CHAPTER 4: RESOURCES

Deterioration of the environment as a consequence of population growth, urbanization, industrialization, improper disposal of solid waste, resource exploitation, and technological developments has been a growing concern worldwide. An additional influence has been a realization of the finite nature and rising costs of energy, water, and other natural resources. On a national and state level it has given rise to policies and controls dealing with air, water, noise pollution, and other forms of degradation of the natural environment as well as the regulation of energy production and waste.

At a local level, urban growth has consumed significant land areas in the past and is expected to continue in the foreseeable future as population continues to increase in the Surprise Planning Area.

The goal of the Resources chapter is to minimize the impact of urbanization on the natural environment and to maintain, protect, and enhance the natural resources in our community. The challenge in Surprise is to achieve a more sensitive balance, repairing damage already done, restoring some natural amenities to the City, and bringing about productive harmony between people and the environment.

This chapter addresses the conservation and management of energy and water in the residential, commercial and transportation sectors. An important piece of the planning process is to give natural environmental amenities appropriate consideration in urban development along with economic and social considerations.

Chapter 4: Resources

CONTENT

EXECUTIVE SUMMARY

This chapter includes four state mandated elements: Environmental Planning, Conservation, Energy, and Water Resources. This chapter focuses on preserving and protecting the environment and natural resources that contribute to the community's quality of life.

The Environmental Planning element is based upon the premise that the existing natural environment possesses its own inherent values and qualities that should be preserved.

The Conservation element is based upon the premise that the existing natural environment possesses its own inherent values and qualities that should be preserved. The role of the conservation element is to help identify limitations and opportunities, and define various policies and implementation measures by which these natural resources can be conserved within the Surprise Planning Area.

The water supply and quality within the City is one of the key elements for maintaining sustainable growth and allowing the City to achieve its development goals. The Water Resources element presents a plan for providing Surprise's residents and businesses with a safe, reliable, and high quality source of water through 2035 and beyond.

The Energy element discusses the importance in reducing energy usage in housing, commercial structures, public facilities, and transportation. A reduction in usage will help maintain local economic vitality and reduce the need for new infrastructure investments to deliver energy to the City.

Environmental Planning Element

INTRODUCTION

Examining the City's natural environment is a classic early step in preparing or revising a general plan. Information about environmental hazards such as floods, subsidence, resources including mineral deposits, and natural phenomena such as critical habitats can help determine the suitability of the lands for development. Population growth and subsequent development continually require the use of finite non- renewable resources as well as those that are renewable. One role of this section is to reconcile conflicting demands on these resources.

The comprehensive, integrated, and long-term nature of the Surprise General Plan 2035 makes it an ideal vehicle for implementing local sustainable goals. As Surprise grows and develops, continued protection of the environment is necessary to maintain the quality of life and the natural functionality of the environment that is currently enjoyed in Surprise. The environmental planning element is based upon the premise that the existing natural environment possesses its own inherent values and qualities that should be preserved. In the context of local planning, conservation is a positive action to assure that as build-out of the community continues to occur as envisioned by the Surprise General Plan 2035, related physiographic, hydrological, biological, and cultural resources are not lost or permanently altered to the detriment of the natural environment that we all share and enjoy. Correspondingly the role of the environmental planning element is to help identify these limitations and opportunities and define various policies and implementation measures by which these natural resources can be conserved within the Surprise Planning Area. Surprise's environmental heritage includes non-renewable resources such as extensive undisturbed natural areas, scattered historic/archaeological sites, and natural landmarks. As irreplaceable resources they warrant preservation from destruction or harmful alteration.

DISCUSSION

Air Quality

In addition to being a regional issue of significance, air quality is vital to the overall health of the environment and the attractiveness of any locality. In recent years on-road and non-road emissions have been decreasing in the region. These reductions are primarily due to the replacement of older, high-polluting vehicles and equipment with new models that meet more stringent federal emission standards.

Two air pollutants of continuing concern areparticulate matter less than ten microns in diameter (PM10) and ozone (O3). There have been no violations of the standard for Carbon Monoxide (CO) since 1996. The Phoenix Metropolitan area is now considered a maintenance area for this pollutant.

Regulatory Setting

Criteria Air Pollutants: Federal, state, and local laws are the basis for controlling air pollution. The federal Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality standards for six common air pollutants also known as criteria air pollutants including ozone (O3), carbon monoxide(CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), suspended particulate matter (PM), and lead (Pb). The State of Arizona also utilizes these National Standards.

Toxic Air Contaminants: Unlike criteria air pollutants, ambient air quality standards have not been established for toxic air contaminants

(TACs). These pollutants are typically carcinogens, mutagens, or reproductive toxins and tend to be less commonly emitted than criteria air pollutants. Regulation of toxic air contami- nants is achieved through federal and state controls on individual sources. The preferred technique for reducing toxic air emissions is source reduction and identification of sensitive receptors.

Noise

Noise can be defined as a sound or series of sounds that are intrusive, irritating, objectionable, and/or disruptive to daily life. Noise varies widely in its scope, source, and volume, ranging from individual occurrences such as a barking dog or intermittent disturbances of overhead aircraft, to the fairly constant noise generated by traffic on highways. It is important to meas- ure the level of noise in the community as many uses are noise sensitive, such as residences, schools, churches, and hospitals. The known effects of noise on humans include hearing loss, communication interference, sleep interference, physiological responses, and annoyance. The purpose of this section is to set forth policies that regulate the ambient noise environment and protect residents from exposure to excessive noise.

Noise Sources and Projections

Future development within the Surprise Planning Area will result in new roads and increased traffic volumes, thus increasing the noise level in some areas. Increased traffic volumes on the highway will result in an increased noise exposure for all adjacent development. Additionally, continued growth of the City, residential as well as commercial and industrial uses, will further increase traffic and noise levels on arterial roadways.

The major sources of noise in Surprise throughout the Surprise General Plan 2035 timeframe include:

SR 303 & US-60

The predominant noise source in Surprise is motor vehicle traffic on SR 303 and US 60. Increased traffic on both these corridors can be expected to increase the noise exposure for sensitive receptors along these thoroughfares.

Arterial Streets

Major arterial streets with substantial noise levels include Bell Road, Sun Valley Parkway, 163rd Avenue, and Jomax Rd. In general, auto traffic volumes will increase by 2035, along with greater noise levels.

Railroad Noise

Surprise is traversed by two railroad alignments owned by the Burlington Northern and Santa Fe (BNSF). The two lines carry freight traffic through Surprise. The infrequency of the train activity results in loud, but sporadic noise events, and therefore, does not have a significant effect on overall noise levels in Surprise.

Luke Air Force Base

Luke Air Force Base (AFB) noise contours impact the southern portion of the Surprise Planning Area as well as around Auxiliary Field #1. Luke-based aircraft account for 97 per cent of flight operations at Luke's AFB airfield. Transient and deployed aircraft conduct the remaining three per cent of operations. The F-16 and F-35 are the principal aircraft operating at Luke AFB. A.R.S Sec. 28-8461 defines a "territory in the vicinity of military airports," within which the law requires disclosure to property owners that they are within the territory of a military airport, and the noise attenuation required for structures within the 65-decibel noise contour applies to entire area.

Source: "Air Installation Compatible Use Zone Study, Volume I", Luke AFB, AZ, November 2003.

Environment	Critical health Effect	Sound level dB(A)*	Time hours
Outdoor living areas	Annoyance	50 - 55	16
Indoor dwellings	Speech intelligibility	35	16
Bedrooms	Sleep disturbance	30	8
School classrooms	Disturbance of communication	35	During class
Industrial, commercial and traffic areas	Hearing impairment	70	24
Music through ear-phones	Hearing impairment	85	1
Ceremonies and entertainment	Hearing impairment	100	4

Table 4.1A - *Source: "Guidelines for Community News", World Health Organization, March 1999.*

Regulatory Setting

The federal government has no enforceable standards or regulations governing environmental noise levels. The Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978, provides a framework for the development of noise control programs through the Quiet Communities program. The state does not promulgate statewide standards for noise but ARS. 9-240 (B)(15)(b) prohibits the ringing of bells and blowing of horns related to frightening people and horses.

Solid Waste

Surprise's growth will increase the quantities of both non-hazardous and hazardous solid wastes generated in the area. An effective and comprehensive long-range waste management plan for the region will ensure that storage, collection, disposal, and recycling of wastes occur in an environmentally and economically acceptable manner. Residential solid waste pickup and disposal are the responsibilities of the City. Currently, commercial and industrial waste is handled by private haulers. Hazardous waste is handled by a private contractor who is certified to handle hazardous material. At this time Waste Management owns and operates the Northwest Regional landfill and contracts the operation of waste transfer stations that provide service to Surprise residents. On an average Surprise generates about 365,000 tons of garbage every year. With a capacity of 92,000,000 tons, the Northwest Regional landfill has sufficient volume to serve Surprise until approximately 2090.

Arizona Department of Environmental Quality regulates solid waste and disposal including:

- Assuring the proper handling, storage, treatment and disposal of wastes.
- Promoting pollution prevention and recycling.
- Responding to environmental emergencies.
- Reviewing and approving construction plans for landfills and special waste facilities.
- Investigating the complaints and violations for Arizona's solid and hazardous waste laws.

Recycling

Surprise annually contributes 7,000 tons of recyclable waste which is only about two percent of the total solid waste generated. Currently, Surprise offers the curbside recycling program as well as several drop-off sites around the City.

GOALS AND POLICIES

Goal 1: Natural Environment

Preserve and protect the natural environment to enhance the quality of life in Surprise.

Policies

1. Retain Surprise's aesthetic values and heritage of the Sonoran Desert.
2. Preserve significant features of Surprise's natural environment including, but not limited to, boulders, major washes, and high priority natural area open space.
3. Identify and protect historical and archeological resources.
4. Integrate environmental quality protection into all phases of local planning, policy, and development.

Goal 2: Air Quality

Promote local and regional efforts to improve air quality.

Policies

1. Reduce vehicle emissions through traffic management, mobility system improvements, and promotion of alternative modes of transportation.
2. Reduce emissions from City fleet vehicles.
3. Actively participate in discussions and decisions regarding coordination and funding of regional air quality improvements.
4. Comply with regional air quality standards.
5. Minimize non-indigenous vegetation that produces pollen.
6. Reduce dust and particulate air pollution created by manmade sources such as construction, maintenance, and vehicles.

Goal 3: Heat Islands

Identify and reduce heat islands.

Policies

1. Identify areas where livability and pedestrian use are impacted by the heat island effect and create strategies to mitigate such effects.
2. Incorporate development strategies that reduce the heat island effect including, but not limited to, vegetation, cool roofs, shade, paving materials, reduction of pavement, and other best practices.

Goal 4: Food Sources

Strive to provide access to healthy, local food resources.

Policies

1. Incorporate food sources including, but not limited to, gardens and neighborhood markets, into neighborhoods.
2. Identify opportunities and locations throughout the community for community gardens, farmers markets, and other local food sources.

Goal 5: Environmental Stewardship

Research, promote, and incorporate innovative policies and practices that support the City's leadership in environmental stewardship.

Policies

1. Provide the community with environmental education and involvement in stewardship opportunities.
2. Develop programs to attract environmentally sustainable industry to Surprise.

1. Support the purchase of products and services from locally owned businesses and the manufacture of local sustainable products.

Goal 6: Sustainable Development

Promote sustainable development.

Policies

1. Encourage green building principles like LEED (Leadership in Energy and Environmental Design) or Energy Star to create a healthy and sustainable building stock.
2. Create durable construction for the desert environment to provide options for adaptive reuse.
3. Promote creative passive solar site and building design strategies that recognize and respond to the Sonoran Desert climate.
4. Preserve, salvage, and/or restore native plants, wildlife habitat, and natural resources to maintain the biodiversity and long-term sustainability of the area's desert ecology.
5. Retain native and mature trees.
6. Protect and enhance the natural elements of all development sites.
7. Consider sustainable stormwater management measures in all development, including but not limited to vegetated roofs, pervious pavements, rainwater harvesting, and low impact development.
8. Discourage the use of invasive plants and support the removal of existing invasive species.

Conservation Element

INTRODUCTION

The conservation element is based upon the premise that the existing natural environment possesses its own inherent values and qualities that should be preserved. In the context of local planning, conservation is a positive action to assure that as build-out of the community continues to occur as envisioned by the Surprise General Plan 2035, related physiographic, hydrological, biological, and cultural resources are not lost or permanently altered to the detriment of the natural environment that we all share and enjoy. Correspondingly the role of the conservation element is to help identify these limitations and opportunities and define various policies and implementation measures by which these natural resources can be conserved within the Surprise Planning Area. Surprise's environmental heritage includes non-renewable resources such as extensive undisturbed natural areas, scattered historic/ archaeological sites, and natural landmarks. As irreplaceable resources they warrant preservation from destruction or harmful alteration.

DISCUSSION

Natural and Biological Resources

Surprise is a part of the Sonoran Desert, one of the four deserts within the North American region. The Sonoran Desert is lush in comparison to most other deserts. Two visually dominant life forms of plants distinguish the Sonoran De- sert from other North American deserts: legume trees and columnar cacti. Much of the Sonoran Desert area has a bi-seasonal rainfall pattern and mild winters. In general the region is characterized by high average temperatures, low humidity, and other extreme temporal and spatial variability in precipitation amounts. The significance of ecologically rich and diverse plant and wildlife communities, the area's precious water and air resources, and productive open air resources contribute greatly to the City's quality of life.

Scenic Resources

Surprise's location near the White Tank Mountains and the Hieroglyphic Mountains provides residents and visitors with an abundance of scenic vistas, and broad expanses of desert land contrasted with distant peaks. Residents of Surprise are well acquainted with these qualities and the existence of such magnificent scenery is an important factor in sustaining a great quality of life. Continued human activity leaves its mark on the landscape, with both positive and negative results to the viewshed. Careful, well designed and sensitive development of slope areas, through techniques such as cluster development near open features and trails, may mitigate negative impacts on the viewshed.

Wash Environs

The environmental characteristic of Surprise is due in large measure to the major washes like the Trilby Wash that traverse through this area. These wash environs are characterized by limited amounts of water and by the presence of arborescent, often spiny shrubs. Flash floods keep the central channel clear of vegetation but along the wash's edge grow thickets of vegetation that are generally taller and denser than those of the surrounding desert habitats. The dense shrubbery also provides food and cover for other wildlife forms. Wash environs are the Sonoran Desert's most precious asset, vital to the movement and survival of all wildlife spe-

cies, linking habitat corridors and a major part of the Agua Fria and Salt River watershed. Neotropical birds use these on the north south journeys, deer, bobcats, and javelina find water to drink and dozens of endangered fish species inhabit permanent pools. Natural landmarks such as these are valued for scenic, visual and aesthetic values, providing a record of the natural heritage of Surprise.

Flora & Fauna

Arid western landscapes provide a habitat for a variety of plant and animal species that are specially adapted for survival in areas with saline conditions and ephemeral water sources. The abundant cacti and other succulents defy the harsh climate with exuberant biodiversity. A brief description of the Surprise Planning Area's common vegetation communities are provided below, followed by an identification of sensitive species and habitats that warrant additional protection and management strategies to preserve their features.

Vegetation types within the planning area may be generally classified into three categories:

- Urban – Includes ornamental landscaping, non native grass and weed associations in vacant lots, and scattered agricultural crop and orchard plantings.
- Rural Agricultural – Includes row crops, orchards and ruderal vegetation. Agricultural products grown in the planning area include cotton, corn, and squash.
- Desert Shrub - Columnar cacti and legume trees and succulents make up most of the vegetation within the Surprise Planning Area.

Sensitive or special status species are those animal species that are designated by federal or state regulatory agencies as needing protection due to rarity or threats to their existence. Sensitive habitats are those areas in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in the ecosystem (Table 4.2A).

It is a miracle that life can survive and thrive in the extreme conditions of the desert. Common animals found in the general environment include many species of invertebrates, birds and vertebrate species including fish, reptiles and amphibians, mammals, and birds like roadrunners and quail. Types of animals that are generally found in this region based on their adaptive characteristic are:

- Escaping animals – Animals that enter lands only when moisture is available.
- Evading animals – Burrowing animals with night activity that do not need to provide water for temperature regulation.
- Resisting animals – Animals that endure dehydration and still remain active through physiological processes by which they are able to conserve water.
- Enduring – Animals that estivate during hot dry periods such as ground squirrels and gophers.

Federal and US Status Terms

Endangered Species Act (ESA) (1973 as amended) US Department of Interior, Fish and Wildlife Service (http://www.fws.gov/southwest/es/arizona). The following are classifications of the Endangered Species Act:

Listed

(LE) Listed Endangered: imminent jeopardy of extinction.
(LT) Listed Threatened: imminent jeopardy of becoming Endangered.
(PS) Partial Status: listed Endangered or Threatened, but not in entire range.
(XN) Experimental Nonessential population.
(PDL) Proposed for delisting.

Proposed for Listing

(PE) Proposed Endangered.
(PT) Proposed Threatened.

Candidate

(C) Candidate. Species for which USFWS has sufficient information on biological vulnerability and threats to support pro-

posals to list as Endangered or Threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

(SC) Species of Concern: The terms "Species of Concern" or "Species at Risk" should be considered as terms-of-art that de- scribe the entire realm of taxa whose conservation status may be of concern to the US Fish and Wildlife Service, but nei- ther term has official status (currently all former C2 species).

(DPS) Distinct Population Segment: a portion of a species' or subspecies' population or range. The DPS is generally described geographically.

Critical Habitat (check with state or regional USFWS office for location details)

(Y) Yes: Critical Habitat has been designated.

(P) Proposed: Critical Habitat has been pro- posed.

(USFS)US Forest Service (1999 Animals, 1999 Plants: corrected 2000) US Department of Agriculture, Forest Service, Region 3 (http://www.fs.fed.us/r3/)

(S) Sensitive: those taxa occurring on National Forests in Arizona which are considered sensitive by the Regional Forester.

Name	Common Name	Status				Quad	Town Range
		ESA	USFS	BLM	STATE		
Athene cunicularia hypugaea	Western Burrowing Owl	SC		S		McMicken Dam	030N020W
Bat Colony						White Tank Mountains NE	030N030W
Cicindela oregona Maricopa	Maricopa Tiger Beetle	SC	S	S		Wickenburg	060N040W
Eumeces gilberti arizonensis	Arizona Skink	SC	S		WSC	Wickenburg	070N040W
Gopherus agassizii (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC	Wickenburg SW	060N040W
Gopherus agassizii (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC	Red Picacho	070N030W
Gopherus agassizii (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC	Garfias Mountain	070N020W
Macrotus californicus	California Leaf-Nosed Bat	SC			WSC	White Tank Mountains NE	030N030W
Myotis velifer	Cave Myotis	SC		S		Wickenburg SW	060N040W

Table 4.2A. There were no listed or endangered plants or critical habitats documented within the Surprise General Planning Area. Source: AZ Department of Game and Fish, Heritage Data Management System, January 10, 2008.

Bureau of Land Management (BLM) (2005 Animals & Plants) US Department of Interior, Bureau of Land Management, Arizona State Office (http://azwww.az.blm.gov)

(S) Sensitive: those taxa occurring on BLM Field Office Lands in Arizona which are considered sensitive by the Arizona State Office.

(P) Population: only those populations of Banded Gila monster (Heloderma suspectum cinctum) that occur north and west of the Colorado River, are considered sensitive by the Arizona State Office.

The City recognizes the need to contribute to the protection of native plants and animals, and their habitats before their populations are so low that they must be listed as threatened or endangered under the State and Federal Endangered species acts and will provide protection to special status species.

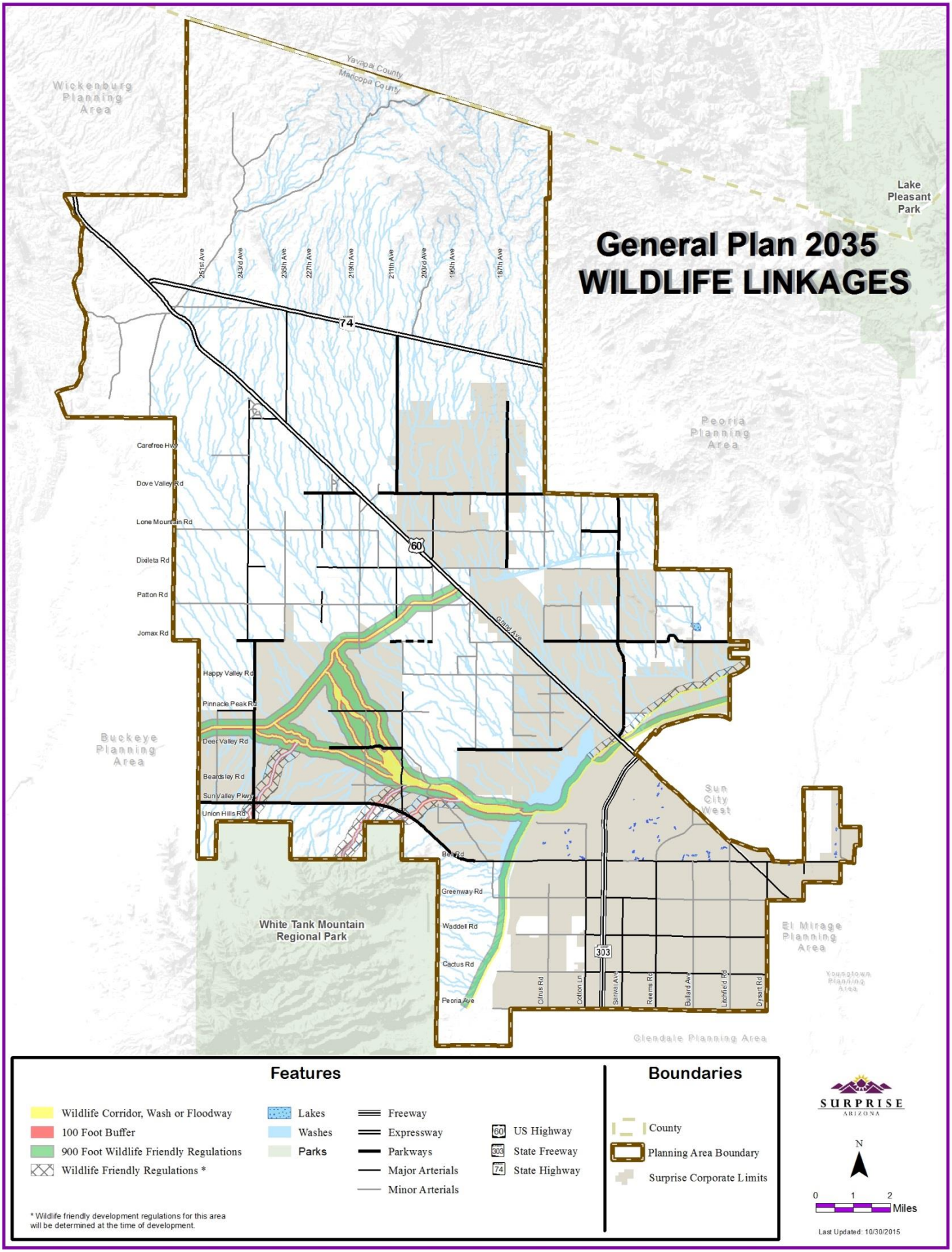
In addition, the Arizona Game and Fish Department (AZGFD) has identified the following focal species to model wildlife linkages in the Surprise Planning Area: tiger rattlesnake, lyre snake, kit fox, blacktailed jackrabbit, javelina, mule deer, mountain lion, desert tortoise, and gila monster. These species are sensitive to habitat loss and fragmentation including those that are unable to cross barriers (mountain lion, mule deer and desert tortoise) and special status species (desert tortoise) while others like javelina are common but still need gene flow among populations. Wildlife movement corridors for these species and others are under threat from recent land use conversions for development and associated infrastructure. Fragmentation of wildlife corridors effectively isolates the local wildlife population thereby increasing the probability of localized extirpation of the species. The wildlife corridors recommended for the City of Surprise Planning area are identified in the Wildlife Linkages Map on page 179.

Geological Resources

The City of Surprise is located within the Salt River Valley, exhibiting very little topographical change in the range of 0-2 percent slope. A two percent slope indicates that for every 100 feet horizontal distance, the land rises or drops two feet. The existing slope drains to the southeast. A slope of two percent allows virtually unrestricted development for agricultural, rural, or urban land uses.

Geologically Surprise lies within the Basin and Range province (Figure 4.2A on page 181). Tectonic stretching of the North American continental crust during the last 25 million years has yielded a broad rift called the Basin and Range province, so named because topographically, it consists of long linear mountain ranges separated from one another by flat plains (basins) of alluvium. The range in the general area of Surprise contains Proterozoic metamorphic and igneous rocks, and the aquifers here are formed of volcanic and carbonate rocks and unconsolidated to consolidated basin-fill deposits. The basin fill deposits form the most productive aquifers and are generally in individual alluvial basins that are drained internally and separated by low mountains. The geology of the area plays a large role in the soils, drainage patterns, and other physiographic features of the region.

Surprise itself is located on top of an alluvial valley and connected to the Salt River Valley to the east. The alluvium is composed of three quaternary sedimentary deposits that are nearly 1,200 feet deep and contain significant deposits of gypsum and calcite. The upper alluvial unit is composed of relatively coarse grained unconsolidated materials and extends to a depth of 800 feet. The middle fine grain unit is composed of finer grained material that extends to a depth of 1,050 feet. The lower conglomerate unit contains mostly consolidated, relatively coarse grained deposits. The characteristics of these strata create a very solid building founda- tion as well as holding and purifying the underground water aquifer.


General Plan 2035
WILDLIFE LINKAGES
Yavapai County
Maricopa County
Wickenburg Planning Area
Lake Pleasant Park
Peoria Planning Area
Buckeye Planning Area
Sun City West
El Mirage Planning Area
Youngtown Planning Area
Glendale Planning Area
White Tank Mountain Regional Park
261st Ave
243rd Ave
235th Ave
227th Ave
219th Ave
211th Ave
203rd Ave
195th Ave
187th Ave
74
60
303
Carefree Hwy
Dove Valley Rd
Lone Mountain Rd
Dixileta Rd
Patton Rd
Jomax Rd
Happy Valley Rd
Pinnacle Peak Rd
Deer Valley Rd
Beardsley Rd
Sun Valley Pkwy
Union Hills Rd
Bell Rd
Greenway Rd
Waddell Rd
Cactus Rd
Peoria Ave
Grand Ave
Citrus Rd
Cotton Ln
Sarival Ave
Reems Rd
Bullard Ave
Litchfield Rd
Dysart Rd
Features
Wildlife Corridor, Wash or Floodway
100 Foot Buffer
900 Foot Wildlife Friendly Regulations
Wildlife Friendly Regulations *
Lakes
Washes
Parks
Freeway
Expressway
Parkways
Major Arterials
Minor Arterials
US Highway
State Freeway
State Highway
Boundaries
County
Planning Area Boundary
Surprise Corporate Limits
* Wildlife friendly development regulations for this area will be determined at the time of development.
SURPRISE
ARIZONA
N
0 1 2
Miles
Last Updated: 10/30/2015

Due in part to the characteristics of the sedimentary strata underlying Surprise, the region is geologically inactive with respect to faults. A seismic risk map places Maricopa County in Zone 2, which can receive moderate earthquake damage, although no record currently exists. The closest linear earth fissures, which act as drains for overland water flow have been identified in Section 25, Township 3 North, Range 3 West, which is located to the south of the Surprise Planning Area.

One of the major geologic features in the general area is the White Tank Mountains. The White Tank Mountains form one of the several metamorphic core complexes in central Arizona. Two major types of rocks are found in the mountain range; 1.7-1.6 billion years old Proterozoic metamorphic rocks and a Tertiary or Cretaceous age granitic intrusion.

Soils

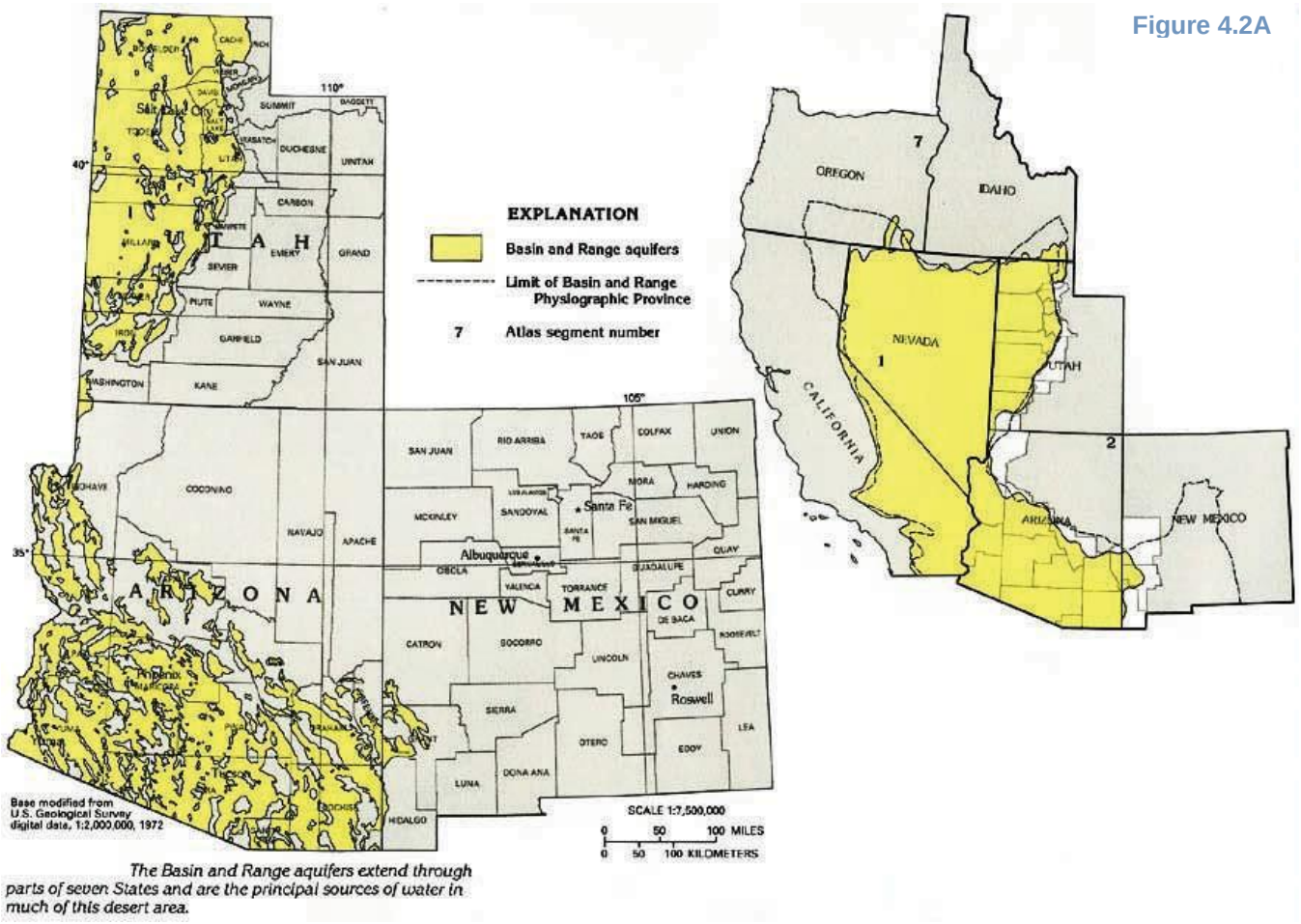
Soil morphology in the general region has been greatly affected by the geology of the area. The ranges drain into the adjacent basins and the sediments transported are usually much finer sands, silts and clays. Soils found in the Surprise area vary slightly in texture; most are loamy or loamy-sandy and gravelly, while others contain layers of sticky clay, or even rock-hard, white limy layers. Most of the soils found in the area are generally suitable for building and agriculture with the main risk associated being erosion. The composition of the soils also makes it low risk for shrink-swell potential. The majority of soils found in the Surprise Planning Area were formed from old alluvium eroded from the White Tank Mountain Range. Although the soil types found in the Surprise Planning Area are generally very similar, each exhibits differing characteristics when utilized for development. The Surprise Planning Area exhibits 23 different types of soils which are categorized as loams, sands, or clays and are listed in the Table 4.2B on page 123.

Subsidence & Fissures

The sediment filled basins in the area hold large quantities of groundwater in storage, and large amounts of withdrawal of groundwater has led to subsidence in many parts of central and western Arizona. Land subsidence is the vertical displacement of the ground surface, where the subsurface consists of compressible silt and clay. The damaging effect of subsidence can include gradient changes in transportation, utility, and flood control facilities. Settlement on the other hand is the gradual downward movement of an engineered structure due to the compaction of the unconsolidated material below the foundation. Because of the gradual, long term nature of subsidence and settlement these phenomena do not pose a life safety hazard but do result in property losses. The effects of subsidence can create decreased groundwater storage capacity, change slope patterns (affecting irrigation, flood control, and drainage patterns), and cause damage to both surface and underground structures.

The impact of land subsidence varies throughout the Surprise Planning Area, but the majority of land has dropped from one to three feet in the last 30 years. The most significant drop that has occurred in the Surprise Planning area is six feet. The land located adjacent to the Beardsley canal has been documented to have subsided less than one foot near the intersection of US-60, but increases to nearly three feet as the canal parallels the White Tank Mountains. Two reported but unconfirmed fissures have been documented by the Arizona Geological Survey, in the very southern portion of the Surprise Planning Area. One occurred near Peoria and Sarival Avenue and the other near Reems and Cactus Road.

Figure 4.2A



The Basin and Range aquifers extend through parts of seven States and are the principal sources of water in much of this desert area.

Drainage Patterns

Surprise lies largely within the West Salt River Valley sub-basin and in a small portion of the Hassayampa basin. The basins in Arizona are mostly made of unconsolidated basin- filled deposits and consolidated sedimentary. These deposits are sands, silts and gravel which are very permeable. The aquifers here can range in depth from 20 feet near the mountains to 150 feet in the center of the basins. Typically the aquifers in Central Arizona yield consider- able groundwater. In the West Salt River Val- ley sub-basin, groundwater enters as under- flow from the Lake Pleasant sub-basin, the northern part of the Hassayampa sub-basin and the Maricopa-Stanfield sub-basin in Pinal County.

GOALS AND POLICIES

Goal 1: Biological Resources

Biological and natural resources within the Surprise Planning Area should be enhanced and protected.

Policies

1. Protect and enhance the wash corridors and environs through a comprehensive management strategy.
2. Discourage mass grading of large parcels to prevent environmental damage.
3. Encourage the retention of washes with 100-year flows of 250 cfs and greater in their undisturbed condition.
4. Encourage new flood control projects to consider stormwater recharge design alternatives to channelization and to impermeable bank protection.

Symbol	Series	Texture
Aa	Agualt	Loam Sand
Aba	Antho	Sandy Loam Gravelly Sandy Loam
Bs	Brios	Sandy Loam Sand and Gravelly sand
Cd	Carrizo	Gravelly Sandy Loam Very gravelly Coarse Sand
Es	Estrella	Loam Clay Loam
GgA	Gilman	Loam Very Fine Sandy Loam
Gt	Glenbar	Clay Loam Silty Clay Loam
GxA	Gunsight	Gravelly Loam Very gravelly Loam
LcA, Le	Laveen	Loam
Ma	Maripo	Sandy Loam Gravelly Loam
Mo, Mp, Mr	Mohall	Sandy Loam Gravelly Sand
PeA	Perryville	Gravelly Loam
RbA	Rillito	Gravelly Loam Gravelly Sandy Loam
Te, Tfa, TrB	Tremant	Gravelly Clay Loam Gravelly Loam
Tu	Tucson	Loam Clay Loam
Ve, Vf	Vecont	Clay
Vh	Vint	Loamy Fine Sand

Table 4.2B

5. Preserve wildlife ecosystems and sensitive habitat areas.
6. Protect special status species and supporting habitats within Surprise, including species that are state or federally listed as endangered, threatened, or rare.

Goal 2: Scenic Amenities

Maintain natural scenic amenities.

Policies

1. Encourage nighttime lighting to be kept at a minimum to maintain dark skies.
2. Create and adopt a Dark Sky Ordinance to reduce the impact of light pollution.
3. Encourage the preservation of the scenic quality and vistas of all mountain ranges in the City.
4. Designate scenic routes and discourage development patterns that reduce scenic qualities.
5. Discourage industrial and commercial uses on slopes greater than 10 per cent and residential uses on slopes over 15 percent unless the natural form of the hillside setting is reflected and visual and environmental impacts are minimized through appropriate planning and architectural design techniques.
6. Establish design standards to ensure retention of ridgelines and prominent hillsides.

Goal 3: Geological Hazards

Minimize risks of property damage and personal injury posed by geological hazards.

Policies

1. Require geotechnical studies prior to development approval in geological hazard areas.
2. Ensure that new development on hillsides is constructed to reduce erosion and other hazards.
3. Promote vegetation of cut and fill slopes to control erosion.
4. Ensure that the appropriate Commission(s) or City Council are informed of any known geological hazard(s) that may impact projects, development or land use, so that an informed decision can be made regarding the property.

Water Resources Element

INTRODUCTION

The water supply and quality within the City is one of the key elements for maintaining sustainable growth and allowing the City to achieve its development goals. By assessing the water demands that will be needed in the future and identifying and acquiring adequate water resources, the City will be able to plan for and meet the demands of future development. Water is a challenging and complex issue, unconstrained by jurisdictional boundaries and requires regional cooperation and long term planning to be sustainable. The water resources and quality section of the natural resources element presents a plan for providing Surprise's residents and businesses with a safe, reliable, and high quality source of water through 2035.

DISCUSSION

Water Resources

Water supply within the City is one of the key factors for maintaining sustainable growth and allowing the City to achieve its development goals. An important goal of the region is the attainment of safe yield, where the amount of water removed from the aquifer equals the amount of water that is replenished. Strong water management policies and practices, focusing on building a strong portfolio, new water supplies, and a community-wide emphasis on conservation are needed to achieve and maintain this goal. Maintenance of a dependable supply of good quality groundwater will continue to be an essential factor in defining Surprise's future health and prosperity.

There are properties within the Surprise Planning Area that are not presently served by City water or sewer systems. Some of these properties are served by private water providers or are not served by either the city or private water providers. This general plan is intended to govern the provision of City water and sewer services within the general planning area.

The City of Surprise Water Resource Management Department is responsible for management of the City's drinking water, wastewater, and reclaimed water systems, as well as the associated long range master planning documents and efforts.

To prepare for future population growth in Surprise, the City has developed a series of Water Resource Management Policies focusing on Conservation, the Use of Reclaimed Water, Water Acquisition and Water Funding, as well an Integrated Water Master Plan (IWMP) which addresses water resource and water infrastructure planning for the future. These documents serve as the City's guiding principles when considering future water resource and infrastructure needs. These documents consider current and future land use data in an effort to stay ahead of the demand curve.

Water Rights

The City currently has an allocation of 10,249 acre-feet per year of Central Arizona Project (CAP) water. This allocation is secured through agreements with the Central Arizona Water Conservation District (CAWCD) and the U.S. Bureau of Reclamation (USBOR). Additionally, the City has rights to groundwater through the City's Designation of Assured Water Supply and extinguished irrigation water rights. The City maintains various water permits for the use and storage of these rights and allocations from the Arizona Department of Water Resources

(ADWR). As a water service provider, the City also receives four percent of the annual water delivered to its customers as incidental recharge.

Another renewable source of water that the City uses is reclaimed effluent from its Water Reclamation Facilities These facilities are permitted as Underground Storage Facilities, after obtaining a Water Storage Permit, by the ADWR to recharge reclaimed water. Recharged water is critical for the City's future water supply and considered the top strategy priority of the City's use of reclaimed water in accordance with Water Resource Management Policies.

Water Supply

Surprise draws its public water supply from the West Salt River Valley sub-basin, through several well fields.

Acquisition of new water rights is fundamental to future development and growth. In the City's Water Resource Management Policies, the City will acquire additional water rights as they become available. Currently, and in the near future, all of the water pumped by the City's wells shall be recovered recharged water. This recharged water consists of Central Arizona Project and reclaimed effluent. All water that is recharged and not recovered in a calendar year is banked as future water needs for the City. Banked water is a necessary component in managing the City's water portfolio and ensuring water availability in the future. Recovered water is the predicted main source of water for the City. Direct delivery of renewable sources will continually be analyzed to supplement existing and future water supplies in order to achieve a diverse, resilient, and sustainable water supply.

Promotion of a continuing and escalating water conservation ethic will enhance the future water supply. Conservation is the most economical water savings source for both provider and user, and in some cases can reduce operating and capital costs. Water rates, conservation programs, and community education will be the primary elements to further conservation efforts.

Water System

As a municipal water service provider, the City has allocations and rights to groundwater and surface water supplies. Ten other water companies have rights to serve within the Surprise Planning Area; including EPCOR Water Company, Beardsley Water Company, Circle City Water Company, Chaparral Water Company, the City of El Mirage, Morristown Water Company, Puesta Del Sol Water Company, Saguaro Acres, Saguaro View, and West End Water Company.

The City currently has two public water systems within Special Planning Areas 1 and 2. The supply for these water systems is comprised of 16 wells and 5 water supply facilities. The City's water supply systems may require additional treatment facilities and other infrastructure should the City elect to use surface water from the CAP canal. These modifications may include construction of a water diversion facility on the CAP, a state-of-the-art water treatment system, and a network of large water distribution pumps and pipelines.

In addition to providing clean and safe water for drinking purposes, the City water system is an important element in fire suppression, directly related to public safety. System reliability for fire suppression requires water facilities be kept in a state of good repair.

Water Demand

Even though Surprise draws its public water supply from an abundant underground aquifer, it is prudent to conserve such an important resource. Demand for water based on quantity billed is 65 percent residential and 35 percent commercial. Demand has been steadily increasing since 2001.

Water Analysis and Documentation

Water is one of the most important issues facing the region, and it has received much attention in the last decade. New legislation, numerous studies, and new programs have generated a significant amount of new information. It is important to document the

details of these programs and studies to provide a basis for analysis and comparison. The public and various agencies need to be able to access reliable data and track the decision-making process for the greatest understanding and community consensus. It is also important to standardize methods and record keeping as much as possible to facilitate comparisons.

Many important decisions which will determine the future course for water programs are made by the Arizona Department of Water Resources (ADWR) and other state and federal agencies. These issues include the quantification of safe yield, the development of safe yield strategies, and federal water quality standards. Water interest associations, such as the Western Urban Water Coalition, WestCAS, and WestCAPS, will have a significant impact on the final outcome of federal regulations.

Water Quality

Water quality is the physical, chemical, and biological characteristics of water usually in respect to its suitability for three particular purposes: drinking water, non-potable uses, and recharging the aquifer. The primary basis for such characterization is parameters which relate to safety for human consumption, bodily contact and for the health of ecosystems. The City's potable water system meets all National Primary Drinking Water Regulations (NPDWRs). The City uses various treatment processes to meet the required rules, regulations, and permit requirements to use, store and serve water. Our goal is to maintain water quality that meets or exceeds the NPDWR and the Safe Drinking Water Act (SDWA) requirements to maintain high quality drinking water for the residents of Surprise. Another water quality factor is the expense and expertise required to comply with the increasingly stringent federal standards for drinking water and Source Water Protection. Regulations, rules, standards, and other requirements will continue to change while water quality itself varies greatly due to well depth, groundwater surface, and activities that may affect the aquifer.

Variations due to human activity

Anthropogenic activities including septic tanks, agricultural activities, petroleum handling and distribution facilities, solid waste disposal sites, illegal and illicit discharges, dumping, industrial facilities, and other such activities can have a negative impact on groundwater and other sources of water.

It is important to identify the sources of these activities, quantify their effects, initiate remedial action where appropriate, and take steps to prevent future contamination. Pesticides, Total Dissolved Solids (TDS), Volatile Organic Carbons, and nitrates are the most common results of human-related groundwater pollution in Surprise.

Most of the unincorporated Maricopa County area was developed without sanitary sewer lines, and groundwater cumulatively has been affected by low density development relying on domestic wells and on-site disposal system. The continued absence of sanitary sewer lines in the unincorporated areas and the newly incorporated areas will result in shallow soil degradation due to higher wastewater volume flowing through on-site disposal systems.

As urban development gets closer to these unincorporated areas, line extensions may minimize the negative impacts on the shallow groundwater. Some groundwater quality problems are a consequence of leaking underground storage tanks which housed petroleum products or other hazardous materials. Currently there is no evidence as to the leaking of any underground storage tanks in the Surprise Planning Area.

Variations due to well depth

Groundwater for drinking water purposes requires deep wells and new state-of-the-art water treatment to meet regulatory requirements. The

natural quality of deep or confined aquifers tends to be less variable than shallow groundwater. The quality changes typically reflect the geochemical reactions that occur naturally as water migrates through layers of the aquifers from recharge areas, including re-charge from natural stormwater runoff, to the well's point of use. The presence of arsenic, fluorides, radiochemicals, nitrates, and dissolved solids in the water are the result of variations in depth and the natural geology of the soils. Arizona is among a handful of western states whose soil naturally contains levels of arsenic and fluoride that are slightly above the NPDWR's standards but are not considered an unreasonable health risk.

In 1974, the United States Environmental Protection Agency (USEPA) established the Safe Drinking Water Act (SDWA) to protect public health by regulating the nation's public drinking water. The law has been amended over the years and requires stringent actions to protect drinking water and its sources. The SDWA has established enforceable standards for several contaminants. The NPDWRs are legally enforceable standards that apply to community and public water systems. These standards protect public health by limiting the level of the following contaminants: microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, organic chemicals, and radionuclides.

Stormwater

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. The statute employs a variety of regulatory and non-regulatory tools to reduce discharge of pollutants into waterways, to finance municipal wastewater treatment facilities, and to manage polluted runoff. Based on CWA, the Phase II National Pollutant Discharge Elimination System (NPDES) rules, adopted by the EPA and administered by the Arizona Department of Environmental Quality (ADEQ), require operators of small municipal separate storm sewer systems (MS4) to obtain a NPDES permit, or coverage under the state MS4 permit, and implement programs and activities to reduce pollutants in stormwater runoff. The City of Surprise, as an operator of a municipal storm drain system, prepared a Stormwater Management Plan and began implementation of this plan in 2003. In order to comply with the Phase II NPDES requirements, the plan acts as the City's permit, describing actions that include best management practices, measurable goals, and timetables for implementation of six minimum control measures as follows:

- Public education and outreach.
- Public participation/involvement.
- Illicit discharge detention and elimination.
- Construction site stormwater runoff control.
- Post construction stormwater management.
- Pollution prevention for municipal operations. The City also maintains Storm Drain Design and Construction Standards and Specifications. These include guidance for design and construction of manholes, detention/retention basins, sidewalk under-drains, and other items appurtenant to storm drainage systems. These standards are found within the City of Surprise Engineering Development Standards.

GOALS AND POLICIES

Goal 1: Regional Cooperation

Support efforts to improve regional cooperation and communications among appropriate agencies and communities.

Policies

1. Support ADWR efforts to assure all water providers and users in the Phoenix Active Management Area (AMA) participate equally in the attainment of a safe yield.
2. Assist the private water companies in conservation, long-range planning, and identification of their roles as water suppliers for the region.
3. Maintain a 100-year Assured Water Supply

designation from the ADWR.
4. Work cooperatively with state of Arizona agencies to refine existing water legislation and achieve the adoption of plans, policies, and regulations.
5. Expand processes to communicate current and planned water programs to the public.

Goal 2: Water Conservation

Continue to promote water conservation in accordance with the adopted Water Resource Management Policies.

Policies

1. Implement conservation programs that meet Arizona Department of Water Resources conservation requirements.
2. Support conservation and efficient water use to minimize the need for new water sources.
3. Expand programs and regulations to reduce water waste.
4. Make information about water-conserving landscaping and water harvesting methods and resources available for property managers, designers, and homeowners.
5. Pursue water plans and policies that protect and benefit natural ecological systems.

Goal 3: Enhance Water Portfolio

Continue to develop and implement programs to enhance the City's water portfolio in accordance with adopted Water Resource Management Policies.

Policies

1. Work with ADWR and local agencies to pursue new water sources and the means to convey these waters throughout the region.
2. Research and implement programs to recharge CAP water in the Area of Hydrologic Impact.
3. Invest in acquisition of all forms of water assets, including long-term water and extinguishment credits, water rights, additional CAP allocation, and other water sources.
4. Pursue acquisition of new water supplies.
5. Leverage existing portfolio assets to grow resources.
6. Standardize data collection and methods for economic comparison of alternative water supplies and programs.

Goal 4: Growth

Work closely with new development to ensure proper balance between available resource water supplies, demand, and growth in Surprise.

Policies

1. Include conservation of water resources in area plans to guide land use decisions.
2. Require large water demand developments to provide the City with water rights associated with the land being developed.
3. Ensure new developments possess water resources to serve future residents.
4. Pursue programs and procedures that require application of xeriscape concepts for all landscape, limit turf to active recreation areas, and keep washes in their natural state.

Goal 5: Drinking Water System

Continue to invest in water treatment, storage, and distribution systems to ensure reliable delivery of high quality water to meet daily and emergency needs.

Policies

1. Develop a plan for future plants, such as surface water treatment plants, to satisfy the city's potable water needs.
2. Provide all future water service in areas that are not currently covered by an existing water franchise. The City should not allow additional water service franchises into the

Surprise Planning Areas.
3. Encourage continued development of the City's water supply and distribution system to meet established system pressure and fire flow standards (including reservoirs, mains, and hydrants).
4. Work with regional agencies to provide and improve emergency measures to ensure adequate water, storage, and distribution during supply interruptions.

Goal 6: Reclaimed Water

Promote the use of reclaimed water in accordance with adopted Water Resource Management Policies.

Policies

1. Maximize the use of effluent as a source of recharge water and integrate effluent management plans.
2. Continue to research and implement programs that increase the use of reclaimed water and secondary effluent.
3. Support the extension of reclaimed water distribution infrastructure throughout the areas of hydrologic impact.

Goal 7: Water Quality

Protect and enhance the quality of Surprise's water sources.

Policies

1. Analyze and mitigate the potential for contamination of groundwater supplies from proposed industrial or commercial land uses.
2. Locate landfills or other groundwater polluting land uses to minimize the potential for the contamination of groundwater.
3. Pursue programs and funds to mitigate groundwater pollution caused by existing and historic land uses which may pose a threat to water resources.
4. Develop plans, policies, and procedures and identify funding sources to comply with federal and state water quality programs as they are developed.

Goal 8: Storm Water

Continue to invest in best management practices of stormwater to ensure health and safety of residents.

Policies

1. Due to potential impact for increased water discharge, all development activities will be constructed and maintained in accordance with federal, state, and local stormwater rules and regulations.
2. Preserve and enhance the design conveyance capacity of the storm water drainage system.
3. Invest in the maintenance, repair, and replacement of the water utility infrastructure.
4. Preserve and improve water quality through enhancement and expansion of the stormwater program including education, policies, and procedures to improve runoff quality.
5. Implement programs to reduce stormwater runoff.

Energy Element

INTRODUCTION

Events of the past decade have brought the issue of energy fully into public view. Ever-increasing energy prices, combined with constraints in the development of conventional energy supplies, have forced the public to question and debate the energy future they would like to see. Increasing the efficiency of energy use is predicated on matching needs with resources. Renewable energy systems allow cities to become more independent from the grid and imported fossil fuels, boost the market for renewable technologies, move to more reliable and affordable resources, and display a visible public commitment to a sustainable energy future.

In areas such as Surprise with high summer electricity demands, using small scale renewable energy systems can also protect residents and businesses from the costly effects. In addition, residential and commercial buildings account for over a third of United States energy use and carbon emissions. As construction methods and insulation technology have improved, so too has our ability to build structures that use less energy, contribute to fewer pollutants to our environment, and improve comfort and productivity. Reduced energy in housing, commercial structures, public facilities, and transportation helps maintain local economic vitality and reduces the need for new infrastructure to deliver energy to the City. In addition, in a wide variety of ways, local and national governments expend a portion of their budgets (i.e. tax dollars) on energy resources, including expenditures for procuring oil on the international market, paying for hazardous waste clean-up, subsidizing energy research, or simply maintaining local roadways.

DISCUSSION

Conventional Energy Sources

Power supply mostly comes from nuclear, coal, and hydroelectric powered plants owned by Arizona Public Service (APS) of Arizona. Power produced at generating plants is transmitted long distances through high voltage transmission lines and stepped down several times for ultimate use. These lines are prominent features in the cityscape. The transmission of power within the City is addressed by the APS transmission line network.

Transportation fuels are primarily supplied by various pipelines across the state to distribution terminals in Phoenix. There are no gasoline refineries in Arizona, so all the fuel must be delivered through pipelines operated by Kinder Morgan.

Arizona's local gas companies buy natural gas from producers in the supply basins and then pay the interstate pipelines to transport the gas to their local service territories. Some larger customers of natural gas such as schools, hospitals, and to a lesser extent local governments are obtaining less expensive natural gas supplies from other suppliers.

Alternative and Renewable Energy Sources

Alternative and renewable energy sources (e.g. solar, wind, geothermal, and possibly solid waste) may be utilized for residential, commercial, industrial, and transportation-related development. Solar energy however can be used more easily in residential development. Most single family dwellings in the city have solar ret-

rofit potential. Some are already laid out to orient lots to facilitate passive solar gains.

Alternative and renewable resources may also supply energy in the future to the commercial and industrial sectors where cogeneration exists. Commercial enterprises which are not utility companies may lead the way in producing power from renewable energy sources for sale in the open market.

Energy Conservation

The City's total demand for energy will increase with projected population growth. Public and private planning decisions should promote energy management and efficient use of energy-related resources to ensure the community is served with a balanced mix of affordable energy supplies.

Energy efficiency supports economic growth and development by freeing funds that otherwise would be spent on energy. Energy efficient development patterns also make the region less vulnerable to conventional energy supply disruptions. Furthermore energy consumption and diversity of supply can reduce the environmental costs of large scale production and distribution. However there are no energy performance standards prescribing annual consumption levels for various types of urban development.

Conservation of electricity and natural gas used in buildings should increase by incorporating innovative and conventional energy efficient techniques into design, siting and construction development. Ordinance amendments and effective compliance of new or existing energy-related ordinances will encourage energy conservation and management. A handbook or guide to maximize solar access should be developed.

Conservation of automobile fuel can be achieved in the short term by strengthening use of travel alternatives and disincentives to private single-occupancy automobile use. Long term conservation may be achieved by policies which decrease the population's auto dependency.

The Energy Independence and Security Act of 2007 requires federal buildings to decrease their energy consumption by the standards found in the table below.

Fiscal year	Percentage Reduction
2010	3
2011	6
2012	9
2013	12
2014	15
2015	18
2016	21
2017	24
2018	27
2019	30

Table 4.3

GOALS AND POLICIES

Goal 1: Reduce Usage

Reduce reliance on non-renewable energy sources in existing and new development.

Policies

1. Develop and implement citywide strategic energy planning.
2. Educate the public on simple strategies to increase energy efficiency and conservation.
3. Pursue opportunities for local management of energy supply.

Goal 2: Energy Management

Encourage efficient energy management techniques.

Policies

1. Implement measures to reduce the energy usage of City facilities.
2. Increase public awareness about the importance of energy conservation and demonstrate cost-effective and effective applications of energy management techniques in local government operations and buildings.
3. Offer financial or regulatory incentives for meeting building energy performance standards in new construction.
4. Encourage energy audits and energy disclosure reports for ratings for residential buildings at the time of sale.
5. Promote public awards program for energy management efforts.
6. Support regional efforts to increase the supply of energy from renewable sources, distributed generation, and cogeneration.

Goal 3: Renewable Energy Sources

Maximize the potential for efficient use of alternative and renewable energy sources.

Policies

1. Encourage developments and clustered housing to enable replacement of individual systems with a single or coordinated community energy system.
2. Encourage housing design and orientation to enable each unit to take advantage of so- lar energy, wind shelter, and other microclimatic devices.
3. Promote resource efficient building design.
4. Develop a transportation system that is more energy efficient.
5. Create and promote policies that incentivize the use of solar technology in development.