



WATER ELEMENT

LAS VEGAS
MASTER PLAN 2020

executive summary

background

introduction

water conservation

flood control

erosion control and wetland
management

goals/policies/programs

objectives and policies



Adopted by
City Council 6-01-05

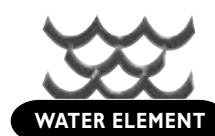
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The City of Las Vegas Water Element
of the Las Vegas 2020 Master Plan
was adopted by
City Council on June 1, 2005
(GPA-6288).



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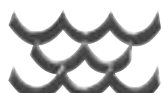


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EXECUTIVE SUMMARY

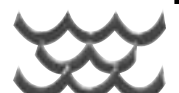
Development in the city of Las Vegas is guided by the goals, objectives and policies outlined in the 2020 Master Plan¹, and elements of the Plan such as the Public Safety Element², which contain goals and policies designed to protect and enhance groundwater drainage. Additionally, the city of Las Vegas Strategic Plan³ has the following goals, strategies, and performance measures:

- Goal: Encourage conservation and optimization of natural resources.
- Strategy: Identify appropriate water conservation strategies and priorities.
- Strategy: Explore best development and urban design practices for environmental stewardship, energy and water conservation, and efficient use of the land.
- Performance Measure: Adoption of a Water Element in the 2020 Master Plan.



Colorado River flowing from the base of Hoover Dam.

- 1 Adopted by City Council through Ordinance 2000-62 on September 6, 2000.*
- 2 Adopted by City Council through Ordinance 2001-84 on September 19, 2001.*
- 3 Adopted by City Council on April 20, 2004.*



INTRODUCTION

The Las Vegas Valley lies within the Mojave Desert, one of the most arid regions in the continental United States. The average annual rainfall in this region is 4.2 inches, while the annual evaporation rate reaches 100 inches. The overall quality of life and prosperity of the Las Vegas Valley depends on a number of factors, one of which is effective long-term conservation and optimization of the area's scarce water resources.

The city of Las Vegas water conservation policies are within the Conservation Element⁴ of the Master Plan 2020, and the regional Southern Nevada Water Authority (SNWA) Drought Plan.

This Water Element outlines existing efforts and policies of the city of Las Vegas pertaining to water conservation, flood control, erosion control and wetlands management (Sections III to V). It describes goals and objectives relating to water supply, water quality, wastewater and drainage/flood control, and underscores the importance of ongoing coordination and cooperation between the city of Las Vegas, Las Vegas Valley Water District (LVVWD), SNWA and other entities such as the Clark County Wastewater Reclamation District, city of Henderson, city of North Las Vegas, Clark County Regional Flood Control District and Las Vegas Wash Coordination Committee responsible for different aspects of the water issue. The objectives and policies set forth in the Water Element direct staff and other city officials in their management of this essential resource. The objectives provide the foundation and vision for the city's role in conserving water resources, while the policies represent steps the city can take to increase or improve its existing conservation efforts.

⁴ Adopted by city council through Ordinance 5529 on November 6, 2002.



*Aeration ponds at the Water Pollution Control Facility.
Courtesy CLV Public Works Department.*



BACKGROUND

The city of Las Vegas' activities related to water issues are guided by federal and state law, as well as a series of planning and policy documents. The following subsections provide a brief overview of these items.

FEDERAL LAW

The primary source of water for the municipal providers in the Las Vegas region is the Colorado River at Lake Mead. The Colorado River is allocated amongst the seven Colorado River basin states and Mexico (Map 1) via a series of laws, compacts, and court cases collectively called The Law of the River. Included within this series of laws are the 1922 Colorado River Compact and the 1928 Boulder Canyon Project Act, which defined all apportionments of Colorado River water in "consumptive use" units. Consumptive use is defined as water diversions minus any water that is returned to the river (the latter is referred to as "return-flow credits"). Of the 16.5 million acre-feet per year (AFY) allocated, Nevada's portion is the smallest at 0.3 million AFY or 300,000 AFY. Even though Lake Mead has the capacity to hold over 26 million AFY, Nevada and the others are only able to take their respective amounts entitled under the Law of the River. Because the Las Vegas Valley treats and returns most of its wastewater back to the Colorado River at Lake Mead via the Las Vegas Wash, it receives a return flow credit for the returned water. This concept enables Southern Nevada to take or divert the amount it has returned (in addition to its allocation of 300,000 AFY) thereby stretching its Colorado River supply.

Federal water quality legislation includes the Clean Water Act and the National Environmental Policy Act (NEPA). The National Pollutant Discharge Elimination System (NPDES) implements the federal Clean Water Act and was adopted in 1990. The NPDES mandates that plans and programs for storm water management be developed, adopted and implemented to assure that municipalities "effectively prohibit non-storm water discharge into the storm drain and require controls to reduce the discharge of pollutants from storm water systems to waters of the United States to the maximum extent possible." The Public Works Department Engineering Planning and Environmental Division manages the city of Las Vegas NPDES program and received the Association of Metropolitan Sewerage Agencies 2002 Peak Performance Award, a recognition presented to individual member facilities for outstanding compliance with NPDES permit limits.



STATE LAW

The Office of the State Engineer in the Nevada Division of Water Resources regulates all groundwater and surface water resources (other than the federally-regulated Colorado River) within the State. The General Water Law Act of 1913 gave the office jurisdiction over all wells tapping into artesian water or water in definable underground aquifers. The 1939 Nevada Underground Water Act granted the State Engineer total jurisdiction over all groundwater in the state. Nevada water law follows the doctrine of prior appropriation, or “first in time, first in right” - meaning the first person to file on a water resource for beneficial use is typically considered first for a permanent right to the water, subject to the State Engineer’s determination of available unappropriated water. The process for obtaining a permit to develop groundwater or surface water includes: filing an application, having the State Engineer act on the application, and then issuing the permit or denying the application.

The city also complies with NRS 278.582, which since 1992 has mandated the installation of low-flush toilets and low-flow showerheads and faucets in new construction.

GUIDING DOCUMENTS

Henderson, North Las Vegas, and the Las Vegas Valley Water District (LVVWD) deliver water to their respective customers through their individual distribution systems, which include pumps, reservoirs, and pipelines (Map 2). The LVVWD constructs and maintains the water distribution system for the city of Las Vegas and portions of unincorporated Clark County.

There are a number of documents, developed with the cooperation of the city of Las Vegas, that help to guide policy and outline current and future plans for water within the greater Las Vegas metropolitan area. These guiding documents are summarized below.

SNWA WATER RESOURCE PLAN

The SNWA Water Resource Plan was first implemented in 1996. The plan outlines the history of water development in the Las Vegas Valley and provides an overview of Southern Nevada’s current and future water resources, both near-term and long-term. The plan includes a discussion of water demand forecasting, existing conservation measures and goals, and environmental issues that can influence the timing and delivery of available water resources. The plan is reviewed annually by the SNWA and updated as needed.



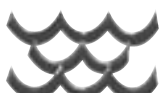
Cheyenne flood channel.



Alta channel during a rainstorm.

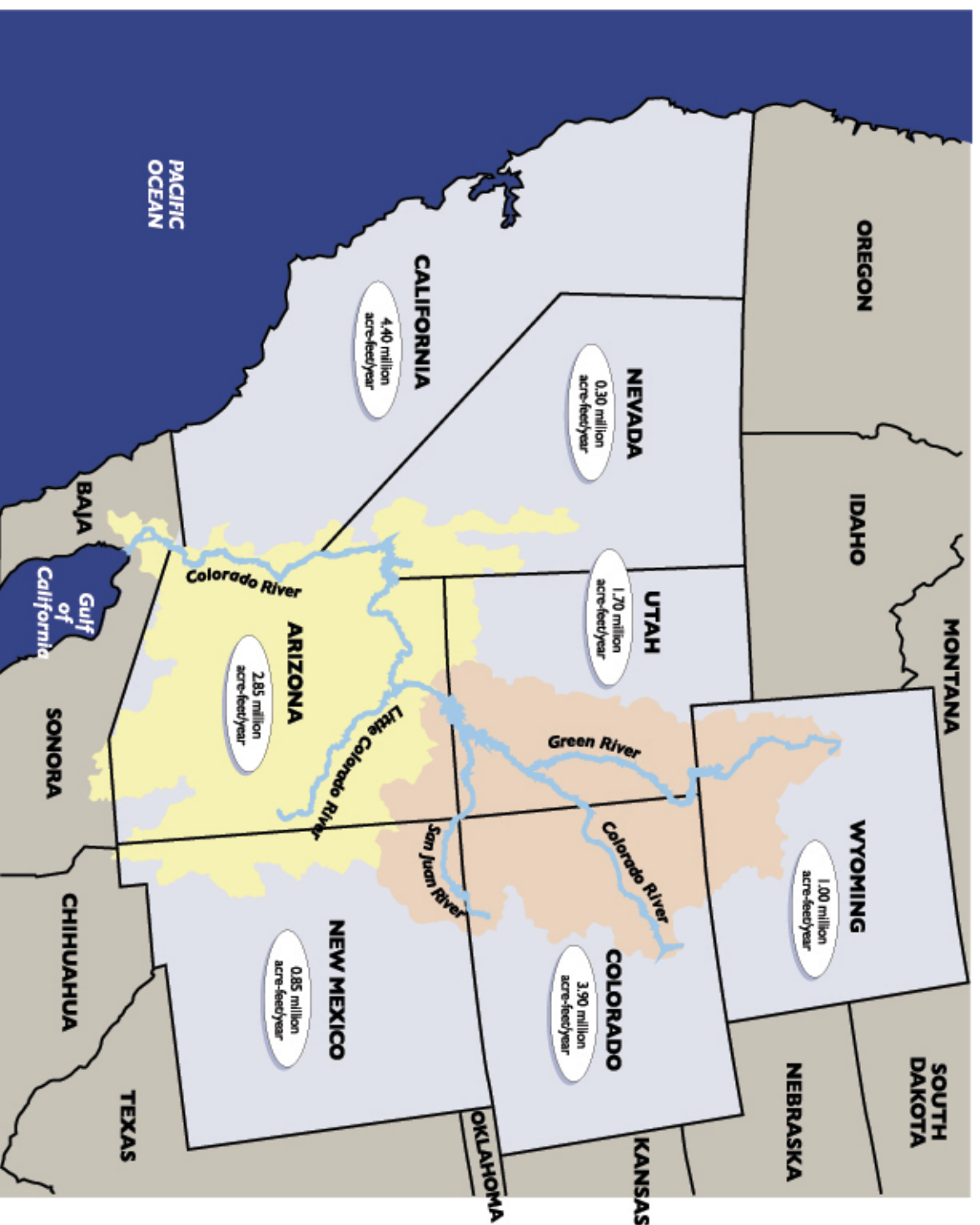
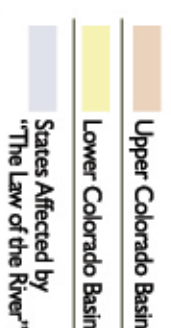


Las Vegas Wash west tributary.



STATES AFFECTED BY "THE LAW of the RIVER"

Map 1

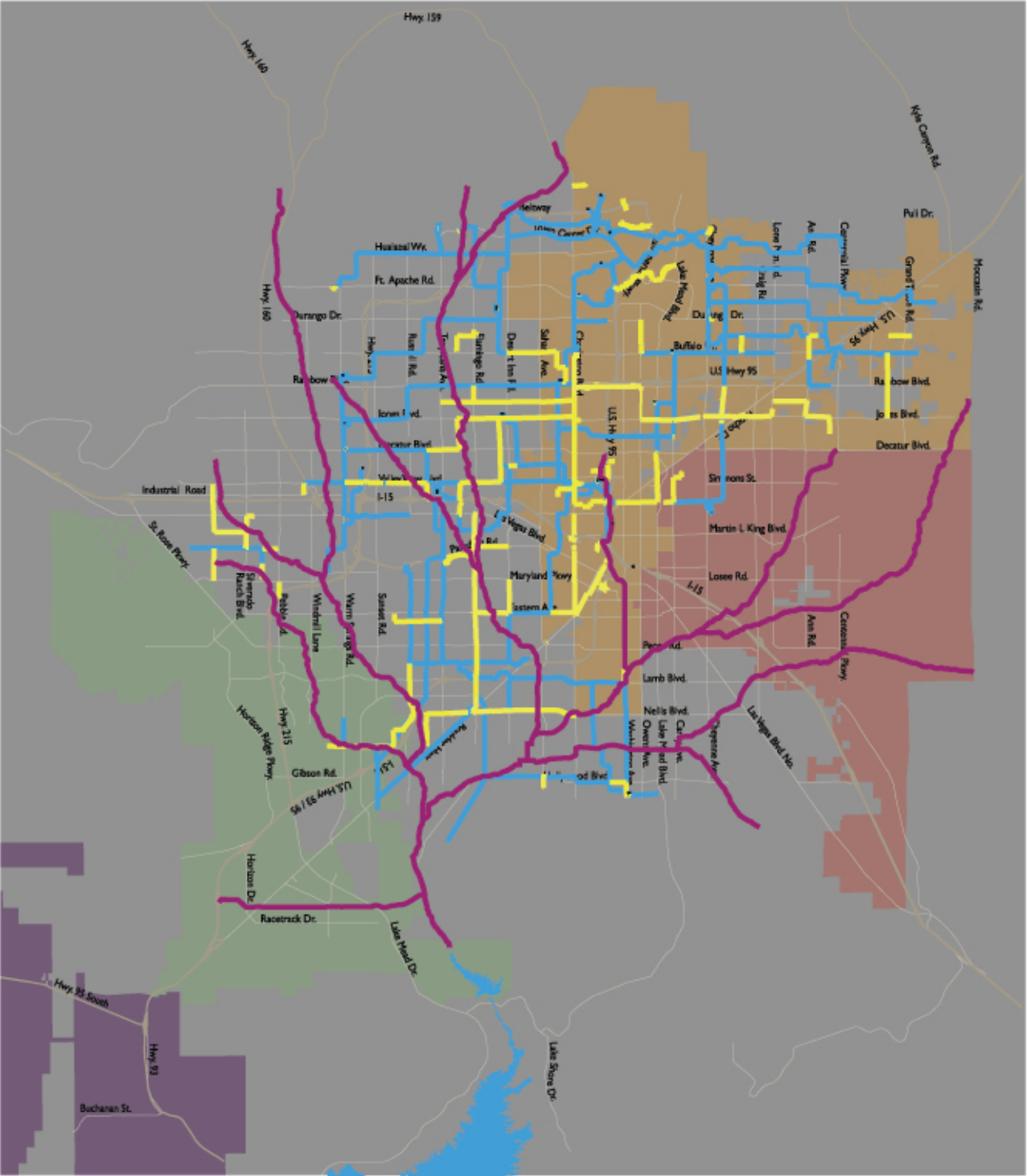


Adopted by City Council 6-01-05

Source: Southern Nevada
Water Authority



reproduced by permission of the Southern Nevada Water Authority



VALLEY-WIDE WATER LINES

Map 2

- City of Las Vegas
- Henderson
- North Las Vegas
- Boulder City
- Clark County
- 36" & Larger Lines
- 24" Water Lines
- USGS Washes



SNWA DROUGHT PLAN

The SNWA Drought Plan was developed by the SNWA and its member agencies in late 2002 to address the severe drought conditions currently affecting the Colorado River Basin. The plan establishes several drought stages and identifies additional conservation measures to be implemented for each stage. At a meeting held on January 5, 2005, the SNWA board of directors declared that the community will stay in drought alert status through 2005.

LAS VEGAS WASH COMPREHENSIVE ADAPTIVE MANAGEMENT PLAN

The Las Vegas Wash Comprehensive Adaptive Management Plan was produced in January 2000. A product of the Las Vegas Wash Coordination Committee, the Plan focuses on the implementation of engineering solutions to address water quality, erosion control and wetlands restoration concerns in the Las Vegas Wash. The Plan outlines 44 actions intended to guide the development of a comprehensive approach to long-term management of the Las Vegas Wash using a full range of stakeholder involvement.

LAS VEGAS VALLEY 208 WATER QUALITY MANAGEMENT PLAN

In 1972 and 1977, the Federal government enacted Federal Water Pollution Control Act amendments that required control of all sources of water pollution to meet the goals of the Act. Section 208 of the Act required the development of an integrated regional water quality management program to deal with water pollution sources. Since 1978, Clark County has prepared a sequence of water quality management plans to respond to these Federal requirements. In the latest of these Plans, prepared in 1997, according to Montgomery Watson the consultants tasked with preparing the Amendment the purpose was to revise the 1990 208 Plan Amendment, include the effects of sustained regional growth and development, revise storm water permitting to a more inclusive non-point section and provide water quality planning to a horizon year of 2020. As a wastewater discharger within the Valley, the city will need to continue to work with other wastewater entities, including the Clark County Water Reclamation District and city of Henderson, to ensure a proactive, integrated approach to water quality planning.



Flood channel into Lake Mead.

WATER CONSERVATION

BACKGROUND

A complete overview of Southern Nevada's water resources is provided in the SNWA Water Resource Plan, which is available online at www.snwa.com. There are two resources with a specific interest for the city of Las Vegas. These are groundwater and reclaimed water.

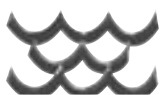
Groundwater was the first and most critical resource for Southern Nevada for much of the last century. Until large-scale importation of Colorado River water was achieved in the early seventies, the Las Vegas Valley relied on local groundwater supplies to meet demands. Although Southern Nevada's primary supply is currently Colorado River water, groundwater remains a critical component of the area's resource picture. In particular, groundwater is instrumental in helping purveyors meet peak water demands during the summer.

According to the Conservation Element of the Clark County Comprehensive Plan, one of the potential issues related to groundwater and wellhead protection in the Las Vegas Valley is that septic systems contribute to shallow groundwater contamination when they malfunction, are used improperly or are located in non-permeable soil such as caliche. Although the vast majority of land within the city of Las Vegas is serviced by the city's sanitary sewer system, there are a number of sites within the city that continue to be serviced by, or contain, septic tank systems (Maps 3a, b and c). Private septic tank systems have the potential to cause high nitrate levels in nearby groundwater; therefore, the city supports the use of the municipal sewer system for new development, wherever possible.

The city of Las Vegas provides direct reuse water within its municipal boundaries and unincorporated Clark County. The Water Pollution Control Facility (WPCF), the city's 91-million-gallon-per-day (MGD) main treatment plant, is located on the Las Vegas Wash in unincorporated Clark County. The WPCF currently provides reclaimed water to an adjacent power plant and four golf courses. The Bonanza Mojave Water Resource Center, a 1-MGD satellite reuse facility, became operational in May 1999. It is capable of providing approximately



Attractive use of xeriscape, or desert landscaping.



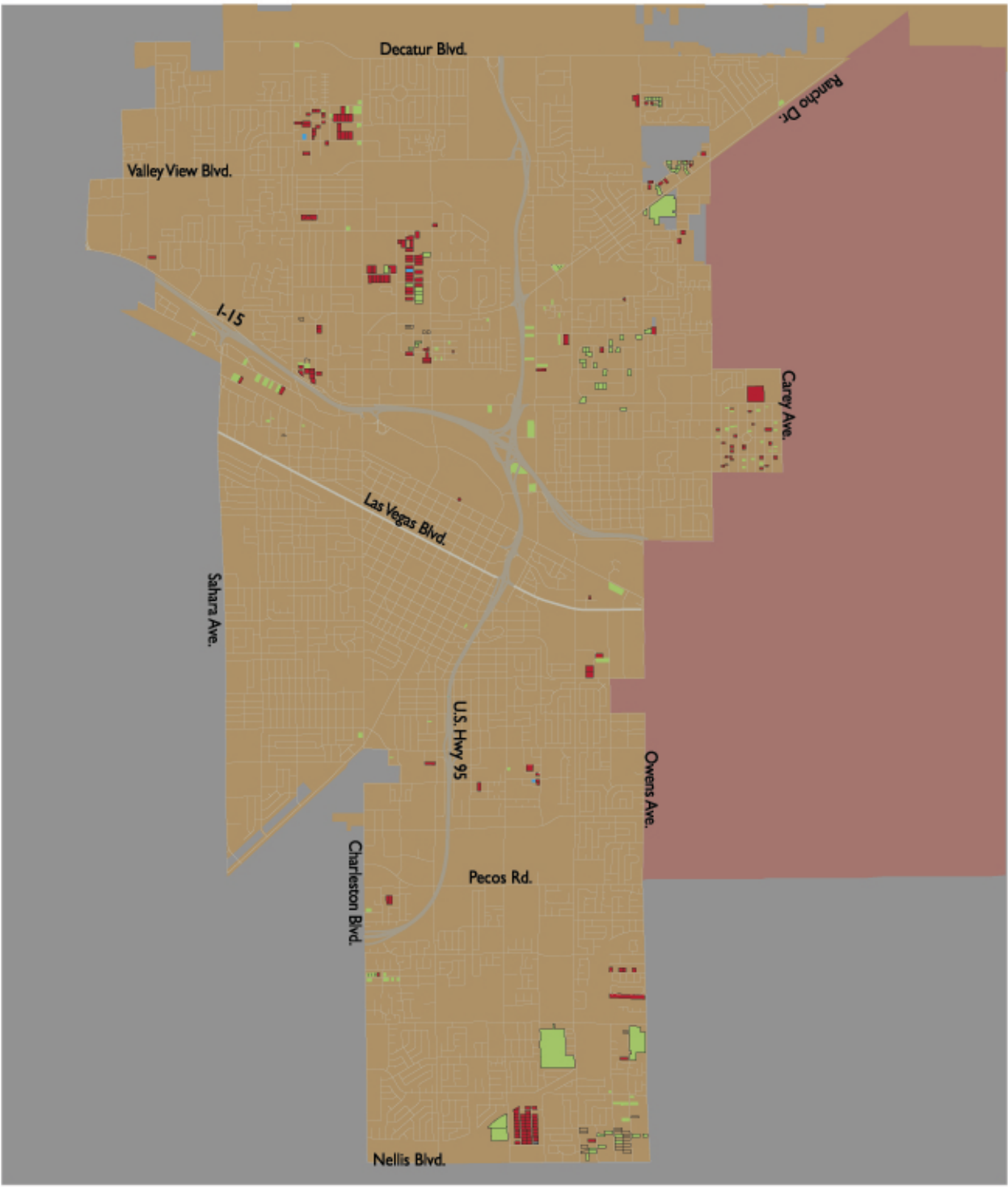
CITY of LAS VEGAS

SOUTHEAST AREA SEPTIC TANK LOCATIONS



Map 3A

- City of Las Vegas
- North Las Vegas
- Clark County
- Active Septic Tanks
- Inactive Septic Tanks
- Expired Septic Tanks



Adopted by City Council 6-01-05

Source: City of Las Vegas
Planning and Development Dept.
January 16, 2002

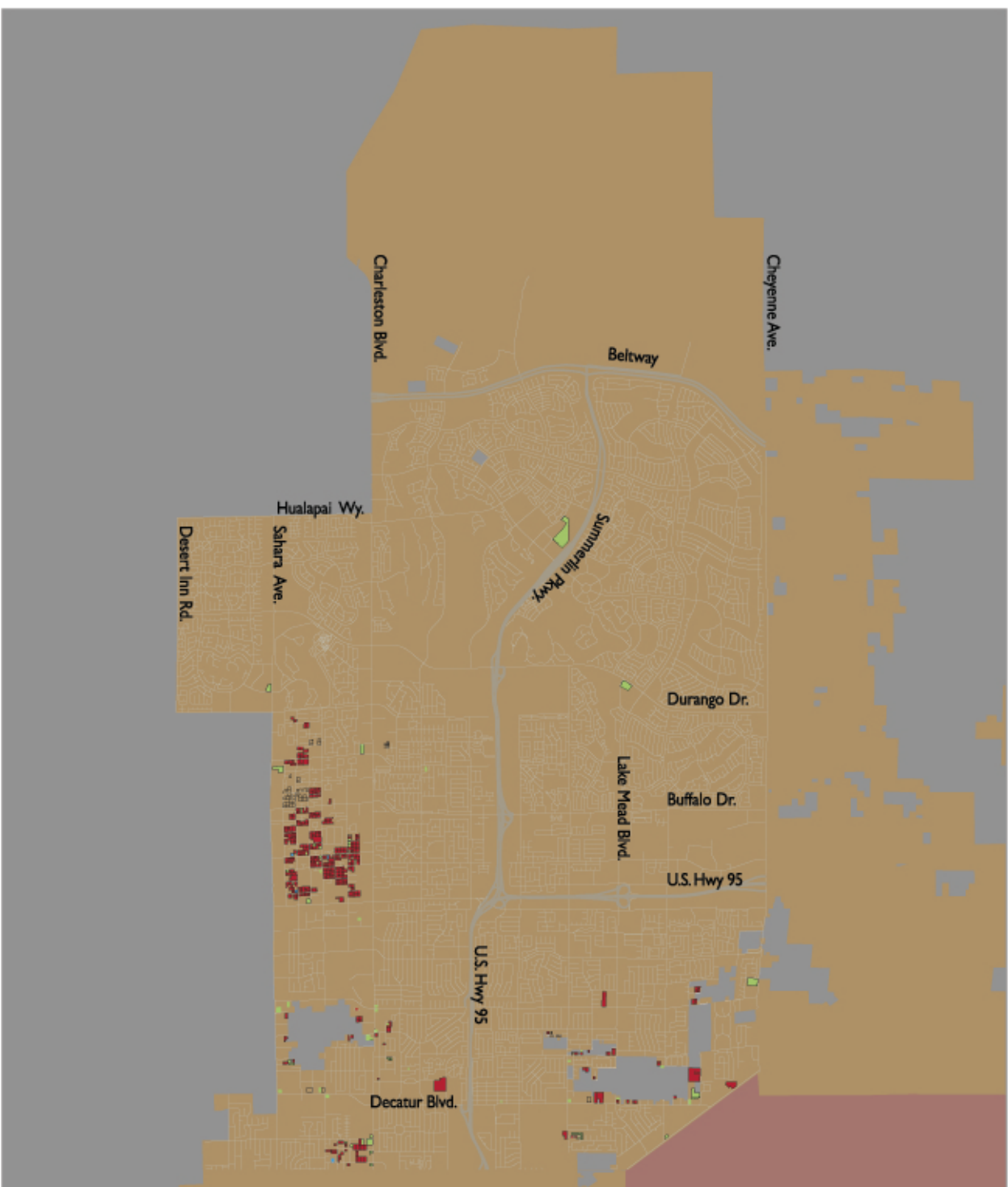
or see map at: www.lasvegas.gov



CITY of LAS VEGAS SOUTHWEST AREA SEPTIC TANK LOCATIONS

Map 3B

- City of Las Vegas
- North Las Vegas
- Clark County
- Active Septic Tanks
- Inactive Septic Tanks
- Expired Septic Tanks



Adopted by City Council 6-01-05

Source: City of Las Vegas
Planning and Development Dept.
January 16, 2002

on new report, March 15, 2011 2015



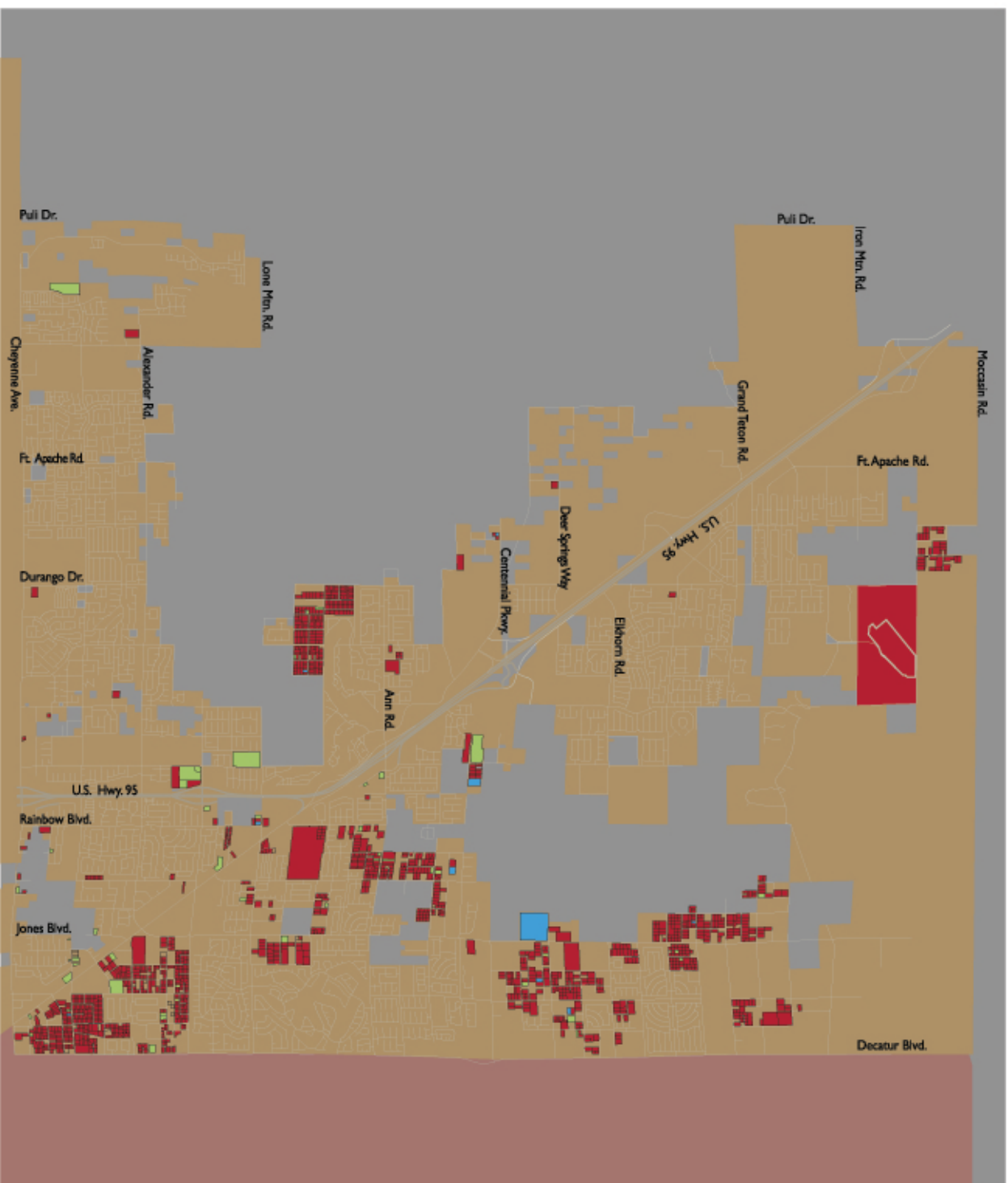
CITY OF LAS VEGAS

NORTHWEST AREA SEPTIC TANK LOCATIONS



Map 3C

- City of Las Vegas
- North Las Vegas
- Clark County
- Active Septic Tanks
- Inactive Septic Tanks
- Expired Septic Tanks



Adopted by City Council 6-01-05

Source: City of Las Vegas
Planning and Development Dept.
January 16, 2002

www.cityoflasvegas.com



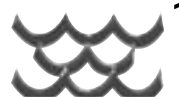
1,120 acre-feet per year (AFY) of reclaimed water to an adjacent park and golf course. The Northwest Water Resource Center (Map 4), a 10-MGD satellite reuse facility, became operational in July 2001. It will ultimately be capable of providing more than 11,200 AFY of reclaimed water to golf courses, schools and parks. Total reuse for the city of Las Vegas in 2003 was about 6,400 acre-feet.

While reclaimed Colorado River water has distinct advantages in terms of environmental sustainability and lower costs, additional reuse does not extend Southern Nevada's Colorado River allocation. For this reason, the city will continue to work with the Clean Water Coalition, LVVWD, SNWA and other entities to identify opportunities for future reclaimed water use, while optimizing Southern Nevada's access to Colorado River supplies.

ROLE OF THE CITY

The city of Las Vegas is served by the Las Vegas Valley Water District (LVVWD), the largest municipal water purveyor in the state of Nevada. The LVVWD also provides water service to portions of unincorporated Clark County. The city of Las Vegas operates and manages its own wastewater agency. In its wastewater role, the city of Las Vegas is a member agency of the Southern Nevada Water Authority (SNWA), the entity responsible for developing and managing regional water resources, regional water treatment and delivery infrastructure, and conservation programs. In its wastewater role, the city also participates in regional planning activities related to flood control, prevention of erosion and the preservation of wetlands along the Las Vegas Wash. Although not specifically responsible for the development, treatment or delivery of drinking water supplies, the city of Las Vegas plays a crucial role in the conservation and management of its citizens' water supply. Existing and future policies governing land use and building development, including landscaping, can strongly influence the community's water use and must be designed with this influence in mind.

The city of Las Vegas encourages water conservation through the implementation of ordinances, based on the SNWA Drought Plan. These ordinances are crucial to successful conservation because they effectuate the provisions of the Drought Plan. The city also plays a key role in water conservation through its role as a provider of reuse water and a supporter of municipal sewer systems for new development, wherever possible.



EXISTING EFFORTS/POLICIES

CITY OF LAS VEGAS ZONING ORDINANCE

With increasing demands on water supplies in the city of Las Vegas, efforts to reduce per capita consumption are a priority. One of the best opportunities for water conservation is the implementation of water-efficient landscaping design and management. To address this, the city of Las Vegas has enacted a turf limitation ordinance⁵, included within the Las Vegas Zoning Code (Chapter 19.12.030.H), to reduce the amount of turf that may be used in new residential (50% maximum for single-family front yards and 30% for multi-family landscapable area) and commercial/industrial (maximum 25% of total landscapable area) development. This section also limits turf on new golf courses to an average of five acres per hole, with an extra 10 acres for a driving range, and prohibits the use of turf for public facilities except for schools, parks and cemeteries. Procedures to enforce these landscaping conditions of development are delineated in chapter 19.00.70 of the Las Vegas Zoning Code. Although the city's development standards do not specifically recommend or discourage any specific types of plants or trees, prospective applicants are referred to SNWA for a list of appropriate types of drought-tolerant landscaping.

NORTHWEST WATER RESOURCE CENTER

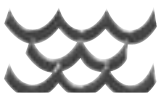
The city of Las Vegas Northwest Water Resource Center is the result of a partnership between the city of Las Vegas and the LVVWD. The LVVWD constructed and operates the recycled water distribution system, which is comprised of one main pump station, a storage reservoir, some 17 miles of pipelines, two remote booster-pumping stations, and four recharge wells. All treatment processes were specifically designed to be either underground or under cover, virtually eliminating the noise and odors typically associated with wastewater treatment. Residual solids are returned to the sewer system for treatment approximately 18 miles away, at the city of Las Vegas Water Pollution Control Facility located at 6005 East Vegas Valley Drive. The \$37 million Northwest Water Resource Center (Map 4) is one of the biggest public works projects ever undertaken by the city of Las Vegas and is built on a portion of a 100-acre city-owned parcel at 3271 North Durango Drive. The 13-acre facility is surrounded by 87 acres of recreational amenities. Groundbreaking ceremonies to start construction of the Northwest Water Resource Center were held March 3, 1999. The Center officially started service July 6, 2001 and can ultimately produce up to 10 million gallons of recycled water a day, which is enough water to fill 1,000 residential swimming pools a day. Currently, water from the Center is used to irrigate the following golf courses: Highland Falls, Eagle Crest, TPC at Summerlin, TPC at the Canyons, Badlands, Canyon Gate and Angel Park.

⁵ Adopted by city council through Ordinance 2002-87 on September 18, 2002.



*Worker checking engine machinery
at Water Pollution Control
Facility.*

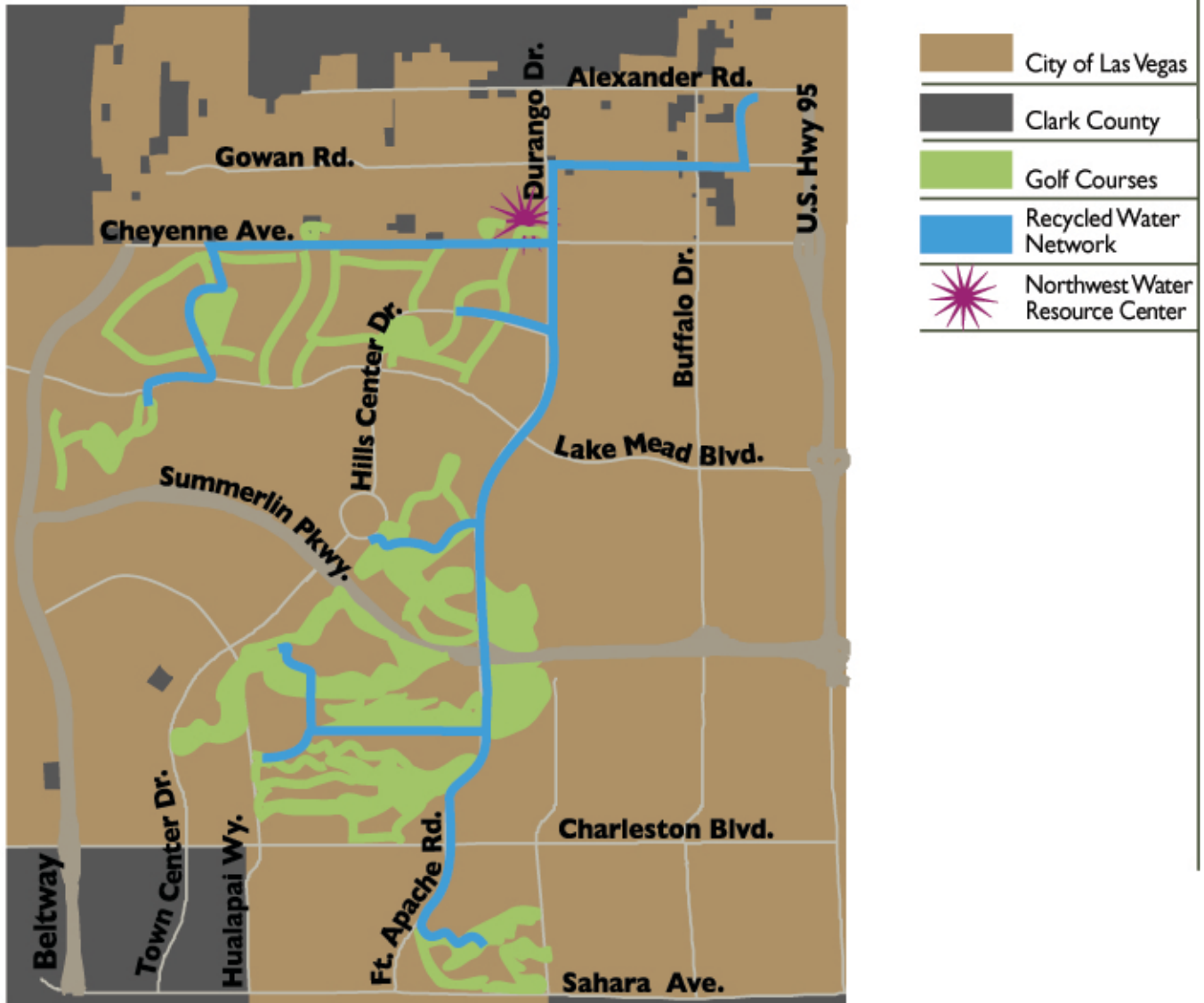
Courtesy of CLV Public Works.



RECYCLED WATER DISTRIBUTION SYSTEM



Map 4



Adopted by City Council 6-01-05

Source: Las Vegas Valley Water District
January 2002



LAS VEGAS SPRINGS PRESERVE

The Las Vegas Springs Preserve is 180 acres of historic land that is owned by the Las Vegas Valley Water District (LVVWD) and located just west of downtown Las Vegas. Historically known as "Big Springs," the area is one of the richest and most unique cultural and biological resources in Southern Nevada. The city has partnered with the LVVWD to receive \$35 million in funding through the Southern Nevada Public Lands Management Act for development of the Preserve. As the site's owner and steward, the Las Vegas Valley Water District is working with the Springs Preserve Foundation to protect the area and create a community gathering place—a gateway through time where people can learn about the valley's rich history and explore methods to ensure sustainability for our future. The future Preserve will include museums, gardens, walking paths and restored structures that recreate the story of Las Vegas' past. The site is scheduled to open to the public in 2006.

KYLE CANYON GATEWAY POLICIES

The Kyle Canyon Gateway (KCG) development plan is intended to promote sustainable development practices, a significant part of which deals with water conservation. At a charrette held on November 6 and 7, 2003, the KCG meeting group indicated that water use in KCG could be reduced to 150 gallons per person per day (50 % of the Las Vegas area average) through efficiency, education and water-use restrictions. In order to achieve this goal, the KCG charette meeting group recommended the following policies:

All community-wide, public landscape irrigation is plumbed for recycled water, using potable water until such time as recycled water becomes available from a future northwest reclamation facility. This system will require a higher cost of infrastructure due to the additional piping. However, it will realize significant life-cycle savings by reducing the amount of water purchased, the amount of water treated to drinking water standards and the cost of energy required to pump the water from Lake Mead;

Provide a central control irrigation system linked to an on-site weather station to improve irrigation efficiency;

Provide low flow water fixtures that meet national low flow water standards;

Comply with current city of Las Vegas landscaping guidelines and other drought restrictions.

Elimination of irrigation runoff on streets and sidewalks;

All water softeners shall use potassium chloride.



VALLEY-WIDE REUSE PLANS

The cities of Las Vegas, North Las Vegas and Henderson, the Clark County Water Reclamation District and the LVVWD completed an Area Wide Reuse Study for the Las Vegas Valley in July 2000. Opportunities for additional satellite reuse facilities were identified in North Las Vegas, the northwest area of the city of Las Vegas and in the southwest area of Clark County near Henderson. The agencies are evaluating these opportunities to determine which projects might be the next most likely projects for development. Henderson, the Clark County Water Reclamation District and the LVVWD jointly explored a site feasibility study in the southwest area of Clark County. This study, also completed in 2000, identified several locations for possible future satellite facilities in the valley, which are being considered independently by the Clark County Water Reclamation District and Henderson.

New technologies are also becoming available which allow individual property owners to reuse water for irrigation and other non-potable uses. This reuse includes gray water reclamation systems, which includes the reuse of water from sources such as sink drains, dishwashers and washing machines for irrigation purposes.



1975 flood in Flamingo Wash under Caesar's Palace parking lot.

FLOOD CONTROL

BACKGROUND

In terms of flood control, prevention of erosion and wetland management, the Clark County Regional Flood Control District (CCRFCD) is the authority responsible for the development of facilities to manage storm water and its impacts. Historically, storm run-off in the Valley followed natural intermittent watercourses called washes, with all Valley runoff draining into Lake Mead through a few major wash systems. As urbanization and related construction activities occurred in the Valley through the 1970s and early 1980s, the effect on these wash systems was dramatic, as increased storm flow rates increased erosion and siltation within these wash systems. Another major issue is the preservation of wetlands along the Las Vegas Wash. Although only a small percentage of the water in Lake Mead comes from the Las Vegas Wash, it is home to a variety of animal species and plays a major role in preserving water quality in the lake.

The Clark County Regional Flood Control District (CCRFCD) was established in 1986 as a result of major flood events during the 1970s and early 1980s that were attributable to the increasing pace of urbanization in the Valley. The mandate for this agency was the prevention of loss of life and property, disruption of commerce,



Table 1: Conveyance and Basin Statistics within the Las Vegas Valley

	Completed	%	Construction	%	10-Year (First 5)	%	10-Year (Second 5)	%	Proposed	%	Total
Conveyances (Miles)	378.71	49.7	30.31	4.0	32.57	4.3	21.99	2.9	298.28	39.1	761.94
Basins	51	56.7	4	4.4	8	8.9	3	3.3	24	26.7	90
Basin Area (Acres)	26,967.50		1,234.00		1,138.90		542.00		14,711.50		44,593.90

Source: Clark County Regional Flood Control District, March 21, 2005

Table 2: Conveyance and Basin Statistics within the City of Las Vegas

	Completed	%	Construction	%	10-Year (First 5)	%	10-Year (Second 5)	%	Proposed	%	Total
Conveyances (Miles)	84.65	47.9	4.44	2.5	8.80	5.5	10.34	5.9	68.41	38.7	176.64
Basins	13	61.9	2	9.5	1	4.8	0	0	5	23.8	21
Basin Area (Acres)	6,878	895.00			250.00		0		3,310.00		11,333.00

Source: Clark County Regional Flood Control District, March 21, 2005

interruption of transportation and communication and waste of water resulting from floods, and furthering the conservation, development, utilization and disposal of water (Map 5). This agency was funded through the imposition of a 0.25-cent sales tax that same year. The CCRFCD adopted a Flood Control Master Plan in 1987. This Master Plan, which is updated at five-year intervals, provides the policy basis for the development of capital projects to control floods and erosion. The actual project programming and capital priorities are updated annually within a ten-year timeframe. (See Tables 1 and 2)

Since its inception, the CCRFCD has constructed some 239 miles of storm drains and channels throughout the Valley, with another 23 miles currently under construction (Map 6). When referring to this map, it should be noted that some of these storm facilities appear to be isolated or disconnected from the overall system. This is due to the fact that, as developments are constructed, storm drains may be installed for lands within these developments that then utilize surface streets as drainage courses downstream. As development continues to occur, drainage constructed to serve other private developments, as well as RTC, CCRFCD and city projects, will provide additional drainage infrastructure that will connect these isolated drainage sections in the future.



July 1999 street flood at 4th Street and Gass Avenue in downtown Las Vegas.

The CCRFCD ten-year plan calls for an additional 70 miles of storm drains and channels over the first five years and another 63 miles in the second five years. Another 183 miles of storm drains and channels will be needed beyond the ten-year plan.

As of July 2004, there are 65 detention basins and approximately 374 miles of channels and storm drains on-line throughout Clark County. To date, 38 square miles or 24,562 acres have been removed from federally identified FEMA flood zones.



WATER ELEMENT

The Regional Flood Control District anticipates another 25-30 years of construction before all Master Plan channels, storm drains and detention basins have been built. Another 62 detention basins are planned, along with 460 more miles of conveyance. Another \$1.7 billion dollars remains to be funded.

The purpose of the basins is to manage runoff by detaining storm flows within the basins and allowing the water to drain at predetermined rates. The intent is to reduce or eliminate floodwater damage to property within the Valley and to greatly reduce the amount of erosion and consequent siltation within Lake Mead and the wetland areas around Lake Las Vegas at the outlet of the Las Vegas Wash system.



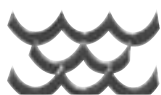
Channelized portion of Las Vegas Wash.

In order to illustrate the task faced by the CCRFCD, Map 5 depicts special flood hazard areas within the Valley. These areas are 100-year Federal Emergency Management Agency (FEMA) flood zones (that is, areas that would flood due to a storm severe enough to cause a flood which only has a 1% chance of being equaled or exceeded in any given year). Such areas are identified by the FEMA as Zone A flood zones, and are calculated based on local hydrology, topology, precipitation patterns, flood protection measures such as levees, detention basins, and a range of other scientific data.

ROLE OF THE CITY OF LAS VEGAS

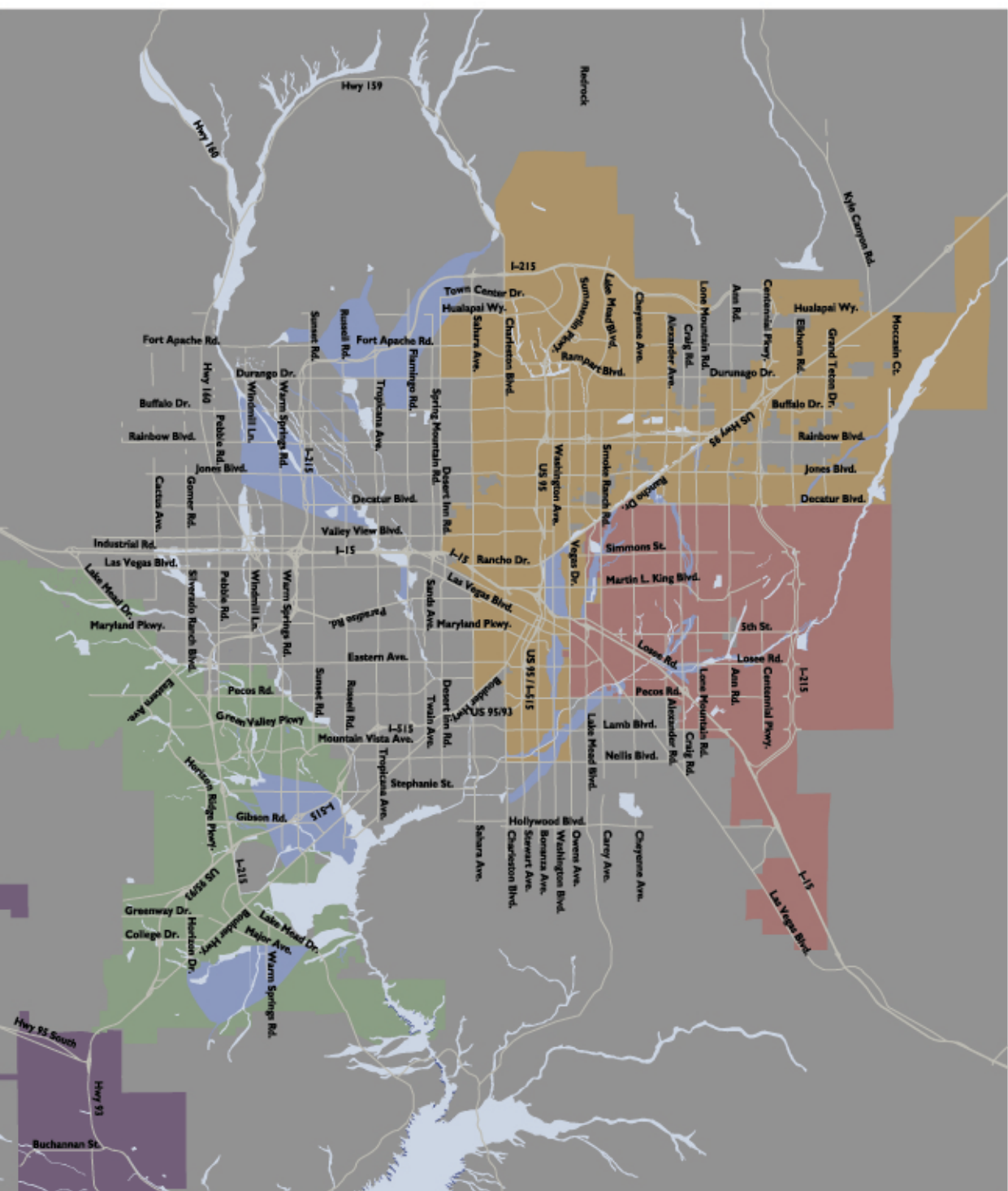
The city's Public Works Department reviews development applications to ensure that new development and redevelopment contains infrastructure to control storm flows and integrates with regional flood control systems.

The Public Works Department manages the National Pollutant Discharge Elimination System (NPDES) program which implements the 1990 Clean Water Act. The NPDES mandates that plans and programs for storm water management be developed, adopted and implemented to assure that municipalities "effectively prohibit non-storm water discharge into the storm drain and require controls to reduce the discharge of pollutants from storm water systems to waters of the United States to the maximum extent possible." The Public Works Department Environmental Division received the Association of Metropolitan Sewerage Agencies 2002 Peak Performance Award, a recognition presented to individual member facilities for outstanding compliance with NPDES permit limits.



FLOOD ZONES

Map 5



- City of Las Vegas
- Henderson
- North Las Vegas
- Boulder City
- Clark County
- 100 Year Flood Hazard Area
- 500 Year Flood Hazard Area

Adopted by City Council 6-0-105

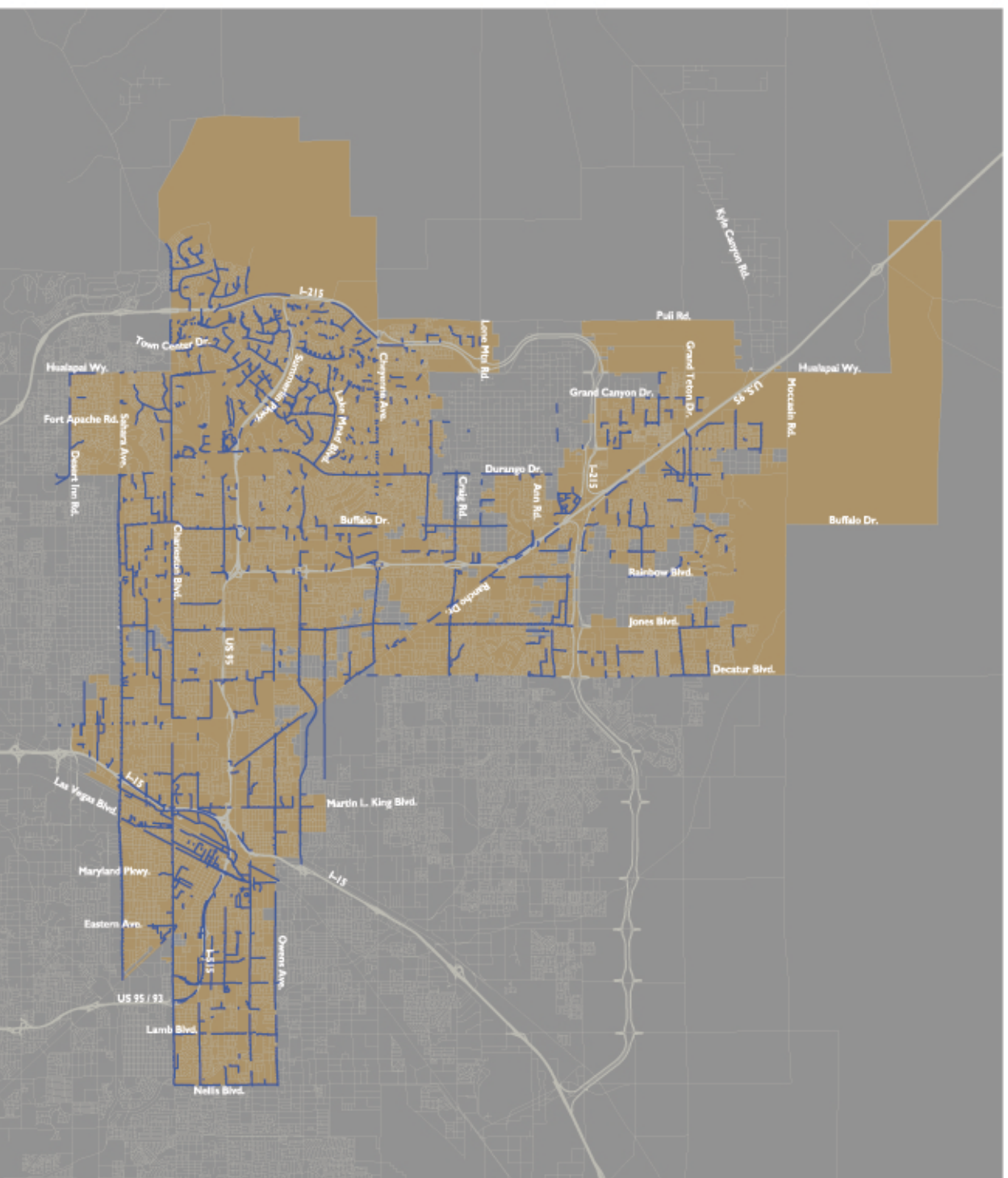
Source: Clark County Regional Flood Control District
March 24, 2005



CITY of LAS VEGAS STORM DRAINAGE SYSTEM

Map 6

- City of Las Vegas
- Clark County
- Existing Local Storm Drains



Adopted by City Council 6-01-05

Source: City of Las Vegas Public Works Dept.
March 24, 2005

City of Las Vegas Public Works Dept.



EROSION CONTROL AND WETLAND MANAGEMENT

BACKGROUND

In January of 2000, the Las Vegas Wash Coordination Committee, of which the city of Las Vegas is a participant, produced the Las Vegas Wash Comprehensive Adaptive Management Plan. Among the issues addressed in this plan are the protection of the water quality of Lake Mead, sustaining wetlands, and return flow credits. Although the Wash provides only about two percent of the water inflow to Lake Mead, it is the primary outlet for water flows from the metropolitan Las Vegas Valley. These flows are comprised of storm water, treated wastewater, landscape and surface street runoff, and intercepted shallow ground water. Although treated wastewater is generally the largest component, the occasional periods of storms can result in massive amounts of water flow leading to erosion, headcutting (a form of upper-channel erosion), and loss of habitat and infrastructure.



Growth in Las Vegas Wash.

Large portions of the highly treated waste water that is returned to the Wash provides valuable return flow credits that increase the amount of water that the State of Nevada can divert from Lake Mead. These credits are a major component of southern Nevada's long term resource planning.

ROLE OF THE CITY OF LAS VEGAS

The city of Las Vegas views the Las Vegas Wash not only from the perspective of its role as a drainage system, but also for the role it can play as a recreational and visual amenity when retained in its natural condition and sensitively integrated with new urban development. Therefore, the city is proposing to construct a multi-use transportation trail and trailhead facilities adjacent to the wash which will eventually connect to the Clark County Wetlands Park. The Las Vegas Wash Trail will provide a significant portion of the Valley's alternative transportation route inventory. Through its connection to the Wetlands Park, the trail will provide access to the Lake Mead Recreational Area, the River Mountains Loop Trail and the Rainbow Gardens Geological Preserve. The city will be receiving over \$15 million in funding through the Southern Nevada Public Lands Management Act (SNPLMA) for improvements related to the Las Vegas Wash Trail.



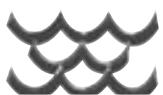


Water runoff from Water Pollution Control Facility entering Las Vegas Wash. Courtesy CLV Public Works Dept.

The city has representatives who sit on the Las Vegas Wash Coordination Committee and the Lake Mead Water Quality Forum. These bodies benefit water quality and the environment of the Las Vegas Wash watershed. The city also participates in the Las Vegas Valley Storm Water Quality Management Committee. This Committee provides a forum for the Clark County Flood Control District to work with the Valley entities as co-permittees in complying with EPA requirements for a National Pollutant Discharge Elimination System (NPDES) Permit.



Northwest Water Resource Center located at Cheyenne and Durango with Palm Valley golf course Sun City in the background. Courtesy CLV Public Works Dept.



OBJECTIVES AND POLICIES

IMPLEMENTATION STRATEGY

This element addresses a broad range of issues related to water, including water supply, water quality, wastewater, and drainage/flood control. These issues are addressed in objectives and policies that seek to ensure that the city will have sufficient supplies of good quality water to address the city's future development needs. The administration of these objectives and policies will require continued cooperation among the city, its residents, and other local entities responsible for water conservation, flood control, and erosion control and wetland management.



Canyon Gate Golf Course uses reclaimed water.

WATER SUPPLY

Objective 1: To ensure the adequacy and support improvements to the city's water supply.

Policy 1.1: The city shall support regional cooperation and communicate regularly with other jurisdictions on sustainable use of potable and non-potable water resources.

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

Policy 1.2: As needed, the city shall provide assistance to the Southern Nevada Water Authority and its member agencies in their regular assessments of currently available and forecasted water supplies.

Policy 1.3: The city shall support and participate in regional processes related to land-use planning, development codes or similar efforts that can influence long-term demands on resources (for example, Southern Nevada Regional Planning Coalition), while ensuring that new or expanded services do not adversely affect existing water users.

DISCUSSION: Effective land-use planning is key to a sustainable water future for the city. While the city accepts new growth and development as an important part of its future, that future can be assured only if land use is optimized, thereby optimizing the efficient use of available water resources.

Policy 1.4: The city shall support regional educational/public relations programs emphasizing the importance of water conservation and water-efficient landscaping.

DISCUSSION: While there are a number of water resources available to Southern Nevada, water conservation is critical to managing demand. While not a purveyor of water, the city is in a position to play a major role in achieving conservation goals by supporting conservation and drought response rules of the LVVWD, which implement the regional conservation and drought response policies of the SNWA.

Policy 1.5: The city shall continue to implement the turf limitation provisions of the Zoning Ordinance, which reduce the amount of turf that may be used in new residential (50% maximum for single-family front yards and 30% for multi-family landscapable area) and commercial/industrial (maximum 25% of total landscapable area) development. The Zoning Ordinance also limits turf on new golf courses to an average of five acres per hole, with an extra 10 acres for a driving range, and prohibits the use of turf for public facilities except for schools, parks and cemeteries. Procedures to enforce these landscaping conditions of development are delineated in chapter 19.00.70 of the Las Vegas Zoning Code. Although the city's development standards do not specifically recommend or discourage any specific types of plants or trees, the SNWA maintains a list of appropriate types of drought-tolerant landscaping.



Policy 1.6: The city shall support initiatives for the recycling of gray water for non-potable uses and shall study the potential of providing incentives to developers and property owners for the installation of on-site recycled water reclamation systems. Recycled water systems include the reuse of water from sources such as sink drains, dishwashers and washing machines for irrigation purposes.

DISCUSSION: While the increased use of reclaimed water does not currently extend Southern Nevada's available Colorado River supply, reclaiming or recycling of non-Colorado River water may prove beneficial in the future. Given the influence of wastewater on Southern Nevada's available supply, it is important for the Clean Water Coalition and SNWA to continue sharing information with one another, particularly as it relates to water recycling and reclamation initiatives.

Policy 1.7: The city shall support efforts to maximize water reclamation and aquifer recharge efforts by both the public and private sectors, where such efforts are not likely to result in excessively high groundwater tables. The city shall support the protection of groundwater by limiting the locations of potential pollution sources from areas of groundwater recharge and pumping.

WATER QUALITY

Objective 2 To ensure the adequacy and support improvements to the city's water quality.

Policy 2.1: The city shall coordinate with the LVVWD to undertake improvements to the pressure and quality of water service within the city, where necessary.

Policy 2.2: The city shall encourage further study of the potentially adverse affects of septic systems on shallow aquifer drinking wells, as well as the appropriate steps needed to ensure the protection of residents utilizing those resources.

DISCUSSION: Over the years, the development pattern of the city has become integrated with unincorporated Clark County lands, particularly in the northwest part of the Valley, where the density of septic tanks, according to county statistics, is about 119 per square mile, and in some areas exceeds 300 per square mile. Residential development on lands serviced by septic tank systems, over time, can degrade and pollute shallow groundwater resources (Map 7). This is borne out by Clark County statistics, which demonstrate elevated levels of bacteria and sediment in some shallow groundwater aquifers. Although only a small percentage of the city's potable water comes from shallow groundwater wells, it is important to assure the quality of these limited resources into the future.

Policy 2.3: The city shall continue to enforce the Nevada Administrative Code (NAC 444.786) requiring new development to connect to public sewer whenever public sewer is available within 400 feet of the nearest property line and can be reached by gravity flow. The city shall also continue to enforce NAC 278.460 requiring subdivisions having density of two or more dwelling units per acre to connect to public sewer when public sewer is available within the distance determined by multiplying the number of single family dwelling units by 100 feet.

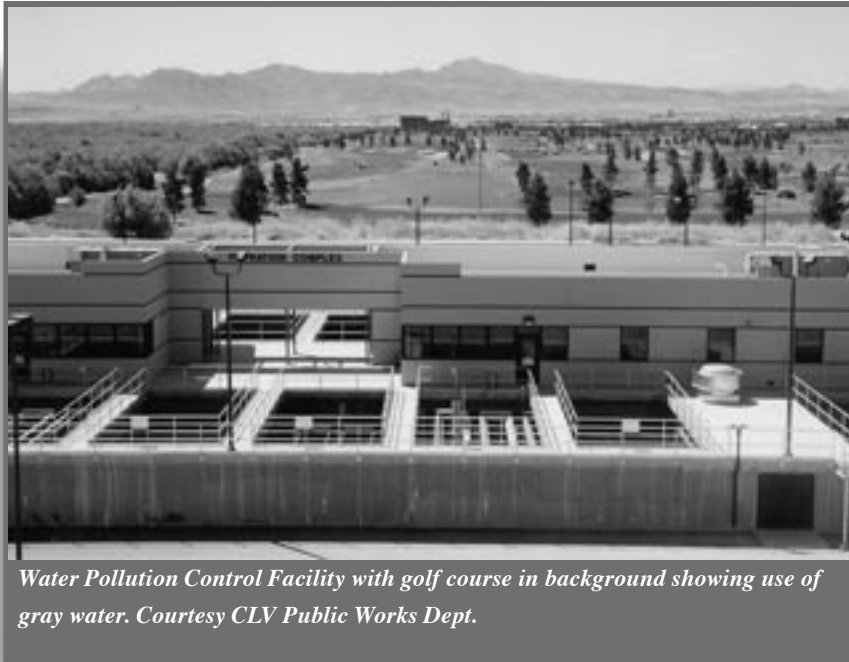
Policy 2.4: The city shall encourage the preservation and restoration of the area's washes to assist in natural groundwater recharge.

Policy 2.5: The city shall continue to participate in the National Pollutant Discharge Elimination System (NPDES) stormwater program

WASTEWATER

Objective 3: To ensure the safe and economic disposal of wastewater generated in the city.

Policy 3.1: The city shall ensure that as new subdivision development occurs, a comprehensive network of wastewater collection lines is provided by requiring the installation of sewers in all new subdivisions.



FLOOD CONTROL / DRAINAGE

Objective 4: To ensure that all areas of the city of Las Vegas are protected against flooding and to ensure that physical infrastructure is in place that will divert storm flows to appropriate, purpose-designed storm channels.

DISCUSSION: The CCRFCD is the principal authority in the Valley charged with the development of the Regional Flood Control Master Plan and provides funding to the city for the design, construction and maintenance of facilities included in the Master Plan. The city owns the facilities (Map 8) and is responsible for ensuring that they function as designed. The city is also responsible for ensuring that new urban development that occurs in the western and northwestern portions of the city incorporates adequate flood control measures and is connected to these flood control systems. The city has developed and maintains some facilities, such as the Gowan Detention Basin, which also perform a secondary recreational function as recreation facilities.

Policy 4.1: The city shall continue to require developers to construct local storm drains in accordance with applicable storm water master plans.

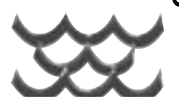
DISCUSSION: In the older parts of the city, surface roads are used to convey floodwaters downstream. However, since approximately 1996, underground storm drains have been required as a component of new development, pursuant to storm water master plans that the city has developed. Although it does add to the overall cost of development, the use of these underground systems in conjunction with detention basins is effective in not increasing the storm water loading on downstream surface streets.

Policy 4.2: Since arroyos, washes and watercourses in their natural state represent visual and possible recreational amenities for adjacent neighborhoods, such areas should not be rechanneled or replaced with concrete structures except where required for bank stability or public safety. Where possible arroyos, washes and watercourses throughout the city should be integrated with urban development in a manner that protects the integrity of the watershed and minimizes erosion.

Policy 4.3: The city shall manage flood control and drainage facilities to have minimal impact on natural washes and their associated habitat.

Policy 4.4: The city shall require property owners to properly maintain wash corridors on privately-owned land, and shall require appropriate easements for such purposes as a condition of development.

Policy 4.5: The city shall continue to work to preserve the Las Vegas Wash by maintaining natural features in all areas of work or construction within the city portions of the Wash. The city should work with the Regional Flood Control District to ensure that natural features are not, unless dictated by physical necessity, replaced with concrete flood channels. Natural features shall be privately maintained. In areas planned for urban development along washes, setbacks from the washes should be implemented to minimize the need for channel reconstruction and to provide a valuable open space amenity.



WATER ELEMENT

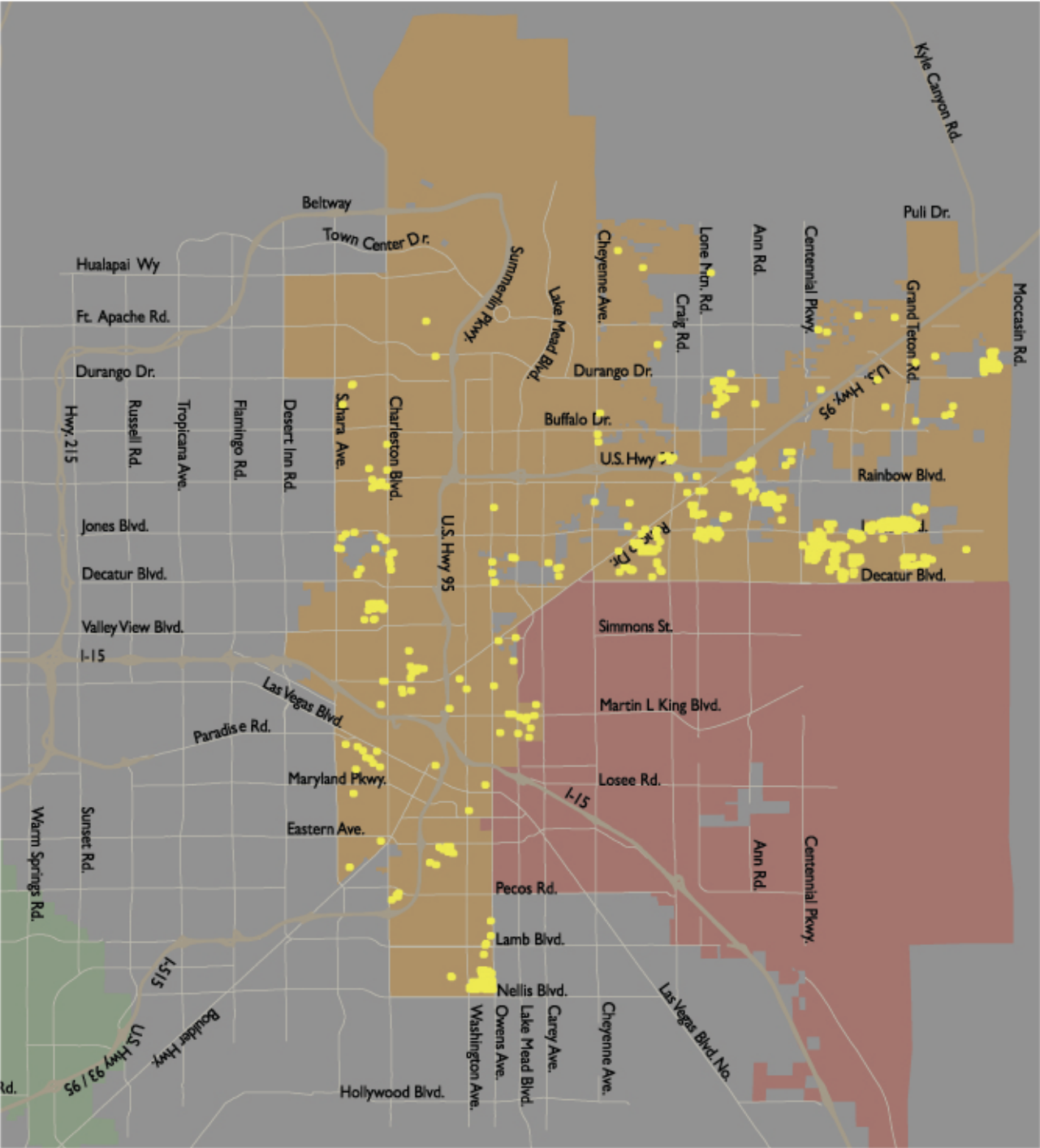
Objective 5: To ensure that development is designed to include measures to mitigate the impact of periodic flooding on those structures.

Policy 5.1: The city shall support the recommendations of the Las Vegas Wash Coordination Committee by ensuring that development within tier one (one-half mile of the Wash) incorporates appropriate drainage facilities and/or design to mitigate any negative impact on the Wash.

DISCUSSION: The Land Use Study Team of the Las Vegas Wash Coordination Committee developed a three-tier system for addressing land use issues along the Wash. Tier one is a half-mile zone in each direction extending the length of the Wash. This zone is obviously the most important as it has the greatest direct impact on the Wash. Tier two is the land above the shallow aquifer. This area is important as land use practices allowing access to the shallow aquifer may eventually impact the wash as intercepted shallow ground water. The Bureau of Land Management (BLM) disposal boundary delineates tier three because within it is the entire developable area of the Valley. The land use study team recommends that all land use decisions consider watershed management.



Flood detention basins at Gowan Road and Tenaya Way serve a secondary function as soccer fields.



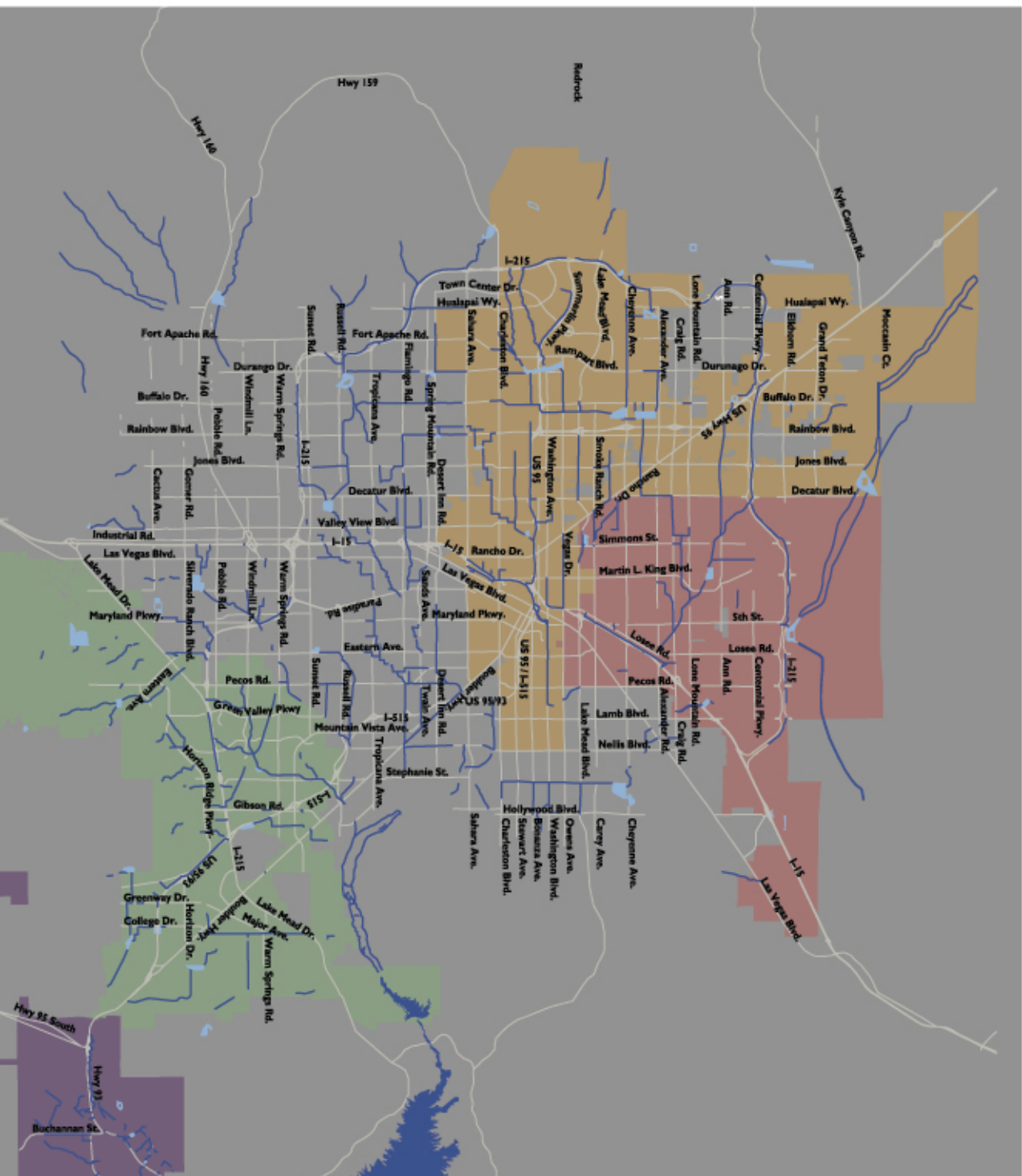
SHALLOW WELL LOCATIONS

Map 7

- City of Las Vegas
- Henderson
- North Las Vegas
- Clark County
- Private (non-municipal) Permitted and non-permitted (domestic) Wells

REGIONAL FLOOD CONTROL FACILITIES

Map 8



- City of Las Vegas
- Henderson
- North Las Vegas
- Boulder City
- Clark County
- Flood Control Basins
- existing
- Flood Control Channels
- existing

Adopted by City Council 6-01-05
Source: Clark County Regional Flood Control District
March 24, 2005

