8-HOUR OZONE EARLY PROGRESS PLAN FOR CLARK COUNTY, NEVADA

June 2008

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Executive Summary

This *Early Progress Plan* provides the basis for establishing early transportation conformity budgets for the Clark County, Nevada, 8-hour ozone nonattainment area. Clark County was designated in nonattainment of the 8-hour ozone standard in April 2004. The Phase 1 Implementation Rule issued by the U.S. Environmental Protection Agency (EPA) on June 15, 2004, classified Clark County as a "basic" nonattainment area under Subpart 1 of the Clean Air Act. Clark County was an attainment area for the previous 1-hour ozone standard.

Following the April 2004 designation, the state of Nevada submitted to EPA a request to reconsider the boundaries of the nonattainment designation for Clark County. The county Department of Air Quality and Environmental Management and the Desert Research Institute carried out an assessment of ozone air quality in Clark County through extensive data analysis and review of other relevant information. The state recommended more appropriate boundaries based on an evaluation of numerous scientific criteria, while emphasizing the boundaries would be under continuous review during the implementation plan process. EPA accepted the Nevada recommendations and issued a final rule in September 2004 delineating those boundaries.

On December 22, 2006, the United States Court of Appeals for the District of Columbia Circuit vacated the Phase 1 Implementation Rule; EPA and other entities petitioned for a rehearing. On June 8, 2007, the court reviewed its decision and decided to vacate only certain portions of the rule, including the classification determinations for areas designated under Subpart 1 of the Clean Air Act. Following the court's decision, EPA issued a memorandum (dated 6/15/2007) stating that nonattainment areas classified under "Subpart 1 are not currently subject to the June 15, 2007 submission date for their attainment demonstrations." These actions have obligated Clark County to develop an early progress plan to obtain transportation conformity budgets.

EPA established a transportation conformity rule allowing states in nonattainment to submit an early progress plan containing early motor vehicle emission budgets that address the ozone standards in advance of a complete attainment demonstration. Early budget submittals do not need to demonstrate attainment, but must show some progress consistent with adopted control measures and projected emissions. Progress is demonstrated if projected emissions by the June 15, 2009 attainment date (2008 ozone season) are less than emissions in the 2002 base year.

The conformity budgets in Table E-1 include the emission estimates calculated for 2008; Appendix A contains the data tables and graphs. The 2008 budget will be used to demonstrate conformity.

Table E-1. Motor Vehicle Emissions Budgets for Clark County

Precursors (tons/day)	2002 Base	2003 Base	2008 Attainment
Volatile organic compounds	70.1	69.4	64.2
Nitrogen oxides	103.1	100.4	76.1

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ACRONYMS AND ABBREVIATIONS

Acronyms

AGL	above ground level
APU	auxiliary power unit
BCC	Clark County Board of County Commissioners
BEIS3	Biological Emissions Inventory System, version 3
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
DAQEM	Clark County Department of Air Quality and Environmental Management
DRI	Desert Research Institute
EDMS	Emissions and Dispersion Modeling System
EGU	emissions generating unit
EI	emissions inventory
EPA	U.S. Environmental Protection Agency
EQM	Environmental Quality Management, Inc.
FR	*Federal Register*
GSE	ground support equipment
HAP	hazardous air pollutant
I/M	inspection and maintenance (program)
NAAQS	National Ambient Air Quality Standards
NDOT	Nevada Department of Transportation
NO_x	nitrogen oxides
OBD	Onboard Diagnostics
PM	particulate matter
RTC	Regional Transportation Commission of Southern Nevada
SIP	state implementation plan
VMT	vehicle miles traveled
VOC	volatile organic compounds

Abbreviations

hp	horsepower
km	kilometers
kW	kilowatts
lb	pound
ppm	parts per million
mph	miles per hour
tpd	tons per day
tpy	tons per year

1.0 INTRODUCTION

1.1 PURPOSE

The *8-Hour Ozone Early Progress Plan for Clark County, Nevada*, establishes motor vehicle emission budgets for use in determining the transportation conformity of the Clark County non-attainment area. Clark County is filing this plan to receive conformity budgets in response to the ruling of the United States Court of Appeals for the District of Columbia Circuit on the U.S. Environmental Protection Agency's (EPA's) Phase 1 Implementation Rule for the 8-hour ozone National Ambient Air Quality Standard (NAAQS). The vacating of the rule by the D.C. District Court delayed Clark County's ability to obtain transportation conformity budgets through the state implementation plan (SIP) process; therefore, Clark County is submitting this early progress plan to obtain approval of those budgets. This plan is not required or intended to demonstrate attainment of the ozone NAAQS.

To complete the plan in accordance with EPA guidance, the Clark County Department of Air Quality and Environmental Management (DAQEM) inventoried 2002 emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) and projected those emissions outward for 2003 and 2008. The inventories were adjusted to reflect federal and local rules on VOC and NO_x emissions that have already been adopted or implemented. These controls were more than sufficient to reduce overall emissions by the desired amounts and to offset emissions growth projected between 2002 and 2008.

1.2 DESIGNATION/CLASSIFICATION FOR THE OZONE STANDARD

In July 1997, EPA replaced the 1-hour ozone NAAQS of 0.12 parts per million (ppm) with an 8-hour standard of 0.08 ppm. Although EPA had designated Clark County a nonattainment area for ozone in 1978, the county was in compliance with the 1-hour NAAQS in 1997 because of air quality planning and regulatory programs it had carried out to achieve and maintain attainment.

EPA implemented the new 8-hour ozone NAAQS through the Phase I Implementation Rule, which became effective on June 15, 2004. This rule designated all of Clark County a "basic" nonattainment area under Subpart 1 of the Clean Air Act (CAA); however, the state of Nevada submitted additional information and a request that EPA reconsider the boundaries of the nonattainment area. With the help of Nevada's Desert Research Institute (DRI), DAQEM carried out an assessment of ozone air quality in Clark County through extensive data analysis and review of other relevant information. In a report to EPA, the state recommended more appropriate boundaries based on an evaluation of numerous scientific criteria. It emphasized the boundaries would be continually reviewed for appropriateness during the SIP process. EPA accepted the state's recommendations and issued a final rule in September 2004 delineating the revised boundaries.

Figure 1 shows the areas within Clark County designated as basic nonattainment for the 8-hour ozone standard:

- Ivanpah Valley (Hydrographic Areas 164A, 164B, 165, and 166)
- Eldorado Valley (Hydrographic Area 167)

- Las Vegas Valley (Hydrographic Area 212)
- Colorado River Valley (Hydrographic Area 213)
- Paiute Valley (Hydrographic Area 214)
- Apex Valley (Hydrographic Areas 216 and 217)
- A portion of Moapa Valley (Hydrographic Area 218).

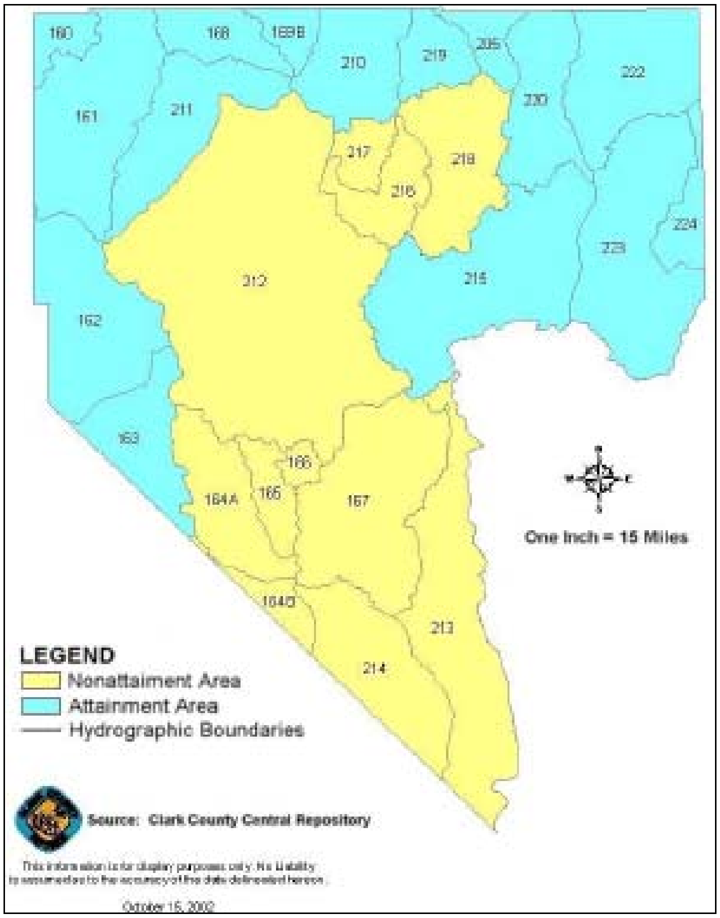

Figure 1-1. Areas in Clark County Designated Nonattainment for the 8-hour Ozone NAAQS.

On December 22, 2006, the D.C. Circuit Court vacated the Phase 1 Implementation Rule. EPA and other organizations filed petitions for a rehearing. On June 8, 2007, the court reviewed its decision to vacate the entire rule and decided to vacate only certain portions, including the classification determinations for areas designated under Title I, Part D, Subpart 1 of the CAA. Following the court's decision, EPA issued a memorandum (dated 6/15/2007) stating that nonattainment areas classified under "Subpart 1 are not currently subject to the June 15, 2007 submission date for their attainment demonstrations." These actions have obligated Clark County to develop an early progress plan for ozone to obtain transportation conformity budgets.

1.3 HISTORY OF AIR QUALITY PLANNING AND OZONE REGULATORY PROGRAMS IN CLARK COUNTY

On March 3, 1978, EPA designated the Las Vegas Valley a nonattainment area for the ozone NAAQS. Air quality monitoring data for calendar years 1975 through 1977 showed violations of the 1-hour ozone NAAQS in effect at that time. In March 1978, Nevada's governor designated the Clark County Board of County Commissioners (BCC) the responsible entity for preparing SIPs for Clark County. At that time, the Air Pollution Control Division in the Clark County Health District was primarily responsible for the implementation of air pollution control measures and technologies.

On February 8, 1979, the 1-hour ozone NAAQS was revised from 0.08 ppm to 0.12 ppm. After EPA's determination that the Las Vegas Valley was a nonattainment area for ozone, improved control technologies to curb precursor pollutants were implemented for targeted industries. Research activities during this period had indicated that industrial processes within Clark County were contributing to elevated ozone levels. By the end of 1984, control technologies were fully implemented and Clark County had completed a SIP demonstrating attainment of the ozone NAAQS.

In January 1985, the Nevada governor submitted the ozone SIP for the Las Vegas Valley to EPA for review and approval. This SIP demonstrated attainment of the 1-hour ozone NAAQS, in accordance with EPA requirements and federal law. In April 1986, the state of Nevada requested that EPA designate the Las Vegas Valley an attainment area for ozone. The request included documentation that implementing control measures and technologies had resulted in improved air quality and compliance with the ozone NAAQS. EPA fully approved the SIP in August 1986, and on November 19, 1986, it designated the Las Vegas Valley as an attainment area for the 1-hour ozone NAAQS effective January 20, 1987.

Clark County, in coordination with the Health District and other entities (including EPA), has continued researching ozone air pollution and implementing control strategies to maintain compliance with the NAAQS. On June 21, 2001, the governor designated the BCC as the air pollution control agency for Clark County. The BCC formally accepted the governor's designation at its July 3, 2001, meeting and directed staff to carry out the actions necessary to transfer air pollution control authority from the Health District to Clark County.

1.4 AGENCY RESPONSIBILITIES

Clark County, through the BCC, is the entity responsible for developing SIPs to demonstrate attainment and maintenance of national air quality standards in Clark County. The county works closely in this effort with other local governments and agencies, including the City of Las Vegas, the City of North Las Vegas, and the City of Henderson. Intergovernmental coordination with the Regional Transportation Commission of Southern Nevada (RTC), the Nevada Department of Transportation (NDOT), and other local and state agencies is an integral part of developing SIPs and other required plans.

In August 2001, the BCC established two committees comprised of local stakeholders to address air quality challenges and solutions: the Executive Advisory Committee (EAC) and the Technical Advisory Committee (TAC). The EAC consists of representatives from local governments and agencies throughout southern Nevada and from key state agencies. Its mission is to:

- Provide input on policy issues to the BCC and the director of DAQEM.
- Discuss and recommend solutions to conflicts, challenges, or policy issues relating to air quality programs in Clark County.
- Ensure that local governments and state or local agencies have an opportunity to provide input regarding all concerns, challenges, and progress in the development and implementation of air quality programs in Clark County.

The TAC consists of representatives from local and state governments, as well as private-sector stakeholders. Its mission is to:

- Provide input on technical and policy issues to the BCC and EAC.
- Provide recommendations and assistance to DAQEM staff.

A subcommittee of the TAC, the Ozone Working Group, was established in April 2004 to guide ozone research activities and SIP development. The group includes stakeholders from both the public and private sectors. DAQEM staff members coordinate closely with the Ozone Working Group in building consensus on research programs to characterize ozone air quality in southern Nevada, in developing protocols for ozone air quality modeling, and in identifying and implementing emission control programs for ozone precursor pollutants.

1.5 CONFORMITY

The CAA requires that federal actions conform to a SIP—more specifically, that actions or activities do not:

- Cause or contribute to any new violation of any standard in any area.
- Increase the frequency or severity of any existing violation of any standard in any area.
- Delay timely attainment of any standard or required interim emission reductions, or any other milestones in any area.

To implement this requirement, EPA issued rules to govern how conformity determinations are conducted for two categories of actions/activities: (1) those dealing with transportation plans, programs, and projects (“transportation conformity”), and (2) all other actions, e.g., projects requiring federal permits (“general conformity”).

Transportation conformity requirements become effective one year after an area is designated “nonattainment.” Local and state transportation and air quality officials must coordinate planning efforts to ensure that transportation projects, such as road construction, do not hinder an area’s ability to reach its clean air goals. During the period after conformity requirements have been triggered but before final transportation conformity budgets have been established, interim emission tests must be passed to show conformity. Alternative interim tests include:

1. Demonstrating that planned-build scenarios for key years of transportation plans do not result in increased emissions when compared to no-build scenarios for those years.
2. Comparing area-wide on-road emission estimates for key years in transportation plans to base year emission levels (i.e., 2002) to ensure transportation plans do not increase emissions.

Prior to development of an attainment SIP or Reasonable Further Progress Report, areas may first develop an Early Progress Plan to establish state and/or local "early" conformity budgets at a level consistent with progress toward attainment and to demonstrate that transportation plans do not exceed those budgets.

For the purposes of transportation conformity, the emissions budget is essentially a cap on the total emissions allocated to on-road vehicles. Projected regional emissions based on a transportation plan, transportation improvement program, or project may not exceed the motor vehicle emissions budget (or cap) contained in the appropriate SIP. Emissions in years for which no emissions budgets are specifically established must be less than or equal to the budget established for the most recent prior year.

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2.0 CLARK COUNTY

2.1 AIR QUALITY DETERMINANTS IN CLARK COUNTY

2.1.1 General

Clark County, formed in 1909, totals more than 8,000 square miles in area. Most residents live in the Las Vegas Valley, a 600-square-mile basin at the southern tip of the county and state. The valley has been the fastest growing area in the nation for the past 20 years; in addition to averaging 5,000 new residents a month, Las Vegas hosts nearly 40 million visitors each year. This rapid population growth, and the accompanying development, has led to increased emissions of pollutants into the atmosphere; ozone concentrations in Clark County have approached (and sometimes exceeded) the 8-hour ozone NAAQS in the last decade.

2.1.2 Topography and Geography

Nevada's mountain ranges delineate 256 separate hydrographic areas, which both channel and block air pollution transport around the state. Figure 2-1 illustrates the extremely complex topography surrounding the Las Vegas Valley.

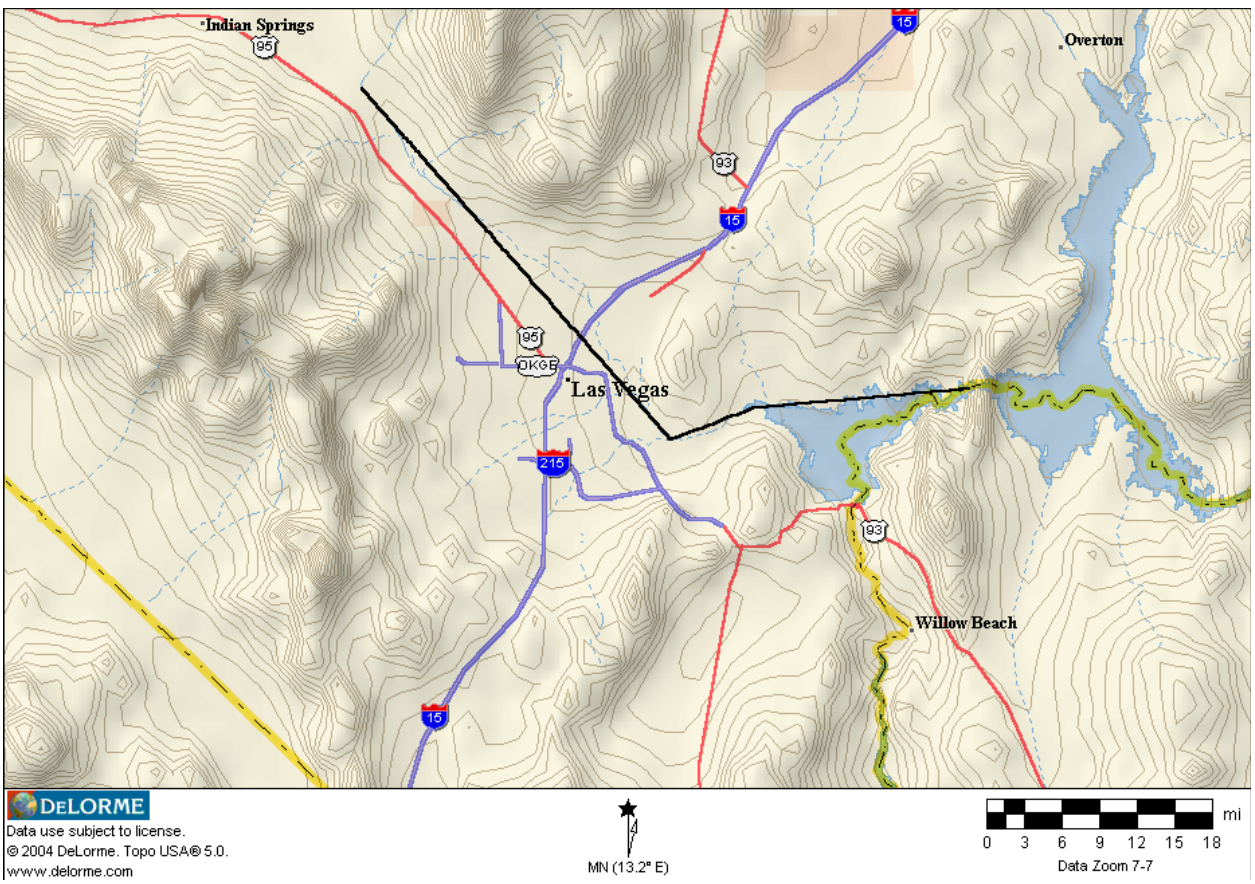

Figure 2-1. Topographical Map of Clark County.

The valley's longitudinal axis runs from northwest to southeast, and surrounding mountains rise between 2,000 and 10,000 feet above the basin floor. To the west, the Spring Mountain Range separates the Las Vegas Valley from the Pahrump and Sandy valleys. In the north, the Las Vegas Valley opens northwest toward Indian Springs and northeast toward Moapa. The Sheep Range forms the northern boundary for the valley; Boulder City and the Lake Mead National Recreation Area form the southern boundary. The Las Vegas Wash channels drainage in the Las Vegas Valley, both hydrological and meteorological, into Lake Mead.

Figure 2-2 shows the location of urban centers in Clark County. The major roadways of I-15 and U.S. Highway 95 follow the lowlands, and continue through natural passes between the Las Vegas Valley and neighboring valleys. The I-15 corridor, especially the southwest segment leading into California, can be a large source of ozone precursor pollutants. Channeled flows along this natural topographic corridor may exchange pollutants in both directions between the Ivanpah, Las Vegas, and Dry Lake valleys.

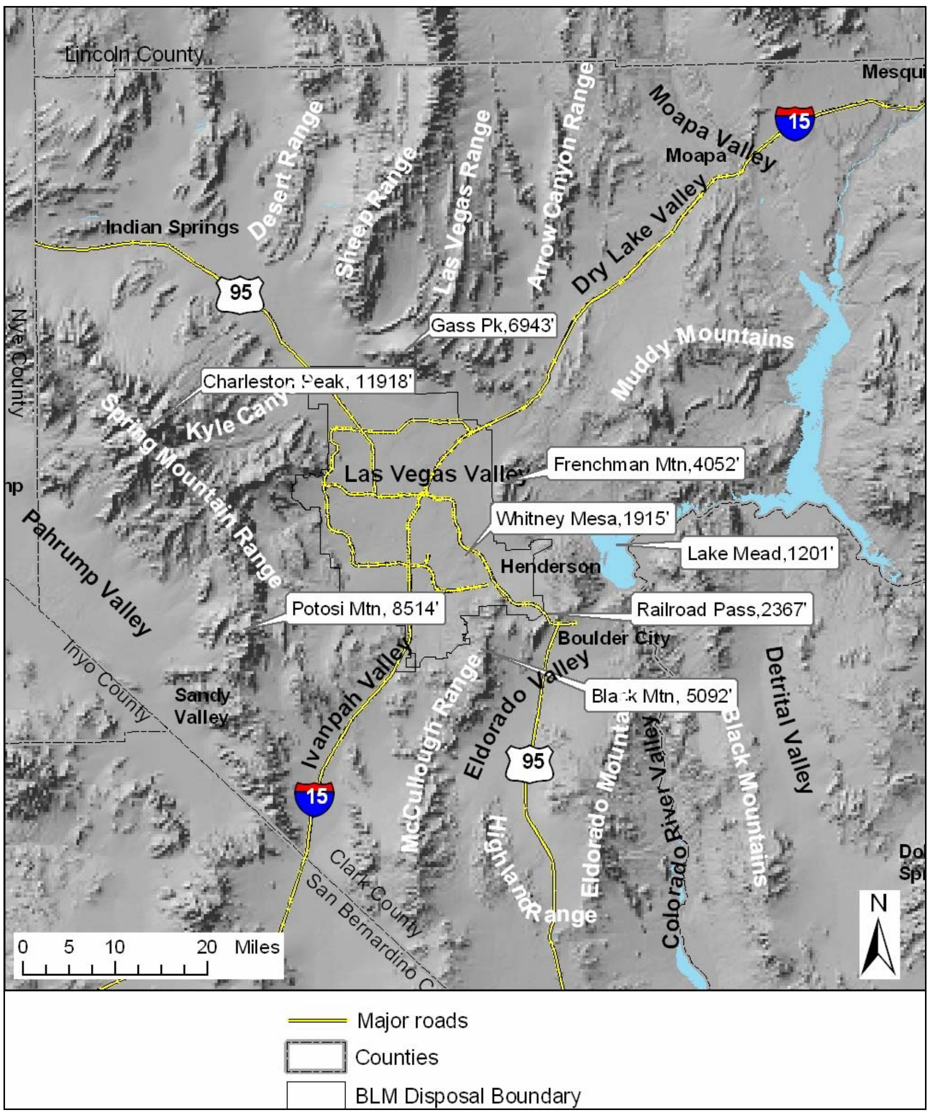

Figure 2-2. Urban Centers in Clark County.

2.1.3 Climate

Although located in the Mojave Desert, Clark County has four well-defined seasons. Summers display the classic characteristics of the desert Southwest: daily high temperatures in the lower elevations often exceed 100ºF, with lows in the 70s. The summer heat is usually tempered by low relative humidity, which may increase for several weeks during July and August in association with moist monsoonal wind flows from the south. This is the most common period for thunderstorms in the valley, which can result in flash flooding.

Temperatures during the spring and fall are generally moderate. Strong winds are the most persistent weather hazard: although winds higher than 50 miles per hour (mph) are infrequent, they sometimes happen during vigorous storms.

Winters are generally mild and pleasant. Afternoon temperatures average 60ºF, and the sky is normally clear and sunny. Snow accumulation on valley floors is rare; however, higher elevations, such as the Spring Mountains, typically receive 5-10 feet of snowfall annually. Based on measurements from McCarran International Airport over the past thirty years, temperatures fall below 32ºF an average of 24 days a year.

Average annual rainfall in the valley, measured at McCarran International Airport, is approximately 4.5 inches. Table 2-1 lists temperature and rainfall averages in Clark County over the last three decades.

Table 2-1. Monthly Averages for Temperature and Rainfall (1971-2000)

Month	Maximum (°F)	Minimum (°F)	Average (°F)	Rainfall (inches)
January	57.1	36.8	47.0	0.59
February	63.0	41.4	52.2	0.69
March	69.5	47.0	58.3	0.59
April	78.1	53.9	66.0	0.15
May	87.8	62.9	75.4	0.24
June	98.9	72.3	85.6	0.08
July	104.1	78.2	91.2	0.44
August	101.8	76.7	89.3	0.45
September	93.8	68.8	81.3	0.31
October	80.8	56.5	68.7	0.24
November	66.0	44.0	55.0	0.31
December	57.3	36.6	47.0	0.41
Annual Average	**79.9**	**56.3**	**68.1**	**4.49**

Source: National Weather Service Forecast Office.

Local meteorology and general weather patterns in the Southwest affect the valley's air quality. Stagnant conditions and low wind speeds can build up concentrations of ozone and precursor pollutants in the valley; winds from the southwest or west can transport ozone and other pollutants into Clark County. Wind speed and direction affect ozone levels in different areas at different times, and complex terrain features influence local flows within, into, and out of neighboring basins. High wind events can generate widespread areas of blowing dust and sand, although winds from summer thunderstorms tend to be more isolated and localized than winds in winter or spring.

2.1.4 Population

More than 95 percent of Clark County's population resides in the Las Vegas Valley (Hydrographic area 212), which encompasses the cities of Las Vegas, North Las Vegas, and Henderson, along with portions of Boulder City. Communities outside the valley have experienced significant growth in the last 20 years, including Mesquite, located on the county's northeastern edge, and Laughlin, located on the Colorado River at the county's southern end. Appendix A contains Clark County population projections for future years. Table 2-2 provides data on population growth in Clark County from 1990 to 2004.

Table 2-2. Clark County Population History (1990-2004)

Year	Population	Annual Population Change	Annual Percent Increase
1990	770,280	—	—
1991	835,080	64,800	8%
1992	873,730	38,650	5%
1993	916,837	43,107	5%
1994	990,564	73,727	8%
1995	1,055,435	64,871	7%
1996	1,119,052	63,617	6%
1997	1,193,388	74,336	7%
1998	1,261,150	67,762	6%
1999	1,327,145	65,995	5%
2000	1,394,440	67,295	5%
2001	1,485,855	91,415	7%
2002	1,549,657	63,802	4%
2003	1,620,748	71,091	5%
2004	1,715,337	94,589	6%

Source: Center for Business and Economic Research, UNLV

2.1.5 Development Patterns

More than 90 percent of the land in Clark County is owned by federal agencies and restricted for use. The U.S. Bureau of Land Management has the largest holdings, including the Red Rock National Conservation Area west of Las Vegas. Most of the Spring Mountain Range, including Mt. Charleston, is administered by the U.S. Forest Service as part of the Toiyabe National Forest.

Urbanized land is concentrated in the Las Vegas Valley and includes the cities of Las Vegas, Henderson, and North Las Vegas, as well as unincorporated areas of Clark County. These communities contain the highest population densities and corresponding roadway networks. Traffic volumes are increasing every year due to population growth and development.

Although pollutant emissions from mobile and area sources in Clark County originate primarily in the Las Vegas Valley, areas outside the valley contain significant industrial sources of pollution. The Apex Valley, located 20 miles northeast of Las Vegas, is home to the Apex Industrial

Park. Power plants such as the Reid Gardner facility near Moapa and the Mohave Generating Station in Laughlin are significant sources of NO_x.

2.2 OZONE

2.2.1 Ozone and Precursor Pollutants

Ozone (O_3) is a gas composed of three oxygen atoms that occurs both in Earth's upper atmosphere (stratosphere) and at ground level (troposphere). Ozone in the stratosphere, which extends upward from 6 to 30 miles, occurs naturally and protects life from the sun's harmful ultraviolet rays. In the troposphere, ozone is a pollutant that poses a significant health risk, especially for asthmatics, children, and the elderly. Ozone at ground level may also damage crops, trees, and other vegetation.

Ground-level ozone is not usually emitted directly into the air, but formed through chemical reactions between NO_x and VOCs in the presence of sunlight. Vehicle exhaust, emissions from commercial and industrial sources, gasoline vapors, chemical solvents, and natural sources emit NO_x and VOCs. Since sunlight is an important factor, ozone pollution is usually a summertime problem.

Ozone and its precursor pollutants may be transported hundreds of miles downwind from their original sources. In Clark County, transport of pollutants from California into southern Nevada contributes to ozone concentrations during the summer months.

2.2.2 Health and Environmental Impacts of Ground-Level Ozone

Ozone can irritate lung airways and cause lung inflammation that resembles a sunburn. Other symptoms include wheezing, coughing, pain when taking a deep breath, and difficulty breathing during exercise or outdoor activities. Those with respiratory problems are particularly susceptible, but even healthy people who are active outdoors can be affected by high ozone levels.

Repeated exposure to ozone pollution for several months may cause permanent lung damage. Children and others who are active outdoors in the summer are particularly at risk. Even when ozone concentrations are low, pollution may trigger aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses like pneumonia and bronchitis.

Ground-level ozone may also affect plants and ecosystems. It interferes with the ability of plants to produce and store food, which makes them more susceptible to disease, insects, other pollutants, and harsh weather. This in turn can impact crop and forest yields. In addition, ozone can damage the leaves of trees and other plants.

2.2.3 National Ambient Air Quality Standards

Two sections of the CAA govern the establishment, review, and revision of the NAAQS. Section 108 directs the EPA administrator to identify certain pollutants that "may reasonably be anticipated to endanger public health or welfare" and issue air quality criteria that accurately reflect the latest scientific knowledge regarding their effects on public health or welfare. Section 109 directs the EPA administrator to propose and promulgate NAAQS for these pollutants. EPA has accordingly set standards for six common "criteria pollutants": ozone, particulate matter (PM), carbon monoxide (CO), nitrogen dioxides, sulfur dioxides, and lead. The CAA established two types of national standards for each pollutant:

1. **Primary standards** establish limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly.
2. **Secondary standards** set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Section 109 also requires EPA to conduct a periodic review and, if appropriate, revise the standards. EPA promulgated a new ozone NAAQS in 1997 to provide increased protection to the public, especially children and other at-risk populations. The standard was set at 0.08 ppm, with a form based on the three-year average of the annual fourth-highest daily maximum 8-hour average concentration measured at each monitor in a specified area.

On March 12, 2008, EPA adopted a revision to the ozone NAAQS effective May 27, 2008. The revised standard was set at 0.075 ppm, with a form based on the three-year average of the annual fourth-highest daily maximum eight-hour average concentration measured at each monitor in a specified area. The primary and secondary standards are identical. EPA will issue new nonattainment designations in 2010, so Clark County does not have any SIP or plan requirements under the revised NAAQS at this time. This Early Progress Plan therefore addresses the provisions of the 1997 NAAQS.

2.2.4 Ozone Air Quality in Clark County

The CAA requires that Clark County develop and operate an ambient monitoring program as an integral part of its effort to attain and maintain the ozone NAAQS. Title 40, Part 58 of the Code of Federal Regulations (40 CFR 58) describes the specific monitoring requirements. Clark County has supported an ongoing ambient air quality monitoring program for all six criteria pollutants since 1978. Table 2-3 contains ozone data for 2005 to 2007, and Figure 2-3 shows the locations of ozone monitoring stations around Clark County. In accordance with federal regulations, air quality monitoring stations are sited to reflect population exposure and the likeliest locations for the highest ozone concentrations given development patterns, topography, and local and regional meteorology. Two stations sample for NO_x, J.D. Smith and Joe Neal. DAQEM does not routinely sample for VOC concentrations.

Table 2-3. Fourth Highest 8-hour Ozone Reading and Average, 2005-2007

Station	AIRS #	2005	2006	2007	Average
Apex	32-003-0022	0.078	0.082	0.081	**0.080**
Boulder City	32-003-0601	0.078	0.074	0.076	**0.076**
Craig Road	32-003-0020	0.083	0.079	0.075	**0.079**
Henderson	32-003-0007	0.077	0.076	0.078	**0.077**
J.D. Smith Middle School	32-003-2002	0.082	0.081	0.080	**0.081**

Table 2-3. Fourth Highest 8-hour Ozone Reading and Average, 2005-2007 (cont.)

Station	AIRS #	2005	2006	2007	Average
Jean	32-003-1019	0.083	0.079	0.083	**0.081**
Joe Neal Elementary	32-003-0075	0.087	0.081	0.081	**0.083**
Lone Mountain	32-003-0072	0.089	0.085	0.080	**0.084**
Mesquite	32-003-0023	0.072	0.069	0.065	**0.068**
Orr Middle School	32-003-1021	N/A	0.085	0.076	**0.080**
Paul Meyer Park	32-003-0043	0.080	0.083	0.083	**0.082**
Palo Verde High	32-003-0073	0.088	0.084	0.080	**0.084**
Walter Johnson Jr. High	32-003-0071	0.088	0.085	0.085	**0.086**
Winterwood	32-003-0538	0.079	0.078	0.076	**0.077**

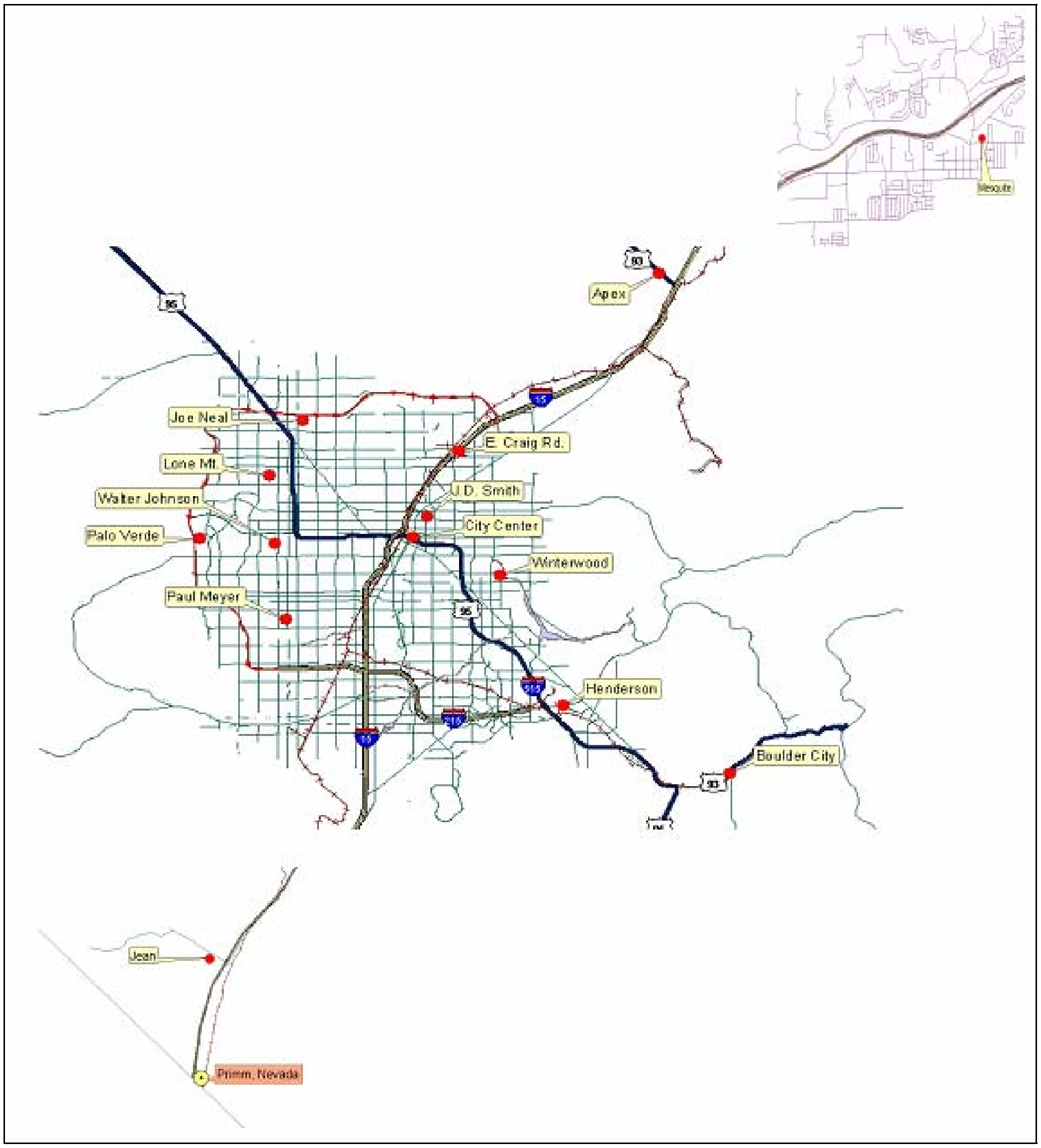

Figure 2-3. Clark County Ozone Monitoring Stations.

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3.0 CONTROL MEASURES

3.1 EMISSION REDUCTION STRATEGIES

EPA has identified four fundamental principles to which control strategies must adhere in order to achieve desired emissions reductions:

1. Emissions reductions ascribed to control measures must be quantifiable and measurable (*quantifiable*).
2. The control measures must be enforceable, in that the state must show it has adopted legal means for ensuring that sources are in compliance with the control measures (*enforceable*).
3. Measures must be replicable (*real*).
4. The control strategies must be permanent, in that the SIP must contain provisions to track emissions changes at sources and provide for corrective actions if emissions reductions are not achieved according to the plan (*permanent*).

In addition to these four EPA principles, Clark County will follow several other strategies:

1. All adopted federal controls that have been or will be implemented by 2007 will be used in base, future, and control case modeling.
2. Voluntary measures will play a supporting role, but if voluntary emission reductions are quantified and credit is taken, those emission reductions will be enforceable.
3. Additional strategies will be implemented to meet quantified reduction requirements if voluntary measures fail. This will be true for all quantified emission reductions.
4. Local emission reduction strategies will be designed and implemented by the community with stakeholder participation.
5. Local emission reduction strategies will be incorporated by the county.

3.2 FEDERAL CONTROL MEASURES

In addition to local control measures, several federal actions have produced or will produce substantial ozone precursor emission reductions inside and outside Clark County (Table 3-1). These actions are aimed at reducing both local emissions and transport of ozone into Clark County. When combined with the local control program, these measures should lower ozone concentrations close to the level of the 8-hour ozone standard (Table 3-2).

Table 3-1. Federal Control Measures

Federal Measures	
Source Category	**Description**
Area Source Measures	**Federal Consumer and Commercial Products Rules** 40 CFR 59: "National Volatile Organic Compound Emission Standards for Consumer and Commercial Products" (compliance required by 12/1998). **Reformulated Architectural and Industrial Maintenance Coatings** 40 CFR 59, Subpart D: "National Volatile Organic Compound Emission Standards for Architectural Coatings." **Auto Body Refinishing** 40 CFR 59, Subpart B: "National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings."
On-road Measures	**Onboard Vehicle Vapor Recovery** 59 FR 16262 (4/6/1994) and 40 CFR 86, 88, and 200: Onboard refueling emissions controls for passenger cars and light-duty trucks (e.g., pickups, minivans, and most delivery and utility vehicles). **Tier 2 Vehicle Emission Standard** 40 CFR 80, 85, and 86: Air pollution; Tier 2 motor vehicle emission standards and gasoline sulphur control requirements; diesel fuel quality controls. **Heavy-duty Diesel Engine Rule** 40 CFR 85 and 86: Emissions control; air pollution from 2004 and later model year heavy-duty highway engines and vehicles; light-duty on-board diagnostics requirements. **National Low Emission Vehicle Standards** 40 CFR 9, 85, and 86: Control of air pollution from new motor vehicles and new motor vehicle engines; state commitments to national low emission vehicle program.
Non-road Measures	**Small Spark-Ignition Handheld Engines** 40 CFR 90 and 91: Phase 2 emission standards for new non-road spark-ignition handheld engines at or below 19 kilowatts; emissions standards for marine spark-ignition engines. 65 FR 24268 (4/25/2000): Minor amendments to emission requirements applicable to small spark-ignition engines and marine spark-ignition engines. **Tier 3 Heavy-Duty Diesel Equipment** 40 CFR 89: "Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines" **Locomotives** 40 CFR 85, 89, and 92: Emission standards for locomotives and locomotive engines (63 FR 18978, 4/16/1998). **Compression Ignition Standards** 40 CFR 89: "Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines." **Emissions from Non-Road Large Spark-Ignition Engines and Recreational Engines** 40 CFR 89: "Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines" (marine and land-based). 57 FR 68242 (11/8/2002): Final rule. **Recreational Marine Standard** 40 CFR 89: "Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines."

CFR = Code of Federal Regulations; FR = Federal Register.

Table 3-2. Federal Control Measure Emission Reductions

Measure	Emissions Reductions
National Low Emission Vehicles Under this program, auto manufacturers have agreed to comply with tailpipe standards that are more stringent than EPA can mandate prior to model year 2004.	EPA estimated NLEVs would result in a reduction of as much as 185 lb/vehicle of VOCs and 186 lb/vehicle of NO_x over the lifetime of a passenger car.
Tier II Tailpipe standards are set at an average standard of 0.07 grams per mile of NO_x for all classes of passenger vehicles beginning in 2004. Vehicles weighing less than 6,000 lbs will be phased in to this standard between 2004 and 2007. Beginning in 2004, refiners and importers will have the flexibility to manufacture gasoline with a range of sulfur levels as long as all their production is capped at 300 ppm. By 2006, refiners will meet a 30-ppm average sulfur level, with a maximum cap of 80 ppm.	EPA estimates a 74% reduction in NO_x emissions nationwide, and a 79% reduction in Nevada.
Heavy-Duty Engine Standard A PM emissions standard of 0.01 grams per brake-horsepower-hour for new heavy-duty engines is scheduled to take full effect in the 2007 model year. In addition, refiners started producing diesel fuel with a sulfur content of no more than 15 ppm for use in highway vehicles beginning June 1, 2006.	The new standard represents a 50% reduction in NO_x from the 1998 and later model year standard, and EPA projects a reduction of 1.1 million tpy in ozone precursors due to the new standard.
Phase I & II Engine Standards Phase I emission standards for non-road, handheld and non-handheld engines operating at or below 19 kW took effect in model year 1997. Phase II standards for non-road, non-handheld Class I and II engines operating at or below 19 kW will be phased in beginning in model year 2002, and completed by 2007.	Expected VOC benefit = 30% reduction by 2005.
Standards for Diesel-Powered Engines A three-tiered process, beginning in 1996 and continuing through 2008, will increase emissions standards for non-road diesel-powered engines used for a variety of purposes, including construction and agriculture.	Expected NO_x benefit = 25% reduction in new engines by 2005.
Standards for Gasoline-Powered Marine Engines Outboard engine standards began in 1998 and will be phased in through 2006. Inboard standards were set in 2000. Auxiliary marine engines that operate at less than 25 hp were subject to emission standards beginning in 1997. A second phase of emission standards for these engines will be phased in between 2001 and 2005. Auxiliary engines that operate above 25 hp will have to meet the requirements for the same-sized land-based non-road spark-ignition engines.	Expected VOC benefit = 25% reduction in new engines by 2005.
Standards for Large Gasoline-Powered Engines A two-tiered standard, with Tier 1 beginning in 2004 and Tier 2 beginning in 2007, will regulate non-road gasoline-powered engines rated over 19kW.	Expected VOC benefit = 20% reduction by 2005. Expected NO_x benefit = 20% reduction by 2005.
Standards for Locomotive Engines A three-tiered emission standard for new or remanufactured locomotive engines was implemented in 1973, 2002, and 2005.	Expected VOC benefit = 30% reduction by 2005. Expected NO_x benefit = 30% reduction by 2005.

3.3 EXISTING LOCAL CONTROL MEASURES

The following control measures apply to Clark County's base year EI.

3.3.1 Stationary and Area Source Controls

As defined in Section 3.3, major point (stationary) sources in nonattainment areas are industrial, commercial, or institutional sources that emit actual levels of criteria pollutants at or above 10 tpy of VOCs, 25 tpy of NO_x, and 100 tpy of any other criteria pollutant. Any source that generates, or has the potential to generate, at least 10 tpy of any single HAP or 25 tpy of aggregate HAPs must also report emissions. As defined in Section 3.4, area sources are commercial, small-scale industrial and residential sources whose emissions fall below point source reporting levels, and which are too numerous or too small to identify individually.

Clark County has numerous control measures in place for stationary and area sources, notably Section 12 of the Clark County air quality regulations, "Preconstruction Review for New or Modified Stationary Sources." Clark County also regulates area sources, including gasoline-dispensing facilities, through the Stage II vapor recovery requirements in Section 52, "Gasoline Dispensing Facilities." Appendix B contains a complete description of Clark County air quality regulations.

3.3.2 On-road Mobile Source Inspection and Maintenance Program

The Clark County I/M program is documented in the *Carbon Monoxide State Implementation Plan: Las Vegas Valley Nonattainment Area, Clark County, Nevada* (CO SIP), which received county approval in August 2000 and EPA approval in September 2004. This program is classified as an EPA low enhanced I/M program and exceeds EPA's performance standard. The Clark County test stations network consists of 262 decentralized testing facilities: 94 (36 percent) are test-only and 168 (64 percent) are test-and-repair.

Vehicle emissions testing is required in the Las Vegas Valley (Hydrographic area 212) and a five-mile buffer zone around it. This includes Kyle and Lee Canyon roads, Blue Diamond, and Bonnie Springs. The only exceptions are vehicles based in Goodsprings and Jean, which are close to but outside the buffer zone.

Passenger cars and trucks must have an emissions test if they are:

1. Based in the urban areas of Clark County.
2. Gasoline-powered.
3. Diesel-powered with a gross vehicle weight up to 10,000 pounds.
4. 1968 model year or newer (new vehicles on their first and second registration are exempted; a test is required upon a vehicle's third registration).

The following vehicles are exempt from emissions testing:

1. New vehicles on their first or second registration.
2. Vehicles from 1967 or earlier model years.
3. Motorcycles and mopeds.

4. Vehicles based in remote areas of Clark and Washoe counties.
5. Vehicles based in all other Nevada counties.
6. Alternative-fuel vehicles.
7. Diesel vehicles with a gross vehicle weight of 10,001 pounds or greater.
8. Vehicles whose ownership/registration is being transferred, if the last test was conducted 90 days or less before the transfer.
9. Vehicles whose ownership/registration is transferred between husband and wife.
10. Vehicles whose ownership/registration is transferred between companies whose principal business is leasing vehicles, if there is no change in the lessee or operator of the vehicle.
11. Vehicles registered as Classic Rods or Classic Vehicles and driven 2,500 miles or less per year.

3.3.2.1 Gasoline-Powered Cars and Trucks

Beginning in 2003, the state of Nevada required that all 1996 and newer light-duty, gasoline-powered vehicles be inspected for emission compliance using the new On-Board Diagnostics II (OBD II) system. This system monitors emissions performance components to ensure that the vehicle runs as cleanly as possible. If a problem is detected, the system illuminates a warning light on the instrument panel and stores information about the malfunction so a repair technician can diagnose and fix the problem.

Model year 1996 and newer vehicles are required to meet EPA specifications for collection and transfer of emissions control data during each driving cycle. To obtain this data, a technician hooks up a cable on the emissions test analyzer to the Diagnostic Link Connector in the vehicle. If the vehicle's OBD system has detected a problem, it transmits this data to the analyzer during the OBD test and the vehicle fails the inspection. The Vehicle Inspection Report will indicate which emissions control systems were checked and display the fault codes retrieved from the vehicle's computer. Model year 1995 and older vehicles are tested with the Two-Speed Idle test, which uses a tailpipe probe exhaust gas analyzer to measure HCs and CO while the vehicle is idling at low and high rates.

3.3.2.2 Light-Duty Diesel Cars and Trucks

Light-duty diesel vehicles with a manufacturer's Gross Vehicle Weight Rating of 10,000 pounds or less undergo testing on a dynamometer. The test includes an inspection for visible smoke and a visual inspection of emissions components.

3.4 LOCAL VOLUNTARY MEASURES

EPA adopted a policy to encourage the development of voluntary and emerging measures—i.e., approaches not typically approved in a SIP that may raise novel issues related to quantifiability and enforceability—by:

1. Providing some flexibility in meeting established SIP requirements for enforceability and quantification.
2. Providing a clear process by which new approaches can be developed and evaluated.
3. Establishing appropriate limitations to govern the conditions under which these new approaches can be applied.
4. Offering provisional pollutant reduction credit up front for attainment, reasonable further progress, rate of progress, or maintenance plan requirements to encourage the substantial investment required to implement many new pollutant reduction approaches.

A voluntary measure is an action by a source that will reduce emissions of a criteria pollutant or precursor, and that a state could claim as an emission reduction in its SIP, but that is not directly enforceable against the source. Some of Clark County's voluntary control measures are described below.

3.4.1 Ozone Action Days

The Ozone Action Days program is a voluntary initiative where DAQEM asks local residents to take additional preventive actions when high ozone levels are predicted. Because ground-level ozone forms under certain weather conditions, meteorologists can predict when concentrations may exceed health standards. On those days, DAQEM faxes an air quality message to media outlets, government agencies, and other Ozone Action Day participants. The department also makes Ozone Action Day messages and daily forecasts available to the public on its website. Clark County will not take credit for emissions reductions from this program in its ozone modeling; however, this program contributes to its clean-air efforts.

Simple actions that people can take to reduce air pollution on Ozone Action Days include:

- Refueling cars after dusk, and driving less.
- Putting off any painting until later.
- Avoiding aerosol consumer products.
- Mowing lawns with non-gas-powered mowers.
- Starting charcoal with an electric or chimney-type fire starter instead of lighter fluid.
- Using public transportation.
- Telecommuting.

3.4.2 Voluntary Vehicle Repair Program

The Voluntary Vehicle Repair Program is funded through a grant from the Emissions Control Program of the Nevada Department of Motor Vehicles. It provides eligible recipients up to $650 toward the repair of their vehicle after a $35 co-payment. An individual may be eligible to receive assistance through the Voluntary Vehicle Repair Program if:

- The vehicle is a high-emissions passenger car or light-duty truck that has failed a smog check.
- The vehicle is currently registered and operating in Clark County, Nevada.
- The vehicle is registered to the owner/participant.
- The repairs are not covered by a manufacturer's warranty.
- The estimated repairs do not exceed the vehicle's fair market value.
- The owner meets income eligibility requirements.

DAQEM started the program on June 1, 2006. As of September 17, 2007, the program had repaired 800 vehicles: 313 were non-OBD (pre-1996) and 307 were OBD (1996 and newer). The estimated reduction of HCs from non-OBD vehicles is 412 pounds a year per vehicle, or 64 tpy; the estimated reduction from OBD vehicles is 116 pounds a year per vehicle, or 18 tpy. Clark County will not take credit for emissions reductions from this program in its ozone modeling; however, this program contributes to its clean-air efforts.

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4.0 EMISSIONS INVENTORIES

4.1 INTRODUCTION

This section describes Clark County's compliance with the emissions inventory (EI) requirements of Section 107(d)(3)(E)(iii) of the CAA. EPA guidance requires the submittal of a comprehensive inventory of ozone precursor emissions (VOC and NO_x). The guidance establishes three requirements:

1. A comprehensive emission inventory of the precursors of ozone completed for the base year.
2. A demonstration that any improvement in air quality between the year the violations occurred and the attainment/progress year is based on permanent and enforceable emission reductions, not on temporary adverse economic conditions or unusually favorable meteorology.
3. Provisions for annual inventory updates to enable tracking of emission levels, including an annual emission statement from major sources.

The following sections address the three elements listed above and present the total NO_x and VOC emissions inventories for Clark County.

4.2 METHODOLOGIES

Following is an overview of the methodologies used to develop the base year and projected emissions inventories (see Appendix A for more detailed information).

4.2.1 Methodologies for Base Year Emissions Inventories

Point Sources. The point sources EI was prepared using actual emission reports from each point source. It includes sources with emissions equal to or greater than 10 tons per year (tpy) of VOCs or 25 tpy of NO_x.

Area Sources. The area sources EI was developed from calculations based on source category or group. With some exceptions, these EIs were calculated by multiplying an established factor (emissions per unit of activity) by the activity or surrogate generating the emissions. Population is the most common surrogate for many area source categories; other activity data include amount of gasoline sold in an area and employment by industry type.

Consumer Products. The consumer product EIs were developed from surveys conducted in Clark County and information obtained from the California consumer products program. These estimated VOC emissions from product source categories identified as being sold and used in Clark County in 2002 and 2003.

On-Road Mobile Sources. The inventories for on-road mobile sources were calculated using EPA's MOBILE6.2 model.

Non-road Mobile Sources. The inventories for non-road mobile sources were calculated using EPA's NONROAD 2005a model.

Biogenics. The biogenics EI was developed from satellite imaging, field biomass surveys, and computer modeling of plant species emission factors.

Locomotives. Locomotive EIs were developed using EPA emission standards for locomotive engines.

Military Emissions. Military EIs were compiled from military emission data.

Airport Emissions. Airport EIs were developed using version 4.2 of the Emission Dispersion Modeling System (EDMS 4.2) and the latest available data on commercial and general aviation.

4.2.2 Methodologies for Projected Emissions Inventories

The Economic Growth Analysis System (EGAS) is an EPA economic and activity forecast model that provides credible growth factors for developing projected EIs. It uses a three-tiered modeling system to generate surrogate growth indicators. The first tier includes available national economic forecasts, which drive the regional economic models that make up the second tier. The third tier estimates fuel consumption, physical output, and vehicle miles traveled (VMT) based on the second tier's regional economic forecasts. Growth factor models from EGAS version 5.0 helped develop projected EIs for point and area sources in Clark County.

Point Sources. Projected point source EIs were estimated by multiplying the appropriate Source Classification Code (SCC)-specific base year emissions by the appropriate EGAS growth factor for the state of Nevada in 2008. Retirement fractions (i.e., estimated percentage of the equipment population retiring each year) were adjusted to account for the 5-, 10-, or 15-year projections from the 2003 base year.

Electric Generating Units (EGUs). These were a key exception to the use of EGAS growth factors. Clark County assumed that all existing EGUs would grow to their individual capacity thresholds by 2008, but instead of projecting these emissions with EGAS growth factors, it obtained capacity threshold emissions for existing EGUs from the Western Regional Air Partnership's projected emissions for Nevada. These emissions were used for the 2008 projections for all existing EGUs. To account for facilities under construction, being permitted, or planned for the future, a number of EGUs and cement kilns were added to the inventories.

Area Sources. As with point sources, projected area source emissions were estimated by multiplying SCC-specific base year emissions by the appropriate EGAS growth factor for Nevada in 2008.

On-Road Mobile Sources. The projected on-road mobile source EI was developed using the EPA's MOBILE6.2 model. The projections account for all federal motor vehicle control programs scheduled to be in place by that year, including the effects of heavy-duty diesel vehicle offsets. Other emission reduction measures, such as low-sulfur gasoline and diesel fuels that reduce vehicle emissions, were also included.

Non-road Mobile Sources. The projected non-road EI was developed using EPA's NONROAD 2005a model. This includes standards for compression-ignition vehicles and equipment, spark-ignition off-road vehicles and equipment, Tier 3 heavy-duty diesel equipment, recreational marine standards, and handheld engine equipment.

Biogenics. The projected biogenics EI was developed from satellite imaging, field biomass surveys, and computer modeling of plant species emission factors.

Locomotives. The projected locomotives EI was developed using EPA emission standards for locomotive engines, applied by date of manufacture. Locomotive engines manufactured in 2005 and after are subject to Tier 2 standards. In 2008, the locomotive population will consist of both pre- and post-2005 diesel engines.

Military Emissions. Emissions cannot be projected because the future of military activities in Clark County is uncertain. Therefore, base case military EIs were applied to 2008 emission projections.

Airport Emissions. Airport emissions were projected using EDMS 4.2 and the latest available data on commercial and general aviation.

4.3 POINT SOURCES

In nonattainment areas, major point sources are defined (for inventory reporting purposes) as industrial, commercial, or institutional sources that emit actual levels of criteria pollutants at or above the following amounts:

- 10 tons tpy of VOCs.
- 25 tpy of NO_x.
- 100 tpy of any of the other criteria pollutants.

In attainment areas, any company that emits at least 100 tpy of any criteria pollutant must complete an EI. Any source that generates, or has the potential to generate, at least 10 tpy of any single hazardous air pollutant (HAP) or 25 tpy of aggregate HAPs must also report emissions.

In Clark County, a few subcategories of point sources produce the majority of ozone precursor emissions. The subcategories that produce the majority of NO_x point source emissions are commercial and industrial boilers, electrical generating plants, lime and cement manufacture, and military facilities. The subcategories that produce the majority of VOC point source emissions are petroleum storage and distribution, surface coating, and military facilities.

To collect emissions and operating information for these sources, DAQEM compiles data from all sources identified as having emissions that trigger the reporting requirements. Companies must report the previous year's type of emissions from all EGUs and emission points, as well as the amount of material used in processes that emit pollutants.

4.4 AREA SOURCES

Area sources are commercial, small-scale industrial and residential sources whose emissions fall below point source reporting levels, and which are too numerous or too small to identify individually. Area sources can be divided into two groups, characterized by emission mechanism: hydrocarbon evaporative emission sources and fuel combustion emission sources. Emissions are estimated based on the source category or group.

Evaporative loss emission sources include printing shops, industrial coatings, degreasing solvents, house paints, underground storage tanks, and vehicle refueling operations. Fuel combustion sources include stationary-source fossil fuel combustion at residences and businesses, as well as structural fires. With some exceptions, these emissions can be calculated by multiplying an established emission factor (emissions per unit of activity) by the appropriate activity/surrogate generating the emissions. Population is the most commonly used surrogate for many area source categories; other activity data include amount of gasoline sold in an area, employment by industry type, and acres of cropland. Airport ground operations, usually classified as an area source, are treated as a separate emissions source in Section 3.7.

4.5 NON-ROAD MOBILE SOURCES

Non-road mobile sources are a subset of the area source category. They include recreational boats, locomotives, and a broad category of off-highway equipment that covers everything from large earth-moving and construction equipment to lawn mowers. Emissions from non-road engine sources were calculated from information about equipment population, engine horsepower, load factor, emission factor, and annual usage. Estimates for all sources in the non-road category except aircraft, locomotives, commercial marine vessels, and diesel construction equipment were developed using EPA's NONROAD 2005a model; locomotive emissions were developed from fuel usage and track mileage data for individual railroads. Emissions were projected by running the non-road model for the required future years. Appendix A contains the detailed non-road mobile source EI.

4.6 ON-ROAD MOBILE SOURCES

On-road mobile sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on roadways. In developing the EI, DAQEM estimated combustion-related emissions for vehicle engine exhaust and evaporative hydrocarbon emissions for the fuel tank and other vehicle leak sources. Emission factors were developed using EPA's MOBILE6.2 model, which processed various inputs that simulated the vehicle fleet in the nonattainment area. Parameters included vehicle speed by roadway type, vehicle registration by vehicle type and age, percentage of vehicles in cold start mode, percentage of miles traveled by vehicle type, type of vehicle inspection/maintenance (I/M) program in place (where applicable), and gasoline vapor pressure. Roadway types were analyzed to determine travel speeds, another model parameter. Every effort was made to use parameters reflecting local conditions. The emissions factors from MOBILE6.2

were then multiplied by the level of vehicle activity, or by VMT, to obtain an on-road mobile source emissions estimate.

Federal Highway Performance Monitoring System data compiled for Clark County by NDOT produced the level of vehicle travel activity. VMT estimates used the RTC travel demand model, which estimates VMT associated with the transportation system as a whole. Inputs for this model include future population and employment estimates, spatially allocated by traffic serial zone. This allocation takes into account all regionally significant and new roads that will be open and operational in the time frame modeled, addressing development and the demand created by new roads (see Appendix A for more information).

4.7 AIRPORT OPERATIONS

This early progress plan treats airport emissions as a point source. Airport EIs were developed using EDMS, which the Federal Aviation Administration (FAA) developed in cooperation with the United States Air Force. EDMS is EPA's preferred guideline model for airport air quality analyses. It is used primarily to generate an EI from sources on and around an airport or air base and to calculate pollutant concentrations in the surrounding environment. The model estimated airport-related emissions in Clark County from the following sources:

- Aircraft at two mixing heights—3,000 feet and 6,535 feet above ground level (AGL)—for all facilities except Ivanpah Airport (modeled with a mixing height of 7,875 feet).
- Auxiliary power units (APUs).
- Ground support equipment (GSE).
- Ground access vehicles associated with movements on roadways and in parking lots.
- Power plants, incinerators, fuel tanks, surface coating facilities, and other point sources.

The following sections describe the methodologies and assumptions used to model emissions at all seven Clark County Airport System facilities. Appendix A contains the detailed airport EI.

4.7.1 Aircraft Emissions

Annual aircraft emissions are a function of the number of annual aircraft operations, expressed as landing and takeoff cycles; the aircraft fleet mix, i.e., types of aircraft used; and the length of time aircraft spend in each of the four EDMS modes of operation: takeoff, climb out, approach, and idle. EDMS treats the takeoff mode as the time from the start of the takeoff roll until an aircraft reaches 1,000 feet AGL. The climb-out mode begins at 1,000 feet AGL and ends when the aircraft reaches the mixing height. The default mixing height in EDMS is 3,000 feet, but the user can change it. The approach mode begins at the mixing height and ends when the descending aircraft reaches the ground. The idle mode is the sum of the landing roll time, the taxiing time, and the time an aircraft spends in the landing queue.

4.7.2 Auxiliary Power Units

Many large commercial aircraft are equipped with APUs. These small turbine engines generate electricity and compressed air to operate instruments, lights, and ventilation systems when the main aircraft engines are not operational, as when aircraft are parked at the gate. APUs also provide power for starting the main aircraft engines. Since they burn jet fuel, they create exhaust emissions.

4.7.3 Ground Support Equipment

GSE encompasses a wide range of vehicles that service aircraft. Examples include tugs that haul baggage carts and other equipment, fuel trucks, catering trucks and other service vehicles, and ground power units that provide electrical power to aircraft when they are parked and the engines are not running. The EDMS database includes default GSE assignments for each aircraft type, expressed in terms of total operating time by specific type of GSE per landing and takeoff cycle.

4.7.4 Ground Access Vehicles

Vehicle traffic on airport roadways, and in airport parking lots and garages, can be a significant source of airport emissions. EDMS was used to model on-site ground access vehicle trips at the county's seven airport facilities, as well as trips along airport roadway segments and in parking lots. It was assumed that the RTC regional travel demand model would account for aviation-related traffic off-site.

Vehicle trips associated with general aviation tenants and commercial (air tour) tenants at the North Las Vegas and Henderson Executive airports were estimated separately. Roadway traffic volumes for these airports in 2002 were based on Federal Aviation Administration operations summaries from the Clark County Department of Aviation and information in *2002 Airport Emissions Inventories, McCarran International, North Las Vegas, and Henderson Executive Airports.*

4.7.5 Airport Point Sources

Other airport emissions come from power generating and heating plants, incinerators, fuel storage tanks, and surface coating facilities. Therefore, point sources owned and controlled by the Department of Aviation were modeled in the EDMS and included in the airport EI.

4.8 BIOGENIC SOURCES

VOC emissions from plants (biogenic emissions) can have a substantial impact on regional air quality. Biogenic sources include crops, lawn grass, and forests, which produce isoprene, monoterpene, alpha-pinene, and other VOCs; soils produce a small amount of NO_x emissions as well. Like emissions from man-made sources (anthropogenic emissions), biogenic emissions react with oxidants in the atmosphere to promote ozone production. Biogenic emissions can even dominate anthropogenic emissions in some areas. Understanding the size and impact of biogenic emissions is crucial: a control strategy to reduce ozone by limiting anthropogenic emissions will be ineffective if biogenic emissions produce more ozone.

A comparison of biogenic emissions estimates to estimates of emissions from other categories (e.g., mobile sources) showed that biogenic VOC emissions represent a large portion of overall VOC emissions in Clark County. Conversely, biogenic NO_x emissions represent only a small fraction of overall NO_x emissions. Because biogenic emissions are beyond the scope of reasonable emission reduction measures, DAQEM assumed these emissions would remain the same and did not develop reduction measures.

Nevertheless, biogenic emissions are important in determining the overall emissions profile of an area. Global modeling of biogenics emissions requires estimates for all land types, including arid lands, but measurements for arid regions such as Clark County have only recently entered the literature. This lack of knowledge complicated efforts to model the impact of biogenic VOCs on ozone concentrations in Clark County, resulting in a model estimate that biogenic emissions in the Las Vegas Valley were four times higher than anthropogenic emissions.

To address this discrepancy, DAQEM contracted with Environmental Quality Management, Inc. (EQM) to develop a locally specific biogenic EI. EQM selected 22 native plant types in rural parts of the county, and adopted 9 urban plant classifications to represent the Las Vegas area. It carried out site surveys to identify dominant plant species and area coverage in many different land-use categories, and added a "barren" category to account for open spaces in the desert between vegetation. EQM used these categories to assign land-use designations and combinations to more than 19,000 modeling grids covering Clark County, each measuring one square kilometer. In general, the isoprene, monoterpene, and other VOC emissions modeled using the county-specific land-use designations were about 50 percent lower than the model's default biogenics emissions. NO_x emissions were somewhat higher on both an annual and episodic basis.

Clark County also contracted with DRI and the National Center for Atmospheric Research to evaluate the accuracy of Clark County's biogenic emissions model, version 3 of the Biogenic Emissions Inventory System (BEIS3). Their evaluation noted three areas of weakness:

1. The biogenics EI relied on plant-specific emissions factors from the BEIS3 modeling framework. Since no BEIS3 emissions factors exist for many of the desert species in Clark County, most of the modeling domain was assigned to the generic "shrub grass" category.
2. The biogenics EI used the standard BEIS3 emission algorithms, which need adjustment for desert plants. Many desert species are drought deciduous—for instance, bursage (*Ambrosia dumosa*), a significant species in Clark County, is physiologically inactive in the summer. The BEIS3 algorithms did not account for this dormancy.
3. The biogenics survey was based on a RECON Environmental, Inc. land cover database that considered only spatial coverage, not foliar densities. The inventory used default foliar densities from the BEIS3 modeling framework, which are not appropriate for desert ecosystems. Other data sources have better estimates of species densities.

DRI compared the EQM land characterization data with new data from the Southwest Gap Regional Analysis Project and conducted biogenic VOC emissions measurements on desert plant species. The National Center for Atmospheric Research provided a beta EI based on existing defaults in the Model of Emissions of Gases and Aerosols from Nature (i.e., MEGAN) and a final EI based on MEGAN model estimates, measured emission factors, and species information from the completed surveys. Appendix A details the results of these studies.

4.9 WILDFIRE EMISSIONS ESTIMATES

Wildfires can contribute significantly to high ozone days and NAAQS exceedances: they create emissions of primary particles and secondary formations of particulates and ozone that affect downwind areas. Smoke from wildfires contains high levels of ozone precursor pollutants (NO_x and VOCs). Local conditions may transport this ozone into urban areas, increasing background levels.

In the summer of 1995, northwest Canada suffered several large forest fires. East Coast and Southeastern states monitored increased levels of ozone and other pollutants. A study conducted by the American Association for the Advancement of Science found that “forest fires influenced the buildup of ozone episodes in the Southeastern United States by increasing background air pollution,” and that during these episodes, “regional background ozone concentrations were elevated by 10 to 20 ppb.”[1] After reviewing the data from these studies, EPA concluded that wildfire smoke could increase ozone precursors and transport ozone, so it might be a contributing factor on some high ozone days.

In 2005, Clark County contracted with Technical and Business Systems, Inc. to perform a major ozone study comprised of several elements (Appendix C). This contractor was conducting aircraft measurements of high-level ozone transport when two large wildfires broke out in June. Intensive Operation Period monitoring was in effect during the fires because forecasters had predicted that conditions in the last part of June would be conducive to the occurrence of high ozone events in Clark County. The first event began on June 23, 2005, and was caused by a wildfire near the town of Goodsprings, 20 km southeast of Las Vegas. The second event, which took place on June 29 and 30, was caused by wildfires in southern California and southern Utah that inundated Clark County with smoke. The June 29-30 event was associated with widespread exceedances of the 8-hour ozone standard throughout Clark County, with concentrations as high as 0.108 ppm. These are some of the highest readings ever recorded in the region.

Preliminary data analysis showed an apparent relationship between wildfire smoke and ozone concentrations that seemed to depend on the age of smoke plume constituents. As in an urban plume, reactants in a smoke plume titrate ambient ozone; therefore, while ozone levels near the wildfire may at first be lower than background levels, they rise higher than background levels as the plume ages. The June 23 Goodsprings fire produced a plume that did not have time to progress very far in converting precursor pollutants to ozone because it started so close to the Las Vegas Valley. However, the association of higher ozone concentrations with smoke plumes was more clearly demonstrated during aircraft measurements taken on July 1, as the smoke started to clear after the June 29-30 wildfires. For these measurements, an aircraft was equipped with a

[1] Trainer & Wotawa (2000).

portable light-scattering PM_{10} analyzer as well as an ozone monitor. The measurements clearly showed an increase in measured ozone concentrations as the aircraft encountered the remnants of the smoke plume, indicated by a corresponding increase in PM_{10} concentrations.

Determining the role wildfire smoke plays in causing ozone exceedances remains a critical goal in DAQEM's study of ozone formations in Clark County. Additional analysis of surface PM_{10}, $PM_{2.5}$, VOC, and NO_y concentrations may better define these smoke events and their correlation with ozone concentrations.

Although they can vary wildly on a day-to-day basis, depending on conditions, wildfire emissions were considered in calculating background concentrations in the ozone model. Average daily wildfire emissions were estimated in the modeling episodes at approximately 15 tons per day (tpd) for VOCs, 323 tpd for CO, and 7 tpd for NO_x (see Appendix A for details).

4.10 COMPREHENSIVE EMISSIONS INVENTORIES

This section presents the 2002 and 2003 base year EIs and the projected 2008 EI . All EIs are for all of Clark County, and all were developed using EPA-approved emissions modeling methods: EPA's MOBILE6.2 model and local VMT data for on-road mobile source emissions, EPA's NONROAD 2005a model and local demographic information for area and non-road sources, and reported actual emissions for point sources. These tools, along with the EGAS model, were used to estimate future point sources activity, VMT growth for on-road mobile sources, and 2008 demographic data for non-road and area sources. DAQEM also used the CONCEPT model to process output from the RTC's Transportation Demand Model (TDM). DAQEM staff will be available to provide the same methodology to RTC so it remains consistent for each conformity analysis in future transportation plan updates. Appendix A contains detailed information on the model assumptions and parameters for each source category.

The EIs represent emissions estimates for an average day; where there is a significant difference, they represent an average day during the summer ozone season (May through September). These estimates were developed from the most recent demographic data and VMT estimates in the RTC's conformity analysis, shown in Table 4-1.

Table 4-1. Demographic and VMT Data

RTC Demographics	2002	2003	2008
Population[1]	1,578,332	1,641,529	2,015,964
Households[2]	595,597	619,445	760,741
Employment[3]	798,100	826,800	1,196,611
VMT[4]	30,652,781	32,724,367	49,167,923

[1]UNLV Center for Business and Economic Research (2006).
[2]Projected from 2000 U.S. Census data estimating 2.65 persons per household.
[3]2002 & 2003 employment data from the Nevada Department of Employment, Training and Rehabilitation; 2008 data projections from UNLV Center for Business and Economic Research (2006).
[4]RTC conformity analysis.

Modeling and EIs for 2002, 2003, and 2008 incorporate the control measures in place in 2002 and assumed to still be in place in 2008. These include:

1. Federal tailpipe standards and regulations, including those for small engines and non-road mobile sources. The credit for these federal requirements changes from 2002 to 2008 as EPA Tier 2 and low-sulfur gasoline standards become effective.
2. The Clark County air quality regulations covering the vehicle I/M program in place during the 2002 and 2003 ozone seasons.

The modeling inventories for mobile sources incorporate a Reid Vapor Pressure limit of 9.0 pounds per square inch for gasoline. Tables 3-2 and 3-3 summarize the base and projected year anthropogenic emissions, in tons per day, of VOC and NO_x in Clark County.

Table 4-2. Summary of Base Year and Projected Year Anthropogenic VOC Emissions (tons/day)

Sector	2002 Base	2003 Base	2008 Attainment	Reduction in tons	Reduction %
Point sources	5.2	4.7	5.8		
Area sources	40.5	42.1	51.4		
Non-road mobile sources (includes locomotive emissions)	67.9	67	55.5		
On-Road mobile sources	70.1	69.4	64.2		
Airports	2.1	2	2.4		
Total	**185.8**	**185.2**	**179.3**	**6.5**	**3.5**

Table 4-3. Summary of Base Year and Projected Year Anthropogenic NO_x Emissions (tons/day)

Sector	2002 Base	2003 Base	2008 Attain-ment	Reduction	Reduction %
Point sources	114.4	101.9	95.7		
Area sources	2.6	2.6	2.7		
Non-road mobile sources (includes locomotive emissions)	44.7	44.1	38.7		
On-Road mobile sources	103.1	100.4	76.1		
Airports	9.3	8.3	14.5		
Total	**274.1**	**257.3**	**227.7**	**46.4**	**16.93**

4.11 MOTOR VEHICLE EMISSION BUDGETS

Table 4-4 shows the emission budgets calculated for Clark County in 2008; Appendix A contains the supporting data tables and graphs.

Table 4-4. Motor Vehicle Emission Budgets for Clark County (tons/day)

Precursors	2008
VOC	64.2
NO_x	76.1

4.12 RATIO OF VOLATILE ORGANIC COMPOUNDS TO NITROGEN OXIDES IN CLARK COUNTY

The VOC-to-NO_x ratio is not an ideal indicator of ozone formation conditions because it does not reflect observed ozone mixing ratios, timing of emissions, transport of emissions, reactivity of available species, or differences between surface conditions and interactions with conditions aloft. Even if appropriate quantities of "total VOCs" and "total NO_x" (or "NO_y") could be quantified, a simple ratio disregards the composition and reactivity of individual HC and nitrogen compounds.

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