White Pine County Exhibit A

GROWTH AND SUSTAINABILITY IN THE LAS VEGAS VALLEY

JANUARY, 2010

SONORAN INSTITUTE

Shaping the Future of the West

SONORAN INSTITUTE OFFICES

7650 E. Broadway Blvd., Suite 203
Tucson, Arizona 85710
520-290-0828 Fax: 520-290-0969

11010 N. Tatum Blvd., Suite D101
Phoenix, Arizona 85028
602-393-4310 Fax: 602-393-4319

201 S. Wallace Ave., Suite B3C
Bozeman, Montana 59715
406-587-7331 Fax: 406-587-2027

1536 Wynkoop Street #307
Denver, Colorado 80202
303-605-3484 Fax: 303-265-9632

FIELD OFFICES

817 Colorado Ave., Suite 201
Glenwood Springs, Colorado 81601
970-384-4364 Fax: 970-384-4370

P.O. Box 543
Helena, Montana 59624
Tel/Fax: 406-449-6086

P.O. Box 20665
Cheyenne, Wyoming 82003
307-635-1973

1 East Alger St., Suite 211
Sheridan, Wyoming 82801
307-675-1970

Magisterio #627
Col. Profesores Federales
Mexicali, Baja California, C.P.
21370 Mexico
011-52-686-580-5431

Joshua Tree National Park
74485 National Park Dr.
Twentynine Palms, California 92277
760-367-5567 Fax: 760-367-6392

www.sonoraninstitute.org

SONORAN INSTITUTE

Shaping the Future of the West

The nonprofit Sonoran Institute inspires and enables community decisions and policies that respect the land and people of western North America. Facing rapid change, communities in the West value their natural and cultural assets, which support resilient environmental and economic systems. Founded in 1990, the Sonoran Institute helps communities conserve and restore those assets and manage growth and change through collaboration, civil dialogue, sound information, practical solutions and big-picture thinking.

The Sonoran Institute contributes to a vision of a West with:

- *Healthy landscapes*—including native plants and wildlife, diverse habitat, open spaces, clean air and water—from northern Mexico to Western Canada.
- *Vibrant communities* where people embrace conservation to protect quality of life today and in the future.
- *Resilient economies* that support prosperous communities, diverse opportunities for residents, productive working landscapes and stewardship of the natural world.

ACKNOWLEDGEMENTS

The Sonoran Institute is grateful to the Progressive Leadership Alliance of Nevada (PLAN) and the Toiyabe Chapter of the Sierra Club for their generous support associated with producing this report . The excellent research was led by the Institute's Joe Marlow, senior economist, with assistance from Claire Zugmeyer, Josh Gage, Jessica Hawn and Rebecca Carter. Credit also goes to the many additional reviewers of this report who provided valuable knowledge, insight and assistance. I also want to recognize Teri Bingham for her skilled hand in graphic design, and Joe Marlow, Ian Wilson and Audrey L. Spillane for their writing and editing support.

Luther Propst
Executive Director
January, 2010

CONTENTS

The Time is Now
An Appeal from the State Director of PLAN 3

Executive Summary 5

Introduction 11

Build-out Scenario for the Las Vegas Valley 13

The Making of the Las Vegas Valley 17

Forces Shaping the Las Vegas Valley 19

The Megapolitan West 23

Working Collaboratively to Solve Problems 25

Six Critical Issues 27
- Water 27
- Economic Diversification 39
- Land Use 43
- Transportation 49
- Resource Conservation 53
- Changing Demography 57

Conclusion and Recommendations 63

Appendix 1
Comments on "The Impact of a Growth Interruption in Southern Nevada," a Report by Hobbs, Ong & Associates 69

Appendix 2
Construction and Implementation of a Build-out Model for the Las Vegas Valley 71

Glossary of Terms 73

References 75

Lincoln County
Clark County
Mohave County
San Bernardino County
Desert National Wildlife Range
Toiyabe National Forest
Red Rock Canyon NCA
Las Vegas Valley
Lake Mead National Recreation Area
Sloan Canyon NCA
Hoover Dam
Lake Mojave
Mojave National Preserve
93
95
15
OR
ID
NV
UT
CA
AZ
Pacific Ocean
N
0 3 6 12
Miles
U.S. Forest Service
National Park Service
U.S. Fish & Wildlife Service
Tribal Land
Other Federal
Other (Non-Federal, State, Private)
U.S. Bureau of Land Management
BLM Wilderness
BLM National Conservation Area (NCA)
SONORAN INSTITUTE

THE TIME IS NOW.

AN APPEAL FROM THE STATE DIRECTOR OF PLAN

The key to Southern Nevada's long-term economic and ecological stability isn't some mystical prize that might be obtained only after solving a series of impenetrable riddles and surmounting a host of seemingly intractable problems. Many of the solutions to the challenges facing the region, particularly those challenges posed by the metropolitan area's three decades of breakneck growth, have already been identified.

The answers are there. All that's missing is some action: Public policies that serve the long-term economic, environmental and social needs of the region. The Progressive Leadership Alliance of Nevada has vigorously championed policies that serve the interests of working families since we were founded in 1994 by an eclectic coalition of labor, environmental, conservation and social justice groups. We continue to work for such policies throughout the state.

Among our successes: In 2008, we found overwhelming support for a binding referendum that forces local governments in Washoe County to consider the availability of a critical natural resource—water—in drafting growth and development plans. Absurdly, and dangerously, such limitations were simply not a part of most planning calculations.

This is an extraordinary time. The nation-leading growth rate of Southern Nevada and the state as a whole has come to a catastrophic end. In part, we now know that the very policies championed by many members of the business community and elected leaders contributed to the huge growth and subsequent collapse of unsustainable bubble in real-estate development. The result has been nation-leading unemployment rates, the near-extinction of residential and commercial construction industries, and the dramatic fall of residential and commercial property values. No one in Southern Nevada has escaped the impacts of the collapse.

In the midst of this troubled time, we at least have the opportunity, long needed, to look at the assumptions and consequences of our regional planning policies. This study by the Sonoran Institute on Growth and Sustainability in the Las Vegas Valley, chartered by PLAN with the assistance of the Toiyabe Chapter of the Sierra Club, will help us look at the issues in a new light.

After briefly tracing the historical, regional and economic context of Southern Nevada's development from a watering hole to part of the "Megapolitan West," the Sonoran Institute examines the "Forces Shaping the Las Vegas Valley." Those forces include a "new focus" on sustainability; population growth; demographic changes; water issues; land use and development patterns; housing and the foreclosure crisis; and transportation needs.

The report then identifies seven "critical issues" that Southern Nevadans have to address to assure the region can sustain a vibrant economy and a rewarding quality of life for future generations: Water, Economic Diversification, Housing Affordability, Land Use, Transportation, Resource Conservation and Changing Demography.

For each of those subject areas, the Sonoran Institute draws on key findings and recommendations developed by the best and most comprehensive prior studies of Southern Nevada public policy issues, from the Pacific Institute's landmark report on water resources to the findings of local citizen task forces. In some instances, notably in the economic diversification and land use sections, the Sonoran Institute supplements prior studies with original research.

SOME KEY FINDINGS:

- *Groundwater development projects should be considered only after more stringent conservation measures have been implemented.*
- *There is enough Bureau of Land Management land within the so-called disposal boundary ringing the valley to accommodate another 11 years of growth at projected rates—but the land should be auctioned off with more emphasis on smart growth principles and less interest on a developer's desire for large parcels of subdivision-friendly contiguous land.*
- *Public transportation. Public transportation. Public transportation.*
- *Transitional space between urban areas and surrounding wildlands should be protected from development now.*

A full list of conclusions and recommendations can be found at the end of the report.

Combining fresh analysis with the results of some of the best of exiting Southern Nevada growth studies, the Sonoran Institute has produced a comprehensive yet relatively brief and to-the-point primer that is bound to be a frequent reference for elected officials, public policy professionals, journalists, public interest minded citizens and armchair wonks.

And more importantly, the report's repeated emphasis on recommendations and solutions is a reminder that "the time for action is now"—particularly given an economic downturn that has proven to be uncharacteristically harsh for Southern Nevada, an area that has spent most of the last several years as one of the most prosperous regions in the nation. As the Sonoran Institute report puts it in Growth and Sustainability:

"The national economic malaise with its strong and ongoing effects on Las Vegas provides an excellent opportunity for the city and surrounding area to re-appraise the situation and to wholeheartedly embrace sustainability on multiple fronts. Indeed, this is an opportunity that must be seized if the region is to continue to thrive."

Bob Fulkerson
State Director
Progressive Leadership Alliance of Nevada

EXECUTIVE SUMMARY

The Las Vegas Valley is an area whose history and economy have been built on rapid and almost uninterrupted growth. In just the past 15 years, the population has doubled and in the process transformed its demography. This growth explosion has strained natural resources and infrastructure, while the area's reliance on two industries—leisure/hospitality and construction—has left vulnerable an economy that depends on continued expansion. How much growth can the area withstand and where should it take place? Can further development and sustainability coexist? What opportunities and warnings does the current economic downturn present? These are some of the questions this report attempts to answer.

Las Vegas Valley is surrounded by public lands managed by the federal Bureau of Land Management (BLM). Pressure to privatize land for development led to enactment of the Burton-Santini Act in 1980 and the Southern Nevada Public Land Management Act in 1998, which established a privatization process and created a "disposal boundary," within which the land available for privatization would be confined. To guide the process for selecting lands to be auctioned, the organization charged with facilitating the process—the Southern Nevada Regional Planning Coalition (SNRPC)—created a regional policy plan containing standards promoting smart-growth practices such as mixed-use development and infill (building in already developed areas to take advantage of existing infrastructure, avoid sprawl and preserve open land). Despite these smart-growth standards, most of the parcels selected for auction have instead been in open areas located on the boundary edge, reflecting developers' desire for large contiguous parcels of land for master-planned communities.

A series of regional growth summits that the SNRPC held in the spring of 2003 revealed a continued desire to expand the current BLM disposal boundary even further. Given the implications of opening more public lands for development, the Sonoran Institute developed a model (the "build-out model") to estimate how many more people could be accommodated within the disposal boundary as it exists today. This report provides the findings of this build-out model, examines the implications for this potential additional development, and provides recommendations specific to the level—or scale—at which they should be addressed.

SIX CRITICAL ISSUES

The Sonoran Institute's build-out model estimates that some 500,000 more people could live in the Las Vegas Valley if all available land in the current BLM disposal boundary were developed. The report identifies six critical issues that must be addressed in light of this potential growth:

Water

Water has always been and remains one of the most critical sustainability issues in the Las Vegas Valley's desert environment. The Valley is currently meeting its water needs—but only just—and further development, along with the threat of decreased precipitation in the Colorado River basin due to climate change, threaten to overwhelm the area's

resources. Conservation efforts have increased dramatically but have been overpowered by the rapid population growth. Still, there is the room for further water usage reduction, as the cities of Tucson and Albuquerque have demonstrated. The Valley gets 90 percent of its water from the Colorado River system, based on Nevada's 300,000 acre-feet allocation, which it stretches 70 percent further by treating the water it uses, sending it back into the river system, and receiving return credits. The remainder of the water for the area comes from groundwater resources with a small amount from private wells. Increasing the water supply is possible, but mostly through extracting groundwater from areas outside of the Las Vegas Valley. The report examines the financial, environmental, and social costs of depleting this limited resource and of building the infrastructure required for the proposed groundwater development project. The report also details the connectedness of energy and water: transporting and treating water require a huge amount of electricity, while generating electricity for the Valley uses more water than is used for any other purpose in the area. Given the intimate link between these two critical resources, planning and conservation efforts for them must be integrated.

The report recommends employing more stringent conservation and efficiency measures as an alternative approach to the groundwater development project. Beyond these local-scale measures, the report recommends regional collaboration to create and implement policies that integrate land use and water supply, as well as Colorado River basin-wide coordination of the water budgeting process.

Economic Diversification

The report finds that the Las Vegas Valley economy is highly concentrated in two industries, leisure/hospitality and construction. While the leisure/hospitality industry has the highest numbers of employees, it also has one of the lowest average annual wages. The industries with the some of the highest average wages—the information, educational and health-care services, and manufacturing industries—have relatively small numbers of employees in the Valley. Diversification into these higher paying industries and drawing manufacturers to the area would make the economy less susceptible to contractions in the dominant industries and would significantly increase personal incomes.

The report recommends improving educational opportunities on the local level to ensure the well-qualified workforce necessary to achieve and sustain economic diversity. On a regional scale, the report recommends implementing the economic development strategy and recommendations contained in the 2006 Southern Nevada Regional Development Strategy, as well as conducting further regional studies as the economy evolves.

Land Use

As described above, pressure to privatize the public lands surrounding the Las Vegas Valley has led to increasingly large areas being made available for development. Despite standards promoting smart-growth practices, many of the parcels chosen for development have been located at the outer edges of the disposal area, raising concerns of sprawl and its negative effects. A persistent desire among some in the community for the disposal boundary to be extended even further—and the ramifications of such additional development—prompted the Sonoran Institute to create a build-out model to estimate how much development capacity is left within the current disposal boundary. The model found that the current area could accommodate up to about 500,000 additional people.

The report recommends continuing to develop and implement policies promoting infill and mixed-use development. On a regional scale, the recommendation is for greater integration and coordination of land-use planning, and for lands to be selected based on a comprehensive regional planning process.

Transportation

Traffic has increased significantly in the Valley, leading to dramatically increased congestion and delays on the area's streets and highways. There has been a corresponding increase in costs associated with these delays, along with excess motor fuel consumption and air pollution.

The report recommends continued development and planning of bus rapid transit, transit-oriented development, and transportation corridors to outlying areas. On a regional scale, recommendations include integrating air-quality, transportation and land-use planning; improving transportation linkages and interconnectivity; and addressing relationships between land uses and vehicle emissions. On the federal scale, the report recommends establishing incentives for the use of alternative fuels and transportation technology.

Resource Conservation

The urban footprint of Las Vegas has expanded significantly, greatly reducing open space and shrinking the wildlife and plant habitat. The area must work to mitigate these impacts and avoid additional environmental degradation in the future. A habitat conservation plan established in response to threats to wildlife habitat has resulted in constricting development in the Valley and will help encourage more sustainable land-use patterns and urban form. A demand for open space, parks, and recreation led to the development of a regional open space plan in 2006. When implemented, this plan will enhance quality of life for Valley residents. Development of solar energy resources in the area will bring environmental impacts, with the siting of solar power generation facilities and electrical transmission corridors. While this development will bring renewable power and encourage economic diversification, a balance must be struck between its benefits and environmental drawbacks.

The report recommends continued implementation of the habitat conservation and regional open space development plans. It also recommends establishing and disseminating information about best management practices and mitigation strategies for siting renewable energy generation facilities and transmission infrastructure.

Changing Demographics

As it has grown, the Las Vegas Valley's population has also evolved, becoming increasingly Hispanic and trending toward greater proportions of older, retired people and school-aged children. Both of these changes have important implications for the educational system, health care and social needs, and the local economy. Annual per-pupil spending and educational attainment in the area lag behind national averages. Improving these measures will be essential to ensuring a qualified workforce and a diversified economy. The aging population will need health care and other social services, requiring spending while creating opportunities for economic diversification. If the segment of middle-aged

people continues to decrease, it will present challenges to the area, since these are the people paying the bulk of the taxes to local governments that support services for others.

The report recommends increased investment in the public education system and improved access for Hispanic and other recent immigrants to post-secondary educational opportunities. Also on the local level is a recommendation to conduct studies of and create strategies to address the changing age demographics. On the regional scale, the recommendation is to develop economic diversification strategies around the demographics. On the federal scale, the report recommends engaging the federal government regarding comprehensive immigration reform.

CONCLUSIONS

There are no easy answers to issues as complex as those discussed in this report. Overall, the Valley must create a comprehensive, consensus vision addressing how Las Vegas expects to remain competitive in the global economy and how it defines its future quality of life. The region needs a strong leader in the form of a more comprehensive regional planning authority to integrate planning efforts across southern Nevada. Recognizing that they share regional issues and resources, the Las Vegas Valley must engage with neighboring states to develop a regional sustainability framework, and also partner with other Intermountain West colleagues to define a common federal agenda addressing the issues of water, energy, transportation, and immigration. The current economic downturn and pause in construction provide an excellent opportunity for the Valley to reexamine the costs and benefits of a growth-driven economy, to act on specific strategies and recommendations developed for each issue, and to embrace sustainability on multiple fronts.

INTRODUCTION

A half-million more residents—that's approximately how many more people could fit into the Las Vegas Valley, according to one scenario from a new build-out model. Developed by the Sonoran Institute, this build-out model uses current land-use zoning and assumes privatization of all Bureau of Land Management (BLM) lands remaining within the current disposal boundary to estimate residential growth capacity in the Valley.

Imagine a half-million more people in the Valley consuming water and energy, requiring places to live and recreate, and commuting to work and play. Their needs, and the associated impacts of accommodating them, are important to understand and to incorporate into local and regional planning efforts.

The Las Vegas Valley is just coming off a period of astounding growth, doubling its population since 1995. Today with some 2 million people, the area finds its resources and infrastructure strained. Always a concern, the Valley's current water supply just meets demand. At projected per capita water consumption rates, a half-million more people will need another 111,000 acre-feet of water annually—nearly 20 percent more than is currently consumed in the Las Vegas Valley. Nevada's entire allocation of Colorado River water is only 300,000 acre-feet per year. Where will Las Vegas get this much additional water, and at what cost?

Annual electrical energy requirements for the new residents, assuming current rates of usage, will be approximately 6.9 million megawatt hours. Meeting these extra electricity demands will require finding new generating capacity equal to 70 percent of the largest local generating facility's output. How and where will this additional energy be generated, and how will it affect the environment?

Las Vegas' current transportation system is already overburdened. Think of a half-million more people needing to get around. What does this mean for mass transit? How much more highway construction will be required? What will be the air quality impacts?

These questions and myriad others will require consideration, discussion and, eventually, answers if Las Vegas is to become a sustainable metropolitan area.

Granted, in the face of the today's local, regional and national economic downturn, it is difficult to imagine a half-million more people headed to Las Vegas to live. Indications are that Las Vegas' population actually decreased last year for the first time in a very long while. In a way, the current slowdown provides an opportunity. Residents of the Las Vegas Valley now have a chance to take a deep breath and think about the future of their area. They also have some time to reflect on and prepare for how the Valley's needs and opportunities interconnect with those of other communities in the West. Solutions to current and potential future sustainability challenges can best be articulated and implemented through collaboration at local and regional levels, with federal coordination and assistance with select issues.

This report examines challenges facing the Las Vegas Valley and provides recommendations for addressing these issues in the context of their scale and the potential collaborative efforts necessary to find the solutions.

BUILD-OUT SCENARIO FOR THE LAS VEGAS VALLEY

Using recent data from Clark County, the Sonoran Institute assembled a geographic information system (GIS) database of planned land-use and zoning for the Las Vegas Valley. Using the GIS database, a build-out model was constructed for the land within the current BLM disposal boundary, and three population scenarios were constructed based on low-, medium- and high-density development.

The methods for this analysis were relatively straightforward. Any parcel in private ownership or that could be made available for development via government land sale was isolated. Next, its zoning classification was identified along with planned land-use, and the density at which it is planned to be developed was associated with the parcel. Finally, the development density in dwelling units per acre (DU/AC) was calculated by multiplying the development density by the area of the parcel. These calculations of the number of potential dwelling units per parcel were then summed across the Las Vegas Valley. (See Appendix 2 for a detailed description of the analysis.)

According to the build-out model with currently identified zoning classifications, the area within the disposal boundary could accommodate an additional 367,000 to 509,000 people, based on the range of attainable development densities. The upper end of this range is approximately a half-million people. Combined with the current population of approximately 2 million, this would yield a total of 2.5 million residents.

Figures 1 and 2 provide a comparison of current residential housing densities in the Valley to those that would exist under the build-out scenario. Accommodating such extensive additional urbanization will require significant new resources. If quality of life is to be maintained and improved in the Valley, planning for this growth is of critical importance.

WATER DEMAND IMPLICATIONS

Long-term demand projections used by the Southern Nevada Water Authority (SNWA) for water resource planning assume system-wide per capita water demand will decline to 199 gallons per day by 2035 (Southern Nevada Water Authority, 2009). Using this figure and multiplying by 500,000 new residents yields an additional daily demand estimate of 99.5 million gallons. On an annual basis, this is approximately 111,000 acre-feet of water, or nearly one-fifth of the water consumed in the Las Vegas Valley in calendar year 2007 (Coache, 2008).

ELECTRICITY DEMAND IMPLICATIONS

Current annual residential electricity consumption in Nevada is approximately 13,284 kilowatt-hours (kWh) per household (Southwest Energy Efficiency Project, 2009). Most of these households reside in the Las Vegas Valley. Using the estimated Las Vegas household size of 2.66 persons from the U.S. Census Bureau, per-capita residential electricity consumption can be estimated at 4,994 kWh annually. This implies that, at current consumption rates, the residential electricity demands alone of 500,000 new residents will be about 2.5 million megawatt hours (MWh) per year. Add to this the associated commercial and industrial electricity to serve and employ these residents, and the estimated amount of electricity required grows to 7 MWh more per year. This is an increase of almost 30 percent from today's electricity consumption levels in the Valley.

Water and electrical power are only two of a host of critical issues that must be considered in light of the build-out scenario discussed above and the evolving situation in the Las Vegas Valley.

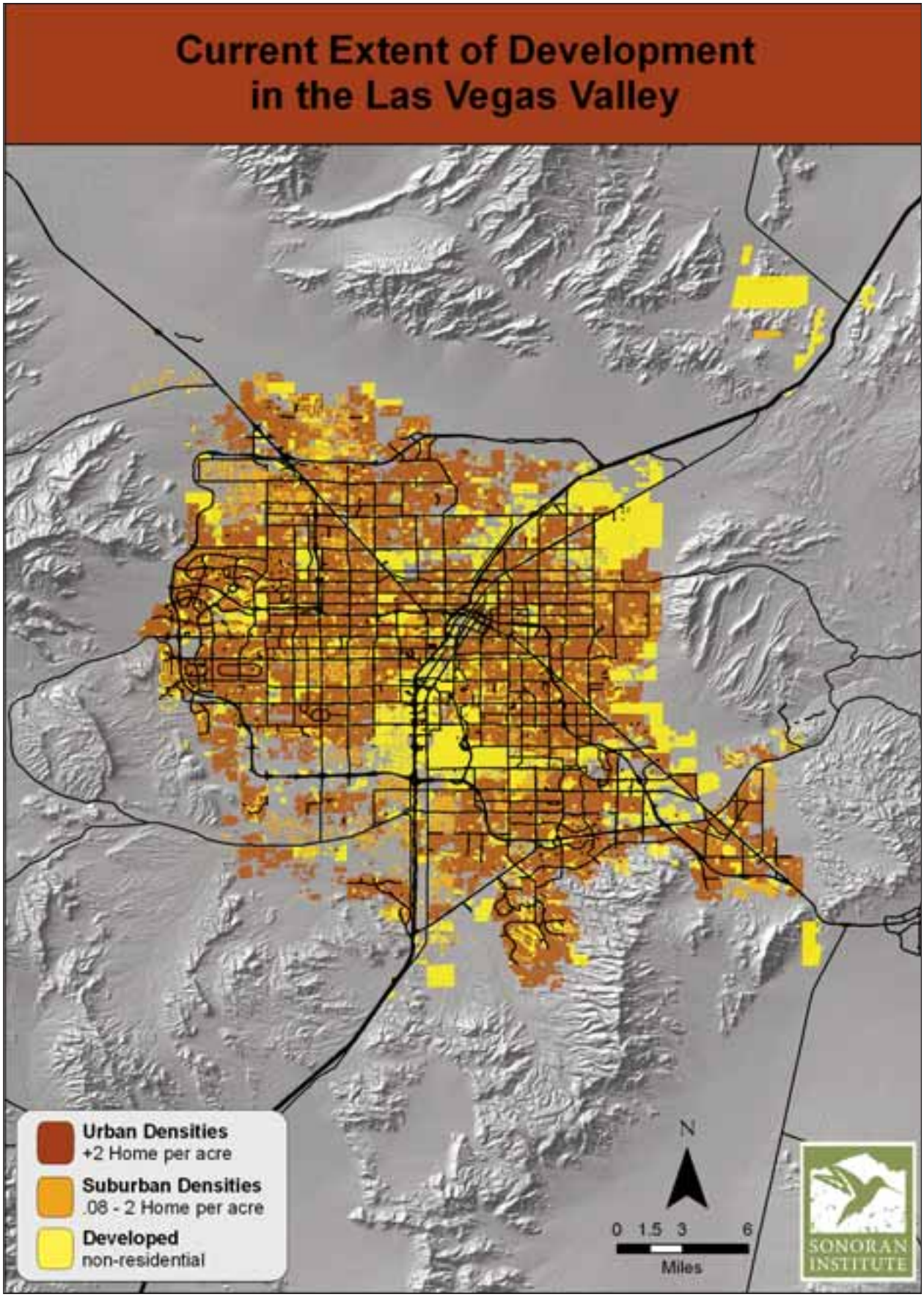

Figure 1 Source: Sonoran Institute

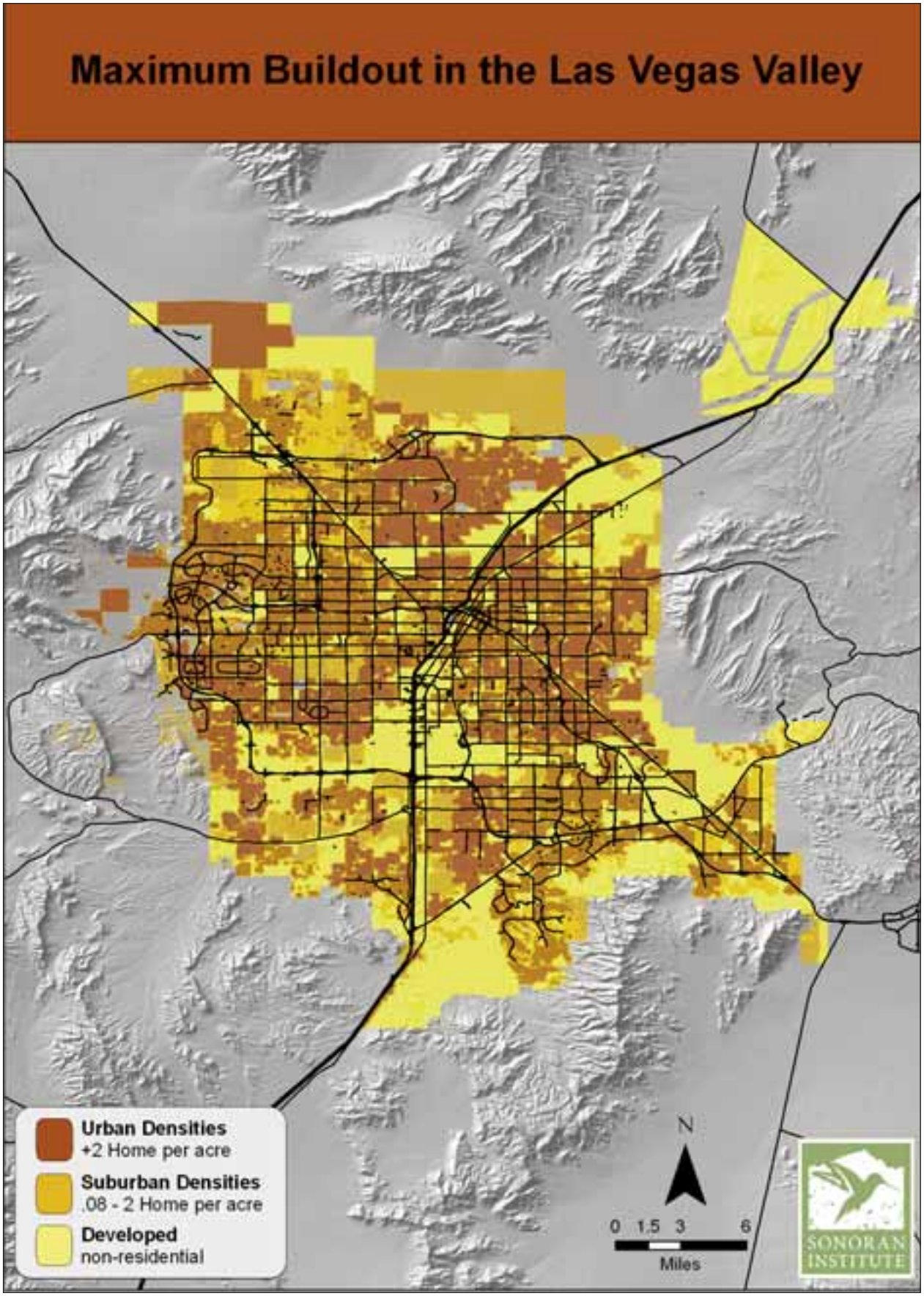

Figure 2 Source: Sonoran Institute 1

WELCOME
TO Fabulous
LAS VEGAS
NEVADA

THE MAKING OF THE LAS VEGAS VALLEY

Rapid growth characterizes the West's history, and the Las Vegas Valley is no exception. Migration to the Valley began in 1905, with the establishment of a railroad stop. People soon came looking for new opportunities in the emerging desert community, where water would, from the beginning, be integral to successful development. Immigrants, migrants and railroad workers made the Valley their home, relying on artesian wells, which were thought to be a more than adequate supply at the time. In 1922, water from the Colorado River was apportioned to the river's upper and lower basins, with Nevada receiving 300,000 acre-feet per year.

During the Depression of the 1930s, southern Nevada flourished while the rest of the nation was in economic and social turmoil. Construction on the Hoover Dam began in 1931, drawing thousands of people in need of jobs and economic stability. Boulder City was soon established as construction workers took residence near the project. The dam eventually created the Lake Mead reservoir, which became the source of most of Las Vegas' water allocation. Gambling was legalized in 1931, marking the beginning of the tourism and entertainment industry for which the city is famous.

The region continued to grow as World War II generated the need for services and products to assist with the nation's war efforts. The Las Vegas Aerial Gunnery School (which later became Nellis Air Force Base) was formed, and Basic Management Inc. was created for construction of specialized materials. Additionally, the area's first modern resort opened, increasing tourism interest in the booming valley. With the advent of these industries and resources, the population—and the strain on the region's water supplies—continued growing.

Rapid growth characterizes the West's history, and the Las Vegas Valley is no exception.

In the 1940s and '50s the tourism and hospitality industries were in full swing (in part due to organized crime), contributing to Las Vegas' economic success and earning it the nickname "Sin City." Relying heavily on tourism, hospitality and construction industries, the city saw the need to draw in consumers during months typically slow for tourism. In the late 1950s the city built the Las Vegas Convention Center, which was later demolished and rebuilt in 1990. The new Las Vegas, the "Entertainment Capital of the World," was taking shape. The Mirage hotel and casino, built in 1989, initiated the megaresort era.

As society has become increasingly aware of the fragility of our environment, sustainable development is becoming the new trend in urbanized areas, including Las Vegas. Green building, smart-growth principles, LEED certification status, and alternative transportation options will likely shape the future of the Las Vegas Valley.

FORCES SHAPING THE LAS VEGAS VALLEY

A NEW FOCUS ON SUSTAINABILITY

In the last few years, citizens, businesses, academia and government jurisdictions in the Las Vegas Valley have begun to focus on the concept of sustainability—meeting the needs of current generations without compromising the ability of future generations to meet their needs. Achieving sustainability requires achieving balance among the spheres of environment, economy and society.

As part of its Community Growth Initiative, Clark County in 2004 established a Community Growth Task Force that examined growth impacts within a sustainability framework. This task force produced a comprehensive report in April 2005, which focused on the areas of urban design, natural resources, facility adequacy, and coordination and partnerships (Goodall, Allen et al., 2005).

Likewise, the city of Las Vegas instituted a sustainability initiative in 2007, focusing on land development, city operations and community outreach. In recognition of its sustainability efforts, the city received an award from International Council for Local Environmental Initiatives-Local Governments for Sustainability in May 2008. (City of Las Vegas, 2008).

In October 2007, the University of Nevada at Las Vegas (UNLV) announced its Urban Sustainability Initiative, with the goal of having the university "play a major role in achieving a sustainable Las Vegas community"(University of Nevada Las Vegas, 2008). As part of the initiative, the university has established and awarded graduate assistantships for students pursuing a program of study associated with any facet of sustainability, including environmental, economic and social/cultural issues.

POPULATION GROWTH

Clark County's population has grown phenomenally, doubling since about 1995 to about 2 million people. From 2000 through 2007 the county population grew by an average of approximately 4,500 people per month. This extremely rapid growth has led to a host of impacts, both positive and negative. It has fueled a housing boom, led to severe traffic congestion, and increased the burden on social services and natural resources.

Indications are that the rate of population growth has flattened out over the last year or so. The Clark County Department of Comprehensive Planning estimated the July 2008 population of Clark County at 1,986,146, a decline of about 10,000. New estimates from the U.S. Census Bureau will provide more definitive information about these population growth changes.

DEMOGRAPHIC CHANGES

Two recent and ongoing changes in the demographics of the Las Vegas Valley—the increase in the proportion of Latino residents and the aging of the area's population—have important implications for the future.

In 2007, an estimated 28 percent of Clark County residents were Hispanic or Latino, up from 22 percent in 2000. This trend has significant implications for the area's education system, workforce and consumption patterns.

The age distribution of the Las Vegas Valley is changing, as the aging of the Baby Boom generation combines with increased immigration of Latinos and other populations having high birth rates. The number of workers is not growing as quickly as the number of older retired people and youth. As this trend continues, there will be changing needs for health care and other social services, along with issues about paying for these services.

WATER ISSUES

Issues surrounding water supply and demand are some of the most important forces affecting the Las Vegas Valley. Approximately 90 percent of the water used in the Valley is from the Colorado River, with the remainder coming primarily from groundwater resources in the Valley. Colorado River water availability is greatly influenced by drought conditions in the river basin and will likely be affected in the future by climate change. On the demand side, water conservation efforts have reduced per capita water consumption from about 350 gallons per day in 1990 to about 252 gallons per day currently (Southern Nevada Water Authority, 2009). However, gains from water conservation have been overwhelmed by the rapid population growth in the same period. To achieve sustainability in the Las Vegas Valley, its water issues must be resolved.

LAND USE AND DEVELOPMENT PATTERNS

The Las Vegas Valley is entirely surrounded by public lands. Pressure to privatize these lands for development led to the Southern Nevada Public Land Management Act (SNPLMA). Enacted in 1998, this legislation created a disposal boundary limiting the amount of land available for development, and set up a process for privatizing the land inside the disposal boundary. Speculation about the supply of developable land and expected future demand caused a rapid increase in the price paid for land released from the public estate, creating concerns about housing affordability. In addition, the tendency of developers to purchase large blocks of land, often at considerable distances from existing infrastructure and development, have raised issues of sprawl and its attendant negative impacts.

ORGANIZED LABOR

One key force shaping the Las Vegas Valley is the presence of organized labor. With a membership of approximately 60,000 in Nevada, the Culinary Workers Union Local 226 is the state's largest union. Most of its members are employed in Las Vegas in the leisure and hospitality industry. Many other unions are represented in Las Vegas; the area's total estimated union membership in 2007 was 135,760, or approximately 16 percent of local wage and salaried workers (Hirsch and Macpherson, 2008).

The presence of organized labor and a relatively low cost of living in Las Vegas have combined to allow unskilled and semi-skilled workers to receive relatively high wages and to enjoy a middle-class lifestyle. Union wages have played a large part in enabling home ownership for these workers and in creating a stable middle class in Las Vegas (Rothman, 2002).

Nevada had the highest state foreclosure rate in the U.S., and over 80 percent of the state's properties in foreclosure were located in Clark County.

A STRUGGLING LOCAL ECONOMY

As of mid-2009, Las Vegas is continuing to experience a significant economic downturn as measured by a range of indicators. Activity in the most important sector of the local economy, leisure and hospitality, has retracted significantly. Year-over-year gaming revenues have declined for many consecutive months. In addition, airline passenger traffic, total visitor volume, convention attendance and hotel occupancy all have continued to decline as well.

Construction, the area's second most important economic sector, is also on the decline. Numbers of residential building permits (both single- and multi-family) and commercial building permits issued have both dropped precipitously from the previous year's figures. Housing price declines and mortgage foreclosures have hit Las Vegas especially hard. Existing home median prices have declined nearly 40 percent from the same time last year.

Due to the decline in economic activity, unemployment in the area has risen dramatically. The construction industry has shed over 38,000 jobs since its height in June 2006, losing more than 21,000 jobs in the last year alone. Area unemployment as of July 2009 was estimated to be 13.1 percent. As of August 2009, Nevada had the highest state foreclosure rate in the U.S., and over 80 percent of the state's properties in foreclosure were located in Clark County.

These factors will likely have significant and potentially long-term economic and social impacts in the area.

TRANSPORTATION NEEDS

Transportation needs in the Las Vegas Valley have been strongly affected by rapid population growth, demographic change and development patterns. Traffic congestion is increasing, and the associated travel delays create environmental and economic costs for individuals and communities. Addressing changing transportation needs and problems resulting from traffic congestion will require a long-term commitment to comprehensive transportation system improvements.

THE MEGAPOLITAN WEST

To varying degrees, the issues now facing Las Vegas are the same ones affecting the metropolitan areas throughout the region. Expansive growth in the Intermountain West is not a new concept. Since exploration in the early 1800s, people have been moving west in search of success and prosperity in a place with room to grow. However, current realities are changing the shape of the region, which is becoming heavily reliant on urban commerce centers and less so on rural agricultural developments.

Such trends prompted the Metropolitan Institute at Virginia Tech to develop a theory based on the emergence of a "Megapolitan Nation." The researchers concluded that over the next few decades a large portion of growth would take place in 20 megapolitan areas, which would combine to form 10 megaregions. These megaregions will eventually constitute nearly 10 percent of the nation's area and more than 60 percent of the population (Lang and Dhavale, 2005).

The western United States is expected to absorb much of this population growth. The Megapolitan West is shaped by fairly new, rapidly growing urban centers that dictate much of the economics, environmental policies and social development of the region as a whole. As stated in the Brookings Institution's 2008 "Mountain Megas" publication, "The region is neither the Old West, nor the New West. It is the New New West, continuously unfolding."

The Megapolitan West consists of the fast-growing urban areas of Arizona, Colorado, Nevada, New Mexico and Utah. These states are each home to a megaregion with two or more urban centers that are combined as a single economic social and urban system. According to the Brookings Institution, these areas are:

- **Sun Corridor**: metropolitan Phoenix, Tucson and Prescott, plus smaller urban areas in Cochise and Santa Cruz counties
- **Front Range**: Colorado's I-25 corridor linking up metropolitan Boulder, Colorado Springs, Denver, Fort Collins and Greeley
- **Wasatch Front**: Utah's I-15 corridor linking up metropolitan Logan, Ogden, Provo and Salt Lake City, plus smaller urban areas in Box Elder and Wasatch counties
- **Greater Las Vegas**: metropolitan Las Vegas plus smaller and increasingly connected urban areas in Nye County, Nevada, and Mohave County, Arizona
- **Northern New Mexico**: metropolitan Albuquerque and Santa Fe plus smaller connected urban areas in Los Alamos and Rio Arriba counties

Virginia Tech's research indicated that by 2040, each megapolitan area in the Intermountain West is expected to reach a population of at least 5 million people. Each will be defined as a U.S. Census Bureau "combined statistical area" (CSA), which requires economic interdependence among two or more metropolitan areas and can be measured by the employment interchange measurement. In this environment, most issues surrounding growth and development will cross governmental boundaries, so local municipalities will have to function cooperatively, joining efforts to facilitate policies and change.

In this environment, most issues surrounding growth and development will cross governmental boundaries, so local municipalities will have to function cooperatively, joining efforts to facilitate policies and change.

POPULATION GROWTH

The Megapolitan West is expected to face its share of growth challenges, with the region projected to gain nearly 12.7 million residents by 2040 (The Brookings Institution, 2008). This change in demographics will have implications on the entire Intermountain West, as a large portion of economic and job-related activities are concentrated in these urbanized regions.

URBAN FORM

As population growth in the Intermountain West continues to soar, leaders and policymakers have become more aware of the benefits of increased density—helping preserve and protect open space and natural amenities. Development patterns are moving toward smart-growth principles, leading to a more compact urban form with less automobile dependence.

CHANGING ECONOMY

As the Megapolitan West grows, job opportunities and industries will follow the population. Megapolitans are where the nation's productivity and wealth are concentrated, accounting for nearly 70 percent of the U.S. gross domestic product (Grady Gammage, Hall et al., 2008). These areas are key in how the nation fits into the global economy.

WATER

As an arid region, the Intermountain West has always faced issues relating to water supply. Growth and development of agriculture, western megapolitans, and smaller cities in the face of limited water have greatly exacerbated water issues. All five Intermountain West megapolitans plus Los Angeles receive portions of their water supply from the Colorado River system. Of these, Las Vegas is the most dependent on river water. Rapid and continuing population growth in these cities is increasing pressure on the Colorado River system's water resources.

WORKING COLLABORATIVELY TO SOLVE PROBLEMS

Las Vegas is connected by the shared resource of the Colorado River and a common set of challenges to other communities, both local and regional. In order to effectively deal with these challenges, Las Vegas will have to work collaboratively at numerous scales, including across local jurisdictions, Colorado River basin-wide, and at the federal level.

The following sections examine six issues facing Las Vegas that need to be addressed if the area is to be sustainable and continue to prosper, provide opportunities for its residents and maintain quality of life. Las Vegas Valley residents and decision makers are well aware of these issues. A range of efforts to study these issues has generated plenty of recommendations for solutions. It does not appear to be a lack of ideas that is delaying action; what is lacking is a collaborative approach at various scales to implement proposed solutions. The solutions will require local action, regional action, Colorado River basin-wide action, and federal action. The collaborative scale necessary will depend on aspects of the specific issues.

In recognition of the need for collaborative solutions, specific recommendations for action regarding the six critical issues addressed in the following section will be organized according to the scale at which they need to be addressed.

6 Critical Issues:

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

Bureau of Land Management

SIX CRITICAL ISSUES

1

WATER

Water is one of the most critical sustainability issues for the Las Vegas Valley. An expanding urban area in a desert environment receiving an average of less than 5 inches of rainfall a year and having limited groundwater resources, the Valley is faced with difficult choices when it comes to this vital resource.

The good news

Fortunately for the Las Vegas Valley, a regional water authority exists to facilitate making the difficult choices. In this respect, the Valley is better positioned for dealing with water issues from a governance perspective than, for example, Arizona's Sun Corridor, where regional water decisions are made more difficult by a large number of water providers operating independently with no real regional framework.

Most of the water used in the Las Vegas Valley is provided by the member agencies of the Southern Nevada Water Authority (SNWA), which was formed in 1991. This regional water agency manages water resources, allocates water to its member agencies, conducts long-term water planning, and negotiates regional water policy. SNWA also constructs and operates the system that delivers water to the member agencies, providing water and wastewater services within their respective operating districts.

The presence of SNWA has promoted a regional perspective on water, facilitated by data gathering and information generation at the regional scale. Because of this, southern Nevada's water supply and demand situation is well understood. Drought and conservation plans have been developed that integrate all of SNWA's member agencies. As the Las Vegas Valley continues to deal with its water issues, the existence of SNWA will likely greatly facilitate the process.

The bad news

The supply of water to the Las Vegas Valley is meeting present needs, but continued population growth threatens to overwhelm existing resources. In addition, the ongoing drought—along with the threat of decreased precipitation in the Colorado River basin due to climate change—exacerbates the risk of a serious water shortage in the area.

Colorado River Water

Water for the Las Vegas Valley is supplied by the Colorado River (diverted from Lake Mead), local groundwater resources and reclaimed effluent. Except for a very small proportion from private wells, water used in the Las Vegas Valley is provided by SNWA's member agencies.

According to the "Law of the River," Nevada's share of Colorado River water is 300,000 acre-feet per year. This is based on consumptive use, which is calculated as diversions from the river minus any "return flows"—treated wastewater that is returned to the water supply. Calculating consumptive use in this way allows the diversion of amounts greater

than the state allocation, as long as the difference between the amounts diverted and returned doesn't exceed 300,000 acre-feet.

Because treated wastewater is returned to Lake Mead, where it mixes with the other water in the lake, a significant proportion of the water supplied to the Las Vegas Valley is actually reused water. In 2007 approximately 211,000 acre-feet of treated wastewater was returned to Lake Mead via Las Vegas Wash (Matuska, 2007). Return-flow credits and re-use of effluent allow SNWA to extend its Colorado River consumptive-use allocation by approximately 70 percent (Southern Nevada Water Authority, 2009).

Groundwater

Permitted groundwater rights in the Las Vegas Valley basin total approximately 86,800 acre-feet. Of this, about 46,000 acre-feet are owned by SNWA member agencies, with the remainder being primarily private wells. Groundwater pumping by SNWA members occurs primarily in the summer months as a supplement to assist in meeting peak water demands (Coache, 2008; Southern Nevada Water Authority, 2009).

Groundwater is present in the Las Vegas Valley in two zones, one shallow and one deep. The shallow, near-surface water reservoir present in the southeastern quadrant of the Las Vegas Valley is saline and is the result of secondary recharge primarily from landscape irrigation and other urban runoff. This near-surface reservoir water is of poor quality and is not suitable for potable usage without treatment. The deeper (300 to 2000 feet), freshwater aquifers are the sources tapped by wells for the groundwater portion of the area's municipal, domestic, and commercial water supply. The near-surface reservoir and deep aquifers are separated by layers of fine-grained sediment and clay which act as a confining layer for the deep aquifer system. Some recharge of the deep aquifer system by the shallow water reservoir occurs through leakage (Pavelko, Wood et al., 1999).

Estimates of natural, average annual recharge of the Las Vegas Valley's deep aquifer system range from 25,000 to 57,000 acre-feet per year (Pavelko, Wood et al., 1999; Donovan and Katzer, 2000). The perennial yield of the aquifer, as established by the State Engineer, is 25,000 acre-feet per year (Nevada Division of Water Resources, 2009). This amount has been exceeded every year since 1945, with a peak withdrawal of over 87,000 acre-feet in 1968 (Pavelko, Wood et al., 1999). In 2008, total net groundwater withdrawal from the basin was 66,299 acre-feet per year (Coache, 2009). Due to groundwater withdrawals which occurred primarily before Colorado River infrastructure was developed, water levels have declined by over 300 feet in some areas. Reduced water levels have led to extensive areas of aquifer compaction and land surface subsidence (the collapse of the aquifer structure and subsequent lowering of the land surface) in the Las Vegas Valley. Reduced water storage capacity due to this aquifer system damage has been estimated conservatively at 187,000 acre-feet (Pavelko, Wood et al., 1999).

SNWA member agencies began artificial recharge operations in 1987. Since then, approximately 350,000 acre-feet have been recharged. As a result, water levels have risen in some central areas of the Valley, while continuing to decline around the edges of the urban area where many domestic and community wells are located (Pavelko, Wood et al., 1999; Southern Nevada Water Authority, 2009). Total annual water recharge in the overall basin, calculated as natural and artificial recharge of the deep aquifer system plus secondary recharge of the near-surface reservoir, is greater than the total annual amount of groundwater withdrawal (Southern Nevada Water Authority, 2009). However, the deep, potable, freshwater aquifer system has declined in some areas, while the shallow, poor-

quality saline reservoir has increased in volume and extent (Pavelko, Wood et al., 1999; Levich, Linden et al., 2000).

Future Needs

According to figures tabulated by the Nevada Division of Water Resources (NDWR) for calendar year 2008, water consumption in the Las Vegas Valley was 539,204 acre-feet (Coache, 2009).

Table 1: Water Sources and Consumption in the Las Vegas Valley *Source: NDWR, 2008*

Category	Acre-feet	% of net
Total net groundwater pumped (net of recharged water)	66,299	12.3%
Colorado River	451,825	83.8%
Effluent re-use	21,080	3.9%
Consumption	539,204	

As can be seen in Table 1, most of the water is obtained from the Colorado River. About 95 percent of all water consumed is provided by water purveyors that are members of the Southern Nevada Water Authority. The remainder derives from private groundwater wells.

SNWA has projected annual water demand through the year 2035, as shown in Table 2 (Southern Nevada Water Authority, 2009). This projection is based on a Clark County population forecast made in June 2008 by the University of Las Vegas Center for Business and Economic Research and incorporates current water conservation goals.

Table 2: Projected Annual Water Demand in Las Vegas *Source: SNWA Water Resource Plan, 2009*

Year	2010	2015	2020	2025	2030	2035
Demand (acre-feet)	553,000	631,000	684,000	717,000	732,000	739,000

Figure 3, taken from the 2009 SNWA Water Resource Plan, shows current water resources compared to the projected demands (red line). This diagram clearly illustrates the water supply challenge facing the area: current water resources just meet the current demand, and further increases in demand will require additional water resources.

In addition to these considerations, there are likely to be far-reaching impacts on water resources in the Southwest and the Great Basin as a result of climate change and drought. While there is significant uncertainty associated with climate models, most point to a trend of warmer and drier climate in the Colorado Plateau and Great Basin over the next century, with an increased probability for drought (Belnap, 2007) .

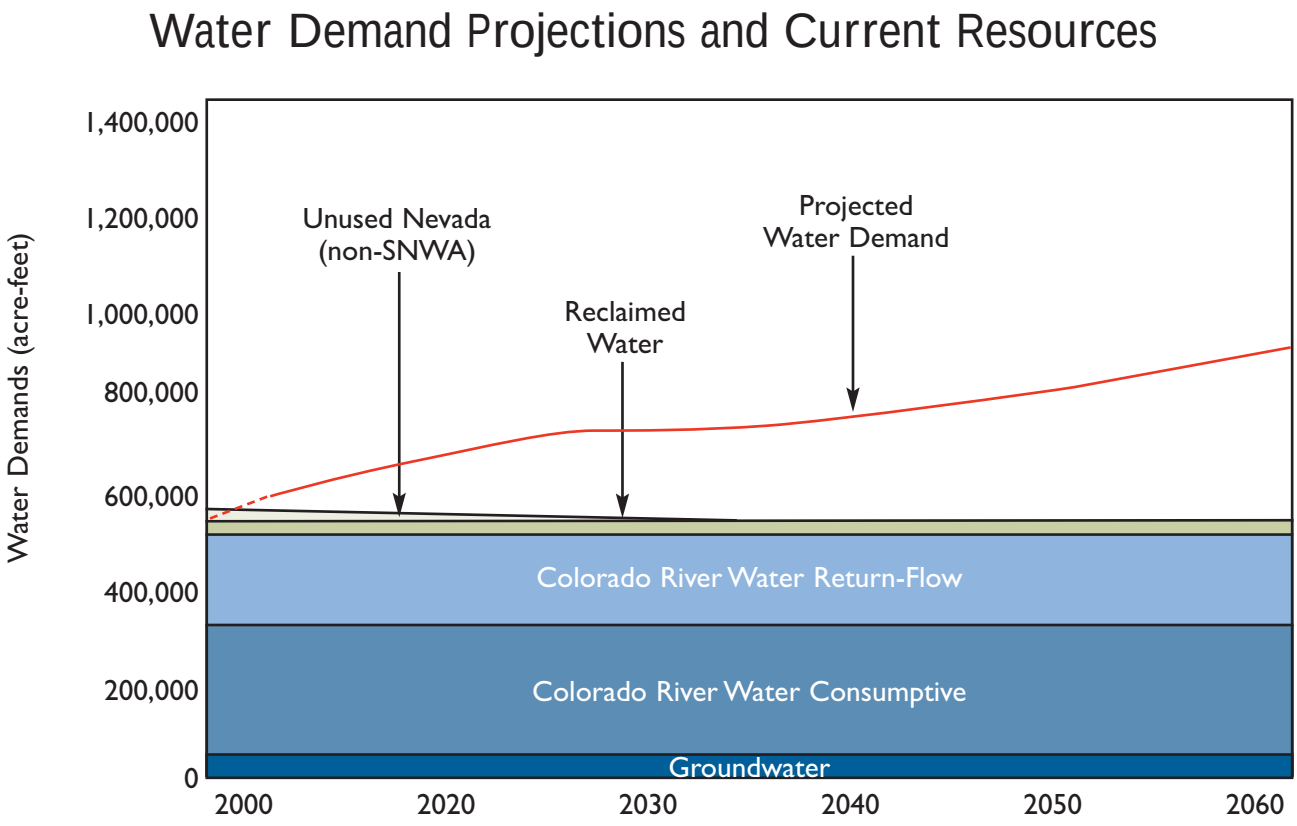

Figure 3 Source: SNWA, 2009

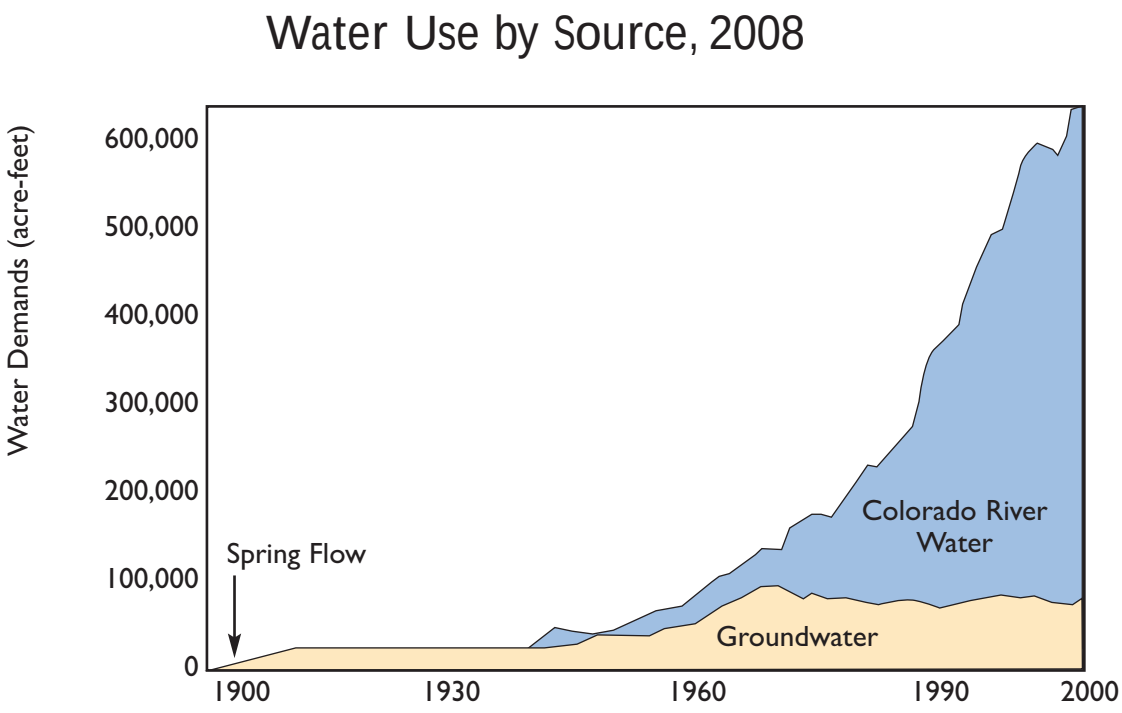

Figure 4 Source: SNWA, 2009

These predictions have at least three important implications for water resource planning:

- Higher temperatures generally increase the demand for water by humans and other species. So, there is likely to be increased per-capita demand in the Las Vegas Valley as the climate warms up.
- Drought means lower flows in the Colorado River and lower reservoir levels, as has been the case for seven of the last eight years starting in 2000 (Bureau of Reclamation U.S. Department of the Interior, 2009). The two existing SNWA drinking water intakes in Lake Mead are threatened by declining water levels, and SNWA has initiated construction of a third intake. If the current drought continues or if the climate becomes significantly drier, the Colorado River may at some point be unable to sustain SNWA's current level of water withdrawal.
- Lower overall precipitation amounts and higher temperatures in the Great Basin will likely impact groundwater levels and surface water flows throughout the area. It is unknown whether climate change will result in an increase, decrease or no change in groundwater recharge in the Great Basin (Dettinger and Earman, 2007). This imparts considerable uncertainty to predictions of long-term groundwater levels and calculations of sustainable yield of groundwater basins.

The options

Short of immediately stopping population growth in the Las Vegas Valley, achieving a water balance in the future will require either decreasing per capita demand, increasing overall supply, or a combination of the two.

Conservation

Water conservation efforts in the Las Vegas Valley have increased dramatically, and there is significant potential to achieve further savings, according to a comprehensive review of water conservation and efficiency that the Pacific Institute and Western Resource Advocates recently conducted (Cooley, Hutchins-Cabibi et al., 2007).

Water agencies in the Las Vegas Valley have made great strides in water conservation and efficiency since the mid-1990s. Significant additional potential water savings remain, both in outdoor water conservation and indoor efficiency. These potential savings are not fully factored into the long-term demand projections for the area. Long-term demand projections by SNWA assume system-wide per capita demand will decline to 199 gallons per day by 2035, a decrease of approximately 20 percent from the current rate of 252 gallons per capita per day (gpcd).

Outdoor water demand in the Las Vegas Valley is much higher than in other cities in the arid Southwest, such as Tucson and Albuquerque, due primarily to landscape irrigation. Las Vegas is significantly drier and hotter than Tucson and Albuquerque. According to the Pacific Institute and Western Resource Advocates analysis, by eliminating all residential turf in the Las Vegas Valley, outdoor water demand for single family residences could be decreased by an additional 40 percent.

The same analysis suggests indoor demand from single-family residences could be decreased by 40 percent, and a 29 percent demand decrease could be realized from hotels.

Total projected savings from outdoor and indoor conservation and efficiency improvements were estimated to be approximately 86,000 acre-feet per year.

Pricing and rate structures, while substantially improved in recent years, still do not effectively promote conservation. Combining incentive programs with an aggressively increasing block-rate price structure, such as employed in Tucson (where the price for water increases with usage) would likely yield significant additional conservation gains.

Increase supply

In addition to conservation, SNWA anticipates employing several other sources to meet future water demand, including:

- Water banked in Arizona, California and Nevada
- Various types of Colorado River surplus water
- In-state groundwater resources and its reuse
- Resources from augmentation of Colorado River water
- Transfers and exchanges

Of these, current planning scenarios rely most heavily on in-state groundwater resources. The scenario presented in the SNWA 2009 Water Resource Plan reflects the development of 134,000 acre-feet per year of in-state groundwater resources to meet expected future demand (Southern Nevada Water Authority, 2009). SNWA is actively pursuing the acquisition of unallocated water in groundwater basins in Clark, Lincoln and White Pine counties. The intent is to ultimately develop up to 170,000 acre-feet of groundwater resources and deliver up to 134,000 acre-feet to the Las Vegas Valley, with the remainder being delivered to Lincoln County (Southern Nevada Water Authority, 2008).

The conceptual plan entails extracting groundwater from five hydrographic basins, as shown in Figure 5.

SNWA estimates that 110 to 130 wells would ultimately be required to obtain the amount of groundwater targeted. The water would be conveyed through approximately 306 miles of lateral and main pipelines with diameters varying between 16 and 84 inches. The system would require several holding tanks along the pipeline network and a 40-million-gallon storage reservoir with a 150-million-gallon-per-day water treatment facility near the town of Apex in northern Clark County. Approximately 323 miles of electric power lines and substations would be required to deliver the approximately 74 megawatts of power needed for water pumping and treatment (Southern Nevada Water Authority, 2008).

Potential benefits from the proposed groundwater development project include:

- Acquisition of additional groundwater to meet increased demand in the Las Vegas Valley;
- Diversification of water supplies;
- Increased reliability of the Las Vegas Valley water system.

Proposed Groundwater Extraction Sites

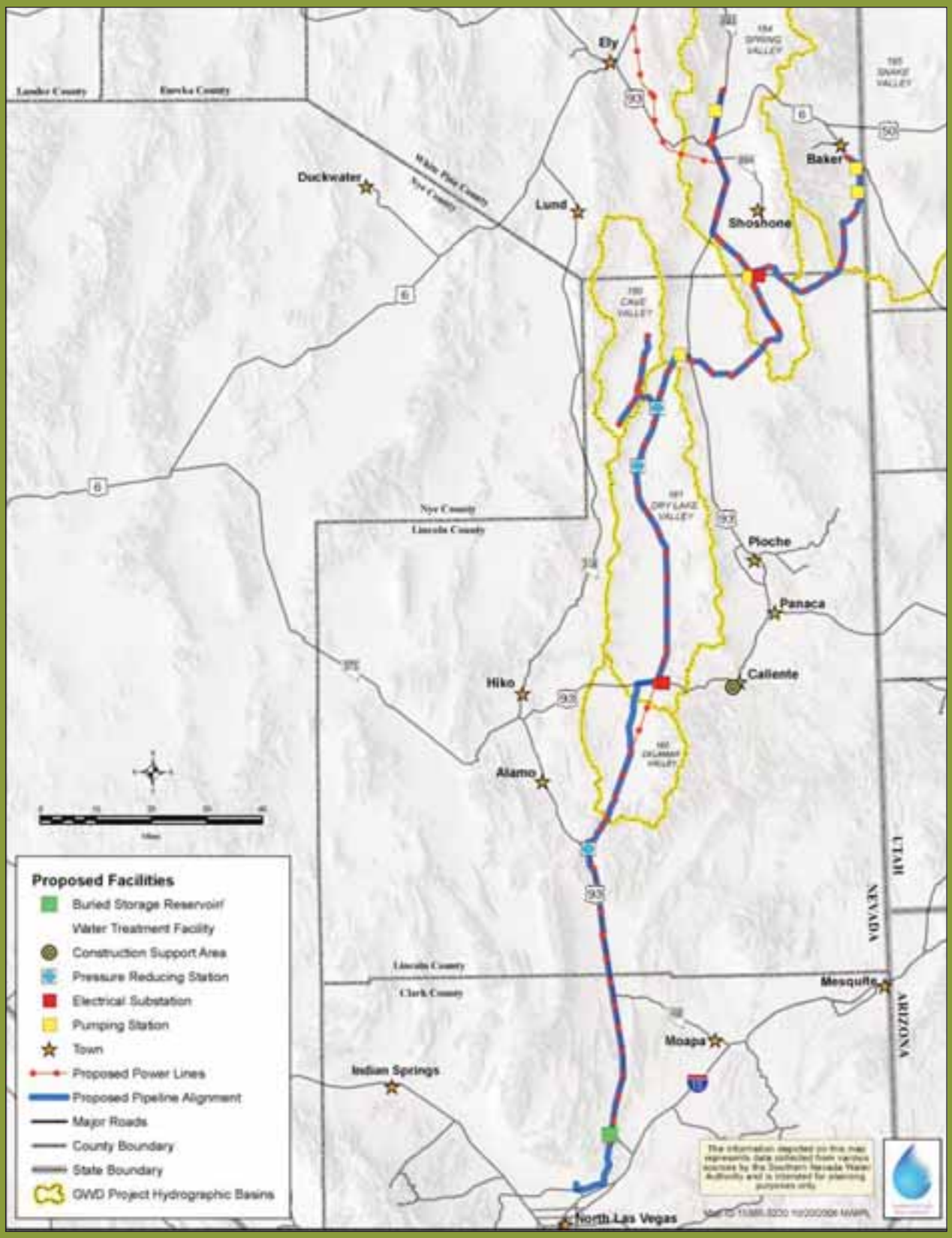

Figure 5. Proposed Groundwater Extraction Sites

At the projected system-wide consumption rate of 199 gpcd, an additional 134,000 acre-feet of water per year, extended by 70 percent through return flow credits and reuse, would serve approximately 1 million additional Las Vegas Valley residents.

The project would diversify the supply portfolio of SNWA, significantly decreasing reliance on Colorado River water. This would in turn decrease exposure of the SNWA system to drought impacts in the Colorado River basin.

Potential costs associated with the proposed groundwater development project include:

- Financial costs of planning, construction and operation of the system;
- Environmental costs resulting from impacts of the system construction and groundwater pumping;
- Social costs deriving from impacts on rural economies and lifestyles.

Perhaps the most controversial aspect of the proposed project is the potential environmental costs of groundwater pumping.

Financial Costs

SNWA has estimated costs for project construction at between $2 billion and $3.5 billion. Actual total project costs are highly uncertain due to potential changes in the final project design, future materials costs and financing charges. Estimated operating costs for the system are unknown at this time.

Environmental Costs

Potential environmental costs of the project derive from two main sources: construction of system infrastructure, and impacts from groundwater pumping.

Although environmental protection measures called for in the project conceptual plan will mitigate negative impacts, clearing the path of the pipeline and locating power line supports and ancillary facilities will require removal of wildlife and result in extensive habitat disturbance.

Perhaps the most controversial aspect of the proposed project is the potential environmental costs of groundwater pumping. Potential environmental impacts associated with decreased groundwater levels include degraded or destroyed wildlife habitat, threats to endangered species, loss of vegetation, and decreased air quality (Deacon, Williams et al., 2007).

Considerable uncertainty exists regarding the effects of groundwater pumping, due primarily to the geological and hydrological complexity of the Great Basin aquifer system and to the consequent difficulty of modeling its behavior in the absence of dynamic data.

A 2007 review of several groundwater models constructed to predict possible effects from the proposed SNWA groundwater pumping found that all of the models, except the one SNWA built, have predictions consistent with a conceptual model of the regional groundwater table constructed in 1995 by Schaefer and Harrill (Schaefer and Harrill, 1995). This model predicts regional groundwater level declines with a steady-state reached in 100-200 years, with groundwater levels 15 to 152 meters (about 50 to 500 feet) below current levels. Surface spring flow would also decline significantly. Differences between the SNWA model and the others are “due largely to the fact that SNWA modelers tended to estimate higher levels of precipitation-induced recharge and evapotranspiration-induced discharge than other modelers” (Deacon, Williams et al., 2007).

Areas where the groundwater levels could be lowered by groundwater pumping provide

critical habitat for many endangered and threatened species, including birds, fish and plants. Many of these are dependent on springs, seeps and other wetlands that could dry up due to groundwater pumping (Deacon, Williams et al., 2007).

Phreatophytes, long-rooted desert plants that depend on groundwater, are an important form of vegetation in the Great Basin. Creosote bush, sagebrush and rabbitbrush, common phreatophytes in the groundwater project area, are an essential component of wildlife habitat and also anchor desert soils, preventing erosion by water and wind (Schlyer, 2007). The groundwater model of Schaefer and Harrill estimates that up to 60 percent of phreatophytes could be lost in some areas due to groundwater level decreases resulting from the project (Schaefer and Harrill, 1995). Loss of phreatophytes would decrease air quality through increased wind erosion, causing higher levels of suspended dust.

Protected public lands potentially impacted by the proposed groundwater project include the Desert National Wildlife Refuge, Pahranagat National Wildlife Refuge, Moapa Valley National Wildlife Refuge, Fish Springs National Wildlife Refuge and Great Basin National Park. These areas provide critical protected habitat for many species, including several that are endangered and threatened. Potential impacts of the groundwater project could cause environmental degradation in these protected lands (Schlyer, 2007).

Social Costs

Social costs from potential groundwater project impacts include effects on local economies and lifestyles. During the construction phase of the proposed groundwater project, it is likely that local economies would realize significant temporary economic benefits, primarily from employment of local residents, purchases made in the area by project employees and contractors, and resulting sales tax revenues. These construction benefits would cease once the project construction was complete. Some local employment likely would exist to support system operations, although no estimates are available as to the number of potential jobs.

A small, but important and growing, tourism and outdoor recreation economy exists in the valleys where groundwater withdrawal is proposed. Increasingly, visitors are drawn to the area by its extensive environmental amenities, such as clean air, scenic vistas, wilderness, unique wildlife and plants, as well as solitude. As such, the environmental amenities are significant assets for local and regional economic development.

The groundwater development project could threaten the sustainability of this important component of the local and regional economy by decreasing revenues from outdoor recreation and tourism through habitat destruction, surface and groundwater impacts, and permanent environmental degradation.

Agriculture, primarily in the forms of cattle ranching and alfalfa production, is a significant part of rural life in the groundwater project area. Surface and groundwater are essential to the existence of these livelihoods and lifestyles. Groundwater level declines and surface water depletion potentially resulting from the groundwater withdrawal would threaten this important component of the local and regional social fabric.

The majority of the benefits of the groundwater development project would accrue to the residents and businesses of the Las Vegas Valley. Few benefits would likely flow to local businesses and residents in the areas of groundwater withdrawals; however, most of the environmental and social costs, along with significant economic costs, would potentially impact these areas.

What next ?

In making the decision regarding whether to go forward with the proposed groundwater project, three critical questions should be considered:

1) What is the overall balance between its benefits and costs ?

2) What are the financial costs of the project versus those of other new sources of water?

3) What is the likelihood that the groundwater basins proposed to be tapped will be able to supply the expected amounts of water?

Comprehensively answering these questions is beyond the scope of the current study, although preceding sections have highlighted some of the pertinent concerns and presented some of the uncertainties and potential risks associated with the proposed project.

Connections between Water and Energy

Water and energy are intimately connected. Pumping and treating water requires a great deal of energy. In turn, generating electrical energy uses large amounts of water. Increasing shortages of both of these resources will necessitate an integrated solution. This is especially the case in the Las Vegas Valley.

A significant proportion of the electrical energy consumed in the Las Vegas Valley is used for water distribution and treatment. In the fiscal year ending June 30, 2007, total energy consumption by SNWA was 909,000 MWh (SNWA reviewer, 2009). For purposes of comparison, this amount is equivalent to the annual electricity consumption of nearly 81,000 households, based on 2006 average household electricity usage in Nevada (Southwest Energy Efficiency Project, 2009).

Electric energy generation consumes water in different ways, depending on the manner of generation. With hydroelectric power plants, which use water pressure to spin turbines to generate electricity, water is lost through evaporation off the reservoirs behind the hydroelectric dams. Thermoelectric generation using coal, oil, or natural gas uses water for cooling. The absorption of heat in the cooling process causes some of the water to evaporate.

An analysis by the U.S. Department of Energy estimates that 7.25 gallons of water are used to generate each kWh of electric energy consumed in Nevada (Torcellini, Long et al., 2003). Multiplying this figure by the estimated 22.11 million MWh of electricity consumed in southern Nevada in FY2007 yields an estimated 492,000 acre-feet of water consumed in order to generate electrical power for the Las Vegas Valley (Sierra Pacific Resources, 2007). In comparison, the total amount of water delivered by SNWA in the year ending June 30, 2008 was 463,300 acre-feet. In other words, power generation for the Las Vegas Valley used more water than all of the houses, lawns, swimming pools, businesses, factories, casinos, hotels, fountains, and golf courses combined.

The direct connections between water consumption and energy generation call for integrated conservation policies. Energy can be conserved by decreasing water consumption through efficiency and conservation measures. At the same time, energy conservation and the use of renewable energy generated by solar and wind facilities have the potential to greatly reduce water consumption.

RECOMMENDATIONS

Local scale

- In light of uncertainties and potential risks associated with the proposed groundwater development project, a prudent approach would be to first pursue other less costly, risky and uncertain sources of water. One alternative approach would be to first implement more stringent conservation and efficiency measures. Current system-wide demand in the Las Vegas Valley is approximately 256 gpcd. If SNWA system-wide demand decreased to levels of other urban areas in the Southwest (such as Albuquerque at 173 gpcd or Tucson at 156 gpcd), significantly more water would be available.

A comprehensive conservation and efficiency program would include:

- Improving outdoor water conservation through measures such as continuation of the turf removal program, creating incentives to implement improved irrigation technology, and strict enforcement of outdoor water restrictions;
- Increasing indoor water-use efficiency in single-family residences, hotels and other commercial buildings by offering incentives for replacing appliances, shower heads, toilets and other fixtures;
- Ensuring that all new residential, commercial and industrial development is extremely water efficient;
- Implementing water pricing that more effectively encourages conservation and efficiency by using a more aggressive block rate structure.
- Information comparing returns from investment in water conservation and efficiency versus new infrastructure development is needed to inform decision making. While not within the scope of this study, a comprehensive examination of this issue should be conducted.

Regional scale

- Beyond improved water conservation and efficiency, the sustainability of Las Vegas Valley development should be advanced by more explicitly linking land use and growth management policies to water policies. Regional planning should involve the county and various municipalities collaborating to create and implement policies which integrate land use and water supply.
- Conservation efforts and policy development regarding water and energy should be addressed in an integrated manner.

Colorado River basin-wide scale

- Nevada, along with the other six Colorado River basin states must work to coordinate the water budgeting process within an integrated framework that considers the entire basin as a whole.

6 Critical Issues:

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

2 ECONOMIC DIVERSIFICATION

Economic diversification is a key factor for a resilient local economy, since diversified local economies are less volatile in the event that a primary industry contracts or shuts down.

The economy in the Las Vegas Valley, while robust until the recent national downturn, is highly concentrated in two industries. This can be seen by examining location quotients for local industries.

Figure 6 shows location quotients calculated using 2007 employment figures from the Las Vegas-Paradise MSA. Two industries—leisure/hospitality and construction—have a location quotient greater than 1.0.

The degree of local concentration in the leisure and hospitality sector is no surprise, as gaming, conventions and trade shows, and entertainment are the backbone of the Las Vegas economy. This sector directly accounts for one-third of all employment in the metropolitan area and is the area's most important export-oriented industry.

Construction is the other sector having a strong concentration in Las Vegas, responsible for about 12 percent of local employment in 2007. A significant portion of these jobs are linked to the leisure and hospitality sector due to hotel and casino construction projects.

At the other end of the spectrum are information, educational and health-care services, manufacturing, and mining and natural resources. These low-LQ industries are much less concentrated in Las Vegas than in the U.S. as a whole.

Figure 7 shows total employment and average annual wages in private firms for 2007. The industry with the highest numbers of employees—leisure and hospitality—is also the industry with one of the lowest average annual wages. With relatively small numbers of employees, the information, educational and health-care services, and manufacturing industries have some of the highest average annual wages.

If Las Vegas diversified its economy into these industries, not only would the local economy be less susceptible to contractions in leisure, hospitality and construction, but local personal incomes could also significantly improve. With the future demographic age profile of the valley indicating increasing proportions of youth and older retired people, there will be an increasing demand for educational and health-care services, likely driving diversification into these sectors. The local manufacturing sector has grown moderately since 2001, adding more than 250 establishments and nearly 6,000 employees. Attracting additional manufacturing concerns should continue to be an essential component of the area's economic diversification strategy.

LOCATION QUOTIENT

Location quotient (LQ) is a statistic that measures an area's industrial specialization as compared to a larger geographic area, usually the country as a whole. An LQ is computed as the ratio of an industry's share of a regional total for some economic measure (such as earnings, employment or local GDP) to the industry's share of the national total for the same measure. As an example, an LQ of 1.0 in manufacturing means that the region and the nation are equally specialized in manufacturing. An LQ above 1.0 means that the region has a higher concentration of manufacturing than the nation; conversely, an LQ below 1.0 implies a lower concentration.

Location quotient provides different information than job numbers or job growth. Industries having a high LQ are usually (but not always) export-oriented industries. These industries are important because they bring money into the region, rather than simply recirculating money already present in the region (as is the case with most retail stores and restaurants). Industries that have both high LQ and relatively high total job numbers typically form a region's economic base. Industries with a low LQ may not be producing enough goods or services to meet local demand, potentially indicating the need/opportunity for developing local sources.

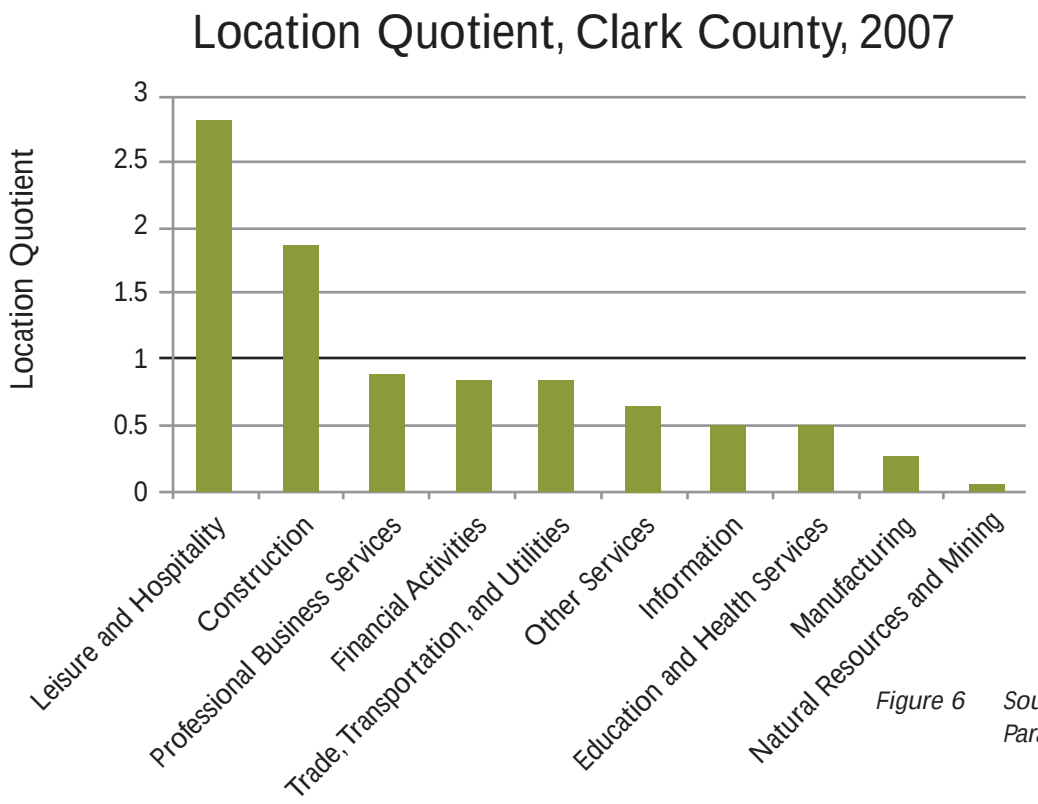

Figure 6 *Source: Las Vegas – Paradise MSA, 2007*

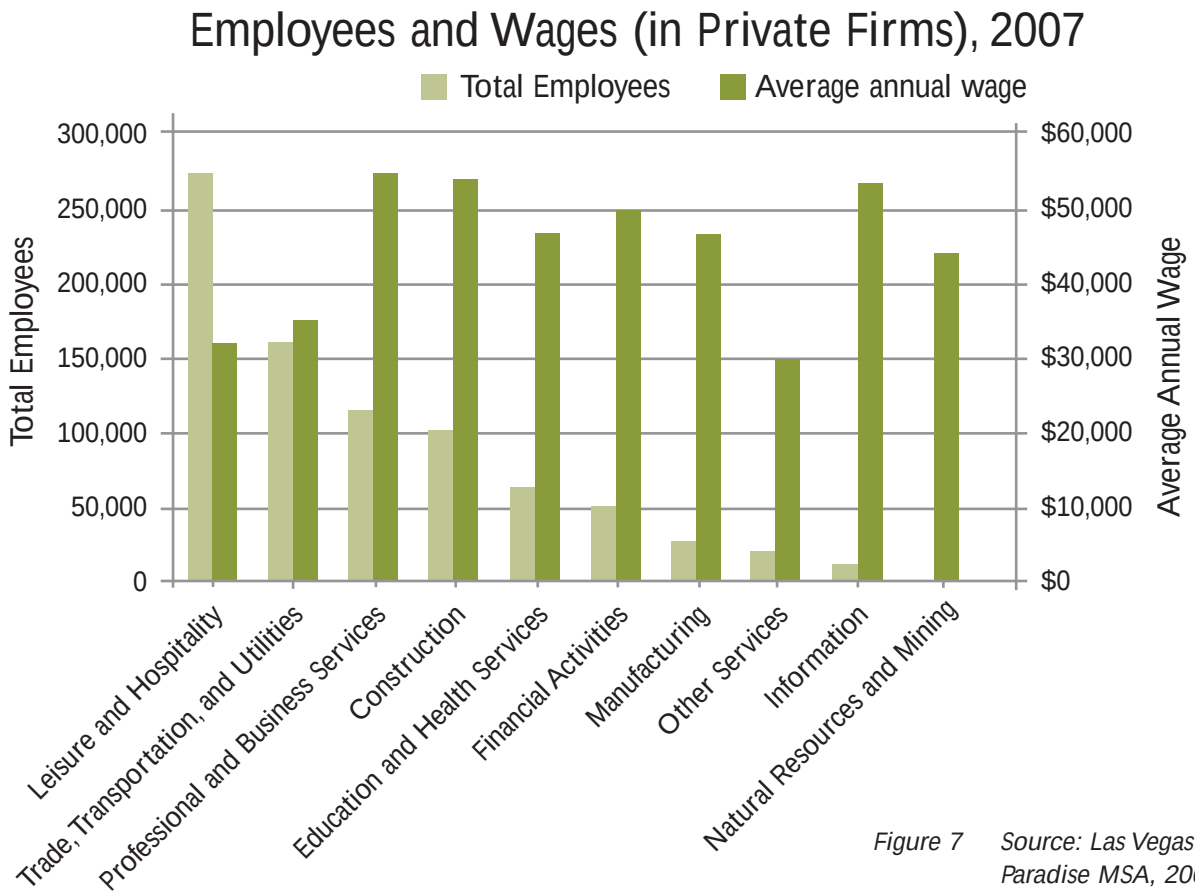

Figure 7 *Source: Las Vegas – Paradise MSA, 2007*

The Southern Nevada Regional Planning Coalition released a regional economic study in 2006, prepared by the Theodore Roosevelt Institute (Schlottmann, Schmidt et al., 2006). This study employed a value-chain cluster methodology to determine an economic diversification and development strategy. The study concluded that southern Nevada provides an attractive business environment for:

- administrative and back-office services;
- distribution centers;
- furniture mart suppliers and related services; and
- public higher education research park expansion.

Based on population and demographic changes forecasts, the analysis also indicated potential for economic diversification into:

- public and private education services;
- hospital and health-related industries;
- research and development; and
- services for senior citizens.

This study also notes the importance of a strong local base of science and technology to achieving and sustaining economic diversity. This fact, along with the critical need for a well-qualified workforce, argues strongly for extensive improvements in the educational infrastructure at all levels in the Las Vegas Valley. Education infrastructure investments would include higher levels of spending on public education, workforce training, access to college education, supporting graduate and professional degree programs, as well as greatly increased spending on university-level research, especially in the sciences and technology. Implementation of these improvements to the local educational system will ensure the human capital necessary for Las Vegas to compete in the national and global economies.

RECOMMENDATIONS

Local scale

- Focus on the linkages between education and economic diversification. Increase levels of spending on K-12 education, improve vocational and workforce training, increase access to secondary education, provide additional support for and development of graduate and professional degree programs, and greatly increase spending on university-level research in the sciences and technology.

Regional scale

- Implement the economic development strategy and recommendations contained in the 2006 Southern Nevada Regional Development Strategy.
- As the Las Vegas economy continues to evolve, conduct additional substantive studies of the area economy in order to determine how to improve the business climate to attract and create a broader diversity of economic activity.

6 Critical Issues:

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

Bureau of Land Management

3 LAND USE

Las Vegas' urban area is surrounded by federal land, primarily administered by the Bureau of Land Management. This unique situation presents opportunities and challenges. The surrounding public lands contribute to the quality of life in the Las Vegas Valley, providing extensive areas for outdoor recreation—hiking, biking, hunting, wildlife watching and camping, among others. These public lands also form a de facto urban growth boundary, constraining development and encouraging densification of the urban area.

Historical mechanisms by which parcels of surrounding federal land were privatized contributed to unplanned development, urban sprawl, and the associated higher costs to local governmental jurisdictions for providing infrastructure and services. Privatization processes have improved greatly in recent decades, but challenges still remain.

Santini-Burton Act

In response to local requests, in 1980 Congress passed the Santini-Burton Act (PL 96-586) to authorize and direct the sale of 7,000 acres of BLM land—with a cap of 700 acres per year—within a specific disposal boundary around Las Vegas (see Figure 8) for the "orderly development of communities" and to finance the purchase of environmentally sensitive land around Lake Tahoe. Lands offered for sale were to be jointly selected with local governments.

The act directed the disbursement of sale proceeds as follows: 85 percent to the U.S. Treasury to be earmarked for Forest Service land purchases and restoration of Lake Tahoe lands; 10 percent to the county or municipalities where the sale occurred for acquisition and development of recreation lands and facilities; and 5 percent to the state of Nevada for education.

Approximately 2,700 acres of land were privatized under this act through 1998. However, land exchanges not governed by the act totaling more than 20,000 acres also occurred, many outside of the disposal boundary. These land transactions continued to exacerbate urban sprawl and frustrate efforts to promote effective land-use planning (Malone, 1997).

Southern Nevada Public Land Management Act

In response to these issues and to Inspector General reports exposing improper practices by the BLM land exchange program—particularly the undervaluation of land—and to continue to make federal land available for development, Congress passed the Southern Nevada Public Land Management Act in 1998 (Weiler, Mouritsen et al., 2007). This legislation built on the Santini-Burton Act's response to the need to acquire public lands to accommodate growth in the area, and authorized the BLM to dispose of 52,000 acres of agency land within a designated disposal boundary (see Figure 8). The lands for disposal are required to be jointly selected with local governments, to be consistent with local zoning and planning, and to be sold through a competitive bidding process. The act also contains a provision to allow for the sale of land below market value to governmental jurisdictions for affordable housing projects.

SNPLMA directed the distribution of sales proceeds as follows: 85 percent to purchase environmentally sensitive lands (with a priority given to Clark County for capital

improvements in federal areas within the county), to create a habitat conservation plan, to develop parks and trails, and to provide for administrative costs associated with land sales and exchanges; 10 percent to the Southern Nevada Water Authority for infrastructure development in Clark County; and 5 percent to the state of Nevada's general education fund.

Subsequent legislation amended SNPLMA to move the disposal boundary and expand the area by 22,000 acres (see Figure 8). This legislation also designated approximately 450,000 acres of wilderness and created the Sloan Canyon National Conservation Area.

As of June 2009, approximately 47,000 acres have been disposed. Nearly 30 percent was auctioned for development, about 30 percent sold through direct sale (primarily federal land surrounded by private land, plus land for affordable housing), approximately 25 percent was reserved for public purposes, 11 percent conveyed through exchanges, and the remainder is land sold in the cooperative management area around McCarran Airport or under provisions of the Recreation and Public Purposes Act (Bureau of Land Management, 2009).

Approximately 27,000 acres of land within the disposal boundary remain to be disposed.

Southern Nevada Regional Planning Coalition

The determination of lands for auction to developers is made through a joint selection process that provides for nomination of parcels by interested parties, review by local government and various affected agencies, selection by local government with public input, and intergovernmental coordination, followed by regional review and recommendation to the BLM.

Approximately 27,000 acres of land within the disposal boundary remain to be disposed.

The Southern Nevada Regional Planning Coalition (SNRPC) facilitates the joint selection process. This organization, composed of representatives from Clark County, the cities of Las Vegas, North Las Vegas, Henderson, and Boulder City, as well as the Clark County School District, created a regional policy plan. The plan includes a land-use component and development standards that promote infill and mixed-use development, and identifies preferred outlying growth areas.

Even though the SNRPC Strategic Growth Plan encouraged effective regional land-use policies and decision-making, there is little evidence that most of the lands selected for auction reflected a comprehensive planning process that targeted areas for growth according to smart-growth principles (e.g., locating development near existing population, infrastructure and transportation corridors). Land developers' desire to have large contiguous parcels of land for master-planned communities appears to have contributed to selection of parcels in open areas near the disposal boundary.

The SNRPC conducted a series of regional growth summits in the spring of 2003, leading to a final report released in March 2004 (Southern Nevada Regional Planning Coalition, 2004). The report recommends discussing the value of developing a coordinated land-use, transportation and air quality plan for the region that could examine future growth scenarios and outline specific steps to implement an adopted plan. A coordinated land-use, transportation and air-quality plan for the region would greatly assist in improving the joint selection process for BLM land disposal.

Build-Out Model

A recurrent theme in the SNRPC regional growth summit discussions was the desire to expand the current BLM disposal boundary. In a map exercise, about 35 percent of new development proposed by participants was outside of the disposal boundary. Given implications of such development for sustainability and fiscal balance, it would be useful to have an estimate of the additional population that could be accommodated by development within the current disposal boundary. To create such an estimate, a build-out model was constructed for the land within the disposal boundary, and three population scenarios were constructed based on low-, medium- and high-density development.

The methods for this analysis were relatively straightforward. Any parcel in private ownership or that could be made available for development via government land sale was isolated. Next, its zoning classification was identified along with planned land use, and the density at which it is planned to be developed was associated with the parcel. Finally, the development density in dwelling units per acre (DU/AC) was calculated by multiplying the development density by the area of the parcel. These calculations of the number of potential dwelling units per parcel were then summed across the Las Vegas Valley. (See Appendix 2 for a detailed description of the analysis.)

According to the build-out model with currently identified zoning classifications, the area within the disposal boundary could accommodate an additional 367,000 to 509,000 people, based on the range of attainable development densities. Population growth in Clark County is currently flat or slightly declining. Should the county resume the rapid annual growth rates which existed in the first half of the current decade (5.5 percent), the land within the disposal boundary could be filled within three to five years. If the growth resumes at a more moderate rate (2 percent), it could take nine to 12 years to exhaust the available land within the disposal boundary.

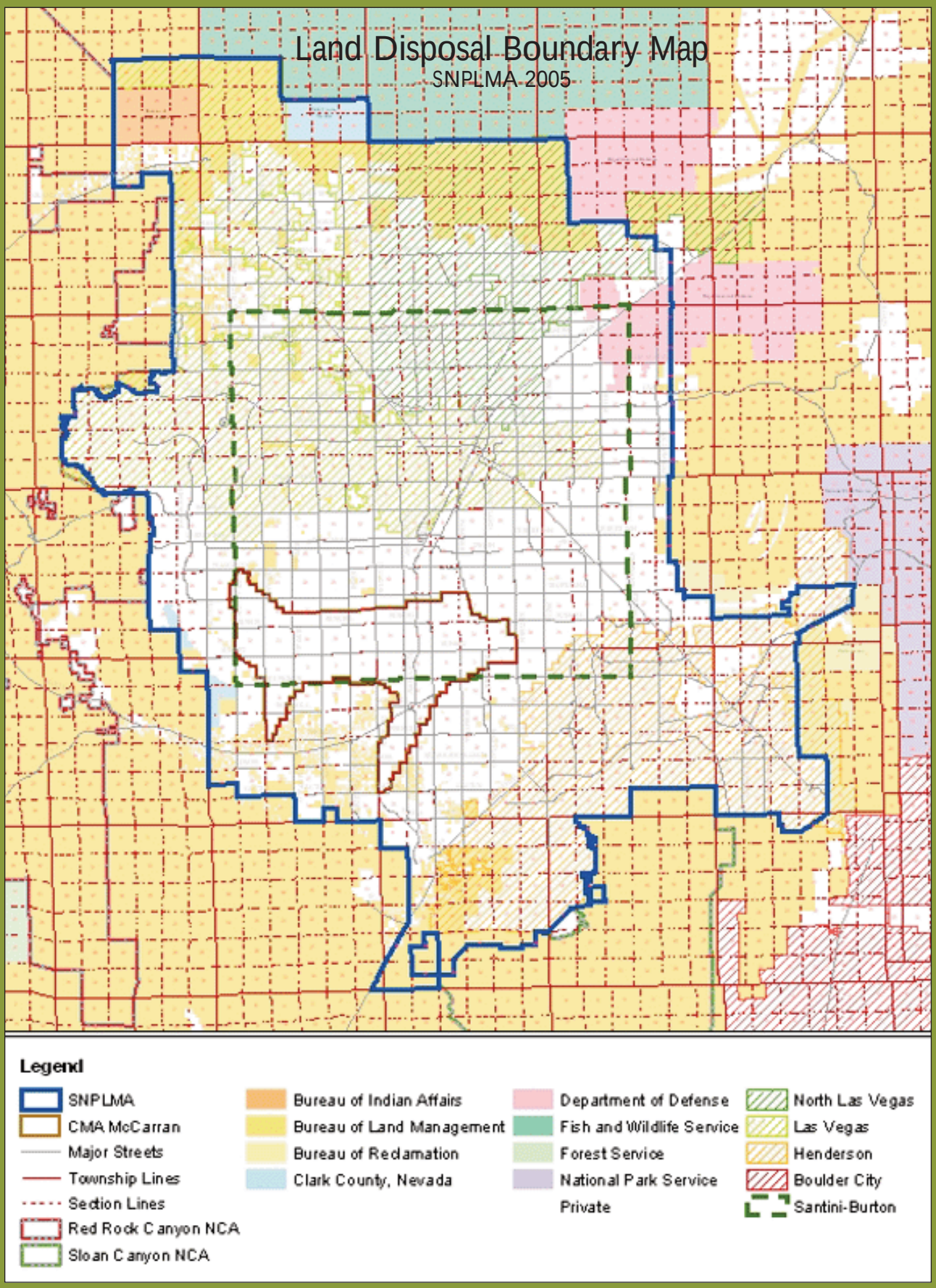
Land Disposal Boundary Map
SNPLMA 2005
Legend
SNPLMA
CMA McCarran
Major Streets
Township Lines
Section Lines
Red Rock Canyon NCA
Sloan Canyon NCA
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
Clark County, Nevada
Department of Defense
Fish and Wildlife Service
Forest Service
National Park Service
Private
North Las Vegas
Las Vegas
Henderson
Boulder City
Santini-Burton

Figure 8

RECOMMENDATIONS

Strategies and recommendations have been proposed by SNRPC and the Growth Task Force, based on broad-based forums. What is mainly needed is implementation of these ideas.

Local scale

- Continue to develop and implement policies that promote infill and mixed-use development.

Regional scale

- Create a comprehensive regional planning authority to integrate and coordinate land-use planning efforts across the Las Vegas Valley.
- Select SNPLMA lands for auction based on a comprehensive regional planning process.
- Develop and implement a coordinated land-use, transportation and air-quality plan for the region.

6 Critical Issues:

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

4 TRANSPORTATION

Rapid population growth and more visitors, along with changes in land use and development in the Las Vegas Valley, have greatly increased traffic, which has outpaced transportation system improvements. Resultant congestion and air quality issues threaten the area's quality of life and impose real costs on local residents.

Figures 9 and 10 show daily total and per capita freeway and arterial miles traveled in the Las Vegas area through 2007 (Schrank and Lomax, 2009; Texas Traffic Institute, 2009). As can be seen, total miles of both freeway and arterial travel increased fairly steadily over the 17-year period. Per capita, freeway miles traveled have risen since 1997, while arterial miles traveled decreased and then increased over the same period, rising consistently during four of the most recent five years of the data. These data also indicate that use of the freeway system has increased slightly more than use of the arterial street system, especially over the most recent five years of the data.

These increases in vehicle travel on the area's streets and highways correspond with significant increases in traffic congestion, as can be seen in the graphs of annual total and per capita congestion delay (Figures 11 and 12).

Traffic congestion creates costs for travelers, as shown in Figure 12. These costs have been rising in the Las Vegas area, with their total estimated at over $700 million in 2007. Costs per traveler at peak traffic times were estimated at more than $900 per year (Texas Traffic Institute, 2009). Additional monetary and environmental costs in the forms of excess motor fuel consumption and decreased air quality also result from the increase in vehicular travel and traffic congestion.

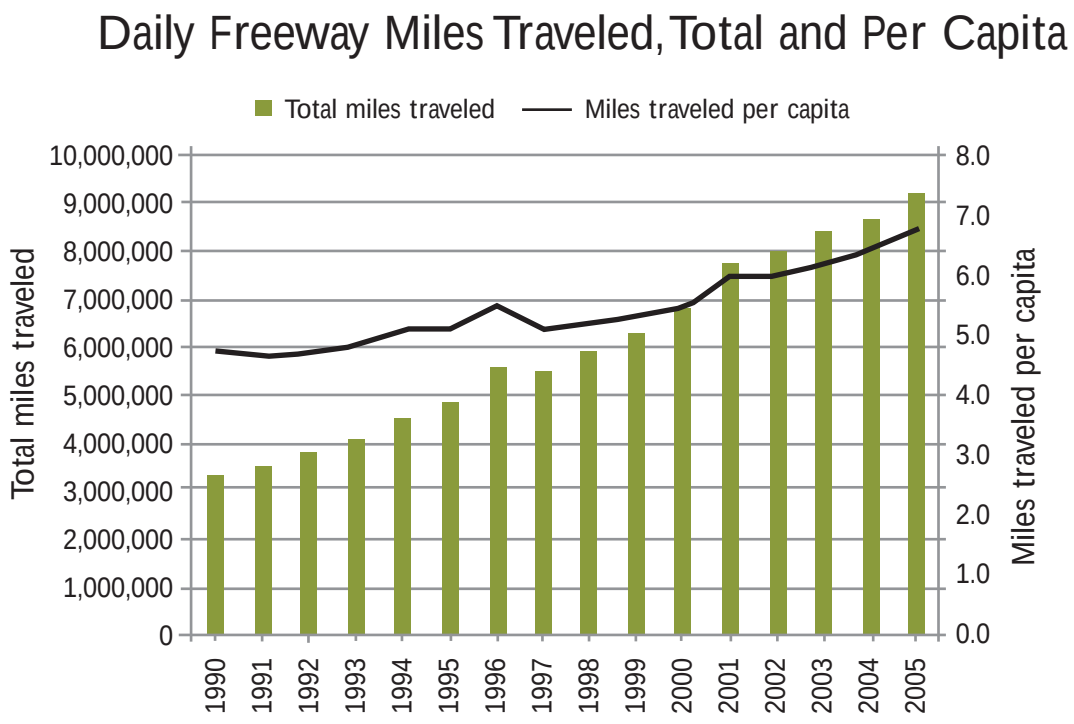

Figure 9 Source: Schrank and Lomax, 2009

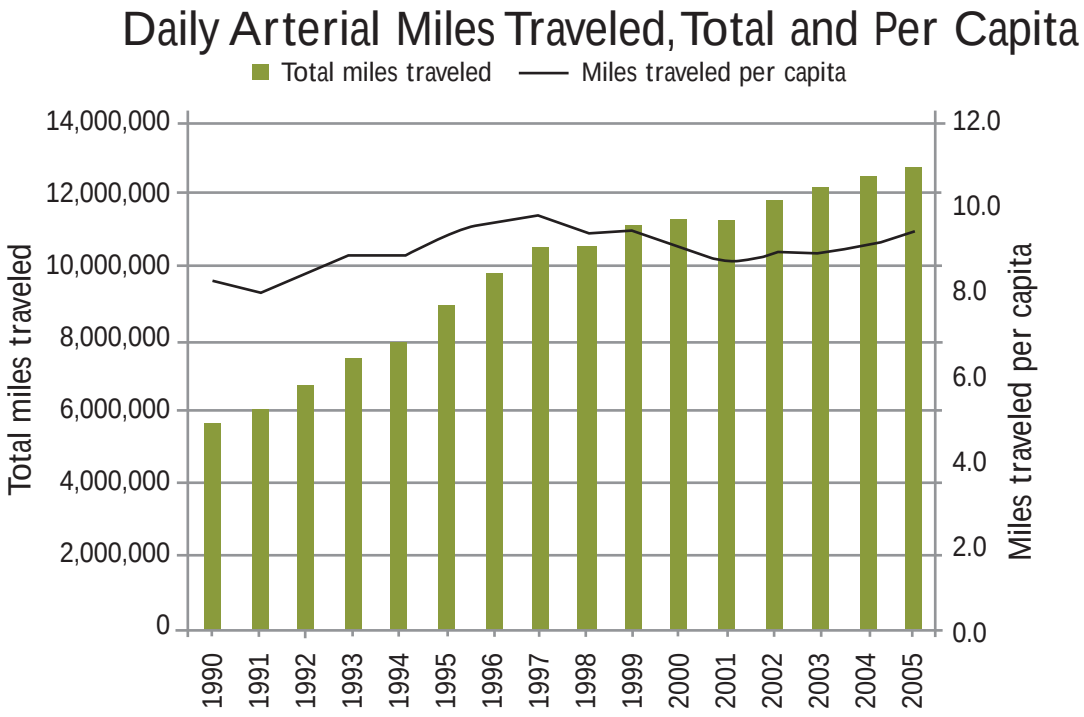

Figure 10 Source: Texas Traffic Institute, 2009

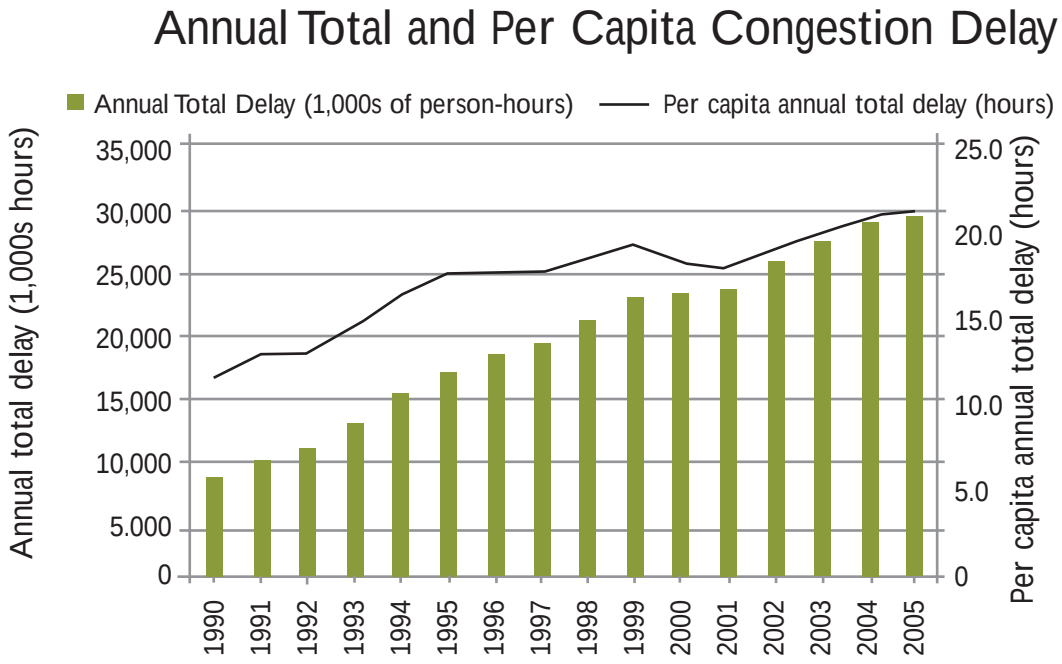

Figure 11 Source: Texas Traffic Institute, 2009

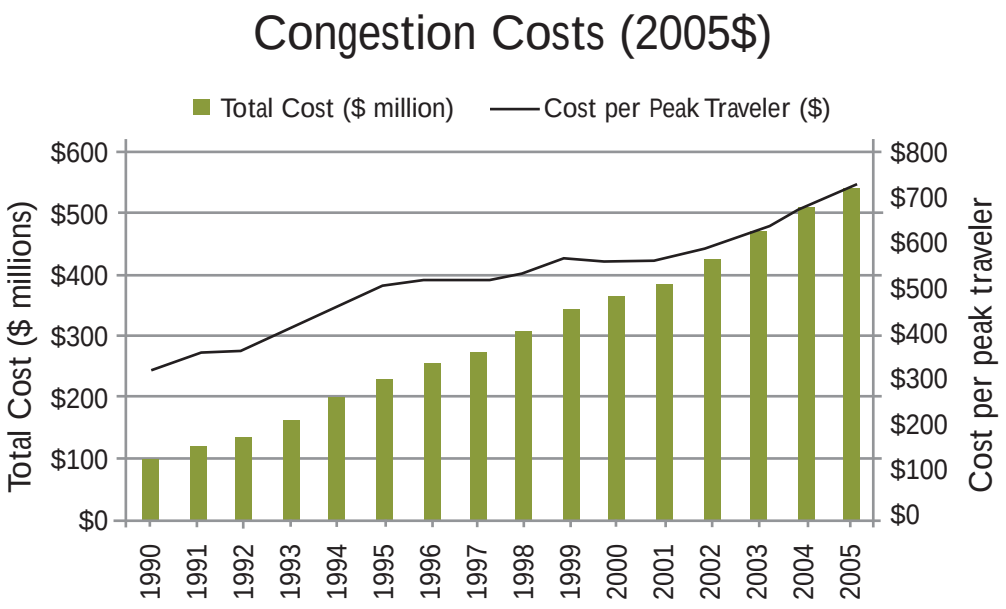

Figure 12 Source: Texas Traffic Institute, 2009

RECOMMENDATIONS

The Clark County Community Growth Task Force recognized the threats to regional sustainability and quality of life posed by traffic congestion and increased vehicular travel and made a series of recommendations in its 2005 report (Goodall, Allen et al., 2005). These recommendations and others noted below should be implemented.

Local scale

- Continue development of bus rapid transit.
- Establish criteria for transit-oriented development.
- Develop transportation corridors to outlying areas where feasible.

Regional scale

- Integrate air-quality, transportation and land-use planning.
- Promote a master planning process that identifies and addresses relationships between land uses and emissions within the plan boundaries.
- Reduce vehicle miles traveled through improved transportation linkages and interconnectivity.

Federal scale

- Establish incentives for the use of alternative fuels and advanced transportation technology.

6 Critical Issues:

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

Bureau of Land Management

Bureau of Land Management

5 RESOURCE CONSERVATION

During the last few decades, the urban footprint of Las Vegas significantly expanded, which greatly reduced open space and shrank wildlife and plant habitat. In seeking sustainability, Las Vegas must work to mitigate these and other impacts and avoid additional environmental degradation.

Animal and Plant Protection

Responding to threats to wildlife habitat and, particularly, the 1989 listing of the desert tortoise as an endangered species, city governments in the Las Vegas Valley along with the Nevada Department of Transportation created the Clark County Multiple Species Habitat Conservation Plan (MSHCP), which was approved by the U.S. Fish and Wildlife Service in 2001. The plan addresses the conservation of 78 species of animals and plants, including the desert tortoise.

Clark County is the administrator of the MHSCP through the county's Desert Conservation Program. The program has several components, including research, monitoring, habitat restoration, installation of tortoise fencing and barriers, protective translocation of tortoises, the use of adaptive management, as well as public education and outreach. The Desert Conservation Program provides an excellent base upon which to build additional local resource conservation efforts.

The MSHCP and the associated Multiple Species Incidental Take Permit identified 145,000 acres of undeveloped land countywide as developable during a 30-year period. As of the most recent accounting, approximately 67,000 acres remains of this developable land in the county (Clark County Desert Conservation Program, 2009).

Available BLM land for disposal in the Las Vegas Valley and elsewhere in the county under the conditions of the SNPLMA is approximately 120,000 acres (Sonoran Institute GIS analysis).

The conjunction of these facts constricts development in the Las Vegas Valley and in Clark County in general. Although viewed negatively by some in the developer community, this situation will help increase the densification of the Las Vegas Valley, leading to more sustainable land-use patterns and urban form.

Renewable Resource Develoment

Southern Nevada is the location of extensive, high-quality solar energy resources. This fact, along with the increasing demand for domestic renewable energy sources and the need to transmit renewably generated electrical energy to urban demand centers, will likely lead to increasing impacts on the Las Vegas Valley resulting from the siting of solar power generation facilities and electrical transmission corridors. While these facilities will encourage economic diversification and bring economic development to the area, it will be important to carefully consider the environmental and economic trade-offs of such development, and to balance short-term losses against long-term gains. To strike this balance, it will be essential to establish and disseminate best management practices and effective mitigation strategies to use in making decisions on this issue. If sited on public lands, facilities should not impinge on conservation values.

Open Space Development

Open space, parks and other areas for recreation have been recurrent topics in regional planning discussions. Research conducted in support of the Southern Nevada Regional Policy Plan indicated that the Las Vegas Valley did not provide enough parks and trails within the urbanized area in comparison to other cities in the West. In the regional growth summits conducted by SNRPC in 2003, the need for more open space, parks, trails and recreation areas in the Valley was a consistently recurring theme. As a result, a regional open space plan was developed and adopted in 2006 (Southern Nevada Regional Planning Coalition, 2006).

The plan recommendations focus on five primary components:

- Preserving the viewscapes and wild lands surrounding the Las Vegas Valley;
- Developing a transitional belt between the urban area and the surrounding lands;
- Preserving and enhancing the desert washes in the Valley;
- Creating a regional trails network that connects to open space corridors within the Valley; and
- Preserving significant scenic, natural and cultural open space areas throughout the Valley.

When implemented, this open space plan will greatly enhance the quality of life for Valley residents and move the area toward environmental sustainability. The current development slowdown and pause in regional population growth provide an excellent opportunity to implement the recommendations in the plan—especially the transitional belt between the urban area and surrounding wild lands, where much development was occurring but has now significantly decreased. Now is the time to ensure that these lands are designated for protection from development.

RECOMMENDATIONS

Regional scale

- Continue implementation of the MSHCP.
- Establish and disseminate information about best management practices and mitigation strategies for siting of renewable energy generation facilities and transmission infrastructure.
- Fully implement the regional open space plan developed by the SNRPC.

6 Critical Issues:

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

6 CHANGING DEMOGRAPHY

The mix of people in Las Vegas is changing. The Valley population is increasingly Hispanic, and there is a growing cohort of older and retired people as well as more school-age children. These changes to the area's social fabric will present both challenges and opportunities.

Latino Las Vegas

As the Valley's population grew over the last 30 years, the proportion of Hispanic residents more than doubled, as can be seen in Figure 13. In absolute terms, the Hispanic population has grown by 209,003 since 2000, an increase of nearly 70 percent (U.S. Census Bureau, 2008).

As can be seen by the age distribution chart in Figure 14, the Hispanic population of the Las Vegas Valley is quite young. The median age of this population segment is 26.8 years, compared to 34.8 for the overall area population. About two-thirds of area Hispanics are less than 35 years of age. Latino students account for approximately 40 percent of the students in the Clark County School District, and are the largest minority group represented in the student population (Przybys, 2008).

Much of its Hispanic population has migrated to Las Vegas; in 2007 about 48 percent of this population was foreign born, mostly in Mexico. Of those born outside of the U.S., only about 25 percent were naturalized citizens in 2007 (U.S. Census Bureau, 2008). A recent nationwide study estimated that 30 percent of the nation's foreign-born population is undocumented immigrants (Passel and Cohn, 2008). If this figure holds for the Las Vegas area, there are a little more than 73,000 undocumented local Hispanic residents.

Employment opportunities attract Latin American migrants to the area. Large numbers of jobs are available in the hospitality/leisure, services, and construction sectors. Figure 15 shows the distribution of occupations in which the Hispanic population of the area is employed. Service (mostly food preparation/serving, and building and grounds cleaning/maintenance) and construction occupations are the two largest sectors. Hispanics also make up large proportions of total employment in these two sectors. Data for 2007 indicate that Latinos held 45 percent of all construction industry jobs and 35 percent of all service employment in the Las Vegas area (U.S. Census Bureau, 2008).

Estimates for 2007 indicate that annual median income among Hispanic households was $46,124. This was significantly higher than the 2007 national median income in Hispanic households ($40,766). However, it is nearly 18 percent lower than the overall median household income in the Las Vegas area ($55,996) (U.S. Census Bureau, 2008).

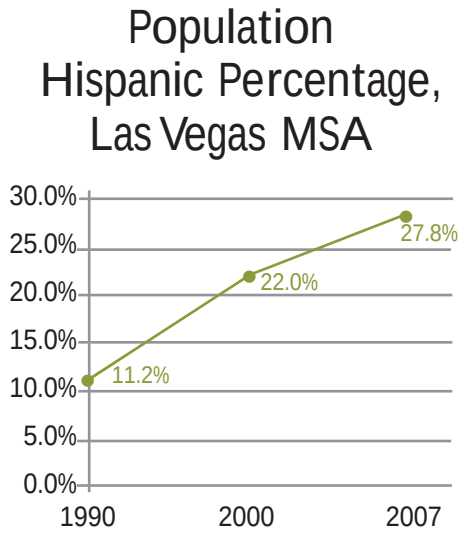

Figure 13 Source: U.S. Census Bureau, 2008

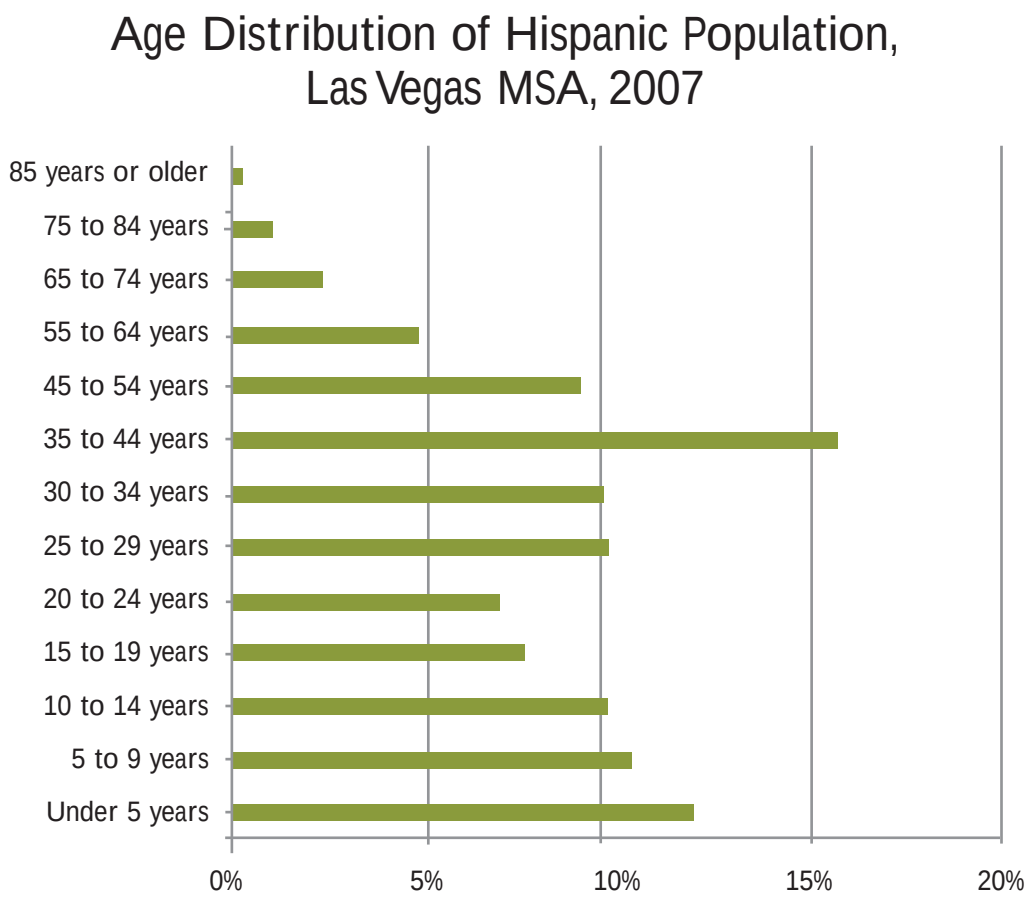

Figure 14 Source: U.S. Census Bureau, 2008

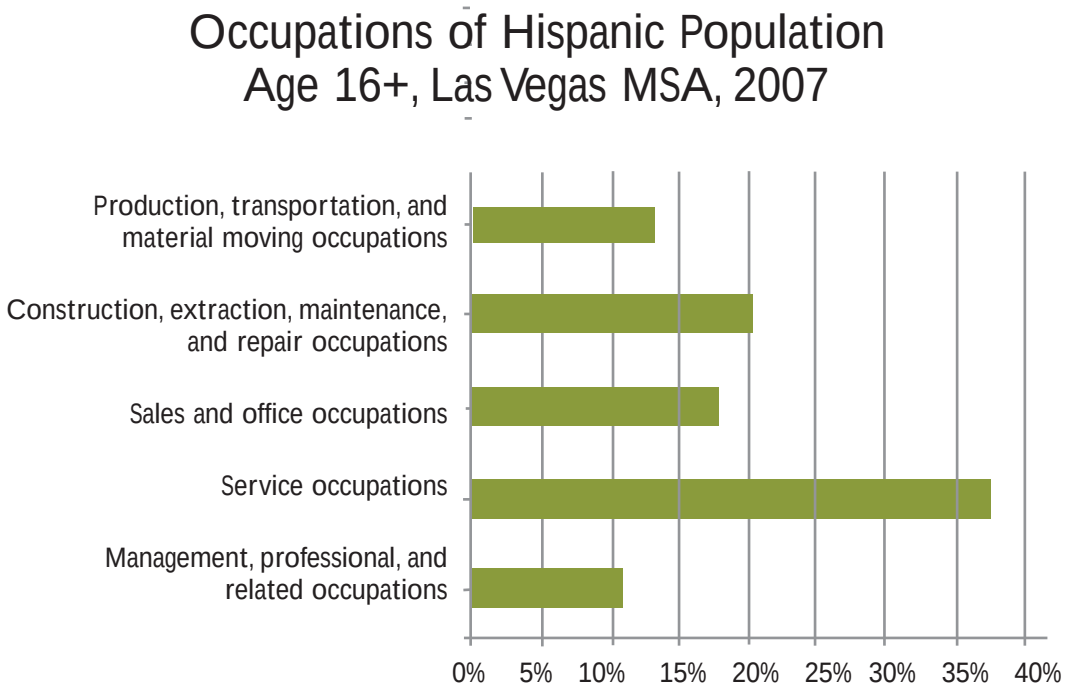

Figure 15 Source: U.S. Census Bureau, 2008

The economic impact of Hispanics on the Las Vegas Valley economy is large. Although no specific data are available for the Las Vegas area, a 2004 study estimated that the combined direct and indirect impact of non-native Hispanic immigrants on the Nevada state economy was $20 billion annually, and this segment of the Latino community is only a portion of the total Latino population (Ginsburg, 2007).

To promote opportunity and economic equity for its Hispanic population, it is essential that Las Vegas increase investment in its public education system and improve access for Hispanics to post-secondary educational opportunities.

To ensure the social and economic integration of the Hispanic immigrant population (and indeed the overall immigrant population), comprehensive immigration reform is needed. The responsibility for this reform falls primarily on the federal government, since it has the authority for national immigration and border policy. Improved immigration policies should, at the least, include:

- more ways to enter the country legally;
- opportunities for obtaining temporary legal status;
- clear mechanisms for achieving permanent legal status; and
- compensation to local and state government jurisdictions for costs incurred in providing public services to immigrants.

Older and Younger Las Vegas

Although the population of the Las Vegas Valley is relatively young, with an estimated median age of 34.8 years old in 2007 (see Figure 16) (U.S. Census Bureau, 2008), it is a population with increasing proportions of retirement-age and school-age people.

Figure 17 shows changes in the age distribution of Clark County between 1990 and 2007. The proportion of young people between birth and 19 years of age increased approximately 1.4 percent, or more than 320,000. Perhaps the most noticeable trend is the strong decrease in the proportion of 20 to 34 year olds from 1990-2000, even though in 2007 this group represented the highest number of residents. This is a large component of the population, but it has decreased in relation to the other age groups over the last 27 years. The increase in the percentage of Baby Boomers (aged 44-62) is also apparent in the graph, growing by a significantly larger amount than other age groups. If these trends continue, the Las Vegas Valley is likely to have an age distribution in the future with larger proportions of both old and young than the middle aged.

These changes have important implications for the educational system, health care and social services needs, and the local economy. The educational system is already bearing the impacts of the large increase in youth. Since 1986, the Clark County School District has constructed 196 new schools. Eleven schools opened in 2007 and six in August 2008 (Clark County School District, 2008). The district had planned to seek funding to construct 73 more new and replacement schools, but removed the bond measure from the ballot due to the global financial crisis.

Annual per-pupil spending in the district in 2006 was $7,092, which was considerably less than the national average of $9,138 (U.S. Census Bureau, 2008). If the Las Vegas Valley is to provide quality education for the growing cohort of youth, it will need to

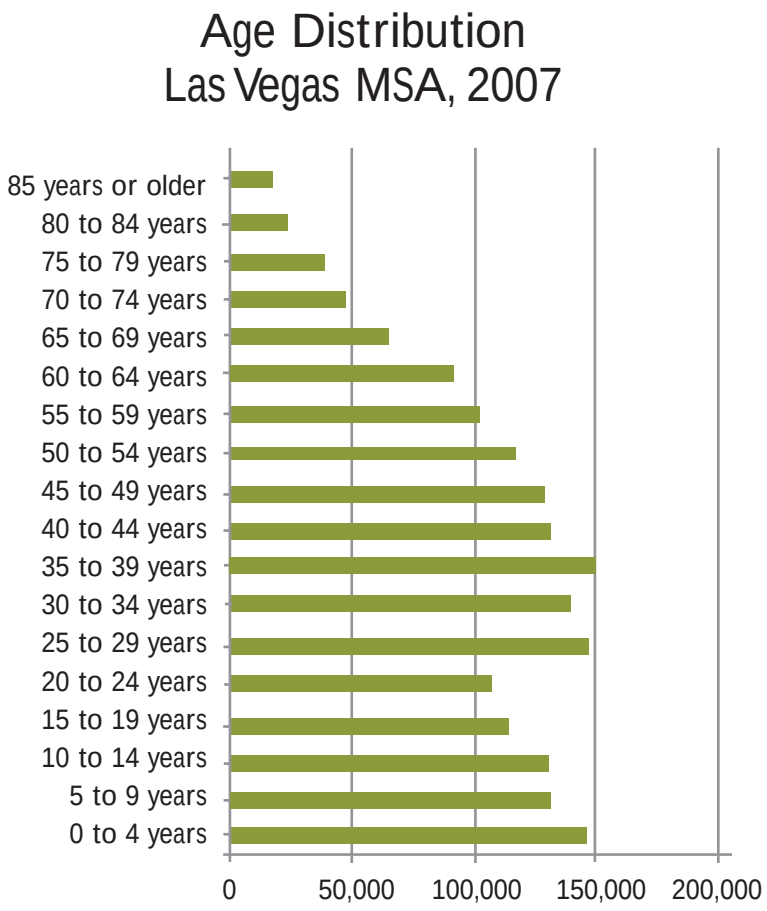

Figure 16 Source: U.S. Census Bureau, 2008

find the funding to continue school construction and to increase per-pupil spending. To do this, it will be necessary to convince the aging population of the Valley that education is a worthwhile expenditure.

Education at all levels is a key contributor to both the social and economic components of sustainability. As such, improvements to the educational system in the Las Vegas Valley are critically important.

Educational attainment in the area lags behind the nation as a whole, with 17.1 percent of residents having less than a high school education (vs. 15.5 percent for the nation), 14.1 percent holding a bachelor's degree (vs. 17.4 percent for the nation), and 7.3 percent with a graduate or professional degree (vs. 10.1 percent for the nation) (U.S. Census Bureau, 2008). Improving this education lag will help to ensure a qualified workforce for the existing economy, provide better life opportunities for new residents, and create a pool of people with the undergraduate and graduate degrees necessary to attract and grow businesses critical for diversifying the local economy.

The aging population will increasingly require health care and other social services, which will necessitate increased public and private spending on hospitals, retirement facilities and in-home care. Increasing spending in these areas will provide significant opportunities to diversify the local economy.

The active lifestyles preferred by the Baby Boomers, along with the generation's wealth, will present other opportunities for the area's economy. This age group will seek entertainment and cultural experiences, as well as a wide range of goods and services.

If the trend of a decreasing proportion of middle-aged individuals continues, it will present challenges to the Las Vegas area. These are the people who drive the bulk of the economy and pay the taxes that help support the local governments in providing services for the other segments of the population. It will be important to develop strategies for adjusting to this demographic trend, should it persist.

Changing demographics in the Las Vegas Valley offer excellent opportunities for economic diversification, while requiring additional investment in the public education system, health care and other social services.

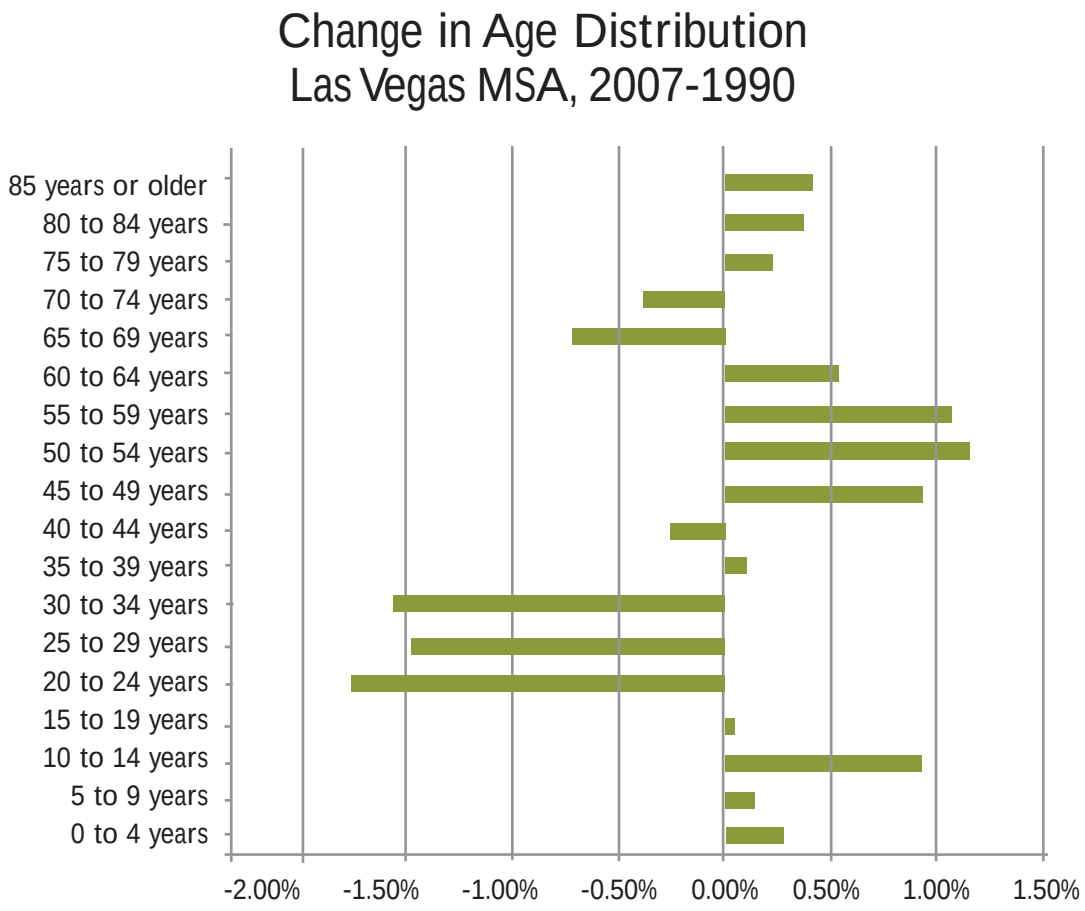

Figure 17 Source: U.S. Census Bureau, 2008

RECOMMENDATIONS

Local scale

- Increase investment in the public education system and improve access for Hispanics and other recent immigrants to post-secondary educational opportunities.
- Conduct studies of impacts of changing age demographics on local fiscal balance, and develop strategies for addressing this issue.

Regional scale

- Develop economic diversification strategies that take advantage of changing local demographics.

Federal scale

- Partner with nearby states and other stakeholders to engage the federal government regarding comprehensive immigration reform.

Conclusions and Recommendations

Water

Economic Diversification

Land Use

Transportation

Resource Conservation

Changing Demography

CONCLUSION AND RECOMMENDATIONS

Currently the concept of sustainability and the reality of the Las Vegas Valley are perceived by most observers to be in opposition. This perception is correct in many ways, but there is an incipient movement towards sustainability in the area.

Beyond the specific issues discussed and recommendations provided within the body of this document, four overarching points need to be recognized and addressed (see the complete series of recommendations starting on page 63).

1. In the Las Vegas Valley, there is no overall vision or clear set of goals guiding policy and actions related to all of the issues discussed in this report. A comprehensive consensus vision must be articulated by area stakeholders and partners. This vision should address not only how Las Vegas expects to remain competitive in a global economy, but also how it defines its future quality of life. Creating, restoring, preserving and enhancing local environmental, economic, social and cultural assets essential to this vision will be critical.

   Utah's Wasatch Front is experiencing rapid growth, much like Las Vegas. The area is managing growth by involving stakeholders, decision makers, and residents through a values and visioning process called Envision Utah, a public-private partnership focused on protecting Utah's environment, economic strength and quality of life for future generations. Key lessons learned through the process are:

   - Use an inclusive regional approach to solve regional problems.
   - Focus on the values of citizens to determine sustainable solutions.
   - Emphasize transportation connectivity within the region, since it is the major determining factor to guiding quality growth. Work to integrate road, rail, and pedestrian networks.
   - Change city ordinances to promote infill, reuse, adaptation, transit-oriented development, and preserve natural areas and open space.
   - Preserve habitat, environmentally sensitive areas, and wetlands. Other open space must be planned for and considered from both monetary and community value standpoints.

2. Very little actual regional integration of planning efforts exists across the geography of southern Nevada. This cannot continue if the Las Vegas Valley is to be sustainable. Key jurisdictions and agencies must work together. Since all of this must be led and coordinated, there is a strong need to consider a more comprehensive regional planning authority. The area's problems are too immense and complex to leave to multiple jurisdictions and agencies to deal with individually.

   One example of successful coordinated regional planning in the Intermountain West has been the effort undertaken by the Denver Regional Council of Governments. Beginning in 1997, Denver's metropolitan area leaders began to work on a number of interrelated planning initiatives that would put Denver in the national limelight in 2004 as a leader in sustainable urban development. This recognition, particularly for their leadership in multimodal transit and transit-oriented development investments,

resulted from excellent local leadership, collaboration, and a comprehensive regional vision. Denver Regional Council of Governments attributes the success of the entire initiative to a number of key lessons learned:

- Start with a common and broadly shared vision.
- Utilize cost/benefit analysis of alternative development scenarios to help build support for strategies.
- Focus on the big picture, encourage desired outcomes, and remain committed—including time, people, and money.
- Promote local champions.
- Be reasonable and recognize the practical needs of individual participants.

3. Due to the complexity and interrelatedness of the issues, solutions will result in conflicts and tradeoffs. Some existing policies serve as incentives for the status quo and disincentives for innovation in sustainability. Two areas in particular will need intensive data-gathering, study and analysis in order to inform decision making: 1) the connections among energy, water and land use, and 2) diversification of the local economy.

4. The Las Vegas Valley needs to engage in a dialogue with southern California, Arizona and Utah to develop a regional sustainability framework. It also must partner with its Intermountain West colleagues to define a common federal agenda to address the issues of water, energy, transportation and immigration, among others. Specific items for this common federal agenda include:

   - Partnering with the federal government to make critical investments in the Intermountain West's transportation, water and energy infrastructure.
   - Enacting comprehensive immigration reform.
   - Investing in improved modeling of climate change and its impacts on water and energy.

The Las Vegas Valley has made initial steps toward achieving sustainability. Many of the issues facing the Valley have been identified. For most of these, specific strategies and recommendations have been developed. What is needed now is action, with collaborative implementation of the proposed solutions. The current pause in development, occasioned by the national economic downturn and its effects on Las Vegas, provides an excellent opportunity for the city and surrounding area to wholeheartedly embrace sustainability on multiple fronts. This opportunity must be seized if the region is to achieve sustainability and thereby continue to thrive.

WATER RECOMMENDATIONS

Local scale

- In light of uncertainties and potential risks associated with the proposed groundwater development project, a prudent approach would be to first pursue other less costly, risky and uncertain sources of water. One alternative approach would be to first implement more stringent conservation and efficiency measures. Current system-wide demand in the Las Vegas Valley is approximately 256 gpcd. If SNWA system-wide demand decreased to levels of other urban areas in the Southwest (such as Albuquerque at 173 gpcd or Tucson at 156 gpcd), significantly more water would be available.

  A comprehensive conservation and efficiency program would include:

  - Improving outdoor water conservation through measures such as continuation of the turf removal program, creating incentives to implement improved irrigation technology, and strict enforcement of outdoor water restrictions;
  - Increasing indoor water-use efficiency in single-family residences, hotels and other commercial buildings by offering incentives for replacing appliances, shower heads, toilets and other fixtures;
  - Ensuring that all new residential, commercial and industrial development is extremely water efficient;
  - Implementing water pricing that more effectively encourages conservation and efficiency by using a more aggressive block rate structure.
  - Information comparing returns from investment in water conservation and efficiency versus new infrastructure development is needed to inform decision making. While not within the scope of this study, a comprehensive examination of this issue should be conducted.

Regional scale

- Beyond improved water conservation and efficiency, the sustainability of Las Vegas Valley development should be advanced by more explicitly linking land use and growth management policies to water policies. Regional planning should involve the county and various municipalities collaborating to create and implement policies which integrate land use and water supply.
- Conservation efforts and policy development regarding water and energy should be addressed in an integrated manner.

Colorado River basin-wide scale

- Nevada, along with the other six Colorado River basin states must work to coordinate the water budgeting process within an integrated framework that considers the entire basin as a whole.

ECONOMIC DIVERSIFICATION

Local scale

- Focus on the linkages between education and economic diversification. Increase levels of spending on K-12 education, improve vocational and workforce training, increase access to secondary education, provide additional support for and development of graduate and professional degree programs, and greatly increase spending on university-level research in the sciences and technology.

Regional scale

- Implement the economic development strategy and recommendations contained in the 2006 Southern Nevada Regional Development Strategy.
- As the Las Vegas economy continues to evolve, conduct additional substantive studies of the area economy in order to determine how to improve the business climate to attract and create a broader diversity of economic activity.

LAND USE

Strategies and recommendations have been proposed by SNRPC and the Growth Task Force, based on broad-based forums. What is mainly needed is implementation of these ideas.

Local scale

- Continue to develop and implement policies that promote infill and mixed-use development.

Regional scale

- Create a comprehensive regional planning authority to integrate and coordinate land-use planning efforts across the Las Vegas Valley.
- Select SNPLMA lands for auction based on a comprehensive regional planning process.
- Develop and implement a coordinated land-use, transportation and air-quality plan for the region.

TRANSPORTATION

The Clark County Community Growth Task Force recognized the threats to regional sustainability and quality of life posed by traffic congestion and increased vehicular travel and made a series of recommendations in its 2005 report (Goodall, Allen et al., 2005). These recommendations and others noted below should be implemented.

Local scale

- Continue development of bus rapid transit.

- Establish criteria for transit-oriented development.
- Develop transportation corridors to outlying areas where feasible.

Regional scale

- Integrate air-quality, transportation and land-use planning.
- Promote a master planning process that identifies and addresses relationships between land uses and vehicle emissions within the plan boundaries.
- Reduce vehicle miles traveled through improved transportation linkages and interconnectivity.

Federal scale

- Establish incentives for the use of alternative fuels and advanced transportation technology.

RESOURCE CONSERVATION

Regional scale

- Continue implementation of the MSHCP.
- Establish and disseminate information about best management practices and mitigation strategies for siting of renewable energy generation facilities and transmission infrastructure.
- Fully implement the regional open space plan developed by the SNRPC.

CHANGING DEMOGRAPHY

Local scale

- Increase investment in the public education system and improve access for Hispanics and other recent immigrants to post-secondary educational opportunities.
- Conduct studies of impacts of changing age demographics on local fiscal balance, and develop strategies for addressing this issue.

Regional scale

- Develop economic diversification strategies that take advantage of changing local demographics.

Federal scale

- Partner with nearby states and other stakeholders to engage the federal government regarding comprehensive immigration reform.

Bureau of Land Management

APPENDIX 1

COMMENTS ON "THE IMPACT OF A GROWTH INTERRUPTION IN SOUTHERN NEVADA," A REPORT BY HOBBS, ONG & ASSOCIATES

In February 2004, the Southern Nevada Water Authority released a report by Hobbs, Ong & Associates entitled, "The Impact of a Growth Interruption in Southern Nevada" (Hobbs-Ong report). In the report, the focus is on an "artificial" interruption of growth in Southern Nevada. What constitutes an "artificial" growth interruption is not explicitly defined, but the statement, "Growth, through policy initiatives, can be artificially limited or halted," provides some insight. This seems to refer to growth management policies, as could be implemented through land-use regulations or a water-system hookup moratorium, for example. A reference to the fact that the state of Nevada has a "form of growth control" through existence of BLM land disposal boundaries further supports this inference.

Unfortunately for the Las Vegas Valley, a growth interruption is currently occurring. Whether or not it is "artificial" is immaterial. Since its peak in June 2006, employment in the construction industry has declined by over 38,000, a decrease of nearly 34 percent (BLS data, 2009). Recent data from Clark County indicate county population declined by about 10,000 people from July 2007 through July 2008 (Clark Co. Comprehensive Planning document). The impacts of this growth hiatus are being felt throughout the economy of the Las Vegas Valley, and it will be interesting to see how these impacts compare to the Hobbs-Ong study results.

The results derive from a modeling of the southern Nevada economy, using input-output analysis implemented with the computer program IMPLAN. An extensive series of scenarios were modeled, driven by a range of declines in construction employment from 10 to 65 percent, phased in over a three-year period, followed by a 10-year period of either rapid, moderate, or no recovery. The executive summary presentation of the modeling results focused primarily on a scenario of a 65 percent decline in construction employment with a "moderate" recovery in which "the economy returns to baseline growth rates 10 years post-interruption, but never 'makes up' for lost growth" (Hobbs and Ong, 2004).

The total impacts predicted by the model based on this scenario for the 14-year impact period are drastic. They include 1.3 million person-years of lost employment, $3.58 billion per year in lost labor income, a 12.3 percent reduction in total economic output, population declines of 278,000 person-years, a $15.1 billion decrease in total tax payments, higher crime rates, and increased poverty. The actual numbers are not actually as important as the concept that a downturn in growth-driven construction activity would have significant negative impacts in the local economy.

It is also important to realize that this is one scenario out of many that were modeled, some of which had less drastic impacts and some that had worse resultant impacts. The particular highlighted scenario was chosen by the authors so that their results could be compared to those of an earlier study that presented similar impacts. It was not chosen because it was the most likely scenario. No attempt was made to predict which of the scenarios might occur in the future. These scenarios were merely constructed, modeled, and the results reported.

The methodology employed by the researchers is an accepted technique for modeling economic impacts. A panel of distinguished economic experts reviewed the study results. These facts support the argument that the model results are reasonable and were generated in a defensible manner. Short of actually observing a "growth interruption" which closely matches one of the model scenarios, it would be difficult to validate the impacts suggested by the modeling.

Although not explicitly stated in the report, in providing a warning about the extensive negative economic and social impacts to be expected from an interruption in growth in the Las Vegas Valley, the Hobbs-Ong study also highlighted the vulnerability of the Las Vegas economy. Because such a large proportion of the local economy is dependent on the construction sector, when this sector is in trouble, there are large and extensive local economic impacts, as are currently being experienced. The Hobbs-Ong study thus provides additional support for diversifying the economy of the Las Vegas Valley, a topic discussed within the main body of this document.

The Hobbs-Ong study presented possible negative economic impacts from a series of potential scenarios in which construction employment declined significantly and rapidly over a three-year period. The Las Vegas Valley is currently experiencing a significant and rapid decline in construction activity and employment, with attendant negative economic impacts. This downturn provides an opportunity for the area to re-examine the costs and benefits of a growth-driven economy and to move toward a more diversified and sustainable local economy.

APPENDIX 2

CONSTRUCTION AND IMPLEMENTATION OF A BUILD-OUT MODEL FOR THE LAS VEGAS VALLEY

This document summarizes the methods used to calculate residential growth capacity within Clark County, Nevada. Data sources and will be referenced as well as the methods of geographical analysis used to calculate different growth scenarios. Scenarios will be outlined with information about each scenario and its assumptions.

METHODS

The methods for this analysis were relatively straightforward. Any parcel that was private in ownership or that could be made available for development via government land sales was isolated. Next, its zoning classification was identified, along with planned land-use, and the density at which it could be developed was associated with the parcel. Finally, the development density in dwelling units (DU/AC) was calculated by multiplying the development density by the area of the parcel. These calculations of the number of potential dwelling units per parcel were then summed across the Las Vegas Valley.

The first steps in preparing the data for analysis involved associating potential development densities with each of the land-use plan and zoning districts within the county. The majority of these data were available via county and city websites which explained the definition of each zoning district as well as the development densities that could be attained within each district. Some zoning districts had a range of attainable development densities, and these ranges were used to influence different development scenarios.

After all land-use plan and zoning districts were identified and maximum densities were associated with each area, all districts were merged into one master zoning layer. For the most part, densities associated with land-use plans were used to determine maximum build-out capacities. In some cases, there were blank spots where current zoning information was used rather than land-use plans. The master zoning layer was then trimmed by removing any zoning district that did not have any development potential (i.e., commercial, industrial and zoning districts with 0 allowed DU/AC). Public lands, tribal lands and lands with slopes greater than 25 percent were removed as undevelopable. After these initial steps, the master zoning layer represented any area that could be developed with residential dwelling units within the county.

The only exception to the public lands removed from the analysis were BLM lands classified as “suitable for disposal.” These lands were available for sale under the Southern Nevada Public Land Management Act (SNPLMA) of 1988, and their extent is defined by the Clark County Disposal Boundary. Although this boundary has been established by the BLM, there is controversy pertaining to specifics of its northern boundary in an area known as the Upper Las Vegas Wash. There are six different scenarios for the Upper Las Vegas Wash, each of which would result in differing areas of land being disposed of by the BLM. At this time, the BLM is unable to share data on the location of this portion of the disposal boundary. For this reason, the maximum extent of the disposal boundary has been used in this analysis. Future changes to this boundary may result in less area being auctioned and less space being built out.

Next, zoning type was assigned to each parcel. In order to do this, parcels were first converted to points representing the parcel-centroid. Zoning information was joined to points based on what zoning feature each point was enclosed by. These points were then joined back to the parcel polygons.

Many land-use plans and zoning districts have a range of attainable development densities. For this reason a multi-scenario approach was taken in the analysis. Three scenarios were conducted which represent high-, medium- and low-density build-out scenarios. The first scenario assumes minimum dwelling unit density and 30 percent of area being used for infrastructure. The second scenario uses the mean of dwelling unit density ranges and 25 percent of area being used for infrastructure. The third scenario uses maximum dwelling unit density and 20 percent of area being used for infrastructure.

Finally, a maximum development capacity (in dwelling units) was calculated for each parcel by multiplying the DU/AC density by the developable area of each parcel. In order to relate these estimates of dwelling units to population, 2010 census estimates of persons per household (PPH) were multiplied by DU estimates. The U.S. Census Bureau estimates that PPH in 2010 may vary between 2.4 and 2.6 persons per household (PPH), based on differing models that account for changing demographics within the country. For the estimates presented here (see Table 3), a mean value of 2.5 was multiplied by the DU estimates.

Table 3 Density Scenarios

	Number of Dwelling Units	Number of Inhabitants PPH = 2.5
Scenario #1 Low Density Total	146,962	367,405
Scenario #2 Medium Density Total	166,890	417,225
Scenario #3 High Density Total	203,441	508,603

GLOSSARY OF TERMS

Acre-foot of water: the amount of water it would take to fill one acre to a depth of one foot.

Aquifer compaction: the collapse of the aquifer substructure due to lowered water levels

Block-rate pricing of water: a pricing mechanism that ties the unit price of water to the amount consumed. An increasing block-rate price structure would encourage water conservation by imposing a higher unit price as water usage increases.

Build-out model: the model used in this report to estimate the residential growth capacity within the current BLM disposal boundary.

Bureau of Land Management (BLM): the federal agency responsible for carrying out a variety of programs for the management and conservation of designated public lands.

Disposal boundary: the demarcation line encircling the public lands that surround the Las Vegas Valley. The BLM has the authority to privatize lands located within the disposal boundary.

Land surface subsidence: the lowering of the natural land surface due to the removal of groundwater.

Location quotient (LQ): a statistic that measures an area's industrial specialization as compared to a larger geographic area, usually the country as a whole. An LQ is computed as the ratio of an industry's share of a regional total for some economic measure (such as earnings, employment or local GDP) to the industry's share of the national total for the same measure.

MSHCP: Multiple Species Habitat Conservation Plan. Approved by the U.S. Fish and Wildlife Service in 2001, the MSHCP addresses the conservation of 78 species of animals and plants, including the desert tortoise. Clark County administers the plan thought the Desert Conservation Program.

Megapolitan West: a term describing the rise of rapidly growing and interconnected urban centers in the West. The Megapolitan West consists of the urban areas of Arizona, Colorado, Nevada, New Mexico and Utah. Each of these states is home to a "megapolitanmegaregion" area with two or more urban centers that are combined as a single economic social and urban system. These urban centers dictate much of the economics, environmental policies and social development of the region as a whole.

SNPLMA: Southern Nevada Public Land Management Act. This 1998 legislation created a disposal boundary around the Las Vegas Valley, limiting the amount of land available for development, and set up a process for privatizing the land inside the disposal boundary.

SNRPC: Southern Nevada Regional Planning Coalition. Composed of representatives from Clark County, the cities of Las Vegas, North Las Vegas, Henderson, and Boulder City, as well as the Clark County School District, the SNRPC facilitates the joint selection process for the approximately 27,000 acres of land remaining to be disposed within the disposal boundary.

SNWA: Southern Nevada Water Authority. Formed in 1991, this regional water agency manages water resources, allocates water to its member agencies, conducts long-term water planning, and negotiates regional water policy. SNWA also constructs and operates the system that delivers water to the member agencies, providing water and wastewater services within their respective operating districts.

REFERENCES

Belnap, J. (2007). Statement of Jayne Belnap, Research Ecologist U.S. Geological Survey. *Hearing on the major environmental threats to the Great Basin in the 21st century. Subcommittee on Public Lands and Forests, Senate Committee Energy and Natural Resources, United States Senate*, October 11, 2007.

Bureau of Land Management. (2009). Southern Nevada Public Land Management Act, Program Statistics, June 30, 2009. Retrieved June 30, 2009, from http://www.blm.gov/pgdata/etc/medialib/blm/nv/field_offices/las_vegas_field_office/snplma/pdf/reports.Par.54784.File.dat/SNPLMA_Land_Sale_Statistics_06_30_2009.pdf

Bureau of Reclamation, U.S. Department of the Interior. (2009). Drought in the upper Colorado River basin. Retrieved August 4, 2009, from http://www.usbr.gov/uc/feature/drought.html

City of Las Vegas. (2008). Sustaining Las Vegas. Retrieved July 23, 2008, from www.lasvegasnevada.gov/sustaininglasvegas/

Clark County Desert Conservation Program. (2009). Desert Conservation Program Multiple Species Habitat Conservation Plan, Quarterly Administrator Update, July 2009. Retrieved August 16, 2009, from http://www.accessclarkcounty.com/depts/daqem/epd/dcp/Documents/Plan_Administrator_Update_July_2009.pdf

Clark County School District. (2008). District Improvement and AMAO Plan, 138.

Coache, R. (2008). Las Vegas Valley Water Usage Report, 2007. State of Nevada, Division of Water Resources, 151.

Coache, R. (2009). Las Vegas Valley Water Usage Report, 2008. State of Nevada, Division of Water Resources, 146.

Cooley, H., & Hutchins-Cabibi, T., et al. (2007). Hidden oasis: Water conservation and efficiency in Las Vegas. Pacific Institute and Western Resource Advocates, 60.

Culinary Workers Union Local 226. (2009). About Culinary Workers Union Local 226. Retrieved July 10, 2009, from http://www.culinaryunion226.org/about.asp

Deacon, J. E., & Williams, A. E., et al. (2007). Fueling population growth in Las Vegas: How large-scale groundwater withdrawal could burn regional biodiversity. *BioScience*, *57*(8), 688-698.

Dettinger, M., & and Earman, S. (2007). Western ground water and climate change—Pivotal to supply sustainability or vulnerable in its own right? *Groundwater News and Views*, *4*(1), 4-5.

Donovan, D. J., & Katzer, T. (2000). Hydrologic implications of greater ground-water recharge to Las Vegas Valley, Nevada. *Journal of the American Water Resources Association*, *36*(5), 1133-1148.

Ginsburg, R. (2007). Vital beyond belief: The demographic and economic facts about Hispanic immigrants in Nevada. Progressive Leadership Alliance of Nevada, 28.

Goodall, L. E., & Allen S., et al. (2005). Clark County Community Growth Task Force Report, 195.

Grady Gammage, J., & Hall, J. S., et al. (2008). Megapolitan: Arizona's Sun Corridor. Morrison Institute, 52.

Hirsch, B. T., & Macpherson, D. A. (2008). Union Membership and Coverage Database from the Current Population Survey, Union Membership, Coverage, Density and Employment by Combined Statistical Area (CSA) and MSA, 2007. Met-107-1.

Lang, R. E., & Dhavale, D. (2005). Beyond megalopolis: Exploring America's new "megapolitan"

geography. *Metropolitan Institute Census Report Series*. Metropolitan Institute at Virginia Tech, 36.

Levich, R. A., & Linden, R. M., et al. (2000). Hydrologic and geologic characteristics of the Yucca Mountain site relevant to the performance of a potential repository. *Geological Society of America Field Guide 2000*, 2, 383-414.

Malone, L. (1997). Testimony by Lance Malone at Hearing on H.R. 449: *A Bill To Provide for an Orderly Disposal of Certain Federal Lands In Clark County, Nevada, and to Provide for the Acquisition of Environmentally Sensitive Lands in the State Of Nevada, National Parks and Public Lands, of the Committee on Resources, U.S. House of Representatives*, 43.

Matuska, P. (2007). Colorado River Accounting and Water Use Report, Arizona, California, and Nevada, Calendar Year 2007. U.S. Department of the Interior, Bureau of Reclamation, 60.

Nevada Division of Water Resources. (2009). Las Vegas Valley Hydrographic Basin Summary. Nevada Division of Water Resources, 1.

Passel, J. S., & and Cohn, V. (2008). Trends in unauthorized immigration: Undocumented inflow now trails legal inflow. Pew Hispanic Center, 25.

Pavelko, M. T., & Wood, D. B., et al. (1999). Land subsidence in the United States, Las Vegas: Gambling with water in the desert. *Circular*, U.S. Geological Survey. *1182*,177.

Przybys, J. (2008). Changing demographics: New neighbors, Hispanics playing increasingly larger role in daily life in Southern Nevada. *Las Vegas Review-Journal*.

Rothman, H. (2002). *Neon Metropolis, How Las Vegas started the twenty-first century*. New York, Routledge.

Schaefer, D. H., & Harrill, (1995). Simulated effects of proposed groundwater pumping in 17 basins of east-central and southern Nevada. *Water-Resources Investigations Report 95-4173*. Carson City, NV, U.S. Department of the Interior, U.S. Geological Survey.

Schlottmann, A., & Schmidt, R., et al. (2006). Southern Nevada Regional Economic Study, Southern Nevada Regional Planning Coalition, 52.

Schlyer, K. (2007). Gambling on the water table: The high-stakes implications of the Las Vegas pipeline for plants, animals, places and people. Defenders of Wildlife, 21.

Schrank, D., & and Lomax, T. (2009). 2009 Urban Mobility Report. Texas Transportation Institute, The Texas A&M University System, 134.

Sierra Pacific Resources. (2007). 2007 Annual Report, 198.

Southern Nevada Regional Planning Coalition. (2004). Regional Growth Summits Summary Report, 308.

Southern Nevada Regional Planning Coalition. (2006). Regional Open Space Plan for Southern Nevada, 73.

Southern Nevada Water Authority. (2008). Southern Nevada Water Authority Clark, Lincoln, and White Pine Counties Groundwater Development Project DRAFT Conceptual Plan of Development, 119.

Southern Nevada Water Authority. (2009). History of groundwater in the Las Vegas Valley. Retrieved July 22, 2009, from http://www.lasvegasgmp.com/html/lvgw_history.html

Southern Nevada Water Authority. (2009). Water Resource Plan 09, Southern Nevada Water Authority, 71.

Southwest Energy Efficiency Project. (2009). Nevada Fact Sheet: Energy Efficiency & Energy Consumption, 2.

Texas Traffic Institute. (2009). Congestion data, performance measure summary Las Vegas, NV.

Retrieved August 24, 2009, from http://mobility.tamu.edu/ums/congestion_data /tables/las_vegas.pdf

The Brookings Institution. (2008). MountainMegas: America's newest metropolitan places and a federal partnership to help them prosper. Washington, D.C., The Brookings Institution, 68.

Torcellini, P., & Long, N., et al. (2003). Consumptive water use for U.S. power production. Golden, Colorado, National Renewable Energy Laboratory, U.S. Department of Energy, 18.

U.S. Census Bureau. (2008). 2007 American Community Survey, Clark County.

U.S. Census Bureau. (2008). 2007 Census of Governments.

University of Nevada Las Vegas. (2008). Urban sustainability initiative. Retrieved August 10, 2008, from http://urban21.unlv.edu/

Weiler, P. J., & Mouritsen, K. E., et al. (2007). Southern Nevada Public Land Management Act (P.L. 105-263) "As Amended," Bureau of Land Management, Nevada State Office, U.S. Department of the Interior, 9.

SONORAN INSTITUTE
7650 E. Broadway Blvd.,
Suite 203, Tucson, Arizona 85710
520-290-0828 Fax: 520-290-0969

www.sonoraninstitute.org

SONORAN
INSTITUTE

Shaping the Future of the West

1/2010