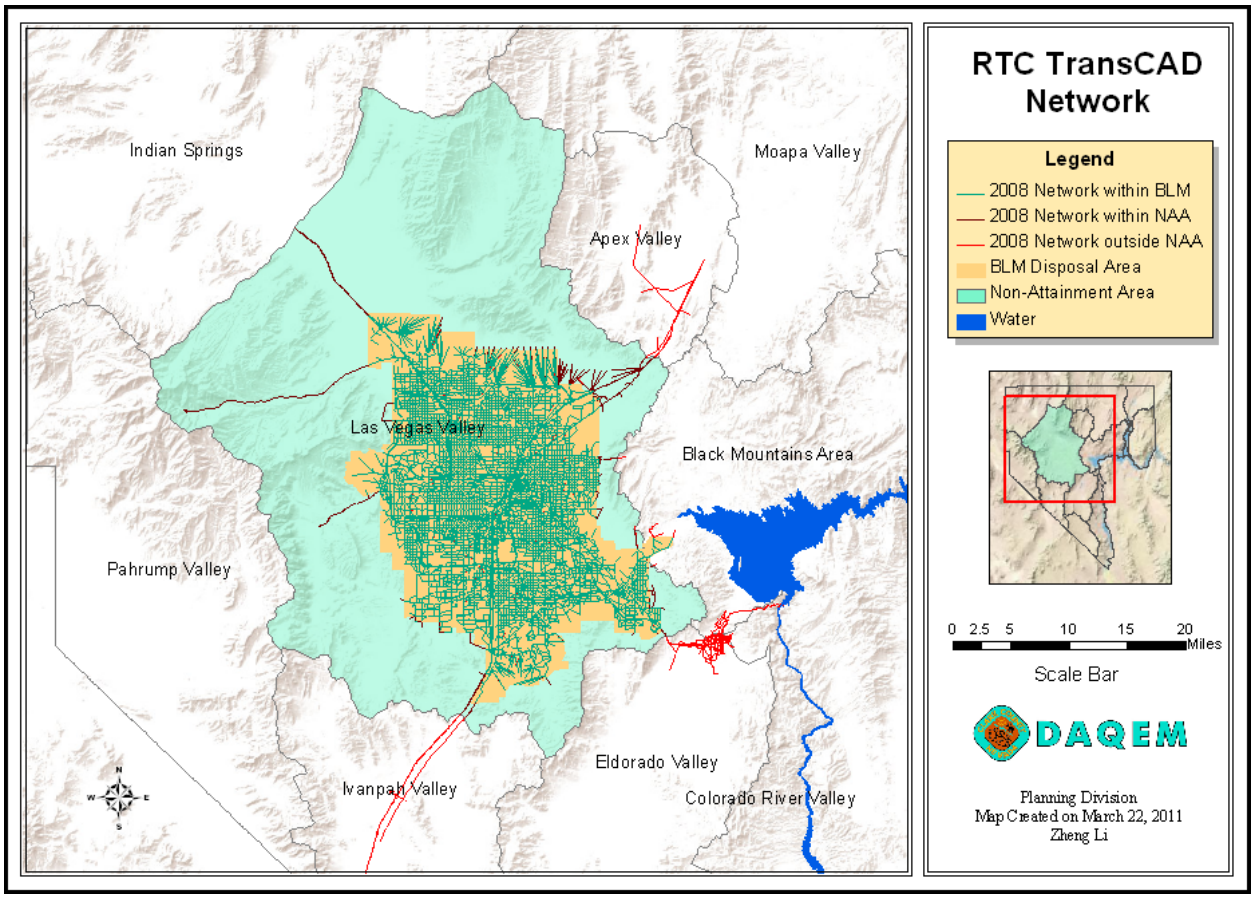

Figure 8-3. TransCAD Networks within the Nonattainment Area and the BLM Disposal Area.

Table 8-4 summarizes design-day VMTs by RTC road type and modeling year for both the nonattainment and BLM disposal areas. Since TransCAD only models average weekday traffic, VMTs were adjusted from annual weekday averages to April weekday averages using a factor of 0.985175, which is consistent with the monthly profile used for Clark County in EPA's Motor Vehicle Emissions Simulator (MOVES) model.

Table 8-4. Design Day VMT by Road Type

Facility Type	HA 212			BLM		
	2008	2015	2023	2008	2015	2023
External	107,706	133,486	156,095	4,774	6,214	7,203
System ramps	338,282	454,448	579,881	338,282	454,448	579,881
Minor arterials	5,027,503	7,105,076	9,923,921	5,038,589	7,114,231	9,935,431
Major arterials	13,296,527	15,782,407	18,973,903	13,272,545	15,751,866	18,921,494
Ramps	1,162,972	1,401,031	1,673,037	1,160,380	1,400,663	1,668,980
Interstates	7,905,429	9,410,350	11,892,020	7,459,766	8,795,559	10,922,316
Freeways	3,701,762	5,589,716	7,946,363	3,701,762	5,589,716	7,936,534
Beltway	701,699	620	1,179,148	701,699	620	1,179,148
Collectors	3,305,015	3,710,233	4,759,649	3,290,110	3,679,677	4,696,782
Centroid	3,382,942	4,185,642	5,398,166	3,379,877	4,166,655	5,375,906
Local roads	57,371	55,888	73,385	57,371	55,888	73,385
HOV lanes	194,857	857,654	1,181,179	194,857	857,654	1,181,179
Intrazonal	140,068	144,441	190,431	140,068	144,441	190,431
Transit bus	55,846	55,846	67,015	55,846	55,846	67,015
TOTAL	**39,377,980**	**48,886,838**	**63,994,191**	**38,795,925**	**48,073,477**	**62,735,685**

8.1.3 Paved Road Dust Emission Results

To calculate paved road dust emissions, the average EF by road type was mapped to each RTC road type. Paved road dust emissions were then calculated using the VMT multiplied by the average EF for the same road category. The resulting design-day emissions by road type, along with the VMT and EFs used in the calculations, are listed in Tables 8-5 (for the nonattainment area) and 8-6 (for the BLM disposal area).

Table 8-5. Paved Road PM_{10} Emissions for Nonattainment Area (HA 212)

Facility Type	VMT (Design Day)			EF (g/v-m)	Paved Road Emissions (tpd)		
	2008	2015	2023		2008	2015	2023
External connectors	107,706	133,486	156,095	1.220	0.14	0.18	0.21
System ramps	338,282	454,448	579,881	1.225	0.46	0.61	0.78
Minor arterials	5,027,503	7,105,076	9,923,921	1.220	6.76	9.55	13.34
Major arterials	13,296,527	15,782,407	18,973,903	0.761	11.16	13.25	15.92
Ramps	1,162,972	1,401,031	1,673,037	1.225	1.57	1.89	2.26

Facility Type	VMT (Design Day)			EF (g/v-m)	Paved Road Emissions (tpd)		
	2008	2015	2023		2008	2015	2023
Interstates	7,905,429	9,410,350	11,892,020	0.066	0.58	0.69	0.87
Freeways	3,701,762	5,589,716	7,946,363	0.066	0.27	0.41	0.58
Beltway	701,699	620	1,179,148	0.066	0.05	0.00	0.09
Collectors	3,305,015	3,710,233	4,759,649	1.225	4.46	5.01	6.43
Centroid connectors	3,382,942	4,185,642	5,398,166	1.225	4.57	5.65	7.29
Other local roads	57,371	55,888	73,385	3.671	0.23	0.23	0.30
Hov lanes	194,857	857,654	1,181,179	0.066	0.01	0.06	0.09
Intra-zonal	140,068	144,441	190,431	3.671	0.57	0.58	0.77
Transit bus	55,846	55,846	67,015	3.671	0.23	0.23	0.27
TOTAL	**39,377,980**	**48,886,838**	**63,994,191**		**31.1**	**38.3**	**49.2**

Table 8-6. Paved Road PM_{10} Emissions for BLM Disposal Area

Facility Type	VMT (Design Day)			EF (g/v-m)	Paved Roads Emissions (tpd)		
	2008	2015	2023		2008	2015	2023
External connectors	4,774	6,214	7,203	1.220	0.01	0.01	0.01
System ramps	338,282	454,448	579,881	1.225	0.46	0.61	0.78
Minor arterials	5,038,589	7,114,231	9,935,431	1.220	6.77	9.56	13.36
Major arterials	13,272,545	15,751,866	18,921,494	0.761	11.14	13.22	15.88
Ramps	1,160,380	1,400,663	1,668,980	1.225	1.57	1.89	2.25
Interstates	7,459,766	8,795,559	10,922,316	0.066	0.54	0.64	0.80
Freeways	3,701,762	5,589,716	7,936,534	0.066	0.27	0.41	0.58
Beltway	701,699	620	1,179,148	0.066	0.05	0.00	0.09
Collectors	3,290,110	3,679,677	4,696,782	1.225	4.44	4.97	6.34
Centroid connectors	3,379,877	4,166,655	5,375,906	1.225	4.56	5.63	7.26
Other local roads	57,371	55,888	73,385	3.671	0.23	0.23	0.30
Hov lanes	194,857	857,654	1,181,179	0.066	0.01	0.06	0.09
Intrazonal	140,068	144,441	190,431	3.671	0.57	0.58	0.77
Transit bus	55,846	55,846	67,015	3.671	0.23	0.23	0.27
TOTAL	**38,795,925**	**48,073,477**	**62,735,685**		**30.9**	**38.0**	**48.8**

Paved road dust emission estimates for the BLM disposal area are slightly smaller than estimates for the nonattainment area because of a few link segments that are outside the BLM boundary but inside the nonattainment area (Figure 8-3). Both estimates show increases of about 58 percent from 2008 to 2023 because of VMT growth; however, Equation 8-1 produces much lower paved road dust EFs than previous AP-42 equations.

8.2 Vehicle Emission Estimates with MOVES

As recommended in AP-42, PM_{10} emissions from vehicle exhaust, brake wear, and tire wear were estimated using EPA's MOVES model (EPA 1995, p. 13.2.1-4). MOVES can be used to estimate exhaust and evaporative emissions, as well as brake and tire wear emissions, from all types of on-road vehicles. Clark County ran the most current version of the model, MOVES2010a, with the option to estimate design-day PM_{10} emissions from on-road vehicles for the base year (2008) and future years (2015 and 2023) in the PM_{10} nonattainment area and the BLM disposal area.

8.2.1 Model Input

Clark County developed county-specific MOVES input data by following EPA's technical guidance document (EPA 2010). MOVES uses different input options and formats from the previous model, MOBILE6.2; however, EPA has developed utility tools to convert some MOBILE6.2 input to MOVES input. These programs were used to generate some of the MOVES input for Clark County, such as vehicle age distribution and VMT mix profiles. NDOT provided 2008 vehicle registration data by model year and vehicle type, which were used to generate vehicle age distributions and vehicle population inputs.

MOVES categorizes vehicle types into 13 source use types, similar to the classification system used in HPMS. EPA's utility tools were used to convert MOBILE6.2 inputs, which were based on 28 vehicle types, to MOVES-required inputs, which are based on 13 source use types. Table 8-7 shows the correlations between MOVES and HPMS.

Table 8-7. MOVES Source Use Type and HPMS Vehicle Class

Source Type ID	Source Type Name	HPMS Vehicle Type ID	HPMS Vehicle Type
11	Motorcycle	10	Motorcycle
21	Passenger car	20	Passenger cars
31	Passenger truck	30	Other 2 axle-4 tire vehicles
32	Light commercial truck	30	Other 2 axle-4 tire vehicles
41	Intercity bus	40	Buses
42	Transit bus	40	Buses
43	School bus	40	Buses
51	Refuse truck	50	Single unit trucks
52	Single unit short-haul truck	50	Single unit trucks
53	Single unit long-haul truck	50	Single unit trucks
54	Motor home	50	Single unit trucks
61	Combination short-haul truck	60	Combination trucks
62	Combination long-haul truck	60	Combination trucks

Local hourly temperature and relative humidity data are required inputs for SIP modeling with MOVES. Table 8-8 shows the design-day meteorological data used for maintenance plan modeling.

Table 8-8. Design-Day Meteorological Observations at McCarran International Airport

Hour	Temperature (F)	Relative Humidity (percent)
1	73.0	11
2	71.1	12
3	71.1	14
4	69.1	18
5	68.0	17
6	68.0	18
7	68.0	16
8	70.0	13
9	70.0	14
10	73.0	11
11	75.0	9
12	75.9	8
13	78.1	8
14	78.1	8
15	80.1	6
16	80.1	6
17	79.0	5
18	78.1	5
19	75.9	6
20	70.0	8
21	68.0	8
22	66.0	7
23	64.0	6
24	63.0	8

Default fuel parameters in the MOVES model were carefully reviewed and determined to be appropriate. Both gasoline and diesel sulfur levels are required to meet EPA requirements for low sulfur content. In the default MOVES database, sulfur levels for gasoline in Clark County were set at 32 parts per million (ppm) for 2008, and 27 ppm for 2012 and later; sulfur levels for diesel fuel were set at 43 ppm for 2008, and 11 ppm for 2012 and later. The market share of ethanol blend in April was about 70 percent in 2008, and is expected to be 100 percent after 2012. Nevada caps the fuel Reid vapor pressure (RVP) in Clark County at 9.0 pounds per square inch (psi), with a 1.0-psi waiver for ethanol-blended fuels. The default April RVP values in Clark County were set at 9.2 psi for 2008, and 9.7 psi for 2012 and later.

Another important input for MOVES is information on vehicle inspection and maintenance programs. In the Las Vegas Valley, the state inspection and maintenance program requires an annual two-speed idle test for 1995 and older vehicles, and on-board diagnostics checks (exhaust and evaporative) for 1996 and newer vehicles. This information was incorporated into MOVES modeling.

Activity data for each source use type category, such as VMT and vehicle population, are required inputs for MOVES. As Section 8.1.2 explains, VMT estimates were drawn from the RTC Trans-CAD model. MOVES also requires annual VMT by HPMS source type. To obtain this, the VMT values in Table 8-4 were converted to annual VMT, then the EPA utility tools were used to generate annual VMT by HPMS source type. Tables 8-9 and 8-10 show the results.

Table 8-9. Annual VMT by HPMS Source Type within HA 212

HPMS Source Type ID	2008	2015	2023
10	66,110,486	81,396,081	103,154,172
20	6,853,380,344	8,482,316,754	11,091,285,588
30	6,325,392,387	7,830,016,112	10,245,780,820
40	57,639,413	71,204,565	93,197,392
50	98,339,829	122,257,612	163,393,303
60	305,123,933	382,230,129	516,591,828
TOTAL	**13,705,986,392**	**16,969,421,253**	**22,213,403,102**

Table 8-10. Annual VMT by HPMS Source Type within BLM Area

HPMS Source Type ID	2008	2015	2023
10	66,098,727	81,363,931	103,098,393
20	6,776,941,797	8,374,773,445	10,924,869,043
30	6,245,787,248	7,718,550,824	10,073,483,422
40	56,513,797	69,680,233	90,845,426
50	91,358,757	112,804,418	148,829,679
60	266,695,052	329,921,537	435,435,645
TOTAL	**13,503,395,378**	**16,687,094,388**	**21,776,561,608**

The source type population data came primarily from NDOT's vehicle registration database. Adjustments were made based on further data obtained from the RTC, the Clark County School District, and local refuse haulers. Source type population estimates for combination short-haul and long-haul trucks were based on VMT and the ratio of the MOVES default population to VMT by source type. Clark County assumed that the source type population in the BLM disposal area is about the same as in the nonattainment area, i.e., approximately 95 percent of the total source type population of Clark County. Table 8-11 lists the source type populations used in the model.

Table 8-11. Clark County Source Type Population within PM_{10} Nonattainment Area

MOVES Source Use Type ID	2008	2015	2023
11	33,214	37,024	42,627
21	939,429	1,047,182	1,205,664
31	168,644	187,987	216,437
32	57,820	64,452	74,206
41	392	437	503
42	715	724	869
43	1,425	1,588	1,829
51	525	586	674
52	16,336	18,210	20,966
53	1,158	1,290	1,486
54	901	1,004	1,156
61	4,048	4,893	5,172
62	3,566	4,665	5,397
TOTAL	**1,228,174**	**1,370,042**	**1,576,986**

8.2.2 Model Output

Table 8-12 shows the design-day PM_{10} vehicle emissions estimated from MOVES2010a. Only emissions for the BLM area were used for rollback modeling in the PM_{10} maintenance plan.

Table 8-12. Clark County On-road Mobile Source Design-Day PM_{10} Emissions (tpd)

Emission Type	HA 212			BLM		
	2008	2015	2023	2008	2015	2023
Exhaust	1.830	0.918	0.660	1.754	0.888	0.642
Brake wear	1.032	1.272	1.639	1.028	1.267	1.632
Tire wear	0.299	0.370	0.482	0.295	0.365	0.474
TOTAL	**3.161**	**2.560**	**2.781**	**3.077**	**2.520**	**2.748**

9.0 NON-ROAD MOBILE EMISSIONS

Non-road mobile equipment includes types that either move under their own power or can be moved from site to site. EPA recommends the NONROAD model to estimate emissions for common non-road sources, since it contains EFs and default county-level population and activity data. The latest model version is NONROAD2008a.

The NONROAD model estimates emissions for more than 80 basic and 260 specific types of nonroad equipment. It does not include commercial marine, locomotive (Section 6), or aircraft emissions. The model arranges equipment into the following categories, using horsepower (hp) rating and fuel type:

- Airport ground support (e.g., terminal tractors)
- Agricultural equipment (e.g., tractors, combines, balers)
- Construction equipment (e.g., graders, backhoes)
- Industrial and commercial equipment (e.g., forklifts, sweepers)
- Recreational vehicles (e.g., all-terrain vehicles, off-road motorcycles)
- Residential and commercial lawn & garden equipment (e.g., leafblowers, snowblowers)
- Logging equipment (e.g., shredders, large chain saws)
- Recreational marine vessels (e.g., power boats)
- Underground mining equipment
- Oil field equipment.

The NONROAD model incorporates the effects of promulgated federal regulations, including the latest Tier 4 emissions standards for non-road compression-ignition engines and low-sulfur non-road diesel fuel. The equation for estimating these emissions in the model is:

(Eq. 9-1) Emissions = (Pop)(Power)(LF)(A)(EF)

where

Pop = engine population
Power = average power (hp)
LF = load factor (fraction of available power)
A = activity (hrs/yr)
EF = emission factor (g/hp-hr)

The NONROAD model incorporates default estimates, variables, and factors for use in calculations. All are in model input files and can be changed by the user if data more appropriate to the local area are available. No local data were available for Clark County, so model defaults were used. The

model does, however, require users to define certain parameters, such as temperature and fuel specification.

The NONROAD 2008a model was used to estimate design-day non-road PM_{10} emissions for the base year (2008), midrange year (2015), and future year (2023). Table 9-1 lists the parameters used in the model runs for Clark County. To calculate the sulfur-level parameters, inputs of 30 ppm for gasoline and 15 ppm for diesel were used for all modeling years. The model internally incorporates fleet turnover effects (as old engines are replaced by new ones subject to stricter controls, engine type EFs decrease over time). Increases in emissions from population growth are incorporated within the model.

Table 9-1. Input Parameters for NONROAD2008a

Parameter	2008	2015	2023
Fuel RVP for gas (psi)	9.18	9.74	9.74
Oxygen weight	2.47%	3.5%	3.5%
Gas sulfur	0.0030%	0.0030%	0.0030%
Diesel sulfur	0.0015%	0.0015%	0.0015%
Marine diesel sulfur	0.0015%	0.0015%	0.0015%
CNG/LPG sulfur	0.0030%	0.0030%	0.0030%
Minimum temperature (ºF)	63	63	63
Maximum temperature (ºF)	80.1	80.1	80.1
Average temperature (ºF)	72.2	72.2	72.2
Regional altitude	LOW	LOW	LOW
Market share of ethanol blends	70.5%	100%	100%
Volume of ethanol	10%	10%	10%

Tables 9-2 and 9-3 show emission estimates for the nonattainment and BLM disposal areas based on NONROAD 2008a outputs for Clark County. Because the NONROAD model can only provide emissions rates for the entire county, Clark County calculated the population differences between the county and nonattainment areas and adjusted the model accordingly. Airport ground support equipment estimates were ignored because they are included in the point source airport EIs (Section 3). Emissions from the "Pleasure craft" category were also ignored, since Lake Mead and Lake Las Vegas are outside the nonattainment area.

Table 9-2. Nonattainment Area Design-Day Non-road PM_{10} Emissions Estimates (tpd)

Equipment Type	2008	2015	2023
Agricultural	0.0049	0.0032	0.0016
Airport	0	0	0
Commercial	0.1204	0.1029	0.0821
Construction & mining	2.5982	1.8105	0.7889
Industrial	0.0752	0.0452	0.0194
Lawn & garden - commercial	0.7943	0.8565	0.9327
Lawn & garden - residential	0.0539	0.0600	0.0666
Logging	0	0	0
Pleasure craft	0	0	0
Railroad	0.0019	0.0015	0.0009
Recreational	0.0991	0.0781	0.0487
TOTAL	**3.75**	**2.96**	**1.94**

Table 9-3. BLM Disposal Area Design-Day Non-road PM_{10} Emissions Estimates (tpd)

Equipment Type	2008	2015	2023
Agricultural	0.0049	0.0032	0.0016
Airport	0	0	0
Commercial	0.1200	0.1026	0.0819
Construction & mining	2.5912	1.8056	0.7868
Industrial	0.0750	0.0450	0.0194
Lawn & garden - commercial	0.7921	0.8542	0.9302
Lawn & garden - residential	0.0537	0.0599	0.0664
Logging	0	0	0
Pleasure craft	0	0	0
Railroad	0.0019	0.0014	0.0009
Recreational	0.0988	0.0779	0.0486
TOTAL	**3.74**	**2.95**	**1.94**

10.0 EMISSION REDUCTION CREDITS

ERCs may be granted, upon request and under strict guidelines, to a source that voluntarily reduces emissions beyond required levels of control. ERCs may be sold, leased, banked for future use, or traded in accordance with applicable regulations. However, once used to offset emissions, the credits are permanently retired.

ERCs are intended to provide an incentive for sources to reduce emissions, which promotes a market-based approach to regulating air pollution. Both the Nevada Division of Environmental Protection (NDEP) and Clark County have authority to bank ERCs in Clark County. NDEP has jurisdiction over permitting, compliance, and ERC banking for specific electric steam-generating emission units within Clark County. All other units in Clark County are under the jurisdiction of Clark County.

NDEP reported no banked ERCs for Clark County sources under its jurisdiction. Table 10-1 lists the amount of PM_{10} ERCs currently banked for Clark County sources under Clark County jurisdiction.

Table 10-1. PM_{10} ERCs Banked in Clark County

Banking Authority	Component	tpy	tpd
Clark County	ERC Balance for PM_{10} in HA 212	112.48	0.31

There are no pending ERC applications at either Clark County or NDEP. For the emissions analysis, all banked PM_{10} ERCs were put into both inventory years of 2015 and 2023.

11.0 REFERENCES

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