

CONSERVATION

LAS VEGAS 2020
MASTER PLAN



ELEMENT

executive summary

introduction

climate

air quality

energy

water

waste management

soils

habitat and wildlife

appendix

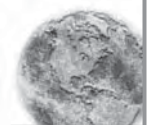
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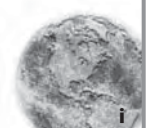
The City of Las Vegas Conservation Element
of the Las Vegas 2020 Master Plan
was adopted by City Council
on November 6, 2002 (Ordinance # 5529) and
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CITY OF LAS VEGAS CONSERVATION ELEMENT

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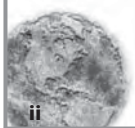
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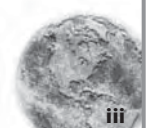
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EXECUTIVE SUMMARY

State law requires that governing entities in counties with a population of over 400,000 people adopt a master plan to address a list of subjects set forth in section 278.160 of the Nevada Revised Statutes. One of these subjects is a conservation plan. In preparing this Conservation plan, the city of Las Vegas has considered how policies stipulated in the *2020 Master Plan* direct future decisions affecting the environmental aspects of land use and other pertinent legislation directed to conservation issues in the Las Vegas Valley. Where appropriate, this *Conservation Element* reflects the concurrence of City policy with these other policy sets.

The conservation issues incorporated into this element are separated into eight components. Each of the components includes detailed subject matter discussing corresponding policy and implementation direction for the city of Las Vegas and its citizens.

Climate

The *Climate* component examines the causes, impacts and mitigation efforts regarding climate change within the city of Las Vegas. Primary discussions include the impacts to the Las Vegas region due to climate change, the City's policy direction and planning efforts enacted to eliminate or reduce the factors associated with climate change, and the regional collaboration efforts undertaken by the city of Las Vegas to address climate change.

Air Quality

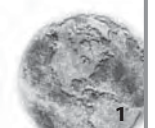
The *Air Quality* component examines the effects of transportation and land use on air quality within the city of Las Vegas, as well as the actions that may be necessary to mitigate air pollutants and improve local air quality. The subsections within the *Air Quality* component include the discussion of pollutants, the green house effect, alternative fuels, the urban heat island effect, and alternate modes of transportation.

Energy

The *Energy* component examines the overall scope of energy use and conservation within the city of Las Vegas. The sources and consumption of various energy types are analyzed, as are the relationships between transportation, land use, and energy consumption. Further discussion is given to alternative sources of energy, renewable energy and building practices. Federal and state legislation pertaining to energy are identified, as are a number of City energy conservation policies and initiatives that have been implemented in recent years.

Water

The *Water* component, which was created as separate element in 2005, has been re-incorporated into the *Conservation Element*. The Water component examines the federal, state and local regulations that govern the City's water conservation, flood, erosion, and wetland management efforts.



Soils Management and Steep Slope Conservation

The *Soils* component examines the characteristics of the soils present in Southern Nevada and how soils and soils management impacts development within the city of Las Vegas. The environmental impacts and benefits of soil conservation are explored, as are the issues regarding development on steep slopes.

Waste and Recycling

The *Waste* component examines the importance of recycling and source reduction, and the role the City should play in achieving state-mandated targets for waste recycling. The Element then outlines local solid waste management practices, and makes recommendations for City action in this regard.

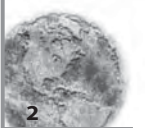
Habitat and Wildlife

The *Habitat and Wildlife* component examines the issues and policies related to the well being of humans in an urban environment, as well as the protection of habitat and wildlife in Southern Nevada. The *Habitat and Wildlife* component of the Element contains three sub-headings: the establishment and protection of urban forestry; entity boundaries and urban expansion issues; the protection of endangered species.

The *Establishment and Protection of Urban Forestry* section focuses on the need to prioritize urban forestry within public settings throughout the city of Las Vegas. The *Boundaries and Urban Expansion* section examines issues involved with any future expansions of the current city boundaries and our ability to accommodate this urban growth in a responsible and sustainable way. The *Protection of Endangered Species* section discusses the City's role in the implementation of the *Clark County Multiple Species Habitat Conservation Plan* and identifies the potential impacts on the City.

Implementation

The *Implementation* section is intended to provide the City direction on conservation related issues in the near future. Administering this direction is done in a hierarchical manner. Direction begins with the *2020 Master Plan* policy document. Several goals, objectives and policies from the policy document provide the primary policy base from a macro level perspective. This document follows up with a series of actions on more specific matters that the City shall strive toward. These actions should be measurable and be based on a five year timeframe. Further explanation for each of the actions can be found in the discussion area of the respective section of the *Conservation Element*.



INTRODUCTION

PURPOSE

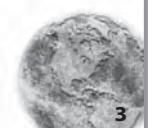
There is a dual purpose to the *Las Vegas 2020 Master Plan Conservation Element*. The first purpose is to address the requirements of state law. The second purpose of this Element is to incorporate the broad level conservation policies of the *2020 Master Plan* capstone document and other policy initiatives, such as the city of *Las Vegas Sustainability Initiative* and *Southern Nevada Regional Policy Plan*. These documents provide a more detailed examination of conservation issues and create suggestions for implementation actions at the local level. Listed below are the numerous federal, state and local agencies that help facilitate the implementation of the *Conservation Element*:

Clark County Regional Flood Control District
Clark County Wastewater Reclamation District
Clark County Department of Air Quality and Environmental Management
Colorado River Commission
Clean Water Coalition
Federal Emergency Management Agency
Las Vegas Valley Water District
Multiple Species Habitat Conservation Plan
Nevada State Office of Energy
Nevada Energy
Regional Transportation Commission of Southern Nevada
Republic Services of Southern Nevada
Public Utilities Commission of Nevada
Southern Nevada Regional Planning Coalition
Southern Nevada Water Authority
US Bureau of Land Management
US Department of Energy
US Fish and Wildlife Service
US Environmental Protection Agency
US Department of Transportation

LEGAL REQUIREMENTS OF A CONSERVATION ELEMENT

The Nevada Revised Statutes (NRS) adopted by the Nevada State Legislature in 2001, made effective in 2002 govern the subject matter of the master plan. Subsection 4 of NRS 278.150 (4) states:

In counties whose population is 400,000 or more, the governing body of the city or county shall adopt a master plan for all of the city or county that must address each of the subjects set forth in subsection (1) of NRS 278.160.



The subject matter of the Master Plan in NRS 278.160 (1) states:

Except as otherwise provided in Subsection 4 of NRS 278.150 and Subsection 3 of NRS 278.170, the master plan, with the accompanying charts, drawings, diagrams, schedules and reports, may include such of the following subject matter or portions thereof as are appropriate to the city, county or region, and as may be made the basis for the physical development thereof.

Among the elements to be included in the Master Plan as required by NRS are a Conservation Plan and Solid Waste Plan.

- *Conservation Plan – For the conservation, development and utilization of natural resources, including, without limitation, water and its hydraulic force, underground water, water supply, solar or wind energy, forests, soils, rivers and other waters, harbors, fisheries, wildlife, minerals and other natural resources. The plan must also cover the reclamation of land and waters, flood control, prevention and control of the pollution of streams and other waters, regulation of the use of land in stream channels and other areas required for the accomplishment of the conservation plan, prevention, control and correction of the erosion of soils through proper clearing, grading and landscaping, beaches and shores, and protection of watersheds. The plan must also indicate the maximum tolerable level of air pollution.*
- *Solid waste disposal plan – Showing general plans for the disposal of solid waste*

Preparation and adoption of this *Conservation Element* fulfills the City's statutory obligation to include conservation and solid waste plans in its Master Plan.

RELATIONSHIP TO THE MASTER PLAN

The Master Plan contains numerous goals, objectives, and policies pertaining directly and indirectly to conservation. As a component of the Master Plan, the *Conservation Element* is intended to not only satisfy NRS requirements, but also to provide a comprehensive document that will assist with the long-range planning and future needs of the City as it continues to grow. This element provides a baseline of detailed information that will aid the City's priorities and initiatives. The element also provides guidance in making decisions that affect conservation and the environment. The *Conservation Element* links the broad policies of the Master Plan to other regional policy documents with respect to land use, transportation and



ultimately assists in the decision making process. The policies of the capstone document that relate to the *Conservation Element*, with relevant sections of the element shown in brackets, are as follows:

- Reduce carbon monoxide and airborne particulate matter [*Air Quality*]
 - Mitigate airborne particulate matter resulting from land clearing or construction [*Air Quality*]
 - Encourage water conservation [*Water*]
 - Coordinate with the Las Vegas Valley Water District to maintain high drinking water standards at a reasonable cost [*Water*]
 - Take the necessary steps to monitor storm water discharge and improve quality where appropriate [*Water*]
 - That the City encourages water conservation [*Water*].
 - Monitor and assess the effects due to poor soil conditions [*Soils*]
 - Work with the Regional Transportation Commission to ensure that future roadway networks provide for multi-modal transportation opportunities [*Energy Conservation*].
 - Work with the Regional Transportation Commission and other governmental agencies to achieve a shift towards greater reliance on mass transit opportunities [*Energy Conservation*].
 - Create an inventory of any archeological resources within boundaries of proposed development and make efforts to preserve any significant resources that are discovered [*Habitat and Wildlife*].
 - Protect desert flora and fauna to the extent practicable [*Habitat and Wildlife*].
- Work with Clark County and environmental organizations to preserve viable desert habitat [*Habitat and Wildlife*].

CONSERVATION PLANNING IN SOUTHERN NEVADA

Southern Nevada Regional Planning Coalition Policy Plan

On September 28, 2010, the Southern Nevada Regional Planning Coalition (SNRPC) amended the Conservation, Open Space, and Natural Resource Element of the *Southern Nevada Regional Policy Plan* to include a sustainability component that encourages a regional approach for greater sustainability and resource conservation throughout southern Nevada. The plan discusses the relationship between the implementation of sustainable practices and improvements in quality of life and economic diversification for southern Nevada. The following are the four regional priorities identified by the sustainability plan:



- The coordination of regional efforts to manage and preserve national resources.
- The implementation of sustainability measures that diversify the economy and that stabilizes local population and employment without adversely impacting the environment.
- The education of residents and visitors about the financial and environmental benefits associated with sustainability.
- The acquisition of funding to achieve the goals and objectives outlined by the sustainability plan.

CONSERVATION ELEMENT OF THE CLARK COUNTY COMPREHENSIVE PLAN

As in the case for the city of Las Vegas, Clark County is required to complete a *Conservation Element* as one of the Master Plan Components pursuant to state legislation. The County Board of Commissioners adopted a *Conservation Element* as a component of the *Clark County Comprehensive Plan* on December 18, 2000. While the county document is over ten years old, it still is important to the structure of the city's conservation planning efforts as the city represents a subset of the county's overall land area in which both entity's conservation goals can overlap. The County plan examines issues dealing with land, air water resources, and plants and animals as these relate to land use and development within Clark County. Under each of these broader heading, the plan examines a range of specific aspects of conservation as well as goals and policies to direct future planning actions.

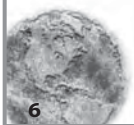
CLARK COUNTY MULTIPLE SPECIES HABITAT CONSERVATION PLAN

The city of Las Vegas is a participant in the *Clark County Multiple Species Habitat Conservation Plan*, which addresses a regional approach to the conservation of wildlife and habitat in southern Nevada. The key purpose of the MSHCP is to achieve a balance between:

- The Long-term conservation and recovery of the diversity of natural habitats and native species of plants and animals that make up an important part of the natural heritage of Clark County.
- The orderly and beneficial use of land in order to promote the economy, health, wellbeing, and culture of the growing population of Clark County.

CITY OF LAS VEGAS SUSTAINABILITY INITIATIVE

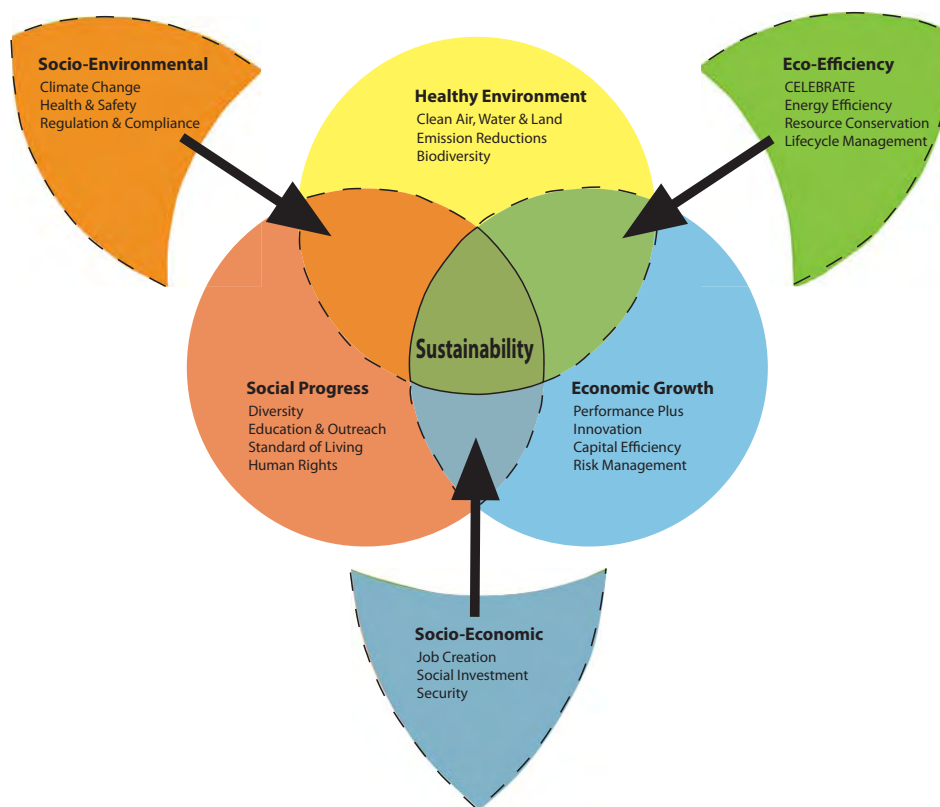
In the last few years, the movement toward more environmentally friendly practices and ways of thinking has made abun-



dant progress. Technological advancements in green energy and transportation, as well as changes to policy, procedure and simply the way we do business have all made significant impacts to the City and are addressed in this document. The city of Las Vegas strives to be a leader in efficient and effective conservation planning. City leadership has provided guidance for moving forward through the Sustainability Initiative summarized below.

Sustainability is defined by the City as meeting the needs of the present without compromising the ability of future generations to meet their needs. Because cities have tremendous influence over growth and development patterns and have the opportunity to provide leadership for conservation based issues, the City has committed itself to economic, environmental, and social aspects of sustainability by making it one of its three key initiatives to ensure the quality of life for its residents and the economic stability for the organization. Starting in 2005 with the signing of Climate Protection Agreement the city of Las Vegas has implemented policies, measures, actions, and practices that conserve natural resources, protect the environment, and maintain the vibrant economy within a community known for abundant energy consumption and limited natural resources.

Figure 1 – Sustainability Diagram



Sustainability is especially relevant to Las Vegas given the risks to the community as a result of climate change. Climate change is a critical issue that we are currently facing. The Climate Protection Resolution (R-57-06) seeks to reduce emissions by seven percent over 1990 levels by 2012. It is believed that the results of climate change could lead to an increase in median temperatures. This change could lead to significant changes that would potentially negatively affect the global, as well as local, environment and economy.

The Las Vegas City Council and City Manager have recognized that efforts can be taken at the local level and have worked with the City's staff to develop a strategy to mitigate the negative impacts climate change might bring to our region. As a part of the Sustainability Initiative, the Office of Sustainability was created in 2010 within the City Manager's Office. The Office of Sustainability works alongside other City departments to meet conservation, renewable energy, energy efficiency, and community program goals established by Council action. Several resolutions and actions have been adopted that provide guidance for the City regarding sustainability. Some of these actions are:

- Green Building Resolution (R-81-06)
- Sustainability Policy (CM302)
- Urban Forestry Initiative (R-26-08)
- Sustainable Energy Strategy (R-50-08)



CLIMATE

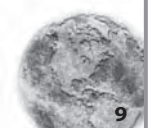
Climate has long been an integral component of long-range community planning. With the goal of protecting human health, safety and welfare, comprehensive planning incorporates climate impacts on zoning and site design, roadways and other major infrastructure systems such as water, energy, wastewater and flood control. In addition, protecting natural resources and understanding the value of natural systems working in harmony with the built environment is becoming more pronounced in planning for urban development.

Given the billions of dollars invested in infrastructure and public safety, failure to adequately plan for climate can be costly. Severe weather events, defined as events with \$1 billion in damages, cost individuals and communities in excess of \$800 billion in the U.S. between 1980 and 2003. In 2011, there were 14 severe weather events in the U.S., each with over \$1 billion in damages. While Nevada and southern Nevada in particular have lower damages from storm events than the U.S., the region is not immune from substantial costs related to climate.

Southern Nevada private businesses and public agencies have invested billions of dollars in infrastructure and improvements to public and private property to make the community more resilient to heat, drought, fire and flood control. The Southern Nevada Water Authority is investing over \$700 million for a third straw to secure water resources and secure water resources during drought conditions. Since 1960, there have been numerous flood events, 11 of those events caused in excess of \$1 million in damage and 31 lives lost. Southern Nevada has invested \$1.6 billion in flood control facilities since 1987. These are a few examples of public investment in infrastructure and service delivery directly linked to climate and weather patterns. When other infrastructure and services like stormwater management, fire protection services and public health are added to the equation, the costs and potential risk expands exponentially. Understanding the vulnerability of infrastructure and public service delivery, and protecting these investments from potential changes in climate and incidence of severe weather events, is responsible stewardship of resources managed and held in the public interest.

Cities and regions that are resilient to changing climate conditions and severe weather patterns will continue to prosper economically, socially and ecologically. A resilient Las Vegas is a place where:

- A diverse and thriving economy can adapt to changing weather patterns.
- Lives, homes and infrastructure are protected from extreme weather events and related flooding, wildfires, landslide and other natural hazards.



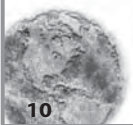
- Natural resources are managed such that species can adapt as their habitats shift with the climate.
- Robust public health infrastructure and social networks enable the region to minimize the health impacts of climate change.
- Resilience and adaptability are incorporated to changing human migration patterns.

While climate has long been a primary consideration when planning and developing cities, more recently there has been increased awareness of the potential changes to climate and weather patterns in Southern Nevada and across the country that could impact the economy, community and environment. There will always be uncertainty about the precise ways in which climate change will impact specific communities; this component of the *Conservation Element* provides direction for developing the tools and policies to make informed decisions about how to adapt based on the best available information.

The State of Nevada and the city of Las Vegas have published reports and established broad policy to address climate change. In 2005, Mayor Oscar Goodman signed the U.S. Conference of Mayors Climate Protection Agreement. The Agreement was subsequently adopted in resolution form by the Las Vegas City Council on August 2, 2006. The resolution directed the City to invest in renewable energy and energy conservation, reduce greenhouse gas emissions, support alternative modes of transit, invest in infrastructure to promote walking and bicycling (sidewalks, trails and street trees) and to promote green building practices.

On April 10, 2007, Governor Jim Gibbons signed an executive order that created the Nevada Climate Change Advisory Committee (NCCAC). The executive order directed the Committee to propose recommendations by which Greenhouse Gas (GHG) emissions can be further reduced in Nevada.

The Governor, with the assistance of the Nevada State Energy Office, assembled the NCCAC from a diverse group of public agency personnel, private industry representatives, interest groups and the public at large. At the first NCCAC meeting, the Governor asked the Committee to review policies and impacts related to climate change in Nevada. He emphasized the need for actionable, Nevada-centered solutions. The committee agreed to create a three-part report delineating the potential impacts, highlighting accomplishments and offering recommendations to address climate change in Nevada. Through the public meetings, the Committee invited several experts to provide presentations on energy transmission, wind energy, water resource issues and geologic carbon sequestration.



The final report was published in 2008 and provided a general overview of the potential undesirable impacts on public health, the environment and the economy of Nevada from a change in climate:

- High temperatures could result in direct public health concerns with heat sickness, increased troposphere ozone pollution and increased dust and particulate matter concentrations.
- Increased drought conditions in the southern part of the state.
- Less snowfall but more precipitation (Sierras) increasing flooding.
- Decreasing water reserves.
- More forest and wild land fires with potential greater intensity and devastating consequences.
- Disappearance of some native species of fauna and increased invasive weed species.
- Agriculture practices and recreation opportunities in Nevada could also be negatively impacted.

DISCUSSION

Potential changes in climate present significant regional and global risk to the environment, economy and society. Las Vegas is located within the Mojave Desert, an arid region with an annual rainfall of approximately 4 inches per year and where temperatures regularly exceed 100 degrees in the summer. The average temperature for Las Vegas is projected to rise 5° to 8° F by the year 2100. A subsequent increase in droughts and fires will stress key infrastructure, utilities and the delivery of health and public services. Major development decisions today will have long term impacts vulnerable to change. Planning and adapting now can save money, whereas inaction can lead to higher costs in the future.

Climate change is largely driven by the greenhouse effect, which regulates the temperature of our planet (See **Figure 2**). The Sun's energy, through infrared radiation drives weather and climate and is regulated in part by the presence of gases and particles in the atmosphere. When the Sun heats the Earth, some of the energy is reflected back into space, while the remainder is trapped in the atmosphere by clouds and naturally occurring greenhouse gases (GHGs) including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFC), tetrafluoromethane (CF₄), and sulfur hexafluoride (SF₆).

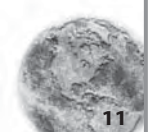


Figure 2 - The Greenhouse Effect



Source: <http://www.epa.gov/climatechange/indicators/slideshow.html>

During the past century, human activities have contributed to the changing of the natural composition of the atmosphere through the combustion of fossil fuels such as coal, natural gas, oil and gasoline to power vehicles and buildings and for agricultural activities. This has resulted in higher concentrations of the six major anthropogenic GHGs and may be contributing to an observed warming trend of 1.0° F to 1.7° F between 1906-2005.¹ The accumulation of GHGs can remain in the atmosphere for centuries and could impose long term effects on global weather patterns.

Since 1990, U.S. emissions have increased at an average annual rate of 0.4 percent. In 2009, total U.S. greenhouse gas emissions were 6,633.2 million metric tons (CO₂e), an increase of 7.3 percent from 1990 to 2009. In 2007, the Intergovernmental Panel on Climate Change concluded that humans are the single greatest contributor to global climate change and the impacts will result in regionally variable droughts, flooding, thawing permafrost, stronger storms, sea-level rise, wildfires, heat waves and other weather effects on the natural and built environments. While there has been national focus on the costs of reducing GHG emissions, the costs of inaction, such as rebuilding or preparing infrastructure to meet the demand of climate change impacts, is difficult to calculate, as is the ripple effect of economic impacts on national or regional households, businesses, industries and public agencies.²

CLIMATE

While climate impacts will vary on a regional scale, state and local policy and investment decisions can be made for the environmental, economic and social systems most likely to be affected by climate change, including water, energy, transportation, tourism and public health. Global changes have likely influenced fluctuations in average temperatures and regional precipitation patterns in the Las Vegas region.

¹ <http://www.epa.gov/climatechange/science/stateofknowledge.html>

² "Economic Impacts of Climate Change on Nevada" University of Maryland, July 2008

Planning for climate change, like other planning efforts, is an iterative process. The City and other local and regional governments in southern Nevada have been adopting policies and implementing quantifiable measures to reduce local greenhouse gas emissions, improve air quality and enhance urban livability and sustainability. In alignment with these efforts, the City has incorporated into its policy and planning documents a framework for measuring and reducing GHG emissions. The framework includes:

- Establishment of an inventory and emission baseline with an emissions reduction goal;
- Development and implementation of a plan to achieve the goal;
- Tracking and evaluating results.

Analysis of Nevada's GHG emissions indicate that for 2005, the most recent year of historical data, Nevada's statewide emissions totaled approximately 56.3 million metric tons of CO₂e. This amount is approximately equal to 0.8 percent of total U.S. GHG emissions in that year. Transportation and generating electricity from fossil fuels represent the largest share of GHG emissions in the state of Nevada, approximately 30 percent and 48 percent respectively of total GHG emissions in 2005.³ In the Las Vegas Valley, GHG emissions increased with a strong economy but began declining after the national economic recession began (See **Table 1 – City of Las Vegas Greenhouse Gas Inventory**).

Performing a local and regional emissions inventory had the added benefit of identifying inefficiencies in operations by tracking data related to energy consumption, waste processes and water consumption at the government operations and regional levels.

Based on energy consumption and waste generation, the city calculated greenhouse gas emissions, which are classified into different categories:

- Scope 1 emissions include all directly generated emissions, such as through tailpipe emissions from fleet vehicles.
- Scope 2 emissions are reported emissions that are indirectly generated and purchased from a different source, such as power or gas purchased from a utility company.
- Scope 3 emissions are also indirect emissions from alternative sources, such as through outsourced activities, indirect travel or waste disposal.

The aforementioned calculations captured emissions levels from all municipal operations (e.g., local government owned and/or operated buildings, streetlights, transit systems, wastewater treatment facilities) and from all community-related activities (e.g., residential and commercial buildings, motor vehicles, waste streams, industry). The Scope 1 and Scope 2 emissions were developed using the Clean Air Climate Protection (CACP) 2009 software tool and Local Government Operations Protocol developed by the California Air Resources Board, California Climate Action Registry, International Council for Local Environmental Initiatives (ICLEI) and The Climate Registry.

3 http://ndep.nv.gov/baqp/technical/docs/NV_Statewide_GHG_Inventory2008.pdf

Based on the inventory, City Operations were responsible for an overall rise in energy consumption and emissions from 2005 to 2009, followed by a decline due to installation of energy conservation measures and a reduction in services precipitated by local economic conditions (See **Table 4 – City of Las Vegas Greenhouse Gas Inventory**).

Table 1 – City of Las Vegas Greenhouse Gas Inventory

YEAR	2005	2006	2007	2008	2009	2010
Buildings						
eCO ₂ (tons)	38,647.10	45,028.80	45,455.60	55,912.50	67,013	37,164
Energy (MMBtu)	179,533.00	186,237.80	190,487.70	243,429.90	275,838	255,542
Vehicle Fleet						
eCO ₂ (tons)	7,194.20	7,712.90	7,536.20	7,730.50	7,764	5,893
Energy (MMBtu)	94,621.20	101,753.60	99,069.40	102,358.20	101,689	81,638
Employee Commute						
eCO ₂ (tons)	9,487.50	9,428.80	9,374.40	9,328.80	9,283.80	9,069
Energy (MMBtu)	121,566.20	120,880.10	120,233.50	119,682.70	119,132.16	115,613
Streetlights						
eCO ₂ (tons)	52,420.40	56,801.30	53,943.10	59,819.60	58,440	40,315
Energy (MMBtu)	165,831.80	179,621.00	169,122.80	186,956.80	182,611	185,160
Water/Sewage						
eCO ₂ (tons)	48,985.80	53,089.00	53,825.00	56,952.50	50,174	37,529
Energy (MMBtu)	166,317.00	175,576.70	174,679.70	185,766.90	156,781	169,308
Total						
eCO ₂ (tons)	156,735.10	172,060.80	170,134.40	189,743.90	192,675	131,731
Energy (MMBtu)	727,869.20	764,069.30	753,593.10	838,194.60	836,051	807,261

The City also participated in the SNRPC's Regional Greenhouse Gas Emissions Inventory, which analyzed regional energy consumption and total emissions for power, gas, transportation, and waste for the residential, commercial and industrial sectors (See **Table 2 and 3 – Regional Greenhouse Gas Inventory**).⁴ Greenhouse gas emissions increased with a strong economy (2005-2006), but as the economic conditions began to change in 2007 (higher gas prices and increased home foreclosures), total emissions began to decline and continued declining through 2008. One exception to the trend is found in the industrial sector, which includes transportation gas, a variable that changes greatly from year to year and makes up more than 75 percent of the sector. Overall, identifying specific reasons for changes in emissions is speculative due to the large number of variables in any one sector.

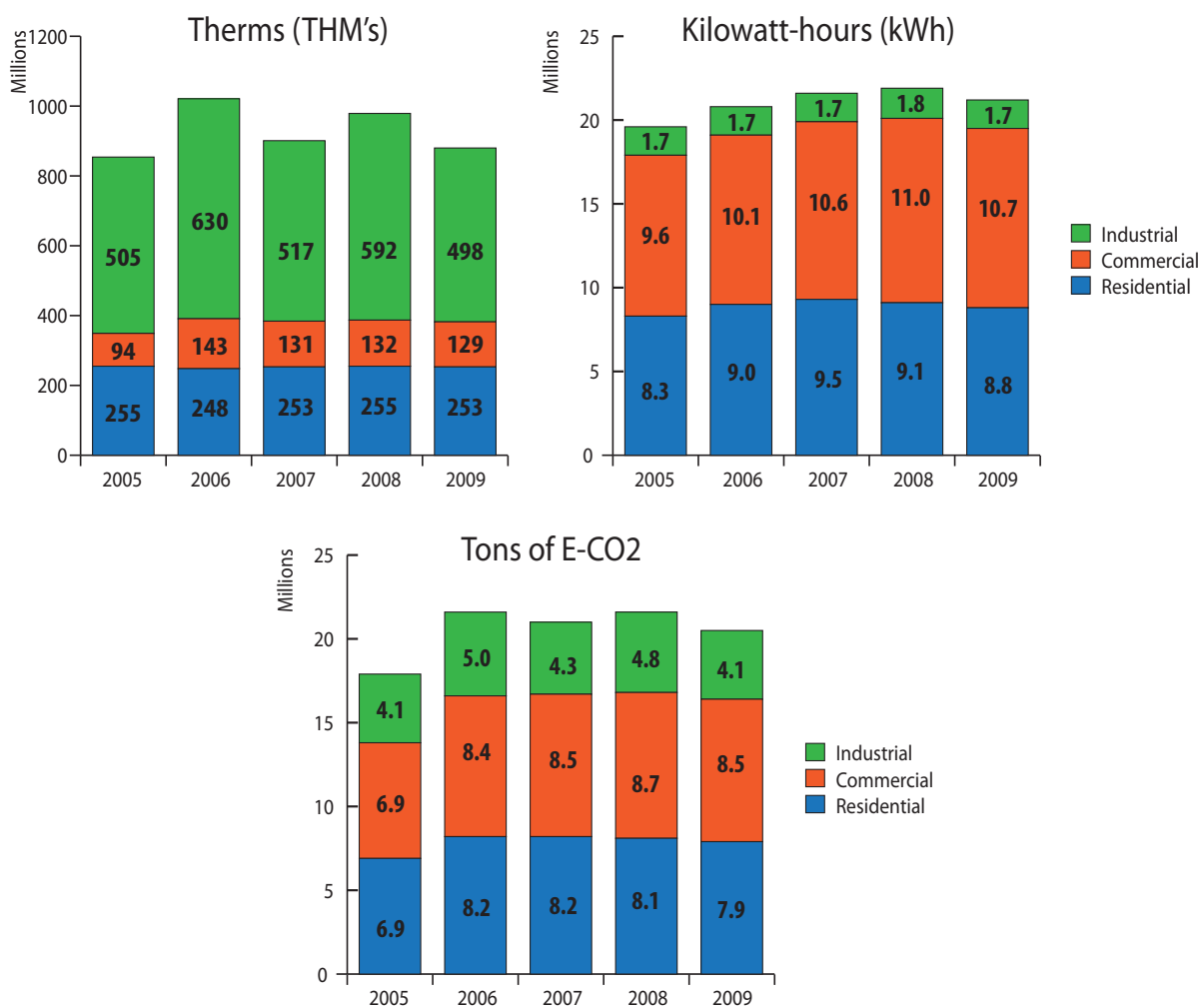
4 SNRPC, Southern Nevada Regional Emissions Inventory: Greenhouse Gas Emissions (2005-2009)

Table 2 - Regional Greenhouse Gas Inventory

CO₂e percentage per sector

	2005		2006		2007		2008		2009	
Residential	6,938,768	24.75%	8,152,680	25.28%	8,230,316	25.98%	8,053,002	25.40%	7,885,981	25.91%
Commercial	6,877,364	24.53%	8,414,735	26.09%	8,453,688	26.68%	8,707,517	27.47%	8,538,580	28.06%
Industrial	4,056,220	14.47%	4,979,459	15.44%	4,287,828	13.53%	4,796,469	15.13%	4,122,414	13.55%
Transportation	8,870,378	31.63%	9,466,314	29.35%	9,518,080	30.04%	8,969,962	28.30%	8,842,226	29.05%
Waste	1,296,808	4.62%	1,241,028	3.84%	1,193,689	3.77%	1,171,889	3.70%	1,043,642	3.43%
Total	28,039,537	---	32,254,215	---	31,683,600	---	31,698,840	---	30,432,843	---

Table 3 - Regional Greenhouse Gas Inventory



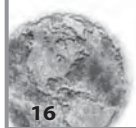
Local and regional government agencies have developed emissions reduction targets and rely on these inventories to assess progress. The City of Las Vegas adopted the Climate Protection Resolution (R-57-2006), requiring the City to reduce greenhouse gas emissions by 7 percent over 1990 levels by 2012 and provided direction for achieving those goals:

- Create a regional emissions inventory
- Adopt land use policies to reduce sprawl and create walkable communities
- Promote alternative transportation
- Increase use of alternative energy
- Adopt energy efficient building and energy code
- Purchase ENERGY STAR equipment and appliances
- Increase average vehicle fuel efficiency for municipal fleet
- Recover wastewater treatment methane for energy production
- Increase recycling rates
- Maintain Tree City USA designation
- Educate the public about climate change

The City Council adopted additional specific City actions aimed at improving air quality and reducing GHG emissions. The Office of Sustainability, created in 2010 within the City Manager's Office, leads and works alongside multiple City departments in a collaborative effort to meet all renewable energy, energy efficiency and community program goals established by prior City Council action, including:

- Green Building Resolution (Oct 18, 2006) (R-81-2006)
 - o Requires all new and existing building retrofits constructed to LEED Silver
 - o Establishes City of Las Vegas Green Building Program
 - o Establishes Green Building Special Revenue Fund
- Urban Forestry Initiative (May 07, 2008) (R-26-2008)
 - o Increase tree canopy coverage to 20 percent by 2035
 - o Prepare Urban Forestry Management Plan
- Sustainable Energy Strategy (Sept 03, 2008) (R-50-2008)
 - o Invest in 7 megawatts of renewable energy by 2015
 - o Reduce GHG emissions by 20 percent by 2020, 30 percent by 2030
 - o Reduce rate of electricity consumption 5 percent per sector
 - o Achieve 20 percent renewable portfolio standard by 2020, 30 percent by 2030

The City has implemented a variety of projects that have met prior goals or will meet goals at a future date. Such projects include energy efficiency improvements to municipal buildings and water treatment facilities, streetlight retrofits, using alternative fuels and electric vehicles in the City's vehicle



fleet, installation of renewable power applications and improvements to recycling procedures.

The city of Las Vegas is currently involved in regional efforts to address climate change. One example is Green Chips, a unique public/private partnership to encourage environmental sustainability initiatives in Southern Nevada. In response to the needs of the global environment, Green Chips is working to help local residents and businesses take steps to reduce environmental impacts; the overarching mission of the organization is to promote environmental sustainability by involving all segments of the community.

Green Chips hosts an annual conference in March called Convene for Green, which brings together local stakeholders to drive collaboration, ownership and outcomes in the long-term. As a result of the conference held in March 2010, a “Regional Sustainability Summit Report” was created through a series of workshops to serve as a road map for the efficient use and reuse of our community’s natural resources, maximize the potential of our human capital and promote policies and programs that will result in a healthy, vibrant and sustainable region.

The city of Las Vegas is also working with the Western Adaptation Alliance (WAA). The Alliance developed a “Report on Climate Change and Planning Frameworks for the Intermountain West.”⁵ The WAA is working with the Institute for Sustainable Communities to conduct a series of Climate Leadership Academies that will bring together practitioners from western cities in the fields of public infrastructure, planning, emergency management, public health and sustainability.

AREAS OF POTENTIAL VULNERABILITY

Climate change can potentially impact many sectors within the Las Vegas Valley including water resources, energy use, air quality, transportation, commerce, recreation and tourism. The potential exists that the City will experience days and periods of extreme weather events, these risks should be mitigated by preparing for both long term impacts and extreme events as they occur over time. This will require the City’s Office of Sustainability, Planning Department and Office of Emergency Management to work with local, regional, state and federal.

As discussed in the Water section, drought and the resulting reduction in water resources is a primary concern to the city of Las Vegas and the region. Long term impacts to weather systems that provide snowpack in the Colorado Rockies and

⁵ http://www.parkcitygreen.org/Files/USDN-Inter-Mountain-West-Report_Final-Aug-2011.aspx





other parts of the inter-mountain West present a possibility of associated impacts to the amount of water available within the Colorado River basin. As a member agency of SNWA, the City must ensure that its residents and new developments adhere to indoor and outdoor water conservation guidelines and regulations and pursue efforts to ensure an adequate supply of water. The region is also projected to see a 5 percent decrease in annual precipitation by 2100 and snowpack declines due to a shift in the jet stream and El Niño, driving precipitation northward and leading to greater water shortages.⁶ Changing weather patterns affect both the amount and quality of water resources available for drinking, irrigation, power generation, recreation and other uses. Rising temperatures are already decreasing the snowpack in the western United States. Over time, this reduced snowpack and prolonged drought could affect seasonal water supplies in the Las Vegas Valley. In addition, floods and severe storms, which could become more frequent, can damage property and infrastructure and compromise the quality of water supplies by washing chemicals, sewage and other contaminants into lakes, rivers and streams.

Increases in extreme weather caused by climate change, including flash floods and heat waves, within the urban environment will potentially be more frequent which will likely lead to impacts on public health. With higher extreme temperatures comes the risk of dehydration, heat stroke and similar illnesses, especially during the hotter months of the year. By working with the Southern Nevada Health District, area hospitals and health care providers, the City can both warn residents and tourists of days where forecasted temperatures could lead to health related impacts and continue to provide resources, such as “cooling stations” for the public on extreme heat days. The City’s Public Works Department works closely with the Regional Flood Control District to ensure adequate flood control facilities are available to prevent incidences of loss of life or property along major drainageways.

With higher temperatures and drier conditions within the area, the increased occurrence of forest, desert and rangeland fires could require the City’s Department of Fire and Rescue to assist other fire departments, the Nevada Division of Forestry, the Bureau of Land Management and the National Forest Service with any fires that are out of control and threaten the City.

Prolonged periods of summer high temperatures will affect the amount of energy used to cool buildings in the summer. Increased demand for air conditioning could stress the capacity of power plants, transmission grids and distribution systems, causing brownouts or power outages during heat waves. Because power plants also use large amounts of water,

⁶ http://www.parkcitygreen.org/Files/USDN-Inter-Mountain-West-Report_Final-Aug-2011.aspx

facilities that serve the Las Vegas Valley where water supplies are expected to be scarce could experience operational difficulties.⁷ The City's prior promotion of green building standards and energy efficient codes has resulted in significant energy conservation compared to conventional codes. Most commonly the majority of electricity delivered to residential, commercial and industrial users goes toward heating, cooling and lighting buildings. The City will continue adoption of energy efficient codes, promoting green building standards and providing incentives as a part of its Green Building Program to reducing the amount of power consumed by buildings.

The City has invested in renewable energy at many of its public facilities and considers itself a leader in renewable energy production. Since the majority of NV Energy's production of electricity comes from coal and natural gas resources in its Southern grid, and thus produces the bulk of GHG emissions, conservation and renewable energy alternatives and options should continue to be expanded for City residents in order to reduce reliance on non-renewable sources of energy. The City will continue to encourage the production and use of energy generated from renewable resources by changing land use, building and site design standards, as well as allowing for solar access easements, improved interconnection standards and allowing for permissible zoning for renewable energy systems. The City should also continue to work with utilities NV Energy and Southwest Gas on public education, conservation and emission reduction opportunities, where possible.

Consequences of inaction could have variable impacts to the City's economy. Heat waves and decreased snowfall can adversely affect various types of sporting and outdoor activities important to the local economy, including hiking, cycling, camping, skiing and tourism. On a global scale, climate change impacts could strain resources in other parts of the world or country, making it more difficult for potential tourists to spend money to visit the Southern Nevada region. Weather events or changes within Southern Nevada itself, such as reductions in water supply or higher temperatures could also deter people from visiting, which could reduce spending, economic growth, and resulting tax revenue from sales or gaming taxes.

7 "Economic Impacts of Climate Change on Nevada" University of Maryland, July 2008



IMPLEMENTATION STRATEGY

The implementation strategy defines specific actions the City will pursue to meet the goals and objectives within the Master Plan and resolutions adopted by the City Council.

Action C.1: The City shall reduce its municipal emissions footprint 15percent for City operations from its established baseline by 2015, in accordance with the Sustainable Energy Strategy Resolution (R-50-2008).

Action C.2: The City shall conduct a municipal emissions inventory annually and will continue to assist the SNRPC with regular updates of a regional emissions inventory. As a part of the municipal inventory and report, the City shall identify projects and probable sources of emissions reductions identified through monitoring and verification activities, with specific emissions avoided from each source.

Action C.3: The City shall work with the local scientific/research community, as well as local and regional government agencies to better understand local climate vulnerability, assess climate impact scenarios, prioritize risks and adaption strategies and develop and implement adaptation plans.

Action C.4: The City shall monitor and verify its electricity, gas, water, waste and fuel accounts to measure progress towards achieving its renewable energy and energy conservation targets, as well as to identify opportunities to improve.

Action C.5: The City shall work with local electric and gas utilities to promote and implement strategic energy conservation, renewable energy and emission reduction opportunities for both City operations and the community.

Action C.6: The City shall work with its franchised municipal waste operator to promote and implement single stream recycling and increasing both the City's and community's recycling rate as a means of controlling the inflow of waste and resultant landfill based emissions.



AIR QUALITY

INTRODUCTION

Maintaining a high standard of air quality is vital to sustaining high quality of life in the Las Vegas Valley. Established by the Clark County Board of Commissioners in 2001, the Clark County Department of Air Quality (DAQ) is responsible for all air quality control issues within Clark County. Due to emissions resulting from building and transportation based sources, as well as the natural topography and environment of the Las Vegas Valley, the air quality of the region is constantly monitored by DAQ for Particulate Matter less than 10 micrometers in diameter (PM₁₀) and Ozone (O₃). The city of Las Vegas supports DAQ's mission by implementing local measures that help protect the health of all Las Vegas residents and visitors by preventing pollution, increasing energy efficiency, improving outdoor air quality, reducing air pollution and addressing climate change.



Water trucks are used for dust control.

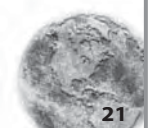
The Air Quality section of the *Conservation Element* will address six subtopics pertinent to improving and maintaining a high level of air quality in the city of Las Vegas. These subtopics include:

- Pollutants
- Alternative Modes of Transportation
- Alternative Fuels
- Urban Heat Island
- Air Quality and Land Use
- Implementation

DISCUSSION

POLLUTANTS

The Environmental Protection Agency's (EPA) top priorities include improving air quality and taking action on climate change. The EPA's authority on these priorities falls under the Clean Air Act, which includes developing national programs, technical policies and regulations for controlling air pollution and radiation exposure. The Clean Air Act, last amended in 1990, required the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. These commonly found air pollutants (also known as "Criteria Pollutants") are found throughout the State of Nevada. The six Criteria Pollutants are Ozone (O₃), Particulate Matter (PM_{2.5} and PM₁₀), Carbon Monoxide (CO), Nitrogen Dioxide (NO₂), Sulfur Dioxide (SO₂) and Lead (Pb). The EPA has designated parts of Clark County



as Nonattainment for PM₁₀ and O₃ (1997 standard).⁸ Air pollutants come from a variety of sources. These include "stationary sources," such as factories, power plants and smelters; smaller sources, such as dry cleaners and degreasing operations; "mobile sources," such as cars, trucks, buses, trains and planes; and "natural sources," such as wildfires and windblown dust.⁹

Under the NRS, Chapter 445B, responsibility for the methodology for the monitoring and control of air pollutants through its State Implementation Plans (SIP's). This program demonstrates how the NAAQS will be achieved, maintained and enforced. The County has identified a methodology for the monitoring and control of carbon monoxide and PM₁₀ pollutants through the state implementation plans. These plans identify actions and recommendations for the County to undertake in order to improve the measured levels of these pollutants in the atmosphere of the Valley.

Most of these controls involve the restriction of unregulated clearing of land, the development and use of dirt roads and the monitoring and control of vehicles creating unacceptably high levels of emissions. Southern Nevada Regional Planning Coalition (SNRPC) initiatives, City land use and transportation policies and City emission and air quality policies together address air quality concerns. As the primary roadway network in the Valley grows, alignments should include provisions for a transit network that is expected to grow over time. Furthermore, dedications of rights-of-way for BRT or fixed guideway systems should be reserved in selected locations. Similarly, provisions for transportation trail alignments should be made to ensure that alternate transportation modes, including bicycles, might be adequately accommodated.

After an area reaches attainment, a Re-Designation/Maintenance Plan is developed to demonstrate maintenance for at least the next 10-year period. These Maintenance Plans also become part of the State Implementation Plan (SIP). Currently, Clark County meets the PM_{2.5} and NO₂ and CO NAAQS and is unclassifiable for Pb and SO₂. The County is developing a maintenance plan for PM₁₀ pollutants. The Las Vegas Valley achieved attainment of the 24-Hour PM₁₀ Standard on December 31, 2006, and the EPA has issued a "Finding of Attainment." A determination of the classification for O₃ will follow the EPA publication of the new O₃ NAAQS.¹⁰

8 <http://www.clarkcountynv.gov/Depts/daqem/Pages/CriteriaPollutants.aspx>

9 Nevada Air Quality Trend Report 1998-2009, Nevada Division of Environmental Protection Bureau of Air Quality Planning

10 http://www.clarkcountynv.gov/Depts/daqem/Pages/Planning_CriteriaPollutants.aspx



The Federal Environmental Protection Agency (EPA) has established standards for various types of air pollutants. For carbon monoxide (CO) pollution, the EPA in 1971 set two standards: the first was a maximum concentration over a given one-hour period of 35 parts per million (ppm), while the second was a maximum concentration of 9 ppm over a continuous 8-hour period. **Map 1** shows the Las Vegas Valley in the context of the EPA's region IX non-attainment areas for carbon monoxide emissions.

To monitor CO emissions, a total of 4 monitoring sites have been established around the Valley. These sites are operated by the DAO and are subject to periodic performance audits by the EPA. The County is also responsible for the preparation of a base year inventory of information against which annual and peak season measurements are compared. The County utilizes a base year of 1996 for CO and inventories CO emissions from stationary point sources, mobile sources, both on-road and non-road and area sources.



Haze over downtown Las Vegas illustrates the need for air quality improvements.

For particulate pollution (PM₁₀), the EPA has set a NAAQS using the index of a 24-hour standard of 150 micrograms per cubic meter (µg/m³). **Map 2** shows the Las Vegas Valley in the context of the EPA's Region IX non-attainment areas for PM₁₀ emissions. As with CO emissions, a base year inventory was established. PM₁₀ levels utilize a baseline year of 1998. The targeted dust sources include areas under construction, paved and unpaved roads and vacant land.

The city of Las Vegas is positioned to help control some of the key sources of air pollution in the Valley. Much of the land within the boundary of the city is either already developed or is intended for some maintenance of a healthy level of air quality in the Las Vegas Valley rests with Clark County and the Regional Transportation Commission (RTC). The Planning Commission and City Council are also responsible for considering the effects of air pollution on overall air quality as a result of their actions. The Clark County Department of Air Quality (DAQ) serves as the regulatory and monitoring agency of air quality in the Las Vegas Valley, operating air quality instruments located in monitoring stations located throughout the valley which measure ambient concentrations of criteria pollutants. Through well-planned infill, redevelopment and new development, the City can promote efficiencies in the way in which people commute to and from work, shopping and other necessary destinations. The *Las Vegas 2020 Master Plan* contains goals, objectives and policies that promote this type of approach to future urban development within the city boundaries.

The *2020 Master Plan* document contains policy directives that support the intensification of urban development, both for housing and for commercial uses within the Downtown area. These policy directives are important from a conservation standpoint because the concentration of housing with employment in the Downtown will reduce the length of home-to-work trips, thereby reducing vehicle emissions. The concentration of housing, commercial and entertainment activity within the Downtown area will also make the area more efficient to service by various transit modes, including bus and a possible monorail. Similarly, the Newly Developing Areas portion of the *2020 Master Plan* supports the creation of a dense urban environment in the northwest portion of the City, at the intersection of U.S. 95 and the Beltway.

ALTERNATIVE MODES OF TRANSPORTATION

Providing residents and visitors to the city of Las Vegas with an abundance of choices for alternative modes of transportation will also assist in improving the City's air quality. The city of Las Vegas in conjunction with the RTC is working diligently to improve the public transit, bicycle and pedestrian networks in the City. Several programs, committees and working groups meet regularly to improve the alternative transportation network.

The concept of a fixed guideway to provide a monorail service into the Downtown area, connected with the existing monorail which services a portion of the Strip, ultimately connecting with McCarran Airport, was previously a key component of planning for the Downtown Las Vegas area. However, the RTC's construction and implementation of the express and Bus Rapid Transit (BRT) program similarly offers faster service along heavily traveled routes which can promote increased ridership and thus reduce vehicle miles traveled and improving air quality. There are currently four BRT routes and two express routes operating in the city of Las Vegas with one more BRT route scheduled to open in May of 2012. These routes provide quick access to all corners of the Valley and the City should assist the RTC in promoting their use. The City is continually working with the RTC to study the potential for the expansion of the BRT program.

The City is also working with the RTC to improve the bicycle and pedestrian network. The Alternative Mode Work Group meets regularly to identify where the bicycle and pedestrian network needs improvement, determine the necessary enhancements and ultimately find funding for design and construction of these improvements. The City is also developing several Walkable Community Plans that will assist in enhancing and encouraging walking and biking for everyday trips such



as grocery shopping or going out to eat. Additionally, this will assist in enhancing the quality of life in these neighborhoods while improving air quality through trip reduction.

Many of these improvements are made through the use the Federal Congestion Mitigation and Air Quality Improvement (CMAQ) program. The CMAQ program supports transportation projects that contribute air quality improvements and provide congestion relief.

ALTERNATIVE FUELS PROGRAM (FLEET)

In 2009, the combustion of fossil fuels for transportation accounted for 29 percent of the gross GHG emissions in the Las Vegas Valley. Alternative fuel sources are an effective way to reduce air pollution and the effects of greenhouse gases, protecting public health and quality of life in the city of Las Vegas. Alternative fuel vehicles have inherently lower harmful emissions, including toxic contaminants, compared to gasoline and diesel vehicles. As a result, alternative fuel vehicles reduce impacts on air quality, global warming, the environment and public health. Another benefit of alternative fuels is they can be extracted and produced domestically, reducing our dependence on a finite supply of imported oil which can be subject to fluctuations in price and supply. For example, ethanol is created through the fermentation of corn or other high starch content grains or biomass and Biodiesel is the result of processing vegetable oils.¹¹

The city of Las Vegas has been a charter member of the U.S. Department of Energy's "Clean Cities Program," since October 1993. Since then the Department of Operations and Maintenance has taken leadership and operates and maintains a fleet of 1,343 vehicles with more than 95 percent of all non-emergency vehicles operating on alternative fuels including Compressed Natural Gas (CNG), Hybrid vehicles, Bi-fueled vehicles, Biodiesel (B5) blend and Oxy gasoline. From 2009 to 2010, the city of Las Vegas' total fuel consumption decreased by approximately 7 percent from 870,728 gallons of fuel consumed to 809,934 gallons (**Table 5**). The largest reduction in fuel consumption occurred in the CNG fuel type which fell nearly 62 percent from the previous year. The City uses a variety of fuel types to power its vehicles and to improve valley air quality (**Table 4**):

¹¹ <http://pugetsoundcleancities.org/Benefits.htm>

Table 4 – City of Las Vegas Vehicle and Fuel Types

# OF VEHICLES	FUEL TYPE	VEHICLE TYPES (JUNE 2011)
33	Compress Natural Gas (CNG)	Pick-up trucks, passenger vans and street sweepers.
34	CNG & 10% oxy gasoline	3/4 ton pick-up trucks with utility bodies
477	Biodiesel (B5) blend	3/4 and 1 ton pick-up trucks, 3/4-1 ton utility body trucks, cargo vans, street sweepers, aerial lifts, vactor/sewer trucks, crane trucks, and dump trucks (1-8 yard). Some of the City's parks equipment also use Biodiesel including Gators, aerators, light to heavy duty mowers, tractors, flatbed tow truck, forklifts, off-road graders, backhoes, trenchers, Bobcats, power generators
493	10 % Oxy gasoline	Cars, 3/4 ton pick-up trucks, passenger vans, and cargo vans
85	Hybrids	Ford Escapes, Toyota Prius, Honda Civics, and Chevy Volt
223	Diesel	Fire Department & emergency medical services
1345 Total Vehicles		

Table 5 – City of Las Vegas Fleet Total Fuel Consumption

YEAR	2009	2010	% CHANGE
Fleet Total (Gallons)	870727.644	809933.9	-6.98%
–Total CNG (Gallons)	28552.544	10795.57	-62.19%
–Total Non-CNG (Gallons)	842175.1	799138.3	-5.11%
–Biodiesel	409149.5	386819.4	-5.45%
–Diesel	176041.1	178767.9	+1.55%
–RFG	204834.5	187551.1	-8.43%
–Unleaded	52150	45999.9	-11.79%

Electric vehicles have recently entered the market nationally at economical prices that make them viable options for fleets. While currently not widely available within the Las Vegas area, some models, including the Chevrolet Volt, Nissan Leaf and Toyota Prius plug-in have been made available at local dealerships. Since most models are combined gas-electric hybrids, their range (in most cases) is not limited and gasoline backup is available in the event of battery depletion. This helps improve air quality by limiting mobile combustion and fuel consumption, provided that most of the travel occurs on the vehicle's battery.

The city of Las Vegas has an opportunity to be at the forefront of the shift in the automobile marketplace to electric vehicles by increasing availability of public and fleet accessible charging stations throughout the city. Currently, the City has one (1) level two electric vehicle charging station installed at Stupak Community Center, with at least five more charging stations slated for installation throughout the city by 2012. Studies



show that by 2015, access to vehicle charging will be available at nearly one million charge points in the United States.¹² The City was the first of the municipalities in the Valley to add electric vehicles to their vehicle fleet.

E-BIKE PROGRAM

As part of the city of Las Vegas' efforts to promote sustainable methods of transportation and to provide an alternative to using a fleet vehicle, the City has partnered with the Regional Transportation Commission to provide electric bikes to City employees located at the Development Services Center and City Hall. The bikes will be used primarily for short distance trips in the downtown area. Other government program partners include Clark County and the Southern Nevada Water Authority. After implementing the program in July 2011, 5 lockers have been installed and 27 employees have been trained to use the bikes. As a result, 126 vehicle miles have been avoided, averaging 30 miles per month, with a reduction of at least 1 ton of pollutants. With the addition of new colored bike lines, striping and additional signage the e-bike program will likely grow to include other public-private partnerships, bike sharing and further bicycle infrastructure improvements.

URBAN FORESTRY

An urban forest is defined as the trees and vegetation found in and around an urban environment. Urban forest functions are generally oriented toward human outcomes such as shade, beauty, and privacy, but can also help improve air quality within a region.

Areas with dense tree canopy coverage can help reduce the impacts of the urban heat island effect. The urban heat island effect is a phenomenon in which areas of urban development are stripped of vegetation and replaced with asphalt, concrete, glass and other impermeable, heat absorbing materials (**Figure 3**). On a hot summer day, the sun can heat dry exposed urban surfaces to temperatures 50-90°F (27-50°C) hotter than the ambient air temperature. The absorbed heat is then radiated back into the air resulting in an "island" of higher temperatures within the urbanized area. The annual mean air temperature of a city with one million people or more can be 1.8–5.4°F (1-3°C) warmer than in surrounding rural areas.¹³ A denser tree canopy leads to reduced air temperatures, which improves air quality because the emissions of many pollutants and/or ozone-forming chemicals increase as the ambient temperature rises.¹⁴

12 "Electric Vehicle Charging Equipment" <http://www.pikeresearch.com/research/electric-vehicle-charging-equipment>

13 <http://www.epa.gov/heatisd/about/index.htm>

14 Nowak, David. The Effects of Urban Trees on Air Quality. www.fs.fed.us/ne/syracuse.



In 2009, the City inventoried approximately 17,000 trees located within the central Las Vegas area. The study revealed that only 56 percent of the surveyed trees were in good to excellent condition, and only 37 percent had a canopy between 16 and 60 feet in diameter. The City can benefit by adding to its inventory of trees and increasing canopy coverage in order to improve air quality and reduce urban heat island impacts.

Trees also reduce air pollution concentrations by intercepting and absorbing airborne particles at the molecular level. Studies have shown that air quality improvements in New York City due to pollution removal by trees during daytime of the in-leaf season averaged 0.47 percent for particulate matter, 0.45 percent for ozone, 0.43 percent for sulfur dioxide, 0.30 percent for nitrogen dioxide, and 0.002 percent for carbon monoxide.¹⁵ In urban areas with 100 percent tree cover (i.e. contiguous forest stands), short-term improvements in air quality (one hour) from pollution removal by trees were as high as 15 percent for ozone, 14 percent for sulfur dioxide, 13 percent for particulate matter, 8 percent for nitrogen dioxide, and 0.05 percent for carbon monoxide.¹⁶

Recognizing the importance of urban forestry within the city of Las Vegas, the City Council adopted the Urban Forestry Resolution. Since the adoption of this resolution, the City has begun to take steps to further prioritize urban forestry within Southern Nevada. The revisions to the Unified Development Code incorporated greater emphasis on street trees, parking lot trees and landscape planting options. Several residential street tree and public facility tree planting projects have been undertaken as a result of the Urban Forestry Initiative and the City maintains an active role in urban forestry stakeholder groups.

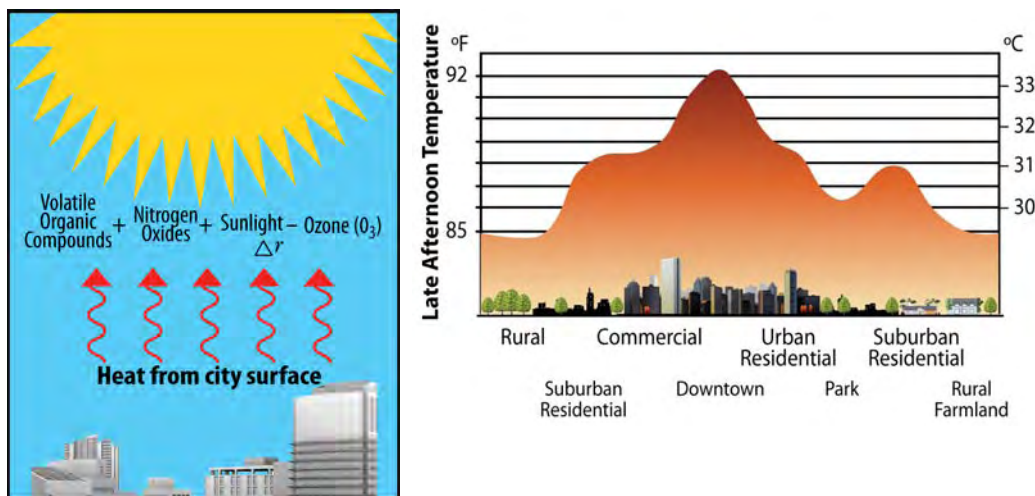
The Southern Nevada Regional Planning Coalition Regional Plant List was approved in June 2011 and all local jurisdictions have agreed to recognize this region-wide document through their zoning codes. Local entities have been working in partnership together to establish universal standards for tree planting requirements to further strengthen and unify urban forestry throughout the Southern Nevada region. The city of Las Vegas is also continuing to participate in a regional tree inventory and canopy study which the Nevada Division of Forestry is overseeing. The City will continue to strengthen its role in urban forestry through these existing and planned projects and will continue to actively engage in the promotion of urban forestry throughout the Southern Nevada Region.

15 Nowak, David. The Effects of Urban Trees on Air Quality. www.fs.fed.us/ne/syracuse.

16 Nowak, David. The Effects of Urban Trees on Air Quality. www.fs.fed.us/ne/syracuse.



Figure 3 – Heat Island Effect Diagrams



AIR QUALITY AND LAND USE

Urban sprawl and the current reliance on automobiles for commuter trips have had an adverse effect on the overall air quality within the city of Las Vegas. People in suburban areas are now living further away from the City's employment centers, which have increased work commutes and traffic congestion. Longer commute times have resulted in more vehicle emissions which contribute the air quality issues in the Las Vegas Valley. In residential areas there has also been a need for safe multi-modal transportation options for short trips to schools and parks in which residents can utilize instead of automobiles. Sound land use planning and orderly development can promote principals that can aid in the reduction of vehicle emissions, as well as provide safe and pleasurable alternatives to automobiles for commuters throughout the city of Las Vegas.

The promotion of Downtown Las Vegas as the principal focus for urban activities within the Valley makes sense from an air quality standpoint. This approach allows for the efficient networking of transit services through a dense central area of urban activity. When compared to automobile trips, the use of transit services reduces the level of emissions produced per mile of ridership. The diversification of Downtown through a mixed-use approach can create a more vibrant Downtown area where people live, work, shop and seek entertainment. The development of housing mixed with office and commercial uses will help to reduce the number and length of home-to-work trips for those wishing to live and work Downtown, thereby helping to improve air quality as it is affected by vehicular emissions.

The redevelopment of parcels that have been abandoned, blighted, or underused within the urban core of the city can also have a positive effect on air quality within the City. Infill and redevelopment of the downtown core and other established neighborhoods with mixed-use or medium to high density residential is vital to creating the types of urban densities that promote living and working in these areas. By allowing and encouraging these housing forms in urban settings, the population within the central city increases, creating additional opportunities for alternate modes of transit and reducing the duration of home-to-work trips. This assists in the improvement of air quality objectives within the portion of the Valley most negatively affected by vehicular emissions.

The importance of infill development as a responsible planning initiative to address air quality concerns is underlined by several actions of the Southern Nevada Regional Planning Coalition (SNRPC). SNRPC adopted an Air Quality Resolution (Resolution #3) on 03/22/01. An Infill Development Plan is in place that includes several recommendations that can impact air quality in the City. Additionally, the *Southern Nevada Regional Policy Plan* (SNRPP), adopted in February 2001 and amended in September 2010, contains specific language and policy for the region regarding air quality as it pertains to land use.

The City can also continue to promote urban hubs, such as employment centers and business parks, and the corridors that link hubs together. Urban hubs are environmentally beneficial designs in that residential and commercial land uses are clustered, which allows for lower reliance on auto-based trips and greater efficiency for transit services between such areas and to areas containing major employment generators throughout the Valley. Urban hubs are encouraged to be located throughout the city in order to provide employment and service opportunities for residents in both suburban and urban areas.

The development of business parks, research centers and advanced education centers that employ large numbers of people and are located in close proximity to transit centers can create mass transit opportunities and in turn have air quality benefits for the Las Vegas Valley. When such employment centers cannot be located in the city core or in proximity to mass transit, the location of these employment centers should be in areas that take advantage of existing roadway infrastructure which can reduce the length of suburban-to-suburban trips to these destinations.

Corridors between hubs should be dense, diverse, walkable and, if properly designed, linked hubs along a linear thoroughfare. Corridors will significantly reduce the need for auto



trips for those living, shopping, recreating and working along the corridor. In the case of the Rancho Corridor, this area provides a crucial transportation link between the Downtown and central city areas with the Centennial Hills area north of Cheyenne Avenue, particularly Town Center. This linkage and other corridors will be a critical route in addressing the jobs-housing imbalance, and will provide a major opportunity for counter-flow traffic and alternative mode transportation methods, particularly transit and as a potential fixed-guideway alignment. The City must work with the Nevada Department of Transportation and the City of North Las Vegas to ensure that these improvements, which would be environmentally beneficial to air quality levels affected by vehicular traffic, can be achieved.

Lastly, new residential and commercial developments should emphasize pedestrian linkages within the neighborhood or development, ready access to transit routes, linkages to schools and integration of local service commercial activities within a neighborhood center that is within walking distance of homes. The pedestrian linkages should be built to make walking and transit more attractive modes of travel in terms of trips to schools, parks and recreational services and local shopping.

IMPLEMENTATION

Maintaining a high standard of air quality is vital to a high quality of life in the Las Vegas Valley. The city of Las Vegas must continue to implement strategies that reduce air pollutants by encouraging the use of alternate modes of transportation, promoting the use of alternative fuels, taking steps to reduce the urban heat island, and implementing sound land use practices that promote densities and land use patterns that reduce commuter trips and improve air quality.

Action AQ.1: The City shall continue to support the efforts of the Clark County Department of Air Quality to address direct or indirect remedies to air quality issues in the Las Vegas Valley.

Action AQ.2: The City shall require developers to be in conformance with the PM_{10} State Implementation Plan.

Action AQ.3: The City shall work with the Regional Transportation Commission of Southern Nevada to improve air quality through transportation improvements that provide for and/or ensure the following:

- The facilitation of the development of a Bus Rapid Transit (BRT) network.
- That potential mixed-use redevelopment sites are adequately served with transit connections.
- That adequate transit service is planned for and can be provided at central city urban hub locations as they are developed.
- That when preparing corridor studies, the City will consider identifying opportunities to establish alternative transit modes to serve the area and along the corridor provide access to the employment centers.
- That multi-modal and alternate transportation technologies be adequately accommodated for within the primary roadway system as the city and the Valley continue to develop.
- Alternative modes of transportation within the urban core, including electric bicycles, bike sharing and bicycle infrastructure to reduce vehicle trips and improve air quality.

Action AQ.4: The City shall work with involved agencies (NDOT, RTC, etc.) and businesses to support and promote the use of telecommuting and the upgrade of technical systems to further enable this technology. The City will also work with these businesses and agencies, particularly those within the City's business parks, to promote the use of rideshare programs, provision of bike racks and secure bike storage, the provision of change room and shower facilities and other incentives to improve the desirability of non-auto commuting methods.

Action AQ.5: The City shall ensure that at least 90 percent of the fuel consumed in its vehicle fleet will be cleaner burning, domestically produced alternative fuels. In addition, the City will pursue opportunities to incorporate electric and electric hybrid vehicles and associated infrastructure into the City's vehicle fleet that result in low or zero emissions to improve air quality.

Action AQ.6: The City shall continue to promote urban forestry and tree planting to increase shading, increased air quality, reduced urban heat island effect and to double the existing tree canopy by 2035.

Action AQ.7: The City shall research, analyze and consider regulations which will limit the amount of land cleared and prepared for large scale residential and commercial development to a prescribed maximum area or percentage of the development site, with the objective of minimizing the area of land contributing to PM_{10} levels, while allowing the developer a sufficient and reasonable phasing program for the development.

Action AQ.8: The City shall continue to work with developers, builders, homeowners and landscape maintenance associations, and the general public, to provide information on adopt and encourage adherence to the regional plant list, as approved by the Southern Nevada Regional Planning Coalition to reduce the number of plant species that cause allergy and respiratory problems and to prohibit new planting of these species.

Action AQ.9: The City should expand its use of Internet technologies for public research, payment services and obtaining forms, so as to minimize VMT and subsequent emissions.

ENERGY

INTRODUCTION

The United States is currently the largest single consumer of energy globally, using more than 94 billion One Million British Thermal Units (MMBTUs) of energy in 2009. The United States relies on electricity, natural gas, and petroleum products to meet a significant portion of its energy demands for the residential, commercial, industrial, and transportation sectors. This direct consumption of energy also contributes significantly to global greenhouse gas emissions. Currently, U.S. electricity generation is 70 percent fossil fuels, 20 percent nuclear and 10 percent renewable.¹⁷

In Nevada, the Nevada State Office of Energy (NSOE) develops the state's energy resources taking into account local community needs and Nevada's natural resources. Nevada is a national leader in renewable energy production, energy conservation, and exportation; however, while Nevada has an abundance of renewable energy resources available to power our communities in an environmentally sustainable way, tapping those resources has proved challenging.

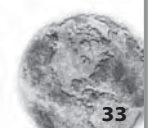
The predominant sources of energy consumed in the city of Las Vegas Valley are either non-renewable or produced from non-renewable resources. In order to address energy and conservation related issues, the city of Las Vegas formed the Office of Sustainability in 2010, whose role is to:

- Reduce the use of finite resources to the maximum extent possible; and
- Explore the use of renewable resources to supplement or replace the present ones.

The following discussion topics address the goals, objectives and policies of the *Las Vegas 2020 Master Plan* that deal with energy conservation issues. This section contains a discussion and recommendations for City action to adequately address concerns related to:

- Sources of Energy
- City Conservation Methods
- Transportation and Land Use
- Building Practices
- Implementation

¹⁷ Annual Energy Outlook 2011 U.S. Energy Information Administration



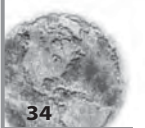
DISCUSSION

The United States Department of Energy (DOE) was created to manage the nation's nuclear weapons and energy program, as well as manage the 1977 energy crisis. As a result, the Department of Energy's primary focus and operations within the State of Nevada were largely focused on nuclear weapons testing at the Nevada Test Site northwest of Las Vegas and developing a repository for spent nuclear fuel at Yucca Mountain. Since its creation, many presidential administrations have broadened the DOE's scope to include consumer and public programs while continuing to research, develop and implement policies, including development of alternate sources of energy.

The direction of national legislation in recent years has been toward greater energy efficiency, finding new sources of non-renewable resources, developing smarter and more efficient energy transmission and delivery systems and developing and implementing sources of renewable energy to help combat climate change and reduce greenhouse gas emissions. The Energy Policy Act of 2005 and Energy Improvement and Extension Act of 2008 included incentives and tax credits for a variety of research initiatives and for homeowners to take action to conserve energy. The 2009 American Recovery and Reinvestment Act also provided increased funding for the DOE's home weatherization program, and new funding for the Energy Efficiency and Conservation Block Grant, which allows states and municipalities to implement energy efficiency and renewable energy measures in their respective jurisdiction.

Nevada state energy policy is described in Title 35 of Nevada Revised Statutes (NRS) and is regulated, implemented, and enforced by the Public Utilities Commission of Nevada (PUCN) and the Nevada State Office of Energy (NSOE). The PUCN supervises and regulates the operation and maintenance of utility services within the State of Nevada for privately owned and operated electric, natural gas, rail, renewable energy, telecommunications, water, and wastewater providers, including that of Nevada's two primary energy providers, NV Energy and Southwest Gas. PUCN powers and regulatory authority are described within Chapters 703, 704, and 704A of NRS, as well as within the Nevada Administrative Code. In addition to conducting policy analysis through the actions of the Legislature, the PUCN conducts market and financial analyses of utility rates, safety checks of utility operations, and resolves consumer complaints.

NSOE was also created in response to the energy crisis of the 1970's with a primary duty to develop and implement a contingency plan for oil and gas shortages. NSOE's general



duties are established in NRS 701, which include analyzing energy supply, demand, resources, and conservation, preparing a state energy plan, reporting the status of energy in Nevada, and managing Federal grant programs, including the State Energy Program that funds state energy offices nationally. In implementing Federal and State funded programs, NSOE is the State leader on a variety of initiatives, including renewable energy and energy conservation programs. The Director of NSOE also serves as the State Energy Commissioner and heads the Renewable Energy and Energy Efficiency Authority, the State and Local Government Panel on Renewable and Efficient Energy and the New Energy Industry Task Force.

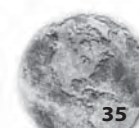
The city of Las Vegas does not provide public electric or gas services. It is instead provided to residents and businesses through franchise agreements with respective providers. The City Council have established energy policy through a number of passed resolutions that will be discussed later in this section:

- Climate Protection Resolution (Aug 02, 2006) (R-57-2006)
- Green Building Resolution (Oct 18, 2006) (R-81-2006)
- Sustainable Energy Strategy (Sept 03, 2008) (R-50-2008)

The City also regulates all utilities and power production facilities, establishes standards, and charges fees, pursuant to Las Vegas Municipal Code (LVMC) Chapter 6.67, Title 16, and Title 19, to ensure safe and efficient distribution of gas and power to customers in buildings and through city right-of-way, and to ensure compatible and reasonable locations and standards for generating electricity.

SOURCES OF ENERGY

In geologic and geographic terms, Nevada has limited non-renewable resources available. Coal, oil, uranium, and natural gas are not produced or mined within the state and instead must be imported by rail or pipeline from Wyoming, the Pacific Northwest, and other Western states to Nevada power plants. These restrictions have factored into past and present decisions on power production. Natural gas, which is primarily comprised of methane and used for energy generation, heating and cooling, cooking, and as a transportation fuel source, tends to have cleaner emissions than other non-renewable sources due to its chemical composition. With a limited population and limited supplies of water needed for producing power, overall demand for different sources of energy and locational decision-making also factor into decisions on where to construct a power plant and what source of energy should be used.



Nevada does have abundant renewable resources; the solar energy potential for much of the State exceeds 7 kilowatt-hours per square meter per day.¹⁸ In Southern Nevada, the solar energy potential exceeds 8 kilowatt-hours per day. Abundant geothermal resources can be found across the Great Basin, especially in Central and Northern Nevada. Given the limited surface water resources across the state, hydropower is found only in a few locations statewide. Hydropower is, however, an important resource in Southern Nevada, where Hoover Dam near Las Vegas and Davis Dam near Laughlin have a generating capacity of 2080 megawatts and 250 megawatts respectively. Finally, despite the abundant north-south mountain ranges that cross the Great Basin, wind energy is not a heavily used resource. While some mountain-valley areas are conducive to large, utility scale wind, those areas are often remote and thus too small for development. In Southern Nevada, only a few locations south of the Las Vegas Valley have good to excellent wind resource potential.¹⁹

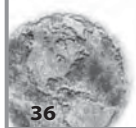
Typically the challenges facing the development of renewable energy projects within the Las Vegas Valley are centered around land and location issues. Because much of the land in the state and surrounding the city is federally owned, it is often challenging to secure access and permitting. While recent initiatives by the U.S. Department of Interior and DOE have sought to ease this burden, many projects, including large scale concentrated solar thermal, solar photovoltaic, geothermal, and wind power plants consume large areas of land and can have their own respective environmental impacts. Another key challenge is access to transmission lines. While Nevada has some of the best locations for renewable energy, these locations often lack transmission capabilities which are necessary to transmit energy to urban areas. Construction of these lines can also be costly and face similar land and easement challenges when crossing Federal lands.²⁰

Historically, electricity was produced and distributed to Las Vegas residents and tourists by Nevada Power Company. After the construction of Hoover Dam in the 1930's, some hydroelectric power was delivered to Southern Nevada, with the remainder transmitted to Arizona and Southern California. The Las Vegas Valley is now served by two primary utilities that provide non-renewable sources of energy for residential, commercial, and industrial consumption: NV Energy and Southwest Gas.

18 http://www.nrel.gov/features/20080601_west_connect.html

19 http://www.windpoweringamerica.gov/maps_template.asp?stateab=nv

20 <http://www.energy.state.nv.us/documents/2009StatusofEnergyinNevada.pdf>



ELECTRICITY

NV Energy, formerly known as Nevada Power until parent company Sierra Pacific Resources reorganized in 2008, is a private, investor-owned company. It is Nevada's primary electric utility and serves 93 percent of the state, including 2.4 million customers and 40 million tourists annually over a 45,000 square mile service territory. The company's southern service territory, serves the Las Vegas Valley and the city of Las Vegas. NV Energy employs a three-part strategy for delivering energy to customers:

- Generating power from new plants,
- Generating power from renewable sources,
- Increasing energy efficiency through energy conservation.

Until the 2000's, Nevada Power and Sierra Pacific primarily purchased electricity on the open market from out-of-state sources to meet electrical demand. As the Las Vegas Valley gradually grew, and due to State and Federal regulations stemming from the Western Energy Crisis of 2000-2001, when the power prices spiked and electricity supply was low, Sierra Pacific embarked on a strategy to generate power. By 2008, NV Energy doubled its amount of generating capacity to nearly 6,000 megawatts at ten generating stations (See **Map 4**).

In 2009, NV Energy delivered 21.26 billion kWh of electricity to residential, commercial, and industrial customers. Residential and commercial electricity consumption account for roughly 40 percent and 50 percent of this total. Approximately 86 percent of NV Energy's power generation portfolio is derived from fossil-fuel based sources. Natural gas power plants account for the majority of this total, including 70 percent of all energy on NV Energy's Southern grid, while coal generation from NV Energy's Reid Gardner and Valmy generation stations accounts for 17 percent. The percentage of coal in NV Energy's portfolio has decreased significantly due to the 2005 shutdown and decommissioning of the Fort Mohave Generating Station in Laughlin.

The State of Nevada established a renewable portfolio standard (RPS) in 1997 under NRS 704.780. Under the standard, NV Energy must use renewable energy resources or energy efficiency measures to supply a minimum percentage of the total electricity it sells or actually reduces demand for. After modifications in subsequent Legislative sessions, the RPS is scheduled at the following tiers:

- 15 percent renewables/efficiency in 2011 and 2012
- 18 percent renewables/efficiency in 2013 and 2014
- 20 percent renewables/efficiency in 2015 through 2019
- 22 percent renewables/efficiency in 2020 through 2024
- 25 percent renewables/efficiency in 2025 and thereafter



In addition, 6 percent of the standard must come from solar power. To meet the RPS requirements, the PUCN permits NV Energy to buy and sell portfolio energy credits (PECs) in order to meet energy portfolio requirements. While NV Energy generates 16 percent renewable sources of energy, the vast majority is from geothermal power plants and power purchase agreements in Northern Nevada (See **Map 5**). In 2010, NV Energy surpassed one gigawatt of renewable energy in production or under development. In Southern Nevada, NV Energy operates a 6 MW waste heat recovery plant outside of Goodsprings, in addition to a new landfill gas-to-energy facility at Apex Regional Landfill.

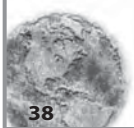
Other sources of renewable energy are derived through customer installed facilities from the public sector, private sector, and non-profits through the Renewable Generations program. As of 2010, over 80 solar, wind, and small hydro projects totaling more than 4 megawatts are installed at homes, businesses, public buildings and schools. NV Energy has awarded more than \$23 million in rebates through this program.

In 2010, construction began on a \$510 million “One Nevada” transmission line (ON Line). The 500-kilovolt line connects Nevada’s northern and southern grids and helps bring renewable energy from remote and rural parts of Nevada areas to the urban areas including Las Vegas. ON Line stretches more than 200 miles from Apex and connects to the northern grid in Ely (See **Map 4**). To further expand accessibility to other sources of energy in other remote locations, such as sites conducive to large scale wind energy, NV Energy will later build separate spurs linking ON Line to grids in Idaho and California.

NATURAL GAS

Southwest Gas, is Southern Nevada’s sole natural gas provider to residential, commercial, and industrial customers. The company’s southern service territory serves the Las Vegas Valley and the city of Las Vegas.

Kern River Gas Transmission Company supplies Southwest Gas the majority of the natural gas to Southern Nevada. The primary pipeline connecting Southern Nevada is routed through Utah from production areas located in Wyoming and can transport 1.8 billion feet³ per day, accounting for over 80 percent of the natural gas consumed in southern Nevada (See **Map 6**). Southwest Gas is subject to similar energy policies enacted by the Nevada Legislature. As a result, the company provides similar rebates for energy conservation measures, including energy audits for large commercial structures, home insulation and weatherization, and solar water heating. Like



NV Energy's Renewable Generations incentive program and demand side energy conservation programs, Southwest Gas's programs similarly help customers reduce their utility bills by reducing the amount of therms consumed.

CITY OF LAS VEGAS ENERGY USE

The phenomenal increase in population within the Las Vegas Valley over recent years is placing an ever-increasing burden on the use of existing energy sources of electricity and natural gas. Brownouts, blackouts and increases in energy costs will be more commonplace unless alternative sources of energy are developed and used to supplement the existing power sources of electricity and natural gas, particularly during periods of high usage. The city of Las Vegas is a major user of energy resources, but is also a regulator and policy-setter and has demonstrated leadership in the community by making key decisions to produce renewable energy, reduce energy consumption and provide resources for residents and visitors to do the same.

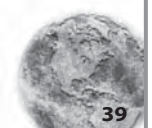
In fiscal year 2011, the city of Las Vegas facilities used:

- 152 million kilowatt-hours of electricity
- 1.3 billion gallons of water
- 840 thousand therms of natural gas
- 789 thousand gallons of Compressed Natural Gas (CNG) and non-CNG fuel

Using Clean Air and Climate Protection software, these totals translate into approximately 692 thousand MMBTUs of energy, resulting in 122 thousand metric tons of CO₂e. Of the energy consumed at primary facilities, approximately 28 percent is from wastewater treatment operations, 42 percent is from buildings and facilities, and 30 percent from streetlights. The resulting costs of all utilities come to approximately \$15 million annually.

As a result of the impact of utilities, the City has been actively engaged in reducing economic and environmental costs. The Mayor and City Council's commitment to sustainability and clean energy has been exemplified through their prior policy actions aimed at reducing the City's carbon footprint, supporting a strong economy and improving the quality of life for current and future generations of Las Vegans and those who come to visit. The City Council has also been committed to reducing the cost of delivering public services while reducing the organization's carbon footprint.

At the forefront of policy is the City's Sustainable Energy Strategy (R-50-2008), adopted by Council in 2008. One imple-



mentation measure of this policy recommends comprehensive investments in energy conservation and renewable energy based on a framework developed at the 2007 City Council – Planning Commission Workshop on Sustainability. The Office of Sustainability leads and works alongside City departments to meet all renewable energy, energy efficiency and community program goals established in the Sustainable Energy Strategy within three core areas: city operations, city codes and community programs. Several key goals lead the strategy: a renewable portfolio standard, a renewable energy investment target and a conservation benchmark. Together, these goals assist the City in attaining the progressive emissions reductions targets of a 10 percent reduction to the City's carbon footprint by 2011, 20 percent by 2020, and 30 percent by 2030. *(Please refer to Appendix EC-1 for a complete listing of the City's Sustainable Energy Strategy goals).*

In 2009, the City began its implementation campaign of energy capital projects at community facilities throughout the jurisdiction by leveraging city funds and American Recovery and Reinvestment Act *Energy Efficiency and Conservation Block Grant* (EECBG) money with utility rebates, tax credit bonds and internal special revenue funds for a total investment of nearly \$40 million. Three types of solar projects have been programmed to help the City reach Sustainable Energy Strategy goals: solar covered parking, solar on public buildings, and a solar generation facility.

Two phases of solar covered parking installations were planned, either using thin film or crystalline solar panel technology at parks, community centers and fire stations combining for an installation of 731 kW. When both phases are completed, nearly 1.79 MW of solar covered parking will have been installed over 1,880 parking spaces. By the end of 2011, the city of Las Vegas will have installed 4.85 Megawatts of renewable energy with the addition of solar covered parking, building installations and the addition of the of a solar plant at the Water Pollution Control Facility, generating 9,660,000 kWh annually. These projects will reduce the City's greenhouse gas emissions by 6,937 tons and save \$1.1 million in annual utility costs. As of November 2011, solar covered parking has been installed at 25 city facilities. The successful completion of all projects will result in the installation of 4.83 MW of renewable energy, more than 10 percent renewable energy portfolio, and a 10 percent reduction in greenhouse gas emissions. (See **Map 7** and **Table 6**) In addition to installing City-generated renewable energy, the City should also consider entering into power purchasing agreements with outside entities, in which the City purchases renewable power generated by a third party on or off-site for City use. This strategy can potentially reduce both short and long term energy costs for the City.

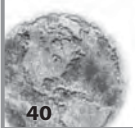


Table 6 – City of Las Vegas Solar Projects**PHASE I CLV SOLAR PROJECTS**

Site Name	Equivalent Parking Space Area	Kw	kwh	Tons ³ CO ₂ e
Durango Hills Community Center (Pool)	42	33.6	67200	47.04
Centennial Hills Community Center	87	69.6	139200	97.44
Natural History Museum	60	46.8	93600	65.52
Stupak Community Center	34	25.3	50600	35.42
Fire Station #10	27	44.5	89000	62.3
East Las Vegas Community Center	147	112.3	224600	157.22
All American Park	132	101.4	202800	141.96
Mirabelli Community Center	131	102.6	205200	143.64
Veterans Memorial Community Center	151	115.9	231800	162.26
Ed Fountain	167	144.1	288200	201.74
Phase I Totals	978	796.1	1592200	1114.54

PHASE II CLV SOLAR PROJECTS

Site Name	Equivalent Parking Space Area	Kw	kwh	Tons ³ CO ₂ e
Centennial Hills Community Center	132.6	99.5	199000	139.3
Lorenzi Park	88.1	66.1	132200	92.54
Fire Station #5	18.8	30	60000	42
Centennial Hills Park	40	30	60000	42
Rainbow Family Park (South Lot)	38.3	28.7	57400	40.18
Fire Station #45	25.7	41	82000	57.4
Fire Station #7	15.4	24.6	49200	34.44
Fire Station #41	22.6	36.1	72200	50.54
Fire Station #43	22.2	35.5	71000	49.7
Fire Station #8	33	52.8	105600	73.92
West Yard -Vehicle Services	47.9	76.6	153200	107.24
East Yard -Fire Equipment Services Center	28.5	45.6	91200	63.84
West Yard -Field Operations Center	49.6	79.3	158600	111.02
Fire Station #48	18.8	30	60000	42
Fire Station #44	18.8	30	60000	42
New City Hall -Solar Trees	46.9	75	150000	105
New City Hall -Rooftop	43.8	70	140000	98
Lorenzi Park HUD	45.9	34.4	68800	48.16
Phase II Totals	736.9	885.2	1770400	1239.28

Another Sustainable Energy Strategy project is an upgrade of major buildings and facilities. Supported by the Green Building Resolution (R-81-2006), the City uses its best efforts to ensure that all public buildings built by and for the City are to LEED Silver standards (or equivalent). An energy audit was completed on City facilities in 2010 by a consultant at 15 of the most energy consumptive City buildings. The energy audit, which included modeling of current energy consumption, gave the City a list of recommended energy conservation measures (ECMs). Typical measures among many facilities included:

- Lighting retrofits and lighting controls
- Daylighting
- Weatherization
- Insulation
- HVAC controls



Solar facilities at the new City Hall

Photo courtesy Forest City

Larger measures included new glass, heavy equipment replacement and a new chiller system at one building. Based on available leveraged funding, the City selected the ECMs that will provide the greatest amount of energy savings and best return on investment. Upgrades will begin in 2011 with future phases incorporating the remaining ECMs. *(Please refer to Appendix EC-2 for a listing of planned facility retrofits)*

As the City upgrades its existing buildings, new buildings and facilities will be built as green buildings. The energy efficient new City Hall, the City's flagship building, will provide space for approximately 570 employees, and will reduce energy costs by more than \$500,000 annually and reduce CO₂ emissions by 2,348 metric tons from the current facility's emissions level. The facility includes multiple LEED design standards in sustainable site design, water efficiency, energy use, materials and resource usage, and indoor environmental quality. The building also features innovative design components, including a green cleaning program, certified, an electric vehicle charging station, and responsibly harvested wood. Renewable energy will also play a role in the construction of the LEED Gold facility. Solar Trees will be located in the plaza along with a roof mounted solar photovoltaic system, all of which is scheduled for completion in the beginning of 2012.

Beginning in the summer of 2011, the City began the first phase of a Streetlight Retrofit Project to replace approximately 51,338 existing streetlights with a more energy efficient Light Emitting Diode (LED) fixtures within neighborhoods and along arterials. The city's street light inventory consists of mostly of high pressure sodium lamps (HPS); the new LED replacement fixtures have a longer life span, which equates to fewer lamp replacements and less maintenance and supply cost. On average, HPS lamps can last up

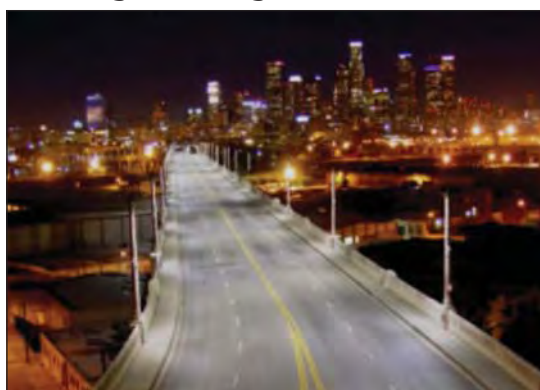
to about 24,000 hours, with LED's lasting up to 50,000 hours. Energy consumption is also lower, on average LED lights use half the electricity of HPS lamps. Currently, the annual city budget for the HPS lighting is approximately \$2,717,458. Upon the installation of the new LED lights, the anticipated annual budget will be \$2,199,245, for a projected yearly savings of \$1,086,983 in energy and maintenance costs.

Figure 4 – Street Light Improvement Results

Before: High Pressure Sodium (HPS)



After: Light Emitting Diode (LED) (Picture)

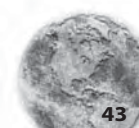


Source: City of Los Angeles Changes to LED (Sixth Street bridge over Los Angeles River, Bureau of Street Lighting, Department of Public Works, <http://bsl.lacity.org>)

TRANSPORTATION AND LAND USE ISSUES

Surface transportation is increasingly congested as urban development continues at a rapid pace within the city of Las Vegas. In 2009, residents, visitors, and interstate travelers traveled more than 13.68 billion miles on Southern Nevada roadways, down from a 2007 high of 14.56 billion.²¹ Single passenger vehicles are the overwhelming modal preference for home-to-work trips within the region and are, by far, the

²¹ Nevada Department of Transportation 2011 VMT Report



most energy-inefficient method of transportation. Of the energy used in this sector, approximately 65 percent is consumed by petroleum-powered vehicles, primarily personally owned. Diesel-powered transport from trains and trucks consumes about 20 percent, and air traffic consumes most of the remaining 15 percent. Due to progressively higher vehicle and fleet fuel economy standards and the introduction of new technology, such as hybrid vehicles and electric vehicles, fuel conservation has progressively improved over time. Subsidies for alternative fuel vehicles have eroded government fuel tax revenues over time and have not addressed vehicle congestion. Although single occupant driving is convenient, the increasing congestion, particularly during peak travel times, will continue to make alternate modes of transportation, or different types of home/work solutions increasingly attractive to growing segments of the work force.

There is a need for the *Conservation Element* to address some of the indirect causes of negative environmental impacts within the city of Las Vegas, and to indicate how some of these impacts can be reduced over time through a paradigm shift in the way that the city is planned and built. In particular, there is a need to examine:

- Transportation and land use planning techniques that promote alternative modes of transportation, increased densities and economic diversification (See **Map 8**);
- The promotion and use of alternative sources of energy that would result in a reduction of fossil fuels consumption; and
- Improved building practices that stress the use of energy-efficient design, materials and appliances.

The consumption of significant amounts of fossil fuels used daily in home-to-work trips throughout the City result in elevated levels of pollutants such as carbon monoxide in neighborhoods that are located in the central part of the Las Vegas Valley. If the City is successful in reducing the number and duration of these trips through improved land use and transportation planning, a corresponding reduction in the use of these fossil fuels and the emissions this use produces may be achieved.

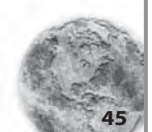
A primary focus of fuel conservation efforts involves the reduction of commuter miles driven. The city of Las Vegas is an active participant in regional planning efforts to promote public transit, bicycle and pedestrian networks in the City. Several programs, committees and working groups, facilitated by Southern Nevada Regional Transportation Commission (RTC), meet regularly to improve and expand the alternative transportation network.



The construction and implementation of the express and Bus Rapid Transit (BRT) program offers faster service along heavily traveled routes, which can promote increased ridership and thus reduce vehicle miles traveled. There are currently four BRT routes and two express routes operating in the city of Las Vegas with one more BRT route scheduled to open by spring of 2012. These routes provide quick access to all corners of the Valley and the City assists the RTC in promoting their use. The City is continually working with the RTC to study the potential for the expansion of the BRT program.

The Regional Transportation Commission (RTC) has instituted a rideshare program called Club Ride that provides incentives to encourage carpooling to and from work. The city of Las Vegas is an active participant in the Club Ride program and is actively exploring the feasibility of other options such as telecommuting to help reduce home to work trips. Other businesses and employment agencies should be encouraged to do likewise. The City is also participating in an Electronic Bike (E-Bike) program through the RTC. This program provides electrically assisted bicycles to various governmental organizations throughout the downtown area to reduce vehicle trips to meetings or other activities. In addition to planning and developing alternative mode solutions, including pedestrian and bicycle path and trail linkages, the RTC has also worked with the Nevada Department of Transportation to implement a network of High Occupancy Vehicle (HOV) lanes for carpools. Approximately 10 miles are constructed or under construction through the city of Las Vegas, with the addition of new direct connector ramps at major interchanges to help facilitate easier movement of high occupancy vehicles and express transit.

In conjunction with the policy initiatives undertaken by the RTC to reduce miles driven, the City's zoning codes have also been revised to allow for sustainable and energy efficient patterns of development. In May 2011, the city's Unified Development Code (UDC) was adopted, which provides updated standards for connectivity and "complete streets" to make alternate modes a viable option to help reduce vehicle trips. The City is also developing several Walkable Community Plans that will assist in enhancing and encouraging walking and biking for everyday trips such as grocery shopping or going out to eat. The improvement of pedestrian linkages and services that make walking and transit more attractive modes of travel is strongly endorsed by the City.



RESIDENTIAL, COMMERCIAL AND INDUSTRIAL BUILDING PRACTICES

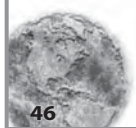
With the high cost of energy and limited natural resources present in Southern Nevada, resource efficient and environmentally responsible building designs have become increasingly attractive. Energy efficient building methods, utility systems, and appliances must be used as a means to further reduce the emphasis on existing energy sources. The City recently adopted the 2009 IECC International Energy Conservation Code (IECC), which requires strict compliance with energy efficient building practices for all new development. Every project, including conversions to habitable living space, must meet 2009 IECC standards. Energy-efficient building practices are generally more expensive at the outset, but typically pay for themselves in reduced utility costs over an extended period of time.

Identification of resources that are suitable to meet Nevada's needs for energy is a crucial step in improving sustainable development. NV Energy's addition of 1.4 million smart meters to buildings across the State, including the Southern Nevada area, is an effort to create a smart grid and reduce energy consumption. Smart meters will allow residential, commercial, and industrial building occupants to monitor daily energy usage and participate in voluntary dynamic (tiered) pricing. Smart meters are digital and communicate with the utility on 15 minute increments to allow building users to observe daily energy patterns and billing in an effort to make them aware of their consumption and to reduce their overall energy costs. The addition of a smart grid within Las Vegas will allow the utility to improve its reliability and capacity and reduce the need to build new generation facilities.

RESIDENTIAL

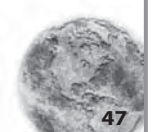
In 2009, the Southern Nevada residential sector consumed 8.8 billion kWh of electricity and 253 million therms of natural gas, accounting for 7.8 million tons of CO₂e. The first step to understanding a building's energy consumption is to have an energy audit or energy assessment completed on a structure. Home energy assessments, done professionally with energy modeling software, can reveal many comfort, durability, health and safety issues. Assessments also reveal how much energy is being used and provide an estimate on energy costs and environmental impact. Greater improvements in residential energy consumption can be made through greater homeowner understanding of how their homes utilize energy.

On average, about half of the energy used in Nevada homes is expended on heating and cooling. Since the effi-



ciency of furnaces and air conditioners has increased steadily over time, there is often limited room for improvement on those systems alone. Improving the area that separates conditioned space from unconditioned space through better or more insulation, weatherization, and air sealing can allow larger improvements, which can be cheaper than replacing a furnace or air conditioner. Certain appliances or home features such as a pool, spa, and appliances use significant amounts of electricity. Energy Star is a federal government sponsored program that encourages homeowners to use energy efficient utility systems and appliances, resulting in tax deductions. Every utility system and appliance is required to be rated for energy efficiency. The program is based on homeowners garnering a sufficient number of points based on these ratings to be identified as having energy-efficient homes. Replacement, downsizing, or changing behavioral habits can all contribute to greater residential energy efficiency.

The city of Las Vegas and HomeFree Nevada recognize the needs of homeowners to save money on their energy bills, in addition to improving the energy efficiency, comfort, health, safety, durability, and value of their homes. Home Free Nevada, Nevada's Home Performance with ENERGY STAR program, is a non-profit organization funded in part by the city's Green Building Program and with American Recovery and Reinvestment Act funds. HomeFree Nevada provides a standard for providing energy efficient upgrades for homeowners while offering rebates to certified contractors for work performed at the homes of program applicants. In addition, the Green Chips public-private non-profit partnership offers low-interest loans to bridge the financing gap on higher cost energy efficiency improvements. Rebates are paid for 20 percent energy savings improvements that are completed to HomeFree Nevada and Home Performance with Energy STAR standards. As a result, nearly 1,000 homeowners have participated in the program since it began in late 2009. Current partnerships with the city, Nevada State Office of Energy, and other community stakeholders have expanded the program statewide and will provide energy efficiency upgrades for another 2,000 homes across Nevada. In addition, recent state legislation now allows cities and municipalities to create special assessment districts for energy efficiency and renewable energy improvements. This provides an opportunity for the City to consider the creation of a property-assessed clean energy (PACE) district and program, in which home occupants can pay for energy conservation upgrades and renewable energy improvements on their property taxes.



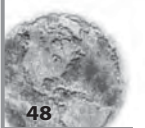
COMMERCIAL/INDUSTRIAL

The Southern Nevada commercial sector, consisting of hotels, casinos, retail stores, offices (business and government), restaurants, schools and other similar buildings, consumed 10.75 billion kWh of electricity and 129 million therms of natural gas in 2009. The industrial sector represents all production and processing of goods, including manufacturing and consumed 1.66 billion kWh of electricity and 498 million therms of natural gas during the same period. Much of the natural gas consumed was transportation gas used for power generation. Unlike the other sectors, total energy use in the industrial sector has declined in the last decade due to increasing costs that have forced energy-intensive industries to make substantial efficiency improvements.

Space conditioning is again the biggest area of energy consumption area for commercial and industrial buildings and represents 30 percent of their total energy use. Lighting plays a much larger role than it does in the residential sector, accounting for 25 percent and is typically the most wasteful component of commercial buildings due to over-illumination.

Commercial and industrial buildings can increase energy efficiency through careful design and management using techniques such as centralized building management systems and coordination of energy conservation efforts. While there are many strategies for increasing commercial building energy efficiency, there are many applications that go beyond the replacement of electrical or natural gas powered heating, ventilation, air conditioning, and refrigeration units with greater efficiency. For example, since many commercial buildings have consistent hours of operation, programmable thermostats and lighting controls are common.

The Department of Building and Safety initiated the City's move toward using more efficient energy codes to ensure that new residential, commercial, and industrial buildings are built as energy efficient as possible, as required by the Sustainable Energy Strategy and Green Building Resolution. The City Council adopted the 2009 International Energy Conservation Code (IECC) standards, which applied to new construction, additions, remodeling, window replacement, and repairs of specified buildings. The code's provisions are primarily intended to ensure the design of energy efficient building envelopes, conserve national resources, and defray energy costs. DOE, the State of Nevada and the city of Las Vegas have mandated that all new construction meet or exceed the minimum requirements of the 2009 IECC. The 2009 (IECC) is approximately 13 percent more efficient than the 2006 IECC within the Southwestern climate zone. The 2012 IECC, under develop-



ment through 2011, could potentially be more than 40 percent efficient than the 2006 code for residential and 30 percent more efficient for commercial.

The City's Green Building Program has further assisted community partners to support and expand green building. Downtown Las Vegas has recently undergone a trend of new "green" developments that have incorporated solar and green building design and are within walking distance of the New City Hall location. Among these are seven new LEED buildings and developments that are completed or under construction, including:

- Las Vegas Metropolitan Police Department Headquarters
- Symphony Park LEED Neighborhood Development
- Molasky Corporate Center
- Smith Center for the Performing Arts
- Bonneville Transit Center
- 302 Carson Building
- New City Hall

As a result, the United States Green Building Council ranked Nevada (10.92 ft. 2 per person) as the number two state for LEED-certified commercial and institutional green buildings per capita in 2010, behind only Washington D.C. (25.15 sf per person).²²

The Green Building Special Revenue Fund, created by the Green Building Resolution, receives 25 percent of any incremental increase in utility franchise fees, not to exceed \$2.5 million per year. The Green Building Program contains incentives and standards for new residential and commercial construction, including LEED construction, as well as retrofits to existing homes and commercial structures.

²² <http://usgbcnv.org/blog/2011/03/nevada-top-state-for-leed-certification-in-2010>

IMPLEMENTATION

As a primary consumer of energy within the Las Vegas Valley, the City must lead by example and ensure that the best local government practices in regard to energy conservation and sustainability policy are implemented. The City must continue promote and improve on our adopted conservation policies, encourage the use of renewable and sustainable energy sources, and monitor our building and zoning codes so that they continue to promote the latest energy conservation and sustainable building practices.

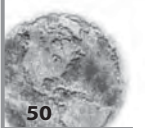
Action E.1: The City shall strive to accomplish the goals set by the Sustainable Energy Strategies Resolution (R-50-2008).

Action E.2: The City shall prepare a plan for investment in renewable energy and energy conservation, with a reduction or no increase in utility costs, to achieve net zero energy consumption for all City operations by 2025.

Action E.3: The City shall examine any current code requirements that may inhibit telecommuting in residential areas for other than safety reasons, and consider appropriate steps to address such inhibiting legislation in order to promote energy conservation.

Action E.4: The City should encourage employers to join the Club Ride Program and to provide bicycle-friendly work environments for employees that may include secured bike parking and change/shower facilities, to promote energy conservation.

Action E.5: The City will continue to support public, private and non-profit energy efficiency and renewable energy programs and initiatives, including HomeFree Nevada and Green Chips, in order to encourage area residents and businesses to decrease energy consumption and improve energy efficiency.



WATER

INTRODUCTION

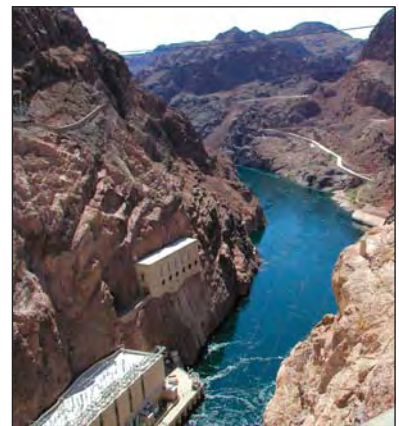
The Las Vegas Valley lies within the Mojave Desert, one of the most arid regions in the continental United States. The average annual rainfall in this region is minimal while the annual evaporation rate is relatively high. The overall quality of life and prosperity of the Las Vegas Valley depends on a number of factors, one of which is effective long-term conservation and optimization of the area's scarce water resources. The Southern Nevada Water Authority (SNWA), which is regional agency responsible for acquiring and managing the area's water resources, has concluded that there are sufficient resources available or under development to meet Southern Nevada's water demands through the year 2060 based on current population projections and expected conservation efforts.²³

Nevada Revised Statutes (NRS) 278.150 and 278.160 requires suppliers of water and their member entities to adopt a plan of development and utilization of natural resources. The Water section of the *Conservation Element* addresses a broad range of issues related to water; including water supply; water quality; water pollutant prevention; wetland preservation; management of groundwater; erosion control; Return Flow Credits; recycling and reuse of water and land use management. The water issues that affect the City are divided into three primary categories. Each of the three categories includes discussions and actions to ensure the City will have sufficient supplies of good quality water to address future development needs. These categories are:

- Water Usage and Conservation
- Water Quality
- Implementation

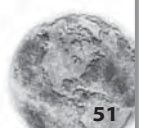
BACKGROUND

The primary source of water for the municipal providers in the Las Vegas region is the Colorado River at Lake Mead. The United States Bureau of Reclamation oversees water resource management in the Colorado River Basin. Beginning with Hoover (Boulder) Dam and Lake Mead (1936), the Bureau of Reclamation has actively overseen construction and operation of Colorado River system dams, reservoirs, and diversion projects. In addition to managing hydroelectric operations at Hoover Dam, the Bureau operates the Colorado River system as a whole, as well as serving as the Lower Colorado River Basin "Water Master" responsible for responsible for administering rights to Colorado River water in the Lower Basin.



Colorado River flowing from the base of Hoover Dam

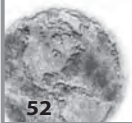
²³ Southern Nevada Water Authority – 2009 Water Resource Plan from http://www.snwa.com/assets/pdf/wr_plan.pdf



The Colorado River is allocated amongst the seven Colorado River basin states and Mexico (See **Map 9**) via a series of laws, compacts, and court cases collectively called the Law of the River. Included within this series of laws are the 1922 Colorado River Compact and the 1928 Boulder Canyon Project Act, which defined all apportionments of Colorado River water in “consumptive use” units. Together the states rely on the river to meet a portion of their industrial, municipal and agricultural needs. Of the 16.5 million acre-feet per year (AFY) allocated for use by among the Colorado Basin States and Mexico, Nevada’s portion is the smallest at 0.3 million. Nevada diverts a majority of its Colorado River apportionment from Lake Mead. Protecting Lake Mead’s water quality is essential to ensure a safe drinking water supply and other water supply needs. The Colorado River Commission (CRC) is the executive agency of the State of Nevada responsible for acquiring and managing Nevada’s share of water resources from the Colorado River.

Another important source of water in Nevada is groundwater. The Office of the State Engineer in the Nevada Division of Water Resources regulates all groundwater and surface water resources (other than federally-regulated Colorado River) within the State of Nevada. The General Water Law Act of 1913 gave the office jurisdiction over all wells tapping into artesian water or underground aquifers. The 1939 Nevada Underground Water Act granted the State Engineer total jurisdiction over all groundwater in the state. Nevada water law follows the doctrine of prior appropriation, or “first in time, first in right” – meaning the first person to file on a water resource for beneficial use is typically considered first for a permanent right to the water. The process for obtaining a permit to develop groundwater or surface water includes filing an application with a map prepared by a water rights surveyor, publicly noticing it within a general circulation newspaper, and a 30 day formal protest period. The State Engineer then acts on the application and issues the permit or denies the application.

The SNWA is a regional agency, whose members include the Las Vegas Valley Water District, the cities of Las Vegas, Henderson, North Las Vegas, Boulder City, as well as the Big Bend Water District and Clark County Water Reclamation District. The SNWA is responsible for developing and managing regional water resources, regional water treatment, and infrastructure and conservation programs. This critical entity acquires groundwater and surface water resources from new sources and agreements, as well as ensures the conservation and efficient use of existing resources. As a member, the City is represented on a seven-member Board of Directors and helps direct, manage and establish the SNWA’s goals, policies and programs.

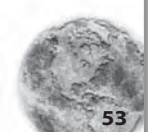


City residents are served by the Las Vegas Valley Water District (LVVWD), as are residents in portions of unincorporated Clark County, making the entity the largest municipal water purveyor in the state of Nevada. The Las Vegas Valley Water District, the city of Henderson and the city of North Las Vegas deliver water to their respective customers through their individual distribution systems, which include pumps, reservoirs and pipelines (See **Map 10**). Although not specifically responsible for the development, treatment or delivery of drinking water supplies, the city of Las Vegas plays a crucial role in the conservation and management of its citizens' water supply. The city of Las Vegas supports LVVWD and SNWA water conservation and water resources management efforts and policies. The City also protects water quality and encourages conservation through its municipal codes, development standards and policies.

In terms of water quality, Federal legislation includes the Clean Water Act and the Safe Drinking Water Act. The Environmental Protection Agency (EPA) is responsible for setting standards and regulations to ensure water purveyors provide safe drinking water. The State of Nevada's Bureau of Safe Drinking Water oversees the state's public drinking water systems. Upon release and return through city sewer systems, the city is required to comply with the Clean Water Act and the National Pollutant Discharge Elimination System. The City's Public Works Department manages wastewater treatment for the city of Las Vegas. The Public Works Department strives to exceed state and federal requirements for the safe return of water to the Las Vegas Wash and Lake Mead.

WATER USAGE AND CONSERVATION

Groundwater was the first and most critical resource for Southern Nevada for much of the last century. Until large-scale importation of Colorado River water was achieved in the early 1970's, the Las Vegas Valley relied on local groundwater supplies to meet demands. A series of social and economic developments, such as tourism and industrial production during World War II, steadily increased local populations and associated demands for water. Groundwater in the Las Vegas Valley was no longer viewed as inexhaustible and additional resources were necessary. The region's first use of Colorado River water occurred in 1936 when a small water line was built from Hoover Dam to supply water to the many construction workers living in a nearby camp. The Colorado River now supplies 90 percent of Southern Nevada's water. Groundwater remains a critical component of the area's resource picture, as it is instrumental in helping purveyors meet peak water demands during the summer. Of the 16.5 million acre-feet per year (AFY) of wa-



ter allocated from the Colorado River, Nevada's portion is the smallest at 0.3 million AFY or 300,000 AFY. Even though Lake Mead has the capacity to hold over 26 million AFY, Nevada and the others are only able to take their respective amounts entitled under the *Law of the River*.

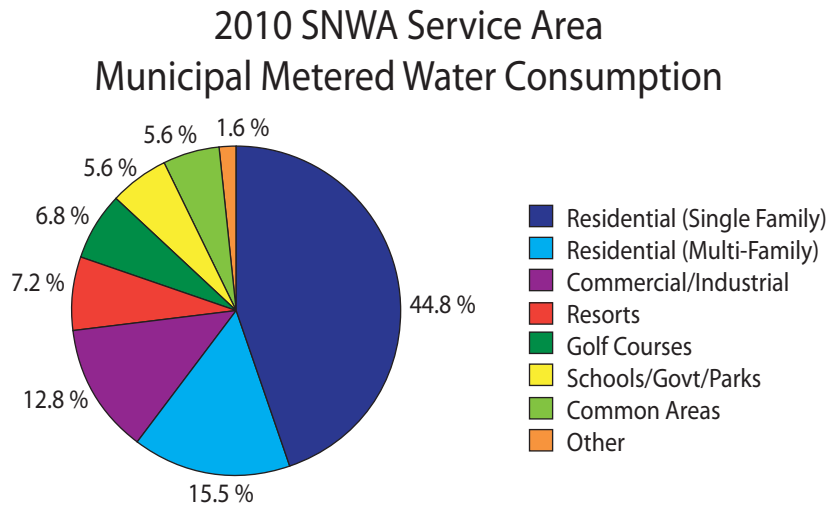
Water is drawn from Lake Mead at intakes near Saddle Island along the western shore of the lake. The water is then treated at one of two water treatment facilities. After treatment, water is pumped through SNWA facilities for members to distribute for customers usage. Residential usage accounts for 60 percent of total water use in Southern Nevada, the majority of which is used outdoors for turf and landscape irrigation (See **Figure 5**). Nearly 14 percent is used at resorts and golf courses, which help contribute to the function and aesthetics for the regional economy.²⁴ After outdoor usage, which is consumptive use of water, water either evaporates, percolates, or enters storm drains that lead to the Las Vegas Wash. After indoor usage, which is considered non-consumptive, water is returned to the sewer system and is then treated at respective wastewater treatment plants. All plants, including the city's Water Pollution Control Facility, discharge water to the Wash.

The Las Vegas Valley treats and returns most of its wastewater back to the Colorado River at Lake Mead via the Las Vegas Wash, for which it receives Return Flow Credits. This concept enables Southern Nevada to take or divert the amount it has returned (in addition to its allocation of 300,000 AFY), thereby stretching its Colorado River supply.

24 Southern Nevada Water Authority Water Resource Plan Chapter 2
Retrieved 11/27/2011 from http://www.snwa.com/assets/pdf/wr_plan.pdf



Figure 5 – Water Usage in Southern Nevada



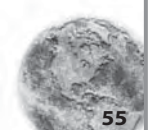
Notes: (a) Municipal metered water consumption billed to customers from all sources (potable and non-potable).
 (b) Potable includes ground water and Colorado River water
 (c) Non-Potable includes raw Colorado River water, reclaimed and reused water
 (d) SNWA Service Area reflects the following municipal service areas: Big Bend Water District, City of Boulder City, City of Henderson, City of Las Vegas, City of North Las Vegas, Clark County Water Reclamation District, and Las Vegas Valley Water District.

Given that the Colorado River is fully apportioned and the Inter-Mountain West is susceptible to drought, Las Vegas and other southwestern cities are vulnerable to water supply shortages. The Colorado River basin and Las Vegas Valley have been experiencing a drought since 1999. This has led to the SNWA declaring drought conditions. During the past 12 years, Colorado River inflows to Lake Powell have been well below normal, averaging 75 percent. This low inflow reduced combined water storage in Lake Powell and Lake Mead from nearly full at the end of 1999 to about 60 percent full at the end of at the end 2011, despite above flows in 2011.

The 2009 Water Resource Plan, as prepared by the Southern Nevada Water Authority (SNWA), is the current guiding document for the region and is reviewed annually and updated as needed. The plan outlines the following:

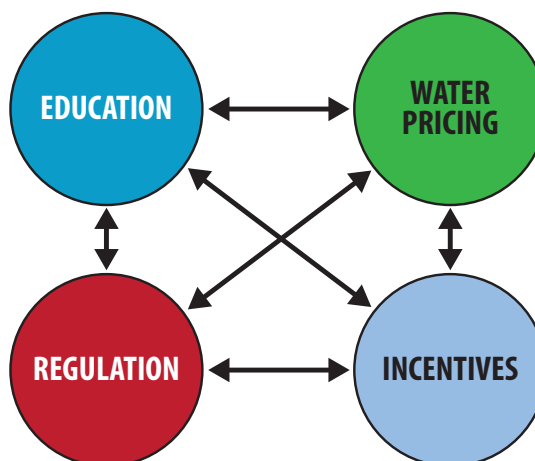
- The history of water development in the Las Vegas Valley
- An overview of Southern Nevada's current and future water resources, both near-term and long-term.
- A discussion of water demand forecasting
- A discussion of SNWA's demand management tools (Figure 6),²⁵
- Existing conservation measures and goals
- Environmental issues that can influence the timing and delivery of available water resources.

²⁵ Southern Nevada Water Authority Water Resource Plan Chapter 2 Retrieved 11/27/2011 from http://www.snwa.com/assets/pdf/wr_plan.pdf



Also incorporated in the Plan are measures that will be taken to ensure sufficient water resources are available to Southern Nevada in the event of supply reductions, such as extended drought conditions. To support these efforts, the city of Las Vegas adopted ordinance (#5616) which outlines a series of permanent conservation measures. Please refer to the 2009 Water Resource Plan for additional information regarding regional water conservation across the range of water supply conditions.

Figure 6 – Southern Nevada Water Authority Demand Management Tool



The 2009 Water Resource Plan forecasts water demands through 2060. This forecast is based on the June 2008 Clark County Population Forecast prepared by the University of Las Vegas Center for Business and Economic Research. To meet demands from 2009 through 2060, the City and the SNWA member agencies must utilize a combination of techniques, including:

- Nevada’s current consumptive use apportionment of Colorado River water and return flow credits
- Las Vegas Valley groundwater and banked resources
- Development of an in-state ground water project
- Water conservation and demand management
- Utilizing a diversified water portfolio, including interim or bridge resources

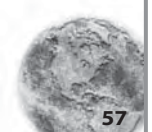
The Las Vegas Valley must ensure the availability and development of the Colorado River and groundwater resources. The SNWA’s Board of Directors approved construction of a new water intake in Lake Mead in 2005. In addition to preserving supply capacity, the third intake will provide access to water at a lower elevation in the event that Lake Mead water levels decline in times of drought. The project is scheduled to be completed in 2014.

Beyond Nevada's Colorado River water apportionment, the main resource to meet future water demands will be in-state groundwater. Groundwater within the Las Vegas Valley remains instrumental in helping purveyors meet peak water demands. To maximize the use of Nevada's Colorado River allocation, SNWA member agencies began storing or "banking" water in the Las Vegas Valley in 1987. Banking occurs through the artificially recharging of Nevada's unused Colorado River water into the local groundwater aquifer. This provides Southern Nevada with additional resources that can help bridge potential shortfalls in meeting demands. While the Southern Nevada Water Bank is a resource upon which the community can draw in times of need, the SNWA, with legislative approval, developed the Las Vegas Valley Groundwater Management Program (GMP), including storage of recharge permanently for the GMP and several other efforts seeking to protect the local groundwater basin from over drafting and potential sources of contamination. This recharge water is not intended for future use, but helps manage the groundwater aquifer for well users. The recharge water also helps maintain stable water levels and reduce the likelihood of subsidence and well failures.

The leading potential for water savings comes from conservation through reclamation, regulations, pricing, incentives and education. The result of these strategies has lead Las Vegas and Southern Nevada to reduce its demand 29 percent, from 314 gallons per capita per day (GPCD) in 2002 to 223 GPCD in 2010. It is the SWNA goal to achieve a water usage of 199 GPCD by 2035.

The ability to increase efficient water use and reduce water waste wherever possible has a direct impact on the amount of resources that will be needed and available in the future. Conservation is a resource, but is fundamentally different from other resources. Unlike typical "wet" resources, which are acquired to meet demands, conservation is a tool that is used to reduce overall demands and extend supplies. The more successful the city of Las Vegas conservation efforts are, the lower the community's overall demand for water becomes, and the more efficiently it uses existing supplies.

Many urban, commercial and industrial uses can be met with water of less than potable water quality. When the demand exceeds the capacity of the purest water source, lower quality water can be substituted to serve the non-potable purposes. Treated wastewater can substitute for irrigation of lawns, parks, roadway borders and medians, toilet flushing, dust control and construction.



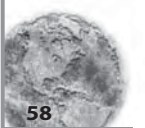
The city of Las Vegas provides direct reuse water within its municipal boundaries and unincorporated Clark County by way of the Water Pollution Control Facility (WPCF). The WPCF has a capacity of treating 91-million-gallon-per-day (MGD) and is located on the Las Vegas Wash in unincorporated Clark County. The WPCF currently provides reclaimed water to an adjacent power plant and four golf courses. The Bonanza Mojave Water Resource Center, a 1-MGD satellite reuse facility, became operational in May 1999 and can provide approximately 1,120 acre-feet per year (AFY) of reclaimed water to an adjacent park and golf course. The Durango Hills Water Resource Center, a 10-MGD satellite reuse facility, became operational in July 2001. It is capable of providing more than 11,200 AFY of reclaimed water to golf courses, schools and parks. Water from the Durango Hills Water Resource Center is used to irrigate nearby golf courses.

In 2002 the city of Las Vegas provided approximately 6,500 AFY of reclaimed water. The highest amount of reuse water to date. In 2010 the total amount of reuse water was approximately 4,800 AFY. The dip can be attributed to the current economic conditions and the closing of a golf course. The reclaimed water that is not reused for golf course, schools and parks is returned to Lake Mead for Return Flow Credits. *(Please refer to the Public Services and Facilities Element for more details regarding water treatment in Las Vegas).*

In March 2009, the SNWA and the Clean Water Coalition (CWC) completed the Southern Nevada Regional Water Recycling Study (SNRWRS). The study examined the potential for direct and indirect reuse of wastewater to enhance the valley's water supply. Given the influence of wastewater on Southern Nevada's available supply, it is important for the local and regional water and wastewater providers to continue sharing information and working cooperatively on recycling and reclamation initiatives.

All jurisdictions on the regional level are aware of the importance of water conservation and aquifer protection. Water availability, water quality, the location of water and the infrastructure required are regional issues. Cooperation on a regional level is important to the health, welfare and safety of the entire community. Sharing ideas, research and concepts for potable and non-potable water use and reuse, as well as plans for recharge facilities can help move toward conservation of water resources.

The Southern Nevada Regional Water Recycling Study states that community leaders from Southern Nevada met in 2009 to establish goals for future water recycling practices. The community leaders consisted of representatives from the



cities of Las Vegas, Henderson, North Las Vegas, Boulder City, the Big Bend Water District, Las Vegas Valley Water District, developers and businesses. These goals are:

- Expand return flow to the Colorado River to increase Nevada's credit for withdrawal
- Expand the use of Recycled Water in areas where large turf and industrial areas exist
- Maximize the use of Recycled Water in areas of Southern Nevada where return flow to the Colorado River system is not practical, including the testing of aquifer storage and recovery
- Develop a salt management strategy to address the accumulation of salts that are detrimental in recycled water
- Continue to advance the research of the health and safety implications of recycled water
- Prohibit the use of treated and untreated graywater, as it introduces the potential to transmit disease
- Educate the public about the benefits of recycled water

The City will continue to support and participate in regional processes related to long term demand on water resources, such as the Southern Nevada Regional Planning Coalition (SNRPC). The coalition was created by the Legislature for regional collaboration and planning efforts across governmental jurisdictional boundaries.

Another demand management strategy is adopting water use regulations. In 2005, the SNWA and its member agencies began working together to implement permanent regulations. The regulations are enforceable by fines from the respective jurisdictions. The enacted regulations cover:

- Landscape watering
- Vehicle washing
- Landscaping (turf) installations
- Mist systems
- Golf course water budgets
- Fountains and ornamental water features
- Water waste

The implementation of water-efficient landscaping is a notable opportunity for water conservation. To address this, the city of Las Vegas has enacted a turf limitation ordinance. The ordinance reduces the amount of turf that may be used for new development and prohibits the use of turf for public facilities except for schools, parks and cemeteries. Procedures to enforce these landscaping conditions are delineated in the Unified Development Code and Title 14.11 of the Las Vegas Municipal Code. On June 28, 2011 the Southern Nevada Regional Planning Coalition (SNRPC) approved a regional Plant



Attractive use of xeriscape, or water-efficient landscaping.

List. The list helps residents and developers make informed decisions about plants suited for the Las Vegas Valley. This list has also been incorporated in the Unified Development Code.

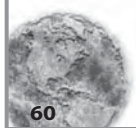
Water pricing is also an effective conservation tool in which tiered rate structures charge higher rates as water use increases. Such rate structures encourage efficiency, while ensuring the affordability of water for essential uses. The SNWA member agencies, including the LVVWD, have adopted tiered pricing. They revisit the pricing structure to ensure their effectiveness is maintained and to make adjustments as needed.

One of the SNWA's most effective water conservation strategies is its incentive programs. The SNWA has offered incentives for several different programs, including:

- Water efficient landscaping rebates, which provides incentives for residential and commercial property owners to upgrade lawn to water-efficient landscaping. Since 2000, the SNWA has supported the conversion of more than 158 million square feet of lawn to water efficient landscaping, saving the community 8.8 billion gallons of water annually with a cumulative savings of more than 59 billion gallons.²⁶
- Use of water efficient technologies, which exchanges existing water usage equipment at commercial businesses with more efficient equipment. This has resulted in a cumulative conservation of more than 2.4 billion gallons.
- Rebates for pool covers, which cover up to half the cost of a cover. By 2010, more than 27,000 pool covers have been purchased through the program, resulting in an estimated cumulative water savings of 1.7 billion gallons.
- A water efficient landscaping program, in which landscape contractors can participate to ensure that their projects meet specific criteria to conserve water.
- A home certification program called Water Smart Homes, in which new homes are certified to ensure homeowners purchase a home that can save as much as 75,000 gallons of water annually. The city of Las Vegas recognizes Water Smart Homes program as a part of its Green Building Program. This program is the nation's largest water efficiency program for new homes and serves as a model for the EPA. In 2011, 410 new Water Smart Homes were labeled, bringing the program-to-date total to almost 8,700 labeled homes.²⁷

26 Southern Nevada Water Authority Conservation Status Update – October 2011

27 Southern Nevada Water Authority Conservation Status Update – October 2011



A fundamental component of water conservation strategy is education. Before communities will accept regulation they must recognize the importance of conservation and understand how they can conserve water most effectively. The Water Conservation Coalition was established in 1995. The coalition is a public-private partnership formed by community leaders to increase water-efficient practices and to promote community-wide water conservation. The coalition provides citizens and organizations with conservation related content to be distributed through newsletters and internet sites. Another educational opportunity for the residents of Las Vegas is the demonstration gardens at the Las Vegas Springs Preserve. These gardens serve as an example of water-efficient landscaping and offer classes by master gardeners and horticulturists.

Alternative and emerging technologies will also be an important component to meeting the region's future water needs. As a component of a diversified water portfolio, cloud seeding and desalination partnerships are being explored to possibly help achieve future regional water management goals. Please refer to the 2009 Water Plan for more detailed information regarding the role of these methods in Southern Nevada.

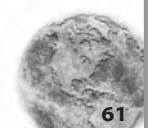
WATER QUALITY

Effective management of the Las Vegas Valley watershed is crucial to ensure that the quality of Southern Nevada's water is preserved. There are a number of elements that will impact water quality in the future. These elements include:

- Increased volumes of treated wastewater released to Lake Mead
- New discharges of treated wastewater by upstream users
- Increased runoff inflows due to development in the watershed.

WATER POLLUTION AND STORMWATER QUALITY

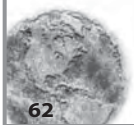
In 1972 and 1977, the Federal Government enacted the Federal Water Pollution Control Act. Section 208 of the Act required the development of an integrated regional quality management program. The intent was to address water pollution sources. The 208 Area-wide Water Quality Management Plan was approved by the Environmental Protection Agency (EPA) in July of 2009. The plan details the objectives, policies and programs for managing water quality in the Las Vegas Valley.



Monitoring and management of Lake Mead inflows are critical to protecting its overall water quality. In 2007, the Las Vegas Valley Watershed Advisory Committee (LVVWAC) was formed. In 2009, the committee published the Regional Water Quality Plan with the number one goal of protecting Lake Mead as a source of water for Southern Nevada. The Las Vegas Wash flows are comprised of highly treated wastewater discharge, stormwater runoff, shallow groundwater and urban runoff. Lake Mead inflows are monitored monthly for nutrients and drinking water contaminants by the Southern Nevada Water Authority (SNWA) and until June 2012 by the U.S. Bureau of Reclamation. The Clark County Regional Flood Control District (CCRFCDD) monitors dry and wet (storm water) weather flows.

Ongoing water monitoring efforts are needed to help ensure that water managers effectively respond to current and emerging water quality issues. In accordance with the Clean Water Act, the Environmental Protection Agency (EPA) regulates non-point source discharges. This is accomplished under the EPA's National Pollutant Discharge Elimination System (NPDES) program. The Nevada Division of Environmental Protection (NDEP) is responsible for implementing and regulating this program locally. In regards to stormwater, preventing contaminant inflow is easier and more cost effective than mitigating impacts. The city of Las Vegas has adopted a stormwater management ordinance (#6006) that prohibits pollutant discharge directly into the storm drain system or local surface water. Stormwater pollution prevention plans ensure that construction activities will not pollute or contaminate downstream water supplies. In addition to the ordinance, the Stormwater Quality Management Committee stakeholders work together to develop and implement stormwater pollution monitoring, control and outreach efforts within the Las Vegas Valley. The city of Las Vegas also conducts numerous operational and maintenance activities that remove pollutants from stormwater discharged into the wash system. Some of these activities include street sweeping, sediment removal from pumping stations and pipes, debris removal from ditches and solid waste collection services.

Septic tank seepage is a pollutant discharge that is an area of concern for the city of Las Vegas. Over the years, the development pattern of the city has become integrated with unincorporated Clark County lands, particularly in the northwest part of the Valley. In these areas, the density of septic tanks is about 119 per square mile, and in some areas exceeds 300 per square mile (See **Map 11**). Clark County statistics have demonstrated that some shallow ground waters in areas serviced by septic tank systems have shown elevated levels of bacteria



and sediment. This groundwater eventually flows into the Las Vegas Wash which deposits into Lake Mead. The protection of local groundwater from septic seepage is an important component to the preservation of the Las Vegas Wash and Lake Mead.

It is imperative that the highest water quality standards are maintained for Lake Mead. The city of Las Vegas must continue to limit urban runoff and facilitate the enforcement of stormwater ordinances in order to protect drainage systems from pollutants. Existing water reclamation facilities must be optimized (as discussed in the Water Conservation discussion) and the Las Vegas Wash Stabilization Plan must be completed to minimize erosion in the Wash.

FLOOD CONTROL

The Clark County Regional Flood Control District (CCRFCD) is responsible for the development of facilities that manage, monitor and treat storm water run-off. Historically, storm run-off in the Valley flowed through natural washes and drained into Lake Mead. As the Las Vegas Valley became urbanized, the increased storm flows caused by growing areas of urban cover subjected many parts of the Las Vegas Valley to severe flash flooding during storm events. In a response to growing flood related problems, the CCRFCD was created in 1985 to develop a coordinated and comprehensive master plan to solve flooding problems, regulate land use in flood hazard areas and coordinate the construction of flood control facilities. Since the implementation of the initial Comprehensive Flood Control Master Plan in 1986, approximately 70 detention basins and 530 miles of concrete open-flow channels, culverts, and storm drains have been developed to safely channel water into the Las Vegas wash systems and ultimately Lake Mead.

The CCRFCD 2008 Comprehensive Flood Control Master Plan was developed to be consistent, to the fullest extent possible, with the *Southern Nevada Regional Policy Plan*. The *Southern Nevada Regional Policy Plan* promotes the preservation of natural washes, as well as the use of flood control facilities as corridors for trail systems and other multi-use, recreational amenities as appropriate. The city should continue to work with the CCRFCD, developers and other entities to ensure that natural washes are preserved and that drainage facilities are utilized as recreation and/or conservation areas where feasible.

WATERSHED AND WETLAND PROTECTION

Over the past 30 years, erosion has destabilized the Las Vegas Wash channel and caused increased sedimentation in



Cheyenne flood channel



Alta channel during a rainstorm



Las Vegas Wash channel

Photos courtesy City of Las Vegas Public Works Department and Las Vegas Valley Water District

Lake Mead. The Comprehensive Adaptive Management Plan was created by the Las Vegas Wash Coordination Committee (LVWCC) to address the issues of water quality, erosion control and wetlands restoration. It identifies wash stabilization as a key step needed for long-term water quality management.

A major component of the wash management plan is the installation of weirs throughout the wash to slow the flow of water and create ponds where wetlands can be established. The wetlands act as “kidneys” that clean the waters by filtering out the harmful residues and pollutants that are associated with urban runoff. As of 2011, 14 of 22 weirs are in place to help mitigate the erosion associated with increased wash flows, water quality concerns and protection of wildlife. The current stabilization efforts have been recognized by the Floodplain Management Association as the most successful stabilization efforts currently in progress within the United States.



Growth in Las Vegas Wash



Water runoff from Water Pollution Control Facility entering Las Vegas Wash.



The Las Vegas Water Pollution Control Facility located on the eastern side of the valley.

Photos courtesy City of Las Vegas Public Works Department and Clark County Water Reclamation District

LAS VEGAS WASH PRESERVATION AND LAND USE

Land use decisions must consider watershed management principals to mitigate any negative impacts development may create along the Wash. The land use study team of the Las Vegas Wash Coordination Committee developed a three tier system for addressing land use issues along the Wash. Tier one is a half mile zone in each direction extending the length of the Wash. This zone is the most important as it has the greatest direct impact on the Wash. Tier two is the land above the shallow groundwater. The protection of this area is important as its close proximity to the urban environment makes the shallow groundwater vulnerable to contamination from a variety of human-related activities including over-irrigation of landscapes, leaking underground storage tanks and improper surface disposal of contaminants. The Bureau of Land Management (BLM) disposal boundary delineates tier three, which is the remaining developable area in the Valley. The City must support the recommendations of the Las Vegas Wash Coordination Committee by incorporating sound wetland protection planning into locations along the Las Vegas Wash.

The city of Las Vegas views the Las Vegas Wash not only as a drainage system, but also as a recreational and visual amenity. The City is constructing a multi-use transportation trail and trailhead facilities adjacent to the wash that will connect to the Clark County Wetlands Park. Construction of approximately 1.5 miles was completed in early 2010, with the remainder of the trail tentatively scheduled to be completed by the end of 2012. The Las Vegas Wash Trail provides a significant portion of the Valley’s alternative transportation route inventory. Through its connection to the Wetlands Park, the trail will provide access to the Lake Mead Recreational Area, the River Mountains Loop Trail and the Rainbow Gardens Geological Preserve. The city has received over \$19 million in funding through the Southern Nevada Public Lands Management Act (SNPLMA) for improvements related to the Las Vegas Wash Trail. The City must

continue to regulate land use within floodplain areas and work with developers to ensure proper clearing, grading and landscaping techniques are addressed within individual developments. Not only will these strategies help address and prevent storm water pollution, they will also help prevent, control and correct erosion.

IMPLEMENTATION

The implementation portion of this section defines specific actions the City will pursue to meet the goals and objectives within the Master Plan. This section focuses on the City's efforts to conserve water, maintain water quality and prevent erosion and pollution of the Las Vegas Wetlands from the Las Vegas Wash. It is the City's objective to ensure that development is designed to include measures to mitigate and limit potential pollution sources and ensure availability and development of water resources.

Action W.1: The City shall support regional cooperation and communicate regularly with other jurisdictions on sustainable solutions of the valley water resources, as well as assist regional organizations and its members in their regular assessments of currently available and forecasted water supplies.

Action W.2: The City shall support and participate in regional processes related to land-use planning, development codes or similar efforts that can influence long-term demands on resources while ensuring that new or expanded services do not adversely affect existing water users.

Action W.3: The City shall support regional educational/public relations programs emphasizing the importance of water conservation and water-efficient landscaping.

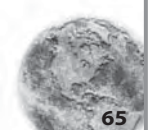
Action W.4: The City shall continue to implement the turf limitation provisions of the zoning ordinance, which reduce the amount of turf that may be used in new residential, commercial/industrial development.

Action W.5: The City shall support the use of water recycling systems through potential programs in a manner that is consistent with the existing Southern Nevada Policy Regarding Recycled Water. Recycled water is water that has been used and subsequently treated to make it suitable for use again.

Action W.6: The City shall support efforts to maximize water reclamation and aquifer re-charging in the public sectors, where such efforts are not likely to result in excessively high groundwater tables. The City shall support the protection of groundwater by limiting the locations of potential pollution sources from areas of groundwater recharge and pumping.

Action W.7: The City shall encourage the preservation and restoration of the area's washes to assist with the shallow groundwater system and Lake Mead.

Action W.8: The City shall ensure that as new development occurs, a comprehensive network of wastewater collection lines is provided by requiring the installation of sewers in all new subdivisions.



Action W.9: The City shall support the recommendations of the Las Vegas Wash Coordination Committee by ensuring that development within tier one (one-half mile of the Wash) incorporates appropriate drainage facilities and/or design to mitigate any negative impact on the Wash.

Action W.10: The City shall coordinate with the LVVWD to undertake improvements to the pressure and quality of water service within the city, where necessary.

Action W.11: The City shall encourage further study of the potentially adverse affects of septic systems on the storm drain system and local surface water to assist with the preservation of the Las Vegas Wash and Lake Mead.

Action W.12: The City shall continue to enforce the Nevada Administrative Code (NAC 444.786) requiring new development to connect to public sewer whenever public sewer is available within 400 feet of the nearest property line and can be reached by gravity flow. The city shall also continue to enforce Nevada Administrative Code (NAC 278.460) requiring subdivisions having density of two or more dwelling units per acre to connect to public sewer when public sewer is available within the distance determined by multiplying the number of single family dwelling units by 100 feet.

Action W.13: The City shall continue to participate in the National Pollutant Discharge Elimination System (NPDES) stormwater program.



WASTE MANAGEMENT

INTRODUCTION

It is the intent of this Waste Management subsection to satisfy NRS 278.150, which requires the inclusion of a Solid Waste Plan component within city's Master Plan.

Responsible control and proper management of waste that is created as a by-product of the urban environment is a contributing factor to a high quality of life and a sound long-term sustainable approach to conserving and protecting the environment. The costs of reducing, reusing, or recycling materials versus the costs of extracting, processing and transporting virgin materials is an economically and environmentally beneficial means of waste management, considering that:

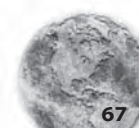
- Americans generate 243 million tons of material solid waste (MSW) annually in the form of product packaging, grass clippings, bottles, food scraps, newspapers, paint, and batteries.
- In 2009, the typical American generated approximately 4.34 pounds of waste per day, nearly a third greater than the volume generated in the 1960's.

The city of Las Vegas encourages practices that reduce the amount of waste by means of source reduction, reuse, and recycling. These terms are defined as:

- **Source reduction:** the elimination of the need for new resources and materials.
- **Reuse:** the physical reuse of material that delays the material's entry into the waste stream.
- **Recycling:** the recovery of useful materials, such as paper, glass, plastic, and metals to make new products and reduce the use of raw materials.
- **Composting:** involves the recycling of organic waste, such as food scraps and yard trimmings, under conditions designed to break down the materials naturally through anaerobic digestion.

Both recycling and solid waste collection services in the Las Vegas Valley are provided through long-term contracts by Republic Services of Southern Nevada (RSSN). In 2009, approximately 83 percent of MSW in Clark County was hauled by RSSN to be landfilled.²⁸ The City can influence and encourage sound environmental practices regarding solid waste disposal and ensure recycling practices are maximized. Recycling and solid waste management methodologies as they are employed in the city of Las Vegas and surrounding Valley are examined

²⁸ http://nevadarecycles.gov/doc/CC_Recycling_Report_050410.pdf



in this portion of the *Conservation Element*, as well as recommendations and actions the City may take regarding waste management. Subtopics within the Waste section include:

- Solid Waste Management
- Recycling and Source Reduction

SOLID WASTE MANAGEMENT

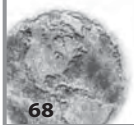
The responsibility for solid waste management is derived and delegated from Federal, State, and local authority. The United States Environmental Protection Agency (EPA) works closely with states, industry, environmental groups, tribes and the public to promote safe solid waste management. The EPA's goals to protect human health and environment is ensured through responsible management of hazardous and non-hazardous waste, conserving resources, enforcing regulations and laws from the Resource Conservation and Recovery Act. In addition, the EPA cleans up areas impacted by waste.

The Nevada State Environmental Commission (SEC) is a quasi-judicial and quasi-legislative board created by NRS 445B and oversees the regulatory appeals from the Nevada Division of Environmental Protection (NDEP). NDEP is the governing body that enforces state law by conducting compliance inspections at regulated facilities and responds to complaints concerning the management or discharge of regulated substances. NDEP has direct jurisdiction over all counties outside of Clark and Washoe and also has limited responsibilities to oversee the Health Districts' solid waste programs.

NDEP's Bureau of Waste Management (BWM) contains a hazardous waste management branch and solid waste management branch that oversees recycling statewide. NDEP maintains a general state plan and requires counties to have a solid waste management plan submitted to the Solid Waste Branch. There is also a special waste plan for used tire management. The Solid Waste Branch also provides technical assistance to local municipalities.

The city of Las Vegas is a member agency of the Southern Nevada Health District (SNHD) created pursuant to Nevada Revised Statutes (NRS) 439.362. The SNHD is charged with protecting the health, environment and the well-being of Clark County residents and visitors. In order to effectively manage issues regarding solid waste, SNHD acts as the Solid Waste Management Authority in Clark County and is responsible for managing:

- Permitted disposal facilities
- Illegal solid waste disposal
- Underground storage tanks



- Nuisance complaints
- Illegal dumping complaints
- Waste management facility audits
- Small Quantity Generator sector inspections

The City's policy, pursuant to Las Vegas Municipal Code (LVMC) Title 9.08.010, is to regulate the collection, transportation, transfer, recycling and disposal of solid waste and recyclables in a manner that is consistent with state law and will protect public health, while conserving natural resources and enhancing the beauty and quality of the environment.

Currently, city of Las Vegas residential MSW is collected manually twice per week using rear loading trucks. Most MSW passes through one of RSSN's three transfer stations in the Valley. The busiest is the Cheyenne Transfer Station in North Las Vegas, about six miles north of downtown Las Vegas. The Cheyenne Transfer Station handles 5,000 tons per day and is permitted up to 9,000 tons. The Sloan Transfer Station handles 1,500 tons per day and the Henderson station handles 1,200 tons per day. Each facility has the capacity to handle 6,000 tons per day. Waste collected at each transfer station is then transported to the landfill.

Clark and Washoe Counties are served by large municipal solid waste landfills and account for about 90 percent of the solid waste disposal in the state.²⁹ Pursuant to Federal regulations, NEC distinguishes three classes of municipal landfills based on quantity and type of waste:

- Class I site – a municipal solid waste landfill that accepts 20 tons per day or more on average of solid waste;
- Class II site – a municipal solid waste landfill that accepts less than 20 tons per day on average of solid waste; and
- Class III site – a land disposal site that accepts only industrial waste.

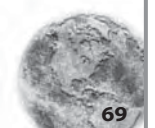
The city is serviced by Apex Regional Landfill, an active Class I waste management facility. Owned and operated by RSSN, the Apex facility is one of the largest landfills in the country. Located approximately 25 miles northeast of downtown Las Vegas along U.S. Highway 93, Apex receives residential, commercial, industrial MSW, non-hazardous sludge, construction and demolition debris. Prior to the construction of the Apex Regional Landfill, the Sunrise Landfill was a 440-acre site located three miles east of Las Vegas city limits that accepted the Valley's solid waste. The Sunrise Landfill is unlined and contains more than 18-million tons of waste including MSW, medical waste, sewage sludge, hydrocarbon-contaminated soils, asbestos, and construction waste.



Waste processing at Apex landfill.

Photos courtesy the Las Vegas SUN

²⁹ <http://ndep.nv.gov/bwm/swmp/swp04.htm>



Upon the closure of the Sunrise facility, the Apex Landfill began accepting waste in October 1993 under a 99-year lease. The landfill was designed with a refuse capacity of approximately 865 million cubic yards and a service life until 2150.³⁰ The Apex facility accepts household hazardous chemicals, asbestos, regulated non-hazardous wastes, and construction and demolition debris. The Soil Treatment Facility of APEX treats hydrocarbon-contaminated soils and reuses the soil as daily cover at the Landfills.

On average, Apex receives a daily intake of approximately 9,000-10,000 tons, six days per week.³¹ Continuous streams of waste sent to the facility increases the overall environmental impact to Southern Nevada. Although the lifespan of Apex is almost 150 years, increasing the amount of waste recycled in the City and Clark County will increase the lifespan of the landfill and reduce the need for additional space. **Map 12** illustrates the location of landfills, transfer stations, convenience centers and recycling facilities within Clark County.

Landfill, transfer station, and other waste disposal activities often generate negative externalities such as anthropogenic greenhouse gas and methane. These emissions have a tremendous impact to the environment and adjacent land uses. The land and uses adjacent to transport routes used for hauling the waste are affected as well.

Landfill and transfer stations are not compatible with residential and commercial zones. Uses associated with the disposal of solid waste must be located in areas appropriately designated such as industrial zones. Additionally the sites should be accessible from arterial streets or have freeway access. The City's land use categories are explained in the *Las Vegas 2020 Master Plan, Land Use and Rural Neighborhood Preservation Elements*.

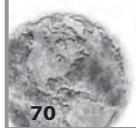
Although placing landfill activities away from urban areas eliminates possible negative impacts and nuisances on urban uses, as is the case with Apex Landfill, waste may be hauled to these sites through urbanized areas. Current street routes through the City that are used to convey bulk waste from transfer locations and sources of treated sewage sludge may pass through or near residential areas. Haul vehicles are a constant source of Scope 1 direct greenhouse gas emissions, noxious odors and vehicle noise and therefore are incompatible with residential areas, schools, parks, and other areas where people may congregate outdoors.

In 2009, landfills accounted for 17 percent of total methane (CH₄) emissions in the United States.³² However, certain

30 <http://ndep.nv.gov/bwm/swmp/Appendix2.pdf>

31 <http://www.republicservicesvegas.com/Pages/AboutUs.aspx>

32 <http://www.epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf>



measures can be taken to mitigate their emissions, including waste-to-energy, anaerobic digestion, and biogas technologies. Construction of a landfill gas-to-energy facility began at the Apex Landfill in 2010 and is slated to begin operating in late 2011. RSSN estimates the facility will capture between 60 to 90 percent of the methane generated by the landfill once in operation.³³ The project will generate roughly 96 million kWh of electricity a year and has a 20-year power purchase agreement with NV Energy.³⁴ These types of efforts can be conducive to lowering emissions and mitigating environmental degradation over the course of the life of the landfill.

RSSN must contend with the disposal of household products considered hazardous waste that contain corrosive, toxic, ignitable or reactive ingredients which can pollute the environment and pose a threat to human health. Products such as paints, cleaners, florescent light bulbs, batteries, and pesticides, contain potentially hazardous ingredients that require special disposal. Improper disposal of household hazardous wastes can include pouring them down the drain, on the ground, into storm sewers or in some cases putting them out with trash.

RSSN has a household hazardous waste program that allows residents to drop off products not permitted in the mainstream garbage. There are two locations designated in the valley with specific dates and times throughout the year. RSSN will not accept explosives, ammunition and pressurized gas cylinders. Currently the recycle center at Gowan Road and the transfer station in Henderson are the only two locations within the valley. Specifics on amounts and preparation of materials can be found on the RSSN website at www.republicservicesvegas.com.

Nuclear waste is possibly the most hazardous material that may threaten Las Vegas residents. The Mayor and City Council has declared the city of Las Vegas a nuclear-free zone through Title 9.37.010 and will not support the transportation of spent nuclear materials on roads through the city. Additional policies regarding nuclear waste are also addressed in the *Safety and Seismic Safety Element*.

RECYCLING AND SOURCE REDUCTION

Recycling is the diversion or removal of materials from a solid waste stream in order to reuse it in the same way or for a different purpose. Source reduction is any action that reduces the amount of solid waste to be collected. Examples of source reduction include the use of materials designed with longer life spans or which use less packaging.

33 <http://waste360.com/news/lfgte-apex-republic-services-20110415>

34 http://www.lvbusinesspress.com/articles/2011/04/28/news/iq_43741091.txt



Recycling is a common shared responsibility to improve the overall environment. Nevada's recycling program is authorized under NRS Chapter 444A. NRS 444A.020 establishes a goal to achieve a 25 percent recycling rate of total solid waste for counties and municipalities with populations over 100,000. Residential recyclables are collected in the city of Las Vegas manually via side loaded trucks every other week, on the same day as trash collection. Most residents utilize multi-stream recycling in which they are required to set out recyclables in three twelve gallon crates that separate the recyclables by glass, newspaper/magazines and plastic/non-ferrous metals.



Republic Services of Southern Nevada recycling plant located on Cheyenne Ave. in North Las Vegas.

Recycling rates are calculated from data provided annually by recycling centers to their respective municipalities. Nevada Administrative Code (NAC) 444A.135 and 444A.140 requires the municipalities to compile the data into reports and submitted them to NDEP. These annual reports quantify the recyclable materials collected at recycling centers for the preceding year. Based on the reported data, the State of Nevada's overall recycling rate decreased from 21.7 percent in 2008 to 20.3 percent in 2009, an increase of 171,842 tons of material deposited into the landfill. In the same time frame, Clark County's overall recycling rate for residential and commercial recycling decreased by 1.6 percent to 17.4 percent.³⁵ Metals and paper were the most abundant materials sent to be recycled in 2009 accounting for roughly 77 percent of all recycled materials and nearly 537,505 tons.

The City's franchise agreement with RSSN allows other companies to either collect or accept source-separated recyclable materials from commercial businesses. Other recycling businesses collect and market recyclables from schools, businesses and other institutions. Several companies handle construction and demolition debris; others handle food waste from casinos and restaurants, while others collect cardboard, plastic, aluminum, metals and other commonly recycled commodities. To date, there has been no recycling program contemplated for organic waste. The City could investigate the possibility of instituting such a program, possibly on a pilot basis with RSSN and the other Valley entities.

In order to achieve a greater level of participation in the residential, and particularly in the commercial/industrial components of regional recycling efforts, it will be necessary to not only develop incentives through a specific program, but to also increase community awareness through outreach and education and by increasing the convenience to participate in recycling efforts. In the non-residential sectors, one way this can be done is by increasing the number of collection points for non-residential clients to drop off recyclable materials. Methods to increase awareness of the benefits of recycling also need to be examined.

³⁵ <http://www.nevadarecycles.gov>



The participation rate of Valley homeowners is approximately 3 percent, and is significantly less than the national rate of 33 percent.³⁶ In 2008 the City and County coordinated with RSSN to help increase recycling rates among homeowners. Single-stream pilot recycling programs (PRP) were established to achieve a greater level of participation as well as improve customer service, control costs and increase recycling rates.³⁷

In communities with a pilot recycling program, recyclables are collected using efficient automatic side-loaded trucks. Residents place their trash and recyclables in separate 96-gallon carts, one dedicated to trash and the other for comingled recyclables. Single stream recycling provides an opportunity to update the collection and processing system. This allows for new materials to be accepted to the list of recyclables (Appendix WM-2). Full implementation of the single stream strategy also allows RSSN to replace the current fleet of manually loaded trucks with more cost-effective automated trucks.

Each pilot program provides a different scheduling option for trash and recycling pick-up (Appendix WM-3). Communities that participated in the pilot program discovered comingled recycling substantially raises diversion rates. Areas that participated in the PRP showed diversion rates from 17 percent to 25 percent.³⁸ In addition, a majority of residents who participated were satisfied with their new pick-up schedule and indicate a preference to the new schedules.

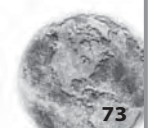
The 2006 Climate Protection Resolution (R-57-2006) established goals to increase recycling in City operations and the community. In an effort to increase the efficiency and sustainability of the City's day-to-day operations an employee based program was created called "City Employees Lowering Energy cost By Recycling And Tracking Efficiency (CELEBRATE)." The City continues to build and strengthen existing key partnerships in solid waste reduction and recycling by working with RSSN and local government leaders to devise strategies to work towards achieving the State mandated 25 percent recycling goal.

The city of Las Vegas also operates a successful internal recycling program. The City recycles a wide variety of different products ranging from paper and plastics to scrap metal and vehicle batteries. A major component of the City's Sustainability Initiative is recycling of materials that can be transformed into another use. In addition the City recycles a wide variety of commodities some of which are deemed hazardous materials (Appendix WM-1). Pursuant to Chapter 459 of NRS, hazardous materials such as batteries, used oil, florescent light fixtures, and cleaning solvents are handled and disposed of according to the regulations established by the SNHD.

36 http://nevadarecycles.gov/doc/CC_Recycling_Report_050410.pdf

37 http://nevadarecycles.gov/doc/CC_Recycling_Report_050410.pdf

38 http://nevadarecycles.gov/doc/CC_Recycling_Report_050410.pdf



IMPLEMENTATION

The *Las Vegas 2020 Master Plan* does not contain direct policy references to the issues related to recycling and waste management. This is primarily due to the fact that the City does not fulfill a role of direct responsibility with regard to these issues. Despite this, it is important to note that responsible and efficient recycling and solid waste management programs are important to achieving and maintaining a high level of environmental quality for the city.

At this time, Nevada's statutes do not contain mandatory recycling requirements. The current statutes place the responsibility to recycle on the residential and commercial sectors, and even that responsibility is voluntary.

Action WM.1: The City shall work with Clark County, Southern Nevada Health District and the franchised operator to ensure that truck haul routes are planned to minimize adverse impacts to the citizens of Las Vegas.

Action WM.2: The City shall work with Clark County and the franchise operator to ensure that the location of transfer stations will be consistent with the Las Vegas 2020 Master Plan.

Action WM.3: The City shall work with the franchise operator to support further development of landfill methane energy production and waste to energy technologies.

Action WM.4: The City shall examine successful residential recycling programs in other municipalities, determine workable options, such as incentive programs, and work with Clark County and the franchise operator to implement a city-wide single stream recycling program to reach the state-mandated goal of 25 percent recycling of total solid waste.

Action WM.5: The City shall investigate an organic waste recycling program, possibly on a pilot basis, with RSSN and the other Valley entities.

Action WM.6: The City shall work with local business and industry representatives, and with Clark County and the franchise operator, to identify options for local consumption of selected recycled materials.

Action WM.7: The City shall work with Clark County and the franchise operator to encourage an increase in the number of convenient recyclable materials drop-off locations.

Action WM.8: The City shall work with Clark County and the franchise operator to investigate the cost, participants and other factors for an enhanced public awareness program promoting recycling, identifying participation incentives and possible penalties as may be developed as part of an incentive program.

Action WM.9: The City shall look to increase its recycling rates in City operations by continuing its internal CELEBRATE recycling program.



SOILS

INTRODUCTION

Conservation practices relating to local soils conditions overlap a number of other issues discussed elsewhere in this *Conservation Element*. For example, poor or negligent soil conservation practices can have negative effects on air and water quality through blowing dust, erosion of soils impeding storm water flows, and creation of public safety risks. The city of Las Vegas has many areas which contain expansive soils that are poor for construction and urban uses by virtue of the fact that they may collapse when they absorb water. Still other areas are subject to tectonic movement due to sub-surface fissures created by horizontal groundwater movement. Some areas in town have soils that are so contaminated with pollutants that costly and time consuming clean-up is required. Classified as “brownfields,” these areas typically require significant soil remediation efforts before the land can be utilized for development. The western boundary of the City abuts the Spring Mountain Range which contains steep slopes and present unique issues to development, but they are also a valuable natural resource that is worthy of conservation efforts.

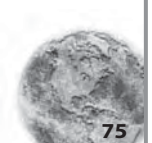
This section contains a discussion of selected soils management practices and recommendations for City action to adequately address concerns related to:

- Soils Management
 - o Subsidence
 - o Fissures
 - o Brownfield Sites
- Soils and Land Use
 - o Urban Development
 - o Conservation of Steep Slopes
- Implementation

SOILS MANAGEMENT

The city of Las Vegas is located in the central portion of the Las Vegas Valley, which is bordered by mountains on all four sides. The floor of the Valley, which ranges from about 1,800 feet to about 2,500 feet above mean sea level, drains generally from the west and north to the east and south. As one approaches the perimeter of the basin, slopes increase to between one and three per cent within the urbanized portion of the Valley.

While the mineral composition of the surrounding hills is a mixture of shale, sandstone and dolomite with gypsum and

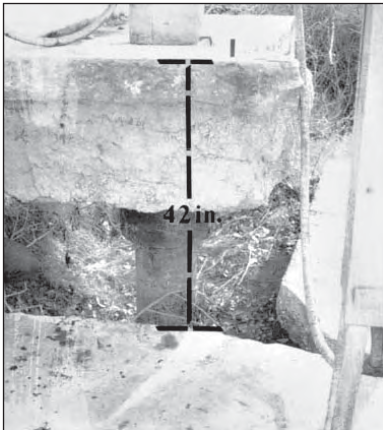


quartzite deposits (See **Map 13**), the floor of the Las Vegas Valley basin is covered with silt and clay left by retreating prehistoric lake water. These types of soils have provided some significant obstacles to urbanization (See **Map 14**).

SOIL SUBSIDENCE

Soils in some areas of the Las Vegas Valley are subject to soil subsidence (See **Map 15** and **Appendix S-1**). Soil subsidence is a condition where a portion of the earth's surface is lowered due to natural or human activity.

Locally, a primary cause of subsidence is the extraction of groundwater from deep underground aquifers. Research (Nevada Bureau of Mines and Geology, Environmental & Engineering Geoscience, Vol. VIII, No. 3, August 2002, pp. 155-174) has indicated that since 1946, the amount of groundwater extracted from deep aquifers in the Valley has exceeded the recharge rate. From 1935 to 1980, the amount of subsidence in the Valley exceeded five feet. Studies of subsidence in the Valley conducted and updated as recently as 2002 show that the principal areas of subsidence in the Valley continues to occur in the central area of the Valley, centered in three "bowls;" one centered around the Downtown area, from Sahara Avenue to Lake Mead Boulevard, a second northwest of McCarran Airport, and the third in the northwest part of the city, centered near the Rainbow Boulevard/Rancho Drive area. In some cases, the groundwater extracted from aquifers within the Valley is a non-renewable resource, as the aquifers may collapse as subsidence occurs and cannot be re-hydrated to the same capacity. Research indicates that as much as 10 percent of the groundwater extracted in the Valley may be non-renewable.



Subsidence at Well #5, located at Las Vegas Springs Preserve.

Photo courtesy of Las Vegas Valley Water District

Another cause of substance is due to the nature of the expansive soils present in the Las Vegas Valley. Local soils contain clays that increase in volume and expand when they become saturated. Expansions of ten percent or more are not uncommon, and this change in volume can exert enough force on a building or other structure to cause damage. Cracked foundations, floors and basement walls are typical types of damage done by expanding soils. To compound the problem, expansive soils will shrink when they dry causing additional damages to structures as the ground sinks and its support is removed.

Recent data from the Nevada Bureau of Mines and Geology shows that subsidence rates in the Valley have declined over more recent years. In the northwest part of the valley the subsidence rate has decreased from 5-6 centimeters (cm) per year to 2.5-3 cm/year. In the central and southern portions of the valley the subsidence rate has declined from 2.5 cm/year to a few millimeters per year.



SOIL FISSURING

Soil fissuring is a condition that has led to problems with urban development in some portions of the Valley (See **Map 16**). Soil fissures are large cracks in the ground that may take place in areas where faulting (due to tectonic movements) has occurred; however, fissuring is often caused by underground water movements or the repeated saturation and drying of expansive soils. Soil fissuring can cause sidewalks to crack and building foundations to warp. Research has indicated that horizontal aquifer movement is responsible for much of the fissuring that has occurred in the Las Vegas Valley. Known and predicted fissures in conjunction with vertical groundwater changes are being studied constantly by the Nevada Bureau of Mines and Geology, in order to create predictive three-dimensional modeling capability. This, in turn, will assist planners and local legislators to assign appropriate land use controls for areas subject to these seismic activities.

BROWNFIELD SITES

The Environmental Protection Agency defines a brown-field site as “the expansion, redevelopment, or reuse of property which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” Brownfields that have been contaminated by chemicals or other toxins in the past will require mitigation prior to development. The city of Las Vegas used five sets of criteria to determine the most likely areas of such contamination in Las Vegas:

- The Redevelopment Plan boundary;
- The current zoning designations for manufacturing and industrial uses;
- The current case file listings from NDEP;
- Historic phone books listing uses such as dry cleaners, radiator and auto repair, paint, chemical and fertilizer storage, and plating companies; and
- Information from the Sanborn maps, which provided historic information on fire ratings based on claim histories.

In 2007, the City received a grant from the Nevada Department of Conservation and Natural Resource’s Division of Environmental Protection which provided funds to generate a soil plan, water plan, and the for the cleanup management of contaminated soils at Symphony Park. As of 2011, the City only identifies and addresses Brownfield remediation issues on city owned property. In cases where private property owners inquire about consultation or funding for remediation, city staff typically refers the individuals to the proper state or federal agency that can assist in those matters.



Fissure south of historic Well #3 located at Las Vegas Springs Preserve.

Photo courtesy of Las Vegas Valley Water District



SOILS AND LAND USE

LAND USE

It is good practice to ensure that proactive land use planning is incorporated into any comprehensive soils conservation plan. The designation and regulation of land ensures that development avoids areas of sensitive soils, promotes best management practices in terms of landscaping and urban development, as well as minimizes the conveyance of harmful chemical ingredients into the ground.

The State of Nevada, as well as local entities within the Las Vegas Valley, have conducted studies to identify areas within the Valley that have inherent instabilities due to soils subject to underground fissures, poor chemical composition, poor bearing capacity, or poor shrink-swell potential. There is a need for the City to work with other agencies that have the technical ability to continually assess these soils conditions to determine if additional adjacent lands become affected. Although there is some existing urban development in such areas, it is important to assess and monitor undeveloped areas, to ensure that urbanized land uses do not expand into these unstable areas. These areas are appropriate for passive or low intensity development that does not require many buildings and structures, such as golf courses.

Areas with poor soils pose risks to development for a variety of reasons. Expansive soils (high shrink-swell potential), poor bearing capacity, high saline or gypsum content which can corrode concrete, and areas with subsidence problems due to underground fissuring or changing water table levels, have been identified across the Valley. In areas within the City that are subject to these types of conditions, it is good practice for the City to identify the type of development that can take place on the various soils types which will have minimal impacts on the environment, protect personal property, and ensure public safety.

Local soils can also contribute to contamination of our drinking water and the leaching of hazardous chemicals into the ground. Due to the lack of arability in local soils, many residential and commercial properties have extensive vegetated areas that require the regular application of fertilizers and pesticides to ensure the continued health of trees, shrubs and turf. This can cause the infusion of potentially harmful chemicals into the environment through storm water runoff. Ultimately, this hazardous runoff can make its way into Lake Mead, which is the principal drinking water supply for the Las Vegas Valley.



CONSERVATION OF STEEP SLOPES

The west boundary of the city of Las Vegas abuts the Spring Mountain Range. Eventually, the foothills leading up to this area will be affected by development and will require special engineering and development considerations due to the unique circumstances that result from the increasing slope of the land.

Areas of steep slopes constrain development in a number of ways. Vehicular access can be extremely difficult, infrastructure is costly to engineer and implement, runoff and erosion are difficult to control or prevent, and if hillsides are improperly developed, they can become unsightly.

Due to these unique circumstances the city of Las Vegas adopted a Hillside Development Overlay District (HS-O) (ORD: 5923) on August 15, 2007. The HS-O District separates hillsides into two categories, those with slopes of 15-25 percent and those with slopes over 25 percent. Development standards are designated for each respective area, to promote orderly development, protect sensitive lands and habitat, and to mitigate erosion and siltation problems downstream.

The City needs to ensure that areas of steep slopes within its boundaries are regulated regarding urban development to prevent erosion, habitat damage and visual blight that can result from disturbance of such areas. Where such areas exist beyond city boundaries, but could have a negative environmental affect on city lands that may be downstream from such sites, the City needs to communicate with the responsible entities to suitably regulate urban development of these areas.

IMPLEMENTATION

Due to the poor quality of soils located within the Las Vegas Valley, the city must continue to ensure that any future development consider areas of problem soils which may adversely affect structures and/or property, public safety, and the environment. When developing areas on steep slopes, care must be given to ensure that any potentially hazardous conditions that are particular to mountainous areas are mitigated while protecting the natural environment from the impacts of development.

Action S.1: The City shall develop, in concert with other relevant agencies, an updated inventory of areas with poor or unstable soil quality, by which to monitor and work with property owners during the development review process to incorporate design measures to neutralize risk to public safety and the environment.

Action S.2: The City shall continue to encourage the utilization of areas with poor soils with appropriate low intensity land uses such as parks, golf courses, recreational fields, etc.

Action S.3: The City shall encourage the use of organic fertilizers and pest control substances and measures that do not add non-biodegradable chemicals or pollutants to the water system. Through examining of its own practices for fertilization and pest control the City will ensure that the most current and effective methods are being employed, as well as those methods are being educated to the public so as to minimize negative impacts on the local ecosystems.

Action S.5: The City shall work closely with developers and landowners to facilitate their adherence to development standards as detailed in the Hillside Development Overlay District and Unified Development Code, so as to ensure that areas developed on steep slopes preserve significant natural features and minimize impacts to native plants and wildlife.



HABITAT AND WILDLIFE

BACKGROUND

Southern Nevada is home to a diverse ecosystem whose inhabitants should be taken into account as urban expansion occurs. Clark County has been the lead agency in the consideration of the effect of urban expansion on sensitive species of vegetation and wildlife in the Las Vegas Valley through the research and preparation of the Multiple Species Habitat Conservation Plan (MSHCP), discussed in greater detail in the following subsection of this Element. This Plan is intended to provide policies that will strike a balance between the long-term protection and eventual recovery of threatened or endangered native species of plants and animals and their habitats, and the logical pattern of urban development that will occur in the Las Vegas Valley over a 30-year period.

In balancing these often-conflicting objectives, the MSHCP is also attempting to maximize flexibility, reduce the regulatory burden and the costs of compliance and maximize the opportunities for recovery of identified species.

The MSHCP identifies a range of habitat types within the County which:

“... supports 142 species of mammals, 392 species of birds, 54 species of reptiles, 9 species of amphibians, 41 species of fish and 775 species of plants.”

The Plan goes on to indicate that most of these species (414 plant species and 579 of all species) are located in mountain communities; nonetheless, urban development within the Valley basin has an impact on a number of sensitive or threatened species. These impacts are analyzed in the MSHCP and policies to address these impacts are identified.

In this section, a discussion of issues, policies and recommendations for City action related to the well being of the Mojave Desert ecosystem are discussed, including:

- Establishment and Protection of Urban Forestry
- Boundaries and Urban Expansion
- Protection of Endangered Species

ESTABLISHMENT AND PROTECTION OF URBAN FORESTRY

As the city of Las Vegas matures quality of life issues become increasingly more important. The City is now challenged



Tortoise hiding in native grasses and bearpaw poppy



Western Pipistelle bat



Salt Bush



Kestrel

Photos courtesy of Las Vegas Valley Water District

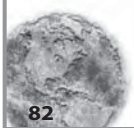
to strive to enhance the level of amenities provided to its citizens and visitors. Providing inviting walkable streetscapes, abundance of parks, shaded transportation corridors and visually enhanced surroundings will improve the quality of the built environment and create a sense of identity and place for the community.

With urban expansion continuing across the nation and sustainability becoming a factor in community planning, urban forestry has become increasingly important within urbanized areas. Urban forestry is the care and management of all vegetation found within an urban setting. This includes the planning, establishment, protection and management of trees and associated plants. Municipalities across the nation have adopted urban forestry protection policies, management plans, established commissions and staffed urban foresters to ensure that the care and management of the urban forest remains a priority for their region.

On May 7, 2008 the city of Las Vegas approved a Resolution (R-26-2008) adopting the urban forestry initiative, stating that the initiative will contribute to the City's long-term sustainability. The resolution was adopted with the goals of doubling the average tree canopy coverage to 20 percent by 2035, to work with existing partners and develop new partnerships in order to ensure that urban forestry remains a priority for the City and the Southern Nevada region and to prepare an Urban Forest Management Plan.

Urban forestry on both public and private property provides numerous benefits to the citizens of Las Vegas. A healthy urban forest reduces atmospheric carbon dioxide, improves air quality, reduces stormwater runoff and energy consumption, decreases the urban heat island effects, improves the pedestrian environment and improves community image and aesthetics. These benefits are multiplied when the size and extent of the tree canopy are increased and offers returns, which are in excess of the cost of planting and upkeep. In order to ensure an adequate and established urban forest, minimum landscape standards have been adopted in the Unified Development Code.

Strengthening the role of urban forestry within the city of Las Vegas can be achieved through a variety of methods. Multiple areas within the City have been identified in the implementation section that can showcase and support the presence of urban forestry within the community. Open spaces and parks are positive environmental elements within urbanized areas, as they contain vegetation that processes out pollutants and generate oxygen, provide a habitat for wildlife, and contribute to the psychological health of the surrounding neigh-



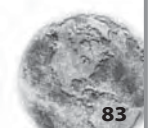
borhood. Parks and open space improvements showcasing urban forestry are part of an overall approach to beautifying the urbanized areas of the City creating a sense of identity and place for neighborhoods and districts. Shaded connections between open spaces, neighborhoods, businesses and public facilities are important in creating walkable communities.

Within the Downtown area, a major park or open space showcasing the benefits of urban forestry will strengthen the role of urban forestry within the community. Connections to this open space should be through identifiable Downtown streetscape themes that mark pedestrian routes linking these areas. On the periphery of the city, allowing for open space in new development will be important to showcase urban forestry in a suburban setting. These open spaces can be retained in a natural state, thereby contributing to some level of conservation of vegetation and wildlife in a natural setting. Other opportunities for showcasing the benefits of urban forestry exist from state legislation (NRS 278.478), which allows for the formation of Landscape Maintenance Districts within residential areas. Landscape maintenance districts allow for property owners to obtain City assistance with certain types of improvements. These improvements include landscaping, public lighting, trails, parks and open space that benefit and able to be utilized by the public, and must be located within roadway medians or along the perimeter of a development.

BOUNDARIES AND URBAN EXPANSION

New suburban growth and expansion of the urbanized portion of the city has been occurring in Las Vegas for many years. Urban growth is approaching the Bureau of Land Management disposal boundary, established in 1998 through the Southern Nevada Public Lands Management Act, to the west and north of the city. Urban development cannot take place outside of this boundary without Federal Congressional approval (See **Map 18**). Policy directives contained in State legislation, the *Southern Nevada Regional Policy Plan* and through an Interlocal Agreement between the City and Clark County also have the effect of curtailing new urban growth within the present disposal area in the northwest part of the Las Vegas Valley.

The Land Use component of the *Southern Nevada Regional Policy Plan* (February 2001) directs the Southern Nevada Regional Planning Coalition (SNRPC) to “identify preferred outlying growth areas, with special attention to the south I-15 corridor, Pahrump, Mesquite and northeast Clark County.” In accordance with Regional Plan policies, new development is to be directed to these areas. The *Clark County Multiple Species Habitat Conservation Plan* mirrors this policy



by confining future urban growth in Clark County to 145,000 acres, most of which is to be located in the areas described above in the Regional Plan.

Legislation approved by the State of Nevada at its 1999 session through Senate Bill 391 (SB391) has the effect of protecting “rural preservation neighborhoods.” Numerous portions of the Centennial Hills area in the northwest part of the Valley are affected by these provisions.

The city of Las Vegas and Clark County in December 2008 entered into an Interlocal Agreement guaranteeing the continued existence and protection of rural preservation neighborhoods. As a result, certain portions of the Centennial Hills Sector area will not build out at urban densities, and will remain essentially rural in nature. This puts greater emphasis on channeling the city’s future development needs into one of three scenarios:

- On vacant suburban land currently within the city’s Centennial Hills area;
- On the limited amount of land within Clark County in the Centennial Hills area available for annexation; and
- On master-planned land within the Summerlin West area, west of the Beltway.

As these areas become urbanized, the City will have to increasingly look to development on infill sites and redevelopment projects to meet its urban development needs. In the future, Clark County and other Valley entities will absorb a proportionately greater share of new urban development than Las Vegas.

As it approaches build-out to its jurisdictional boundaries, the City needs to actively promote the use of infill sites and the redevelopment of blighted or underutilized areas as a means of accommodating future urban development, retaining its proportionate share of Valley growth and retaining a healthy urban core. Despite the fact that many types of capital improvements are cost-shared regionally, the City needs to consider how it will fund some of its capital improvements, upgrades of its facilities, and the operational and capital growth of jointly funded organizations that, in the future, become necessary as a result of increasing population and urban development in outlying areas beyond the City’s boundaries. The city of Las Vegas should be able to accommodate its proportionate share of urban Valley growth and its costs.

Urban growth will need to be accommodated through expansion where possible and through an increasing proportion of infill development and redevelopment. Future develop-



ment within the city of Las Vegas will be dependent on the strength of the economic climate, as well as the strength of the City's development plans. Creating well written neighborhood plan documents, such as the Downtown Centennial Plan, the Town Center special area plan and the Las Vegas Medical District Plan that strengthen the existing sustainable principles of the City will encourage infill development and redevelopment in a viable and sustainable pattern. To better ensure that the city of Las Vegas continues to be a leader in sustainable development that meets the needs of the community, coordination with and consideration of the development community on future plans will be necessary. Regional coordination through a presence on the SNRPC will ensure that the distribution of the costs associated with future growth is equitable.

PROTECTION OF ENDANGERED SPECIES

While the city of Las Vegas and its surrounding region continue to experience population increases it is important to balance growth and development with the needs of existing species of vegetation and wildlife with whom we share the land, and to meet the minimum regulations imposed by the federal government.

The *Clark County Multiple Species Habitat Conservation Plan* (MSHCP) was adopted in February 2001, after more than a decade of preliminary work leading up to the final multi-jurisdictional plan. On April 2, 1990, the desert tortoise was listed as threatened by the United States Fish and Wildlife Service, thereby bringing it under full protection of the federal Endangered Species Act of 1973. This act by the federal government nearly halted all new development in Clark County, including the then-new 22,000-acre master-planned community of Summerlin, which was just beginning construction.

Early in September of 1989, Clark County and the cities of Las Vegas, North Las Vegas, Henderson, Boulder City, and Mesquite began investigating the possibility of applying for a permit issued by the U.S. Fish and Wildlife Service, pursuant to the provisions of Section 10(a) of the federal Endangered Species Act of 1973. Shortly thereafter, the County and these cities entered into an Interlocal Agreement wherein all entities agreed to fund the preparation of a Habitat Conservation Plan to provide conservation measures for the desert tortoise, and which would support a Section 10(a) Permit to allow the incidental take of that species.

That Plan was designated as the Short-Term Habitat Conservation Plan for the Desert Tortoise, and was approved and a Section 10(a) Permit was issued on August 24, 1991. The



Peregrine Falcon

Photo courtesy of Las Vegas Valley Water District

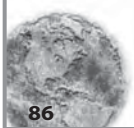
Plan was good for an initial term of three years, during which time the entities agreed to continue working to develop appropriate conservation measures for the desert tortoise and to thereafter apply for a long-term permit with a term of 30 years.

In 1991, the Clark County Commission appointed the 40-member Implementation and Monitoring Committee. The Committee was charged with the task of drafting an interim plan, which it did accomplish. The Clark County Desert Conservation Plan was approved on August 5, 1995, and a new Section 10(a) Permit was issued, which allows the incidental take of only desert tortoises for a term of 30 years.

In May of 1996, the Implementation and Monitoring Committee began discussing the possibility of preparing a multiple species habitat conservation plan and applying to the U.S. Fish and Wildlife Service for one or more Section 10(a) Permits to allow the incidental take of many species in addition to the desert tortoise. In August of 1996, after additional study, the Board of County Commissioners and the councils of the cities authorized the preparation of the MSHCP by means of an amendment to the existing Interlocal Agreement. The final June 2000 draft Plan was adopted by all entities by February of 2001. The Plan allows for the incidental take of some 78 endangered species, authorized through the collection of a fixed per acre development fee as specified in the MSHCP for new development within the urbanized areas of the Las Vegas Valley.

The Plan also identifies those actions deemed necessary to maintain the viability of natural habitats in Clark County for the approximately 232 species residing in those habitats, including four species that are currently listed as endangered (the southwestern willow flycatcher, the Moapa dace, the woundfin, and the Virgin River chub), one threatened species (the Mojave desert tortoise), and one candidate species (the Blue Diamond cholla) (See **Maps 17 and 19**). The expenditure of the collected fees is directed by the Implementation and Monitoring Committee for habitat preservation, research, security, and education.

The city of Las Vegas has been an active participant in the formation, implementation, and adoption of the Short-Term Habitat Conservation Plan for the Desert Tortoise, the Desert Conservation Plan, and the MSHCP. The City, along with Clark County and the cities of Henderson, North Las Vegas, Boulder City and Mesquite, and the Nevada Department of Transportation, in cooperation with other federal and state entities, has supported the preparation by Clark County of the MSHCP and the related Environmental Impact Statement, in order to allow for future urban development in the Las Vegas



Valley that is in compliance with the regulations of the federal Endangered Species Act. Issues of regional significance, requiring the city of Las Vegas to coordinate with other government entities and agencies within the Valley, should be addressed within a timely fashion.

The city of Las Vegas covers a broad range of ecosystems and desert habitat whose resources should be considered as the City nears build out. The methodology contained in the *Clark County Multiple Species Habitat Conservation Plan* offers the best opportunity to provide financial reserves, generated by development, to spend on the protection and preservation of threatened species where they exist in the region, in locations where long-term conservation is a viable option. Maintaining a presence on the MSHCP Implementation and Monitoring Committee will help ensure that the needs and goals of the City's interests, plans and sustainability policies remain a priority. The City's continuance of the development fee collection and implementation of the adopted MSCHP will further the efforts of the protection and conservation of the Mojave Desert ecosystem.



Desert Tortoise

Photo courtesy of Las Vegas Valley Water District

IMPLEMENTATION

The implementation portion of this section defines specific actions the City will pursue to meet the goals and objectives within the Master Plan. This section focuses on the City's efforts to establish and protect Urban Forestry initiatives, to address issues related to existing boundaries and urban expansion, as well as the protection of endangered species.

Action HW.1: The City shall continue to improve streetscape enhancements in the highly urbanized areas of the city where suitable, such as landscaped streetscapes, pedestrian environments, medians or other landscaped public areas.

Action HW.2: The City should consider cost and implementation of landscape maintenance procedures to adequately design, install and maintain urban forestry within public rights-of-way throughout the Downtown area.

Action HW.3: The City should pursue a standard of 30 percent of lands transferred from the BLM to the city in the far northwest part of the city are retained through community master plan processes as park land available to the public, open space, natural resource areas and for other recreational amenities that benefit both area residents and the city as a whole

Action HW.4: The City shall strive to accomplish the goals set by the Urban Forestry Resolution (R-26-2008) and subsequent Urban Forestry Management Plan to Vegas to assure the protection, preservation and maintenance of mature trees, shrubs and decorative plantings within public parks, public rights-of-ways and public facilities throughout the city for future generations.

Action HW.6: The City shall encourage the establishment of urban forestry on school sites and continue to partner with the Clark County School District where feasible, and as described in the Parks and Recreation Element of the Master Plan (Appendix A), on the joint use and maintenance of a portion of school sites for recreational use by the general public.

Action HW.7: The City shall continue to consider applications by existing and future property owners and neighborhood associations to form and sustain Landscape Maintenance Districts, encouraging urban forestry, where appropriate. Property owners or neighborhood associations must follow the guidelines established by the City in order to qualify for the creation of a Landscape Maintenance District by the City.

Action HW.8: The City shall ensure that its future urban growth is planned and developed in a manner that is environmentally responsible and meets the environmental objectives of this Conservation Element and other Valley-wide environmental policies.

Action HW.9: The City shall continue to be an active participant in the Implementation and Monitoring Committee of the Clark County Multiple Species Habitat Conservation Plan, for the duration of the MSHCP, which continues through the year 2028.

Action HW.10: The City shall continue to collect the per acre development fee as specified in the MSHCP for new development on behalf of the Clark County Multiple Species Habitat Conservation Plan, for the duration of the MSHCP, and for use as directed by the Implementation and Monitoring Committee.

Action HW.11: The City should continue to participate in the implementation of the adopted Clark County Multiple Species Habitat Conservation Plan.



APPENDIX

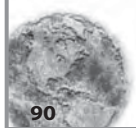
IMPLEMENTATION TABLE

CLIMATE

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
7.1.1	Action C.1 – The City shall reduce its municipal emissions footprint 15 percent for City operations from its established baseline by 2015, in accordance with the Sustainable Energy Strategy Resolution (R-50-2008).	City Manager's Dept.	High
7.1.1	Action C.2 – The City shall conduct a municipal emissions inventory annually and will continue to assist the SNRPC with regular updates of a regional emissions inventory. As a part of the municipal inventory and report, the City shall identify projects and probable sources of emissions reductions identified through monitoring and verification activities, with specific emissions avoided from each source.	City Manager's Dept.	High
7.1	Action C.3 – The City shall work with the local scientific/research community, as well as local and regional government agencies to better understand local climate vulnerability, assess climate impact scenarios, prioritize risks and adaption strategies and develop and implement adaptation plans.	City Manager's Dept.	Medium
7.1	Action C.4 – The City shall monitor and verify its electricity, gas, water, waste and fuel accounts to measure progress towards achieving its renewable energy and energy conservation targets, as well as to identify opportunities to improve.	City Manager's Dept. & Public Works & Fleet OPS	High
7.1.6	Action C.5 – The City shall work with local electric and gas utilities to promote and implement strategic energy conservation, renewable energy and emission reduction opportunities for both City operations and the community.	Public Works	High
7.1	Action C.6 – The City shall work with its franchised municipal waste operator to promote and implement single stream recycling and increasing both the City's and community's recycling rate as a means of controlling the inflow of waste and resultant landfill based emissions.	Public Works	High

AIR QUALITY

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
7.1.1	Action AQ.1: The City shall continue to support the efforts of the Clark County Department of Air Quality and Environmental Management to address direct or indirect remedies to air quality issues in the Las Vegas Valley.	Dept. of Planning	High
7.1.2	Action AQ.2: The City shall require developers to be in conformance with the PM ₁₀ State Implementation Plan.	Building & Safety	High
1.6.1 1.6.2 2.3.6 7.3.5 7.3.6	Action AQ.3: The City shall work with the Regional Transportation Commission of Southern Nevada to improve air quality through transportation improvements that provide for and/or ensure the following: <ul style="list-style-type: none"> • The facilitation of the development of a Bus Rapid Transit (BRT) network. • That potential mixed-use redevelopment sites are adequately served with transit connections. • That adequate transit service is planned for and can be provided at central city urban hub locations as they are developed. • That when preparing corridor studies, the City will consider identifying opportunities to establish alternative transit modes to serve the area and along the corridor provide access to the employment centers. • That multi-modal and alternate transportation technologies be adequately accommodated for within the primary roadway system as the city and the Valley continue to develop. • Alternative modes of transportation within the urban core, including electric bicycles, bike sharing and bicycle infrastructure to reduce vehicle trips and improve air quality. • That consideration and planning for a future mass transit system connecting Downtown with the Clark County Strip be made, as well as the incorporation long-term future phasing for extension of the system be considered. 	Public Works/Dept. of Planning	High
4.1.3 7.3.5 7.3.6	Action AQ.4: The City shall work with involved agencies (NDOT, RTC, etc.) and businesses to support and promote the use of telecommuting and the upgrade of technical systems to further enable this technology. The City will also work with these businesses and agencies, particularly those within the City's business parks, to promote the use of rideshare programs, provision of bike racks and secure bike storage, the provision of change room and shower facilities and other incentives to improve the desirability of non-auto commuting methods.	Dept. of Planning	Ongoing



AIR QUALITY, continued

7.1	Action AQ.5: The City shall ensure that at least 90 percent of the fuel consumed in its vehicle fleet will be cleaner burning, domestically produced alternative fuels. In addition, the City will pursue opportunities to incorporate electric and electric hybrid vehicles and associated infrastructure into the City's vehicle fleet that result in low or zero emissions to improve air quality.	City Manager's Dept.	High
3.6.8	Action AQ.6: The City shall continue to promote urban forestry and tree planting to increase shading, increased air quality, reduced urban heat island effect and to double the existing tree canopy by 2035.	Dept. of Planning	High
7.1.2	Action AQ.7: The City shall research, analyze and consider regulations which will limit the amount of land cleared and prepared for large scale residential and commercial development to a prescribed maximum area or percentage of the development site, with the objective of minimizing the area of land contributing to PM ₁₀ levels, while allowing the developer a sufficient and reasonable phasing program for the development.	Public Works	High
3.5.6 3.5.7	Action AQ.8: The City shall continue to work with developers, builders, homeowners and landscape maintenance associations, and the general public, to provide information on adopt and encourage adherence to the regional plant list, as approved by the Southern Nevada Regional Planning Coalition to reduce the number of plant species that cause allergy and respiratory problems and to prohibit new planting of these species.	Dept. of Planning	High
7.5	Action AQ.9: The City should expand its use of Internet technologies for public research, payment services and obtaining forms, so as to minimize VMT and subsequent emissions.	City Manager's Dept.	Medium

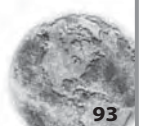
ENERGY

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
6.1 7.1	Action E.1: The City shall strive to accomplish the goals set by the Sustainable Energy Strategies Resolution (R-50-2008).	City Manager's Dept.	High
6.1	Action E.2: The City shall prepare a plan for investment in renewable energy and energy conservation, with a reduction or no increase in utility costs, to achieve net zero energy consumption for all City operations by 2025.	City Manager's Dept.	Medium
4.1.3	Action E.3: The City shall examine any current code requirements that may inhibit telecommuting in residential areas for other than safety reasons, and consider appropriate steps to address such inhibiting legislation in order to promote energy conservation.	Dept. of Planning	Medium
7.1.1			
7.3.6	Action E.4: The City should encourage employers to join the Club Ride Program and to provide bicycle-friendly work environments for employees that may include secured bike parking and change/shower facilities, to promote energy conservation.	City Manager's Dept.	Low
7.1	Action E.5: The City will continue to support public, private and non-profit energy efficiency and renewable energy programs and initiatives, including HomeFree Nevada and Green Chips, in order to encourage area residents and businesses to decrease energy consumption and improve energy efficiency.	City Manager's Dept	High



WATER

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
7.1.3 7.1.8	Action W.1: The City shall support regional cooperation and communicate regularly with other jurisdictions on sustainable solutions of the valley water resources, as well as assist regional organizations and its members in their regular assessments of currently available and forecasted water supplies.	Public Works	Medium
7.1.3	Action W.2: The City shall support and participate in regional processes related to land-use planning, development codes or similar efforts that can influence long-term demands on resources while ensuring that new or expanded services do not adversely affect existing water users.	Public Works / Dept. of Planning	Medium
3.5.5 7.1.8	Action W.3: The City shall support regional educational/ public relations programs emphasizing the importance of water conservation and water-efficient landscaping.	Admin	Medium
3.5.5 7.1.8	Action W.4: The City shall continue to implement the turf limitation provisions of the zoning ordinance, which reduce the amount of turf that may be used in new residential, commercial/industrial development.	Dept. of Planning	Medium
7.1.4	Action W.5: The City shall support the use of private sector recycled water reclamation systems through potential incentive programs. Recycled water systems include the reuse of water from sources such as sink drains, dishwashers and washing machines for irrigation, dust control and construction purposes.	Public Works	Medium
7.1.4	Action W.6: The City shall support efforts to maximize water reclamation and aquifer re-charging in the public sectors, where such efforts are not likely to result in excessively high groundwater tables. The City shall support the protection of groundwater by limiting the locations of potential pollution sources from areas of groundwater recharge and pumping.	Public Works	Medium
7.2.1	Action W.7: The City shall encourage the preservation and restoration of the area's washes to assist with the shallow aquifer and Lake Mead recharge.	Public Works / Dept. of Planning	High
7.1	Action W.8: The City shall ensure that as new development occurs, a comprehensive network of wastewater collection lines is provided by requiring the installation of sewers in all new subdivisions.	Public Works	Medium



WATER, continued

7.2	Action W.9: The City shall support the recommendations of the Las Vegas Wash Coordination Committee by ensuring that development within tier one (one-half mile of the Wash) incorporates appropriate drainage facilities and/or design to mitigate any negative impact on the Wash.	Public Works	Medium
7.1.3	Action W.10: The City shall coordinate with the LVVWD to undertake improvements to the pressure and quality of water service within the city, where necessary.	Public Works	Medium
7.1.3	Action W.11: The City shall encourage further study of the potentially adverse affects of septic systems on the storm drain system and local surface water to assist with the preservation of the Las Vegas Wash and Lake Mead.	Public Works	Medium
7.1	Action W.12: The City shall continue to enforce the Nevada Administrative Code (NAC 444.786) requiring new development to connect to public sewer whenever public sewer is available within 400 feet of the nearest property line and can be reached by gravity flow. The city shall also continue to enforce Nevada Administrative Code (NAC 278.460) requiring subdivisions having density of two or more dwelling units per acre to connect to public sewer when public sewer is available within the distance determined by multiplying the number of single family dwelling units by 100 feet.	Public Works	Medium
7.1.5	Action W.13: The City shall continue to participate in the National Pollutant Discharge Elimination System (NPDES) stormwater program.	Public Works	Medium



WASTE MANAGEMENT

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
7.1.6	Action WM.1: The City shall work with Clark County, Southern Nevada Health District and the franchised operator to ensure that truck haul routes are planned to minimize adverse impacts to the citizens of Las Vegas.	City Manager's Office	High
7.1.6	Action WM.2: The City shall work with Clark County and the franchise operator to ensure that the location of transfer stations will be consistent with the Las Vegas 2020 Master Plan.	City Manager's Office	Ongoing
7.1.6	Action WM.3: The City shall work with the franchise operator to support further development of landfill methane energy production and waste to energy technologies.	City Manager's Office	Low
7.1	Action WM.4: The City shall examine successful residential recycling programs in other municipalities, determine workable options, such as incentive programs, and work with Clark County and the franchise operator to implement a city-wide single stream recycling program to reach the state-mandated goal of 25percent recycling of total solid waste.	City Manager's Office	Medium
7.1	Action WM.5: The City shall investigate an organic waste recycling program, possibly on a pilot basis, with RSSN and the other Valley entities.	City Manager's Office	Medium
7.1	Action WM.6: The City shall work with local business and industry representatives, and with Clark County and the franchise operator, to identify options for local consumption of selected recycled materials.	City Manager's Office	Medium
7.1	Action WM.7: The City shall work with Clark County and the franchise operator to encourage an increase in the number of convenient recyclable materials drop-off locations.	City Manager's Office	Medium
7.1	Action WM.8: The City shall work with Clark County and the franchise operator to investigate the cost, participants and other factors for an enhanced public awareness program promoting recycling, identifying participation incentives and possible penalties as may be developed as part of an incentive program.	City Manager's Office	High
7.1	Action WM.9: The City shall look to increase its recycling rates in City operations by continuing its internal CELEBRATE recycling program.	City Manager's Office	High

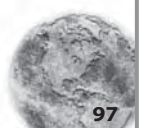
SOILS

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
7.3.3 7.4	Action S.1: The City shall develop, in concert with other relevant agencies, an updated inventory of areas with poor or unstable soil quality, by which to monitor and work with property owners during the development review process to incorporate design measures to neutralize risk to public safety and the environment.	Building & Safety / Dept. of Planning	Low
7.3.3	Action S.2: The City shall continue to encourage the utilization of areas with poor soils with appropriate low intensity land uses such as parks, golf courses, recreational fields, etc.	Dept. of Planning	Medium
7.1.5 7.3	Action S.3: The City shall encourage the use of organic fertilizers and pest control substances and measures that do not add non-biodegradable chemicals or pollutants to the water system. Through examining of its own practices for fertilization and pest control the City will ensure that the most current and effective methods are being employed, as well as those methods are being educated to the public so as to minimize negative impacts on the local ecosystems.	City Manager's Dept.	High
7.3.3 7.4.3 7.4.4	Action S.5: The City shall work closely with developers and landowners to facilitate their adherence to development standards as detailed in the Hillside Development Overlay District and Unified Development Code, so as to ensure that areas developed on steep slopes preserve significant natural features and minimize impacts to native plants and wildlife.	Building & Safety / Dept. of Planning	Ongoing



HABITAT AND WILDLIFE

Master Plan Policy	Implementation Action	Liaison Department(s)	Priority
1.2 1.2.1 1.2.2	Action HW.1: The City shall continue to improve streetscape enhancements in the highly urbanized areas of the city where suitable, such as landscaped streetscapes, pedestrian environments, medians or other landscaped public areas.	Field Operations/ Public Works/ Dept. of Planning	High
6.1.1	Action HW.2: The City should consider cost and implementation of landscape maintenance procedures to adequately design, install and maintain urban forestry within public rights-of-way throughout the Downtown area.	Field Operations/ Public Works/ Dept. of Planning	High
3.4.1	Action HW.3: The City should pursue a standard of 30 percent of lands transferred from the BLM to the city in the far northwest part of the city are retained through community master plan processes as park land available to the public, open space, natural resource areas and for other recreational amenities that benefit both area residents and the city as a whole	Dept. of Planning	Ongoing
3.4.1 3.5.1 3.5.6 3.6.5 3.6 6.1 6.1.1	Action HW.4: The City shall strive to accomplish the goals set by the Urban Forestry Resolution (R-26-2008) and subsequent Urban Forestry Management Plan to assure the protection, preservation and maintenance of mature trees, shrubs and decorative plantings within public parks, public rights-of-ways and public facilities throughout the city for future generations.	Field Operations/ Public Works/ Dept. of Planning	Ongoing
3.6.7	Action HW.5: The City shall continue to pursue the development of a cohesive and balanced parks system linked by trails and alternative transportation routes that incorporate the plantings of native and desert adapted shade trees.	Public Works/ Dept. of Planning	Ongoing
3.6.6	Action HW.6: The City shall encourage the establishment of urban forestry on school sites and continue to partner with the Clark County School District where feasible, and as described in the Parks and Recreation Element of the Master Plan (Appendix A), on the joint use and maintenance of a portion of school sites for recreational use by the general public.	Dept. of Planning	Ongoing
3.6	Action HW.7: The City shall continue to consider applications by existing and future property owners and neighborhood associations to form and sustain Landscape Maintenance Districts, encouraging urban forestry, where appropriate. Property owners or neighborhood associations must follow the guidelines established by the City in order to qualify for the creation of a Landscape Maintenance District by the City.	Field Operations/ Public Works/ Dept. of Planning	Ongoing



HABITAT AND WILDLIFE, continued

7.1	Action HW.8: The City shall ensure that its future urban growth is planned and developed in a manner that is environmentally responsible and meets the environmental objectives of this <i>Conservation Element</i> and other Valley-wide environmental policies.	City Manager's Office/Dept. of Planning	Low
7.4.4	Action HW.9: The City shall continue to be an active participant in the Implementation and Monitoring Committee of the <i>Clark County Multiple Species Habitat Conservation Plan</i> , for the duration of the MSHCP, which continues through the year 2028.	Dept. of Planning	Ongoing
7.4.4	Action HW.10: The City shall continue to collect the per acre development fee as specified in the MSHCP for new development on behalf of the <i>Clark County Multiple Species Habitat Conservation Plan</i> , for the duration of the MSHCP, and for use as directed by the Implementation and Monitoring Committee.	Building & Safety	Ongoing
7.4.4	Action HW. 11: The City should continue to participate in the implementation of the adopted <i>Clark County Multiple Species Habitat Conservation Plan</i> .	Public Works/ Dept. of Planning	Ongoing

APPENDIX EC-1

CITY OF LAS VEGAS SUSTAINABLE ENERGY STRATEGY GOALS

City Operations

GOAL	STATUS
By 2009, 100 percent of decisions on major capital projects and new City programs will be made after considering life cycle financial, environmental and social costs and benefits using the Sustainability Action Map.	COMPLETE
By 2011, invest in 3 megawatts of renewable energy, and 7 megawatts by 2015.	COMPLETED 2011 GOAL
Invest 100 percent of cost savings from renewable energy projects in energy conservation and additional renewable energy projects.	IN PROGRESS
By 2011, 10 percent reduction to the City's carbon footprint, 20 percent by 2020, and 30 percent by 2030.	COMPLETED 2011 GOAL
By 2011, reduce rate of electricity consumption per unit by 5 percent.	IN PROGRESS
By 2011, achieve 10 percent renewable energy portfolio standard, 20 percent by 2020, and 30 percent by 2030.	COMPLETED 2011 GOAL
By 2009, implement preferential purchasing policy for products that are certified to be environmentally friendly.	COMPLETE
By 2010, 90 percent of fuel consumed will be cleaner burning, domestically produced alternative fuel.	COMPLETE
By 2010, adopt contracting policy consistent with NRS that considers sustainable practices as criteria for awarding contracts.	COMPLETE



City Codes, Regulations and Policies

GOAL	STATUS
By 2010, adopt form-based sustainability zoning code.	COMPLETE
By 2011, adopt an energy code that is 30 percent more efficient than the current energy code	COMPLETE
By 2009, work with Green Council to revise the Green Building Program to include mandates and incentives.	COMPLETE

Community Involvement

GOAL	STATUS
By 2009, participate in creating regional Home Performance energy audit and conservation program, and provide incentives to City residents who enroll in the program.	COMPLETE
By 2009, have fully implemented residential solar rebate program.	COMPLETE
By 2009, implement indoor water conservation program.	COMPLETE

APPENDIX EC-2

CITY OF LAS VEGAS FACILITY RETROFIT TABLE

Site Name	Energy Conservation Measure
Atrium Building	High efficiency Central Plant Supply Fans, Motors & VFD's replaced Exhaust fan off at night Lighting Controls Glass Replacement
Baker Pool	25w Long Life T8 Lamps
East Las Vegas Detention Center	25w Long Life T8 Lamps 15 EER Packaged Units w/ Heat Wheels R-11 Wall Insulation Lighting Controls HVAC Controls Shading
East Las Vegas Senior Center	15 EER Packaged Units w/ Heat Wheels Interior Shading (Shading Coefficient 0.3) Tight Construction - Decrease Infiltration Lighting Controls HVAC Controls 25w Long Life T8 Lamps Florescent Lamps
Fire Station #7	Lighting Motion Detectors Interior Shading Lighting Retrofit Replace 2 refrigerators w/ Energy Star
Fire Station #41	Variable Refrigerent System Interior Shading Lighting Replacement
Freedom Pool	25w Long Life T8 Lamps Replace probe start metal halide w/ compact Fluor
Lieburn Senior Center	25w Long Life T8 Lamps Lighting Controls Daylighting Gallery
Mirabelli Community Center	25w Long Life T8 Lamps Lighting Controls Daylighting Vending Miser Controls HVAC Controls Weather Stripping
Natural History Museum	Replace East facing glass with wall
West Yard -Field Operations	Lighting Controls Vending Miser Controls Shading on West Doors HVAC Controls

APPENDIX WM-1

50 THINGS THE CITY OF LAS VEGAS RECYCLES

1. Paper
2. Plastic
3. Aluminum Cans
4. Methane Gas
5. Printer Toner Cartridges
6. Copier Toner Cartridges
7. Ink Cartridges
8. Cell Phones/Blackberries
9. Dell CPUs
10. CRTs
11. Vehicle Batteries
12. Non-Vehicle Batteries
13. Cardboard Boxes
14. Used Oil (includes hydraulic oils, transmission fluids, etc.)
15. Aluminum Signs
16. Scrap Metal – General waste, un-separated
17. Antifreeze
18. Refrigerant
19. Waste Water at Plant
20. Fire Dept. Clothing
21. Grease at Jail
22. Clothing at Jail
23. Wood Pallets
24. Plastic Shrub Buckets
25. Office and Casual Furniture
26. Copper Wire
27. Scrap Aluminum (cast and extruded)
28. Scrap Iron (cast and rolled)
29. Vehicle oil filters
30. Scrap Stainless Steel (rolled and pressed)
31. Fire Vehicle Drum Brake Shoes (reline and reuse)
32. Fire Truck Hand Tools (axes, pry bars, etc.)
33. Tires
34. Fire Hydrant Brass couplings / fittings
35. Traffic Signal Cabinets – Aluminum
36. Street light covers (cobra heads) - Aluminum
37. Fire Hydrants - Iron
38. Manhole Vault Covers - Iron
39. Copper Pipe
40. Aluminum Wire
41. Fire Hose Aluminum Fittings
42. SCBA Aluminum Cylinders
43. Storefront framing and thresholds- Aluminum
44. Parking Meter heads – Aluminum
45. Vehicle Alternators
46. Small Motors
47. Vehicle Starters
48. Shopping carts
49. Light poles
50. Paint (non-traffic related)



APPENDIX WM-2

Acceptable Recyclable Materials

Corrugated Cardboard Paperboard Magazines / Catalogs	Aluminum/Steel Cans Plastic Bottles Brown Paper Bags	Junk Mail Office Paper Phone Books	Newspapers Glass Bottles / Jars ---
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APPENDIX WM-3

COMPARATIVE EFFECTIVENESS OF PROGRAM OPTIONS

ATTRIBUTES	CURRENT PROGRAM	OPTION #1	OPTION #2	OPTION #3
Trash Collection Frequency	Twice Per Week	Twice Per Week	Twice Per Week	Once Per Week
Recycling Collection Frequency	Once Every Other Week	Once Per Week	Once Every Other Week	Once Per Week
Trash Truck Type	Manual Rear Load	Auto Side Load	Auto Side Load	Auto Side Load
Collection Type	Three Bin	96-Gallon Carts	96-Gallon Carts	96-Gallon Carts
% of Materials Sent to Recycling	3.45%	19.20%	16.67%	25.15%
% Materials Sent to Bulk Collections	0%	7.07%	7.27%	6.59%
% Materials Sent to Waste	96.55%	73.73%	76.06%	68.26%

APPENDIX S-1

SPECIFIC CASES OF DAMAGE CAUSED BY SUBSIDENCE

ID # ON MAP 21	TYPE OF DAMAGE	LOCATION	DATE OF OCCURRENCE	REMARKS
1	Protruding well District well Field Well No. 5	Las Vegas Valley Water	By 1963 As of 1978	1.5 ft. of protrusion 4 ft. of protrusion of well head, casing pumping in 1971; pumped much sand.
2	Protruding well Stocker (west tank) Well	City of N. Las Vegas	1936 - 1963 1963- 1969	3 ft. of protrusion 6 in. protrusion; casing replaces in 1969; shows no present protrusion.
3	Protruding well	City of North Las Vegas Losee Well	1968- 1971 1968	7 in. protrusion; casing replaced in 1969; shows no present protrusion. Ruptured well line.
4	Protruding well Tonopah Well	City of North Las Vegas	Unknown	
5	Protruding well	City of North Las Vegas Tonopah Well	Unknown	Presently shows 6 in. of protrusion with broken well pad.
6	Protruding well Well No. 4	Nellis AFB area Nellis		Well head and pad show 4 in. of protrusion.protrusion.
7	Protruding well LVVWD Well No. 57	City of North Las Vegas	As of 1978	2.5 ft. protrusion of casing; well abandoned.



8	Warping of railroad tracks	UPRR at Owens Ave.	1961	5 in. gradual displacement; 6 in. rapid displacement associated with fissuring.
9	Damaged house	Harrison and Owens	1961	2 in. rupture in house believed result of fissuring.
10	Damaged house Country Club	Near Craig Ranch near	Unknown	Reportly large separation.
11	Damaged house between Owens and and Washington Ave.	Twin Lakes Drive	Pre 1974	Two residences damaged; extent of damage unknown; online with fissures from LVVWD well field.
12	Damaged house	Adams St. at Las Vegas Blvd.	Pre 1963	Result of movement on scarp III.
13	Popped windows in houses, cracked driveways, broken curbs	Twin Lakes Drive area	Pre 1965	Attributed to movement on scarp II.
14	Cracked pavement and curbs and B Sts.	Between Owens and Harrison Ave. and A	Pre 1970	Accompanied renewed fissuring.
15	Cracked pavement Losee Well	Commerce St. near	Pre 1971	
16	Cracked pavement	Craig Rd. near Nellis AFB well field	Unknown	
17	Cracked asphalt in playground	Gilbert School in North Las Vegas	Unknown	Occurs where fissure extends beneath pavement.
	Well failures	Strip area	1970- 1974	At least two failures due to sheared casing.
18	Damaged wells	Northwest of North Las Vegas	1974- 1976	15 claims or complaints of: decreased productivity, turbid or sandy water, and deformation or shearing of casing.
19	Ruptured water mains; damaged pavement	Charleston Blvd. at Maryland Pkwy.	1964	\$10,000 damage reportly related to movement on scarp III.
20	Ruptured water main	Highland Ave. at Hastings Ave.	1964	\$2,000 damage
21	Ruptured water main	1626 Thelma Ln.	1964	\$1,500 damage
22	Ruptured water main	12th St. between Bonneville and Clark Aves.	1964	\$1,500 damage
23	Ruptured water main	1128 Francis Ave.	1964	\$14,000 damage
24	Ruptured water main	400 E. Garces Ave.	1964	\$12,000 damage
25	Ruptured water mains; damaged pavement; cracked house	Near Owens Ave and UPRR	1961	Related to fissuring
26	Warped sewage line	Charleston Blvd.	Unknown	Differential movement attributed to land subsidence; lowered flow gradient required construction of new line.
27	Ruptured gas line	Washington Ave. near Twin Lakes Dr.	Unknown	Two reported breaks attributed to movement on scarp II.
28	Ruptured swimming pool	Near Commerce St. and Losee Road	Unknown	Concrete pool back rotated and cracked; attributed to movement on scarp III.
29	Buckled drainage channel	In Flamingo Wash	Pre 1974	

Source: Bulletin 95: Subsidence in Las Vegas Valley, by John W. Bell, MacKay School of Mines, UNR, 1981 (Nevada Bureau of Mines and Geology).

Also quoted in 1992 City of Las Vegas General Plan, Appendix, and in Las Vegas 2020 Master Plan Public Safety Element, 9/05/01.



ACRONYMS

AFY	Acre-Feet per Year
B5	Biodiesel
BLM	US Bureau of Land Management
BRT	Bus Rapid Transit
BWM	SEC's Bureau of Waste Management
CACP	Clean Air Climate Protection
CCRFGD	Clark County Regional Flood Control District
CCWRD	Clark County Wastewater Reclamation District
CELEBRATE	City Employees Lowering Energy Costs by Recycling and Tracking Efficiency
CF₄	Tetrafluoromethane
CH₄	Methane
CMAQ	Federal Congestion Mitigation and Air Quality Improvement
CNG	Compress Natural Gas\
CO	Carbon Monoxide
CO₂	Carbon Dioxide
CRC	Colorado River Commission
CWC	Clean Water Coalition
DG	Distributed Generation
DOE	US Department of Energy
E-Bike	Electronic Bike
ECM	Energy Conservation Measures
EECBG	Energy Efficiency and Conservation Block Grant
EIS	Environmental Impact Study
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GCPD	Gallons per Capita per Day
GHG	Green House Gas
GPCD	Gallons per Capita per Day
HFC	Hydrofluorocarbons
HOV	High Occupancy Vehicle
HPS	High Pressure Sodium Lamps
HS-O	Hillside Development Overlay District
ICLEI	International Council for Local Environmental Initiatives
IECC	2009 International Energy Conservation Code
LED	Light Emitting Diode
LVMC	Las Vegas Municipal Code
LVVWAC	Las Vegas Valley Watershed Advisory Committee
LVVWD	Las Vegas Valley Water District

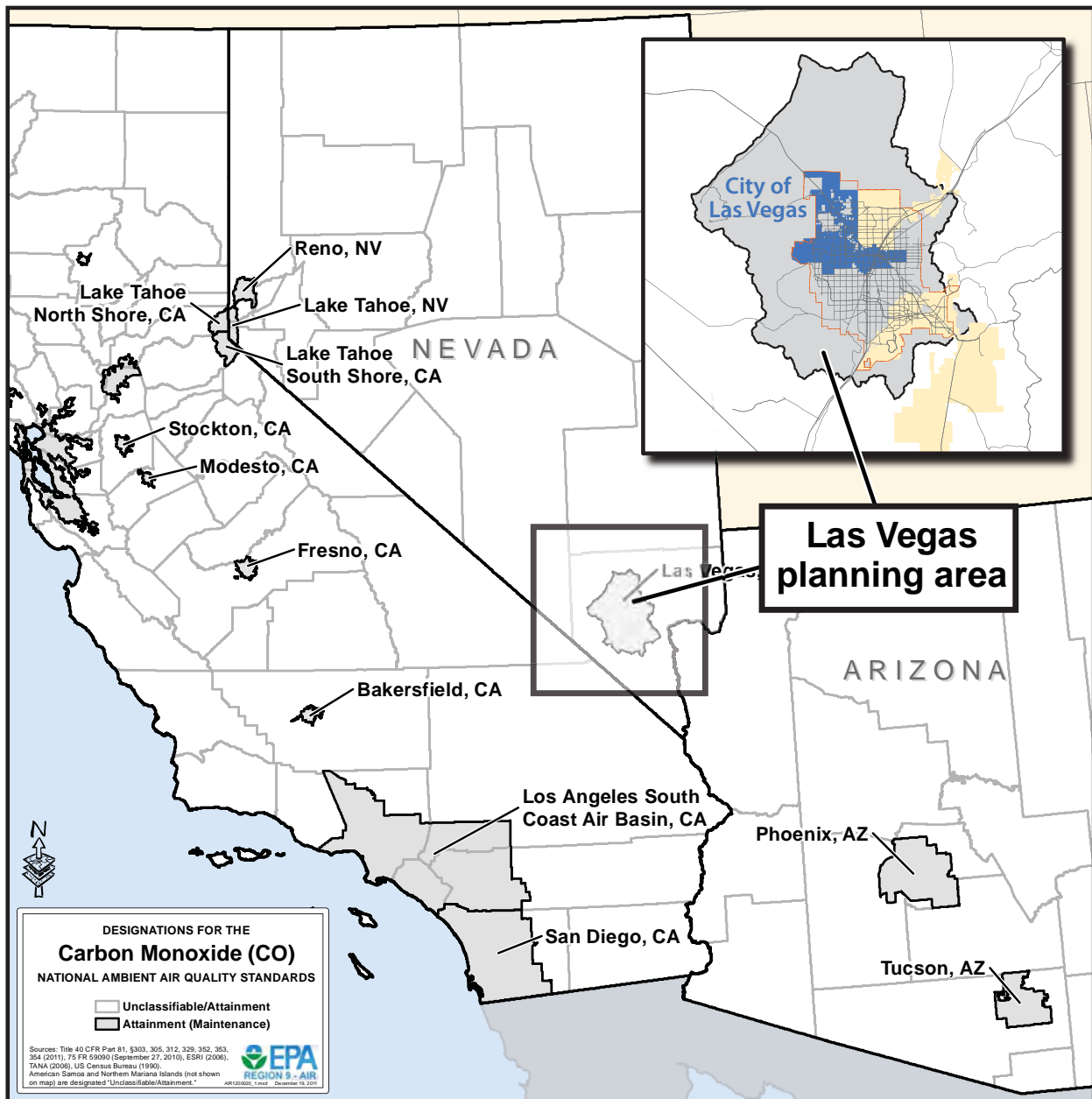


LVWCC	Las Vegas Wash Coordination Committee
MGD	Million Gallons per Day
MMBTU	One Million British Thermal Units
MMT	Million Metric Tons
MSHCP	Multiple Species Habitat Conservation Plan
MSW	Material Solid Waste
N₂O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRS	Nevada Revised Statutes
NSOE	Nevada State Office of Energy
NSOE	Nevada State Office of Energy
O₃	Ozone
ON Line	"One Nevada" transmission line
PACE	Property-Assessed Clean Energy
Pb	Lead
PEC	Portfolio Energy Credits
PM₁₀	Particulate Matter Less than 10 micrometers in diameter
PM₂	Particulate Matter Less than 2 micrometers in diameter
PRP	Single-stream Pilot Recycling Programs
PUCN	Public Utilities Commission of Nevada
RSSN	Republic Services of Southern Nevada
RTC	Southern Nevada Regional Transportation Commission
SEC	Nevada State Environmental Commission
SF₆	Sulfur Hexafluoride
SIP	State Implementation Plan
SNHD	Southern Nevada Health District
SNPLMA	Southern Nevada Public Lands Management Act
SNRPC	Southern Nevada Regional Planning Coalition
SNRPP	Southern Nevada Regional Policy Plan
SNRWRS	Southern Nevada Regional Water Recycling Study
SNWA	Southern Nevada Water Authority
SO₂	Sulfur Dioxide
UDC	Unified Development Code
VMT	Vehicle Miles Traveled
WPCF	Water Pollution Control Facility

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MAPS



Map 1 CO Non-Attainment Areas – Region IX Conservation element



GIS maps are normally produced only to meet the needs of the City. Due to continuous development activity this map is for reference only.

Geographic Information System

Department of Planning
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City of Las Vegas

Maps





Map 2 **PM10 Non-Attainment** **Areas – Region IX** **Conservation** **element**

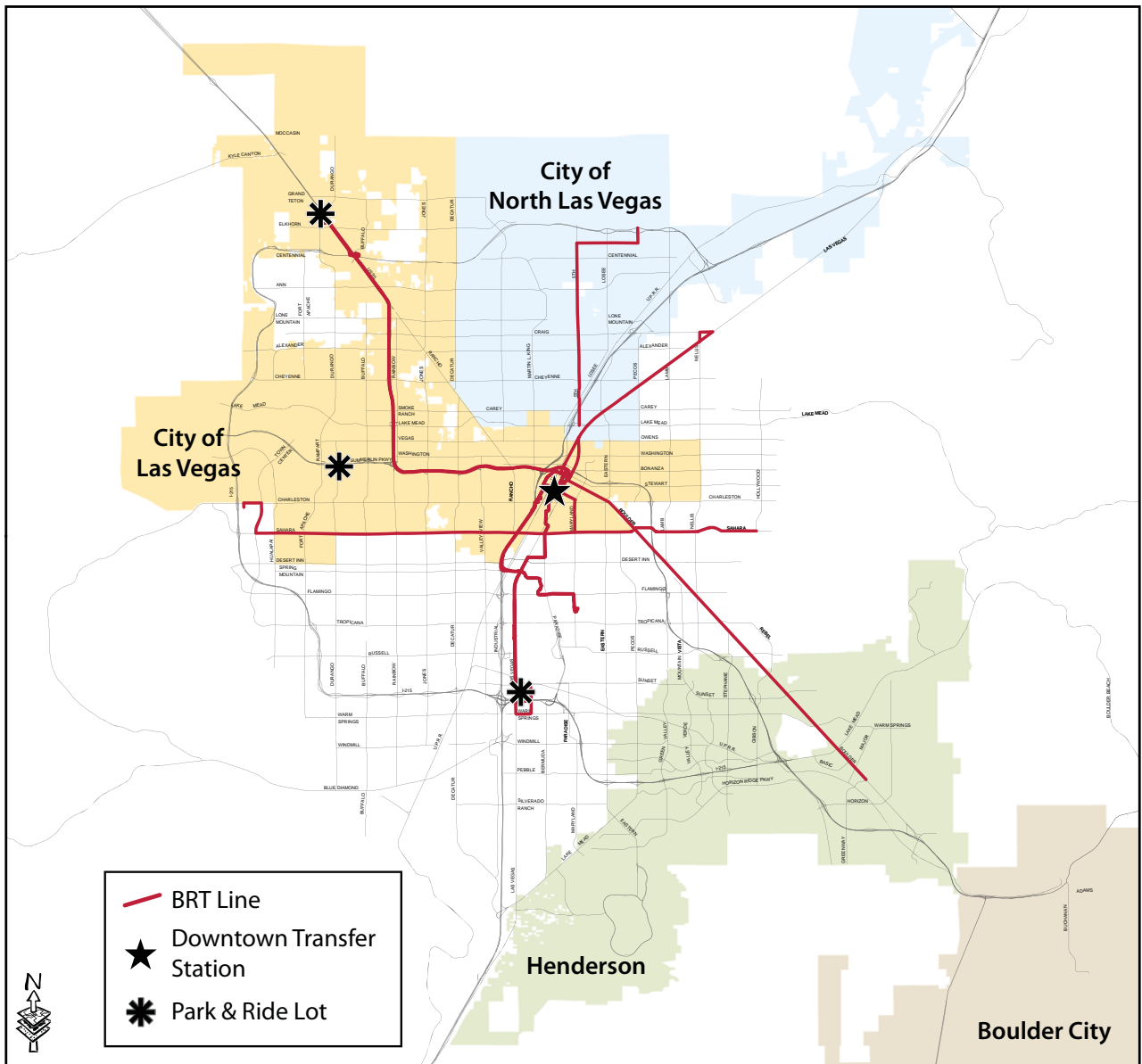


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Map 3 Bus Rapid Transit (BRT)

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element**



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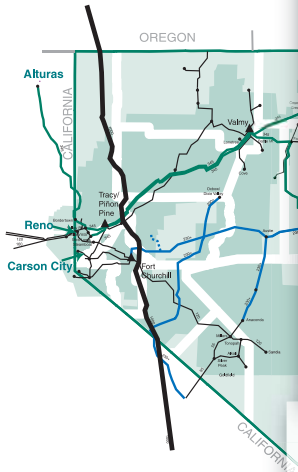
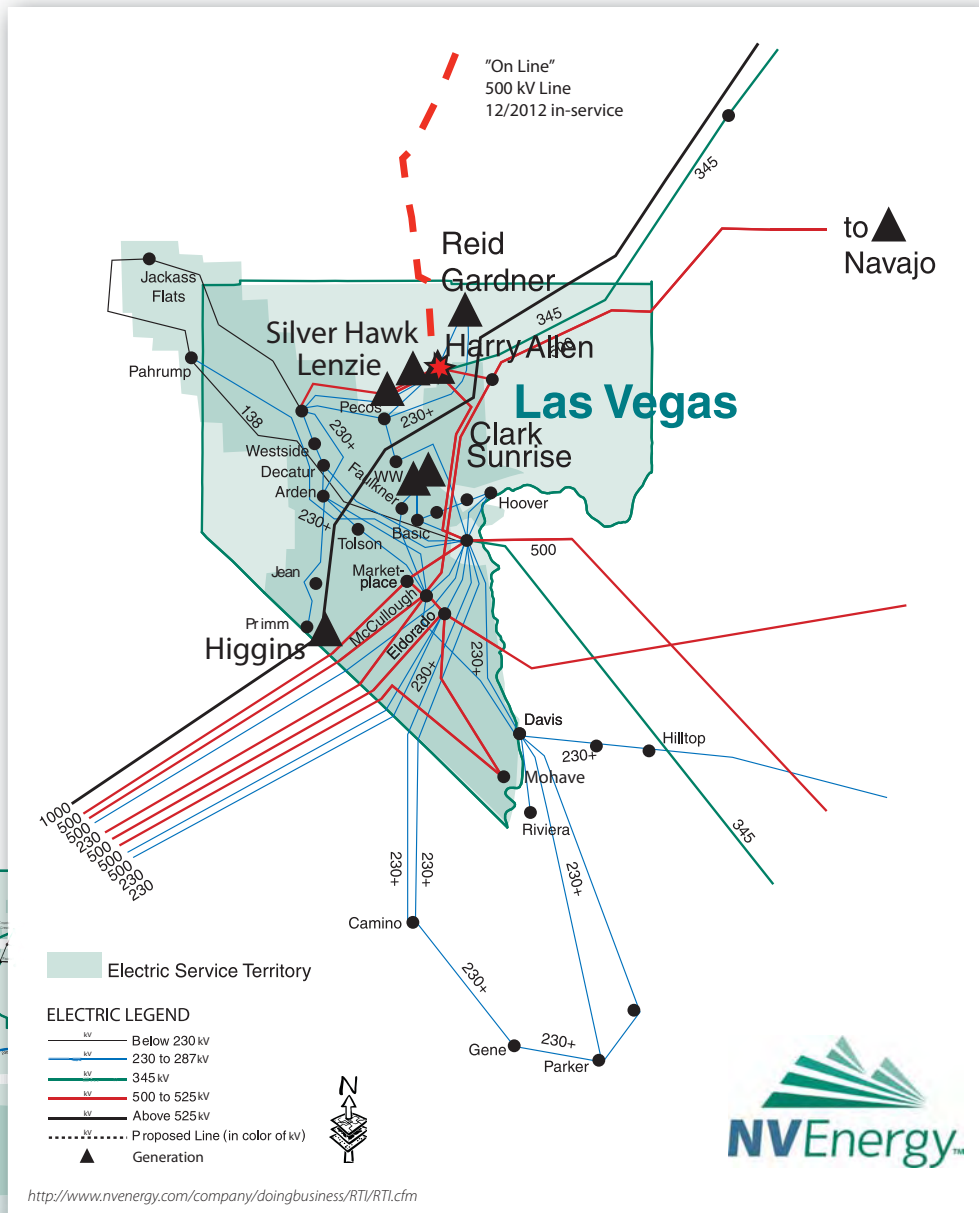
Maps

Map 4

NV Energy System Generation Map

Las Vegas Valley Close Up

**note, the images below
and to the right are from
existing NV Energy maps.*



<http://www.nvenergy.com/company/doingbusiness/RTI/RTI.cfm>

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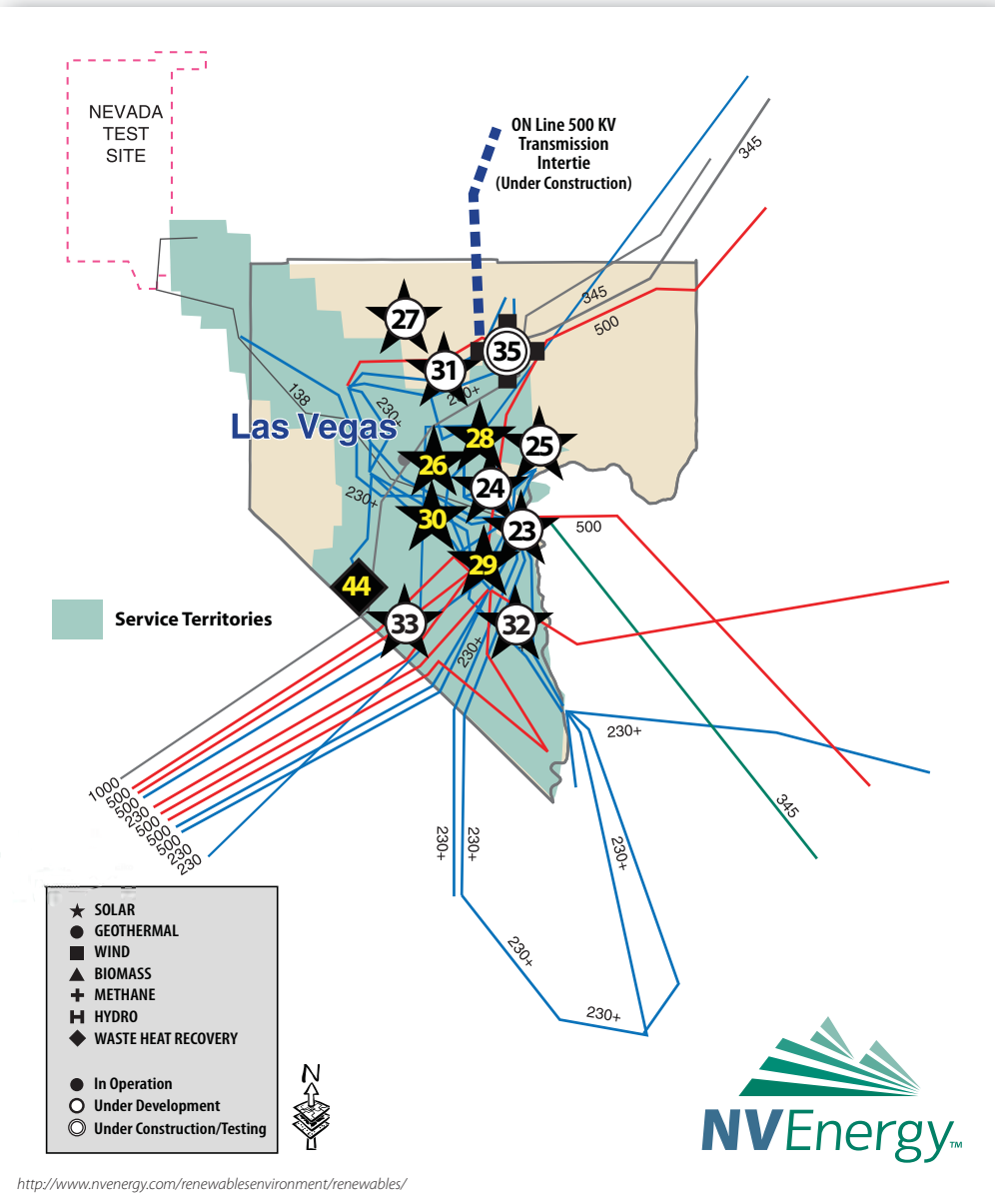
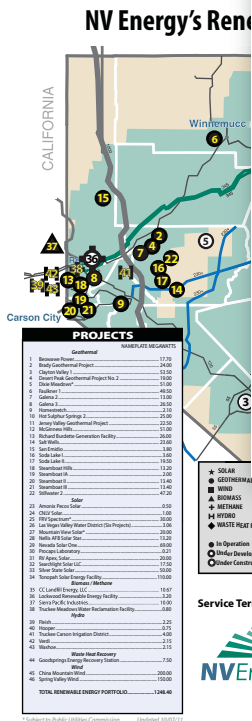


Map 5

NV Energy Renewable Energy Map

Las Vegas Valley Close Up

*note, the images below
and to the right are from
existing NV Energy maps.



Conservation element



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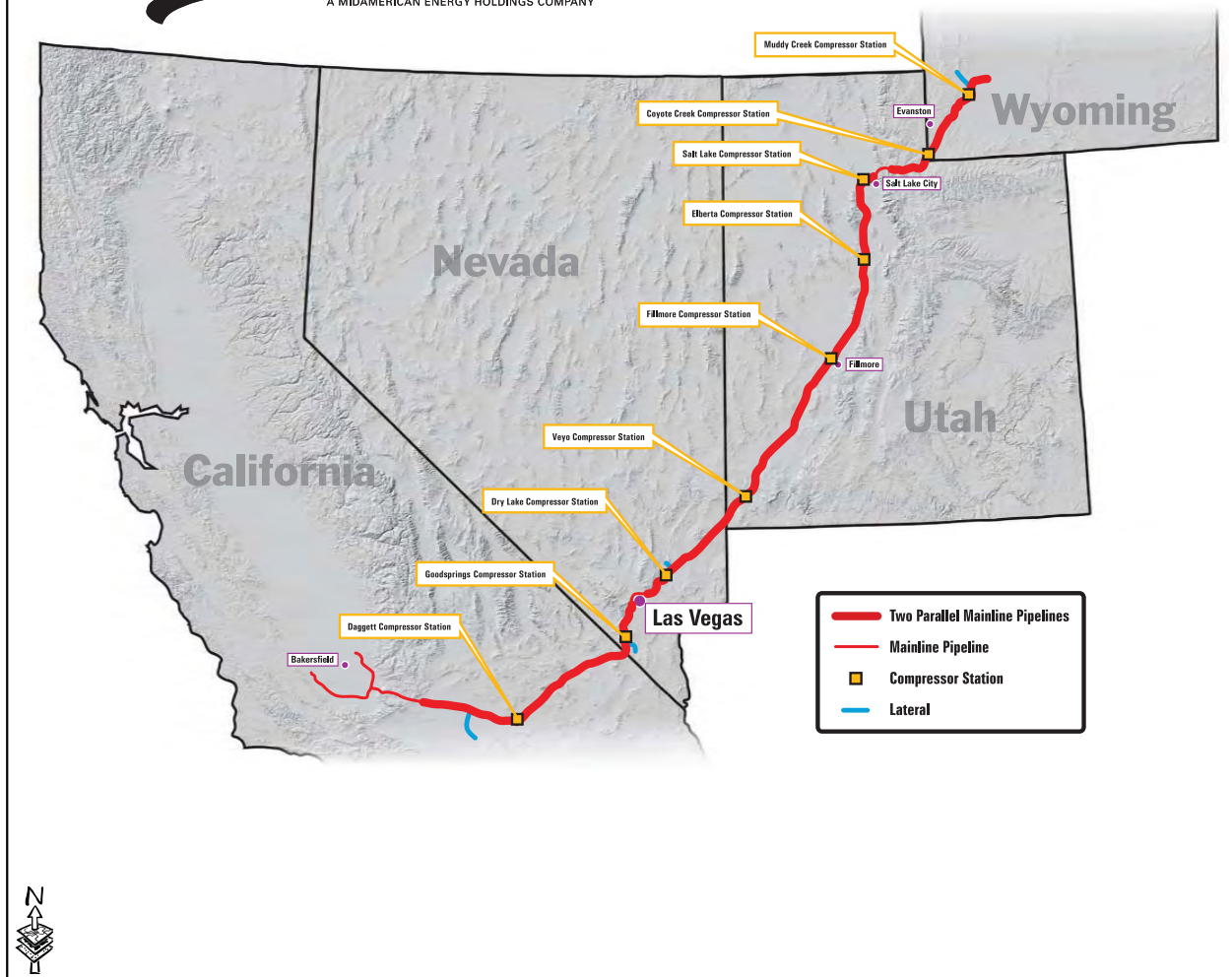
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Pipeline System



Map 6 Natural Gas Pipelines

**Conservation
element**



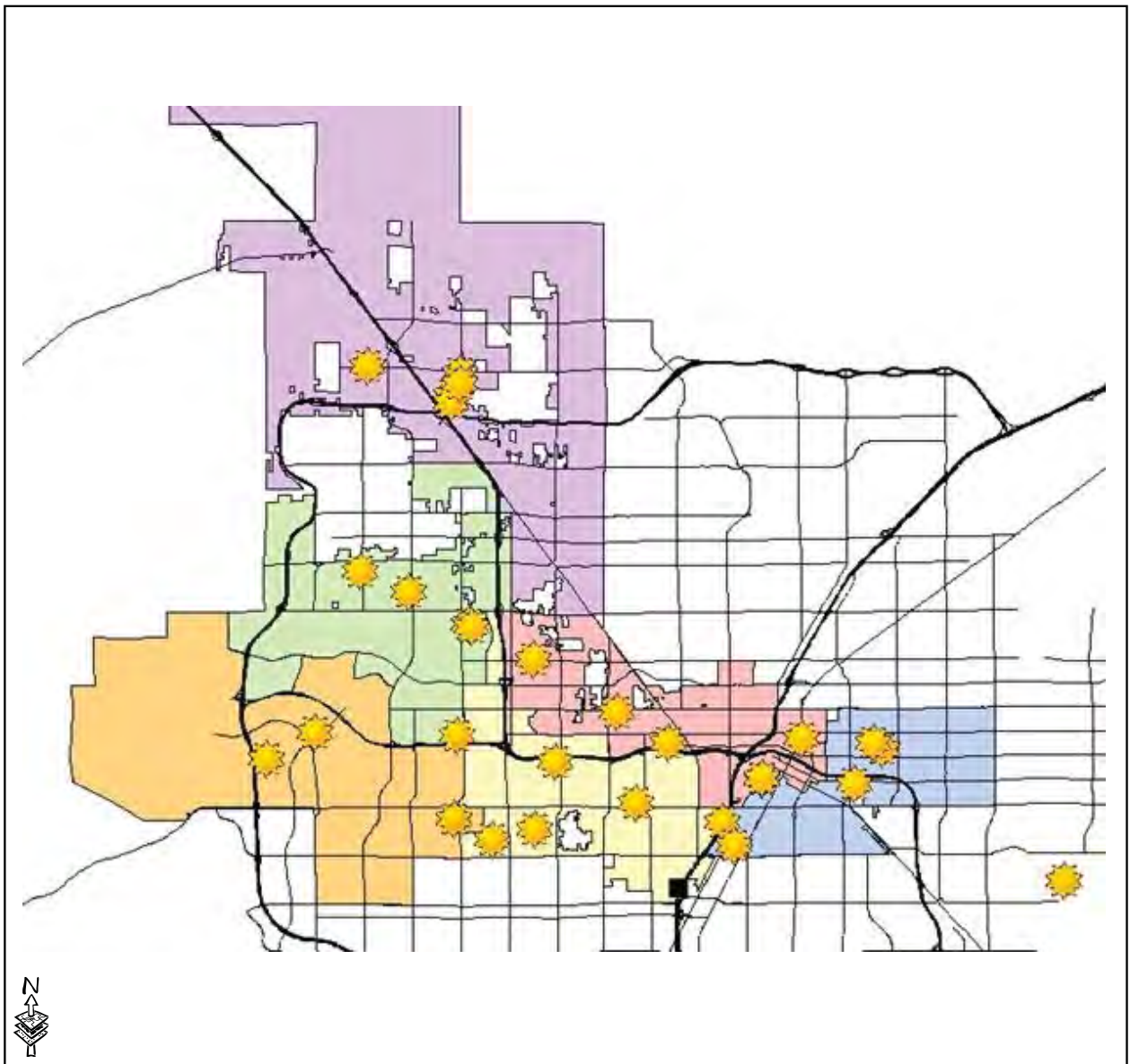
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Map 7 City of Las Vegas Solar Facilities Map

**Conservation
element**



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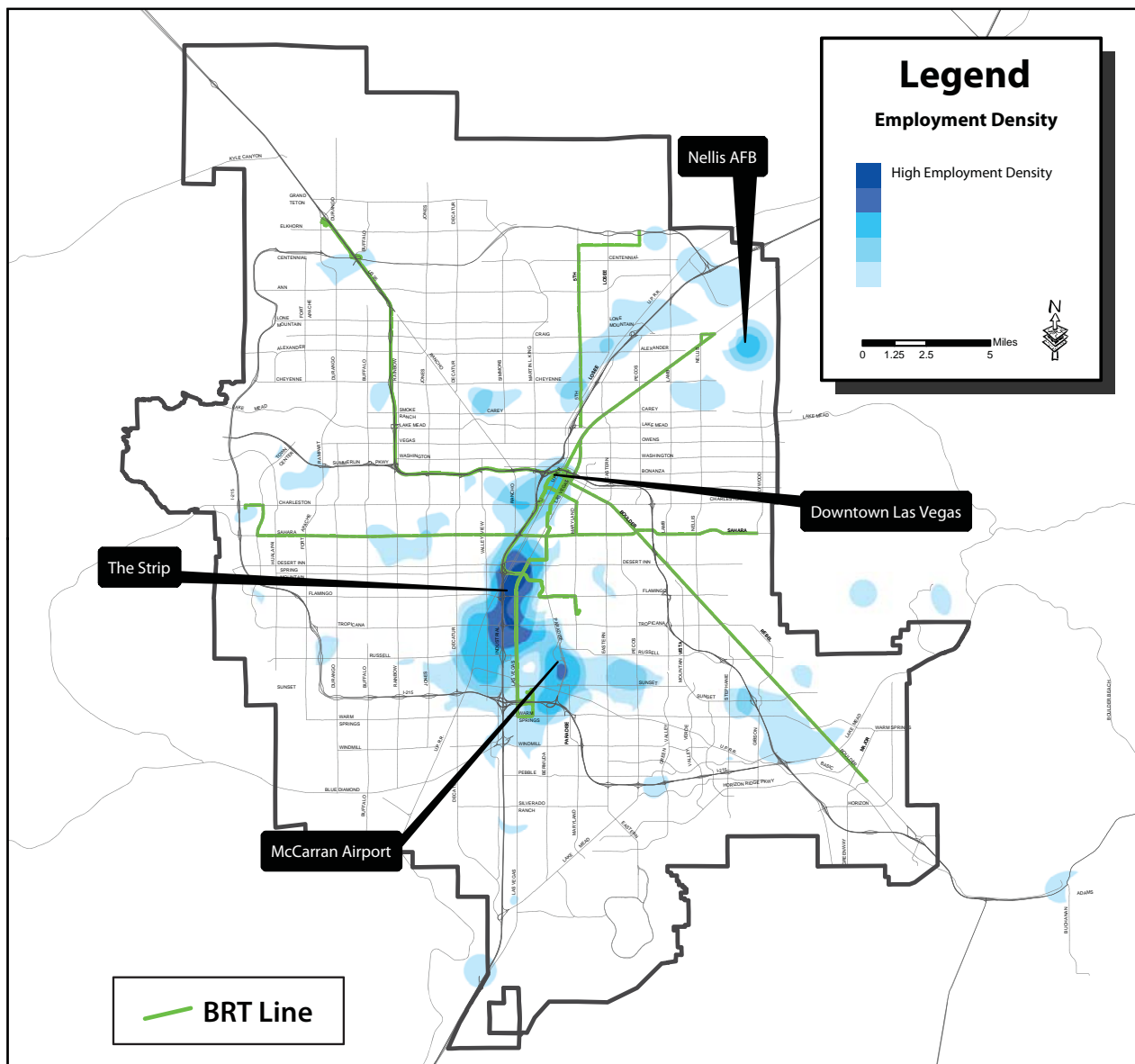
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Map 8 Employment Areas and Transportation Routes

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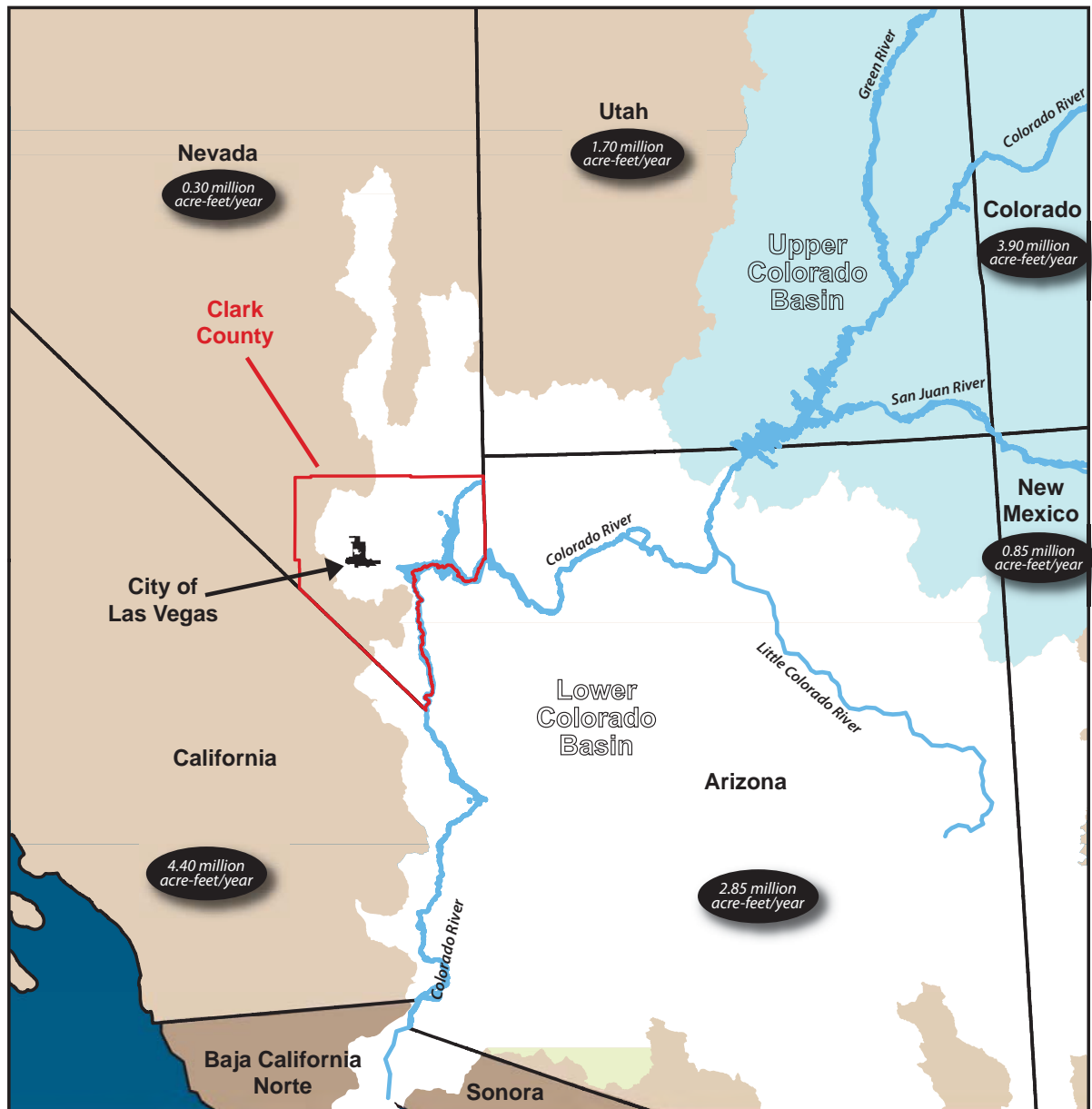
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Map 9

States Affected by "The Law of the River"

Conservation element

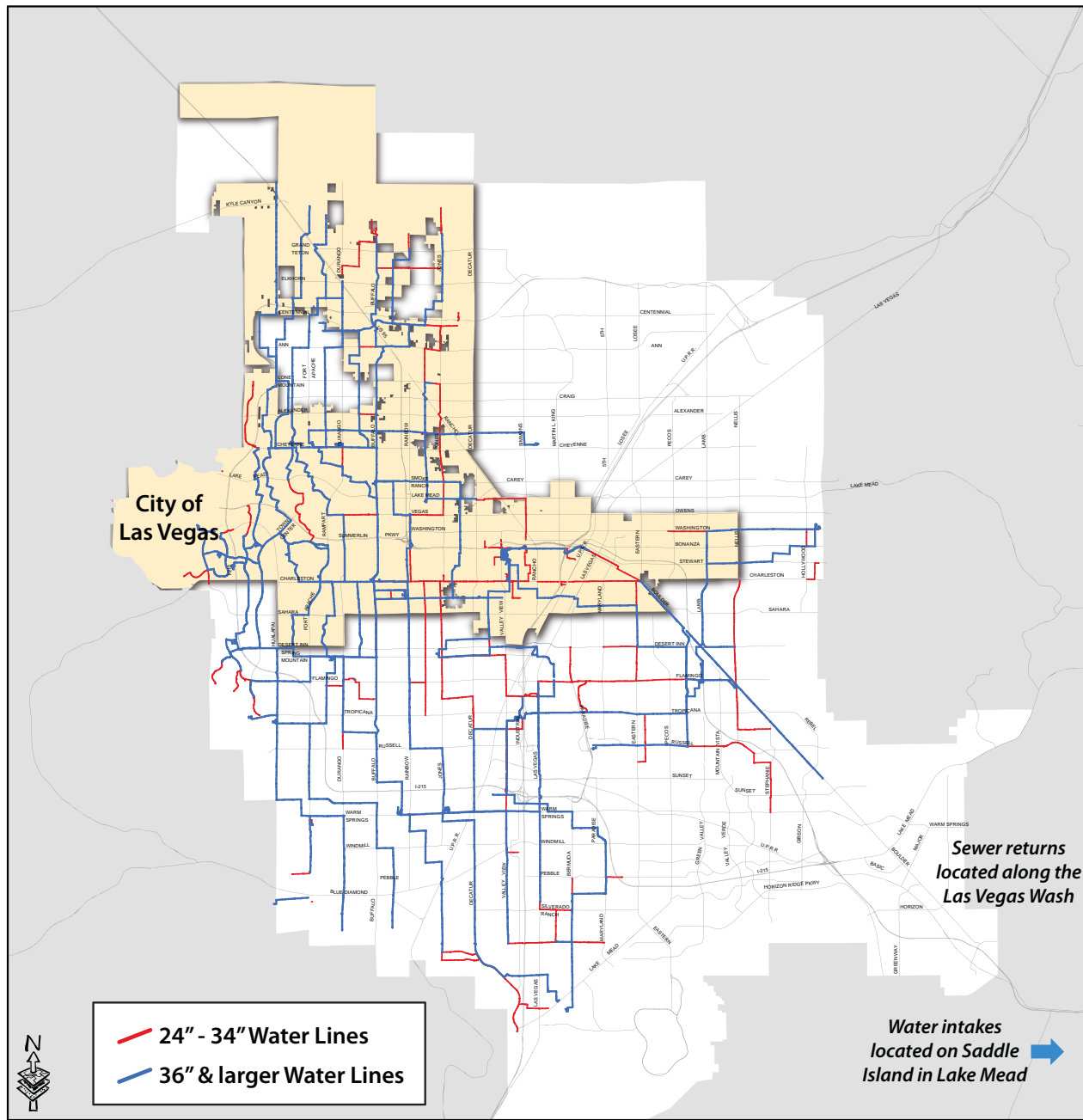


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Map 10 Valley Wide Water Lines

**Conservation
element**

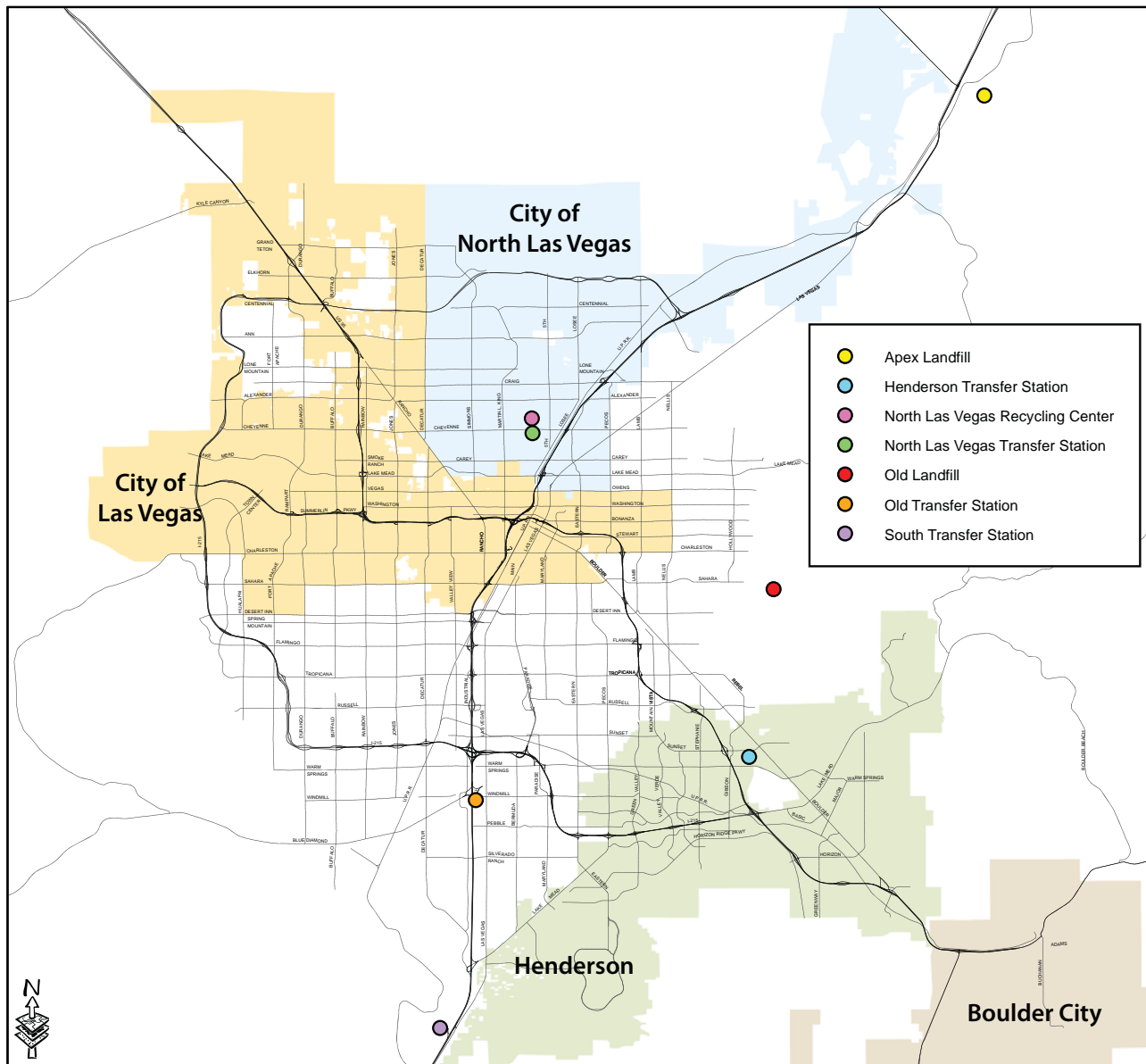


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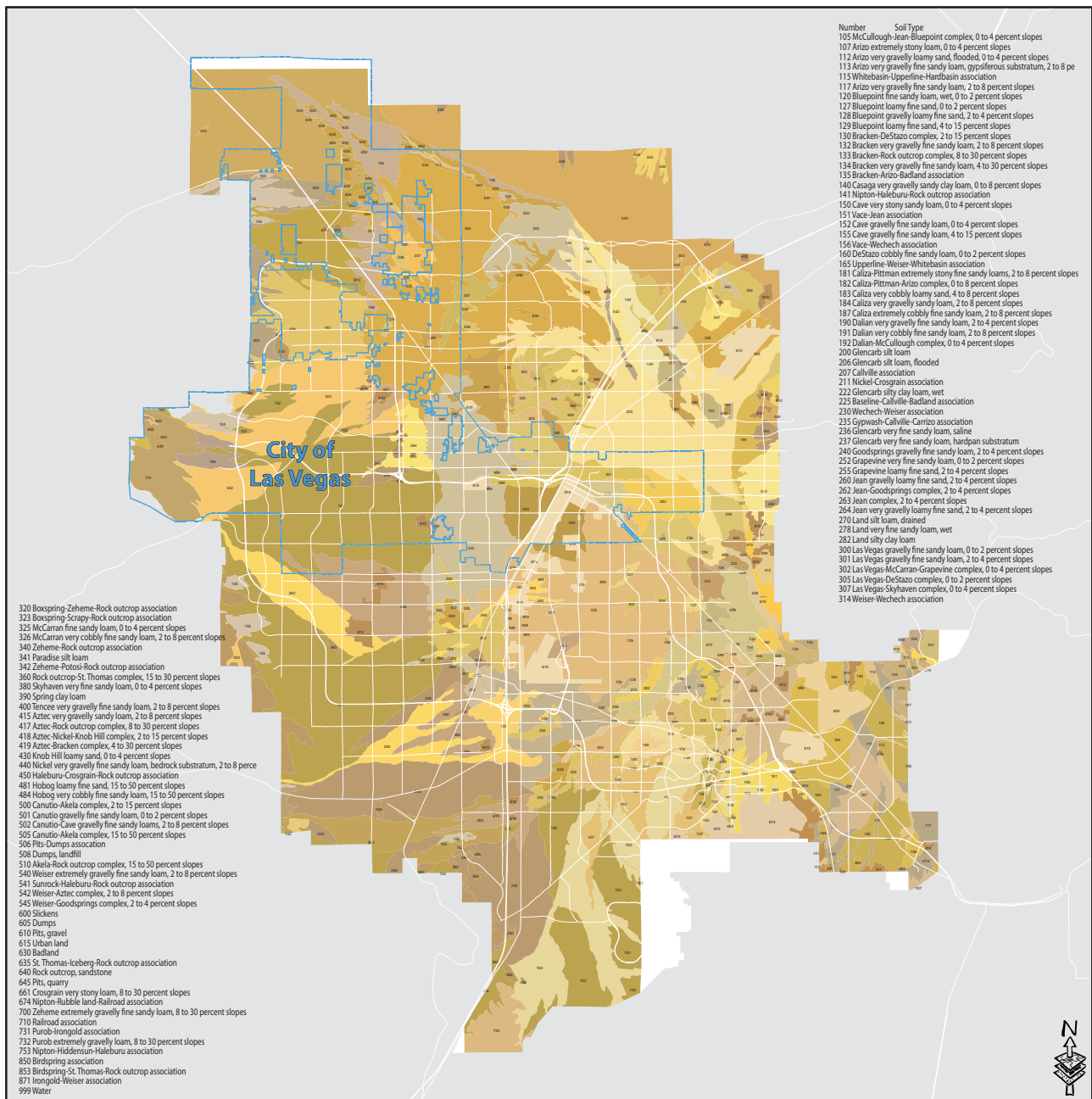
Map 12 Waste Disposal & Recycling Facilities

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Map 13

Las Vegas Soils Classification

Conservation element



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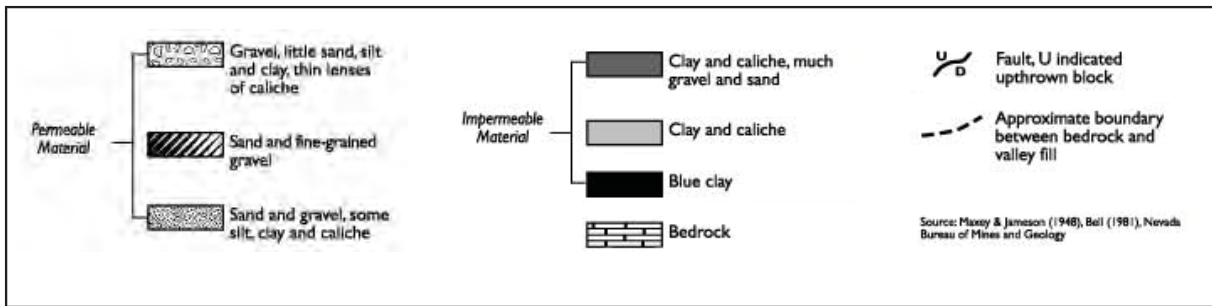
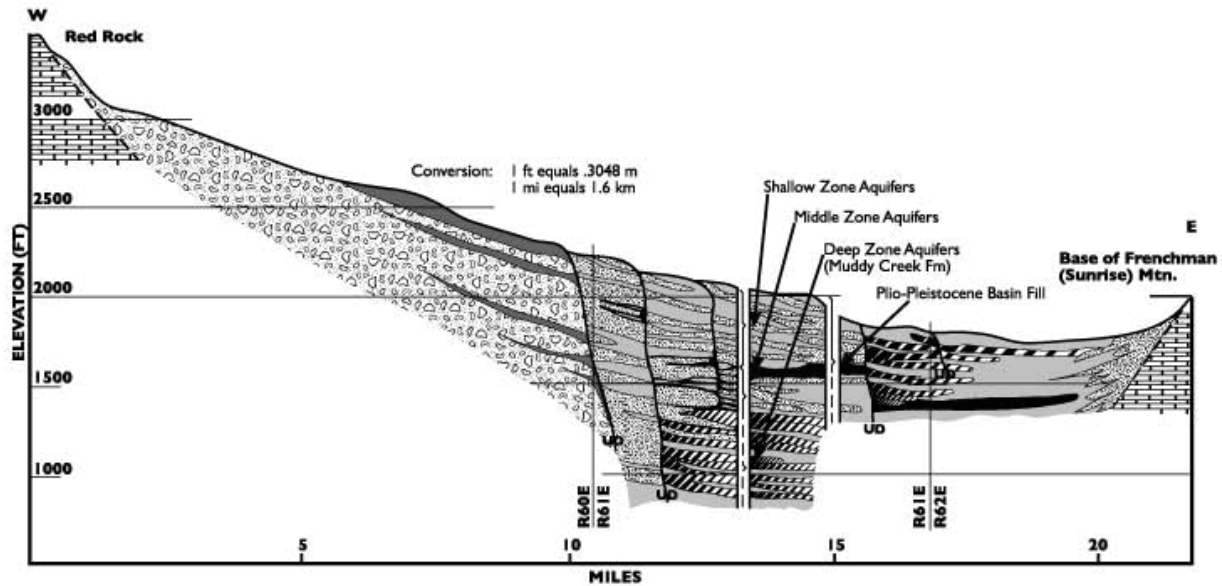
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Map 14 Generalized Geologic Cross-Section of the Las Vegas Valley

Conservation
element



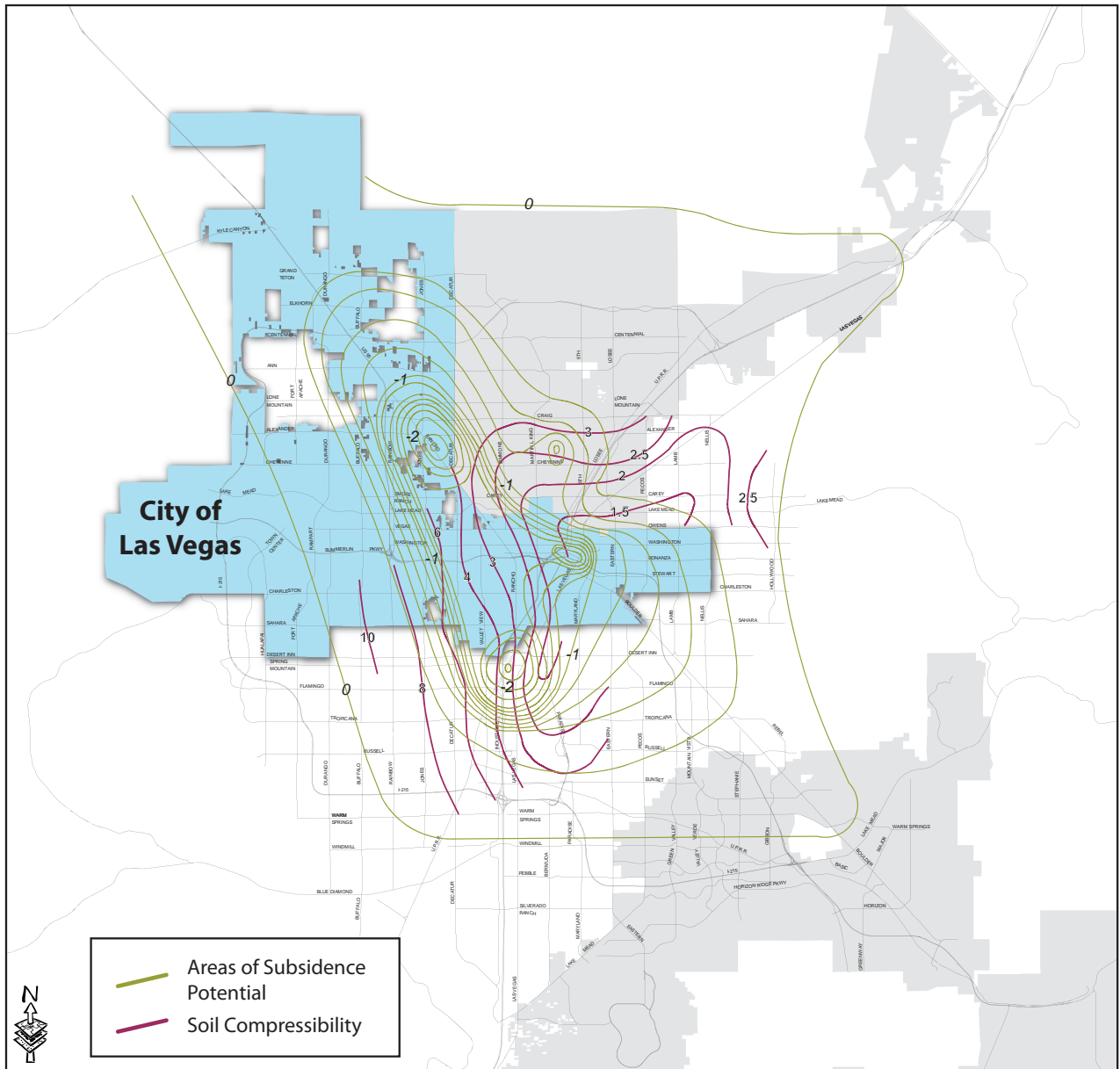
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Map 15 Compressibility and Subsidence

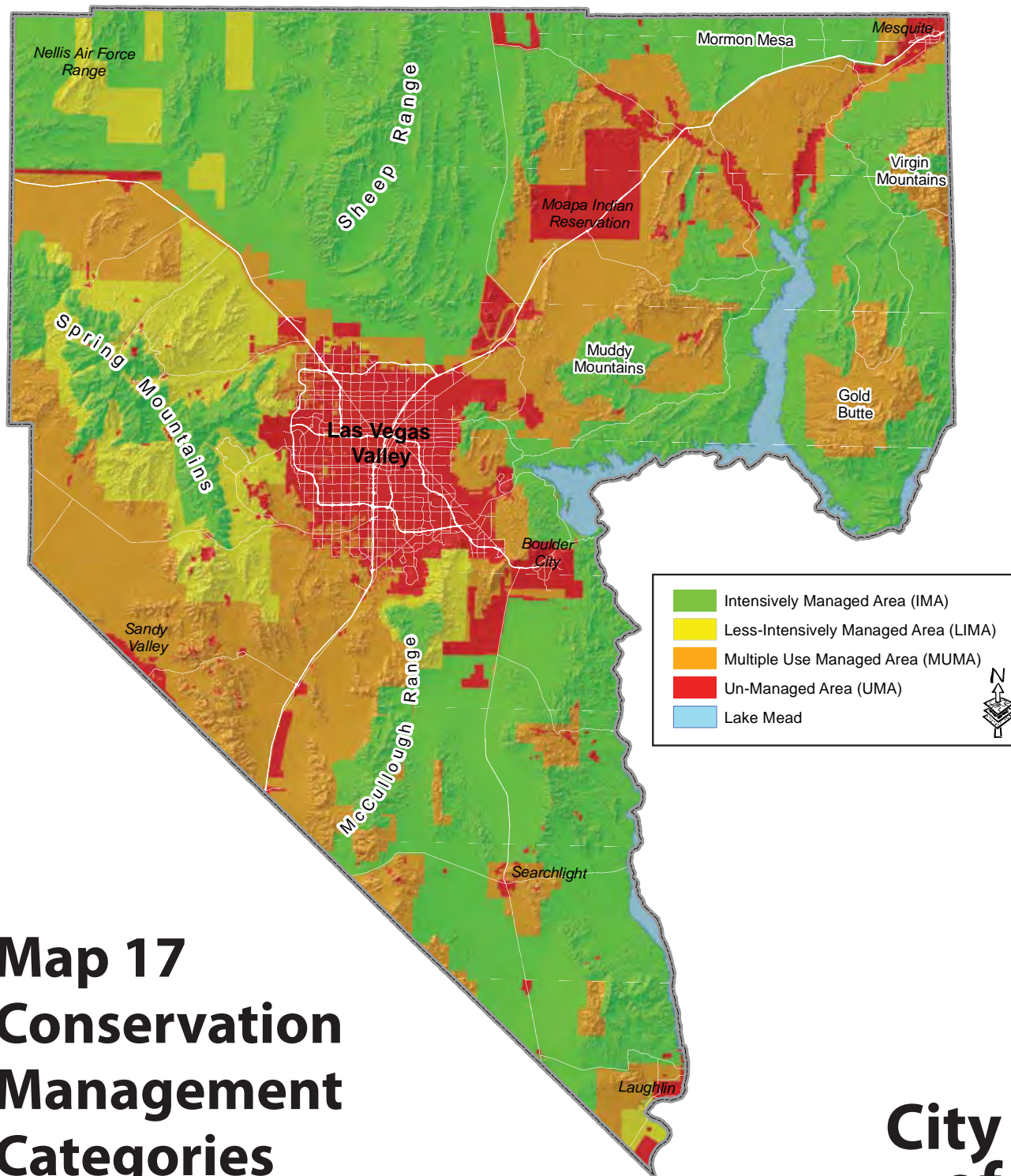
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Map 17

Conservation Management Categories

Conservation element



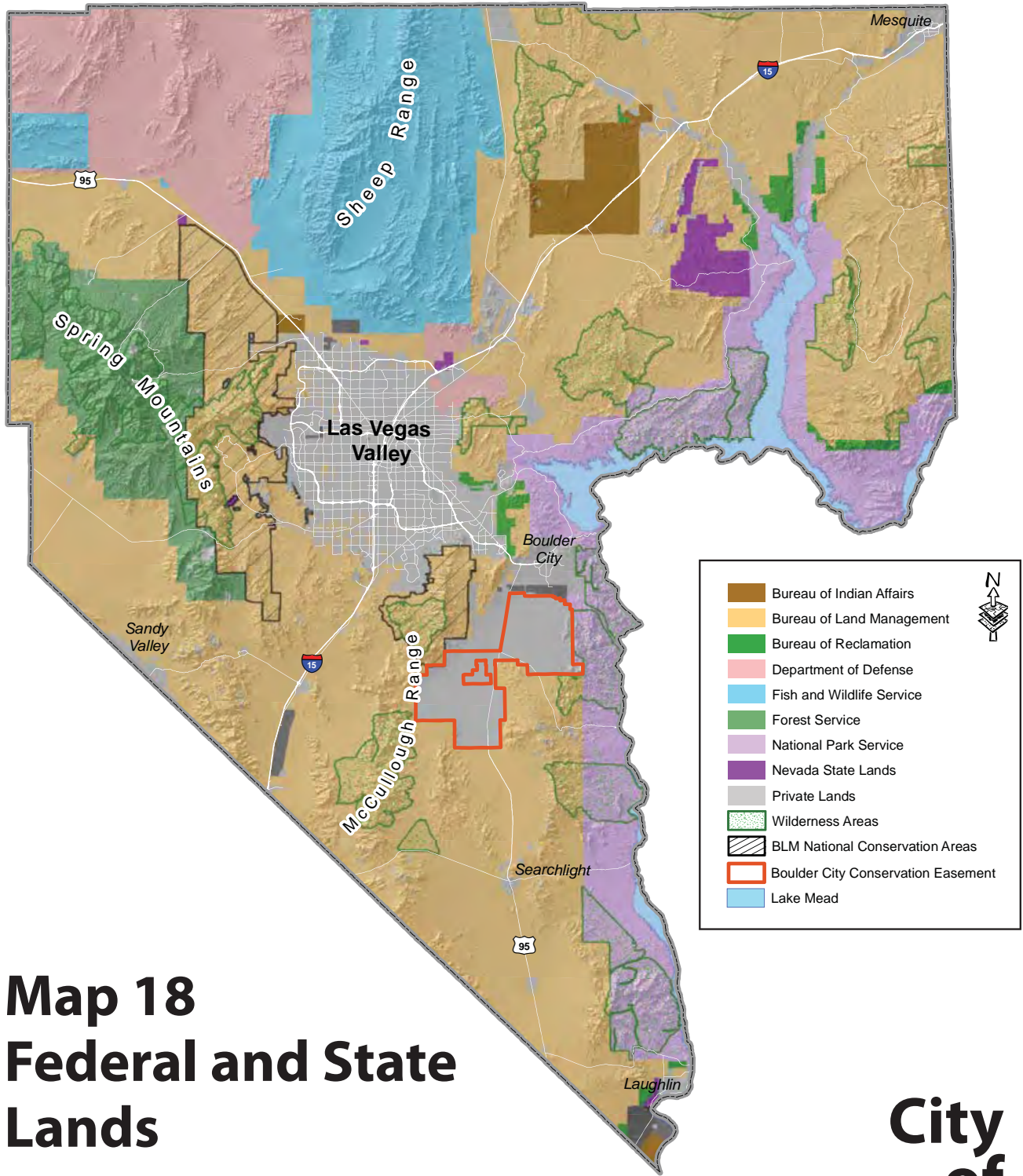
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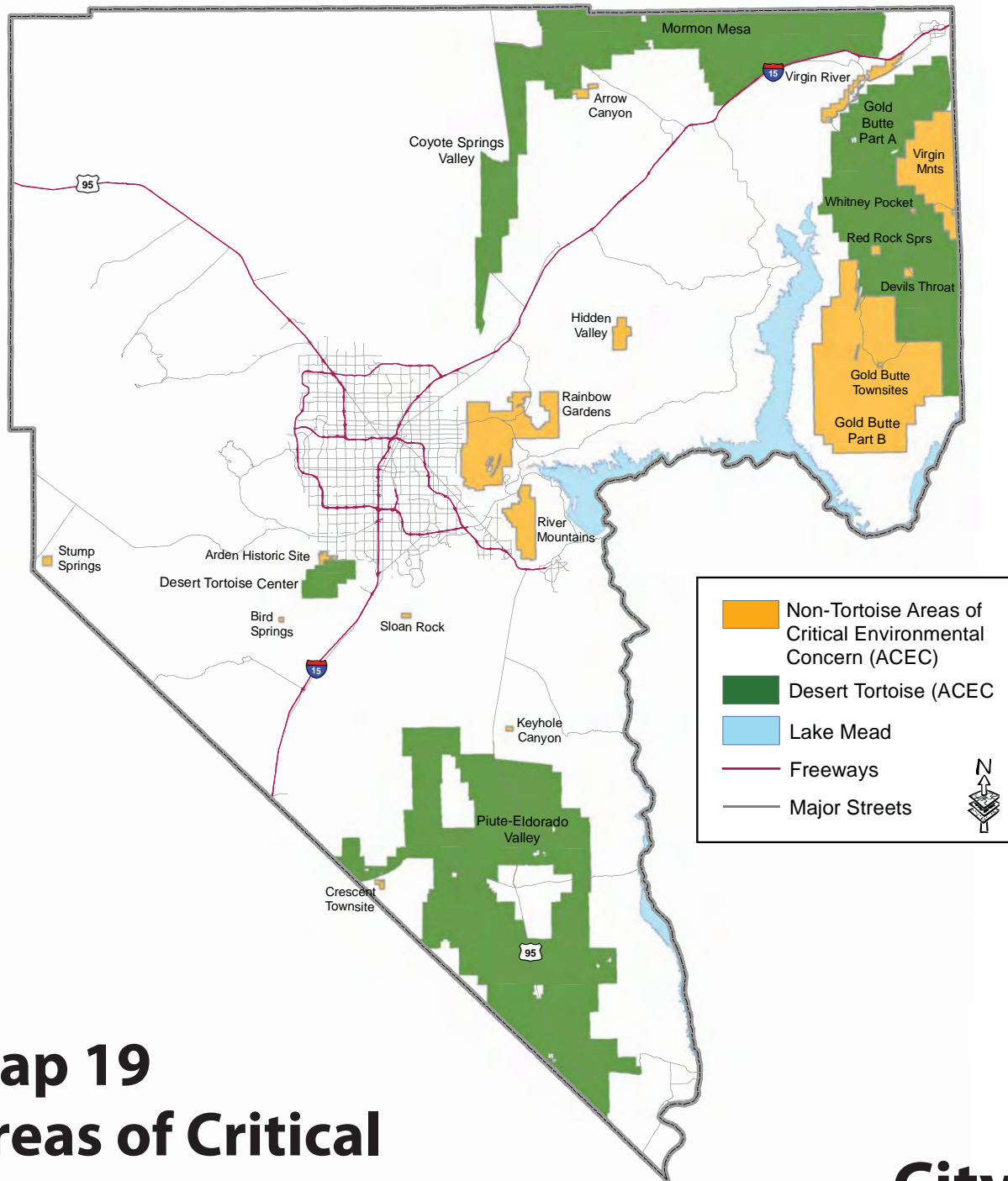
Map 18 Federal and State Lands

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Map 19 Areas of Critical Environmental Concern

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