City of Las Cruces®
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Council Action and Executive Summary

Item # 16 **Ordinance/Resolution#** 15-110

For Meeting of _____ (Ordinance First Reading Date)

For Meeting of December 1, 2014 (Adoption Date)

Please check box that applies to this item:

☐ QUASI JUDICIAL ☐ LEGISLATIVE ☒ ADMINISTRATIVE

TITLE: A RESOLUTION TO ADOPT THE ARROYO MANAGEMENT PLAN. (PA-14-01)

PURPOSE(S) OF ACTION:

Adopt Arroyo Management Plan.

COUNCIL DISTRICT: N/A		
Drafter/Staff Contact: Carol McCall	**Department/Section:** Community Development/ Planning & Neighborhood Services	**Phone:** 528-3209
City Manager Signature:		

BACKGROUND / KEY ISSUES / CONTRIBUTING FACTORS:

In 1992, the City's Storm Water Management Policy Plan was adopted calling for the creation of an *arroyo plan* that would encourage the preservation of open space corridors along major arroyos within the East Mesa and would establish a major arroyo drainage system that encouraged both recreation and open space uses. According to the plan, land use, transportation, recreation, and drainage characteristics would be identified via the *arroyo plan*. Community Development staff is in the final stages of this planning effort, which has included extensive stakeholder engagement and three meetings with the Planning and Zoning Commission.

The City of Las Cruces Arroyo Management Plan (AMP) will be used by the City to help guide regulations in the Development Standards, Subdivision Code (Chapters 32 and 37 respectively of the Las Cruces Municipal Code) and all other relevant codes as amended. It will guide design and development adjacent to arroyos on the East and West Mesa areas in a manner that adheres to the Comprehensive Plan, Storm Water Management Plan, Mesilla Valley MPO Transportation Plan, and other related plans adopted by the City. This in turn protects the health, safety and welfare of the general public. (Attachment "A" further explains these concepts.)

Development of the plan entailed extensive outreach and dialogue. Stakeholder engagement in 2014 included: two public input meetings; two conservation meetings, two engineering meetings; three development meetings; a joint development/ engineering meeting; one meeting each with Paso del Norte Watershed Council, Elephant Butte Irrigation District, and International Boundary and Water Commission; a Planning and Zoning Commission work session on May 20; and two Planning and Zoning Commission public hearings, on June 24 and October 28. Numerous emails were also received. A compilation of stakeholder comments is included here as Attachment "D."

On October 28, 2014, the Planning and Zoning Commission voted to recommend adoption of the Arroyo Management Plan with conditions (5-1-0, one member absent). These conditions consist of revisions to the plan. In summary, these conditions are:

- Correct a factual error in the Geology and Soils section of Chapter 3, Regional Characterization;
- Include conditions of arroyo modeling, i.e. an explanation, as detailed in Appendix 4, Arroyo Modeling, as an addition section of the plan narrative in Chapter 4, Issues, Challenges and Opportunities;
- Better define "buffers";
- Clarify in the plan narrative how buffers would be determined including options for buffer uses and/or compensations to property owner.

The Planning and Zoning Commission revisions impact various sections of the plan and have been incorporated into the document that is attached to the Resolution as Exhibit "A." The revisions are individually noted in a "tracked changes" version of the plan as Attachment "C."

In addition, the City's Legal Department has recommended that additional facts regarding enabling legislation be added to the "Planning Background" section of Chapter 1, Introduction, and that actions regarding taxing legislation and funding strategies in Chapter 6, Administration and Implementation, be revised. Since these changes were suggested subsequent to the Planning and Zoning Commission meeting, they have not been reviewed by the Commissioners and are not included in the document presented as Exhibit "A." However, in the "tracked changes" version of the plan, Attachment "C," these changes are noted and will be discussed during the presentation. They are also explained in a memo included here as Attachment "B."

SUPPORT INFORMATION:

1. Resolution.
2. Exhibit "A", Arroyo Management Plan.
3. Exhibit "B", Findings and Comprehensive Plan Analysis.
4. Attachment "A", Memo highlighting plan components.
5. Attachment "B", Memo from Legal Department.
6. Attachment "C", Arroyo Management Plan with "tracked changes."
7. Attachment "D", Planning and Zoning Commission Minutes (draft), October 28, 2014.
8. Attachment "E", Public engagement compilation, June 24, 2014 to present.

SOURCE OF FUNDING:

Is this action already budgeted?			
N/A	Yes	☐	See fund summary below
	No	☐	If No, then check one below:
	Budget Adjustment Attached	☐	Expense reallocated from: _____
		☐	Proposed funding is from a new revenue source (i.e. grant; see details below)
		☐	Proposed funding is from fund balance in the _____ Fund.
Does this action create any revenue?			
N/A	Yes	☐	Funds will be deposited into this fund: _____ in the amount of $_____for FY__.
	No	☐	There is no new revenue generated by this action.

BUDGET NARRATIVE

N/A

FUND EXPENDITURE SUMMARY:

Fund Name(s)	Account Number(s)	Expenditure Proposed	Available Budgeted Funds in Current FY	Remaining Funds	Purpose for Remaining Funds
N/A	N/A	N/A	N/A	N/A	N/A

OPTIONS / ALTERNATIVES:

1. Vote "YES"; this will approve the Resolution. In doing so, the City will adopt the Arroyo Management Plan.
2. Vote "NO"; this will not approve the Resolution. In doing so, the City of Las Cruces will not adopt the Arroyo Management Plan.
3. Vote to "Amend"; this modification may include additional revisions to the Plan as Council finds appropriate.
4. Vote to "Table"; and direct staff accordingly.

REFERENCE INFORMATION:

The resolution(s) and/or ordinance(s) listed below are only for reference and are not included as attachments or exhibits.

N/A

RESOLUTION NO. 15-110

A RESOLUTION TO ADOPT THE ARROYO MANAGEMENT PLAN (PA-14-01).

The City Council is informed that:

WHEREAS, by managing arroyo systems holistically we can help ensure that the full potential of arroyos as a community asset is realized; and

WHEREAS, the City's first subdivision regulations, adopted in 1956, noted that natural watercourses can be an attractive asset to development; and

WHEREAS, the 1992 Storm Water Management Policy Plan encourages the facilitation of a consistent, regional storm water management program for the Las Cruces urban area; and

WHEREAS, the Arroyo Management Plan is consistent with numerous goals and policies in Comprehensive Plan 2040; and

WHEREAS, through many public forums, area residents, property owners and other stakeholders have provided their comments and input regarding the Arroyo Management Plan; and

WHEREAS, the Planning and Zoning Commission recommended by a vote of 5-1-0 that the Arroyo Management Plan be approved with conditions at the October 28, 2014 public hearing.

NOW, THEREFORE, Be it resolved by the governing body of the City of Las Cruces:

(I)

THAT the City of Las Cruces hereby adopts the Arroyo Management Plan, as shown in Exhibit "A," attached hereto and made part of this Resolution.

(II)

THAT approval is based on the findings contained in Exhibit "B" (Findings and Comprehensive Plan Analysis), attached hereto and made part of this Resolution.

(III)

THAT said plan shall serve as an additional policy document guiding land use decisions.

(IV)

THAT City staff is hereby authorized to do all deeds necessary in the accomplishment of the herein above.

DONE AND APPROVED this _____ day of _____, 20__.

APPROVED:

_____
Mayor

ATTEST:

_____
City Clerk

(SEAL)

Moved by: _____

Seconded by: _____

VOTE:
Mayor Miyagishima: _____
Councillor Silva: _____
Councillor Smith: _____
Councillor Pedroza: _____
Councillor Small: _____
Councillor Sorg: _____
Councillor Levatino: _____

APPROVED AS TO FORM:

_____
City Attorney

Exhibit "A"

CITY OF LAS CRUCES
ARROYO MANAGEMENT PLAN

November 12, 2014

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ACKNOWLEDGEMENTS

CITY COUNCIL

Mayor: Ken Miyagishima
District 1: Councillor Miguel G. Silva
District 2: Councillor Greg Smith, Mayor Pro-Tem
District 3: Councillor Olga Pedroza
District 4: Councillor Nathan Small
District 5: Councillor Gill Sorg
District 6: Councillor Cecelia Levatino

PLANNING AND ZONING COMMISSION

District 1: William Stowe, Vice-Chair
District 2: Charles Beard, Secretary
District 3: Ruben Alvarado
District 4: Godfrey Crane, Chairman
District 5: Joanne Ferrary
District 6: Kirk Clifton
Mayoral Appointee: Charles Scholz *(until February 2014);* Harvey W. Gordon

CITY MANAGER

Robert Garza, P.E.

ASSISTANT CITY MANAGERS

Brian Denmark, AICP - ACM/COO
Mark Winson, P.E. - ACM/CAO

COMMUNITY DEVELOPMENT DEPARTMENT

David Weir, AICP - Director
Vincent M. Banegas, AICP - Deputy Director
Paul Michaud, AICP, Senior Planner *(until March 2014)*
Srijana Basnyat, AICP/CNU-A, Senior Planner
Carol McCall, AICP - Planner

TECHNICAL TEAM

Roy Arnoldt, P.E. – *Civil Engineer – Geotechnical Engineer, Public Works Department*
Peter A. Bennett, CFM, CMS4S –*Engineering Technician Senior, Stormwater Pollution Prevention, Public Works Department*
Natashia Billy, EI, CFM –*Civil Engineer Associate, Sr., Community Development Department*
Rocio Dominguez, P.E., *Development Chief Engineer, Community Development Department*
Cathy Burr Mathews, RLA – Landscape Architect, Public Works Department
Meei Montoya, P.E. –*Senior Operations Engineer, Las Cruces Utilities*
Adrienne Widmer, P.E. - *Acting Administrator, Water Resources, Las Cruces Utilities*
Hilary Brinegar, *Marron and Associates*
Kelly Isaacson, P.E., CFM, *Daniel B. Stephens and Associates*

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CHAPTER 1. INTRODUCTION

Arroyos are recognizable geographic features of the southwestern Chihuahuan Desert surrounding Las Cruces, New Mexico. Arroyos provide natural pathways for surface water runoff to flow from higher elevations to low-lying lands and ultimately the Rio Grande. Vegetation in and adjacent to arroyos provides habitat for many Chihuahuan Desert wildlife species. Arroyos are non-static, living systems and their shapes, sizes, depths and directions change in response to the frequency and intensity of storm events. As both urban and rural development increases, many arroyos have been rerouted, channelized, or dammed to protect property and increase useable land. These actions have altered natural drainage function, wildlife connectivity, and the propagation of vegetation in some areas.

Surrounding Las Cruces, development and open spaces exist together, and the natural terrain is part of the community character. It has often been the practice to carve out development and leave the rest for open space, but planning for open spaces first may prove to be more valuable for property owners and the desert environment in the long run. Through sound development standards, new land uses can incorporate characteristics of the existing natural environments – topography, soils, vegetation, geology, and hydrology – so that ecologically-sensitive[1] and dynamic lands are protected. Safe and effective engineering standards for flood control, utilities, stormwater conveyance, and water storage are important factors for all development. But specifically in arroyo environments, development designs can be implemented to maintain the natural character of the arroyo. It is also important to maintain

[1] One Valley One Vision 2040 describes critical and sensitive land as "land that generally should be conserved in its natural state (e.g., surface water, floodplains, wetlands, arroyos, steep slopes, protected wilderness, wildlife habitat, tree stands, and cultural areas) in a manner that reasonably compensates, provides incentives, maintains similar existing property rights, or balances the public and property owner interests."

arroyos to ensure historical drainage patterns adhere to water quality regulations administered by the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permit program.

Arroyos can also provide a variety of recreational opportunities. Proper design of trails, trail amenities, connectivity, equestrian facilities, street crossings, parking, signage, etc. can result in opportunities that meet the needs of all users. Economic development is also impacted by how our arroyo systems are managed, as quality of life and a community's green industry become larger considerations when businesses and people choose where to relocate.

Purpose of the Arroyo Management Plan

The City of Las Cruces wants to protect the major arroyos as open space and encourages private property owners to preserve smaller tributaries where ever possible when designing new neighborhoods. Healthy arroyo systems impact many aspects of life in Las Cruces and the AMP provides policy guidance designed to improve quality of life and help accomplish the following goals:

- Protect and manage major arroyos in their natural state;
- Allow maintenance of historic flows in arroyos;
- Protect private property;
- Improve flood control & drainage functions;
- Accommodate and protect essential utility installation and maintenance;
- Improve stormwater quality;
- Strengthen compliance with the NPDES permit;
- Protect native vegetation and wildlife habitat;
- Encourage responsible and profitable development;
- Increase protected open space; and
- Increase trails, trail connectivity, and recreational opportunities.

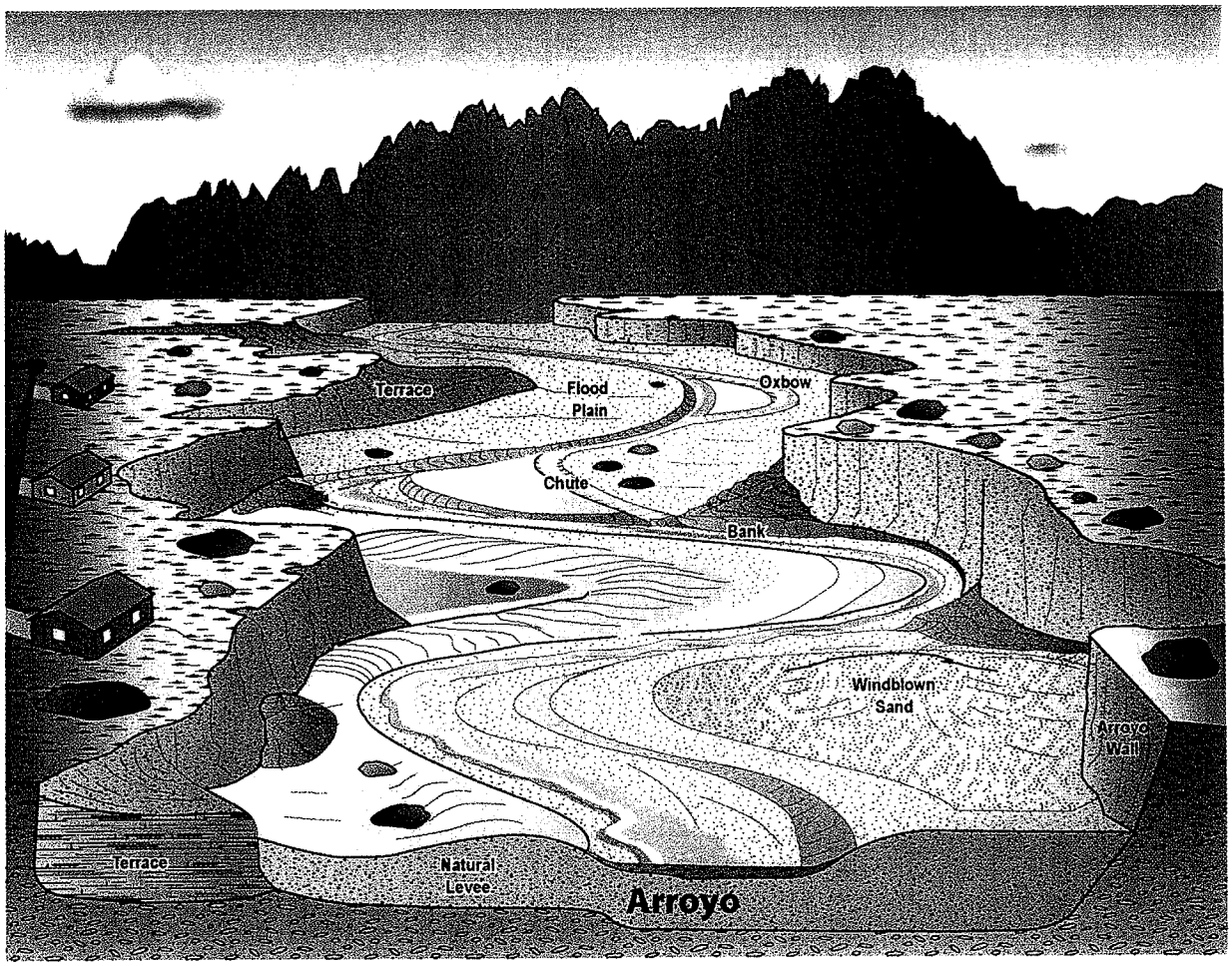
The City of Las Cruces Arroyo Management Plan will be used by the City to help guide regulations in the Development Standards, Subdivision Code (Chapters 32 and 37 respectively of the Las Cruces Municipal Code) and all other relevant codes as amended. It will guide design and development adjacent to arroyos on the East and West Mesa areas in a manner that adheres to the Comprehensive Plan, Storm Water Management Plan, Mesilla Valley MPO Transportation Plan, Parks and Recreation Master Plan, and other related plans adopted by the City. Any future action or activity that stems from the AMP policies will have a common basis for drainage management throughout the city by reducing flooding, improving water quality and mimicking the pre-development hydrologic conditions. This in turn protects the health, safety and welfare of the general public.

Geographically, the AMP includes major arroyos on the East and West Mesas, undeveloped floodways, unnamed 100-year flood zones, including areas in the Extraterritorial Zone (ETZ), and largely native areas on the West Mesa escarpment. Because most of the development in the Las Cruces area has been directed east toward the Organ Mountains, numerous studies have been completed addressing stormwater, watershed management, soils, vegetation, etc. For this reason, much of the information presented in this document is based on data collected for the East Mesa. But the AMP will guide development on the West Mesa in the same way it will on the East Mesa, and the same goals and policies will be relevant as the community grows to the west. Additional policies will address the West

Mesa escarpment where drainage to the Rio Grande varies greatly from drainage on the East Mesa. Map 1, below, shows the AMP Planning Area and the major arroyo systems.

Within this planning area, arroyos and the lands adjacent to them are owned by many parties, mainly the New Mexico State Land Office, U.S. Bureau of Reclamation, City of Las Cruces and numerous private owners. While some of the policies in the plan may guide maintenance efforts in already-developed areas, the plan is primarily intended as guiding policy for public and privately-owned lands that are undeveloped. Historically, developers have followed the regulations in place at the time of development. In the absence of regulation, plan policies are not binding, but can guide decision making. Appropriate land use practices must balance the rights of landowners with the protection of the region's unique landscapes, arid vegetation and natural wildlife habitat. It is also critical to understand the potential impacts of human actions on a regional and watershed perspective. By managing arroyo systems holistically – looking broadly at the watershed level – we can help to ensure that the full potential of arroyos as a community asset is realized and in doing so, maintain the desert's ecological health over time.

Figure 1 Arroyo Characteristics



Although every arroyo is different, this diagram shows the many elements an arroyo may have, depending on location, soils, width and the slopes of its edges.[2]

[2] Graphic by P. Bennett, after http://geochange.er.usgs.gov/sw/impacts/geology/puerco1

Map 1. AMP Planning Area

Planning Background

During the first half of the 20th century, Las Cruces was a small community and was situated in the mostly flat valley floor and stormwater runoff was easily contained on site. But capacity overload was common, resulting in frequent damage to property. This led to the more formal implementation of on-lot ponding to reduce excessive runoff in roadways. While the City recognized the need for flood control and drainage, Article 4.5 of the *Rules and Regulations Governing the Subdivision of Land within the City of Las Cruces,* adopted in 1956, makes only one indirect reference to arroyos: "The developer should keep in mind that natural watercourses can be an attractive asset to his subdivision as well as to the community and, where possible, should improve and beautify the watercourses to this end."

Inspired by the success of the Albuquerque Metropolitan Arroyo Flood Control Act of 1967, the City Commission (as it was known at that time) asked the New Mexico legislature to draft one for Las Cruces. Delegated through state statute, the Las Cruces Metropolitan Flood Control Authority (LCMAFCA, 1968) was formed to administer stormwater management throughout the Las Cruces area. Apparently the taxing provisions provided in the legislation were not adequate for what Las Cruces wanted and the organization was never formed.

The City's 1968 *Comprehensive Plan* described the conditions of the drainage system at that time: a system that "includes major drains and laterals developed for irrigation purposes and used to carry stormwater, retention dams, collection basins, open ditches, storm drainage and the major arroyos. The existing storm drainage facilities are not adequate" because the dams were not designed for high hazard duty, and the open ditches were primarily agricultural drains designed for water table control, not high storm water flows. The excessive surface flow resulted in street flooding, washing out of unpaved streets and property damage. According to the plan, "the open ditches and storm drains that are available offer some protection to the areas they serve, but even these facilities are generally inadequate or create problems where a ditch ends and the water must revert to surface flow." The Capital Improvement Program section of the plan addressed these problems by proposing storm sewer improvements and a major retention dam along the east side of Interstate 25. Now known as the Las Cruces Flood Control Dam, it was a joint project between the City of Las Cruces and the U.S. Army Corps of Engineers and was completed in 1975.

The 1975 *City of Las Cruces Land Subdivision Regulations* also included a design standards section that dealt with drainage issues. However, the standards don't include specific requirements for construction and as growth increased, developers, builders, property owners, City officials, etc., found them inadequate to regulate development. Arroyos are not specifically mentioned in these regulations.

The City continued addressing stormwater management by adopting an ordinance in 1987 that established more detailed regulations for flood control. *An Ordinance for the Purpose of Flood Damage Prevention* called for: restricting or prohibiting uses that were dangerous to health, safety or property in times of flood or that would cause excessive increases in flood heights or velocities; controlling the alteration of natural floodplains, stream channels and natural protective barriers; and regulating the construction of flood barriers which may unnaturally divert flood waters or which may increase flood hazards to other lands.

Flood control standards continued to evolve in the 1990's. The City's *Storm Water Management Policy Plan* (November 1992) states as a goal, to "develop an overall City storm water system that promotes aesthetics and multiple-use activities through the use of 'natural' arroyos or linear park systems,

preservation of open space, and visual enhancement." It identified the following arroyos as suitable for open space corridors: Fillmore Arroyo, Telbrook Arroyo, segments of Little Dam Arroyo, North and South Fork Las Cruces Arroyo, Alameda Arroyo, a segment of Sandhill Arroyo and unnamed major arroyos as identified on the Major Arroyo Corridor Identification Map. The Storm Water Management Policy Plan also calls for a Major Arroyo Plan, which would identify how each major arroyo would be used. A plan was not drafted at that time.

The City's 1999 *Comprehensive Plan* addressed arroyo preservation in a more meaningful manner. It called for the creation of a major arroyo plan with policies to protect and maintain the existing natural environment and to minimize impacts created by development. It addressed safe hillside and escarpment development, and the use of arroyo systems as trails and trail connections. Also, for the first time in the City's comprehensive plan, the topic of the physical health of residents was addressed: the 1999 Plan included policies that supported ways to promote physical activity thereby improving the overall health of our communities. The *Draft Storm Water Management Plan* (SWMP), adopted in 2009, outlines the City's 5-year program to comply with the EPA's Final NPDES General Permit for Small Municipal Separate Storm Sewer Systems (MS4s) in New Mexico to improve stormwater quality in accordance with the Clean Water Act of 1972. The SWMP describes six minimum control measures, which if carried out, would significantly reduce pollutants being discharged into the stormwater drainage system, and ultimately the river. The City's Public Works Department adopted the EPA's Best Management Practices (BMP) to address each of the six areas. They include public education and involvement, discharge detection and elimination, construction site storm water runoff control, post-construction stormwater management, and pollution prevention for municipal operations.

The Mesilla Valley Metropolitan Planning Organization's (MPO) *Transport 2040 Transportation Plan,* adopted in June 2010, includes policies to identify major arroyos in the Las Cruces area as potential trail corridors. Its Trail System Priorities map contains text on a tiered network of trails, examples of improved and unimproved trail facilities, and a discussion of potential pavement types. The aim of these policies is to provide a variety of transportation choices that serve all users by developing safe, reliable, and convenient non-motorized transportation modes, i.e. pedestrian and bicycle facilities.

The *One Valley One Vision 2040 Regional Plan*, adopted in 2012, reinforces various arroyo policies found in the *1999 Comprehensive Plan* and *Transport 2040*. It calls for the preservation of open space; improving our water supply by better management of stormwater and the effects of erosion; providing an adequate network of corridors for wildlife (e.g., buffer zones adjacent to arroyos or wildlife over/under passes); developing strategies for low-impact recreation along arroyo buffers; and increasing access to non-motorized transportation options to promote healthy living and provide mobility alternatives. *One Valley One Vision 2040* also supports an arroyo and open space management plan that would "help protect our sensitive environmental resources".

The *Parks and Recreation Master Plan*, updated in 2013, suggests integrating the siting of proposed trail segments into the development design process and requiring development projects along designated trail routes to incorporate the trail as part of the project. It also supports the MPO's *Transport 2040's* Trail Plan by calling for a comprehensive parks and trails facilities mapping program that promotes active lifestyles in Las Cruces and integrating arroyos into the trail system. Additional policies address trail accessibility for all users and promote an open space protection program.

The 1999 Comprehensive Plan was amended in 2013 as *Comprehensive Plan 2040* and carries these policies forward to present day. In addition, the Future Concept Map in the amended plan specifically

calls for "conservation areas" consisting of areas of historical, cultural, environmental value or open areas that could become community assets and are worth conserving, such as arroyos (Goal 35, Policy 35.1). At present, the 2001 Zoning Code as amended has three zoning districts related to open space and arroyos: Flood Control (FC); Open Space-Recreation (OS-R); and Open Space-Natural/Conservation (OS-NC).

For a comprehensive listing of the goals and policies in the plans and ordinances noted above, see Appendix 2, Planning Background.

CHAPTER 2. GLOSSARY AND ACRONYMS

Access points: Low impact areas that form entrances into the arroyo buffer from adjacent urbanization. These points provide access for pedestrians, cyclists, equestrians, and, occasionally, motor vehicles for purposes of maintenance and operations.

Alluvial fan: A fan-shaped pile of sediment that forms where a rapidly flowing watercourse enters a relatively flat valley. As water slows down, it deposits sediment (alluvium) that gradually builds the fan shape.

Arroyo: The American Geological Institute Glossary (1972) defines an arroyo as "a deep, flat-floored channel or gully of an ephemeral stream or of an intermittent[3] stream usually with vertical or steeply cut banks of unconsolidated material at least 60 centimeters *(2 feet)* high, that is usually dry, but may be transformed into a temporary water course or short lived torrent after heavy rains." Also called a wash or draw.

Major arroyo means any channel whose watershed exceeds 320 acres in a 100-year design storm, whether the watershed is in its natural or unaltered state or has been altered by development, runoff diversions, or detention facilities.[4]

Natural arroyo is an arroyo that has not been directly altered by human intervention.

Naturalistic arroyo corridor is an arroyo that has been directly altered by human intervention and in which non-continuous or limited erosion protection measures have been installed to prevent damage to infrastructure while maintaining the natural bed and bank materials.

Arroyo boundary: The elevation line on the banks of an arroyo that represents the lateral reach and depth of water calculated from a 100-year flood event.

Arroyo buffer: The area adjacent to an arroyo where development may not occur or may be reduced in intensity. It would be determined starting at the boundary of the 100-year flood zone and measured laterally from that point. Over the arroyo's length, the buffer may vary, depending on

[3] Ephemeral flows carry water only during and immediately after a rain, and intermittent flows carry water for only part of the year.
[4] Las Cruces Municipal Code, Chapter 32 Design Standards

	the hydrology, natural vegetation, wildlife corridors, the slope of the sides of the arroyo, soil type, etc. Buffer distances could be determined using similar computer modeling software that is used to determine flood zone boundaries and buffer widths would be identified on a case by case basis.
Arroyo system:	A major arroyo, its buffers and tributaries that, integrated, form an unaltered, natural drainage area.
Best Management Practices (BMPs):	Management measures or practices used to protect air, soil, or water quality or reduce the potential for pollution associated with storm water runoff. BMPs may be a structural device or non-structural practice, including processes, land use alternatives, activities, or physical structures.
BMPs, structural:	Engineering solutions to stormwater management. Structural BMPs are used to treat stormwater at the point of generation, the point of discharge, or at any point along the stormwater "treatment train." Structural BMPs can serve many different functions based on their design. Common examples of structural BMPs usually found within urban areas include stormwater ponds and open channels (swales).
BMPs, non-structural:	Those BMPs in which there are no physical structures associated. Nonstructural BMPs are designed to limit the amount of pollutants available in the environment that would potentially end up in stormwater runoff, and typically lessen the need for the more costly structural BMPs. Natural elements include floodplains, wetlands, forests and riparian buffers. Nonstructural BMPs may also be achieved through such things as education, management, and development practices.
Buffer:	See "Arroyo buffer"
Channel:	Any arroyo, stream, swale, ditch, diversion, or watercourse that conveys storm runoff, and including structural facilities.
Channel stability:	A condition in which a channel neither degrades to the degree that structures, utilities or private property are endangered, nor aggrades to the degree that flow capacity is significantly diminished as a result of one or more storm runoff events or moves laterally to the degree that adjacent property is endangered.
Channel treatment measure:	A physical alteration of a channel for any purpose.
Climate change:	Any substantial change in measures of climate (such as temperature or precipitation) lasting for an extended

period (decades or longer). Climate change may result from natural factors and processes or from human activities.

Design storm: A storm that deposits a stated amount of precipitation within a stated period over a defined area and which is used in calculating storm runoff and in designing drainage control, flood control and erosion control measures.

Detention facility: Basin whose outlet has been designed to detain stormwater runoff for some minimum time (e.g., 24 hours) to allow soil particles and associated pollutants to settle. Unlike retention ponds, these facilities do not have a large permanent pool of water.

Disturbed area: Any area in which the soil will be altered by grading, leveling, scraping, cut and fill activities, excavation, brush and timber clearing, grubbing, and unpaved soils on which vehicle operations and/or movement will or has occurred.

Drainage: Movement of waters through a watershed that is collected from higher elevation or surrounding lands, eventually reaching a lower elevation waterbody like a river or ocean.

Drainage course: A natural watercourse for the drainage of surface waters.

Drainage plan: A plan indicating an on-site drainage proposal for developed land, outlining the passage of stormwaters through the development and safe discharge of runoff onto adjacent lands or into storm drainage facilities. Also, a drainage plan provides a comprehensive analysis of (i) the existing storm drainage conditions of a proposed development, and (ii) the detention/retention of the increased runoff which is generated by the development.

Easement: The right, liberty, advantage or privilege that one individual or entity has in land of another, either express or imputed (utility, grant, or necessity).

Encroachment: Any man-made obstruction in the floodplain that displaces the natural passage of flood waters.

Erosion: The transport of soil particles, or mass movement of soil. Caused by water, wind, or mechanical means.

Erosion control: Treatment measures for the prevention of damages due to erosion and soil deposition from the ten-year design storm runoff.

Escarpment: A long, steep slope, such as a slope at the edge of a plateau or separating areas of land at different heights.

FEMA: Federal Emergency Management Agency. FEMA's primary purpose is to coordinate the response to a disaster that has occurred in the United States, such as flood events.

Finger: A small arroyo or gully that forms a fan-shaped extension at the head of a system of arroyos.

Flood control: Treatment measures necessary to protect life and property from the 100-year design storm runoff.

Flood hazard area: An area inundated by a flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA).

Floodplain: A relatively flat or low land area adjoining a river, stream or watercourse that is subject to partial or complete inundation by floods.

Floodway: The channel of a river or watercourse and adjacent areas that must be reserved from development in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than one foot (cumulatively one foot for all changes).

Flood zone: Geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. These zones are depicted on the published Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map (FHBM). For the purposes of this document, flood zone is used to describe an area subject to inundation from the 100-year design storm runoff.

Green infrastructure: Infrastructure associated with stormwater management that utilizes low impact development techniques to infiltrate, evapotranspire, capture, and reuse stormwater to maintain or restore pre-development hydrology.

Historic flows: Those flows naturally present in the drainage area prior to any disturbance by development within the upstream watershed.

Hydrology, pre-development: The combination of runoff, infiltration, and evapotranspiration rates and volumes that typically existed on a site before human-induced land disturbance occurred (e.g., construction of

infrastructure on undeveloped land such as meadows or forests).

Las Cruces Municipal Codes (LCMC): Las Cruces Municipal Codes found at: www.municode.com/library/nm/las_cruces

Low impact development (LID): A stormwater management approach that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives.

Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances (including roads and municipal streets with drainage systems) which is used for collecting and conveying storm water and that is owned or operated by a public entity that is a designated and approved management agency under Section 208 of the Clean Water Act. Operators of MS4s can include municipalities, local sewer districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities.

Native plants: Plants that are indigenous to the region or are from other places that have become established in wild lands without cultivation.

Natural cover: Vegetation, exposed rock, or barren ground that exists prior to commencement of earth-disturbing activities or vegetation achieved through restoration back to a natural state.

National Pollutant Discharge Elimination System (NPDES): The national permit program for administering and regulating Sections 307, 318, 402, and 405 of the Clean Water Act. The program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES General Permit specifies by what conditions construction activities may discharge stormwater.

One hundred-year flood (100-year): A storm whose precipitation within a given period of time and resulting runoff has a one-percent (or one time in a hundred) chance of being equaled or exceeded in any given year. It is also referred to as 100-year design storm.

Open space: The area of a lot, tract, or parcel not devoted to any building or structure, driveway, parking lot or stall, or street. The term generally refers to natural or undeveloped land.

Path: See "Trail"

Retention facility	Constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season). Ponds treat incoming stormwater runoff by allowing particles to settle and algae to take up nutrients. Also called wet ponds, and are used as a common stormwater management BMP.
Scenic corridor:	A single-loaded street that abuts open space lands such as arroyos, the Organ Mountains, the Rio Grande, or designated protected lands such as an area of critical environmental concern (ACEC) as defined by the U.S. Bureau of Land Management, and provides a scenic view.
Sediment:	Loose particles of sand, clay, silt, and other organic substances that settle at the bottom of a body of water. Sediment can come from the erosion of soil or from the decomposition of plants and animals.
Setback:	The minimum distance from the property line to where a structure may be built, as regulated by zoning statutes or restrictions in the deeds in various locales.
Site planning:	Analysis of a proposed development area to ensure that stormwater management and impact to environmental features are considered early in the development process.
Slope:	An inclined piece of land, three feet or higher vertical rise, with a five horizontal to one vertical incline or greater.
Soil cement:	A mixture of sandy soil excavated on site with Portland cement. The mixture is compacted in place like earth fill and over time hardens to the consistency of sandstone.
Trail:	A paved or unpaved right-of-way or grade-separated right-of-way for which primary purposes are to provide a place to walk, cycle or horseback ride, and to provide access to other areas, such as recreational facilities, neighborhoods, schools, commercial areas, etc.
Transect:	A geographical cross-section of a selected environment and a master planning tool that guides the placement and form of buildings and landscape, allocate uses and densities, and may detail civic spaces. The result is a natural gradient of development that moves from large, rural lots to more compact mixed-use main streets.
Viewshed:	The natural environment that is visible from one or more viewing points.
Wash:	Another term for arroyo or gully.

Watershed: A basin-like landform defined by upper elevation ridgelines that descend into lower elevations and stream valleys. A watershed acts as a drainage basin and carries precipitation (either from rainfall or snowmelt) to stream tributaries making its way to larger rivers and groundwater aquifers.

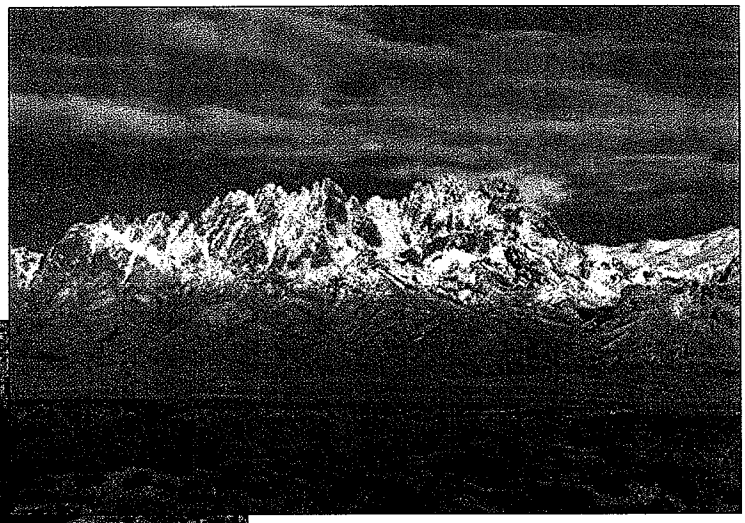
Wetland: An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

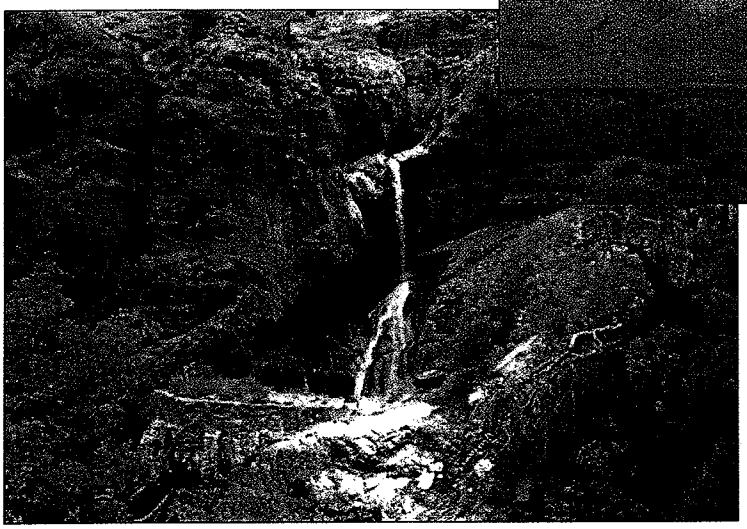
CHAPTER 3. REGIONAL CHARACTERIZATION

Las Cruces is situated in the central portion of Doña Ana County in south central New Mexico. The Organ Mountains flank the eastern part of the city, and on the north, south, and west, agriculture and open space. The area is located within the northern reaches of the Chihuahuan Desert which extends north from approximately Zacatecas, Mexico to Socorro, New Mexico, about 220,000 square miles in total area. The Chihuahuan Desert is described as a high-elevation desert because a large portion lies above 4000 feet in elevation.[5] Further west, the Rio Grande flows through the Mesilla Valley. Agriculture is one of the historical foundations of the area's culture and is one of the major sources of groundwater recharge in the region.

The Organ Mountains are the scenic backdrop to Las Cruces and are Doña Ana County's most recognizable feature. The Organ Needle is the high point in the county, at about 8,990 feet in elevation.[6] Just three miles to the west the elevation drops to about 4,000 feet, making the Organ Mountains one of the steepest mountain ranges in the western United States.

It is not uncommon to see snow in the Organs as late as May while the rest of the area enjoys milder weather.
Photo: http://lascrucesblog.com/.





Dripping Springs Natural Area has over four miles of easy hiking trails that display desert scrub and low elevation pinon-juniper and oak woodlands. The area also provides wildlife viewing opportunities. Photo: www.elpasotimes.com/ living/ci_21498935.

[5] Chihuahuan Desert Nature Center, http://cdri.org
[6] Organ Mountains Desert Peaks National Monument, http://www.organmountains.org

Climate

The climate around Las Cruces is considered mild and arid or semi-arid, which is characterized by fairly hot summers and mild winters with warm spring and fall seasons. The average minimum and maximum daily temperatures in January are 21°F and 57°F, respectively, increasing to 62°F and 96°F in July. Average annual precipitation in Las Cruces is 9.23 inches and over 11 inches in the Organ Mountains. August is the wettest month with an average of 2.12 inches of precipitation and April is the driest month with an average of 0.21 inches of precipitation. The average annual snowfall in the area is 3.7 inches, typically in December, January, and February.[7]

Unlike the Sonoran and Mojave Deserts, the Chihuahuan Desert does not have a winter rainy season. Instead, over 90% of the annual rainfall occurs between the months of July and October, the period of "monsoonal" activity. Locally, "monsoons" are thought of as heavy and continuous storms, but the term refers to a system of alternating winds that shift direction because of differential heating between land and water.[8] The North American Monsoon (NAM) is characterized by shifts in summer wind patterns that occur as Mexico and the southwestern U.S. become hotter. When this happens, the prevailing winds start to flow from moist ocean areas into dry land areas, bringing moist air into Mexico in May then north to Arizona and New Mexico as summer begins.[9] These wind patterns can be erratic which then results in erratic storm activity.

El Niño and La Niña events further influence storms in the Southwest. El Niño occurs when warm water builds up along the equator in the eastern Pacific Ocean. The warm ocean surface warms the atmosphere, allowing moisture-rich air to rise and develop into rainstorms.[10] La Niña occurs when cooler than normal sea surface temperatures form along the equator, slowing cloud growth overhead. The result is usually drier than normal weather in the Southwest.[11]

Within Doña Ana County, storms are usually brief yet deliver an abundance of rain. This results in a high amount of runoff that naturally collects n arroyos and is transported or drained to the Rio Grande. The arroyos are made up of multiple intertwining channels that result from the unpredictable nature of stormwater runoff. Waters flow downhill through the watershed, collecting into larger and fewer channels until they converge in what is referred to as a "major arroyo".

Watersheds

Healthy watersheds provide three major functions. First, they transport and store water, sediment, pollutants, and organisms. Second, watersheds cycle and transform elements such as carbon, nitrogen, and phosphorus. And finally, they provide ecological succession through changes in vegetation due to movement of a watershed's energy, water, and materials. Through these functions, a watershed can provide habitats for aquatic and terrestrial organisms, and convey runoff and sediment loads out of each stream's watershed. The complex system of streams within a watershed is commonly referred to as the drainage net. Within drainage nets, small streams join or come together to form successively larger ones. This relationship, although variable in detail, holds true for watersheds of any size or extent.

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[7] National Weather Service: www.weather.gov
[8] Arizona Cooperative Extension: http://cals.arizona.edu/pubs/natresources/az1417.pdf
[9] University of Arizona Climate Assessment for the Southwest: www.climas.arizona.edu/sw-climate
[10] NASA Earth Observatory: http://earthobservatory.nasa.gov/Features/WorldOfChange/enso.php
[11] www.climas.arizona.edu/sw-climate

A watershed acts as a drainage basin and carries precipitation (either from rainfall or snowmelt), which is then channeled to stream tributaries making its way to larger rivers and groundwater aquifers. Watersheds also transport sediment, pollutants (both natural and anthropogenic), and aquatic organisms. The structure of a watershed can change over time due to shifts in soils and alluvial fans depending on hydrologic forces, land cover, and surface characteristics. In the Las Cruces area, the receiving surface water body is the Rio Grande; groundwater aquifers also receive water through seepage and infiltration. [12]

The Southwest has experienced severe drought since 2002, and questions regarding how much water is available in the region and how it will be used influence development, economic growth and every other aspect of community life. In Doña Ana County, water is strictly controlled for agricultural, domestic and industrial use, and many agencies are involved in its management. They are primarily the United States Section of the International Boundary and Water Commission (USIBWC), U.S. Bureau of Reclamation (BOR), the New Mexico Office of the State Engineer (OSE), and Elephant Butte Irrigation District (EBID). Other entities involved in water management include the New Mexico Interstate Stream Commission, the Lower Rio Grande Water Users Organization (LRGWUO), the Paso del Norte Watershed Council (PdNWC), and the South-Central New Mexico Stormwater Management Coalition.[13]

Characteristics such as land use, geology, soil type, amounts of deposited sediment and debris, and hydrologic interactions, all play a role in how a watershed drains to major rivers and aquifers. Channels can be altered considerably over time depending on hydrologic conditions. The relationship between alluvial fans and the greater watershed is significant, because extreme stormwater events can alter channel formation.

Alluvial fans are gently sloping, fan-shaped landforms common at the base of mountain ranges in arid and semiarid regions. Alluvial fans develop where streams or debris flows emerge from steep reaches to relatively straight, narrow channels then to zones that are wider and flatter. These conditions develop where there are major breaks in gradient or channel confinement, allowing both deposition of sediment and the lateral movement of channels to spread the sediment into fan-shaped landforms. An undisturbed upstream alluvial fan is important to the health of the entire arroyo system. Proper infiltration and drainage within the alluvial fan can lead to more natural and consistent downstream tributary flows.

Alluvial fans are made of sediments that are deposited where a stream or river leaves a defined channel and enters a broader and flatter floodplain. As the flow path spreads out, conveyance is reduced and active erosion, sedimentation, deposition and unpredictable flow paths can inundate the low-lying areas. Alluvial fans can convey high flood risk and be even more dangerous than the upstream canyons that feed them. Their slightly convex perpendicular surfaces cause water to spread widely until there is no zone of refuge. [14] If the gradient is steep, active transport of materials down the fan creates a moving substrate that is inhospitable to travel on foot or wheels. But as the gradient diminishes downslope, water comes down from above faster than it can flow away downstream, and may pond to hazardous depths. When the stream repeatedly deposits sediment into its floodway and channel bed, the conveyance capacity of the channel is quickly exceeded resulting in overbank flooding, erosion and the

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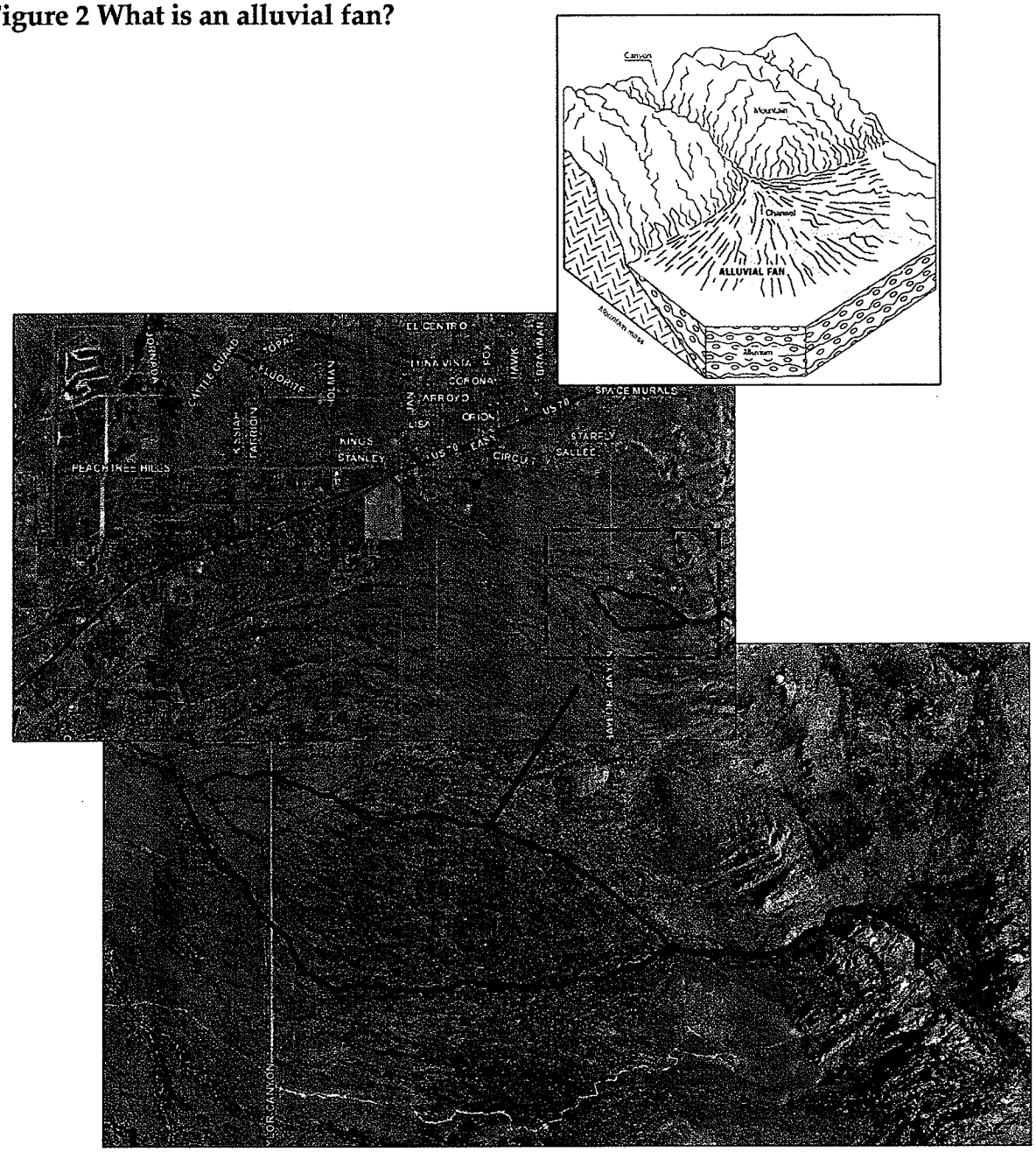
[12] Paso del Norte Watershed Council, www.pdnwc.org

[13] *One Valley One Vision 2040* Regional Plan

[14] Alluvial Fan Flooding. National Research Council Committee on Alluvial Fan Flooding, Washington DC. 1996.

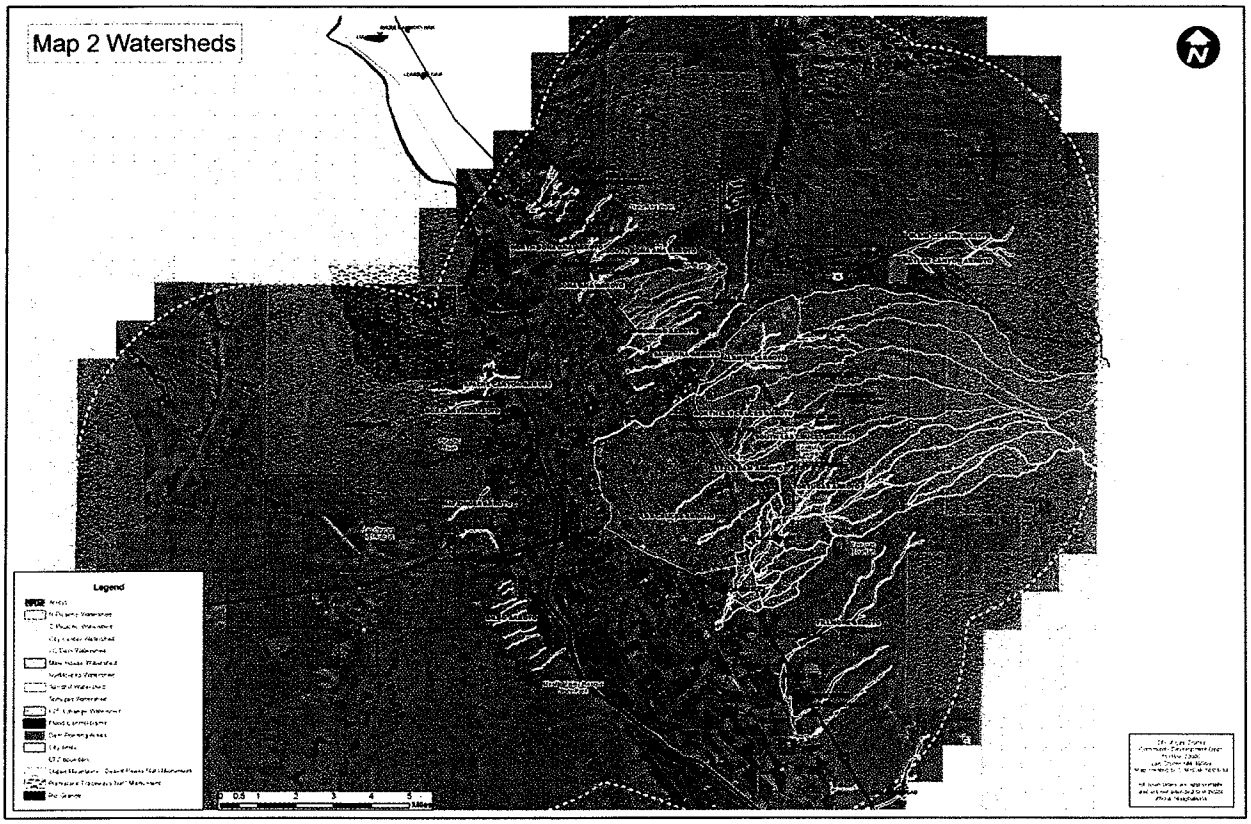
formation of a new channel. Alluvial fans are also dangerous because the stream channel will slowly erode the soft sediments and meander outside of the mapped 100-year flood zone.

Figure 2 What is an alluvial fan?



These images show the general path of the Sandhill Arroyo in 2010. The well-defined portion of the flow path within the Organ Mountains is delineated in blue. As the arroyo drops out of the mountains into the relatively flatter alluvial plain below many fingers begin to form as the flow fans out. This area is roughly indicated in red. As flows continue to the valley floor, these smaller fingers generally come back together again into a well-defined channel. The well-defined downstream portion is indicated in green. Graphic by Mary Evans

Map 2 Watersheds in the Planning Area



East Mesa

On the East Mesa, there are several major arroyos that cross Las Cruces from east to west. All of the major arroyos are well defined from the Organs but as the arroyos cross into flatter alluvial fans and urban and agricultural areas, they become more poorly defined.[15] Many of the larger arroyo systems on the East Mesa were dammed because they were the source of damaging flooding and sediment deposition on the valley floor where agriculture and older development were located. The Alameda and Las Cruces (north and south forks) Arroyos caused flooding in the city center prompting the construction of the Las Cruces Dam in the early 1970s. The City of Las Cruces manages these and the Sandhill Arroyo, which play an integral part in flood control and public safety in the community.

Under natural conditions, arroyo channels meander within their floodplains, shifting locations in response to unpredictable storms and their runoff. Severe summer storms sometimes produce high flows that erode the channels, dramatically changing the slope and paths of the arroyos. Development impacts to the natural drainage system have increased the likelihood of flooding within an arroyo because the rain falls on impervious surfaces such as rooftops, driveways, parking lots, sidewalks and streets. This runoff is more rapid and concentrated, adding more water in a shorter time to the arroyo than would be the case under historic flows. This rapid surge increases the quantity of water in the arroyo making it capable of forcing changes to its channel and to the surrounding land. When the

[15] City of Las Cruces Storm Drain Master Plan, 2006. Bohannan Huston, Inc.

existing channels cannot accommodate the flow by cutting wider and deeper, the stream overflows its banks, flooding the surrounding area and sometimes changing its boundaries.

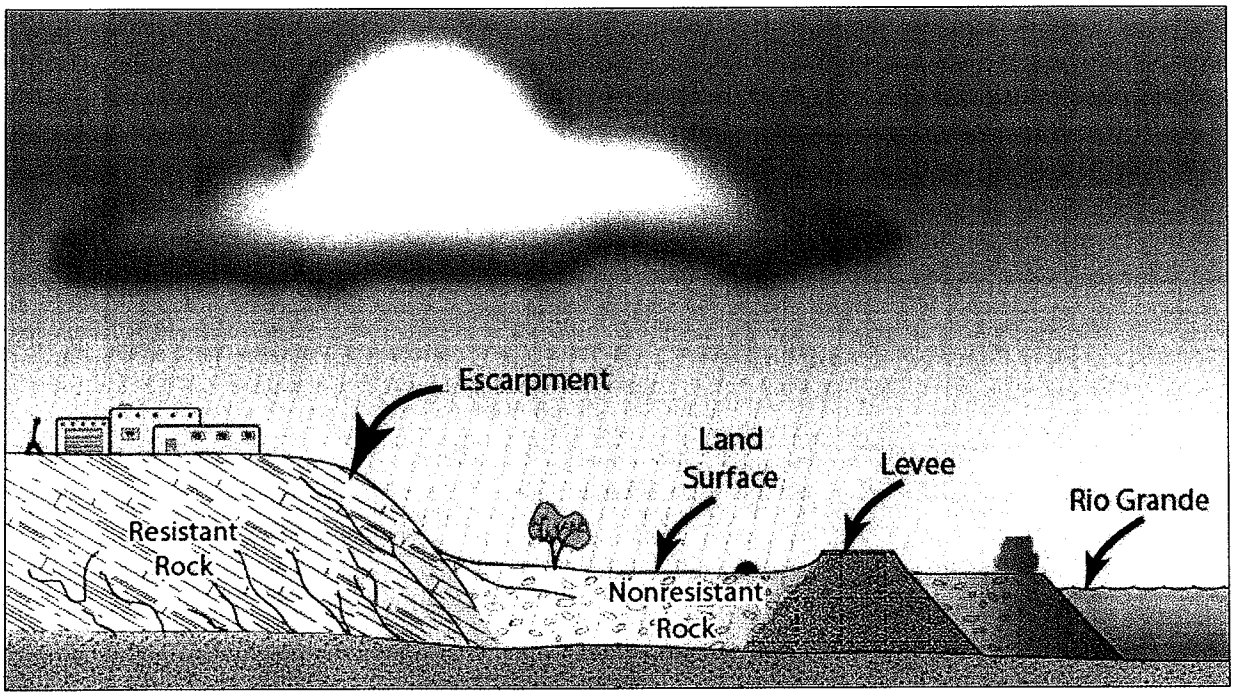
Other intrusions by development within the floodplain of an arroyo also impact the balanced relationships between the flow of flood waters and their erosion of the channel soils. Historically such changes to the channel increase the velocity of the drainage water, increasing erosion, which transports sediment and causes downstream deposition that alters the natural channel. These impacts start a series of adjustments in which a new equilibrium within the channel is sought. Such adjustments, once started, may require tens or hundreds of years to reach a new equilibrium. Conversely, to slow the drainage water down in an arroyo channel to a velocity below its historic equilibrium velocity could lead to an early deposition of sediment that would start the formation of a sandbar, further restricting or deflecting the flow of the captured water. The least impact to the arroyo drainage is to maintain the naturally established system that forms the arroyo flood zone and its channel.

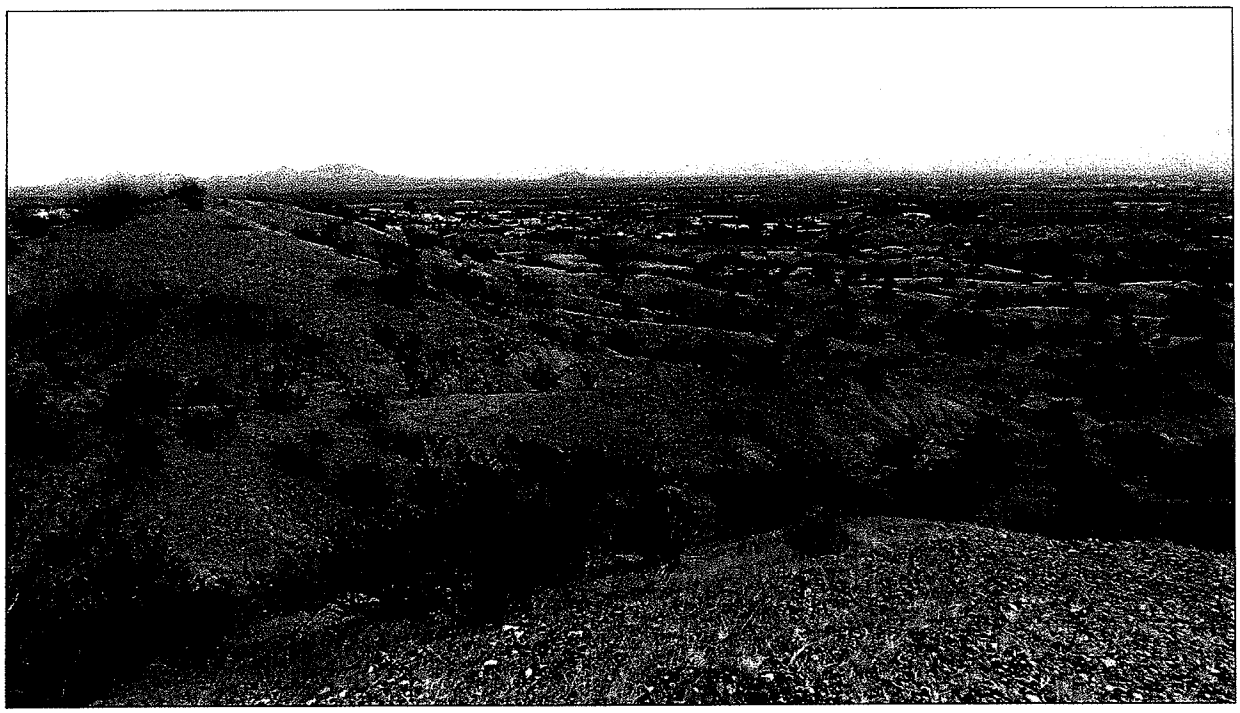
West Mesa

On the West Mesa, Picacho Hills and Picacho Mountain developments have added several hundred residences in recent years, but with the exception of these neighborhoods, there is very little development to date that impacts arroyo function. The West Mesa continues along the valley much further south than the East Mesa with few flood protection structures and affords much greater opportunity for natural flood protection without dams if development is planned properly.

On the West Mesa, rather than gradually sloping from the mountains, the Apache Canyon, Box Canyon, Nafzinger, and Bilbo Arroyos drop down an escarpment then flow to the Rio Grande. An escarpment is an area where elevation changes suddenly; it usually refers to the bottom of a cliff or a steep slope (see Figure 3). On the West Mesa, elevation can drop 200-500 feet in as little as a mile, depending on location. Escarpments and hillsides present unique challenges to arroyo protection as well as to development, including extreme slopes, lack of soil stability, infrastructure and roadway development impediments, and wildlife habitat protection. These unprotected arroyos are very dynamic in nature and it will prove difficult to avoid engineer solutions unless development is planned to avoid the need to control the numerous arroyos. While this area is largely outside of the city, it is important to maintain a watershed-based perspective. In these instances, increased focus needs to be provided to protect views, surface integrity, and other issues related to constructing along hillsides and escarpments.

Figure 3 Escarpment diagram[16]





Issues on the West Mesa escarpment include roadway development impediments and unstable soils due to steep slopes and erosion.

[16] Graphic by Peter Bennett, after: Guidebook to the Geology of Travis County, University of Texas-Austin, 1977.

Geology and Soils

The geology of the Las Cruces area is extraordinary and diverse. Las Cruces is located in the Mexican Highland Section of the Basin and Range Physiographic Province.[17] Landforms consist of alluvial and terrace deposits that occur along the Rio Grande Valley west of the Organ Mountains. Geologic formations in Las Cruces are Quaternary piedmont and the Upper Santa Fe Group.[18] The underlying geology of an area determines the soil types found toward the surface.

Doña Ana County is characterized by 70 different soil types.[19] For the most part, the soils of the arroyos and surrounding areas are gravelly sand with some cobblestones, boulders and un-weathered bedrock. The sandy soils extending east from the Las Cruces Dam to the Organ Mountains generally become more gravely closer to the mountains. The terrain on the East Mesa is nearly level, then slopes gradually upward, becoming very steep on the approach to the Organ Mountains.

Closer to Las Cruces the gradation of the soils gradually increase in their small particle contents in both silt and clay size. Within the intervening areas various alluvial deposits can be found which typically exist as thin beds of horizontally stratified sands or other soils probably deposited during historic storm or tectonic events. Further west into the middle of Las Cruces, the soils also start showing past sorting by the Rio Grande historic flood events. In these locations, and extending to the Rio Grande, an increased content of clay-like soils are found. There is also a decreased aggregate content.

Soils located in arid and semi-arid regions are subject to more extreme cycles of expansion and contraction than those located in more consistently moist areas, and great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding; they may be shallow to bedrock; or they may be too unstable to be used as a foundation for buildings or roads. Very claylike soils have a high water-holding capacity and do not promote infiltration or movement to groundwater. Conversely, very sandy soils provide a porous environment which provides better infiltration but are more susceptible to erosion.

Whether soils expand or collapse under varying conditions also impacts infrastructure. Collapsible soils consist of loose, dry, low-density materials that collapse and compact under the addition of water or excessive loading. These soils are distributed throughout the southwestern United States, specifically in areas of young alluvial fans, debris flow sediments, and wind-blown sand/silt sediment deposits. Collapsible soils are most often encountered in arid climates, where wind and intermittent streams deposit loose sediment. Expansive soil and rock are characterized by clayey material that shrinks and swells as it dries or becomes wet, respectively. Problems often associated with expansive soils include foundation cracks, ruptured pipelines and heaving or cracking of sidewalks and roads. Similar to expansive soils, collapsible soils result in structural damage such as cracking of the foundation, floors, and walls in response to settlement. But human activities can sometimes facilitate soil collapse, notably water impoundment, irrigation or changing the natural drainage of a site.[20]

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[17] Williams, J. L. 1986. *New Mexico in Maps, Second Edition.* Albuquerque, NM: University of New Mexico Press.
[18] New Mexico Bureau of Geology and Mineral Resources. 2003. *Geologic Map of New Mexico.* Socorro, NM: New Mexico Institute of Technology and USGS.
[19] Ibid
[20] Association of Environmental and Engineering Geologists, http://www.aegweb.org/

The level of the water table is also a factor for infrastructure placement and design. A high water table is not suitable for subsurface installations and erosion must be accounted and managed for. Soil type analysis is an important step in the design and placement of any infrastructure in our desert environment.

Soil formation is largely controlled by five major factors:

1. The physical and mineralogical nature of the parent material (underlying bedrock),
2. Plant and animal life,
3. Topography,
4. Present and past climatic conditions, and
5. Time.

Dynamic factors like climate and organisms alter soil's parent material over time, resulting in more or less distinct soil layers. No single factor dominates the soil-forming process except in extreme cases. Rather, the effect of any one factor is either enhanced or hindered by the others. For example, topography can modify the effect of rainfall by influencing drainage and surface runoff. Likewise, rainfall and temperature together can stimulate the effect of vegetation in soil formation. These and other interactions give rise to the different soil characteristics found within any given landscape.[21] Soil type is a primary factor in determining drainage and surface runoff, and often a main factor for a site's topography.

Vegetation

Although much of this area was at one time covered in Chihuahuan Desert grasses such as sideoats grama, black grama, fluffgrass, vine mesquite, tobosa, burro grass, alkali mallow and cane bluestem, desertification has caused a transition to scrubland.[22] The East Mesa holds relatively sparse vegetation in the overland areas and larger, denser vegetation along the beds of the arroyos. An arroyo is technically an ephemeral stream, but the vegetation is basically upland desert vegetation. Shrubs, stem succulents, cacti, and grasses; creosote bush and tarbush are dominant.[23] On much of the East Mesa, desert willow, little-leaf sumac, Apache plume, and cut-leaf bricklebush are good indicator species for significant arroyo corridors since these plants require the additional water carried by arroyos. In the upper reaches of the major arroyos on the East Mesa dense stands of the small tree known as Western Soapberry can also be found. Many of these plants, especially the Apache plume, bricklebush, and soapberry reproduce readily through root-sprouting, creating dense stands with tightly packed stems and underlying root systems that are very good at stabilizing soils. The dense growth forms and low overhanging branches of desert willows and little-leaf sumac also result in thick vegetation at ground level, allowing these plants to reduce the erosive force of floods by slowing the flow of stormwater and capturing sediment and other debris carried by floods.[24]

Other typical plant species found in this area include snakeweed, whitethorn acacia, Mormon tea, Sand sagebrush, Soaptree Yucca, Giant and Mesa Dropseed, Fourwing Saltbush, lechuguilla, sotol, and various types of yuccas. Other common shrubs include mimosa, acacia, mariola, tarbush, javelina bush, skeleton

[21] Soil Survey of Doña Ana County Area, New Mexico, 2007. www.nrcs.usda.gov
[22] USACE East Mesa Watershed Study
[23] Asombro Institute for Science Education: http://asombro.org
[24] Nancy Stotz memo, April 29, 2014

leaf goldeneye, allthorn, and ocotillo.[25] Perhaps one-fifth of all the world's cacti – as many as 350 of the 1,500 known species – occur in the Chihuahuan Desert.[26] Common cacti include the prickly pear, hedgehog, living rock, nipple cacti, and cory cacti. The night blooming cereus, a cactus, has been observed and is state endangered. Other species of concern and State-endangered species include various pincushion cacti.[27]

Vegetation has a direct impact on the health of arroyos. In addition to root systems that hold water and prevent erosion, the plants themselves provide habitat and protection for wildlife. It takes many years for vegetative species to establish and stabilize in the Chihuahuan Desert, furthering the need for protecting the arroyo systems from disturbance.

Wildlife

There are approximately 80 species of mammals, 185 species of birds and 60 species of reptiles and amphibians that inhabit this area.[28] But according to the Army Corps of Engineers East Mesa Watershed Study (2007), mammalian wildlife is somewhat limited in the more urbanized areas and animal diversity may be further limited by the lack of permanent or perennial sources of surface water.[29]

No federally listed wildlife species are believed to occur in the Las Cruces desert arroyo areas. In 2007, one state-threatened species, the peregrine falcon, and one USFWS species of concern, the burrowing owl, were observed on the East Mesa.[30] However, according to the U.S. Fish and Wildlife Service and the New Mexico Department of Game and Fish websites, these birds are no longer listed as vulnerable species.[31]

This region is home to several plant and animal species found nowhere else on earth.[32] Military lands to the east and north prohibit public access, which helps protect many sensitive native species. In addition, military land north of Highway 70 protects a critical wildlife corridor between the Organ Mountains and the San Andres National Wildlife Refuge, home to the New Mexico's largest herd of Desert Bighorn Sheep, which are listed as endangered by the state of New Mexico.[33]

Flood Control Dams

There are 37 earthen flood control dams within the Extra-Territorial Zone (ETZ) all varying in size, condition, age and original purpose (see Map 3 and Table 1 below); nine of them are believed to have been constructed by the Civilian Conservation Corps during the years 1936 to 1939. Twelve of these are within the Las Cruces city limits. Most of the dams on the East Mesa were constructed on alluvial fan deposits that originated from the Organ Mountains to the east. There are also several flood control

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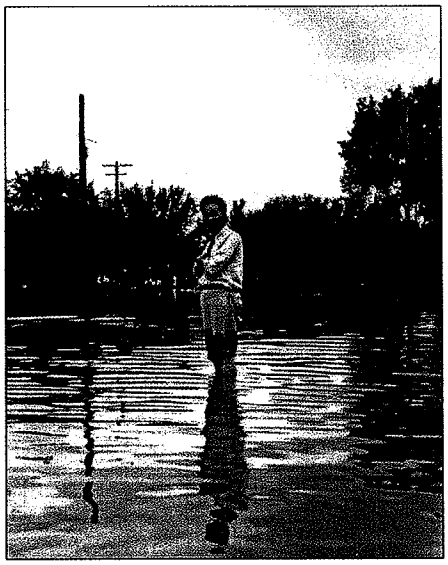
[25] University of Texas at El Paso Centennial Museum: http://museum2.utep.edu/chih/chihdes.htm
[26] World Wildlife Fund: http://worldwildlife.org/ecoregions/na1303
[27] U.S. Fish & Wildlife Service: www.fws.gov/endangered
[28] U.S. Army Corps of Engineers East Mesa Watershed Study, 2007
[29] Ibid
[30] Ibid
[31] NM Department of Game & Fish: www.wildlife.state.nm.us/conservation; and www.fws.gov/endangered.
[32] Citizens' Task Force for Open Space Preservation (CTFOSP) *A Vision: Open Space and Trail System*
[33] Ibid

dams on the West Mesa. These structures were built to protect agricultural lands within the Mesilla Valley and were intended as low hazard structures providing protection from a 50-year storm event.[34]

As areas downstream of these structures became urbanized, the hazards and required protection of the structures changed without upgrades or rehabilitation of the structures themselves. Currently a significant number of the dams are approaching or have met the end of their design life, but still protect downstream developments to a small degree. The Las Cruces Dam, which is a flood control pass-through dam, was constructed by the U.S. Army Corps of Engineers (Corps) in 1975 to protect development in Las Cruces by controlling flood flows from the Alameda and Las Cruces Arroyos.

Most dams in Doña Ana County are dry dams and have ungated outlets positioned so that essentially all stored water will drain from the reservoir by gravity, resulting in a normally dry reservoir area. The intent of a dry dam is to capture and slowly release storm water in order to lessen the velocity, flow rate, and sediment load that result from major storms. These dams are currently required by state law to drain their impounded water within 96 hours from the end of the storm. They also allow groundwater recharge by ponding runoff and allowing it to slowly infiltrate into the aquifer. In addition, through cooperative planning, these dams can fulfill other purposes such as habitat restoration, open space preservation, and public recreation.

Flood of August 29-30, 1935.
Boat of International Boundary Commission on Alameda Boulevard. This boat carried several people and personal property to safety.



Flood of August 29-30, 1935.
Professor D.B. Jett standing near Alameda Boulevard and Greening Avenue. Both photos: NMSU Library, Archives and Special Collections, 00941776/00941777. Used with permission.

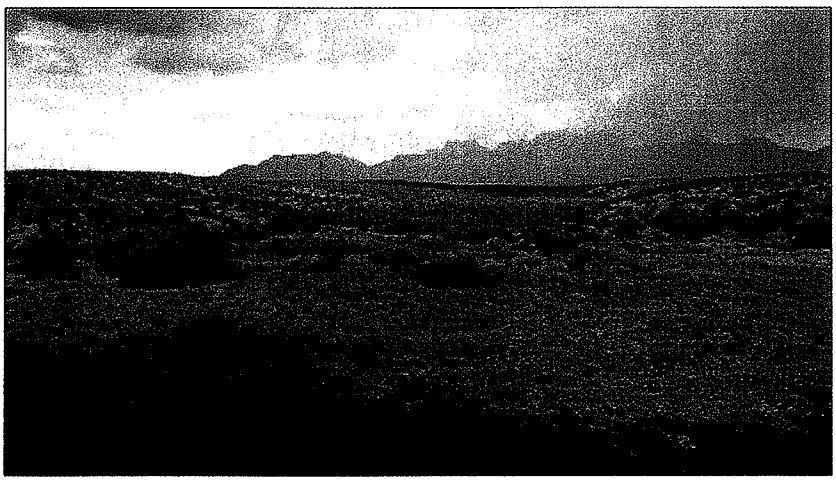
[34] A 50-year storm is an event having a 2 percent chance (or one in fifty) of being equaled or exceeded during any given year.

The New Mexico Office of the State Engineer Dam Safety Bureau requires dam owners to prepare Emergency Action Plans (EAP) for some of these dams (non-Significant Hazard Dams do not require an EAP.) An EAP is critical for protecting the dam and downstream development. It should be noted that the Hazard class will change if development is allowed below the dam. The EAP assists a dam owner in recognizing emergency and non-emergency events and to respond appropriately. It also provides local emergency officials with an inundation map to assist in developing an evacuation map.[35] The dams are owned and operated by a number of entities, including the City of Las Cruces, Dona Ana County, Elephant Butte Irrigation District, New Mexico State University and some private owners.

Table 1 Flood Control Dams

Dams within Las Cruces	Dams within the ETZ but outside the Las Cruces city limits	
Tortugas Site 1 Dam	South Picacho Dam	Alvillar 1-A Dam
Alameda Dam	North Picacho Dam	Alvillar 1-B Dam
North Fork Dam	Apache Dam	Alvillar 1-C Dam
Escondido Dam	Box Canyon Dam	Alvillar 2-A Dam
Redwood Dam	Brahman Channel	Alvillar 2-D Dam
South Fork Dam	North Doña Ana Dam	Alvillar 3-A Dam
McClernon Dam	Doña Ana Dam	Alvillar 4-A Dam
Butler Dam	Doña Ana South Dam	Alvillar 4-B Dam
Cothern Dam	Tortugas Site 2 Dam	Alvillar 4-C Dam
Fairbanks Dam	Fillmore Dam	Alvillar 4-D Dam
Sandhill Arroyo Dam*	Salopek Dam	Alvillar 4-E Dam
Las Cruces Dam*	Lower Fillmore Dam	
Villa Mora Dam*	Apache Arroyo Dam	
	Little Detention Dam	
*City of Las Cruces has management authority for these three dams		

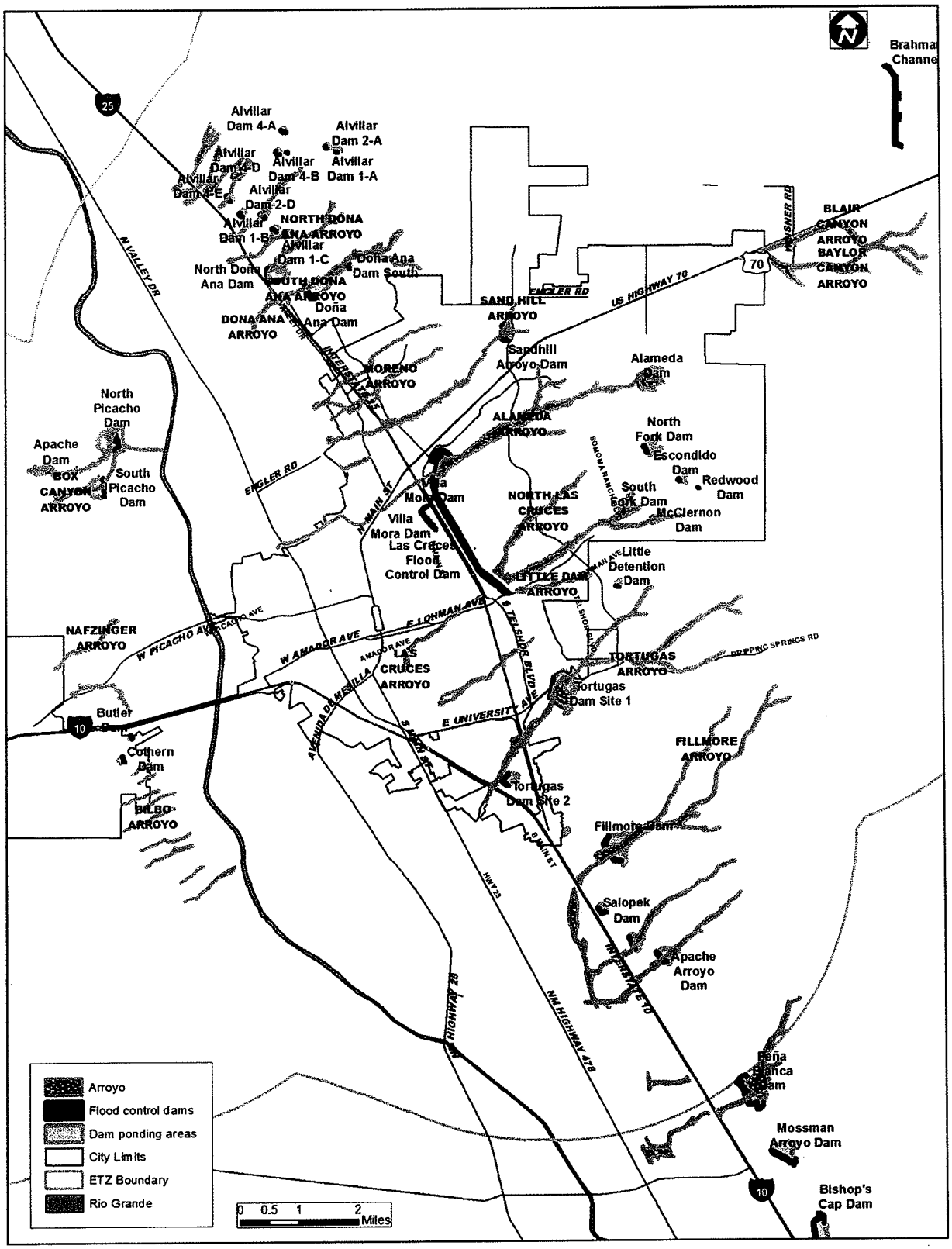
For more detailed descriptions of these flood control dams, including owners and Hazard class, see Appendix 3.



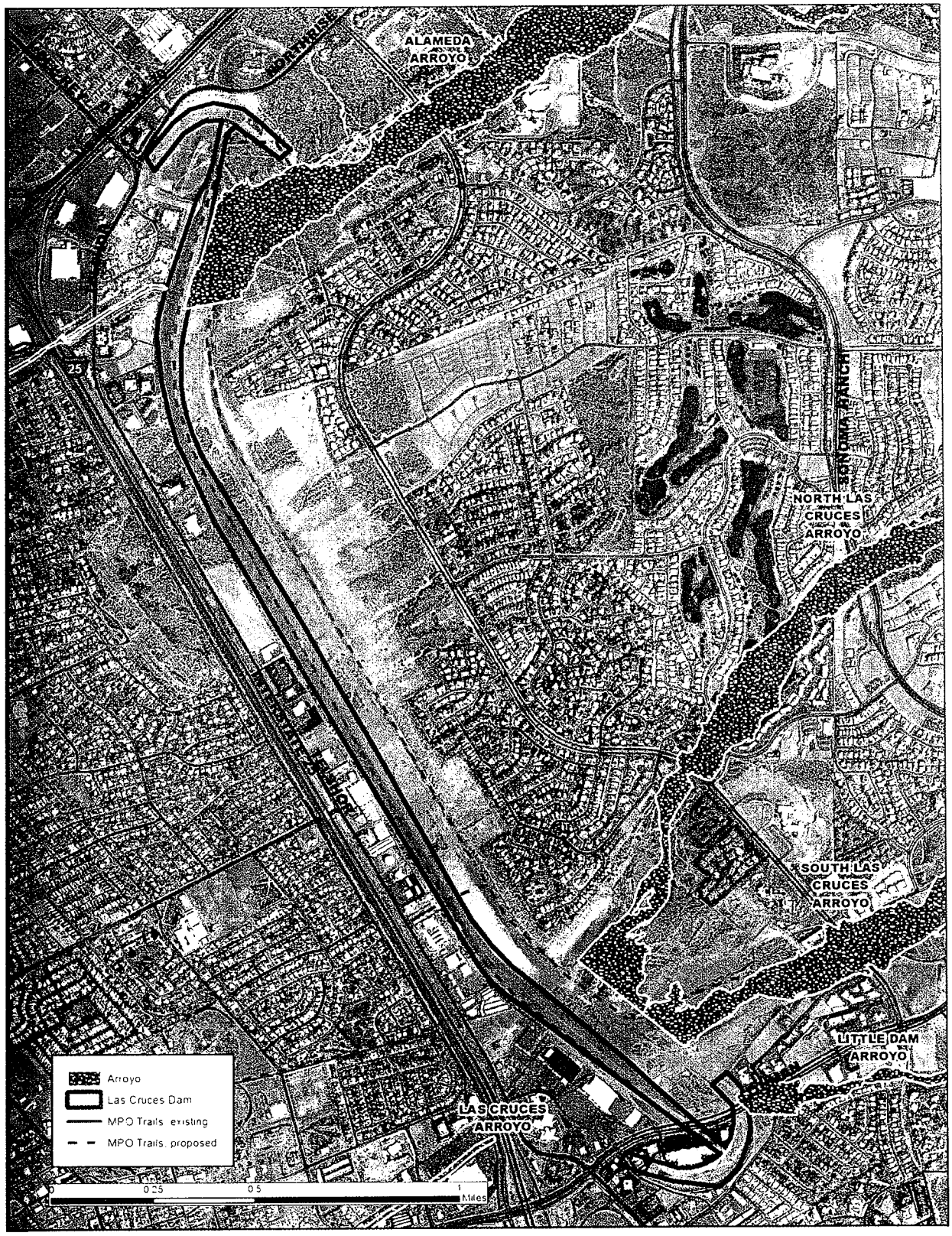
Looking upstream across the flood pool upstream from McClernon Dam. Pooling presents an opportunity for vegetative growth and habitat restoration. Photo: USACE Sediment Transport Analysis Report.

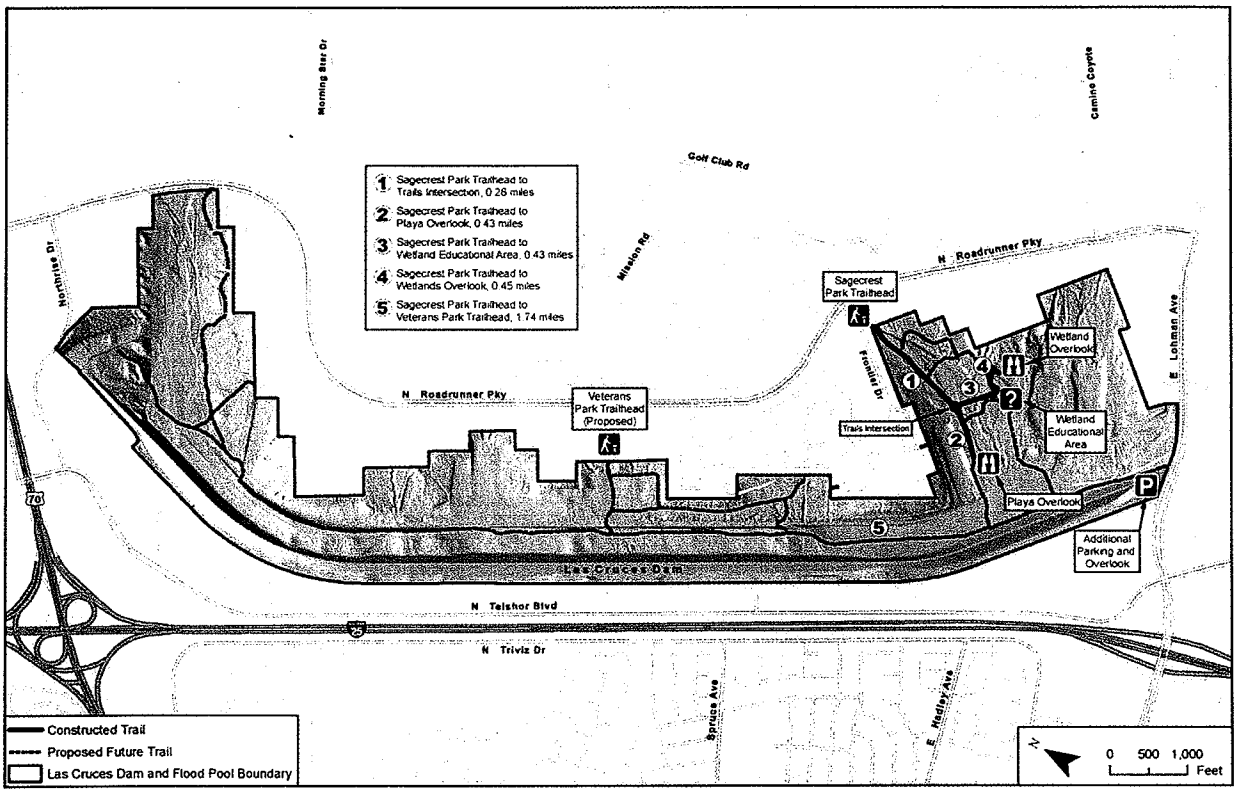
[35] New Mexico Office of the State Engineer http://www.ose.state.nm.us/water_info_dam_safety_info.html

Map 3 Flood Control Dam Locations



Map 4 Las Cruces Flood Control Dam





A partnership between the City of Las Cruces and the U.S. Army Corps of Engineers is sponsoring an environmental restoration project behind Las Cruces Dam. The project includes the creation of trails, viewing blinds, benches, shade structures, pond, a wetland meadow and a variety of riparian vegetation such as Cottonwood trees, grasses and shrubs.

Stormwater Management and Drainage

Floodwater that does not absorb into the ground flows into an arroyo carrying sediment with it until it eventually dissipates into the bed of the arroyo or continues on to the Río Grande. Because of the high sediment load in the floodwater and the amount of erosion and deposition, arroyos often change flow paths creating flooding concerns where none existed previously. Manmade changes to an arroyo system, such as road construction, may also result in unpredictable changes to the arroyo's path.

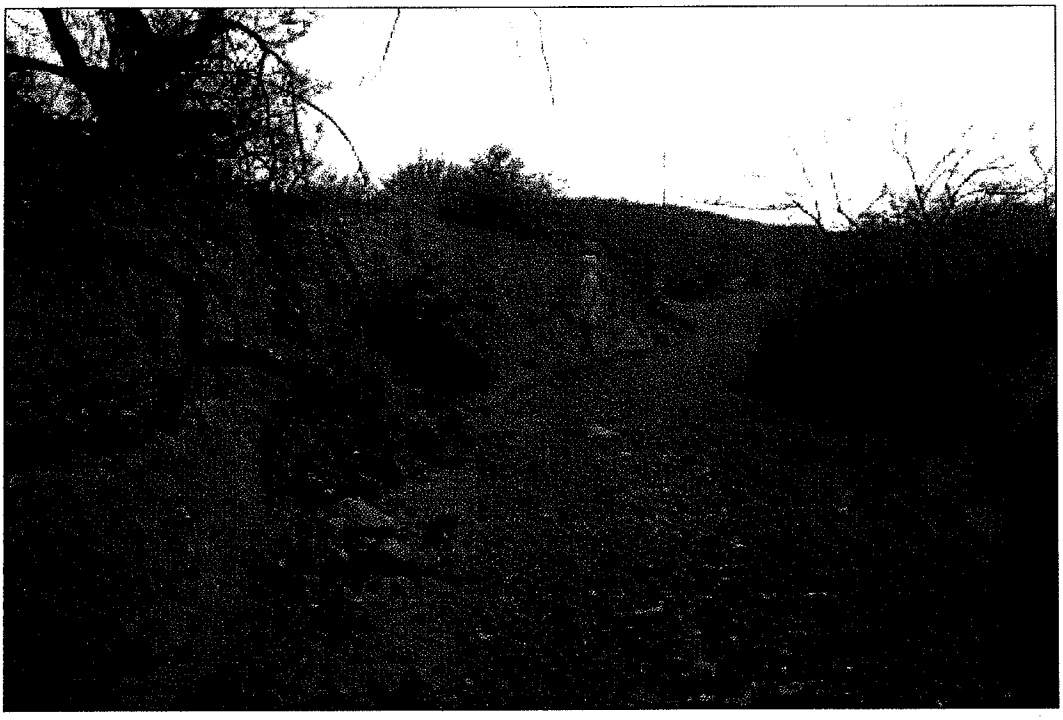
Stormwater management in Las Cruces is accomplished through a storm drain network, which consists of storm drain pipes, inlets/outlets, detention ponds as well as roadways and natural arroyos. There are 17 major detention ponds within the city limits. The stormwater collected through the natural arroyos and in the detention ponds is transported and discharged to the Rio Grande at several locations. In addition to the larger scale detention ponds, individual commercial lots also require their own on-lot ponding to handle storm water runoff. The runoff collected in these smaller on-lot ponds either evaporates, percolates down into the groundwater or adds to the controlled downstream runoff of the area.[36]

The City prepared a Storm Water Management Plan in April 2009 that serves to develop, implement and enforce its stormwater management program. In addition, the City also has a Storm Water Management

[36] City of Las Cruces Storm Drain Master Plan, 2006, Bohannan Huston Inc.

Ordinance in effect (Chapter 34 of the LCMC), which defines means of reducing pollutants from entering the City's municipal storm sewer system. Together with LCMC Chapter 32 Design Standards, the City ensures that its own projects and those of private developers comply with the EPA's NPDES permit program.[37]

As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating point and non-point sources that discharge pollutants into waters of the United States. Most stormwater discharges are regulated under this permit. The program regulates stormwater discharges from three potential sources: municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as arroyos and the Rio Grande.



Looking downstream in typical portion of the incised reach of the Alameda Arroyo about 0.4 miles downstream from Alameda Dam where the left bank is being cut into an alluvial terrace.
Photo: USACE Sediment Transport Analysis Report.

[37] Ibid

Utilities

The majority of City utilities are located in public right-of-way for the purposes of serving customers. Since arroyos are situated in low-lying areas, they naturally become main drainage ways and create ideal spots for locating gravity-driven sewer interceptors (collection lines of ten inches or more in diameter). It is necessary in some instances to place utility lines adjacent to or along the floors of the arroyos, or across arroyos in a perpendicular manner.

According to the City's Utility Standards, City utilities have been buried at minimums of six feet for sewer and five feet deep for water and gas under the arroyo bottom. To avoid erosion after installation, the soil is compacted to 90% of original compaction,[38] which is slightly less than soil compaction required for street construction. With proper design and protection of gravity-driven sewer collection systems within and around arroyos, the need for lift stations is eliminated, therefore reducing operations and maintenance costs.

Parks and Open Space

The City's current park inventory includes numerous parks and trails on the East Mesa that include arroyos in their design. There are three trails that are part of an arroyo trail network shown on the MPO Trail Plan: the Alameda Arroyo Trail (0.78 mi.), the Engler Road Trail (1 mi.), and the Sonoma Ranch Trail (3.64 mi.). In addition, there are several neighborhood and community parks in close proximity to arroyos: Desert Trails Park (34.42 ac.), Sam Graft Park (2.8 ac.), Veterans Memorial Park (8.99 ac.), Sagecrest Park (2.2 ac.), Paseo de Onate (2.5 ac.), Oro Vista Park (18.85 ac.), and Vista de la Montana Park (2.11 ac.). There are also two privately-owned golf courses that include arroyos in their designs: the Red Hawk Golf Course in the Metro Verde development and the Sonoma Ranch Golf Course west of Roadrunner Parkway.

These facilities provide outdoor recreation opportunities. The Parks & Recreation Master Plan (PRMP), updated in 2013, envisions a City park and trail system that will continue to provide high-quality recreational opportunities for residents and visitors during the next decade and beyond. And according to the PRMP, Las Cruces residents would like more of these. During May and June of 2011, the City of Las Cruces Parks and Recreation Department conducted a Community Interest and Opinion Survey. The purpose of the survey was to gather input to help determine parks, trails, open space and recreation priorities for the community.

According to the survey, 42% of respondents said they had used or visited walking, hiking, and biking trails over the past 12 months, 65% said they have a need for walking and biking trails, and 43% said their most important parks and recreation facilities are walking and biking trails. In addition, 64% of respondents indicated that they would be willing to pay at least $10-$19 per year in additional property taxes to build and operate the types of parks, trails, aquatics, sports and recreation facilities most important to their household. Fifty-nine percent (59%) of respondents indicated that they would either "vote in favor" (37%) or "might vote in favor" (22%) if an election were held for a bond issue to be used only for open space and parkland acquisition, construction of amenities and trails development in Las Cruces.[39]

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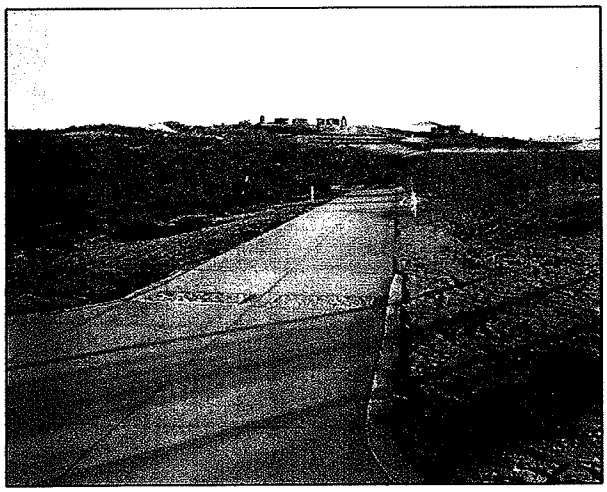
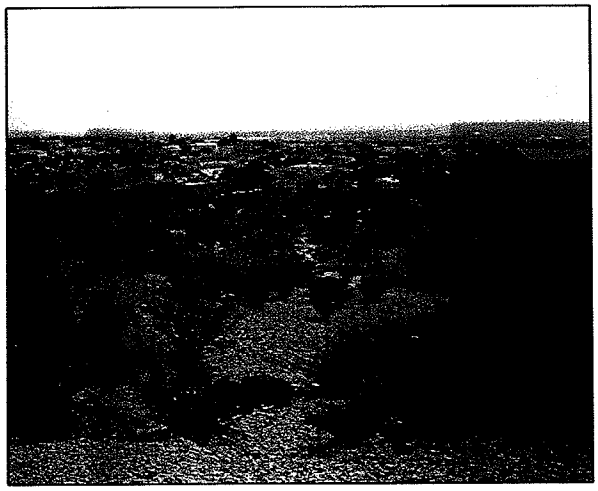
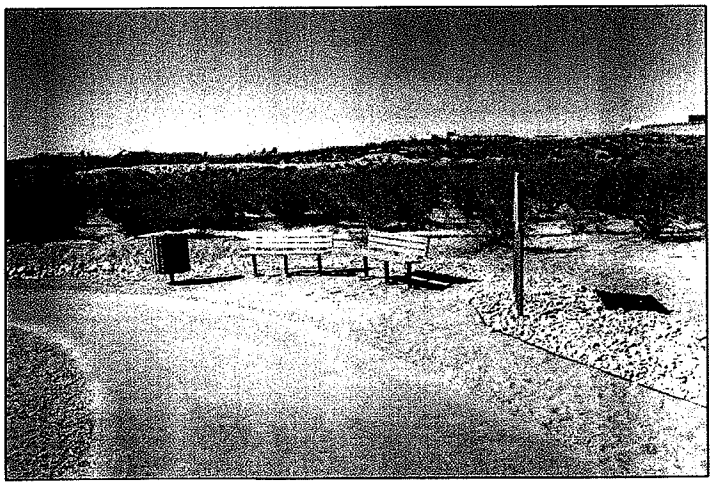
[38] http://www.las-cruces.org/Departments/Utilities

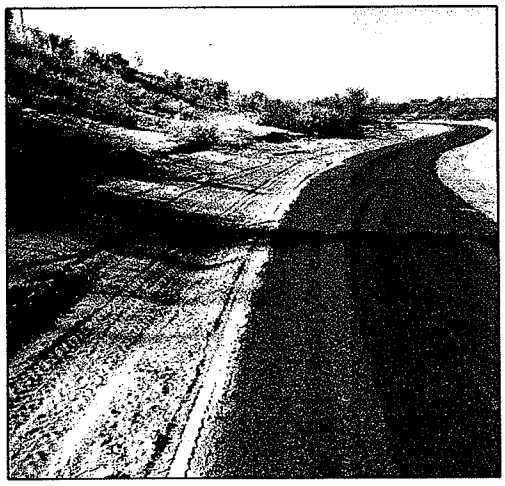
[39] Parks & Recreation Master Plan & Park Impact Fee Update, May 2012.





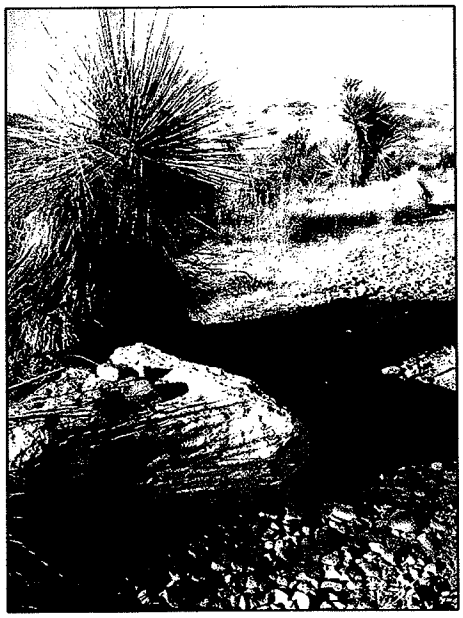
Desert Trails Community Park





Alameda Arroyo Trail

Paseo de Oñate Park



CHAPTER 4. ISSUES, CHALLENGES AND OPPORTUNITIES

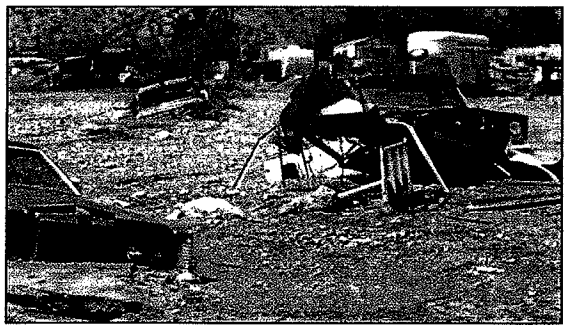
There have been many area flood events in recent memory, and in the last decade, severe flooding in 2006 and 2013 are notable. Over 400 homes were affected by flooding in Hatch in September 2006.[40] Four foot-deep waters flooded downtown Hatch damaging homes, businesses and motor vehicles and almost all of Hatch's 1600 residents were forced to evacuate. In addition, the same storm delivered golf ball-sized hail and heavy rains along Interstate 10 and over Las Cruces and Mesilla. Total storm damage was estimated at over $10 million.[41] In September 2013, New Mexico experienced an estimated $6.87 million worth of road and highway repairs alone from heavy rains and floods that hit the state.[42] Two major storms within days of each other delivered more than 8 inches of rain in Doña Ana County, nearly as much as the region usually receives in a year. There are cumulative impacts of multiple storm events that can increase the chance of flooding, risk, and damages

In his 1969 text, *Design with Nature*, Ian McHarg proposed that development plans be based on maps that identified natural resource and landscape constraints. He promoted an ecological view in which the developer analyzed soil, climate, hydrology, etc. and designed the project in concert with the conditions of setting, climate and environment. Harg advocated that the first stage in the planning process is mapping the resources then building where there were the fewest constraining features (either by avoidance or minimization). By definition, mitigation recognizes that something has been built in a dangerous area and seeks to protect against subsequent events. But there is always the chance that mitigation is under-designed, will deteriorate, and fail. As Harg points out, a more appropriate strategy is often avoidance.

The previous chapter, Regional Characterization, described some of the existing conditions in our area – flood control dams, utilities infrastructure, vegetation and wildlife, recreation facilities, stormwater management, and how the general climate of the area impacts arroyo health. This chapter focuses more closely on problems associated with all of these elements and in some cases, offers suggestions for preventing or mitigating them.

[40] "Governor seeks presidential disaster declaration for Hatch, NM," USA Today, August 21, 2006.
[41] "Heavy Rains and Flash Floods Devastate Western Texas and Southern New Mexico," Southwest Weather Bulletin, Autumn-Winter 2006-2007 Edition, National Weather Service El Paso/Santa Teresa.
[42] "Final Cost of New Mexico Flood Repairs Still Unclear," John Guzzon, October 2, 2013. ENR Southwest, http://southwest.construction.com/.

Flooding near New Mexico State University as a result of the September 13, 2006 thunderstorm.
Photo: Dr. Deborah Bathke/NMSU.



High waters from heavy rains breached the Las Placitas Arroyo 3 times during the summer of 2006 resulting in widespread flooding and damage in Hatch and surrounding areas.
Photo: Southwest Weather Bulletin, Autumn-Winter 2006-2007 Edition.

Flooding in La Union, September 13, 2013.
Photo: Shari V. Hill, Las Cruces Sun-News.
www.lcsun-news.com/ci_24087689/rain-continues-soak-southern-new-mexico.

Arroyo Modeling

Most often, development occurs up to the 100-year flood zone boundary. The course of an arroyo changes with time and, as described previously, runoff can migrate out of the existing flowpath simply with sheer force. Development may restrict natural channels for flowpath, which can lead to erosion, landslides and flooding along the bank of the channel. This can ultimately put adjacent development at greater risk. Therefore, it is critical that the City direct growth away from the arroyos and adopt plans and ordinances that will accommodate dynamic arroyo systems.

Several strategies would be effective in this regard. Some would rely on a detailed science-based characterization of the each major arroyo using in-depth modeling that evaluates proposed land uses against arroyo characteristics. Models that have been used for this purpose in Las Cruces are the U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC) Hydrologic Modeling System (referred to as HEC-HMS) and the River Analysis System (HEC-RAS). Some modeling of the arroyos has already been completed as part of the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP).

Modeling proposed under the AMP would not replace the floodplain designations show on the NFIP's Flood Insurance Rate Map (FIRM), but would add to this information base by modeling further upstream and determining flood zones there. These are free software tools that are publically available and are frequently used in this type of work.

This can then serve as a baseline for further analysis of major arroyos. Additional data sets that may be needed include, but are not limited to, land use, vegetation and wildlife, rainfall, and soil type. Using GIS mapping software, the aerial extent of water at the 100-year and 500-year storm could also be evaluated for the presence of wildlife, proximity of a parcel to other identified open space, existing infrastructure like roads, power lines, water lines, gas, etc., and proximity to existing developments and privately owned parcels within the 100-year flood zone.

Once the models are in place and functioning, they could be used to determine areas where upper watershed flood control improvements may provide additional downstream benefits. For instance, upper watershed improvement may help to slow flowpath and increase infiltration, reducing the chance for high velocity flowpaths downstream. Also, a model could help identify areas suitable for buffers or areas that may be appropriate for development with fewer constraints.

A buffer is an area adjacent to an arroyo where development would not occur or where development would be of lesser intensity. It would be determined starting at the boundary of the 100-year flood zone and measured laterally from that point. Over the arroyo's length, the buffer may vary, depending on results from the modeling discussed above. Identified buffer acreage could be dedicated to the City or withdrawn by the New Mexico State Land Office or U.S. Bureau of Land Management prior to selling acreage for development. If privately held, a buffer could take the form of a linear park, trail, or conservation easement, all of which could be offset by various incentives such as higher density farther away from the arroyo, federal tax break, or park credits.

Just as the NFIP maps are intended to help protect the public from the potential negative impacts of flooding, buffers are proposed as part of the AMP to further protect the health, safety and welfare of the public. The use of buffers would be determined by a need for further erosion control, for example by protecting pockets of natural vegetation outside the 100-yar flood zone. An ancillary benefit would be their use for open space, trails, and parks.

Development

According to the *One Valley One Vision 2040 Regional Plan*, a great deal of new growth is expected east of Interstate 25, bringing with it not only residential development but new activity centers and employment opportunities.[43] As we look to the future, the city and county are expected to increase in population by over 50% and 40% by 2040, respectively.[44] Due to an increase in impervious surfaces in these areas, storms that occur as short duration high intensity events are no longer lessened by soil and vegetation but are rapidly discharged into arroyos. The increase in runoff rate and volume from developed areas can overwhelm structures designed to convey a storm with a lower peak discharge. The

[43] One Valley One Vision 2040

[44] The city's population is estimated to increase from its 97,618 Census 2010 population to 150,000 by 2040. The overall population of the county is projected to increase from 210,000 people in Doña Ana County to about 300,000 by 2040. Source: U.S. Census Bureau; University of New Mexico Bureau of Business & Economic Research, 2013 Doña Ana County Snapshot Report.

tremendous growth in the area since the 1980s has put many more people in the path of potential flooding.[45] As Las Cruces has grown, development intensity has increased on the East and West Mesas, areas that historically have been open land or occupied by larger lots and fewer structures.

Arroyo modeling described above may provide additional insight when considering areas suitable for development. Land acquisition and buffer distances could be prioritized in relation to each parcel's function and importance, as well as the measure of likelihood and immediacy of development projects. It is important to note that a buffer is only one of several strategies for arroyo protection and management, and that a buffer may not be needed for all arroyos or for an entire arroyo. If a buffer is found to be needed for erosion control purposes in privately-owned areas, eliminating developable land could come at a high cost to the City. In some cases it may be necessary to purchase the land outright. Alternatively, incentives could play a major role in encouraging private land owners to participate in these strategies. For instance, it may be practical to use buffers as utility easements for access to infrastructure where necessary.

A similar process for protecting natural stormwater conveyances has been successfully used for many years by other entities in New Mexico, including Southern Sandoval County Area Flood Control Authority (SSCAFCA) and Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). SSCAFA's use of the Lateral Erosion Envelope (LEE) identifies areas that are susceptible to erosion and protects them from development, allowing them to continue serving their stormwater conveyance functions. AMAFCA's use of the prudent line serves a similar purpose, facilitating development while protecting natural water courses.

As arroyos form at the base of the Organ Mountains, they typically form a single channel but fan out into a larger number of small tributary channels as they move westward over the terrain. These tributary systems take up more square footage of the land, which becomes less suitable for traditional developments that require filling, flattening and clearing of vegetation. Development must be sensitive to existing landforms, and arroyo modeling can assist in this when using detailed information and analysis. Major arroyos that are in city limits have relationships with alluvial fan tributary systems that originate in the upper watershed, outside of the 100-year flood zone. Incorporating upper watershed data such as 2-foot contour lines can increase the precision and clarity in which development and arroyo management decisions are made. Directing development toward relatively flat areas would reduce land disturbance and destruction of vegetation in the uneven terrain of these small channel tributary systems. Another strategy may be to propose a density gradient in a development that would include larger rural lots close to the arroyo and denser, compact mixed-use streets further away from the arroyo (see Figure 4).

There may be other strategies for development to further incorporate arroyo preservation and management, and to address the financial obligations of land acquisition if the City were to purchase privately-owned land. Some of these options are described below. It is also important to note the relationship between improved arroyo management and costs that are passed on to the home owner, thus directly affect overall housing costs in Doña Ana County. A significant portion of county residents lives at or below the poverty line. Costs for land acquisition and/or maintenance of open spaces are passed onto property owners and in some cases the renters of the property. Policy would need to address incentives, compensation or other means (such as acquisition by the City) to preserve arroyos

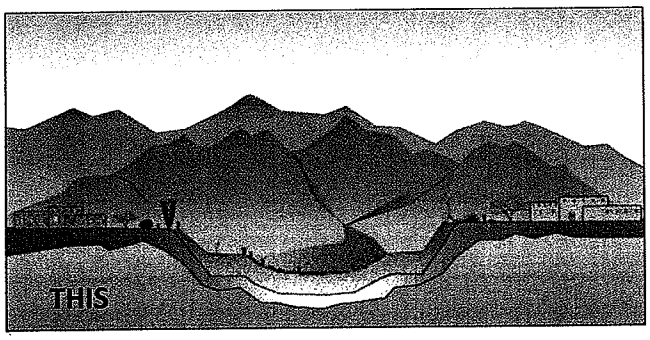
[45] "Recovering from New Mexico's Floods," October 3 2013, New Mexico State University Frontera NorteSur. http://fnsnews.nmsu.edu/recovering-from-new-mexicos-floods.

and other open spaces. Policy would also need to address affordable housing in the land preservation context.

Land trusts are widely recognized as an effective means of conserving natural land and open spaces. Not to be confused with a *land bank*, which seeks to repurpose underused, abandoned, or foreclosed property, a land trust normally has a singular purpose to preserve sensitive natural areas, farmland, ranchland, water sources, cultural resources or notable landmarks. Many different strategies are used to provide this protection, including outright acquisition of the land by the trust. In other cases, the land remains in private hands, but the trust purchases a conservation easement on the property so that it won't be developed.

Conservation easements are not frequently used in this region, but they offer an effective means of protecting sensitive environmental areas. A conservation easement is a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values. It allows landowners to continue to own and use their land, and they can also sell it or pass it on to heirs. A landowner who donates a conservation easement to a land trust gives up some of the rights associated with the land but it offers great flexibility for the landowner for watershed improvements to be planned, designed and installed. An easement may apply to all or a portion of the property, and need not require public access. Each conservation easement is crafted to meet the needs of the landowner while not jeopardizing the conservation values of the land. The size of the parcel can range from just a few acres, such as a pocket nature preserve, to hundreds or even thousands of acres.

Land protection measures could be used effectively to designate privately-owned buffers as linear parks, buffers or protected open space. Building on only one side of the street (referred to as a "single-loaded" street) allows enhanced views for those purchasing homes across from an arroyo. It also provides opportunities for linear parks and trails, both of which could be credited toward park impact fees. Single-loaded roads increase safety for open space users and nearby property owners by providing visibility for surveillance and monitoring, as well as improving accessibility for park users and improving access for emergency response. Since a developer would be choosing to leave developable land open, the overall costs of developing that area would inevitably be higher. If an arroyo buffer has not already been withdrawn from development and is privately owned, a tax deduction through a conservation easement or some other incentive would have to be determined.



Buffers would allow arroyos to shift and move naturally and would provide many positive outcomes, including: added soil stability; less structural loss due to erosion/flooding; more desirable open space; more wildlife corridors and wildlife viewing opportunities; and preservation of native vegetation.
Graphics: Peter Bennett

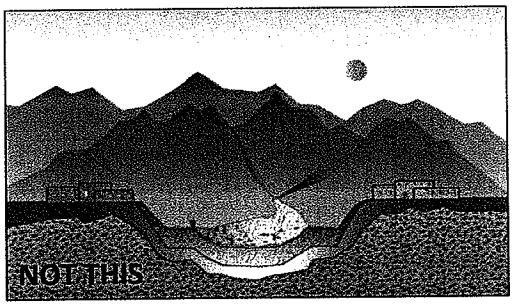
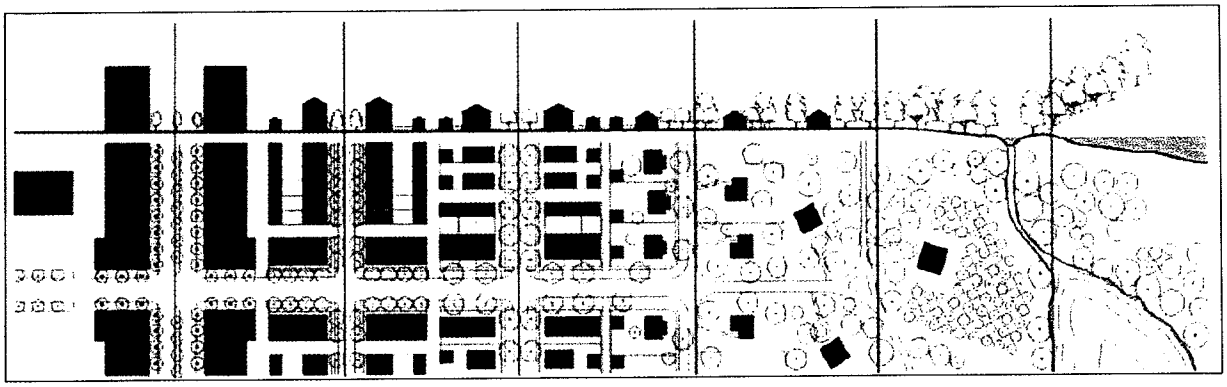
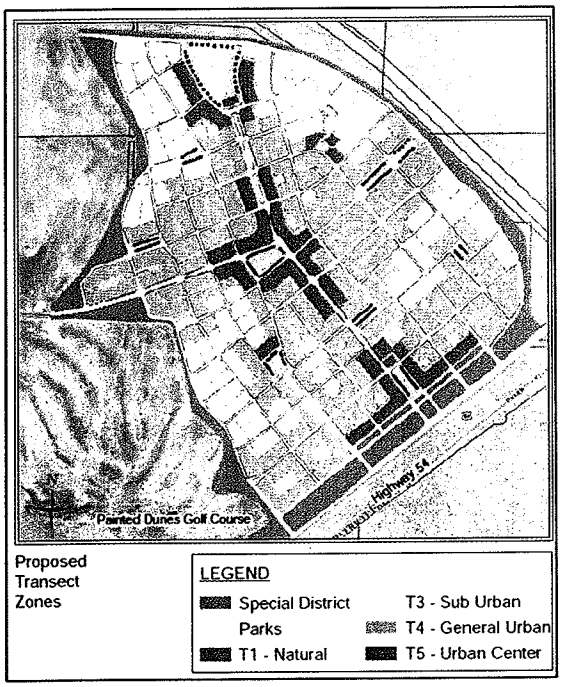


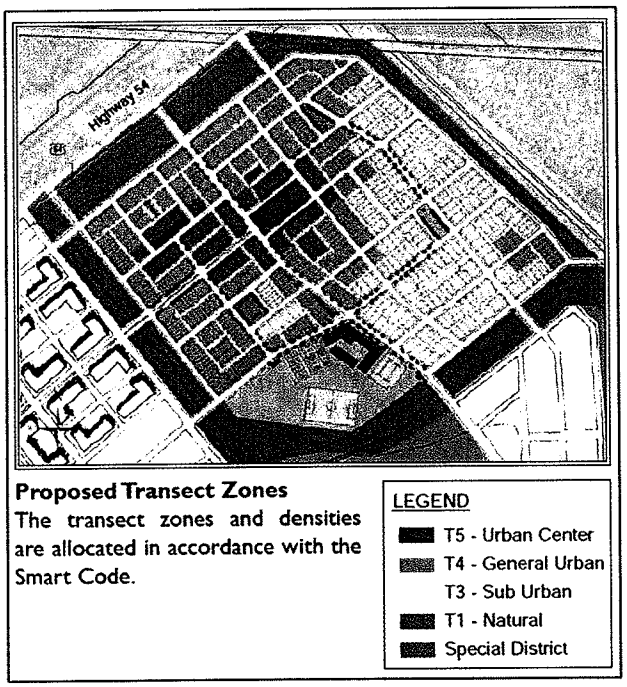
Figure 4 Rural-to-urban transect



The transect is a geographical cross-section of a selected environment and an effective master planning tool that guides the placement and form of buildings and landscape and allocate uses and densities. Many communities are organized this way, providing a natural gradient of development from urban center to natural edge.
Graphic: www.planetizen.com.

Linear parks and trails adjacent to development enhance the views for property owners. A conservation easement could provide a tax break for the owner, a different incentive could be devised, or the acreage could be purchased by the City. This is Pinnacle View Drive adjacent to the Little Dam Arroyo. Photo: Peter Bennett.





These illustrations, from the El Paso Comprehensive Plan (2012), show how transect zones that included protected open space and parks can be applied to individual neighborhoods and sections of the city. Graphic: *Plan El Paso*, volume I.

On the West Mesa, hillside and escarpment developments present several issues that are more complicated than developments on relatively flat land. These include topography and geometry, slope stability, velocity of stormwater runoff, erosion, and access (emergency and non-emergency). Hillsides, mountain terrain, and escarpments are generally unstable landforms to begin with, and disturbance can increase their instability and potentially require additional structural support to ensure infrastructure and slope stability. With many shifts in grade and elevation, density gradients could be used successfully here with denser development to the west on flatter terrain.

The City's *Comprehensive Plan 2040* proposes a 'Future Concept Map' which includes conservation areas consisting of areas with historical, cultural, environmental value or open areas that could become community assets and are worth preserving, such as arroyos and hillsides (Goal 35, Policy 35.1). At present, the 2001 Zoning Code as amended has three zoning districts related to open space and arroyos: Flood Control (FC); Open Space-Recreation (OS-R); and Open Space-Natural/Conservation (OS-NC). However, these are not frequently used as a means to permanently preserve natural environments because they are voluntary options. Providing incentives to expand the use of the OS zoning districts in developments would further accomplish the protection of sensitive areas that have been identified by the public as valuable resources.

Low impact development (LID) and green infrastructure (GI) techniques can reduce the volume of runoff that reaches arroyos. Traditional stormwater management design has been focused on collecting stormwater in piped networks and transporting it off site as quickly as possible, to an arroyo, a constructed channel, a large stormwater management facility (basin), or a combined sewer system flowing to a wastewater treatment plant. LID and GI techniques are newer practices intended to lessen runoff at its source. They address these concerns through a variety of techniques, including strategic site design, measures to control sources of runoff, and thoughtful landscape planning. LID aims to restore natural watershed functions through small-scale treatment by designing hydrologically-functional sites that mimic predevelopment conditions. GI includes approaches and technologies to infiltrate, evapotranspire, harvest, and reuse stormwater to maintain or restore natural hydrologies.[46]

However, some GI/LID practices aren't appropriate in all cases. At times, residential on-lot ponding can be an ineffective strategy. This is because ponds are often filled in or not maintained properly so their water retention and infiltration properties diminish. Increasing education and awareness of the importance of these structures and other GI/LID techniques could improve overall management of arroyo systems by reducing runoff in some cases.

Other communities in the southwestern U.S. have successfully integrated land conservation, water harvesting and other GI/LID techniques, and preservation of the natural terrain into attractive, functional and affordable developments:

- Mesa del Sol in Albuquerque, NM includes parks and other public landscaped areas that have been designed using native, drought-resistant plants and a reclaimed water system that is used for non-potable uses like outside landscaping. Homes include rainwater harvesting and other water-saving features.

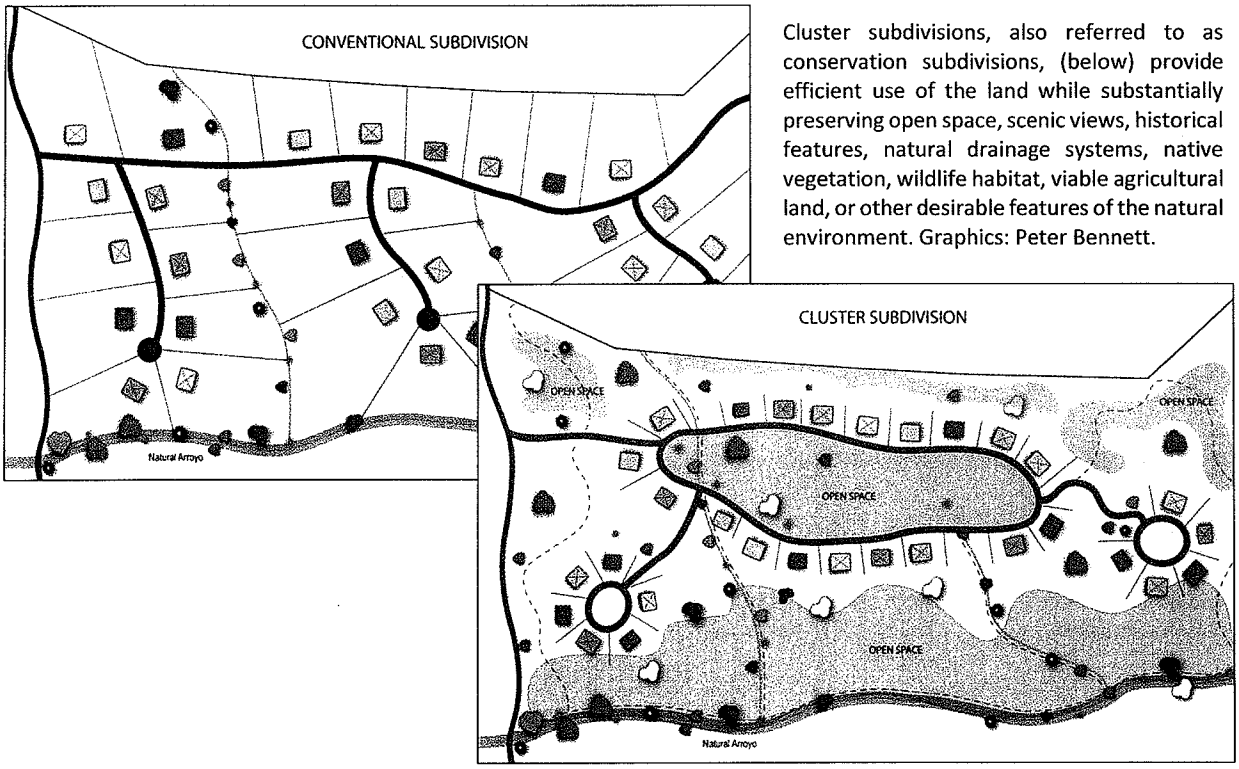
- Village Homes in Davis, CA utilize a natural drainage system that includes a network of creek beds, swales and pond areas to allow rainwater to be absorbed into the ground rather than

[46] EPA NPDES Stormwater Program Overview: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

carried away through storm drains or detention ponds. Besides helping to store moisture in the soil, this system provides a visually enhancing backdrop for landscape design.

- The Civano development near Tucson, AZ is based on a tenet for development to tread lighter on the land through innovative design. Civano began by setting aside 35% of the land area for natural or enhanced open space. Community orchards, linear parks, pedestrian trails, bike paths, environmentally friendly recreational facilities, and preserved desert wild lands are all integral to the community's design.

It is important that our community balance the costs, types and quality of development against the long term value gained by preserving landscape views and open spaces associated with arroyo systems. The impact that open space can have on property values may actually underestimate the value of open space, by excluding the nonmarket values associated with passive uses, such as recreation or just knowing that open space exists.[47]



Cluster subdivisions, also referred to as conservation subdivisions, (below) provide efficient use of the land while substantially preserving open space, scenic views, historical features, natural drainage systems, native vegetation, wildlife habitat, viable agricultural land, or other desirable features of the natural environment. Graphics: Peter Bennett.

Watersheds

As a community expands and grows, the amount of impervious surfaces from development changes the nature of watersheds and how they function. Over time, a stream becomes graded, which means that an equilibrium was reached between channel slope (gradient), channel characteristics, available discharge, and load (debris). Stream banks and channels are relatively stable under graded conditions. But this balance can be upset by changes to land cover and surface characteristics of the watershed.

[47] The Economic Benefits of Open Space, Recreation Facilities and Walkable Community Design, Active Living Research, Robert Wood Johnson Foundation, May 2010. www.activelivingresearch.org

Development and other changes to land cover can increase the amount of impervious surfaces, alter the density of arroyo channels, increase the volume and velocity of stormwater, and change the amount and type of material that arroyos convey. Ultimately, these changes can divert much of the surface drainage to underground storm sewers. Stormwater events and resulting floods can strike with little warning, can travel at extremely high velocities, and carry a tremendous amount of sediment and debris. Changes in land cover can also alters the physical configuration and stability of stream channels, changing vegetation patterns and potentially reducing their value as wildlife habitats.

Enhancing and improving existing channels and arroyo systems can allow them to withstand erosion caused by turbulent flood and debris flows. Such enhancements and improvements require careful design, proper implementation and sufficient maintenance in some cases. Development on or near an arroyo should not increase downstream peak flows. Studies can be performed for such development to ensure it does not change the direction of an arroyo or have negative downstream effects. Erosion control techniques like culverts and arches can maintain flow path and protect from erosion. The location of erosion control structures is important: constructing them where a flow path has been or is likely to be altered, or downstream of a road crossing (where increased flow velocity is likely) can assist in maintaining a healthy arroyo system where development has already occurred.

Floodwaters may pass safely through an alluvial fan system if the existing channels and banks are protected. Because alluvial fans represent critical sites of sediment routing in mountainous watersheds, including a fan analysis in an arroyo characterization model may provide a fundamental tool for assessment. In addition, mapping alluvial fans could provide quality risk assessment data and suggest additional mitigation actions that assessing arroyo characteristics may not provide alone.

Stormwater Management, Impacts and Risks

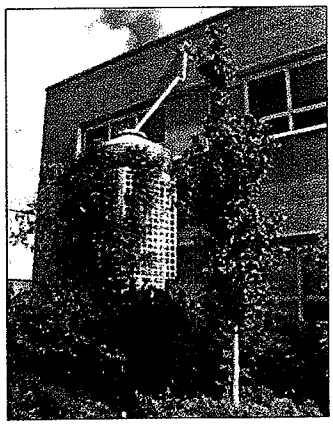
When stormwater is absorbed into the ground, it is filtered and ultimately replenishes aquifers or flows into streams and rivers. In developed areas, however, impervious surfaces such as pavement and roofs prevent precipitation from naturally soaking into the ground in an evenly displaced manner. Instead, water collected from impervious surfaces gathers and flows more rapidly into storm drains, sewer systems, and drainage ditches and can cause:

- Downstream flooding
- Stream bank erosion
- Increased turbidity (muddiness created by stirred up sediment) from erosion
- Habitat destruction
- Changes in the stream flow hydrograph (a graph that displays the flow rate of a stream over a period of time)
- Combined sewer overflows
- Infrastructure damage
- Contaminated water

As runoff flows over the land or impervious surfaces, it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated. In addition, most stormwater discharges are considered non-point sources (NPS) and require coverage under the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permit. Stormwater discharges from construction activities (such as clearing, grading,

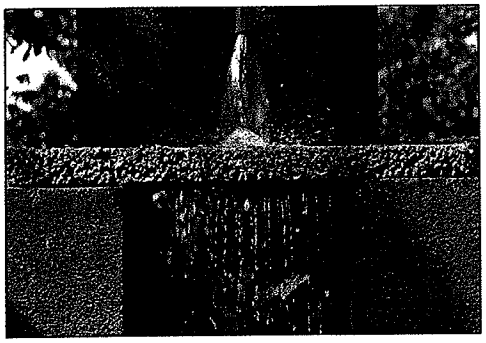
excavating, and stockpiling) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the NPDES stormwater program. The NPDES program requires the City to have a Small Municipal Separate Storm Sewer Systems (MS4s) permit for such construction activities. This includes a USEPA Construction General Permit requirement, where BMPs are mandatory during construction in order to control stormwater discharges; post-construction activities require runoff containment, revegetation or ponding are two ways to accomplish this.

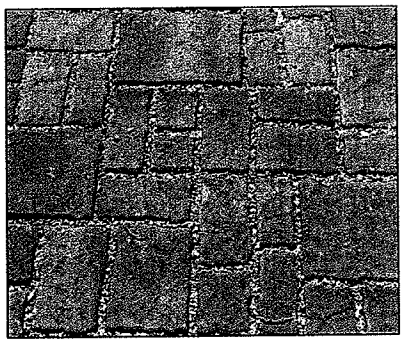
Mitigating stormwater pollution by reducing impervious surface and preserving open space for drainage are examples of green infrastructure techniques. Although many green infrastructure strategies are not approved by the City at this time, developers and contractors understand the need for better stormwater management and have made changes to their practices independently where permitted. As we become more knowledgeable about these techniques and the benefits they bring, the City can incorporate these mitigation practices as acceptable means of drainage design. Studies should be conducted using green infrastructure techniques to gain more confidence in implementing these practices, which can achieve proper drainage performance, flood safety and cost effectiveness.



Cisterns and rain barrels are a cost-effective way to collect and store water for garden and lawn irrigation and would keep the water out of storm drains.
Photos: www.epa.gov

Bioswales are vegetated, mulched or xeriscaped channels that provide treatment and retention as they move stormwater from one place to another. Swales slow, and filter stormwater flows. As linear features, vegetated swales are particularly suitable for draining water from streets and parking lots. Photo: Dave Leonard Tree Specialists, www.dlarborist.com





Permeable concrete and pavers allow rain to seep into the ground. Permeable paving can capture and soak in up to 80 to 100 percent of the rain that lands on it and can reduce construction costs for residential and commercial development by reducing the need for drainage features. Photos: www.epa.gov.

Sometimes, BMPs are not implemented properly or sufficient maintenance is not provided following construction. The City has begun to address this by dedicating additional staff and resources to inspection and enforcement of existing regulations. Policies calling for enforcement of BMPs may further improve these practices.[48] The use of structures to protect from flooding is sometimes necessary and even desirable, but structural floodplain management should not be the primary mitigation plan. Because areas exist that are already fully developed and near a flood hazard, it is necessary to thoughtfully explore some appropriate structural methods as part of an overall plan in order to protect existing property.

Upstream debris barriers stop or reduce the movement of debris down a channel system. Debris barriers may be permanent structures in the watershed or constructed as temporarily control measures. Either way, these structures allow flood waters and fine grained sediment to pass through but stop larger sediment, rocks and vegetative material from flowing downstream. Debris barriers are one example of an engineered watershed improvement designed to manage the effects of stormwater.

Like many urban communities, Las Cruces relies on drainage channels, storm sewers, and other expensive infrastructure to deal with localized flooding from sudden storms. Both public and private landowner tax dollars pay to clean up nonpoint-source pollution caused when water transports contaminants from parking lots and other impermeable surfaces. But natural hydrologic systems recharge and cleanse the watershed from NPS pollutants. Undeveloped areas (i.e. natural land) provide a natural nonstructural floodplain management BMP because the land has not yet been altered with structures subject to the effects of flooding. In addition, NPS pollutants in discharge from urban runoff can affect EBID agricultural drains and may put the District's agricultural exemption from NPDES permitting at risk.

At the Rio Grande, the levees are intended to keep flows from leaving the river into the surrounding land during a flood event, that is, away from the river. This hinders runoff from arroyos and watersheds that flows toward the river in times of flooding. Elephant Butte Irrigation District's (EBID) drain and canal system flows mostly north to south, creating multiple impediments to arroyos and channels reaching the river. These drains and canals were not designed for storm flows, and were not designed for the increases in storm flow runoff associated with recent development.

Watershed conservation has proven to be a cost-effective alternative to expensive structural BMPs. Also, water sources can become polluted when sediment, pesticides, oil, animal waste and other contaminants wash into them from impervious surfaces. Conserving land and re-establishing vegetation along the sides of arroyos and other stream beds can help prevent this pollution. Vegetation also assists in bank stability and water quality mitigation within watersheds. Roots of riparian plants filter and remove suspended materials. Plants and algae use and remove such nutrients as nitrogen and phosphorus. Bacteria, fungi, and other microorganisms decompose organic material.[49] These are important functions of a healthy watershed.

The most significant hazard to public safety along incised channel reaches is often related to lateral erosion into infrastructure and adjacent property rather than flooding, because the capacity of the incised channel is typically quite large. All of the soils in Doña Ana County are considered highly

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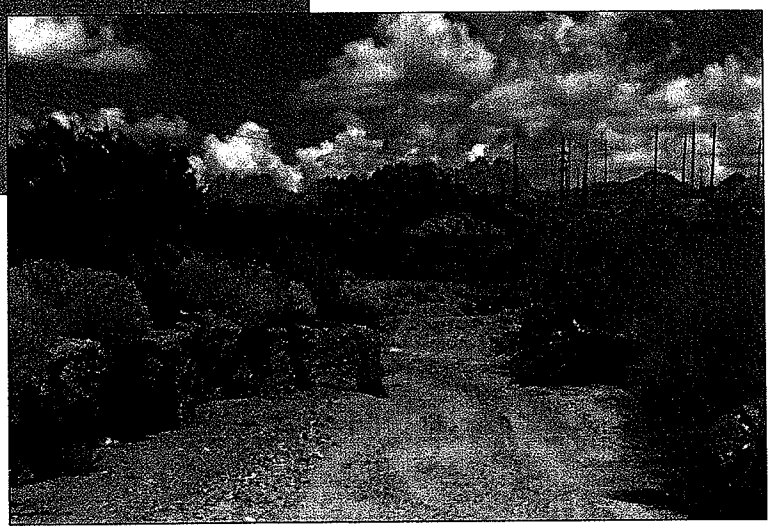
[48] For the EPA's National Menu of BMPs, go to http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

[49] *"Eco Tipping Points: How a Vicious Cycle Can Become Virtuous."* Amanda Suutari and Gerald Marten. Earth Island Journal 22, no. 2 (Summer 2007).

erodible.[50] Wind, rainfall, soil moisture, the type and size of soil particles, and the condition of the soil surface (e.g. vegetated, barren, or disturbed) all determine how much erosion occurs. The unstable and erosive nature of soils in the arroyos are what makes it so difficult to predict how an arroyo will change in any given flood event. As shown below, unchecked erosion could eventually reach a point at which retaining walls, accessory structures, or infrastructure would have no support and fall away.

Sediment that is eroded during the incision process is carried downstream where it can deposit in low energy zones, decreasing channel capacity and potentially increasing the flood hazard in the depositional zones. Stormwater generally develops a flowpath in the hillside areas and follows existing arroyos that are in its natural path. Just as on the East Mesa, development on our western hillsides creates impervious surfaces and modifies storm flows, which can lead to increased erosion. Excessive incision can also remove natural vegetation and destroy habitat adjacent to the channel.

Besides their unsightly appearance, canalized arroyos increase runoff volume and water velocity, thus contributing to flooding and erosion downstream. This is a section of the South Fork of the Las Cruces Arroyo, east of Roadrunner Parkway.



Natural areas reduce runoff volume while providing wildlife habitat. Most of the arroyos in our region have great potential for restoration and preservation. This is a different section of the South Fork of the Las Cruces Arroyo, further east.
(Photos by Peter Bennett.)

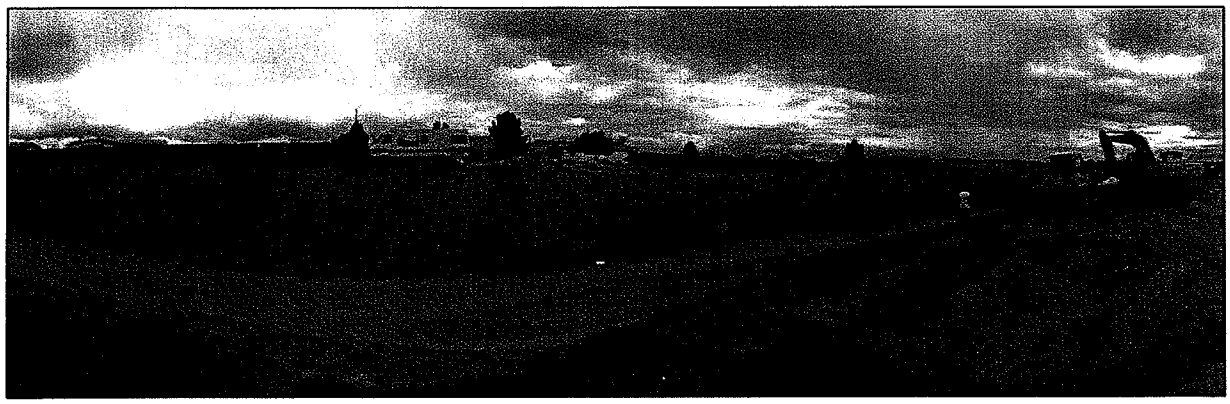
Another problem associated with erosion is damage to culverts under road crossings, usually caused by flood waters eroding culvert entrances or outlets and road embankments, and usually resulting in a full or partial washout, or misalignment of the culvert. Damage or failure of a culvert could be due to insufficient culvert capacity and/or inefficient end sections (mouth of the culvert), so appropriate hydrologic analyses of flood peaks and volumes, and applying appropriate culvert design criteria are both important. It is important to make a careful determination of the cause of the damage, as different

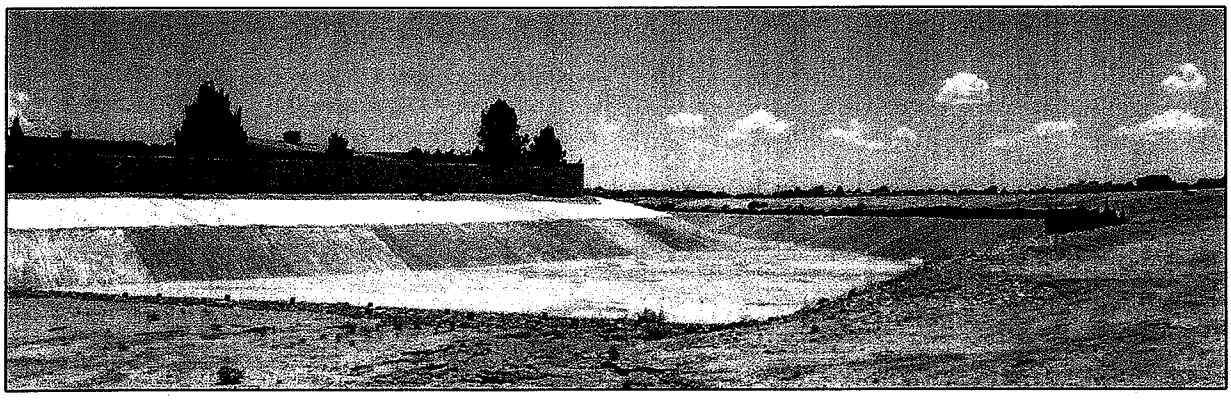
[50] Soil Survey of Dona Ana County New Mexico.

causes require different mitigation. Also, mitigation applied inappropriately could actually increase risk to the facility or other structures in the floodplain.[51]

In its simplest sense, an arroyo is only a drainage path. But with closer inspection it can be seen that the curves, width, and grade are all dynamic properties and continually seek a balance in response to its most recent flood event. For these reasons urbanization along banks inherently carries a higher risk for instability than does development further away. Some of the risks include 1) bank mass failure from bank instability through undercutting erosion or overloading of stormwater through development, 2) weaknesses from previous mass failure events, and 3) water flow regime risks by flooding of zones that have moved downward to place them below a 100-year flood elevation.

Further analysis of a given arroyo would identify many of the risks of urban development outside its flood zone boundary. This would help determine its inherent stability and likelihood of erosion and erosion speeds, and would identify historic failures within the embankment. This information could be used to help determine any necessary buffer distance for arroyos that have not yet been developed.



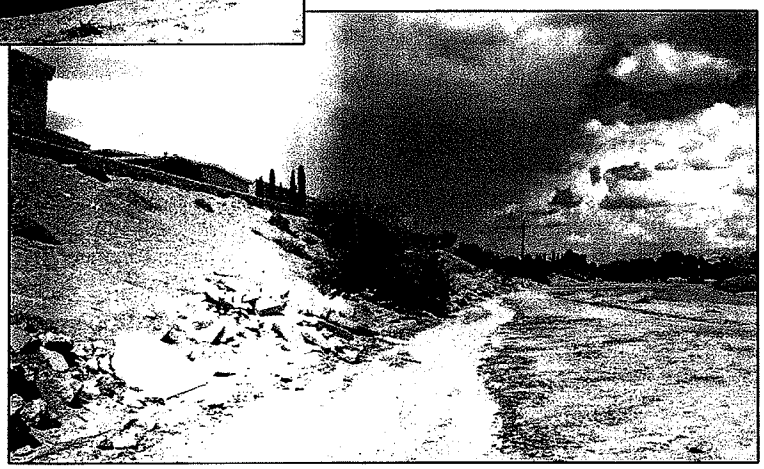


The solution to this severe flooding problem near Rinconada was to broaden the channel and line it with concrete. The banks were seeded with native grasses and an erosion fence was added.

[51] Randolph Langenbach, Conservationtech.com: http://www.conservationtech.com

Flooding near the Sonoma Ranch Golf Course inspired a simple and inexpensive naturalistic erosion measure (below) which preserves natural vegetation and blends in with the surrounding terrain. Both photos: CLC Public Works Dept.

This photo illustrates what can happen when development restricts a natural channel. Continued erosion could eventually reach the point at which the retaining wall would have no support and would fall away. The photo below illustrates a quick and inexpensive (although unsightly) fix for the erosion problem. All photos: CLC Public Works Dept.



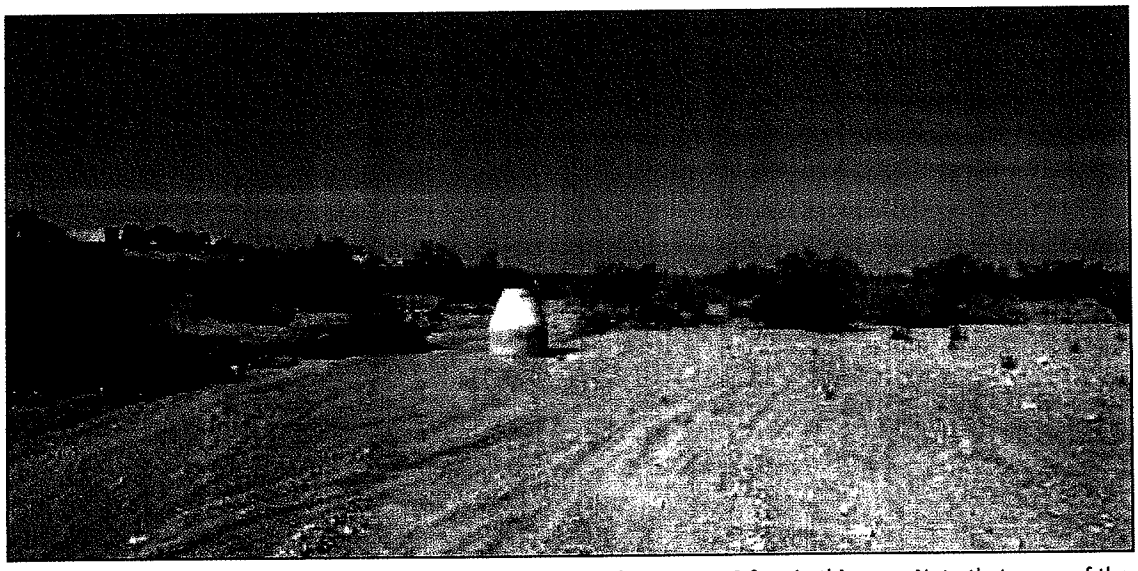
Utilities and Infrastructure

City utilities oftentimes place sewer interceptors in or near arroyos. These interceptors receive flow from a number of other sewer lines for transport to one of the three wastewater treatment plants operated by the City. Challenges with the location of these interceptors in or near arroyos can occur despite the installation of erosion control structures, such as rip-raps or check dams. For instance, since the soil is disturbed to bury the lines, the soil becomes more susceptible to erosion during a flood event and infrastructure may become exposed. Exposure may also occur when stormwater creates higher and faster runoff. In addition, water and gas mains and services are to have 5-foot minimum cover and sewer mains a 6-foot cover, as measured from the bottom, or floor, of the arroyo. But as arroyo floors erode with rain events, there is a risk of exposure, regardless of how deep the pipes were initially buried.

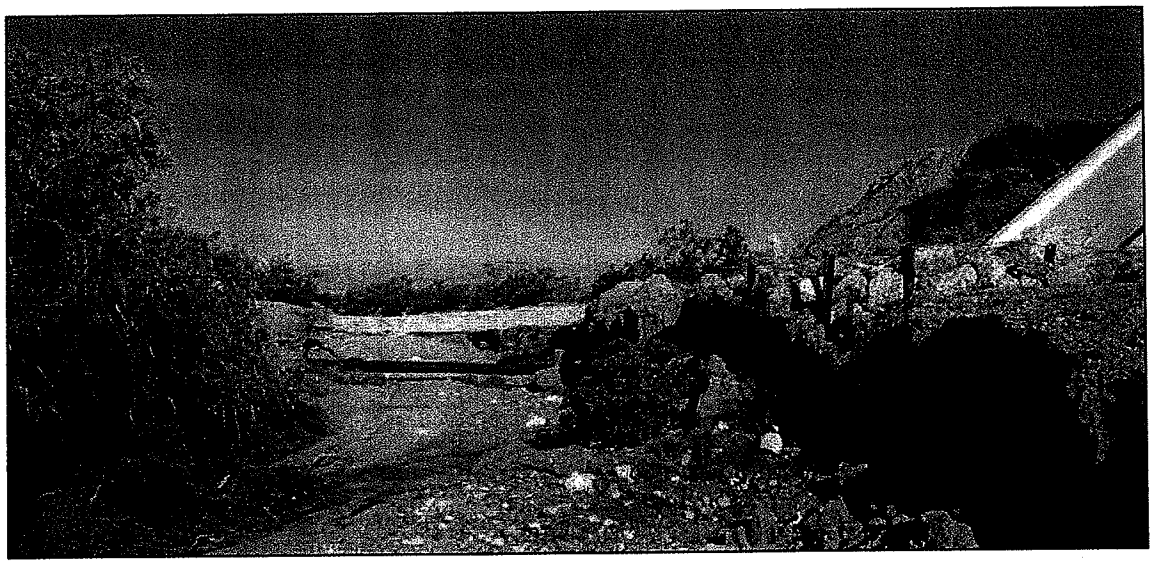
A cost-benefit analysis may warrant the efficiencies gained by locating interceptors or other utilities in or near arroyos. If warranted, updated design and installation procedures could help to ensure the least amount of disturbance to the arroyo environment. For example, when road crossings are constructed, arroyos become semi-closed channels that have limited or restricted access from a bridge or street. Most (if not all) of these bridges do not have large enough culvert openings to drive through, and bridge design typically doesn't include an access ramp for maintenance vehicles or a vactor truck. Without proper design to allow access, arroyo disturbance potentially increases when City staff needs to reach manholes or exposed pipes that cross or lie on the arroyo floor. According to the City's Utilities Standards, manholes must be accessible by 2-wheel-drive vehicles 24 hours a day and must be approachable by a dedicated 15-ft. (minimum) right-of-way or City utility easement.[52] However, this is very often not the case due to space constraints.

On the West Mesa, infrastructure such as utility lines and roads are more expensive to install and maintain due to a more hilly terrain. Access becomes more difficult to provide because hillside roads are generally narrower, do not always provide secondary connection due to physical constraints, and can be easily blocked or narrowed due to on-street parking.

[52] City Utility Standards Sections 504, Sewer Lines Outside of Street/Road Right-of-Way, and 510, Manhole Design Criteria, www.las-cruces.org/Departments/Utilities



Exposure around the manhole indicates incision in this reach of up to 2 to 3 feet in this area. Note that some of the exposure could also be due to lateral movement of the low flow channel. This is the Alameda Arroyo looking downstream (west) from Roadrunner Parkway. Both photos: USACE Sediment Transport Analysis Report



Exposed pipeline in an incised reach of the South Fork Arroyo downstream (west) from Roadrunner Parkway.

Flood Control Dam Functionality

Several of the flood control/detention dams listed on page 29 are within the East Mesa watershed. Some dams were built at the request of residents and were designed to protect those residents, but most were built with a lower hazard in mind and present a potential risk to those who have developed below them since their installation. Maintenance of these structures has been neglected over the past 30-40 years during which time the pool areas have experienced extensive sediment deposition and build-up. This has impeded the primary outfall of most of the dams and diminished their storage capacities. These dams were originally intended to protect agricultural land, not urban or rural development. The City's Storm Drain Master Plan of 2006 found that:

"Under current conditions, the effectiveness of the Civilian Conservation Corps (CCC) dams as flood control structures is questionable; their main role at this time appears to [be] control and retention of sediment." [53]

According to the Natural Resources Conservation Service (NRCS), many of the dams are approaching the end of their planned service life and will require rehabilitation to continue to function safely. To ignore these dams will eventually place life and property at risk.[54]

The key areas where additional technical information is needed to support dam rehabilitation activities are summarized as:

- Technology for predicting performance of dams during extreme hydrologic events.
- Improved means of characterizing reservoir sediment quantity, quality, and distribution.
- Improved tools and guidance documentation for efficient application of current technology at the field level.
- Improved technology and tools for predicting the environmental impacts of dam failure.
- Improved procedures for predicting the response of channel and reservoir systems to change.
- Improved procedures for evaluating the short and long-term impacts of dam removal.

The Agricultural Research Service (ARS) and the NRCS have cooperated in the development and application of design criteria for flood control structures and channel stabilization measures. Over the past 60 years, achievements such as the development of tools to predict upland erosion, sediment delivery, and stream channel stability have contributed to improved reservoir design. ARS has also worked closely with NRCS in the development of design criteria for flood control project components such as spillways and stilling basins that allow the dams to operate effectively. Joint efforts in the area of software development for technology application are continuing to result in improved tools for design and analysis of dams and systems.

There are different options for dams to provide flood control functionality for Las Cruces. These could range from larger dams and reservoirs just outside developed areas, to a series of smaller dams strategically located through the extent of the arroyo system. These dams also represent the potential for wetlands and habitat where wetlands never existed before, but such repurposing could have impacts on the flood control function of the dams. Assessments on effective and desirable flood control structures would need to be addressed when considering upgrades or rehabilitation of the dams, and would involve the State Engineer's Office of Dam Safety, the NRCS, the Dona Ana County Flood Commission, the USBOR, the, private property owners and many other entities. In addition, the recent designation of the Organ Mountain Desert Peaks National Monument may impact owners' ability to maintain their dams, depending on the management plan created by the U.S. Bureau of Land Management.

Since the City has limited control over the fate of these dams (with the exception of the Villa Mora, Sandhill Arroyo and Las Cruces Dams), policies addressing upgrades and rehabilitation are not included in the AMP. However, the City fully supports a regional stormwater management strategy that fulfills

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[53] City of Las Cruces Storm Drain Master Plan, 2006, Bohannan Huston Inc.

[54] Rehabilitation of Aging Watershed Flood Control Dams. U.S. Department of Agriculture Technology Fact Sheet, May 2001. www.nrcs.usda.gov

the programs of all entities and would participate as a regional partner in efforts to mitigate problems associated with improving dam functionality.

Factors that need to be considered include the costs for rehabilitation (including technology that would aid in decision-making), the values of downstream development which would be at risk due to dam ineffectiveness, and whether or not these flood control dams would be the best way to handle stormwater runoff. Other methods, including larger dams, designed channels to redirect flows where development has taken place downstream or ponds may be more effective. But the Las Cruces, Alameda, North Fork, and South Fork Dams are important to the overall drainage of the East Mesa watershed because they play a major role in the watershed's hydrology.

Weather and Climate Variability

One does not have to accept theories about climate change to understand that the unpredictability of El Niño, La Niña and the North American Monsoon makes it difficult to plan for storm events and flooding, and makes it all the more important. Monsoonal rainfall events in southern New Mexico tend to be short and spotty, with intense, local storms drenching some neighborhoods but not others. Rising temperatures and increased storm activity have occurred simultaneously, although the timing, intensities and frequencies of storms change from region to region and from year to year and may not be related to climate change at all.[55] It is worth noting, however, that the increased droughts, fires, flooding and severity of storms recorded in the last ten years have all occurred with a warming of only 1.3°F [56] and scientists project that Earth's average temperatures will rise between 2 and 12 degrees Fahrenheit by 2100.[57] In the Southwest, temperatures since 2000 have risen about 1.5°F from recorded averages.

Many regions are experiencing more frequent and severe heat waves while experiencing more intense rainfall, as well. Scientists theorize that changing the average global temperature by even a degree or two can lead to serious consequences and predict that for about every 2°F of warming, we can expect to see:

- 3—10% increases in the amount of rain falling during the heaviest precipitation events, which can increase flooding risks.
- 5—10% decreases in stream flow in some river basins, including the Rio Grande.
- 200%—400% increases in the area burned by wildfire in parts of the western United States which increases the likelihood of soil erosion and flooding in burned areas. [58]

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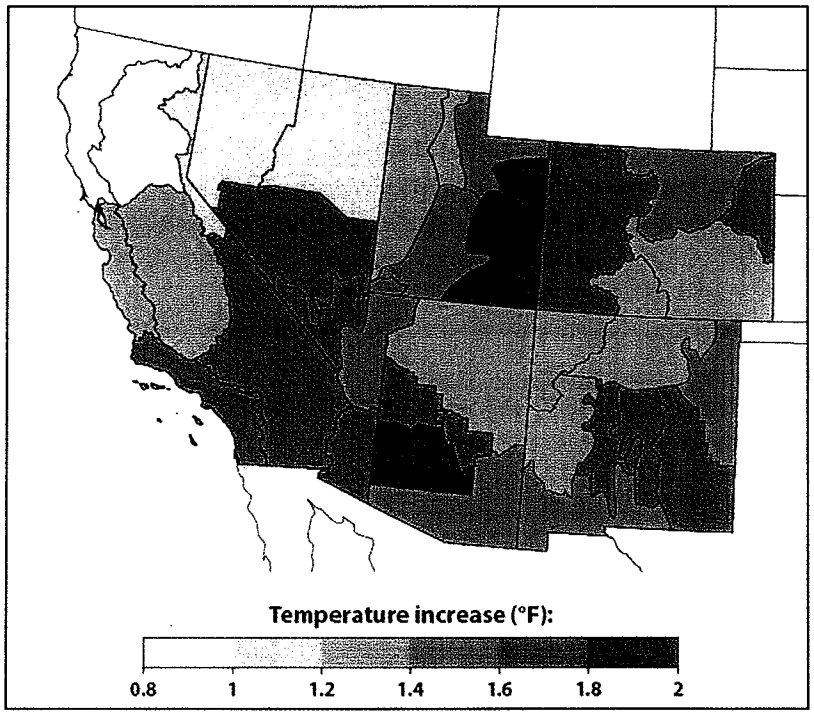
[55] "Understanding the Southwestern Monsoon," Jack Guido. Southwest Climate Network, 2010. www.southwestclimatechange.org

[56] "Understanding Climate Change: A Primer," Woods Hole Research Center, 2014. www.whrc.org

[57] *America's Climate Choices: Final Report*. National Research Council, 2011. The National Academies Press, Washington, DC, USA. http://nas-sites.org/americasclimatechoices/

[58] *Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia*. National Research Council, 2011. The National Academies Press, Washington, DC, USA. http://nas-sites.org/americasclimatechoices/

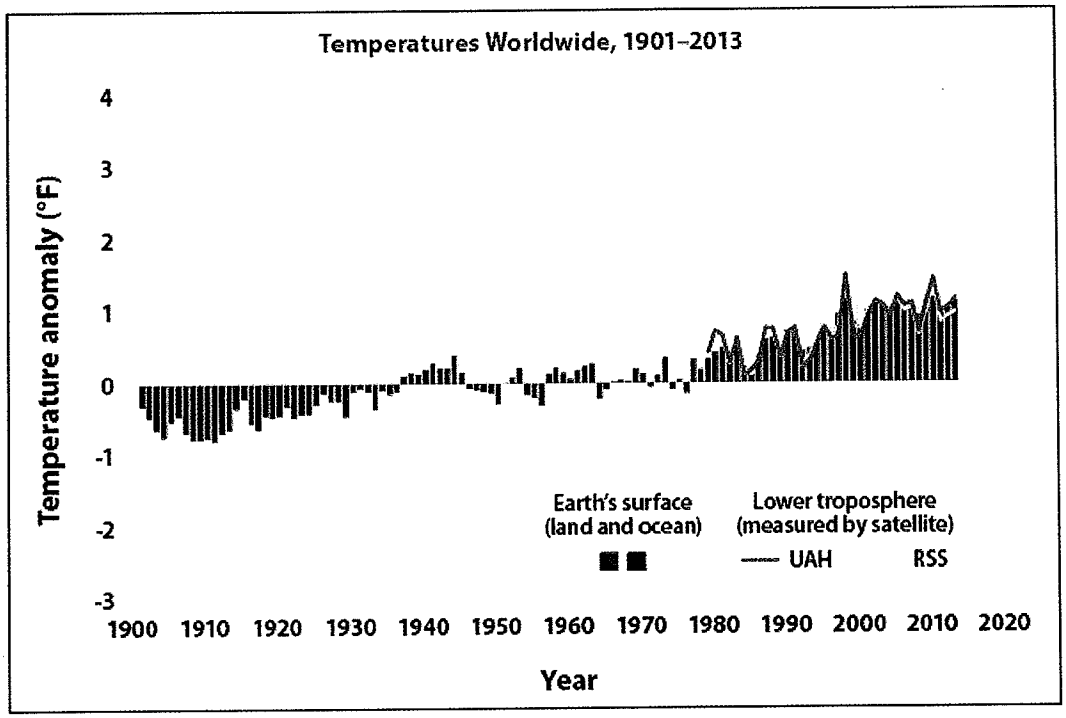


This map shows the average increase in air temperature in the Southwest compared to long-term averages (1901-2013). Southern New Mexico has experienced an average increase of 1.5° F in the last decade. National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA), 2014. www.ncdc.noaa.gov/oa/ncdc.html

The high costs associated with extreme and variable weather is something to keep in mind during discussions about development and arroyo management. Most climate models indicate that the Southwest will become drier in the twenty-first century, and that there will be increased frequencies of extreme weather events, including drought, flooding, and heat waves.[59] Increasing temperatures are expected to alter precipitation patterns (i.e. volume, frequency, and intensity) and correspondingly alter regional stream flow patterns.[60]

[59] IPCC 2007

[60] Climate Choices for a Sustainable Southwest," from The Assessment of Climate Change in the Southwest United States. Available at http://swcarr.arizona.edu/content/about-report. P 286



This figure shows how annual average temperatures worldwide have changed since 1901, when reliable temperature data began being collected. In the early part of the 20th century, temperatures were slightly below normal. The first significant heat wave occurred in the mid-1930s, but steady and sharp increases in temperature began to occur in the late 1970's. National Climate Data Center, National Oceanic and Atmospheric Administration (NOAA), 2014. www.ncdc.noaa.gov/oa/ncdc.html and www.epa.gov/climatechange/indicators

Typically, arroyo capacity is analyzed with respect to the 100-year storm event, to assure no development occurs within the inundated areas. With predicted increases in intensity and frequency of storms, arroyos will have to carry a greater amount of water than they currently do and will flow beyond the 100-year flood boundary.

Short- and long-term perspectives on disaster risk management and adaptation to weather extremes can be difficult to reconcile. But community vision changes over time and development decisions are framed by tradeoffs between competing prioritized values and objectives. In other words, what we want today may not be what we want tomorrow. A proactive approach would not necessarily commit our community to a different vision, but would simply prepare us for whatever it may be. Planners, developers and elected officials will face choices to react to extreme storms and flood events or to take steps that could help head off some of the more damaging and expensive results of them. In the long run, better planning and erring on the side of caution save money and could simultaneously make our region better able to cope with the coming changes.[61]

A regional stormwater management plan, based on thorough hydrologic modeling, may help identify the most fragile land forms where development should not occur. If we consider potential extreme weather events and climate change in determining locations of critical facilities and systems and more fully incorporate natural systems to help control erosion and manage stormwater, we may be reducing

[61] Melanie Lenart, Southwest Climate Change Network, March 2013. http://www.southwestclimatechange.org/node/16780

disaster risk because we have a better understanding and acceptance of the natural hazards we may face in the future.[62]

Vegetation and habitat

Mitigation measures to restore vegetation disturbed during development can be challenging because vegetation generally takes a long time to establish in the desert environment. Also, since soil is disturbed during construction, it is more likely to erode, making vegetation more vulnerable to destruction.

Vegetation loss and desertification are issues with development as well. More impervious surfaces and narrow channels diverting stormwater to arroyos cause increased velocities and flows. Devices such as rip-rap, check dams and energy dissipaters are not always incorporated at drainage outlets that enter arroyos, causing destruction of downstream vegetation. Those that are incorporated sometimes fail due to poor design or insufficient maintenance.

Construction permitees in New Mexico are required to follow Section 9.4. of the NPDES General Permit for Discharges from Construction Activities, which states that operators in New Mexico have three years to establish a uniform perennial vegetative cover with a density of 70 percent of the native background vegetative cover for all unpaved areas and areas not covered by permanent structures. Other areas of the U.S. are required to revegetate areas in one year, but the EPA recognizes the difficulty in arid desert regions and therefore has allowed a longer time period for this requirement in New Mexico.

According to the Army Corps of Engineers' *East Mesa Watershed Study* (2007), the relative scarcity of perennial grasses that would be expected to occur in this area is a cause for some concern and perhaps presents an opportunity for restoration. Typically native species like sideoats grama, black grama, fluff grass, vine mesquite, tobosa, burro grass, alkali mallow and cane bluestem are very rare or absent altogether across the East Mesa, but could be replanted as part of mitigation efforts following construction.

Wildlife

As part of a healthy desert ecosystem, arroyos provide vital wildlife habitat and are natural east-west wildlife corridors. It is important to have intact, unfragmented corridors so that wildlife can access different parts of their home territory without crossing highways or arterial roadways. The East Mesa Watershed has undergone significant changes over time, especially within the past two decades.[63] Before development, the watershed was largely comprised of Chihuahuan Desert vegetation, with Chihuahuan Desert arroyo riparian communities, interspersed in the valley areas and along the arroyos. However, these community types are experiencing increased pressure from development, grazing, and other human uses. With development, wildlife habitats are encroached upon which can force interaction with humans or the elimination of their ranges and areas altogether.

During the Army Corps of Engineers *East Mesa Watershed Study* (2007), many species of wildlife expected to be present in the area were either absent or not observed. It has been speculated that

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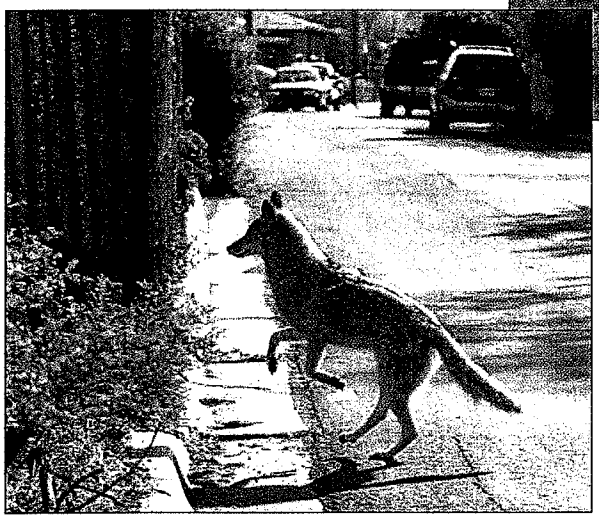
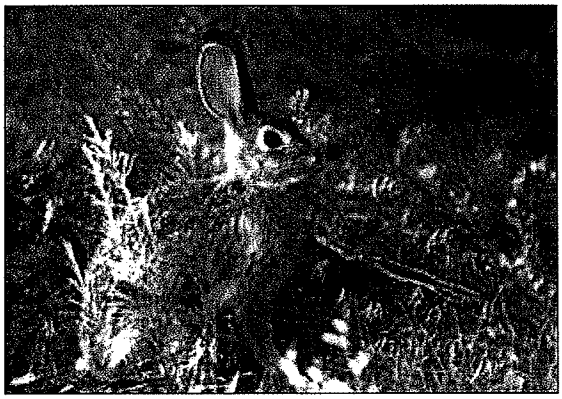
[62] United Nations Office for Disaster Risk Reduction, www.unisdr.org/we/coordinate/hfa
[63] East Mesa Watershed Study, U.S. Army Corps of Engineers, 2007.

development and competition by other species or predation have caused this decline.[64] Development within the watershed has transformed the wide, uninhibited alluvial fan to a patchwork of subdivisions that have restricted arroyo flows and segmented wildlife corridors and habitat. New roadways and neighborhoods have interrupted connectivity and have made it nearly impossible for wildlife to travel outside a very limited range. Although they have been reduced in size and diversity, some unfragmented wildlife corridors could perhaps be identified and preserved. A requirement for arroyo buffers could also benefit wildlife in appropriate areas.





Wildlife have adapted to changes caused by human presence and are drawn to garbage, gardens, pet food, and backyard bird feeders. Left, Coyote: Albuquerque Journal. Middle, Collared Peccary aka Javalina: Encyclopedia of Life, http://eol.org. Right, Desert Cottontail: New Mexico Tech, http://www.nmt.edu.

[64] Ibid

Parks and Open Space

Arroyos are an important recreational asset. Runners, cyclists, equestrians and walkers use the arroyos the open spaces adjacent to them on a regular basis. Encroaching development has threatened open space recreational opportunities by limiting access to these areas through subdivision design. As an example, subdivisions may reduce or limit pedestrian and bicycle access, may make no provisions for trails and may reduce opportunities for amenities along arroyos due to development that is too close to the 100-year flood zone boundary. This limits the value of arroyo systems as a multi-faceted community asset. In addition to providing more trail possibilities, planning development further back from the 100-year flood zone would also provide more privacy for property owners and would provide greater flooding protection in higher risk areas.

Unfortunately, motorcycles and all-terrain vehicles (ATV) have disturbed vegetation and wildlife and over time, leave a scarred landscape that isn't easily returned to a natural state. Signage and perhaps fencing in specific areas may help with this as will education and raising awareness of the value of the natural environment. Providing dedicated ATV areas may also reduce the overall damage to natural areas.

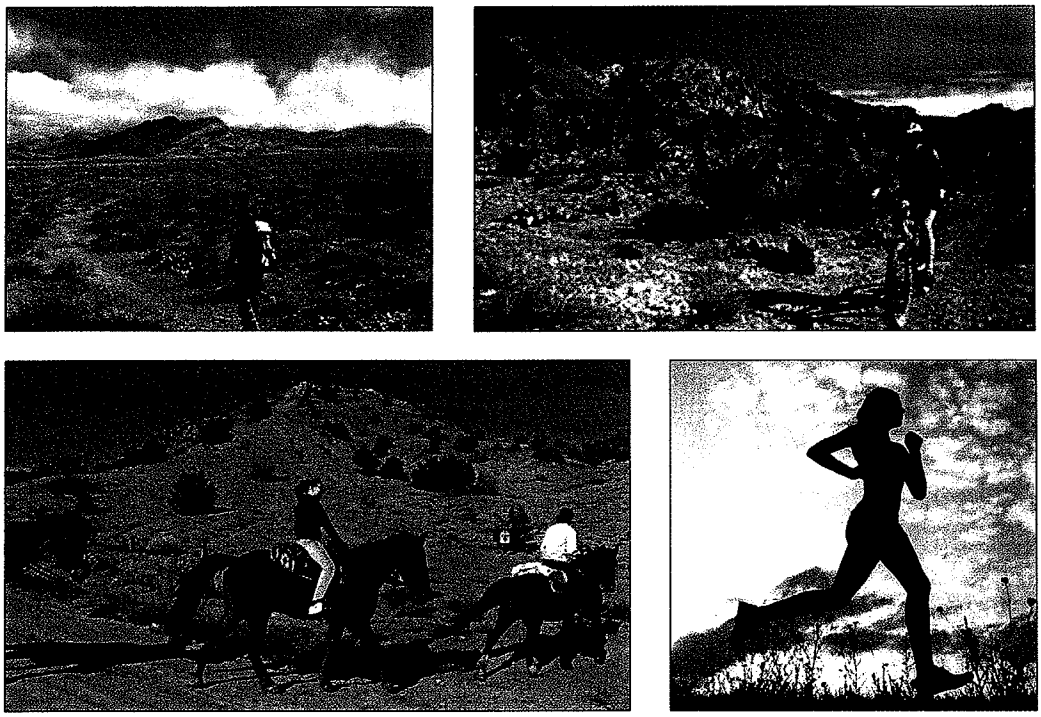
Equestrians often travel along arroyo bottoms but crossing under thoroughfares is difficult because bridges are generally too low to ride under. Increased demand for natural areas, trails and trail connections, and equestrian amenities means there is a need for design standards for trail construction and trail and road crossings that consider the needs of all users. These do not currently exist.

Suitable trails for equestrians have become increasingly hard to find, particularly close to urban areas. Many trails prohibit equestrian use, fearing conflicts with other users and damage to the trail surface. However, with proper design, a multi-use trail can accommodate equestrians while minimizing user conflicts. Hard surfaces (asphalt and concrete) and coarse gravel can injure horse hooves, so loose or compacted dirt trails may be called for in selected locations.

There may be opportunities for east-west linear parks along certain arroyos, but this has not yet been studied in any great detail. Further analysis of arroyos based on geology and soil stability, vegetation, slopes, drainage patterns, etc. will identify suitable areas for such parks. More important, there is a need for an identified funding source so that open space and arroyo buffers may be acquired by the City and to ensure adequate maintenance and repairs are performed.

Buffers along arroyo systems can provide non-motorized transportation for commuting cyclists and pedestrians. Left: This mostly flat paved trail in Tucson follows the banks of the normally dry Santa Cruz River for 9.5 miles.
Photo: www.flickr.com/photos/lasertrimguy

According to the publication *Better! Cities & Towns*, total U.S. driving has dipped then leveled off in recent years, and per capita vehicle miles traveled (VMT) has steadily dropped since 2005. Per capita driving is down 8.75 percent, and is now at 1996 levels.[65] In other words, non-motorized transportation networks are becoming increasingly important. There are very few connections in Las Cruces between schools, neighborhoods, commuter bike routes and major commercial areas. Trails adjacent to arroyos are part of the Mesilla Valley Metropolitan Planning Organization's proposed trail plan and could easily be factored into new development proposals in an effort to provide additional connectivity for non-motorized transportation.



Passive recreation opportunities that incorporate arroyo systems can bring a boost to an area's economy through tourism, sporting events, and quality of life factors. Photos, clockwise from upper left: National Recreational Trails; BLM; Albuquerque Journal; Arizona Foothills Magazine.

The Economy and Quality of Life

Today the U.S. economy is dominated by high technology and service businesses selling knowledge and intellectual expertise. This economic sector is not tied to specific business locations or by the need for certain kinds of transportation facilities or raw materials. With more freedom to choose a site, businesses often select one with a high quality of life – including parks, aesthetics open space, and easy access to the outdoors – in order to compete for highly trained, in-demand workers.[66]

Companies frequently relocate where their top talent wants to live, and that is most often in places of natural beauty. When land is protected, the adjacent properties often increases in value, with homes selling for 10–20 percent more than comparable homes without access to such areas. A survey by the

[65] *Better! Cities & Towns,* Ithaca, NY 14851, June 2013. www.bettercities.net
[66] "Conservation: An Investment That Pays." Trust for Public Land, 2007, http://www.tpl.org

National Association of Realtors concludes that new homebuyers value trails and natural areas above any other amenity.[67]

As quality of life becomes an increasingly important factor for business location, there will be a greater demand for natural areas and passive recreation activities. Frederick Law Olmsted, designer of New York's Central Park, was one of the first people to suggest that parks could be paid for with increasing tax revenues that resulted from rising land values adjacent to the park. In fact, studies conducted by the Trust for Public Land have shown that investments in land conservation and open space return from $4 to $10 for every dollar invested.[68]

Conserved land and open space can provide opportunities for eco-tourism as well. The Bosque del Apache National Wildlife Refuge (NWR), which is located about 130 miles north of Las Cruces, is a protected area with unique wildlife viewing opportunities. Recreational visits generate over $4.5 million in tax revenue for the region. For every $1 of the NWR budget, there is a local economic effect of nearly $8.

One method for estimating the economic value of open space and recreation areas that do not have a market value is through hedonic[69] pricing methods. This statistical approach is used to link a good traded in the marketplace (i.e. a house) with an environmental good (i.e. a nice view) that is not traded in the market. According to a survey done by the Robert Wood Johnson Foundation, various research studies conclude that the average household living half a mile from open space would be willing to pay $4,104 more for a home to live a quarter mile closer to the open space.[70] In addition, traditional neighborhood development concentrates neighborhood density, allowing room for large open space areas. Neighborhoods that feature open spaces, parks and greenbelts have been found to have higher home sale prices, enhanced marketability and often faster sales or leases than conventional development.[71]

Key research results found by the Robert Wood Johnson survey include:

- Open spaces such as parks and recreation areas can have a positive effect on nearby residential property values, and can lead to proportionately higher property tax revenues for local governments.
- In general, urban parks, natural areas and preserved open spaces showed positive effects on property values.
- Environmental protection, greenhouse gas reductions, and mental health benefits, as well as recreational benefits, should be considered as indirect effects.

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[67] The Economic and Tax-Base Benefits of Land Conservation, Land Trust Alliance Factsheet. www.landtrustalliance.org. 2003

[68] Ibid

[69] Hedonic pricing is a model identifying price factors according to the premise that price is determined both by internal characteristics of the good being sold and external factors affecting it. The most common example of the hedonic pricing method is in the housing market: the price of a property is determined by the characteristics of the house (size, appearance, features, condition) as well as the characteristics of the surrounding neighborhood (accessibility to schools and shopping, level of water and air pollution, value of other homes, etc.).

[70] The Economic Benefits of Open Space, Recreation Facilities and Walkable Community Design, Active Living Research, Robert Wood Johnson Foundation, May 2010. www.activelivingresearch.org

[71] Ibid

- Natural area parks, on average, have the largest statistically significant effect on a home's sale price, holding all other factors constant. Value increase to homes located within 1,500 feet of the following types of parks:
    - Natural areas: $10,648
    - Golf courses: $8,849
    - Specialty parks: $5,657
    - Urban parks: $1,214[72]

It is often more cost-effective for a community to maintain open space, which can control flooding, filter water runoff, or help to mitigate air pollution, than to invest tax dollars in expensive infrastructure projects to achieve the same function.[73] For developers, these economic benefits can translate into reduced financial liability, faster sales and ultimately higher profits. The design elements of compact developments may also present cost savings. Watershed areas that are used as a form of natural drainage protection and open space also reduce construction and maintenance costs from stormwater drainage systems.

Conservation easements have been a powerful tool to protect land from development by providing federal tax breaks for donating land development rights. With a conservation easement, a property owner gives some or all of the development rights on the property to a government agency or not-for-profit (there are more than 1,700 local land trusts), and receives a federal income tax deduction for the gift amounting to the difference in the value of the land before and after the easement is in place. The land owner still owns the land and can continue to use it.

The Enhanced Easement Incentive is a temporary measure that was originally enacted by Congress in 2006, and repeatedly extended. The most recent extension, which was in effect until the end of 2013, allowed a non-farmer donor to use a conservation donation deduction for up to 50% of his gross income in any year, up from the normal 30% that is a permanent part of the law. The temporary break also allowed a donor to carry forward any unused write-off for a full 15 years, instead of the normal five. Currently, there is a new measure before Congress which would make the incentive permanent and would allow modest-income landowners to receive significant tax deductions for donating conservation easements that permanently protect important natural or historic resources on their lands.

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[72] , Active Living Research, Robert Wood Johnson Foundation, May 2010. http://activelivingresearch.org.

[73] "Conservation: An Investment That Pays," Kline, J., et al, 2009. Trust for Public Land, www.tpl.org

CHAPTER 5. GOALS AND POLICIES

We are fortunate to be able to enjoy the arroyos for passive recreation activities, wildlife viewing and other fresh air experiences. But it's important to remember that first and foremost, arroyos exist as natural stormwater conveyance systems and are an integral part of the desert ecosystem. In developing policy guidance for arroyo management, our goals must further systematic flood control and drainage functions, allow continuance of historic flows in arroyos, and protect arroyos in their natural state. If those things are done well, we can continue to enjoy open space experiences for years to come.

This chapter is divided into four sections. *Land Use* addresses overarching issues related to development and growth management. *Environment* focuses ways in which the land, vegetation and wildlife can be protected. *Community Facilities* suggests policies to increase the use of arroyo systems as community assets. *Utilities and Stormwater* looks at design standards for more effective and efficient stormwater management, including erosion control, sedimentation, and utilities installation and maintenance.

Goals and Policies describe *what* should be accomplished; Actions explain *how* they will be carried out. The guiding actions to implement the goals and policies are listed in tables in Chapter 6, Administration and Implementation. Many of the policies in this plan are limited to arroyos that are not already privately owned or to arroyo areas that have not yet been developed. This will have to be determined on a case-by-case basis as individual arroyo characterization modeling is carried out. Those that may affect developed areas are limited to maintenance or mitigation issues, since flood control systems are already in place. Some of the policies below will require changes to existing codes, including LCMC Chapter 32 Design Standards and Chapter 37 Subdivisions. However, AMP policies provide guidance for decision making but are not regulatory. As is the case currently, public and private development projects follow codes that are in place at the time of development.

SECTION 1 -- LAND USE

Wise land use practices must balance the rights of landowners with the protection of our region's unique landscapes, arid vegetation and natural wildlife habitat. It is also critical that we increase our ability to manage arroyos holistically by understanding the potential impacts of our actions on a regional and watershed level. Development in the East Mesa area (and eventually on the West Mesa) should logically occur from downstream to upstream so that downstream infrastructure can be in place before upstream development occurs. It is also important that upstream flood control measures be engineered sufficiently so that downstream properties are not adversely affected.

The major arroyos that are most important to the City in the context of stormwater management and open space protection are the Alameda, Sandhill and Las Cruces Arroyos. As development moves further away from the city center, managing other arroyos properly will also become a priority. The Fillmore, Doña Ana, Moreno and Torgugas Arroyos extend into the ETZ and will be impacted as our community grows.

GOAL 1. Take a proactive approach to watershed management that takes into account existing drainage conditions as well as conditions affected by future development.

Policies:

1.1. Complete a detailed characterization of the main stems of each major arroyo so that it may be managed for optimum protection, stabilization and resiliency.

1.2. Work with governmental agencies (BLM, SLO, etc.) to retain or dedicate their arroyos and identified buffer areas to the City or County before public lands are sold for development.

1.3. Identify critical and sensitive environmental areas and contiguous open spaces and protect them from development using conservation easements, incentives, the Open Space (OS) zoning designation, etc.

1.4. Develop public/private partnerships to develop funding strategies for acquisition and maintenance of arroyo systems.

1.5. Clearly outline drainage or flood control modifications to arroyos in PUD concept plans and master plans, and include necessary details in subsequent development processes for review and approval purposes.

1.6. In areas that are in close proximity to arroyos, design and lay out lots and street locations in a way such that the natural characteristics of arroyos, such as vegetation and contours, are utilized. Site specific plans that address these issues rather than a standard design often results in a safer, more cost effective result.

1.7. In new development proposals include intended pedestrian, bicycle and equestrian connections between arroyos, thoroughfares and existing developments.

1.8. Allow green infrastructure techniques in development proposals as a way to manage storm water before it reaches the arroyos.

1.9. Increase the availability of reclaimed (purple pipe) water that could be used for establishing and supplementing native vegetation adjacent to arroyos.

1.10. Identify areas adjacent to arroyos or sections of arroyos that may be suitable for linear parks, trails or scenic corridors and provide incentives to create them.

GOAL 2. Improve the safety of the flood control dams and restore native vegetation in the storage pool areas.

Policies:

2.1. Evaluate conditions of Sandhill, Villa Mora and Las Cruces flood control dams and prioritize them for necessary mitigation, such as seepage and slope stability, pool area and spillway capacity of each dam, etc., and identify responsible City departments for these actions.

2.2. Complete appropriate re-vegetation with Chihuahuan Desert native grasses following any dam rehabilitation or maintenance activities that disturb existing vegetation.

2.3. In development proposals downstream of flood control dams, include an analysis of dam effectiveness and potential flooding impacts to that development.

2.4. Support a regional stormwater management strategy that fulfills the programs of all entities and participate as a regional partner in efforts to mitigate problems associated with improving dam functionality.

2.5. Ensure that development, zoning, and land use changes do not impede flood control dam maintenance or operations.

GOAL 3. Improve road crossing infrastructure to maximize drainage function

Policies:

3.1. Design and/or retrofit existing arroyo crossings to limit or prevent a hydraulic constriction/bottleneck under present conditions and for potential flows under future hydrologic conditions. Failure to do so could lead to incision problems and hazards to adjacent infrastructure and property improvements.

3.2. Make maximum use of existing infrastructure and previously developed road crossings to minimize encroachment into natural areas.

SECTION 2 -- ENVIRONMENT

Many opportunities exist for environmental restoration of riparian ecosystems on the East and West Mesas. While it may be unrealistic to set goals to restore developed areas to historic riparian and grassland ecosystems, it is possible to make significant strides in that direction. Desert riparian communities that will survive with surface water flows along arroyos can be restored within the watershed by various erosion control and arroyo stabilization techniques. Also, there are opportunities for environmental restoration at the dam sites in the watershed.[74] Through sound development standards, new development can adapt to existing natural environments, topography, soils, vegetation, geology, and hydrology so that fragile land forms, natural wildlife habitat and wildlife connectivity are protected.

GOAL 4: Protect and maintain natural vegetation within arroyo systems and mitigate damage that may result from development.

Policies:

4.1. Without compromising engineering design standards, promote flexibility in planning and landscaping development and utility installations that propose to retain the natural characteristics of the terrain or preserve undisturbed tributaries that feed major arroyo corridors.

4.2. When constructing and installing utility components, survey existing vegetation in arroyos and design utility installations to disturb as little vegetation as possible.

4.3. Replace vegetation lost during construction by reseeding with Chihuahuan Desert native vegetation following the requirements in NPDES 9.4.[75]

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[74] ACOE East Mesa Watershed Study 2007

[75] Construction permitees in New Mexico are required to follow section 9.4. of the NPDES General Permit for Discharges from Construction Activities, which states that operators have additional time – up to three years – to establish a uniform perennial vegetative cover with a density of 70 percent of the native background vegetative cover for all unpaved areas and areas not covered by permanent structures. See EPA Construction General Permit, http://cfpub.epa.gov/npdes/stormwater/cgp.cfm

GOAL 5: Manage arroyos to retain wildlife corridors.

Policies:

5.1. Increase valuable desert wildlife habitat by evaluating areas within the watersheds where native plant restoration is feasible.

5.2. Identify and map wildlife corridors so they may be protected from construction activities.

5.3. No fencing or walls may obstruct free flow of waters or debris.

SECTION 3 -- COMMUNITY FACILITIES

Strengthening arroyo systems as a community asset can improve quality of life and bolster our economy. Las Cruces' natural areas attract tourists and new residents to the community. In addition, arroyos already provide occasions for outdoor recreation and non-motorized transportation for current residents. But it is important that in doing so, the privacy and rights of residents living adjacent to the arroyos are respected. Proper design of parks, trails, trail amenities, connectivity, equestrian facilities, street crossings, parking, signage, etc. will result in opportunities that meet the needs of all users. The Mesilla Valley Metropolitan Planning Organization (MPO) includes a Trail Plan map in their long-range transportation plan, Transport 2040. Policies in the Arroyo Management should complement and support the MPO's goals.

GOAL 6: Minimize impacts created by development and human activities to realize the full potential of arroyo systems as a community and economic asset.

Policies:

6.1. Create regional development and conservation guidelines for arroyos that cross jurisdictional boundaries.

6.2. Identify and map those arroyos and open spaces that might serve as natural connections to other public properties.

6.3. Promote neighborhood and subdivision designs that incorporate arroyos as neighborhood amenities. These may include such things as street alignments that are placed between developed areas and arroyos; open space corridors, linear parks, trails, etc.

6.4. Put forth a Quality of Life initiative to help fund community amenities such as open space acquisition.

6.5. Use adopted park impact fees or development waivers as incentives to developers to designate open space, trails and connectivity, or a linear park on a case-by-case basis.

6.6. Work with other City departments and other agencies to develop strategies to prevent illegal dumping in the arroyos, such as sign postings, Neighborhood Watch, Adopt-A-Spot, increased patrols by Codes Enforcement officers, etc.

6.7. Incorporate linear parks adjacent to arroyos into the City's Parks and Open Space Master Plan in areas where an arroyo is suitable for such a park.

6.8. Create a promotional outreach campaign about recreation opportunities, nature and open space experiences, etc. in the Las Cruces area.

GOAL 7: Achieve the goals of the MPO Trail Plan to create a continuous system of regional trails that integrates and connects arroyo systems.

Policies:

7.1. Working from the proposed trails mapped in the MPO Trail Plan, identify areas where arroyo trails may be located.

7.2. Provide adequate distance from residential development to protect privacy of property owners and from roadways to provide safe pedestrian and bicycle passage.

7.3. Construct trails outside the designated 100-year flood zone boundary on an arroyo.

7.4. Update MPO Trail Plan to improve connectivity of trails between arroyos, parks and other public open spaces, such as SLO and BLM land.

7.5. Identify potential trail locations that would be appropriate for accessibility and compliance with ADA standards.

GOAL 8: Work with the Mesilla Valley MPO to create design guidelines that ensure trails suit the characteristics of the arroyo, provide maximum usefulness and address pedestrian, cyclist and equestrian safety.

Policies:

8.1. Develop standards in the LCMC Chapter 32 Design Standards for arroyo trails according to the characteristics of the arroyo and its available buffer area.

8.2. Design arroyo crossings to include appropriate measures such as signage, push button signals or other features that will maximize safety, access and mobility.

8.3. Where applicable during the development design process, meet with adjacent neighborhoods to discuss appropriate trail amenities for pedestrians, bicycles and equestrians.

8.4. Where possible, locate parking, trail heads and amenities in such a way as to support a dual use such as postal cluster boxes, playgrounds, parks, etc.

8.5. In partnership with the MPO, develop standards for park, trail and facilities signage, route and wayfinding signage and an informational brochure identifying existing and planned trail facilities.

SECTION 4 – UTILITIES AND STORMWATER MANAGEMENT

Safe and effective engineering standards for flood control, utilities installation, storm water conveyance and water storage are important. But these designs should maintain the natural character of the arroyo and minimize impacts of development so the arroyos function optimally and natural terrain is not destroyed. This is also important to ensure historical drainage patterns are not altered.

The City promotes flexible design standards when channelizing and storing stormwater for development adjacent to designated arroyos that will enhance the natural arroyo system. It should be noted that the LCMC Chapter 34 (Drainage and Flood Control) may require more than minimum storm water standards if arroyos on a site to be developed or immediately downstream of the site show evidence of increased

flooding, accelerated erosion, channel erosion of sedimentation, as a direct result of conditions on the site. These additional requirements may include buffer zones, re-vegetation of highly eroded areas, and arroyo restoration or other erosion control measures within highly eroded channels.

GOAL 9: Create safe and effective engineering standards for flood control and conveyance while maintaining the natural character of the arroyo and achieving visual harmony.

Policies:

9.1. Keep arroyos in a natural or naturalistic condition to counteract erosion. Naturalistic treatments could include such things as native vegetation and channel stabilization using rock riprap, weirs, weirs, gabions, contouring, etc.

9.2. Do not alter a natural arroyo unless such a modification is shown to be without reasonable hazard and liability, and there are no adverse impacts to public and private infrastructure, habitats and open space. Altering a drainage path may create new and unpredictable flood responses.

9.3. Replace vegetation in areas that are disturbed during construction, in accordance to NPDES 9.4. This includes a well-established mixture of native grasses, forbs, and other ground cover to help reduce sediment movement.

9.4. In laying out adjacent street systems, keep drainage outfall structures to the minimum needed to maintain a naturalistic arroyo treatment.

9.5. Pursue innovative methods of funding storm water management practices. Special funding could include user fees, special taxation, tax incentives, grants, conservation easements, and Public or Private Improvement Districts.

GOAL 10: Minimize soil and slope instability, erosion, sedimentation and water run-off to protect water quality and the natural characteristics of the land.

Policies:

10.1. Use public education to raise awareness level of the general public and the construction/development community in regard to urban runoff, non-point source pollution and other watershed-related issues.

10.2. Strengthen the permitting and inspection process to improve compliance with the EPA NPDES MS4 permit and Construction General Permit

10.3. Do not discharge stormwater runoff directly into arroyos. Direct discharge into a settling pond, impoundment or other solution designed to stop or slow water before it reaches the arroyo. This will assist in bank stabilization by minimizing erosion and promoting growth of native vegetation.

10.4. Extend drainage structures completely into the arroyo bottom, extending to the arroyo flow line, and matching the natural terrain.

10.5. Confirm that a Notice of Intent (NOI) to the Environmental Protection Agency (EPA) has been submitted before issuing grading permits.

10.6. Place fills in such a way that they do not cause encroachment upon arroyos or other natural drainage ways.

10.7. Use Best Management Practices (BMPs) related to NPDES compliance to reduce pollutants from storm water.

10.8. Apply credits to the FEMA/Community Rating System (CRS) program for those projects adopting the management practices in the CRS program plan. This will provide additional flood protection and cost savings.

GOAL 11: Improve the safety and efficiency of utilities installation to better protect the natural environment.

Policies:

11.1. Bury utilities to a depth as determined through a soil stability analysis and to meet requirements outlined in the City Utilities Standards. In some cases this may be deeper than the minimum standard.

11.2. Design utility crossings to minimize damage to flora and fauna and to minimize changes in surrounding natural grades.

11.3. Replace desert vegetation lost during utilities installation as per NPDES 9.4.

11.4. Provide erosion control measures for infrastructure built in arroyos.

11.5. Provide appropriate access provisions to infrastructure and other facilities in arroyos and along their buffers to provide for necessary operation and maintenance.

CHAPTER 6. ADMINISTRATION AND IMPLEMENTATION

The City's comprehensive planning framework begins with broad goals defined in *Comprehensive Plan 2040*, and is referred to as "Level 1" within the framework. More detailed plans, Level 2, include community planning blueprints and neighborhood, corridor and technical plans. The Arroyo Management Plan (AMP) is considered a Level 2 technical plan. In order to accomplish goals and policies in these Level 2 plans, Actions are identified, some of which lead to regulations in our codes, such as the Zoning Code, Development Standards, Subdivision Code and other related chapters in the City's Municipal Code. Goals, Policies and Actions are defined as:

> **Goals** represent an ideal future condition or long-term end state that the City strives to achieve, but which are not necessarily measurable.
> **Policies** are statements that guide action and imply clear commitment toward achieving or advancing a goal.
> **Actions** identify procedures, programs, or techniques City departments and/or other entities accomplish on a day-to-day basis that will make the policies and goals a reality.

The last step is in this process is implementation, during which most of the actions are carried out. Actions in the AMP involve changes to codes, strengthening enforcement of these codes, educating the public, and regulating the City's own practices in such a way that we meet or exceed the minimum requirements. In some cases, regulations and practices that are not already reflected as policies in the AMP will have to be added later as a plan amendment. In this way, policy and practice are consistent and support the same purpose. Listed below are actions that address goals in the Land Use, Environment, Community Facilities, and Utilities & Stormwater Management sections of Chapter 5. In most cases, cooperation among City departments, other governmental agencies and/or the private sector will be critical.

The actions noted below are intended to guide arroyo management and may need to be modified somewhat to reflect the realities of implementation. For example, some measures as written may simply be too expensive to implement or may conflict with existing regulations. In these cases, steps should be taken to remove barriers to implementation, i.e. secure funding, amend existing codes, etc.

As noted earlier, the City supports a regional stormwater management strategy and would participate as a regional partner in efforts to manage arroyo systems. It is important that we look broadly at arroyo systems at the watershed level, and then continue to characterize individual arroyos for specific management needs. This will require the participation and collaboration of many different public and private entities with land and natural resource management responsibilities. Development would then occur systematically and would be based on thorough physical and regulatory analyses of the arroyos and surrounding terrain.

LAND USE

GOAL 1. Take a proactive approach to watershed management that takes into account existing drainage conditions as well as conditions affected by future development.

Actions for Policies 1.1 – 1.10

It is important to understand the potential impacts of human actions on a regional and watershed perspective. By managing arroyo systems holistically – looking broadly at the watershed level – we can help to ensure that the full potential of arroyos as a community asset is realized and in doing so, maintain the desert's ecological health over time. Protecting arroyo systems and improving overall stormwater management begins by amending existing ordinances that would set parameters for these activities. Once amended, a checklist of reports, data or other appropriate information that should be submitted with development proposals ensures that these issues are addressed to the satisfaction of the City.

ACTION	COLLABORATING PARTIES
To characterize individual arroyos, combine existing and new modeling work to include data about hydrology, land use, vegetation, wildlife, soil type, topography, drainage patterns, etc. This complete watershed model would be used to determine buffers, areas appropriate for linear parks, scenic corridors, and areas that are more susceptible to erosion that may require treatments beyond the minimum regulations. Measured laterally from the 100-year flood zone boundary, buffers would be determined based on the characteristics of the arroyo or its banks. For example, a buffer may include bands of indicator species of vegetation and small channels that are apparent outside the 100-year floodplain if the modeling data support those inclusions.	City of Las Cruces all appropriate departments
Carry out appropriate joint agreements to dedicate arroyo systems (arroyo + buffer) to the City of Las Cruces.	City of Las Cruces, NM State Land Office, Bureau of Land Management
Identify long-term funding sources and other strategies for land acquisition, maintenance and other activities. These may include such things as: • Land and Water Conservation Fund (LWCF) funding to acquire new lands and secure conservation easements on private lands. • General obligation bonds could be used for "Quality of Life" amenities including open space acquisition. Generally backed by the City and paid back through property taxes. • Special Assessment District (SAD) distributes the cost of a project to property owners who realize a direct benefit once the improvements are constructed. This could be used for storm drains, sanitary sewers, water service, roadways, sidewalks and other related public infrastructure.	CLC all appropriate departments

• Public Improvement Districts are similar to a SAD in that they provide a means to generate funds for construction and maintenance of public infrastructure. Cost of project is distributed to only those properties that gain a direct benefit. Different from SAD in that funds are placed in a fund that is managed by a board of directors. Increasing mil levy for Dona Ana County Flood Commission projects or reconsider the creation of the Las Cruces Metropolitan Flood Control Authority (LCMAFCA).Other federal funding sources for environmental protection.	
Map arroyos and proactively zone major arroyo systems as OS-NC to preserve them as open space.	CLC Community Development
Consider a City development pilot project that adheres to the goals and policies of the AMP to demonstrate the plan's implementation.	CLC all appropriate departments
Amend appropriate chapters of the LCMC to revise requirements for PUD and subdivision proposals to fulfill policies herein.	CLC all appropriate departments
Expand education program about project designs that minimize impact to water quality.	CLC all appropriate departments
Identify areas requiring erosion protection in development proposals and require designs for protective measures, as provided in UTILITIES & STORMWATER MANAGEMENT GOALS in Chapter 5	CLC all appropriate departments
Strengthen enforcement of NPDES Stormwater BMPs for Construction and Post-Construction.	CLC all appropriate departments
Create incentives for developments that zone arroyo buffers or larger contiguous areas of opens space as OS-NC.	CLC Community Development
Increase access to reclaimed water.	CLC Utilities

GOAL 2. Improve the safety of the flood control dams and restore native vegetation in the storage pool areas.

Actions for Policies 2.1 – 2.5:

The initial purpose of East Mesa flood control dams, particularly the Alameda, North Fork, and South Fork Dams, was to provide localized flood and sediment control. These dams are at varying stages of effectiveness and currently serve, mainly, as sediment catch basins. According to the 2006 Storm Drain Master Plan, these three dams are serving to reduce peak discharge rates under both the 100- and 500-year storms. The dams do not have a major impact on the total volume of water that is delivered to each analysis point as they are designed as detention and not retention facilities; even so, the dams are still valuable for peak reduction and lagging.[76] Additionally, the conditions of the dams have probably changed somewhat since 2006. For example, the Bureau of Land Management has performed rehabilitation work on the Alameda Dam. Updating the dam condition and effectiveness reports may be called for.

[76] City of Las Cruces Storm Drain Master Plan, Section 4, Analysis of the Dams in the East Mesa Watershed, Bohannan Huston, Inc., 2006

There is an opportunity for improving dam safety and bringing them up to current safety standards. Additionally, there is an opportunity for environmental restoration features in the storage pool areas. Las Cruces can participate in a regional effort to address problems related to the flood control dams. But direct responsibilities and actions are limited to the Villa Mora, Las Cruces and Sandhill dams.

ACTION	COLLABORATING PARTIES
Consider City membership in the South-Central New Mexico Storm Water Management Coalition support watershed-level planning for arroyo management. For dams outside the jurisdiction of the City of Las Cruces, the City encourages participating entities to re-evaluate dam effectiveness and make appropriate decisions about mitigation measures, such as breaching, installing hydraulic structures, rehabilitating, etc. This may include vegetative restoration if disturbed during dam maintenance or rehabilitation. For the City's dams and for dams outside the jurisdiction of the City of Las Cruces, the following measures are suggested: • Install hydraulic structures upstream and increase capacities of those dams identified by the Army Corps of Engineers for such measures. • Utilize the full catalog of storm water management, erosion control, and revegetation options for dam rehabilitation before making the decision to breach those dams which have been identified for such actions. • Implement appropriate restoration measures in the upper reaches of the watersheds to slow flow and decrease sediment loads that reach the dams.	All entities participating in regional stormwater management.

GOAL 3. Improve road crossing infrastructure to maximize drainage function

Actions for Policies 3.1 – 3.2:

ACTION	COLLABORATING PARTIES
Amend Design Standards to require strategies to prevent erosion, sedimentation and constriction problems under roadway crossings, such as installing sediment catch basins upstream of the culvert, debris barriers, energy dissipaters, etc.	City of Las Cruces all appropriate departments
Identify and secure increased funding for regular maintenance of such infrastructure.	

ENVIRONMENT

GOAL 4: Protect and maintain natural habitat & wildlife connectivity within arroyo systems to the greatest extent possible and mitigate damage that may result from development.

Goal 5: Manage arroyos to retain wildlife corridors.

Actions for Policies 4.1 – 5.3:

ACTION	COLLABORATING PARTIES
Amend Landscape Design Standards to include revegetation requirements as per NPDES General Construction Permit Section 9.4., including a list of acceptable/desirable species for revegetation in and/or adjacent to arroyos and dam ponding areas.	CLC all appropriate departments
Work with the local Soil and Water Conservation District to offer programs to encourage planting native vegetation and trees. Outreach to developers and homeowners would demonstrate the importance of establishing vegetation and other measures to control soil erosion.	CLC all appropriate departments
Work with NMSU, U.S. Fish & Wildlife and/or other appropriate organizations to begin a wildlife corridor database project.	CLC, NMSU, USFW, etc.

COMMUNITY FACILITIES

GOAL 6: Minimize impacts created by development and human activities to realize the full potential of arroyo systems as a community and economic asset.

Actions for Policies 6.1 – 6.8:

Since these areas are managed by private and public sector parties, actions that will maximize the public value of arroyo systems and open space must satisfy the policies and needs of all parties. Providing incentives, securing additional funding sources and creating partnership agreements are just some of the ways this can be achieved.

ACTION	COLLABORATING PARTIES
Work with appropriate agencies to establish regional conservation guidelines within city limits and the ETZ area.	CLC all appropriate departments, Doña Ana County (including Flood Commission), SLO, BLM, NMSU, etc.
Identify and map existing and potential open space linkages and zone as OS-NC.	CLC all appropriate departments

Amend appropriate codes to allow transfer of development rights.	CLC all appropriate departments
Intensify Neighborhood Watch, Adopt-A-Spot, and other anti-dumping programs in areas where illegal activity is frequent.	CLC Police (Codes Enforcement)
Advertise local transfer stations and county collection centers to promote proper disposal of waste and reduce trash dumping in arroyos and other open spaces.	CLC all appropriate departments, Doña Ana County
Using the arroyo characterization model, develop criteria to define a linear park and identify arroyo systems suitable for such parks.	CLC all appropriate departments

GOAL 7: Working from the MPO Trail Plan, create a plan for a continuous system of regional trails that integrates and connects arroyo systems.

GOAL 8: Create design guidelines for trails and trail crossings to ensure that the trails suit the characteristics of the arroyo, provide maximum usefulness and address pedestrian, cyclist and equestrian safety.

Actions for Policies 7.1 – 8.5:

Connecting isolated pockets of open space to each other and to existing parks, trails and schools will expand the potential of arroyos systems as a public asset. While some arroyo systems may be perfectly suited for a multi-use trail, others may not due to lack of soil stability or sufficient buffer distances. Trails and trail crossings must be designed according to the type of trail desired and the characteristics of individual arroyos.

ACTION	COLLABORATING PARTIES
Amend Design Standards to reflect policies 7.1 through 8.7. regarding landscaping, trails, trail crossings and trail heads that will meet the needs of bicyclists and equestrians as well as pedestrians.	CLC Community Development, Public Works (Facilities), and Parks
Identify appropriate locations for multi-use trails (accessible) and include them in next updates of the Parks & Recreation Master Plan and MPO Transport 2040.	MVMPO, CLC Community Development, Parks, Public Works (Facilities), GIS

UTILITIES AND STORMWATER MANAGEMENT

GOAL 9: Create safe and effective engineering standards for flood control and conveyance while maintaining the natural character of the arroyo and achieving visual harmony.

Actions for Policies 9.1 – 9.5:

These actions are intended to minimize the visual impacts of stormwater management structures adjacent to and in the arroyos and protect the natural landscape as much as possible. While it may first appear difficult or expensive to carry out these methods, most of them are techniques that are already used extensively and will only require small changes.

ACTION	COLLABORATING PARTIES
Participate in the creation of a regional stormwater utility – an organization complete with its own revenue source that collects, treats and disposes of stormwater. (Legislation to enable the establishment of the Las Cruces Metropolitan Flood Control Authority (LCMAFCA) was passed in XXXX but the Authority was never formed.)	City of Las Cruces and all entities involved in stormwater management and flood control in the plan area.
Consistently follow and enforce Storm Water Management Ordinance requirements.	CLC all appropriate departments
Amend Chapter 32 Design Standards and other relevant codes to reflect policies above.	CLC all appropriate departments
Improve review and inspection of all construction projects, including CLC-initiated projects, for compliance with the MS4 Permit, specifically PART 5 Storm Water Management Program (SWMP).	CLC all appropriate departments

GOAL 10: Minimize soil and slope instability, erosion, sedimentation and water run-off to protect water quality and the natural characteristics of the land.

Actions for Policies 10.1 – 10.8:

ACTION	COLLABORATING PARTIES
Amend development standards in Chapter 32 to create maximums for the amounts and types of cut and fill activity allowed adjacent to and surrounding identified arroyos systems and drainage facilities.	City of Las Cruces all appropriate departments
Amend Design Standards to adhere more closely to National Menu of Best Management Practices (BMPs) to further reduce pollution from stormwater. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm	City of Las Cruces all appropriate departments

GOAL 11: Improve the safety and efficiency of utilities installation to better protect the natural environment.

Actions for Policies 11.1 – 11.5:

ACTION	COLLABORATING PARTIES
Create improved methods for constructing utilities, taking into account proper scour analysis, loss of service risk, and minimizing aesthetic impacts to the arroyos.	City of Las Cruces all appropriate departments
Require revegetation of areas where native vegetation is disturbed, as per NPDES General Construction Permit Section 9.4.	City of Las Cruces all appropriate departments
Develop handbook of appropriate modifications to arroyos for situations in which minimally containing the arroyo would be the most appropriate option. For example, illustrations of acceptable structures, materials, etc.	City of Las Cruces all appropriate departments
Engage the Soil and Water Conservation District to offer programs to encourage planting native vegetation and trees. Outreach to developers and homeowners would demonstrate the potential for soil erosion in the region and the importance of establishing vegetation and other measures to control soil erosion.	CLC Community Development, Public Works (Facilities), Utilities and Parks
Develop an erosion and sedimentation design guide for use by the City, developers and property owners.	CLC Public Works
Require minimum LID techniques in all development proposals and provide incentives for those proposals that exceed minimums.	CLC Public Works, Parks, Community Development

CHAPTER 7. CONCLUSIONS

Since 1956, City of Las Cruces planning documents have called for an approach to development and stormwater management that preserves arroyos in their natural state. In recent years, Comprehensive Plan 2040, the Storm Water Management Plan, Transport 2040, the Parks and Recreation Master Plan, and other related plans adopted by the City have included policies to guide both public and private efforts. The Comprehensive Plan 2040 Future Concept Map specifically calls for "conservation areas" consisting of areas of historical, cultural, environmental value or open areas that could become community assets and are worth conserving, such as arroyos.

As development has increased, arroyos have been rerouted, channelized, or dammed to prevent or mitigate flood damage. In some cases, these actions were the only alternatives to protect downstream property. But in general, this has interrupted natural drainage function, wildlife connectivity and the propagation of vegetation, and have, in several instances, modified historic drainage in negative ways.

Specifically in arroyo environments, development designs can be implemented to maintain the natural character of the arroyo. It is also important to maintain arroyos to ensure historical drainage patterns adhere to water quality regulations administered by the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permit program. In addition, arroyos can provide a variety of recreational opportunities.

Geographically, the AMP includes major arroyos on the East and West Mesas, undeveloped floodways, unnamed 100-year flood zones, including areas in the Extraterritorial Zone (ETZ), and largely native areas on the West Mesa escarpment, as called for in the 1992 Storm Water Management Policy Plan. Within this planning area, arroyos and the lands adjacent to them are owned by many parties, mainly the New Mexico State Land Office, U.S. Bureau of Reclamation, City of Las Cruces and numerous private owners. While some of the policies in the plan may guide maintenance efforts in already-developed areas, the plan is primarily intended as guiding policy for public and privately-owned lands that are undeveloped.

The AMP suggests utilizing "buffers" in certain instances where additional flood protection may be called for. The plan defines a buffer as an area adjacent to an arroyo where development may not occur or may be reduced in intensity. It would be measured laterally from the boundary of the 100-year flood zone. Over the arroyo's length, the buffer may vary, depending on the hydrology, natural vegetation, wildlife corridors, the slope of the sides of the arroyo, soil type, etc. Buffer distances could be determined using similar computer modeling software that is used to determine flood zone boundaries. Additional data could be integrated into the modeling, such as the presence of wildlife, pockets of vegetation outside the 100-year flood zone and other geographical or built features that may inform appropriate buffer locations and distances.

Identified buffer acreage could be dedicated to the City or withdrawn by the New Mexico State Land Office or U.S. Bureau of Land Management prior to selling acreage for development. If privately held, a buffer could take the form of a linear park, trail, or conservation easement, all of which could be offset by various incentives such as higher density farther away from the arroyo, federal tax break, or park credits

Although one may not think immediately of economic development when considering arroyo management, key research results found by a Robert Wood Johnson Foundation survey conclude that open space has a positive effect on residential property values and that environmental protection and the mental health benefits afforded by open space protection should be considered indirect positive effects. In addition, it is often more cost-effective for a community to maintain open space, which can control flooding, filter water runoff, or help to mitigate air pollution, than to invest tax dollars in expensive infrastructure projects to achieve the same function. For developers, these economic benefits can translate into reduced financial liability, faster sales and ultimately higher profits.

Planning for the possibility of more intense rain storms in the future, protecting vegetation and wildlife habitat, maintaining the flood control dams, and carrying out improved installation and maintenance of utility infrastructure are just some of the considerations that must be kept in mind when planning for future growth in our community. Requiring buffers in specific areas for added erosion protection, proactively zoning land as Open Space-Recreation (OS-R) and Open Space-Natural/Conservation (OS-NC), tightening compliance with stormwater management regulations, opting to go beyond the minimum requirements, and committing to Best Management Practices are a few changes that will further protect the health, safety and welfare of the general public. This integrated approach to development and open space preservation will prevent further damage to our open lands and improve the overall health of our environment.

RESOURCES

EPA Stormwater Home Page -- This website contains technical and regulatory information about the NPDES stormwater program. It is organized according to the three types of regulated stormwater discharges – municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. It also provides links to general stormwater topics and tools available, including Best Management Practices (BMP).
http://water.epa.gov/polwaste/npdes/stormwater/index.cfm

Using Smart Growth Techniques as Stormwater Best Management Practices
http://www.epa.gov/smartgrowth/pdf/sg_stormwater_BMP.pdf

Protecting Water Resources with Higher-Density Development – This report is intended for water quality professionals, communities, local governments, and state and regional planners who are grappling with protecting or enhancing their water resources while accommodating growing populations.
http://www.epa.gov/smartgrowth/pdf/protect_water_higher_density.pdf

Center for Watershed Protection -- The Center for Watershed Protection, Inc. is a 501(c)(3) non-profit organization dedicated to fostering responsible land and water management through applied research, direct assistance to communities, award-winning training, and access to a network of experienced professionals.
http://www.cwp.org/

The **Stormwater Manager's Resource Center** is designed specifically for stormwater practitioners, local government officials and others that need technical assistance on stormwater management issues. Created and maintained by the Center for Watershed Protection, the SMRC has everything you need to know about stormwater in a single site:
http://www.stormwatercenter.net/

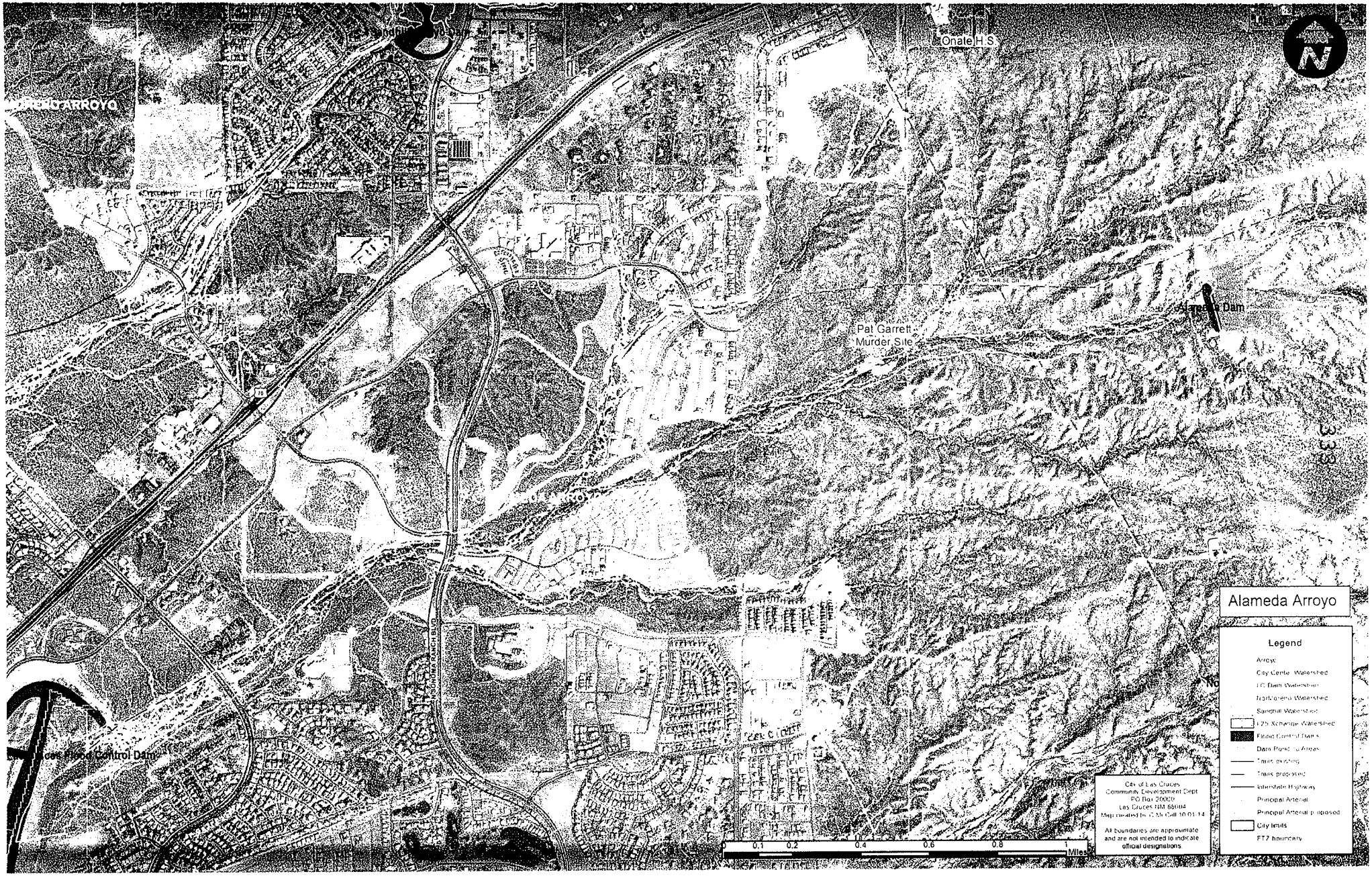
Low Impact Development -- LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible.
http://water.epa.gov/polwaste/green/

Low Impact Development (LID) Urban Design Tools Website -- This site provides watershed managers with a new set of tools and techniques that can be used to meet regulatory and receiving water protection program goals for urban retrofits, re-development projects, and new development sites.
http://www.lid-stormwater.net/index.html

Green Infrastructure – GI generally refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate (the return of water to the atmosphere either through evaporation or by plants), or reuse stormwater or runoff on the site where it is generated.
http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm

Municipal Separate Storm Sewer System (MS4) Main Page -- Stormwater runoff is commonly transported through a Municipal Separate Storm Sewer System (MS4), from which it is often discharged untreated into local water bodies such as the Rio Grande. To prevent harmful pollutants from being washed or dumped into an MS4, operators (in our case, the City of Las Cruces) must obtain a NPDES permit and develop a stormwater management program.
http://water.epa.gov/polwaste/npdes/stormwater/Municipal-Separate-Storm-Sewer-System-MS4-Main-Page.cfm

APPENDIX 1 ARROYOS within EXTRA-TERRITORIAL ZONE



Onate H.S.
Pat Garrett
Murder Site
Alameda Dam
Alameda Arroyo
Legend
Arroyo
City Center Watershed
I-C Dam Watershed
NorMoreno Watershed
Sandhill Watershed
I-25 Xchange Watershed
Flood Control Dams
Dam Pond Up Areas
Trails existing
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
City limits
FTZ boundary
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
Map created by C Mc Call 10-01-14
All boundaries are approximate and are not intended to indicate official designations.
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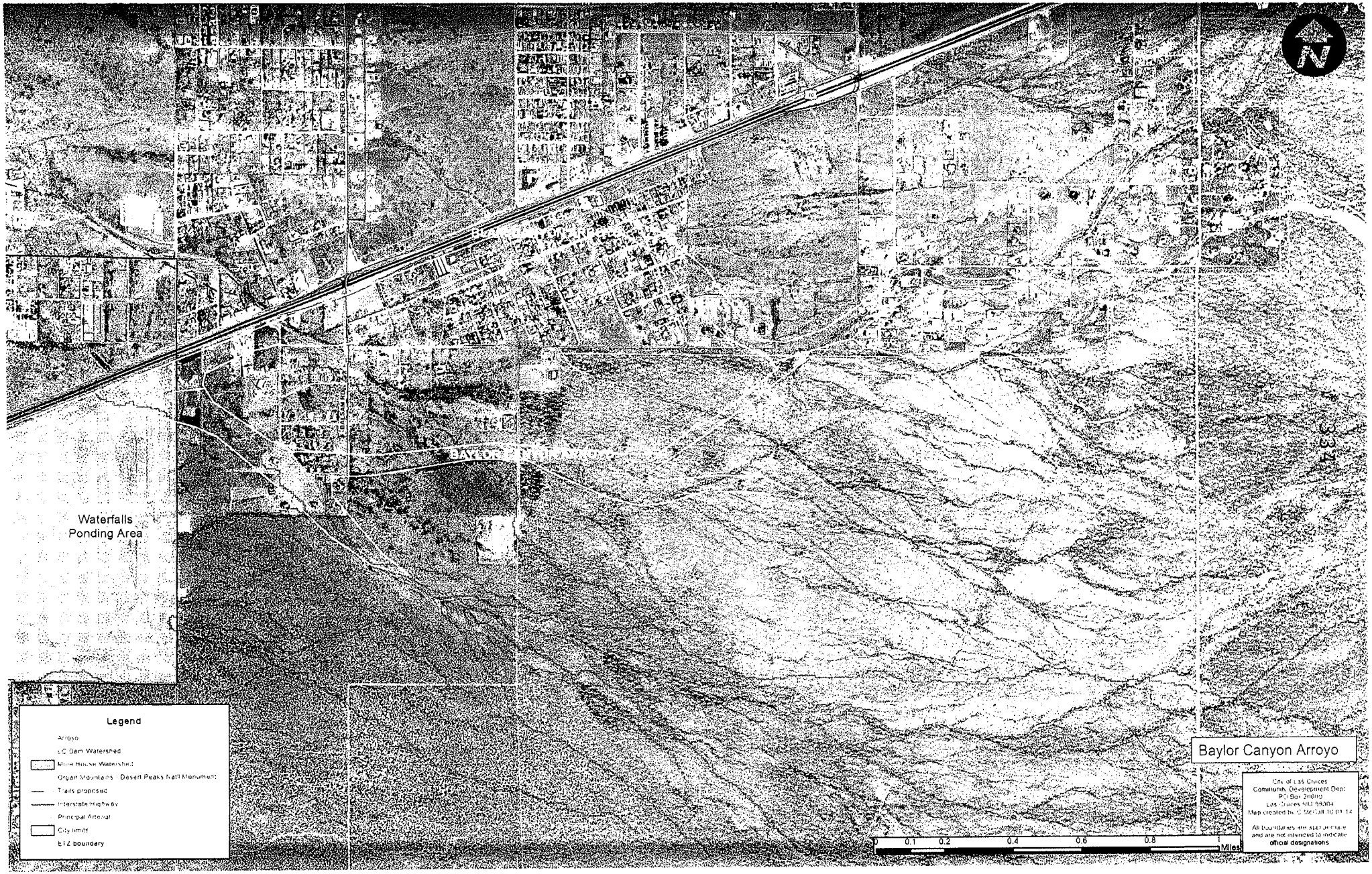
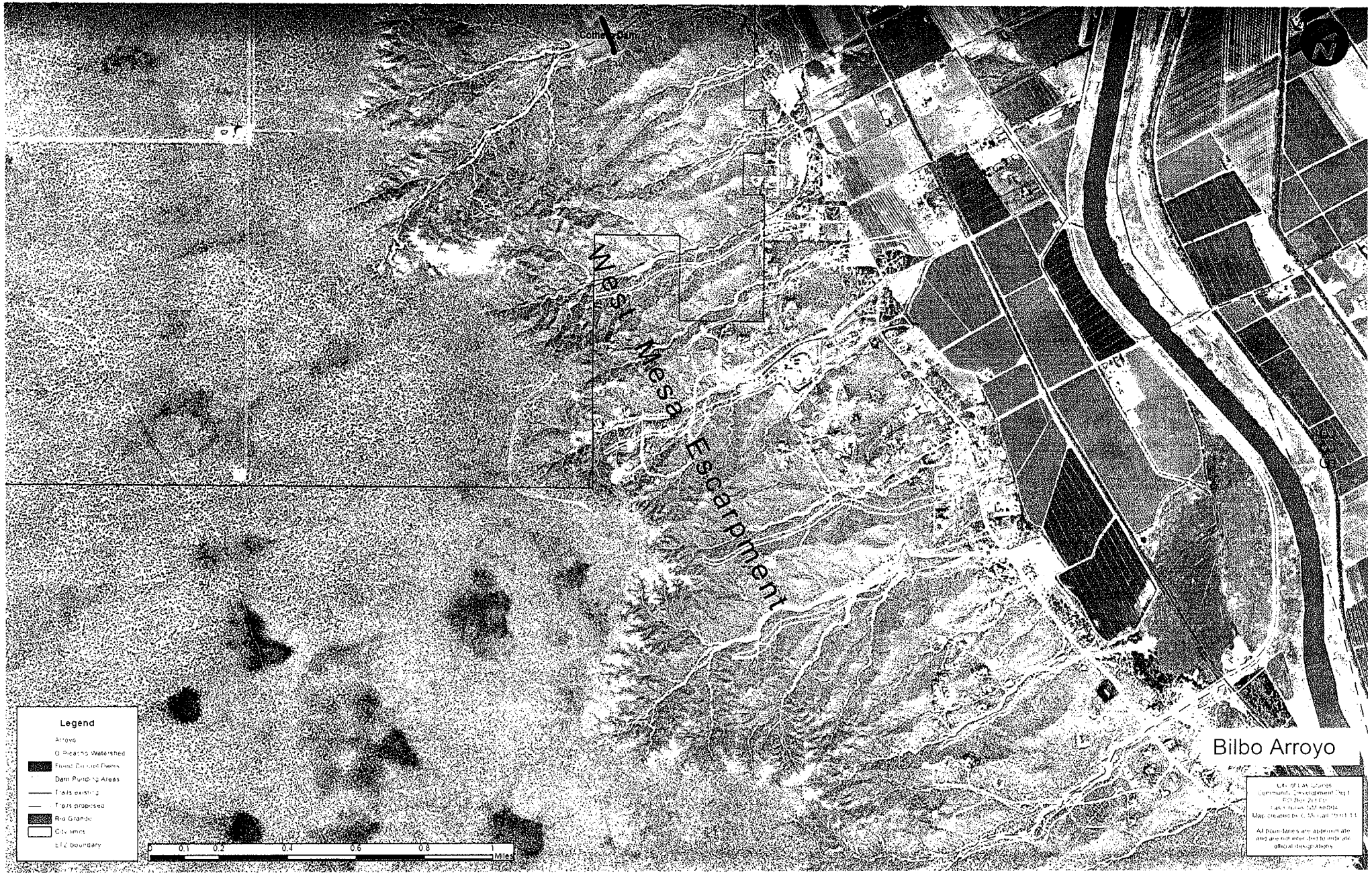
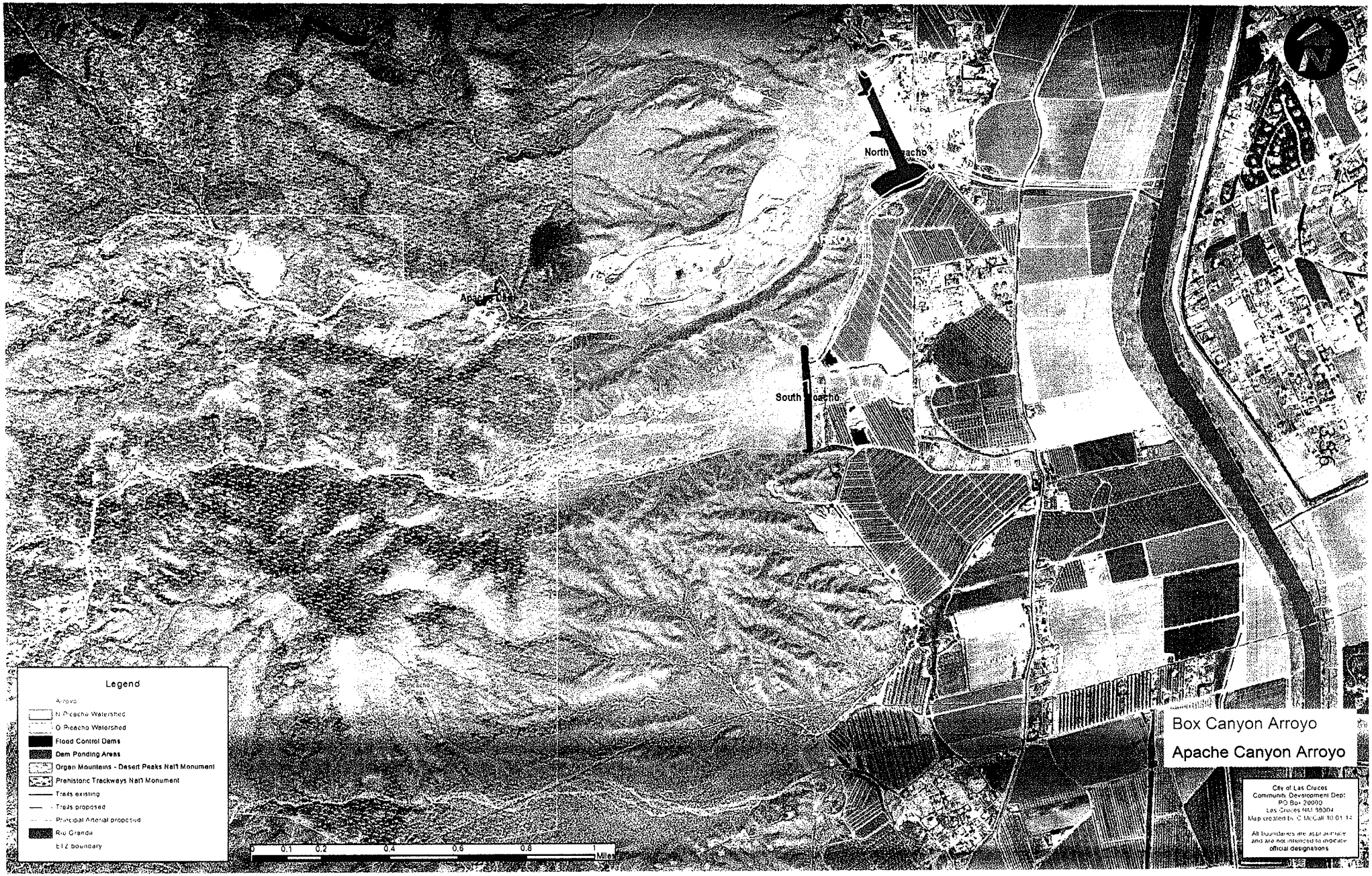
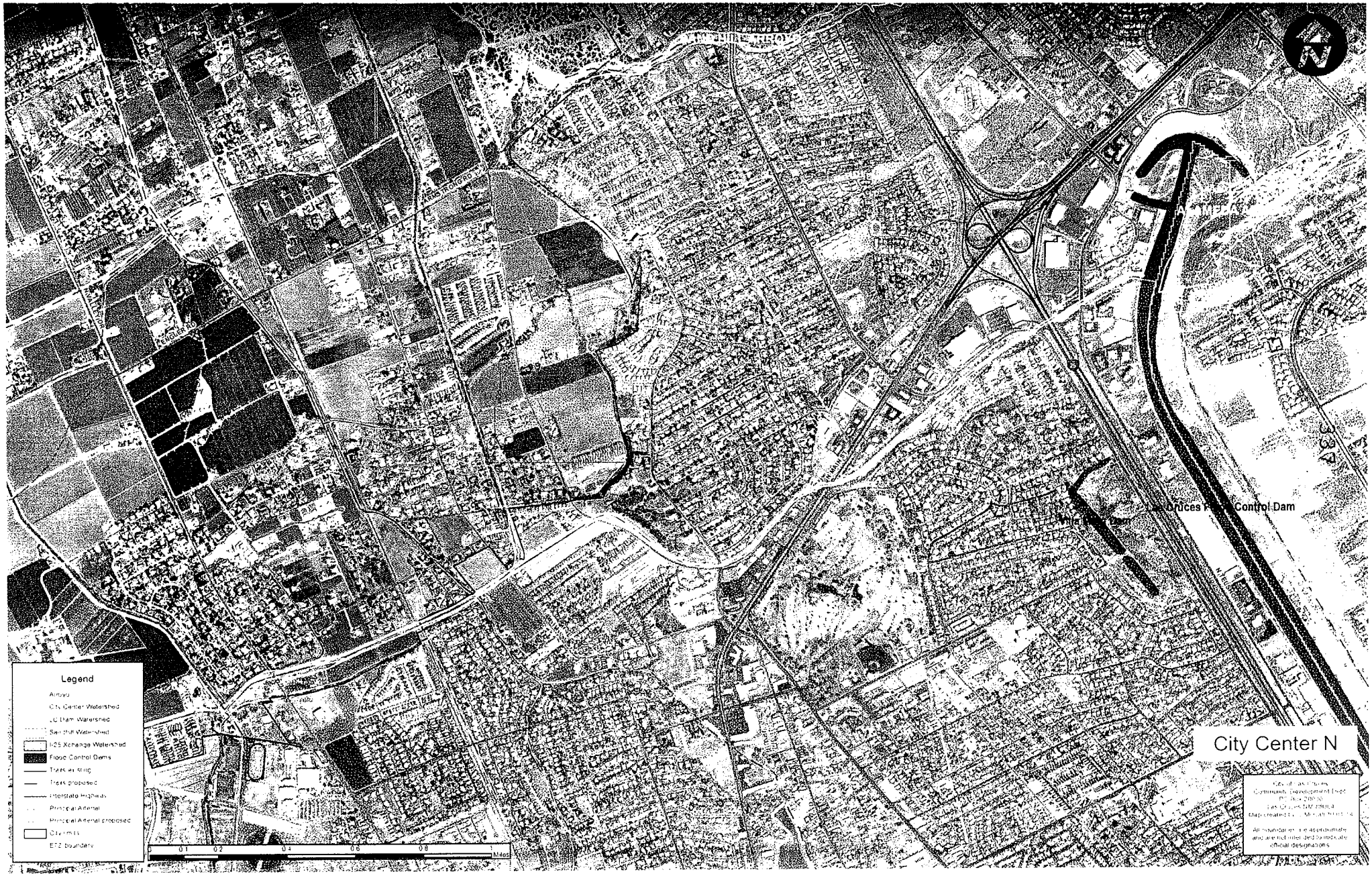

Waterfalls
Ponding Area
Legend
Arroyo
LC Dam Watershed
Mesa House Watershed
Organ Mountains - Desert Peaks Natl Monument
Trails proposed
Interstate Highway
Principal Arterial
City limits
ETZ boundary
0 0.1 0.2 0.4 0.6 0.8 1 Miles
Baylor Canyon Arroyo
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
Map created by C McCall 10.01.14
All boundaries are approximate and are not intended to indicate official designations



Cotton Dam
West Mesa Escarpment
Bilbo Arroyo
Legend
Arroyo
O Picacho Watershed
Flood Control Dams
Dam Ponding Areas
Trails existing
Trails proposed
Rio Grande
City limits
ETZ boundary
0 0.1 0.2 0.4 0.6 0.8 1 Miles
City of Las Cruces
Community Development Dept
All boundaries are approximate and are not intended to indicate official designations


North Picacho
South Picacho
Apache Canyon
Legend
Arroyo
N Picacho Watershed
O Picacho Watershed
Flood Control Dams
Dam Ponding Areas
Organ Mountains - Desert Peaks Nat'l Monument
Prehistoric Trackways Nat'l Monument
Trails existing
Trails proposed
Principal Arterial proposed
Rio Grande
ETZ boundary
0 0.1 0.2 0.4 0.6 0.8 1 Miles
Box Canyon Arroyo
Apache Canyon Arroyo
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
Map created by C McCall 10.01.14
All boundaries are approximate and are not intended to indicate official designations


City Center N
Legend
Arroyo
City Center Watershed
LC Dam Watershed
Salt Fall Watershed
I-25 Xchange Watershed
Flood Control Dams
Trails existing
Trails proposed
Interstate Highways
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
0 0.1 0.2 0.4 0.6 0.8 1 Miles
Control Dam

Las Cruces Control Dam
Little Detention Dam
Tortugas Dam Site 1
S SONOMA RANCH BLVD
DRIPPING SPRINGS RD
Legend
Arroyo
City Center Watershed
LC Dam Watershed
Tortugas Watershed
Flood Control Dams
Dam Ponding Areas
Trails existing
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
0 0.1 0.2 0.4 0.6 0.8 1 Miles
City Center S
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
Map created by C McCall 10/01/14
All boundaries are approximate and are not intended to indicate official designations

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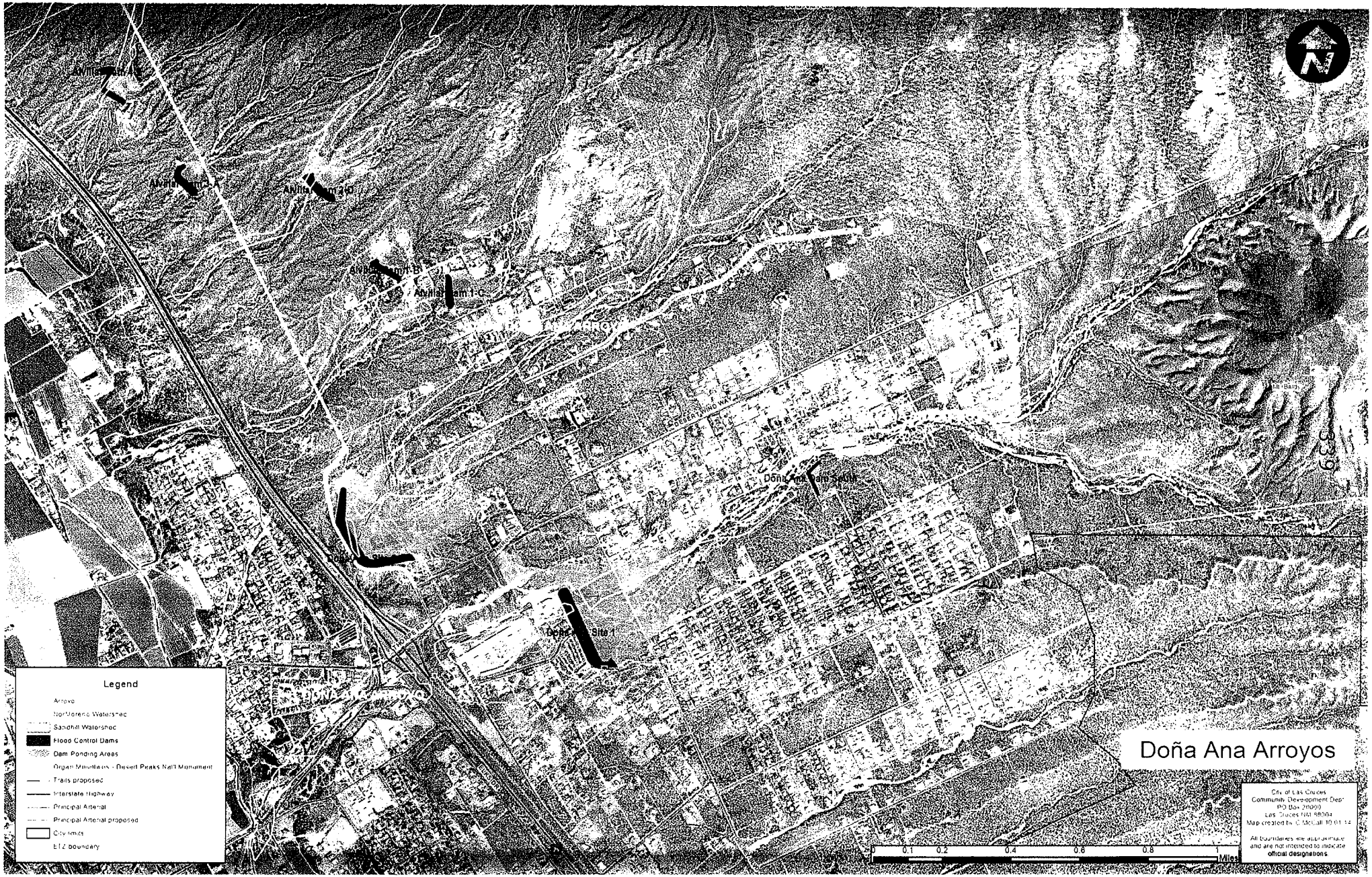
Doña Ana Arroyos
Legend
Arroyo
Northrone Watershed
Sandhill Watershed
Flood Control Dams
Dam Ponding Areas
Organ Mountains - Desert Peaks Natl Monument
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
Doña Ana Dam South
Site 1
0 0.1 0.2 0.4 0.6 0.8 1 Miles
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
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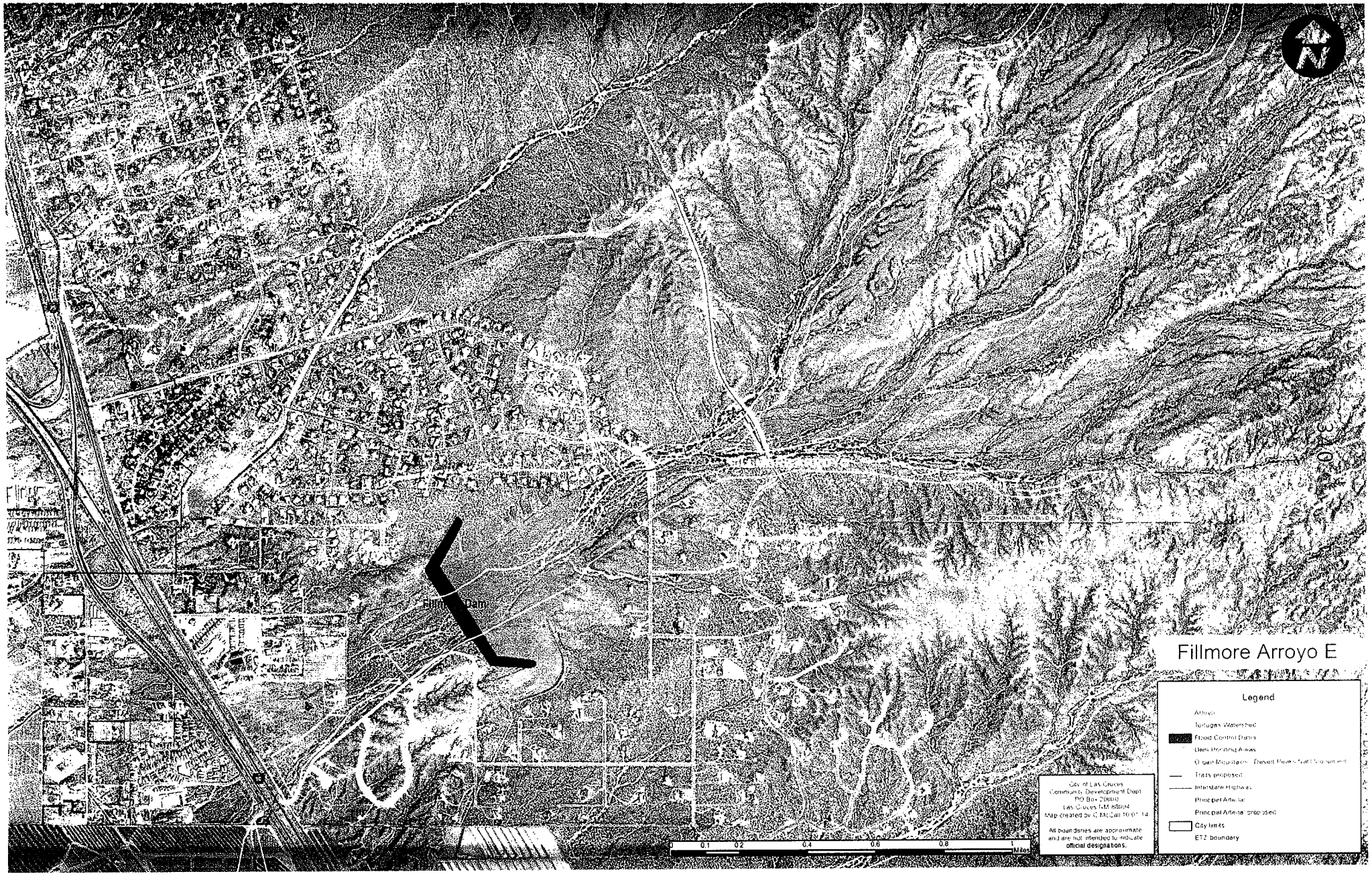
All boundaries are approximate and are not intended to indicate official designations.


Fillmore Arroyo E
Legend
Arroyo
Tortugas Watershed
Flood Control Dams
Dam Ponding Areas
Trails proposed
Interstate Highways
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
All boundaries are approximate and are not intended to indicate official designations.
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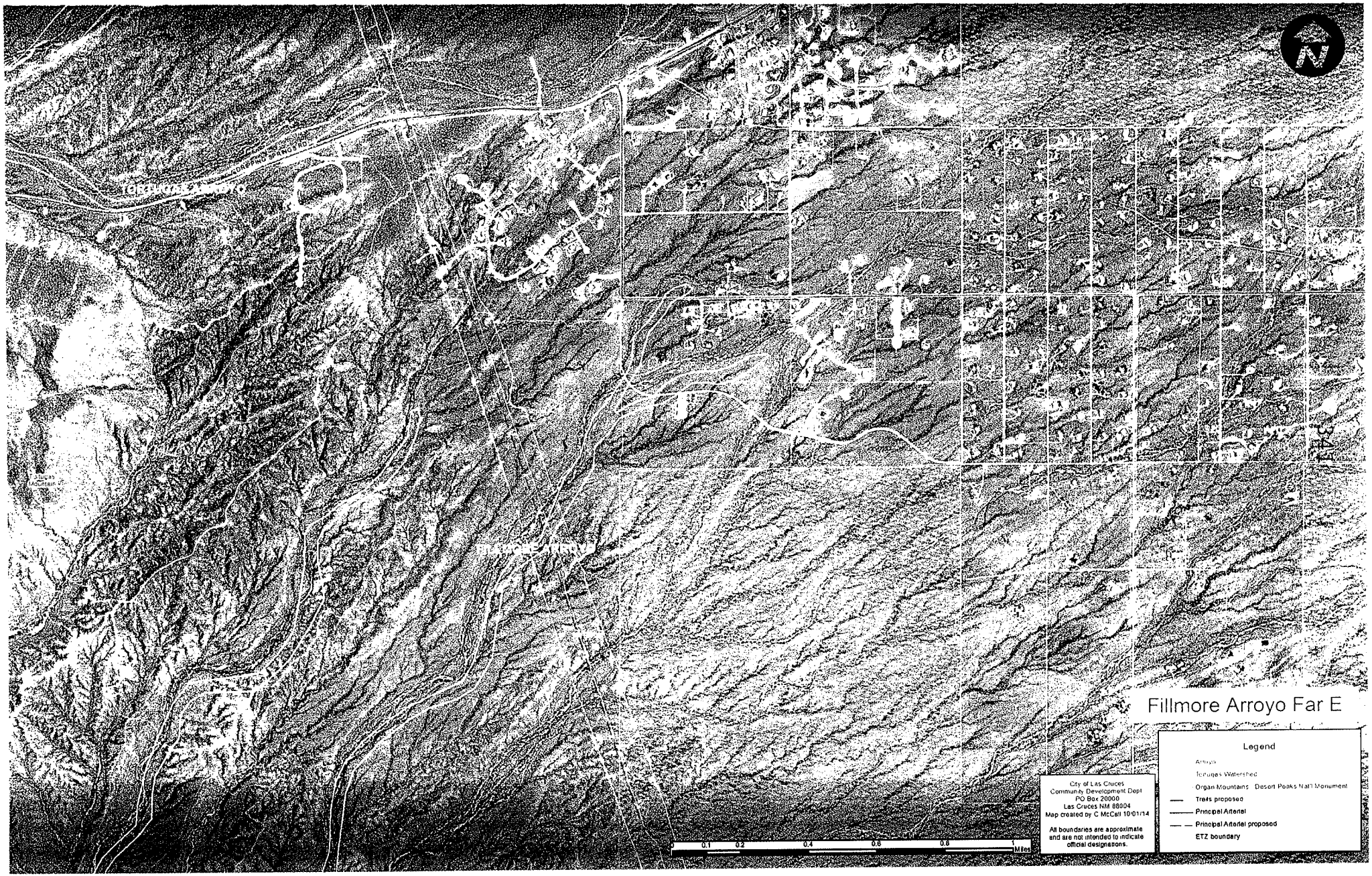
Fillmore Arroyo Far E
Legend
Arroyos
Tortugas Watershed
Organ Mountains Desert Peaks Nat'l Monument
Trails proposed
Principal Arterial
Principal Arterial proposed
ETZ boundary
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
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All boundaries are approximate and are not intended to indicate official designations.
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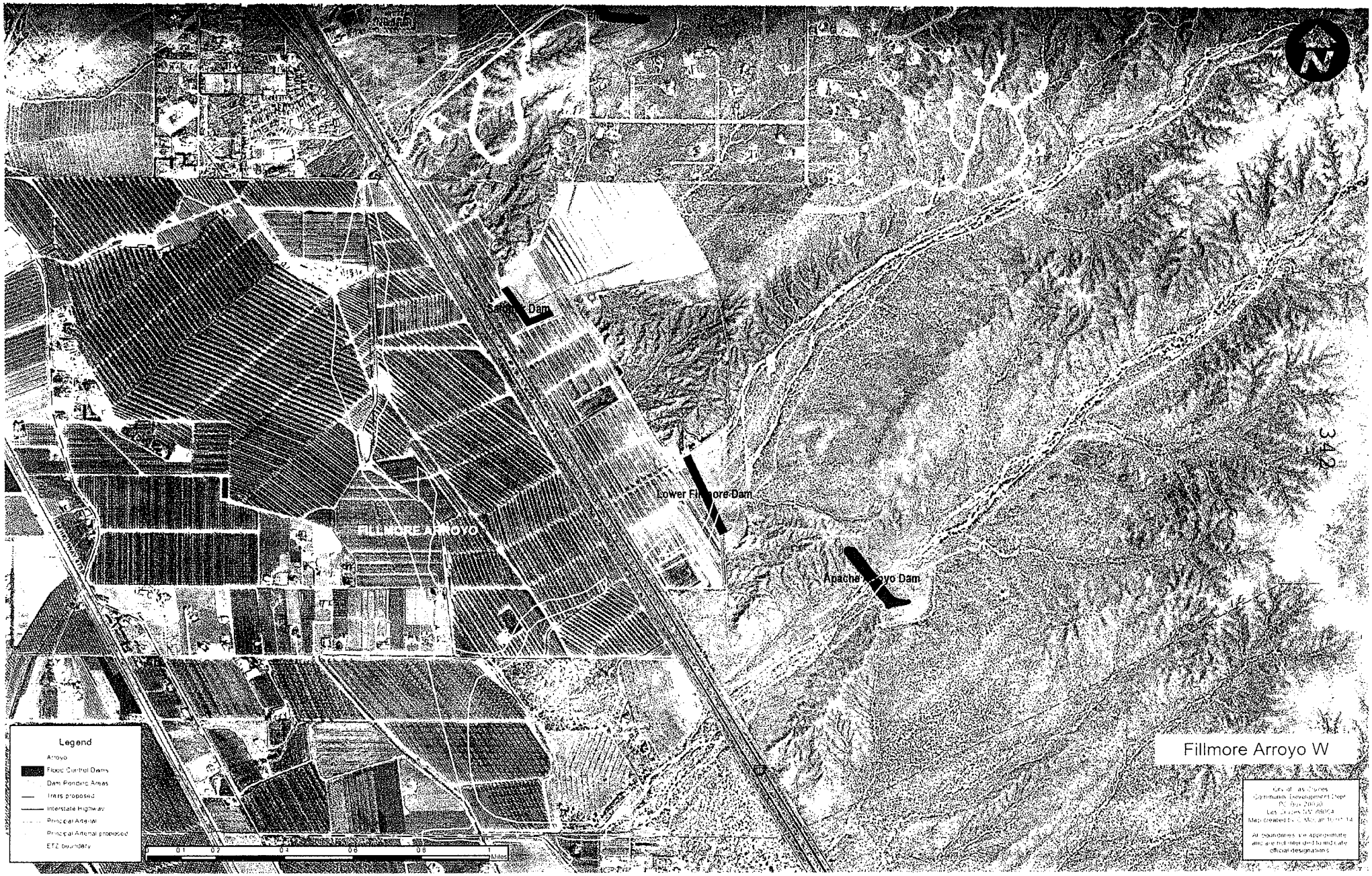
Lower Fillmore Dam
FILLMORE ARROYO
Apache Arroyo Dam
Legend
Arroyo
Flood Control Dams
Dam Ponding Areas
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
ETZ boundary
0.1 0.2 0.4 0.6 0.8 Miles
Fillmore Arroyo W

Las Cruces Arroyo
North Fork Dam
Redwood Dam
South Fork Dam
McClenton Dam
CLC Public Safety Complex (proposed)
Foothills Landfill
Little Detention Dam
Las Cruces Flood Control Dam
LOHMAN AVE
CRUCES ARROYO
Legend
Arroyo
City Center Watershed
LC Dam Watershed
Tortugas Watershed
Flood Control Dams
Dam Ponding Areas
Trails existing
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
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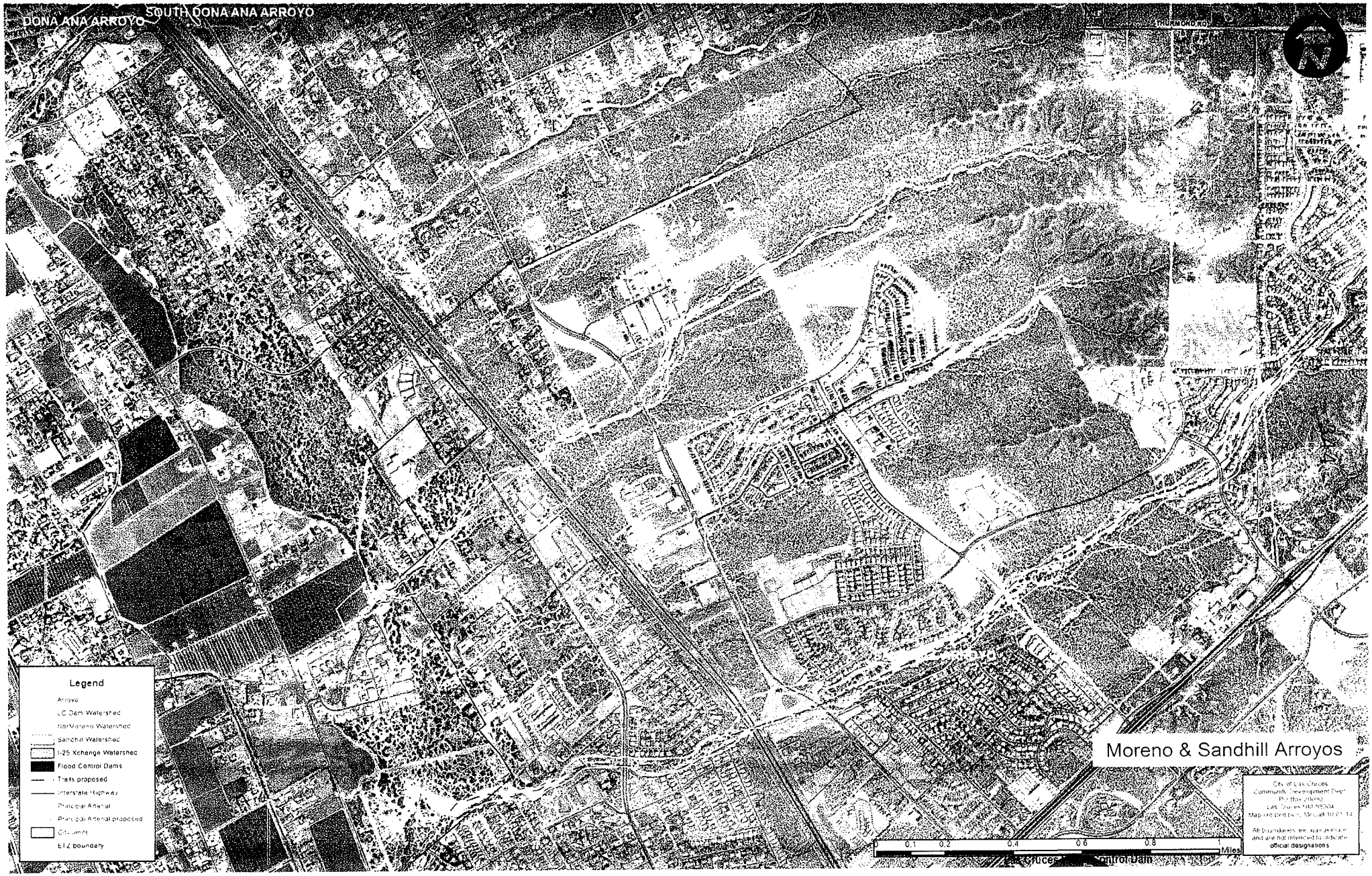
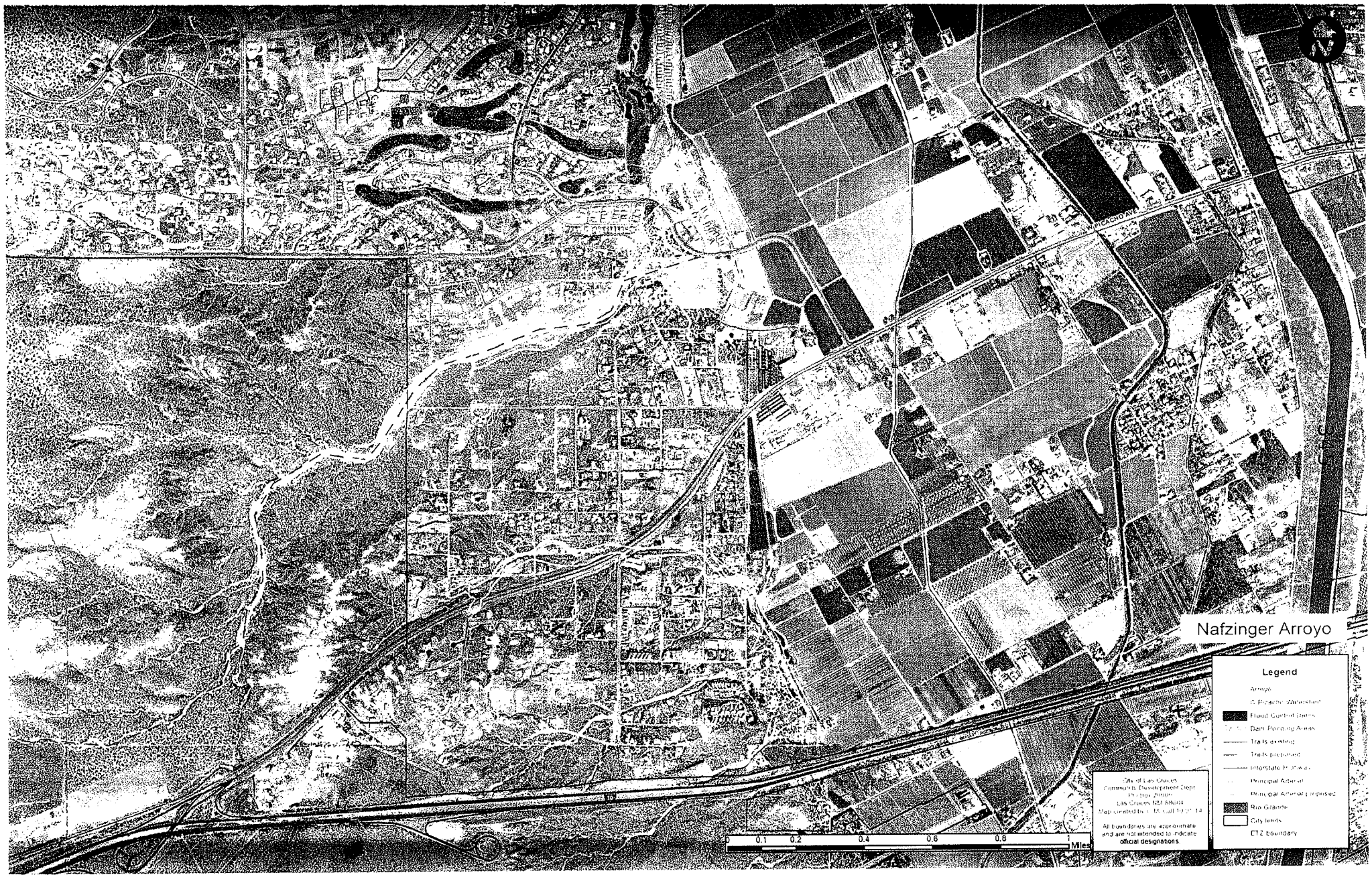
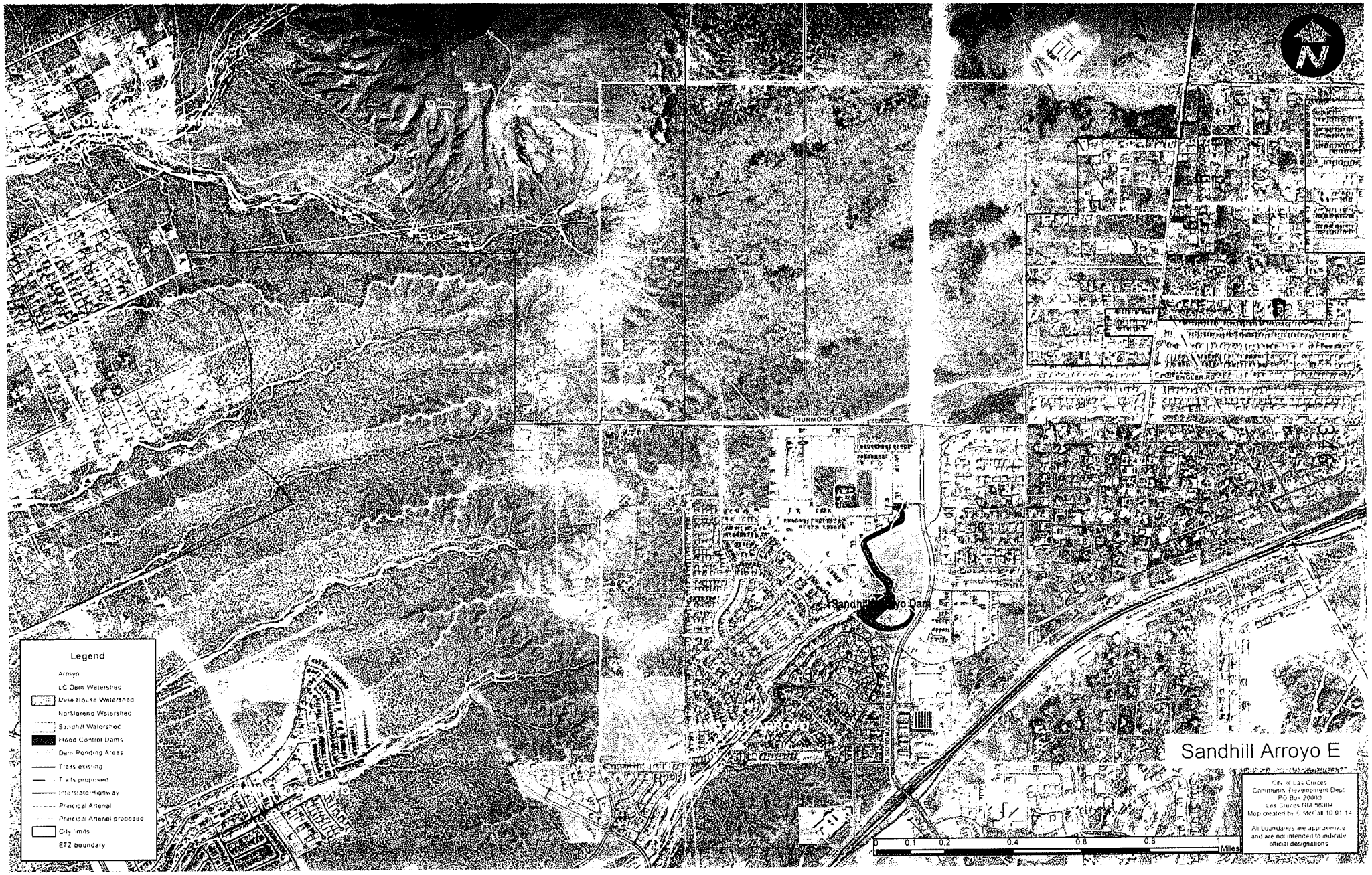
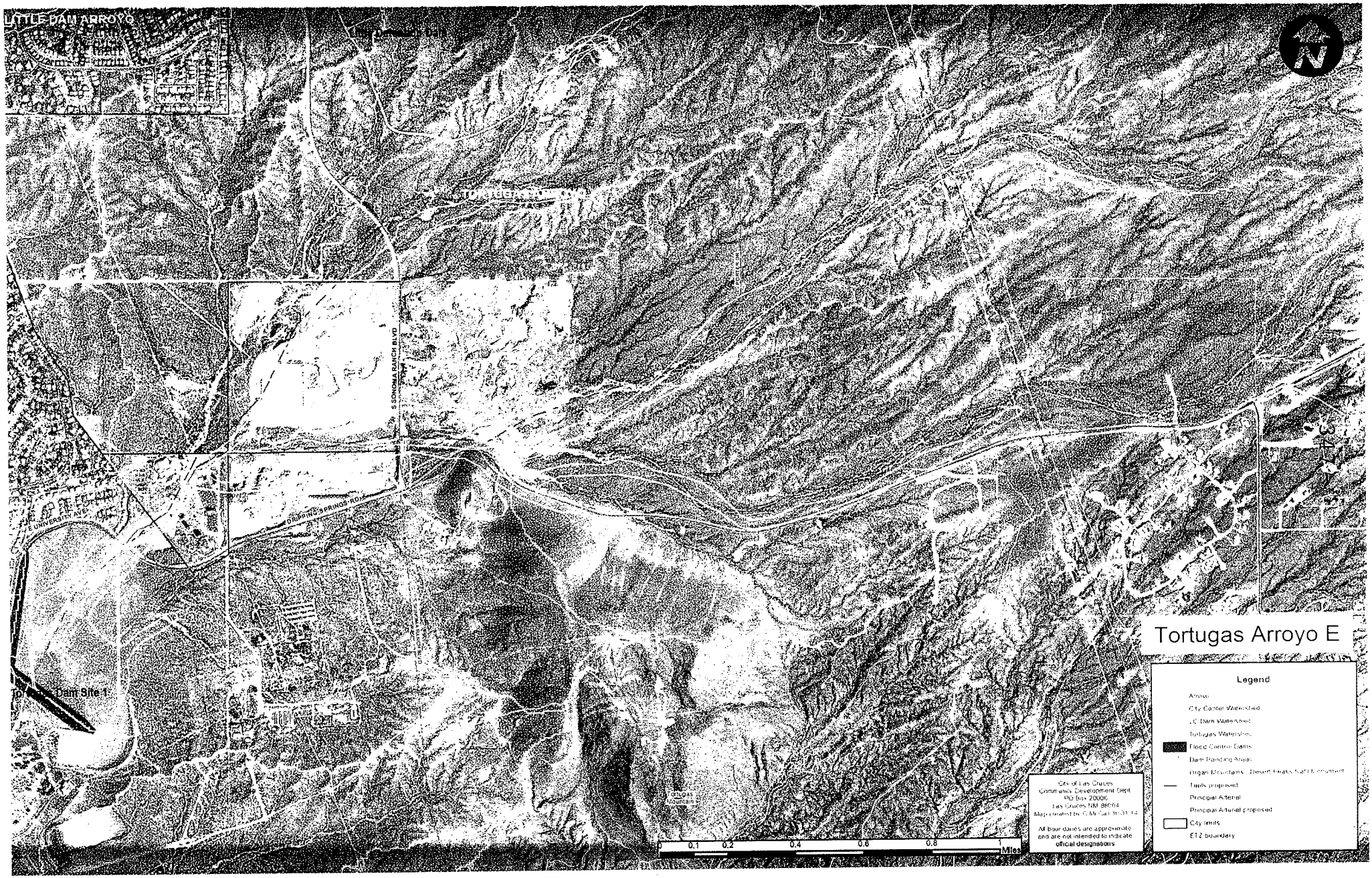
All boundaries are approximate and are not intended to indicate official designations.
0 0.1 0.2 0.4 0.6 0.8 1 Miles


DONA ANA ARROYO
SOUTH DONA ANA ARROYO
Legend
Arroyo
LC Dam Watershed
NorMoreno Watershed
Sandhill Watershed
I-25 Xchange Watershed
Flood Control Dams
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
City Limits
ETZ boundary
Moreno & Sandhill Arroyos
0 0.1 0.2 0.4 0.6 0.8 1 Miles
Las Cruces
Control Dam


Nafzinger Arroyo
Legend
Flood Control Dams
Dam Ponding Areas
Trails existing
Trails proposed
Principal Arterial
Principal Arterial proposed
Rio Grande
City lands
ETZ boundary
0.1
0.2
0.4
0.6
0.8
1
Miles
All boundaries are approximate and are not intended to indicate official designations.



Sandhill Arroyo E
Legend
Arroyo
LC Dam Watershed
Mine House Watershed
NorMoreno Watershed
Sandhill Watershed
Flood Control Dams
Dam Ponding Areas
Trails existing
Trails proposed
Interstate/Highway
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
THURMOND RD
ENGLER RD
N SONOMA RANCH BLVD
0 0.1 0.2 0.4 0.6 0.8 1 Miles
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
Map created by C McCall 10 01 14
All boundaries are approximate and are not intended to indicate official designations


LITTLE DAM ARROYO
TORTUGAS ARROYO
S SONOMA RANCH BLVD
DRIPPING SPRINGS RD
E UNIVERSITY AVE
Dam Site 1
Tortugas Mountain
Tortugas Arroyo E
Legend
Arroyo
City Center Watershed
LC Dam Watershed
Tortugas Watershed
Flood Control Dams
Dam Ponding Areas
Organ Mountains - Desert Peaks Natl Monument
Trails proposed
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
City of Las Cruces
Community Development Dept
PO Box 20000
Las Cruces NM 88004
All boundaries are approximate and are not intended to indicate official designations
0 0.1 0.2 0.4 0.6 0.8 1 Miles

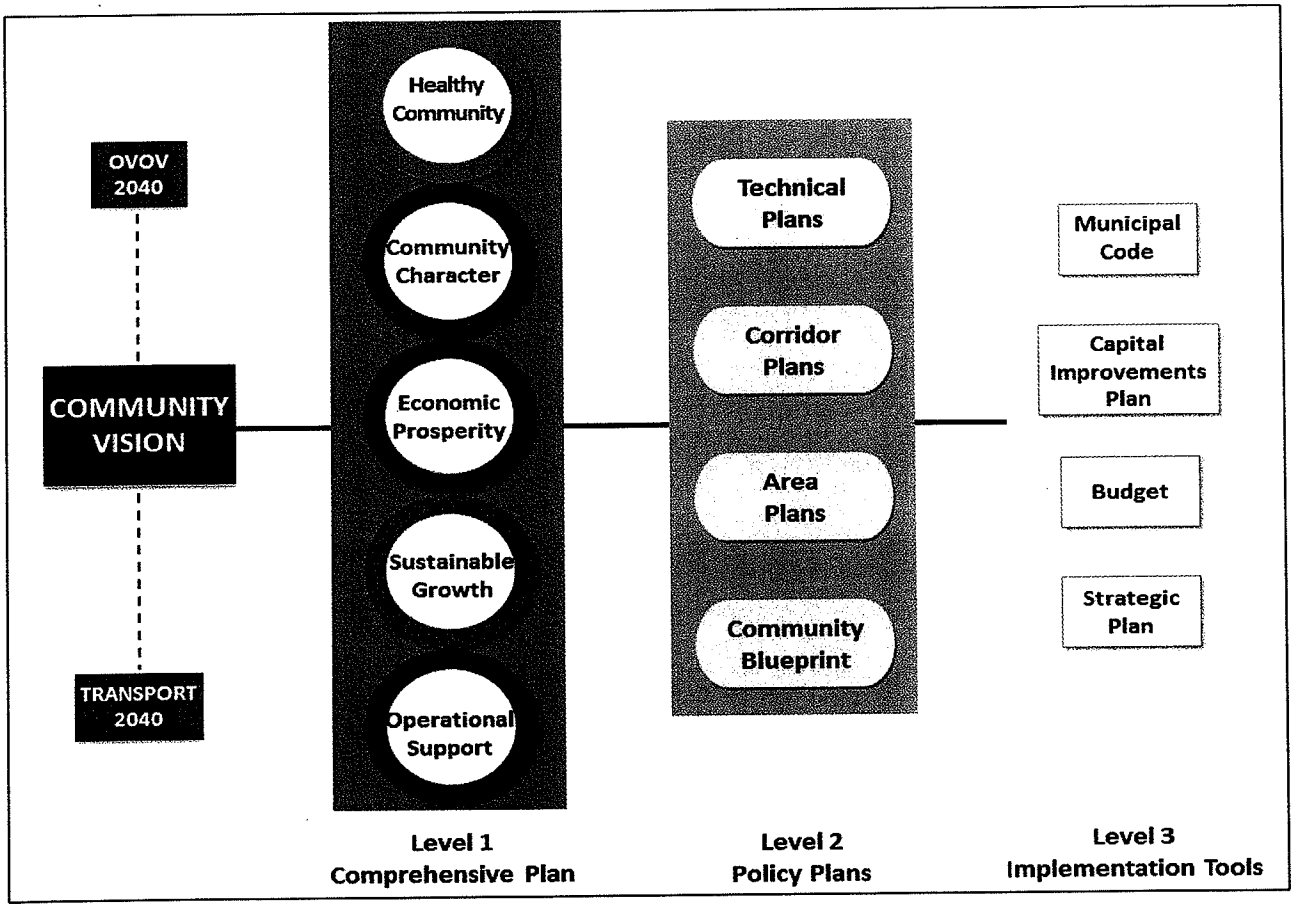
LAS CRUCES ARROYO
Tortugas Dam Site 1
Tortugas Dam Site 2
Legend
Arroyo
City Center Watershed
Tortugas Watershed
Flood Control Dams
Dam Ponding Areas
Trails existing
Trails proposed
Interstate Highway
Principal Arterial
Principal Arterial proposed
City limits
ETZ boundary
0 0.1 0.2 0.4 0.6 0.8 1 Miles
Tortugas Arroyo W
All boundaries are approximate and are not intended to indicate official designations

Legend
Arroyo
Flood Control Dams
Dam Ponding Areas
City limits
ETZ boundary
Organ Mountains - Desert Peaks Nat'l Monument
Prehistoric Trackways Nat'l Monument
Rio Grande
Surface Ownership
BLM
BOR
DOA
DOD
P
S
SP
0 0.5 1 2 3 4 5 Miles
Dona Ana Peak
Mt. Barry
Picacho Peak
Las Cruces Int'l Airport
Mesilla Valley Bosque State Park
Tortugas Mountain
Foothills Landfill
TORTUGAS ARROYO
BOX CANYON ARROYO
Surface Land Ownership
City of Las Cruces
Community Development Dept.
PO Box 20000
Las Cruces NM 88004
Map created by C.McCall 10/01/14
All boundaries are approximate and are not intended to indicate official designations.

APPENDIX TWO
SPECIFIC GOALS AND POLICIES FROM OTHER PLANNING DOCUMENTS

The diagram below illustrates how the City's Comprehensive Plan guides subsequent, more specific planning documents and the ordinances which implement them. The Arroyo Management Plan is considered a Level 2 technical plan.

Figure 1. Comprehensive planning framework[1]



Goals and policies that are relevant to arroyo and open space protection, trails, alternative modes of transportation, stormwater management and other issues discussed in the Arroyo Management Plan (AMP) are found in all levels the planning process. They are listed below and are described in general terms in Chapter 2 of the AMP.

[1] "OVOV 2040" refers to One Valley One Vision 2040 Regional Plan, adopted by the City of Las Cruces in 2012. "TRANSPORT 2040" is the title of the Mesilla Valley Metropolitan Planning Organization's transportation plan, adopted by the City of Las Cruces in 2010. Both may be found at www.las-cruces.org

RULES AND REGULATIONS GOVERNING THE SUBDIVISION OF LAND WITHIN THE CITY OF LAS CRUCES (1956)

4.5—STORM DRAINAGE

4.51 General Design. Adequate provision shall be made for drainage of storm water subject to approval of the City Engineer.

A. Protection of Capacity. The developer shall provide adequate measures for the protection of open drainage channels by establishing drainage easements sufficiently wide (generally 20 ft.) to enable the working of the channel by motorized equipment or alternatively, where authorized by the Planning Commission, a center block park of a minimum width of 50 feet. All easements shall prohibit the erection of structures, the dumping of fill, or the alteration or obstruction of the watercourses without the written permission of the appropriate City official. Property lines shall be so designed as to follow drainage easements, except that drainage easements may be allowed to cross lots larger than one acre.

B. Appearance. The developer should keep in mind that natural watercourses can be an attractive asset to his subdivision as well as to the community and, where possible, should improve and beautify the watercourses to this end.

FLOOD CONTROL (1965)
NMSA ARTICLE 41 SECTIONS 3-41-1 THROUGH 3-41-5

To review the entire statute, search online for: **2011 New Mexico Statutes Chapter 3: Municipalities Article 41: Flood Control, 3-41-1 through 3-41-5.** (http://law.justia.com/codes/new-mexico/2011/chapter3/article41/section3-41-2)

LAS CRUCES METROPOLITAN ARROYO FLOOD CONTROL (1968)
NMSA ARTICLE 17 SECTIONS 72-17-1 TO 72-17-103

To review the entire statute, search online for: **2006 New Mexico Statutes - Article 17 — Las Cruces Metropolitan Arroyo Flood Control, 72-17-1 through 72-17-103.** (http://law.justia.com/codes/new-mexico/2006/nmrc/jd_ch72art17-1974f.html)

CITY OF LAS CRUCES COMPREHENSIVE PLAN (1968)

PUBLIC UTILITIES

Storm Drainage

Even though Las Cruces is located in a semi-arid area with an average rainfall of only eight to nine inches a year, there is a very real flooding problem as evidenced by the floods of recent years. The system includes major drains and laterals developed for irrigation purposes and used to carry storm water, retention dams, collection basins, open ditches, storm drains and the major arroyos. The existing storm drainage facilities are not adequate.

Since there are so few storm drainage facilities, the major storm water flow must, of necessity, be a surface flow. This occasionally results in flooding of streets so that they become impassable, washing out of unpaved streets, and some property damage. The collection basins serve to hold water for a temporary period so that the limited existing facilities are able to remove the water more slowly. The small retention dams offer limited protection to those areas directly downstream from the arroyos leading to the dam. The open ditches and storm drains that are available offer some protection to the areas they serve, but even these facilities are generally inadequate or create problems where a ditch ends and the water must revert to surface flow.

The most serious problem facing the city is the large drainage area between Las Cruces and the Organ Mountains which can collect a terrific amount of water that ultimately enters the city in a few major arroyos. To somewhat oversimplify the problem, there is a need to slow down the flow of water entering the city and to speed up the flow of water leaving the city. Currently, facilities are not available to control the flow of water entering the city. The Park Drain and Las Cruces Lateral are the two most important facilities for ultimately removing storm water from the city.However, structures downstream from Las Cruces limit the capacity of these facilities so that they are not capable of removing storm water as fast as it enters the city.

Las Cruces, with the assistance of the Corps of Engineers, is in the process of taking initial steps necessary to build a major retention dam just east of Interstate Highway 25, between U.S. Highway 70 and Lohman Avenue. The outfall channel for this dam will generally follow the Country Club arroyo and parallel the Dona Ana Drain westward to the Rio Grande. There is a possibility that existing drains could be utilized as part of the outfall channel; however, this idea will require very careful analysis. In addition to the large retention dam, the Corps of Engineers proposed a smaller "campus dam" to be built in the area located in the northwest quadrant of the intersection of Interstate 25 and University Avenue. The provision of the Corps of Engineers assisted flood control facilities will solve the most serious flooding problems resulting from rainfall in the large drainage area east of town.

CAPITAL IMPROVEMENT PROGRAM

Storm Drainage

As indicated in a previous chapter of this report, the storm drainage in Las Cruces relies very heavily upon surface runoff. The need for an adequate storm sewer system is quite apparent. It is estimated that the total cost of the necessary storm sewer improvements would be approximately $3,000,000. With 50 percent matching federal funds, the cost to the city will be approximately $1,500,000. It is proposed that the basic elements of the system be constructed during the five-year improvement program, in view of other required improvements, and the remaining portion be added as possible. The estimated cost of the storm drainage system to be built during the five-year program is approximately $1,630,000, with the city's share at $815,000.

Flood Control

The city and Corps of Engineers have developed plans to build a major retention dam and outlet channel to protect a major portion of the city from flood water emanating from the large drainage area to the east of the city. The timing of the undertaking of this project is very critical. The expiration date of the Corps' assistance falls within the next two years. Although

the city has purchased most of the right-of-way necessary for the dam, there still remains a necessary expenditure on the city's part of approximately $527,000 for the outlet channel.

The provision of the storm drainage system improvements along with the retention dam and outlet channel will substantially reduce the problems Las Cruces has experienced in the past from excessive runoff of storm water.

CITY OF LAS CRUCES LAND SUBDIVISION REGULATIONS (1975)

SECTION III: Suitability of Land

A. GEOGRAPHIC SUITABILITY
1. With reference to the Comprehensive Plan and the Zoning Ordinance land shall be suited to the purpose for which it is to be subdivided.
2. Land which is not programmed to have adequate public or private water sanitary sewer service or flood control facilities within a reasonable time shall not be subdivided for purposes which require such services.
3. Possible environmental problems and the availability of adequate paved street access transit service fire protection police protection refuse service public schools parks and recreation facilities and individually provided utilities shall all be evaluated in considering the subdividing of land.
4. Land with the following types of problems may have subdivision approval withheld until it is demonstrated by means of an engineering analysis submitted by the developer that such hazards have been or will be eliminated.
   a. Special drainage conditions.
   b. Difficult topography.
   c. Soil conditions which are unusually limiting.
   d. Other geographic hazards to life health or property.

B. GRADING
1. No person shall proceed with any grading in relation to a proposed subdivision until the City has approved a drainage plan Such grading shall be consistent with the recommendation of an approved drainage plan as required by these regulations.
2. The subdivider shall give consideration to the preservation of trees, scenic points, historic places, and other community landmarks where feasible.
3. Subdivisions shall be laid put so as to match existing topography insofar as possible,
4. Grading shall be held to a minimum in subdivision preparation and shall be done only as needed for construction.

SECTION IV: Plats and Data for Preliminary Approval

B. STORM DRAINAGE ANALYSIS PLAN
1. A drainage report or plan shall be prepared by a Professional Engineer registered in New Mexico and submitted with the proposal.
2. The analysis plan shall include soil classification, silt and sediment erosion analysis, and infiltration and absorption tests.
3. Storm drainage computations for a 50-year frequency storm showing the estimated run-off

from the subdivision prior to and following completion of development shall be included in the plan.

4. The plan shall include a detailed scheme for controlling the increased run-off for a 50 year frequency storm such as catch basin or ponding area for controlled entry of water into natural drainage ways or storm sewers to insure that the increase does not overload the system or cause damage to property and areas at lower elevations.
5. The plan shall show that all property within the subdivision is developed in such a manner that flood damage will be minimized and that construction and substantial improvements are elevated to the 100-year flood level if the property lies in an area which has been designated a flood plain under the National Flood Insurance Program New water and sewer systems (including on-site systems) shall be located to avoid impairment or contamination during flooding.
6. Areas which will be inundated by run-off from a 50-year frequency storm shall not be divided into lots for sale in any proposed subdivision within the planning and platting jurisdiction of the City of Las Cruces.

SECTION VI: Design Standards

D. UTILITY IMPROVEMENTS

8. A storm drainage system adequate to serve the needs of the proposed new streets and the entire subdivision will be required in new sub divisions. Where an adequate public storm sewer main is available at the plat boundary the subdivider shall construct a storm drainage system and connect with such storm sewer main of adequate size. Drainage improvements shall maintain any natural water course insofar as practical and shall prevent the collection of water in any low spot unless it is to be specified as a ponding area in the drainage plan.

ORDINANCE 124 (1977)
AN ORDINANCE FOR THE PURPOSE OF FLOOD DAMAGE PREVENTION

ARTICLE I
SECTION C. STATEMENT OF PURPOSE
It is the purpose of this ordinance to promote the public health safety and general welfare and to minimize public harm and private losses in special flood hazard areas with provisions designed to:

1. Restrict or prohibit uses that are dangerous to health safety or property in times of flood or cause excessive increases in flood heights or velocities;
2. Require that uses vulnerable to floods including public facilities which serve such uses be protected against flood damage at the time of initial construction;
3. Control in the sense of providing authoritative guidance the alteration of natural flood plains their protective barriers and stream channels;
4. Prevent construction of barriers which will divert flood waters and subject other lands to greater flood hazards;
5. Control in the sense of authoritative guidance development which would cause greater erosion or potential flood damage such as grading dredging and excavation.

ORDINANCE 879
AN ORDINANCE FOR THE PURPOSE OF FLOOD DAMAGE PREVENTION (1987)

ARTICLE 1

SECTION C STATEMENT OF PURPOSE

It is the purpose of this ordinance to promote the public health safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

1. Protect human life and health
2. Minimize expenditure of public money for costly flood control projects
3. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public
4. Minimize prolonged business interruptions
5. Minimize damage to public facilities and utilities such as water and gas mains electric telephone and sewer lines streets and bridges located in floodplains
6. Help maintain a stable tax base by providing for the sound use and development of floodprone areas in such a manner as to minimize future flood blight areas and
7. Insure that potential buyers are notified that property is in a flood area

SECTION D METHODS OF REDUCING FLOOD LOSSES

In order to accomplish its purposes this ordinance uses the following methods:

1. Restrict or prohibit uses that are dangerous to health safety or property in times of flood or cause excessive increases in flood heights or velocities
2. Require that uses vulnerable to floods including facilities which serve such uses be protected against flood damage at the time of initial construction
3. Control the alteration of natural floodplains stream channels and natural protective barriers which are involved in the accommodation of flood waters
4. Control filling grading dredging and other development which may increase flood damage
5. Prevent or regulate the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.

ARTICLE 5 PROVISIONS FOR FLOOD HAZARD REDUCTION

SECTION A GENERAL STANDARDS

In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:

1. All new construction or substantial improvements shall be designed or modified and adequately anchored to prevent flotation collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads including the effects of buoyancy
2. All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage
3. All new construction or substantial improvements shall be constructed with materials resistant to flood damage
4. All new construction or substantial improvements shall be constructed with electrical heating ventilation plumbing and air conditioning equipment and other service facilities that are designed and located so as to prevent water from entering or accumulating within the components during conditions of flooding
5. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system
6. On site waste disposal systems shall be located to avoid impairment to them or contamination

from them during flooding

SECTION D STANDARDS FOR AREAS OF SHALLOW FLOODING AO/AH ZONES
Located within the areas of special flood hazard established in Article 3 Section B are areas designated as shallow flooding These areas have special flood hazards associated with base flood depths of 1 to 3 feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident Such flooding is characterized by ponding or sheet flow therefore the following provisions apply:

1. All new construction and substantial improvements of residential structures have the lowest floor including basement elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community FIRM at least two feet if no depth number is specified
2. All new construction and substantial improvements of nonresidential structures
   i. have the lowest floor including basement elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community FIRM at least two feet if no depth number is specified or
   ii. together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy
3. A registered professional engineer or architect shall submit a certification to the Floodplain Administrator that the standards of this Section as proposed in Article 4 Section C1a are satisfied

Require within Zones AH or AO adequate drainage paths around structures on slopes to guide flood waters around and away from proposed structures

STORM WATER MANAGEMENT POLICY PLAN (1992)

Objective A: Establish a storage management system throughout the city of Las Cruces that utilizes a regional detention storm water system for greater coordination between development and "developed" areas of the city.

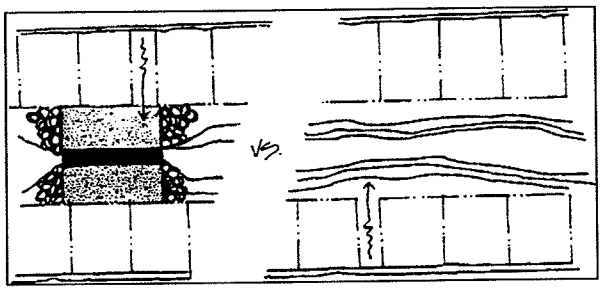
Policy 6: Developers and/or subdividers shall be required to design their storm drainage systems to ensure that historic flows are achieved after development of a project.

Objective B: Establish a conveyance storm water system that connects project-scaled detention facilities, arroyos, and regional detention/storm water systems together in a logical, economical and safe manner.

Policy 1: Unless specifically identified within this policy plan, the City encourages flexibility in design when channelizing storm water to enhance the environment and promote public safety.

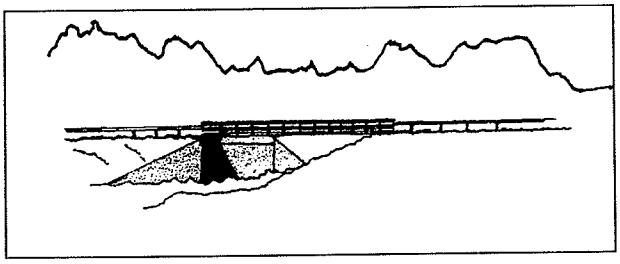
Policy 2: The City encourages asphalt-lined channels used for conveyance of storm water in cases where City utilities are placed beneath the surface the channel.

Policy 3: Channelization design of storm water shall be compatible with the adjacent channelized systems where possible.



Policy 4: "Natural" arroyos may be used for conveyance of water only when maintaining the existing velocity and rate of the arroyo and in designated areas as specified by this policy plan or the Las Cruces Major Arroyo Plan.

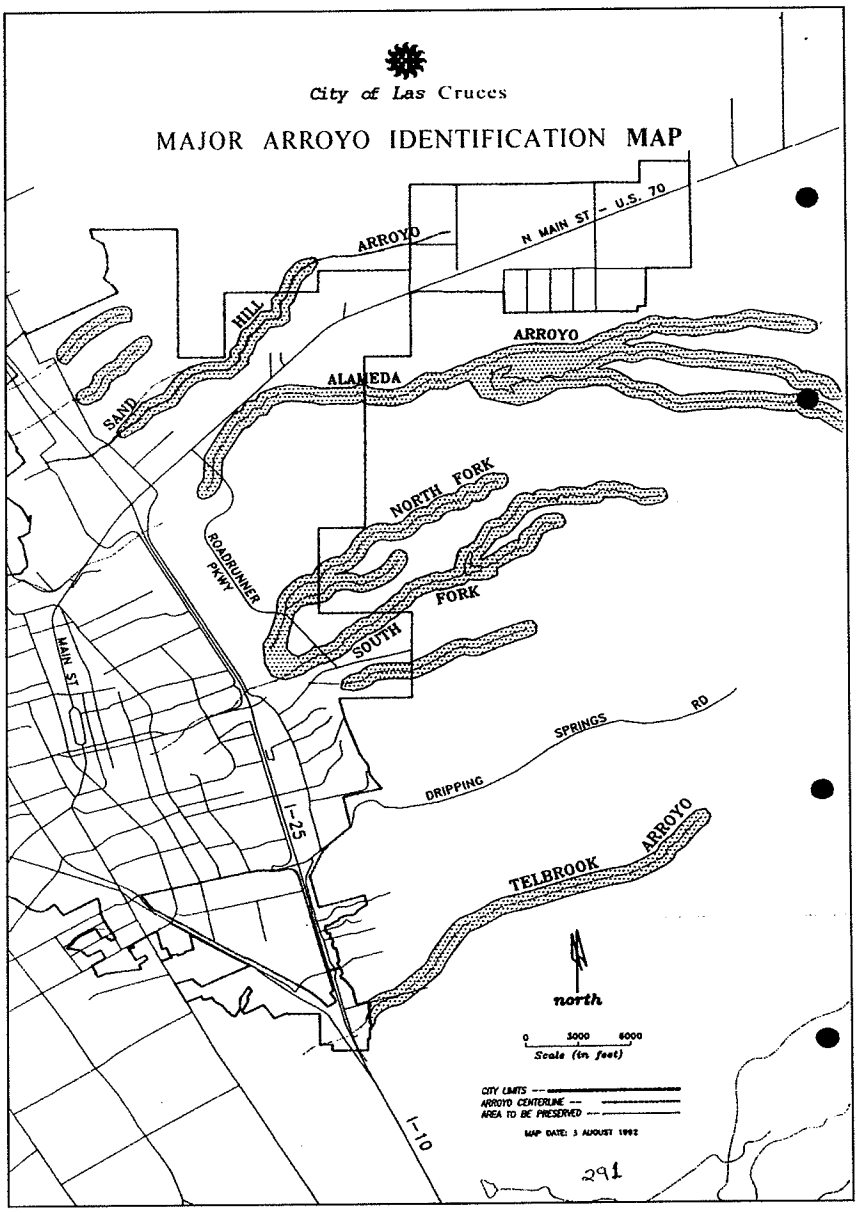
Policy 7: The City supports the use box culverts or concrete pipe culverts as the primary mechanism used to convey water beneath major and minor arterial roadways, major collector streets, and primary access to a subdivision.



GOAL: Develop an overall City water system that promotes aesthetics and multiple-use activities through the use of "natural" arroyos or linear park systems, preservation of open space, and visual enhancement.

OBJECTIVE A: Establish a major arroyo drainage system that encourages both recreation and open space uses.

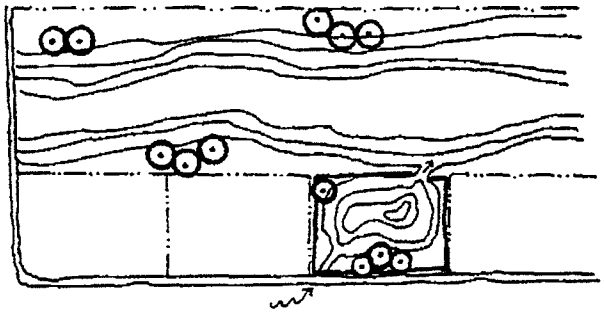
Policy 1: The City will encourage the preservation of open space corridors along major arroyos within the East Mesa. Such major arroyos shall include the Fillmore Arroyo, Telbrook Arroyo, segments of the Little Dam Arroyo, South Fork Arroyo, Las Cruces Arroyo, Alameda Arroyo, a segment of the Sandhill Arroyo and unnamed major arroyos as identified on the Major Arroyo Corridor Identification Map. Land use, transportation, recreation, and drainage characteristics shall be identified via the Arroyo Plan.



Policy 2: The City will encourage the preservation and utilization of major tributaries that feed designated major arroyo corridors.

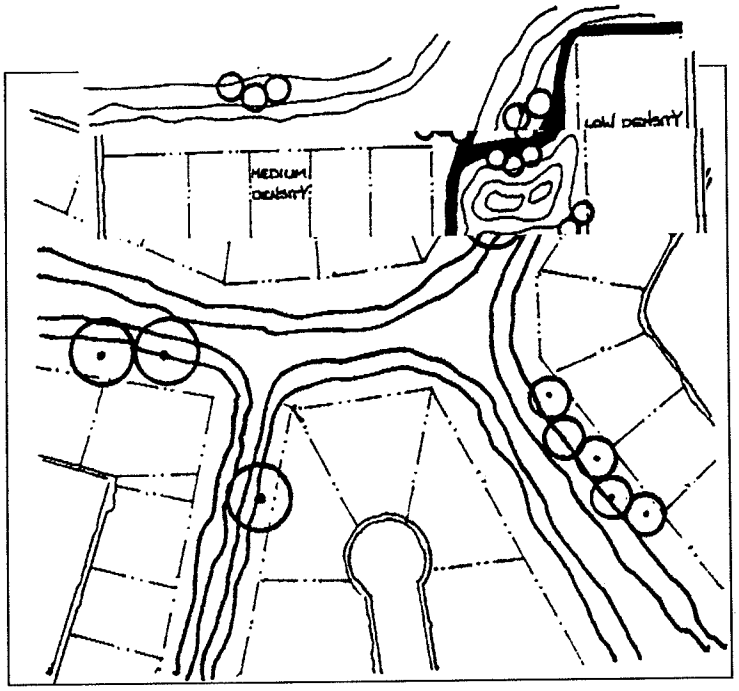
Policy 3: The City promotes flexible design standards when channelizing and storing storm water for development that is adjacent to designated major arroyo corridors to encourage enhancement of a natural system.

Policy 4: Park fees may be waived for development that provides open space and recreational opportunities in accordance with the Major Arroyo Plan.



Objective B: Establish requirements that facilitate multiple uses for storm water basins.

Policy 4: Project-scaled detention facilities should be coordinated with open space areas to ensure multiple uses and linkages between different land uses. Such linkages maybe include bike paths, pedestrian trails or buffer areas between land uses.



Policy 6: Connect project-scaled detention facilities or on-site retention basin vegetation to existing natural drainage channels and washes to enhance a natural open environment.

GOAL: Develop a city-wide Storm Water Management Policy Plan that will facilitate coordination with other governmental entities that are impacted by analogous drainage systems.

Objective A: Encourage the facilitation of a consistent, regional storm water management program for the Las Cruces urban area.

Policy 1: The City will submit the adopted Storm Water Management Policy Plan to the ETZ Commission to encourage the development and implementation of a Las Cruces urban area Flood Control Management Program.

Policy 2: The City will submit the adopted Storm Water Management Policy Plan to the Town of Mesilla and Dona Ana County to encourage acceptance and implementation of a Las Cruces Urban Area Flood Control Management Program.

Policy 3: The City will submit the adopted Storm Water Management Policy Plan to the Las Cruces Flood Control Authority to encourage the process of development and

implementation of an urban area management program.

Policy 4: The City will encourage the Town of Mesilla and Dona Ana County to participate with Las Cruces in converting storm drainage responsibility to the Las Cruces Flood Control Authority.

STORM WATER MANAGEMENT PLAN (SWMP) (2009)

The EPA has identified six minimum control measures which must be specifically addressed within this plan. By following these six minimum control measures, the City of Las Cruces will benefit from significant reductions in pollutants being discharged. They are:

1. Public Education and Outreach on Storm Water Impacts
2. Public Involvement/Participation
3. Illicit Discharge Detection and Elimination (IDDE)
4. Construction Site Storm Water Runoff Control
5. Post-Construction Storm Water Management in New Development and Redevelopment
6. Pollution Prevention/Good Housekeeping for Municipal Operations

Part 1 Public Education and Outreach

1.2 Best Management Practices

BMP 1-6 Construction General Permit Education

Developers and construction personnel are the target audience for this BMP. The City of Las Cruces will identify local building organizations, contractor groups, engineering organizations, and other construction related associations to educate them on storm water pollution prevention for construction sites. The City will contact these associations and will offer presentations relating to storm water and the construction general permit.

Educational information such as posters, information sheets, and brochures on storm water pollution prevention for construction sites will be made available at the City of Las Cruces Office Center or other sites where construction permits are issued. This information will be accessible to developers and contractors obtaining a building permit. The information will include, but not be limited to, requirements for storm water runoff from construction sites, erosion control plans, and pollution prevention BMPs.

Las Cruces Municipal Code, Chapter 16 - Licenses, Taxation and Miscellaneous Business Regulations, Article IV - Business Registration and Licensing requires contractors operating within the City limits to secure a business license or registration from the City of Las Cruces. New contractors will be given storm water information related to construction when they receive their business registration. The Director of Community Development is responsible for implementing this portion of the BMP using information provided by the Program Coordinator.

BMP 1-7 Brochure Dispensers at Public Facilities

The City of Las Cruces currently has brochure dispensers at the City of Las Cruces Office Center while a new City Hall is being constructed. In future years, the City will make informational material about storm water pollution prevention accessible to the general public (resident and visitors) at the public library and the new City Hall. Educational material may address storm water runoff, storm water management, and methods to prevent pollution from entering storm water systems.

Part 2 Public Participation and Involvement

2.2 Best Management Practices

BMP2-4 Community Clean-Up Activities

The City of Las Cruces will sponsor community clean-up activities to involve citizens in removing pollutants from the watershed. Advertising material for the activities will include information about the connection to storm water quality. Clean-up activities will focus on street rights-of-way and arroyos that are part of the storm drainage system. Examples of community clean-up activities that the City may sponsor and participate in are Keep Las Cruces Beautiful, the Toss No Mas highway clean-up campaign, and the Great American Clean-up.

Part 4 Construction Site Runoff Control

4.2 Best Management Practices

BMP4-1 Plan Review

The City of Las Cruces recognizes that construction sites can discharge a significant amount of sediment in a short period of time. The City has adopted an ordinance to control erosion and reduce sediment and other pollutants in storm water runoff from construction sites. Las Cruces Municipal Code Chapter 34 – Drainage and Flood Control, Article III - Storm Water Management requires the operators of a land disturbance of one or more acres to submit an Erosion and Sediment Control Plan (ESCP) to the City for review. Operators disturbing less than one acre are also required to submit an ESCP if the site is part of a common plan of development.

The City's Design Standards require that all construction plans for subdivision (residential) and commercial permits comply with the requirements of Las Cruces Municipal Code Chapter 34 – Drainage and Flood Control, Article III - Storm Water Management. The ESCP is reviewed by the Public Works Engineering Services Section and stamped as the "Permit Set" prior to Issuance of a subdivision or commercial permit for construction. The City's ordinance gives it the authority to deny permits if the ESCP is not acceptable. The City's plan reviewers were trained in review of erosion and sediment controls during the first permit year.

Part 5 Post-Construction Storm Water Management

5.2 Best Management Practices

BMP 5-1 Structural BMPs

The City has already implemented an ordinance that addresses drainage design for development and redevelopment. Las Cruces Municipal Code, Chapter 32 - Design Standards, Article III - Drainage Design Standards includes the following requirements:

- On-site retention or detention of the 1% chance rainfall allowing the pre-developed flow or less to flow off the development (i.e. no increase in runoff);
- Erosion control on the side slopes of ponding areas;
- Low maintenance landscaping for a perimeter buffer on ponding areas;
- Drainage outfalls designed in such a manner that it will not increase erosion downstream;
- Riprap for erosion control downstream of culverts; and
- Velocity limits and lining protect channels from erosion.

Ponding areas are the primary structural BMPs used by the City. Las Cruces Municipal Code, Chapter 32 - Design Standards requires grading and drainage plans be submitted to the City for review before starting construction. During review, the City confirms that ponding areas are designed according to the Design Standards and are protective of the drainage system and any downstream natural features, such as

arroyos. Construction is not authorized until the City stamps the plans as the "Permit Set." The City has the authority to deny a permit if the construction plans do not meet the Design Standards. The Engineering Services Administrator and Street Systems Administrator in the Public Works Department and the Director of Facilities are responsible for implementing this BMP.

BMP 5-2 Open Space Program (Non-Structural BMP)
The open space program seeks to reduce the amount of impervious cover by increasing natural land set-asides for conservation and by using pervious areas for more effective storm water management. The program includes several initiatives to reduce pervious area in new development and remove pervious area from existing development.

The City of Las Cruces Public Works Department has looked at ways to reduce the amount of runoff in new subdivisions. One such way has been the recent re-evaluation of the drainage design standards to encourage regional ponds and parks. This will provide additional pervious area and native flora and fauna. The net increase of scenic features will positively impact the neighborhood's aesthetic and increase residential property values.

Las Cruces Municipal Code, Chapter 34 - Drainage and Flood Control, Article III – Storm Water Management authorizes the Director of Public Works to require more than minimum storm water standards if arroyos on a site to be developed or immediately downstream of the site show evidence of increased flooding, accelerated erosion, channel erosion of sedimentation, as a direct result of conditions on the site. These additional requirements may include open space such as buffer zones, re-vegetation of highly eroded areas, and arroyo restoration or other erosion control measures within highly eroded channels.

The City has developed a Draft Arroyo Plan to guide the preservation and restoration of arroyos. After the plan is finalized, the Public Works Engineering Services Section will develop arroyo design standards that will emphasize preserving arroyos as open space.

Part 6 Municipal Pollution Prevention/Good Housekeeping
6.2 Best Management Practices
BMP 6-1 Good Housekeeping Procedures
The City of Las Cruces will review operations and facilities within the departments listed in Part 6.1. Each department will prepare a list of outdoor activities and material storage that is exposed to storm water. These operations have the potential to negatively impact storm water quality. For each activity or storage area, the potential pollutants and waste streams will be listed. The City will then develop written Good Housekeeping Procedures and BMPs for the potential pollutant and waste streams.

Written procedures will decrease the potential for activities to result in storm water pollution and will ensure proper disposal of wastes. Written procedures will also aid consistency in pollution prevention and facilitate knowledge transfer when employees performing an activity change. The Good Housekeeping Procedures will be revised when activities or facilities are modified.

MESILLA VALLEY METROPOLITAN PLANNING ORGANIZATION TRANSPORT 2040 (2010)

Goal 2: Balance the built and natural environments to promote physical activity, social interaction, and the sustainable use of resources.

This goal entails a balance between built and natural environments that promote physical activity, social interaction, and the sustainable use of resources. The goal can be achieved through land use and transportation integration and design that enhance the unique characteristics of communities, and by investing in safe, healthy, and walkable neighborhoods. Application of this goal can minimize negative impacts to natural resources and help improve quality of life.

Goal 3: Provide a variety of transportation choices that serve all users through developing safe, reliable, and convenient transportation modes.

This goal is focused on providing a variety of transportation choices that serve all users through developing safe, reliable, and convenient transportation modes. Different areas of the region will be served with a variety of transportation options based on their range of needs while endeavoring to maintain system efficiency.

Transportation Principles:

3. Preserve natural, cultural, historical, and agricultural resources -- Exploring new methods for addressing environmental and cultural impacts are essential. This includes consulting with state and federal land use agencies and stakeholder organizations before projects are designed and implemented. For example, well designed projects can sustainably integrate aspects of the existing natural environment with the built environment while lessening the disruption of natural habitats or existing water flows. Encouraging more sustainable and energy efficient designs and applications are important parts of preserving natural, cultural, historical, and agricultural resources.
4. Promote and design healthy and livable communities -- Transportation infrastructure can be an integral part of supporting physical activity and social interaction and therefore improving the overall health of our communities. A livable community means the creation of sustainable urban and rural environments that foster walking, biking, and transit, while reducing dependency on the private automobile.

Green Opportunities

Associated Policies:

- Support development that contributes to reduced storm water volume and velocity and fewer storm water overflow events

Planning and Environmental Linkages

Associated Policies:

- Support the National Environmental Protection Agency (NEPA) process through well-coordinated land use and transportation planning and the five core MPO functions

Associated Tasks:

- Develop a map that illustrates historical, cultural, and environmental areas of importance and their relationship to the transportation system
- Cooperate with Vision 2040 efforts on a view shed analysis

Trail System Priorities Plan

The Trail System Priorities Plan is a map that identifies current and potential future trail locations within the MPO area. The plan prioritizes trail facilities into three levels, or tiers, that will create a trail network across the region. Tier 1 trail routes will be the trail arterial network that will connect major destinations and provide continuous routes across the region. Tier 2 trail routes will act as minor trail arterials to

complete the network of intra-regional travel. Tier 3 trail routes will round out the network as collectors between neighborhoods and the trail arterial network. The trails outlined in this plan are intended to augment the roadway transportation system by providing additional networks for bicyclists and pedestrians.

The governing boards of each member jurisdiction have passed resolutions in support of a loop trail system around central Las Cruces and extending into Mesilla and Doña Ana County. The proposed loop trail includes the following routes: Triviz Multi-use Path, the Outfall Channel, La Llorona Trail, Calle del Norte, New Mexico Highway 28, and University Avenue. Improvements needed to create this loop include paving, trail amenities, and shoulders along well-traveled roadways.

Many of these trails are located along arroyos and Elephant Butte Irrigation District (EBID) facilities. Use of EBID facilities require a Special Use permit by the local jurisdiction and a willingness to provide for liability insurance. The plan prioritizes trails that the residents and stakeholders would prefer to be improved or left unimproved. The MPO encourages the local jurisdictions to utilize these existing networks for a comprehensive regional trail system that connects important destinations for pedestrians, bicyclists, and equestrian use.
Associated Tasks:

- Increase access to regional recreational activities
- Protect the natural environment of Arroyos and enhance them with trail development
- Support Loop Trail resolution

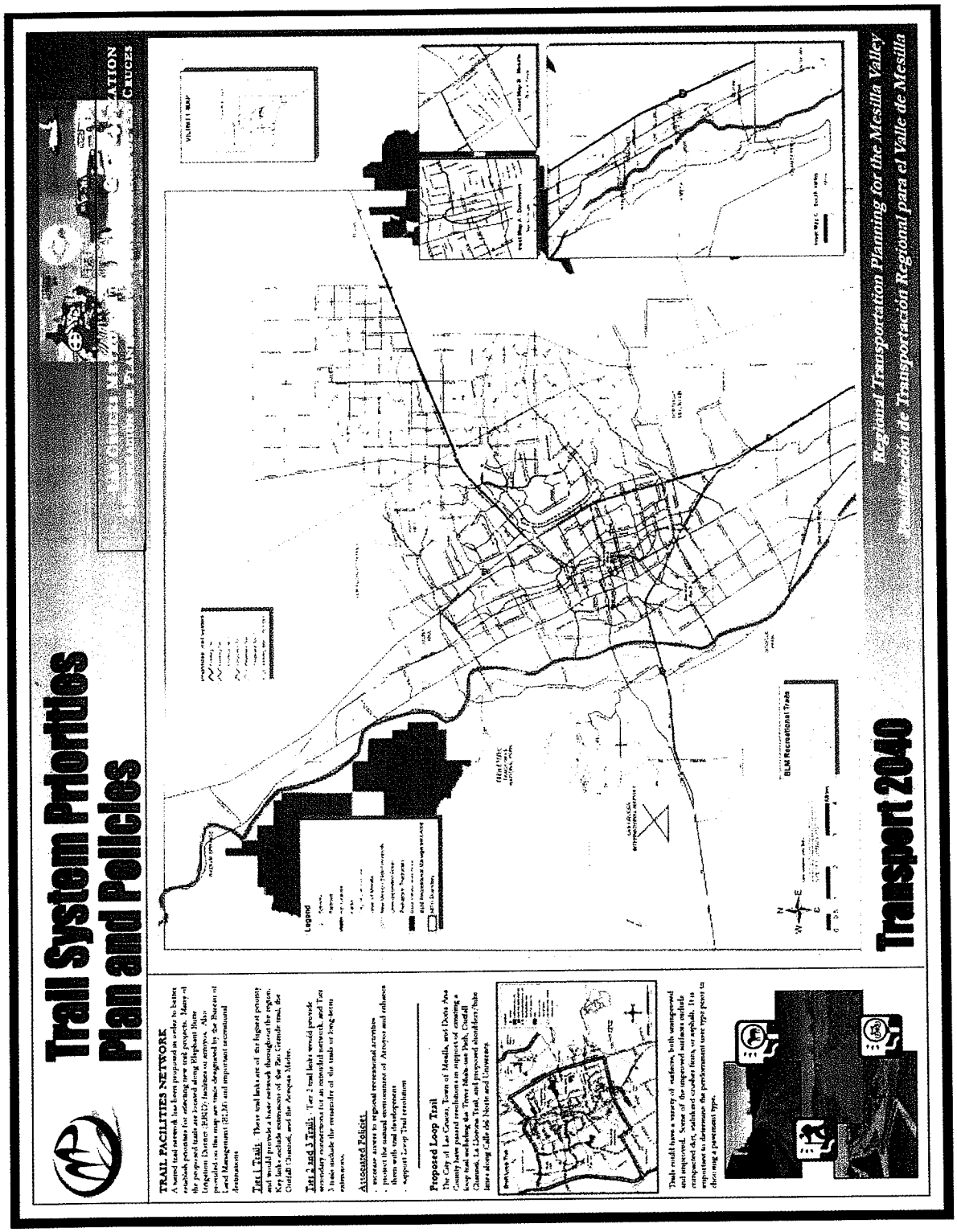
On the Map:
The Trail System Priorities Plan map contains text on the identified tiered network (the loop and spoke system), examples of improved and unimproved trail facilities, and a discussion of potential pavement types.

Trail Improvements
The trail system priorities consist of first a central loop system and then an extended loop and spoke system. These loop systems connect some important destinations and neighborhoods to provide a complete network around the City of Las Cruces and into Doña Ana County and Mesilla. A trail connection may include a roadway or multi-use path. The following are comments from the public and MPO committees on critical connections and area attractions.

Project lists organized by Status:

Connections		
Location	**Issue/Improvement**	**Status**
Alameda arroyo	Designated trail	Proposed Tier 1 Trail System Priorities Plan; CLC RTP application submitted
Outfall Channel	Connectivity; part of central loop	MPO unfunded illustrative list
Over Las Cruces Flood Control Dam	Connectivity	Proposed Tier 1 Trail System Priorities Plan
Connection to Bosque Park	Improve Calle del Norte bridge crossing	Proposed Tier 1 Trail System Priorities Plan
La Llorona Trail extension (North to Doña Ana School Rd and South to Pajaro Rd)	Connectivity; part of extended loop	Proposed Tier 1 Trail System Priorities Plan
Las Cruces Arroyo South Fork	Designated trail	Proposed Tier 1 Trail System Priorities Plan
Hadley Street (Triviz to Downtown)	Bicycle Boulevard	Proposed Tier 1 Trail System Priorities Plan
Las Cruces Drain (Outfall Channel to Calle de Norte)	Connectivity within central loop	Proposed Tier 1 Trail System Priorities Plan
Acequia Madre (Downtown to NMSU near El Paseo)	Overall pedestrian connectivity and access per Downtown Main Street Master Plan; Paved path along EBID ROW	Proposed Tier 1 Trail System Priorities Plan
South side of Tortugas Hill (A Mountain)	Multi-use path	On BLM land

The MPO Trail Systems Priority Plan and Policies Map may be viewed in more detail at:
http:// www.las-cruces.org/en/Departments/Community%20Development/ Sections/MPO/Maps.aspx#



ONE VALLEY ONE VISION 2040 REGIONAL PLAN (2012)

6.1 Land Use

Goal 6-1-8: Encourage retention of open space, scenic aspects of rural areas, entranceways to urban areas, and transition areas between urban areas.

Strategies

• Prepare an assessment of the open space, scenic aspects of rural areas, entranceways to urban areas, and transition areas between urban areas that significantly contribute to the region's character.

• Work with property owners to determine the most appropriate methods to balancing public purposes with individual property rights, which may include such means as providing design flexibility, easements, and purchase or transfer of development rights.

• Use incentives or public acquisition of property rights, as appropriate, instead of regulations.

• Offer zoning districts (e.g., cluster zoning) that encourage developers to provide open space, allow access to public areas, protect scenic elements, emphasize key entranceways, and are sensitive to transition areas.

6.2 Water

Goal 6-2-1: Ensure the availability of a safe, dependable, affordable, and sustainable water supply to meet or exceed the needs of all reasonable beneficial uses.

Strategy

Plan and create additional water supplies in ways that do not adversely affect existing water users or the environment. Some possible methods include thinning or removal of invasive plant species within water recharge areas; preservation and restoration of arroyos to assist in water recharge; using desalination, water reclamation, or other technologies to make lower quality water supplies usable; storing surface and stormwater for later use, expanding water lease/transfer programs, and importing water from other basins.

Goal 6-2-2: Protect existing surface and groundwater from pollution and ensure it meets or exceeds water quality standards.

Strategies

- Continue participation in the National Pollutant Discharge Elimination System (NPDES) permit program to help control water pollution carried by stormwater runoff.
- Develop ways to better enforce and control illegal dumping through reasonable and equitable funding mechanisms, particularly within key arroyos and other sensitive water recharge areas.
- Identify and map sensitive water recharge areas.
- Coordinate with other local jurisdictions and state and federal agencies to ensure a safe water supply.
- Include water-conserving stormwater management techniques such as green infrastructure and low-impact development as part of a comprehensive stormwater and water-quality improvement strategy by adopting them into land use development and building codes where appropriate.
- Support planning and analysis of the local Rio Grande watershed that will provide recommendations of best management practices in managing pollutant loads, such as E. coli bacteria, to meet state water quality standards.

6.4 Environmental Resources

Goal 6-4-1: Make land use decisions that protect and enhance the natural environment.

Strategies

- Investigate the use of tools such as conservation easements, transfer or purchase of development rights, and other similar programs.
- Direct new development to already developed areas in order to protect critical wildlife habitat, help prevent erosion and flooding, reduce demand for water, and preserve open space.
- Prohibit development in designated environmentally sensitive areas in a manner that reasonably compensates, provides incentives, maintains similar existing property rights, or in another similar manner balances the public and property owner interests.
- Work with landowners and stakeholders to develop a map of critical and sensitive natural areas in the county.

Goal 6-4-2: Protect and maintain natural habitat and wildlife connectivity to the greatest extent possible and mitigate damage that may result from development.

Strategies

- Work cooperatively with entities engaged in open-space conservation to enhance these valued resources as the region grows.
- Identify areas of natural, historical, architectural, or cultural significance and protect them by providing incentives for property owners to maintain them, or by acquiring an appropriate public interest in the property.
- Provide an adequate network of corridors for wildlife (e.g., buffer zones adjacent to arroyos or wildlife over/under passes) in a manner that reasonably compensates or incentivizes, maintains similar existing property rights, or in some way balances the public and property owner interests.

Goal 6-4-3: Minimize impacts created by development and human activities to realize the full potential of the environmental resources as a community asset.

Strategies

- Develop plans that allow for low-impact and passive recreational uses along arroyo buffers where feasible.
- Assess the implementation of an environmental impact fee for development that encroaches upon sensitive areas based upon a comprehensive environmental or pollution control plan that would balance the public and property owner interests.
- Protect arroyos, open spaces and sensitive areas by adopting an Arroyo and Open Space Management Plan.

6.5 Hazards

Goal 6-5-2: Protect people and property from the negative effects of stormwater.

Strategies

- Coordinate stormwater management policies with water-management agencies to aid in better response, allow for improved funding opportunities, and have better protection of property from flooding erosion.
- Encourage communities to adopt and implement storm drainage master plans.
- Prepare an assessment of the arroyos and man-made stormwater systems of regional

significance to develop policies for minimizing impact to natural arroyos, provide appropriate drainage, retention, and detention functions, and allow for regular maintenance.

- Develop regulations requiring adequate flood and drainage control systems and maintenance for new and redevelopment.
- Install weather stations and telemetry systems to aid in advanced warning of potential flood conditions.
- Implement existing stormwater management plans.
- Identify factors that increase the likelihood of flooding and develop mitigation plans accordingly. These plans would integrate wildlife protection and other goals found in Section 6.4, "Environmental Resources."

6.6 Transportation

Goal 6-6-3: Increase access to non-motorized transportation options to promote healthy living and provide mobility alternatives.

Strategies

- Incorporate bicycle lanes, sidewalks, multi-use paths, and trails with roadways.
- Use alternative options for non-motorized transportation routes where necessary, Solano Road Multi-Modal Access, Las Cruces including, but not limited to, areas adjacent to irrigation ditches or arroyo channels, connections between cul-de-sacs, and utility corridors.
- Coordinate non-motorized improvements to minimize or avoid discontinuous connections.
- Design safe, efficient non-motorized transportation systems and use educational programs to reduce or eliminate conflicts with motorized transportation systems.
- Develop non-motorized routes that maximize direct travel trips.
- Ensure non-motorized systems meet or exceed standards for use by persons with disabilities.

6.7. Community Facilities & Services

Goal 6-7-2: Meet the existing and projected needs of residents through location, access, extent and timing, staffing, and category of community facilities and services.

Strategy

Develop stormwater basins, stormwater management dams, and arroyos to serve multiple uses, including passive and active open spaces that provide habitat for plants and animals and recreational opportunities.

Actions

Action 3

Preserve BLM and State Land outside the proposed future service boundary through actions, including and not limited to:

Maintaining and enhancing dialogue with the BLM and State Land Trust

Expressing that land located outside the proposed future service boundary should be given priority for preservation as disposal plans are prepared and released.

Associated Goals: 6-1-8

Primary Responsible Entities: ETA, DAC and municipalities, BLM, NMSLO

Action 14
Work to identify critical and sensitive natural areas and wildlife corridors, and protect these areas from development in a manner that reasonably compensates, provides incentives, maintains similar existing property rights, or in another similar manner that balances the public and property owner interests.
Associated Goals: 6-1-8; 6-4-1; 6-4-2; 6-4-3; 6-10-4; 6-11-1
Primary Responsible Entities: ETA, DAC and municipalities, BLM, NMSU, U.S. Fish& Wildlife Service, NM Department of Game& Fish, NMSLO, WSMR, and USDA.

Action 16
Draft and adopt arroyo, trail, and open-space management plans which balance the public and property owner interests.
Associated Goals: 6-4-2; 6-4-3; 6-5-2; 6-6-3; 6-7-2; 6-7-5
Primary Responsible Entities: ETA, DAC and municipalities, BLM, NMSLO, WSMR, USDA, and NMSU

Action 17
Evaluate the possibility of environmental impact fees for development that encroaches on sensitive environmental areas.
Associated Goals: 6-4-3
Primary Responsible Entities: ETA, DAC and municipalities

PARKS & RECREATION MASTER PLAN (2013)

Community Engagement & Information

1.3 Prepare, publish and promote a comprehensive park and trail facilities map for online and print distribution to highlight existing and proposed sites and routes, while promoting Las Cruces as an active-lifestyles community.

Recreation Programming

2.13 Continue to promote and expand family-oriented programming, special events, festivals and concerts, such as The Whole Enchilada Festival and Spring Fest, to enhance community identity, activity and education. Utilize the City's parks, trails and recreation

Parks & Park Maintenance

Goal 3: Acquire and develop a high-quality, diversified system of parks, recreation facilities and open spaces that provides equitable access to all residents.

3.5 Continue to examine, identify and prioritize lands that have potential value for inclusion in the open space system based on factors such as level of service, connectivity, preservation, scenic and recreational opportunities to residents.

3.9 Actively plan and coordinate with Doña Ana County for the acquisition of parks and open space within or in close proximity to the ETZ.

3.10 Pursue low-cost and/or non-purchase options to preserve open space, including the use of conservation easements and development covenants.

3.13 Create regional development and conservation guidelines for resources that cross jurisdictional boundaries, such as an Arroyo Protection Plan, a Hillside and Escarpment Protection Plan, a Wildlife Conservation Plan and a Farmland Conservation Plan.

4.2 Design and maintain parks and facilities to offer universal accessibility for residents of all physical capabilities, skill levels and age; Assess planned and existing parks and trails for compliance with the newly adopted ADA Standards for Accessible Design (*effective March 15, 2012*) for requisite upgrades.

Parks – Construction & ROW Maintenance

Goal 5: Provide high-quality care for play structures and surfaces and maintenance of trails, medians, parkways and ROW's throughout the City.

5.6 Recognize that designating private property for open space uses does not establish or promote any public access rights to such property.

Trails

Goal 7: Support and promote the efforts of the MPO to create a network of interconnected trail opportunities including hard- and soft-surfaced trails and right-of-way trails and bikeways.

7.1 Acknowledge and support the trail planning policies of the Las Cruces Metropolitan Planning Organization as outlined in Transport 2040.

7.2 Coordinate with the Metropolitan Planning Organization and Doña Ana County for the joint planning, development and maintenance of priority trail corridors.

7.3 Foster the development and capacity of local volunteer trail advocates to help with trails planning efforts, garner community support, leverage community resources and play a role in stewardship and maintenance of trail facilities.

Goal 8: Develop a high-quality system of shared-use recreational trails and bicycle & pedestrian corridors that connect significant local landscapes, public facilities, neighborhoods and the downtown core.

8.1 Expand the network of shared-use recreational trails for walking, hiking and cycling to promote connectivity between parks, neighborhoods and public amenities.

8.2 Provide a recreational trails service standard of 0.25 miles per 1,000 persons.

8.3 Integrate the siting of proposed trail segments into the development review process; Require development projects along designated trail routes to be designed to incorporate the trail as part of the project.

8.5 Coordinate with the Bureau of Land Management and others to identify and provide for trails along arroyos.

8.6 Work with local agencies, utilities and private landholders to secure trail easements and access to open space for trail connections; Assist and support the work of local agencies to secure trail easements and access to open space for trail connections.

8.7 Provide trailhead accommodations, as appropriate, to include parking, wayfinding signage, restrooms and other amenities.

Administration & Management

10.3 Maximize the multiple-use aspects of arroyos, detention ponds, utility easements, by preserving and enhancing the natural and ecological value of these lands.

LAS CRUCES COMPREHENSIVE PLAN 2040 (2013)

The following are general guiding policies from Las Cruces Comprehensive Plan 2040 for Healthy Community, Community Character, Sustainable Growth and Operational Support that are relevant to the Arroyo Preservation Plan:

Chapter 4 Healthy Community

Great Parks & Recreation

GOAL 4: Enhance the quantity and quality of parks, programs, and associated facilities to satisfy the recreational, cultural, and educational needs of residents.

4.5.1 Establish standards and policies for trails, pocket, neighborhood, and community parks.
f. Provide a combined trail service standard of 0.25 miles per 1,000 persons.

GOAL 5: Provide a comprehensive, attractive, cost- and resource-efficient system of parks and recreation facilities responsive to the needs and desires of the community.

5.1 Encourage parks and multi-use activity/recreational fields (functional open space) in conveniently located areas.

5.10 Use water conservation methods as illustrated below in parks, trails, and other types of open space.

a. Use drought tolerant and native plantings where feasible.
b. Leave native vegetation in its natural state, where feasible.
c. Employ timed drip irrigation systems, mulches, and other such methods/techniques as a means of controlling water usage.

Multiple Mobility Options & Connections

GOAL 10: Provide multiple mobility options and connections to move within and outside Las Cruces.

10.1 Encourage a comprehensive trail system which provides linkage between parks, recreational facilities, and other activity centers. Trails should be multi-purpose and allow all citizens an opportunity to use them. Trails should be easily accessible and well maintained.

a. Continue to work with Elephant Butte Irrigation District, Bureau of Land Management, Bureau of Reclamation and other state and federal agencies so that the lateral and drainage way trail network may be expanded and improved.
b. Collaborate efforts with local governments to link facilities in order to provide connectivity between facilities for a more regional approach toward recreational planning.
c. Utilize arroyo buffers as trails.
d. Develop trails within existing easements.
e. Incorporate maintenance and safety strategies, such as lighting, landscaping and signage, into trail design.

Healthy and Safe Environment

GOAL 12: Protect environmentally-sensitive areas, habitats, and valuable features of the existing natural environment.

12.4 Encourage urban residential cluster development along major arroyos where such development lends to the preservation of arroyos in their natural state.

12.5 Identify, map and characterize arroyos, hillsides and escarpments within the ETZ and the city limits, and prepare a plan to address protection of environmentally-sensitive areas or the types of development allowed given the specific characteristics of the subject area. The Plan should address, but not be limited to:

a. Determination of appropriate degree of slope
b. Stability requirements
c. Fire protection and emergency access
d. Stormwater run-off and erosion controls
e. Wildlife protection, connectivity and interaction
f. Habitat protection or mitigation
g. Aesthetics, urban design, and visual quality guidelines
h. Open space protection
i. Infrastructure and roadway development standards
j. Allowed land uses and density restrictions
k. Development standards related to lot size, setbacks, and building heights.

Flexible Design & Positive Image

GOAL 19: Encourage development that is context-sensitive and compatible to the surrounding area.

19.20 When located within or adjacent to a residential neighborhood, design public/quasi-public facilities so they are compatible with the neighborhood's character. The following criteria shall be observed in establishing neighborhood compatibility:

b. Facility design and siting shall insure proper screening from an adjacent neighborhood. Traffic, noise, vehicle headlights and facility exterior lighting shall not spill over into the neighborhood. Setbacks, open space, rock walls, and organic landscaping are some recommended buffering techniques.

GOAL 20: Enhance Las Cruces' natural environment, physical environment, and character through inspiring quality design.

20.3 Encourage creative and sustainable site planning for all new development and redevelopment through a variety of means not limited to the following:

a..... Maintain the topography and slope of a site in its natural state.
b..... Encourage a balance between open space and built space in developments.
c..... Develop standards to prevent monotony.

Chapter 5 Community Character

Open Space Connectivity

GOAL 22: Protect those natural resources and features unique to the region.

22.1 Encourage the preservation and provide a system of open space on the mesas and in the valley in order to provide a desirable environment and quality of life in the urban area as well as perpetuating the unique natural and rural environments of the region.

22.2 Encourage acquiring land and planning for open space networks.

22.3 Encourage the dedication of undeveloped open space. Undeveloped open space shall include all types of scenic areas, environmentally sensitive areas, wildlife habitat areas and land that may serve as part of the non-motorized transportation network.

22.4 Consider offering density bonuses, conservation easements, development covenants, waivers to park fees, or similar mechanisms for development in exchange for dedications of land for open space.

22.5 Protect arroyos and arroyo buffers in urban and rural areas from development where such arroyos lend positively to an open space network, with preservation consistent with the Storm Water Management Policy Plan and the Arroyo Preservation Plan.

22.6 Protect irrigation channels in urban and rural areas from development encroachment to preserve their open character and establish their role as pedestrian and bicycle trails linking open spaces in urban and rural settings.

22.7 Establish urban and rural open space networks in the area.

22.8 Advocate an appropriate balance between physical development and open space that will provide a desirable environment and quality of life in the urban area as well as preserving the unique natural and rural environments of the region.

22.9 Develop standards that assist in the expansion of open space networks as part of new development. Open space should be linked with parks and recreational trails so that any open space areas may be considered "usable" space. Develop incentives for developers to create and/or maintain additional open space.

22.10 Develop standards that protect arroyo systems and other sensitive lands from development so that they remain in their natural state especially where such areas lend to an open space network.

22.11 Work with Doña Ana County, the Bureau of Land Management, and the New Mexico State Land Office to continue to preserve the designated buffer around the Organ Mountains. Encourage the acquisition of remaining private land and the development of park/open space as a natural buffer between the urban area and the Organ Mountains.

22.12 Discourage hillside development along Picacho Peak, Tortugas Mountain, the West Mesa escarpment and the other desert mountains which surround Las Cruces.

22.13 Protect views and vistas for the community through appropriate standards and techniques.

Aesthetics & Maintenance

GOAL 23: Establish high maintenance standards for all properties for safe and sanitary living conditions and enhancement of the city's image.

23.6.1 Require any private land within open space networks such as arroyos, channels, canals or any drainage ways to be properly maintained, left in a natural state, and not impede or manipulate historic stormwater flows by means of development or alterations.

Chapter 6 Economic Prosperity

Ready Workforce & Environment

Goal 26: Enhance the infrastructure network to help attract, retain, and bolster economic vitality for Las Cruces.

26.1 Enhance pedestrian pathways in areas frequented by citizens and tourists through standardized designs, landscaping, signage, signals, lighting, and paint.

Business & Industry Support

27.1 Support annual, seasonal and special events such as the Whole Enchilada Fiesta, the Southern New Mexico State Fair, area Wine Festivals, and special sporting Events.

27.5 Strengthen tourism through the development and improvement of active and passive recreational opportunities.

Chapter 7 Sustainable Growth

Vibrant Planning Areas, Neighborhoods & Districts

GOAL 35: Create a Future Concept Map and planning process to reflect the desired development pattern for the city.

35.1 Establish Planning Area designations and map planning areas.

a. *Open Space:* consists of areas that permanently function as dedicated open space or civic space such as City parkland or the Las Cruces Dam.

b. *Conservation:* consists of areas of historical, cultural, environmental value or open areas that could become community assets and are worth conserving, such as arroyos.

Managed Growth

GOAL 36: Establish annexation policies that support and is consistent with this Comprehensive Plan.

36.2 Prioritize annexation of areas that close open spaces between irregular city boundaries.

Chapter 8 Operational Support

Active Cooperation & Engagement

GOAL 44: Strengthen communication and cooperation in guiding quality growth through conveying the City's policies.

44.6 Work with existing neighborhoods to identify neighborhood priorities and needs related to infrastructure improvement (i.e. street and utilities), provision of parks and open space, and other related concerns.

46.7 Strengthen the cooperative joint-use agreement with the school district involving the creation of playgrounds, parks and the use of auditoriums and classrooms as a means of conserving money, reducing the demand for open space and parks, and supporting outreach efforts regarding community issues.

Responsive Processes

GOAL 49: Establish procedural and development requirements.

49.11 Use the PUD's flexibility to create unique, quality developments that provide a meaningful benefit to the community.

b. Support deviations from typical requirements when the development provides a community benefit as illustrated below.

ii. Preservation of major arroyos

xi. Extension, connection or creation of multimodal and/or trail networks

49.13 Acquire easements or purchase major arroyos and their buffers for public uses as drainage, open space networks and alternate transportation modes.

a. Develop arroyo systems, rights-of-way and City-owned land as multi-use open spaces, stressing the development of recreational trails and other connections between parks and other public and private open spaces, maintenance of natural landscape and aesthetic drainage improvements.

b. Work with the Bureau of Land Management, the New Mexico State Land Office, and private developers to preserve arroyos on the east and west mesas as open space.

GOAL 50: Use Best Management Practices to address stormwater run-off.

50.1 Update as required the wastewater system's National Pollutant Discharge Elimination System (NPDES) permit.

50.2 Continue to update and implement the City's Storm Water Management Policy Plan (SWMPP) through Chapter 32, Design Standards, of the City Code, as amended, to reflect current and changing practices.

50.3 Identify and monitor businesses that could potentially contribute pollutants or contaminants into stormwater run-off.

50.4 Increase enforcement activities that retain existing on-lot ponding facilities, specifically in residential properties.

a. Allow the movement of on-lot ponds but not their elimination.
b. Inform about the negative impacts of altering or eliminating on-lot ponds and the benefits of xeriscaping, stormwater capture and use, and green infrastructure.

50.5 Encourage shared stormwater ponding facilities

Chapter 10 Implementation

10.2 Actions

Item Number	Action	Healthy Communities	Community Character	Economic Prosperity	Sustainable Growth	Operational Support
5	Establish a process for the purposes of acquiring land and assisting in planning for open space networks.	√	√	√	√	√
28	Complete the implementation of the Storm Water Management Plan (SWMPP) • Adopt an Arroyo Preservation Plan to identify major arroyos that impact the city and offers policy recommendations regarding drainage, open space, recreation, and land use requirements. • Include provisions to address soil erosion, hillside, and/or escarpment issues. • Address the amounts and types of cut and fill activity allowed adjacent to and surrounding identified arroyos and drainage facilities.	√	√	√	√	√
31	Develop a viable long-term plan for the old landfill off of Lohman Avenue for future use, such as dedicated park land or open space.	√				√

APPENDIX 3
Flood Control Dams within the Extra-Territorial Zone (ETZ)

According to the New Mexico Office of the State Engineer, dams have a Hazard Potential Classification. This is a rating for a dam based on the potential consequences of failure. The rating is based on loss of life, damage to property and environmental damage that is likely to occur in the event of dam failure. No allowances for evacuation or other emergency actions by the population are considered. The hazard potential classification is not a reflection of the condition of the dam.[1]

A. Low hazard potential: Dams assigned the low hazard potential classification are those dams where failure or mis-operation results in no probable loss of life and low economic or environmental losses. Losses are principally limited to the dam owner's property.

B. Significant hazard potential: Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in populated areas with significant infrastructure.

C. High hazard potential: Dams assigned the high hazard potential classification are those dams where failure or mis-operation will probably cause loss of human life.

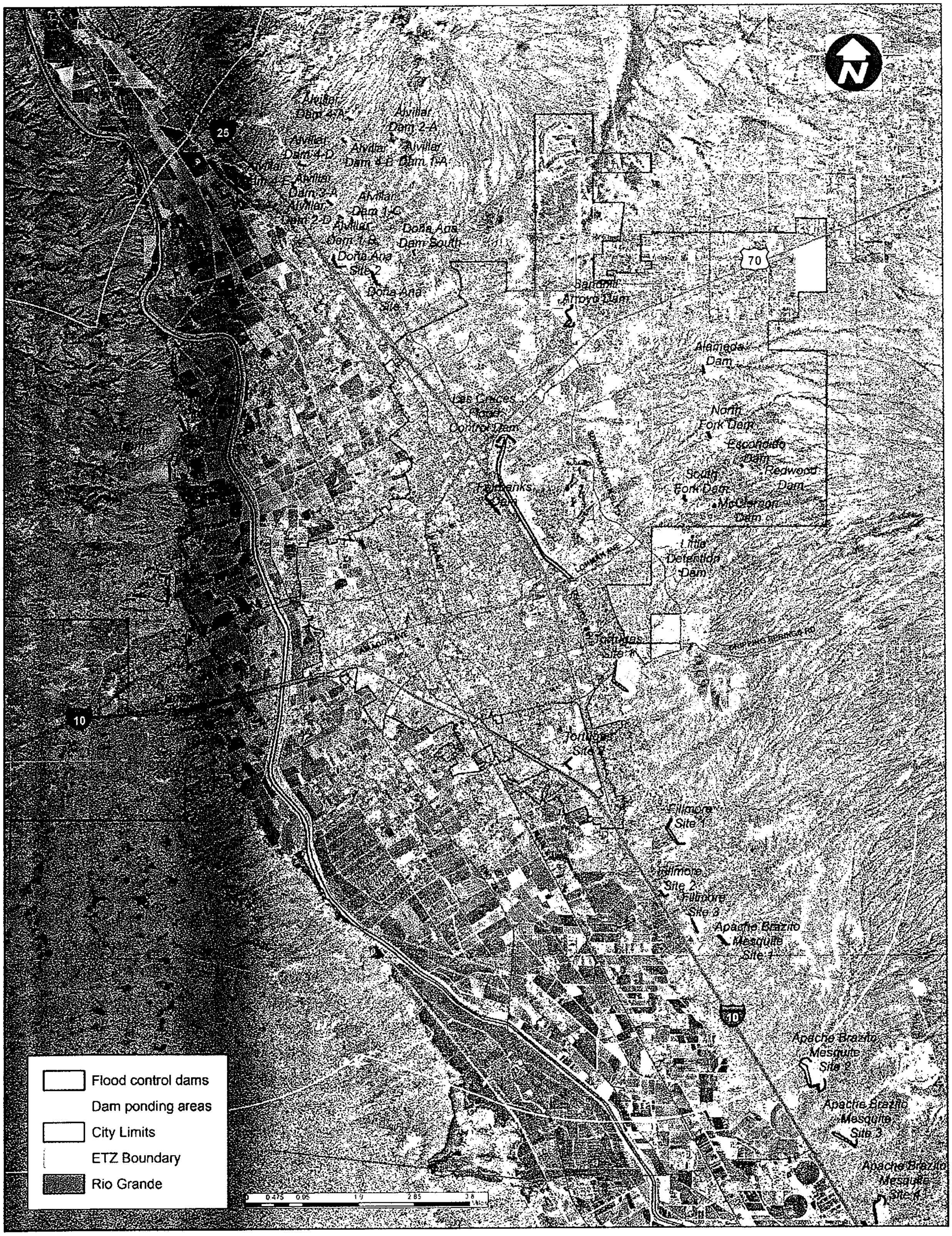
East Mesa Dams

Alameda Dam. The Alameda dam is an earthen structure operated by the City of Las Cruces. This dam is located on BLM property to the east of the Las Cruces Dam within an easement owned by the City. It was built by Soil Conservation Service (SCS) in the 1930's to protect the community of Las Cruces and is classified as a Class A.

Alvillar Dams. The Alvillar Dams are earthen dams located northeast of the city in the Doña Ana area. The La Union Soil and Water Conservation District owns the easements on which these structures reside, but ownership varies from private property to BLM land. The dams were constructed by the NRCS in the mid 1970's and were classified as Type C dams at the time of construction. The original purpose of these 11 structures was to provide flood control for agriculture up to the 50-year storm. These structures are maintained by the Doña Ana County Flood Commission.

[1] New Mexico Office of the State Engineer, 2005. http://www.ose.state.nm.us/water_info_dam_safety_info.html.

Map 3 Flood Control Dams
(May be enlarged for details)



Apache Arroyo Dam. The official name of this structure is Apache Brazito Mesquite Site 1 Dam but is more commonly referred to as Apache Arroyo Dam. The dam is an earthen structure designed by NRCS, owned and operated by EBID, and situated on BLM land south of Las Cruces. It was constructed in 1965 and primarily provides protection to the Mesquite area south of Las Cruces. The original purpose of the dam was to protect agricultural facilities. The dam was classified as a Class A structure but is now listed as a Class C due to downstream development.

Escondido Dam. Escondido Dam was built by the SCS during the same timeframe as the Alameda Dam to protect the City of Las Cruces from damaging floods and is classified as a Class A.

Fairbanks Dam. Fairbanks Dam is located west of N. Triviz and east of Fairbanks. The Flood Commission does not have information on this structure.

Fillmore Dam. The Fillmore Dam is officially named the Fillmore Site 1 Dam. This structure is located north of the Salopek Dam on the east side of I-10. Similar to the Site 2 and 3 Fillmore Dams, it is owned and operated by EBID, and was constructed to protect agricultural infrastructure in the valley. It was also built in 1962 to protect against the 50-year design storm. The dam is classified as a Class A dam.

Las Cruces Dam. The Las Cruces Dam, a flood control pass-through dam, was constructed by the U.S. Army Corps of Engineers (Corps) in 1975 to protect development in Las Cruces by controlling flood flows from the Alameda and Las Cruces Arroyos. It is currently classified as a Class C dam.

Little Detention Dam. These structures were built by the SCS during the same timeframe as the Alameda Dam to protect Las Cruces from damaging floods and are classified as a Class A.

Lower Fillmore Dam. The Lower Fillmore Dam is officially known as the Fillmore Site 3 Dam. It is an earthen structure located just north of the Apache Arroyo Dam on the east side of I-10. The Lower Fillmore was constructed in 1962 for agricultural purposes and is operated by EBID. The structure is classified as a Class A dam. The structure is capable of containing the 50-year design storm.

McClernon Dam. McClernon Dam was built by the SCS during the same timeframe as the Alameda Dam to protect the City of Las Cruces from damaging floods and is classified as a Class A.

North and South Fork Dams. These structures were built by the SCS during the same timeframe as the Alameda Dam to protect the City of Las Cruces from damaging floods and are classified as a Class A. (On the north and south forks of the Las Cruces Arroyo.)

North Doña Ana Dam. North Doña Ana Dam is officially known as Doña Ana Site 2 Dam. This structure is located just north of the Doña Ana Site 1 Dam. This dam detains flows from the North Doña Ana Arroyo and outfalls into the Doña Ana Lateral. The dam was constructed in 1957 and is operated by EBID. It is currently classified as a Class C dam and provides protection up to the 50-year storm.

Redwood Dam. Redwood Dam was built by the SCS during the same timeframe as the Alameda Dam to protect the City of Las Cruces from damaging floods and is classified as a Class A.

Salopek Dam. Salopek Dam is located just north of the Lower Fillmore Dam and is officially named the Fillmore Site 2 Dam. This dam is an earthen structure built in 1962 for agricultural purposes. The dam is owned and operated by EBID and is classified as a Class A structure. The structure is capable of containing the 50-year design storm.

Sandill Arroyo Dam. The Sandhill Arroyo Dam is located north of Highway 70 and immediately west of Sonoma Ranch Boulevard. The earthen dam was constructed in 1956 and rehabilitated in 1974 to protect the city from floodwaters produced by the Sandhill Arroyo. This dam is classified as a high hazard (Class C) dam due to the large amount of highly developed land downstream of the structure. The dam outfalls into the historic arroyo which continues west of I-25 until it reaches the valley floor.

South Doña Ana Dam. South Doña Ana Dam is officially known as the Doña Ana Site 1 Dam. The structure is located northeast of I-25 near the intersection of Thorpe Road and I-25. This dam detains flows from the South Doña Ana Arroyo and outfalls into the Doña Ana Lateral. The dam was constructed in 1958 and is operated by EBID. It is currently classified as a Class C dam and provides protection up to the 50-year storm.

Tortugas Dam Sites 1& 2. The dams constructed on the Tortugas Arroyo southeast of Las Cruces were constructed in 1962 as part of a plan for watershed protection and flood prevention within the Tortugas watershed. The plan was proposed by the Elephant Butte Irrigation District, with assistance from the Natural Resources Conservation Service (NRCS), in 1959 in response to reoccurring floods that had repeatedly caused damage to the Las Cruces Lateral and surrounding farmland, as well as nearby roads and the rail lines. The dams were designed to the 50-year design storm. Both dams are maintained by the Elephant Butte Irrigation District and both are classified as Class B dams.

West Mesa Dams

Apache Dam. Apache Dam is also known as the Apache Canyon Dam and is located west of the North and South Picacho Dams. The structure was constructed in1937 by the Civil Conservation Corps. Maintenance responsibility and classification information is not available at the Flood Commission.

Box Canyon Dam. Box Canyon Dam is located approximately two and half (2.5) miles north of the Las Cruces Airport and west of Picacho Peak. The structure was constructed in 1937 by the Civil Conservation Corps. Maintenance responsibility and classification information is not available at the Flood Commission.

Butler Dam. The Butler Dam is located immediately south of I-10 as it drops off the escarpment. The dam was constructed in 1974 to protect agricultural infrastructure from the 50-year design storm. The easement associated with this structure is owned by the La Union Soil and Water Conservation District and maintenance of the dam is sponsored by the Doña Ana County Flood Commission. This dam is classified as a Class B.

Cothern Dam. The Cothern Dam is located immediately south Butler Dam. Like Butler Dam, this dam was constructed in 1974 to protect agricultural infrastructure from the 50-year design storm. The easement associated with this structure is owned by the La Union Soil and Water Conservation District and maintenance of the dam is sponsored by the Doña Ana County Flood Commission. This dam is classified as a Class B.

North & South Picacho Dams. The North and South Picacho Dams are located west of the Rio Grande and north of Picacho Mountain on the Apache and Box Canyon Arroyos. These dams provide protection, predominantly to agricultural lands, up to the 50-year design storm. Both dams are sponsored and maintained by EBID. The outfalls of both structures merge where they intersect Shalem Colony Road and are routed through existing farmland to the Rio Grande. These dams are classified as a Class B.

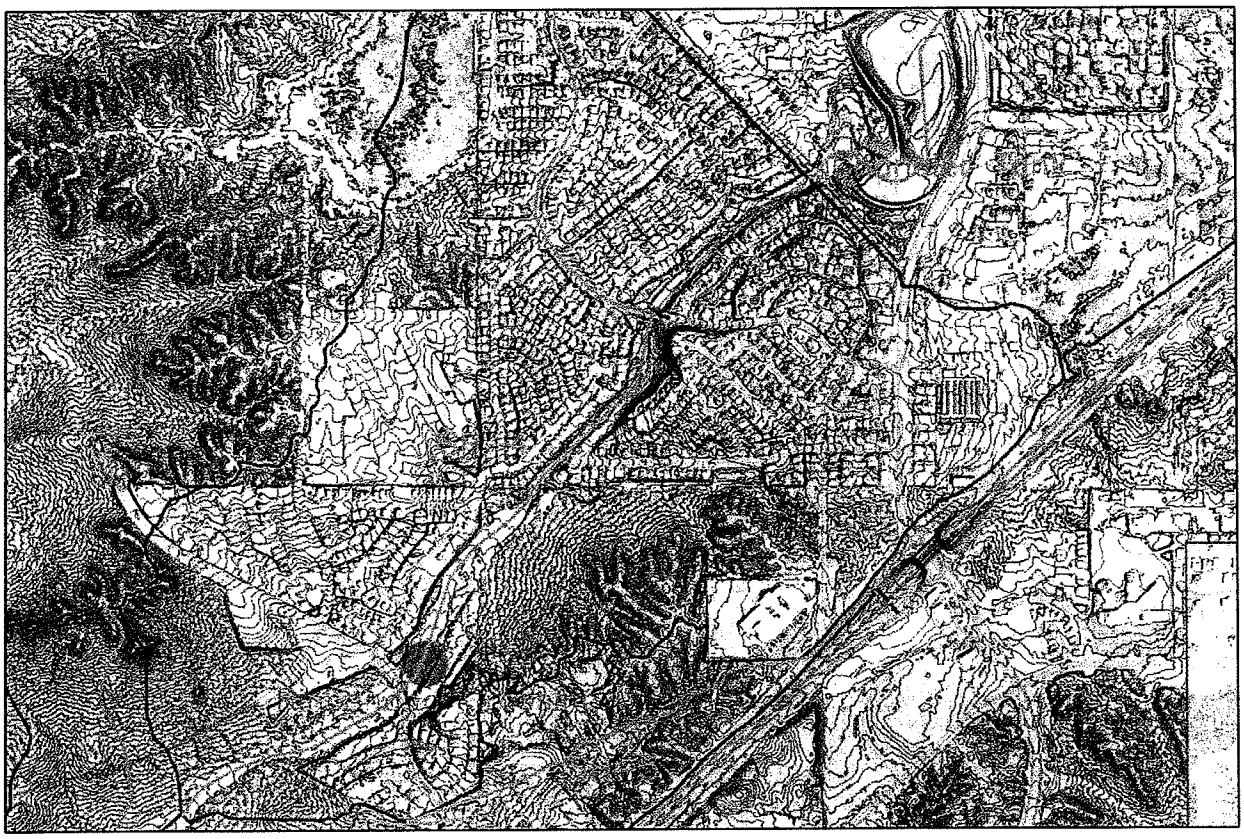
APPENDIX 4 ARROYO MODELING

The existing HEC-HMS model can serve as a baseline for further development and analysis of major arroyos in the city. The model would need to be updated and expanded to consider areas upstream of the flood control dams. Data sets that would be needed to complete this task include, but are not limited to, topography, land use, rainfall, and soil type. It is important to carefully define the boundaries of the major arroyo under analysis, and to use 2-foot contour lines where possible. Contour lines aid in the determination of flow patterns by defining the behavior of crest points that separate flow directions within the watershed. Contour maps that are then projected onto soils maps provide important information about infiltration and runoff behavior, and can be used for informed decision-making about development adjacent to major arroyo systems. Soils are also a determining factor for vegetation, which also is a factor for hydrologic behavior as well as sediment transport and erosion control.

The hydrologic model can be tightly coupled with a hydraulic model that would take the 100-year or 500-year storm hydrograph from the hydrologic model and map the extent of the water surface for such events. A model that has been used to a limited extent for this purpose in Las Cruces is the HEC-River Analysis System (HEC-RAS) model. Again, a new or expanded model would need to be built upstream of the flood control dams. The output water surfaces from this model would then be imported into a GIS system. The USACE has built tools to facilitate data transfer from HEC-HMS and HEC-RAS to ArcGIS, although other GIS systems could be used. Sediment transport functions within hydraulic models or other sedimentation models could also be generated to predict erosion along arroyos and adjacent areas. Erosion control strategies could include natural-based materials such as rocks/boulders and drought-tolerant vegetation as opposed to concrete where applicable.

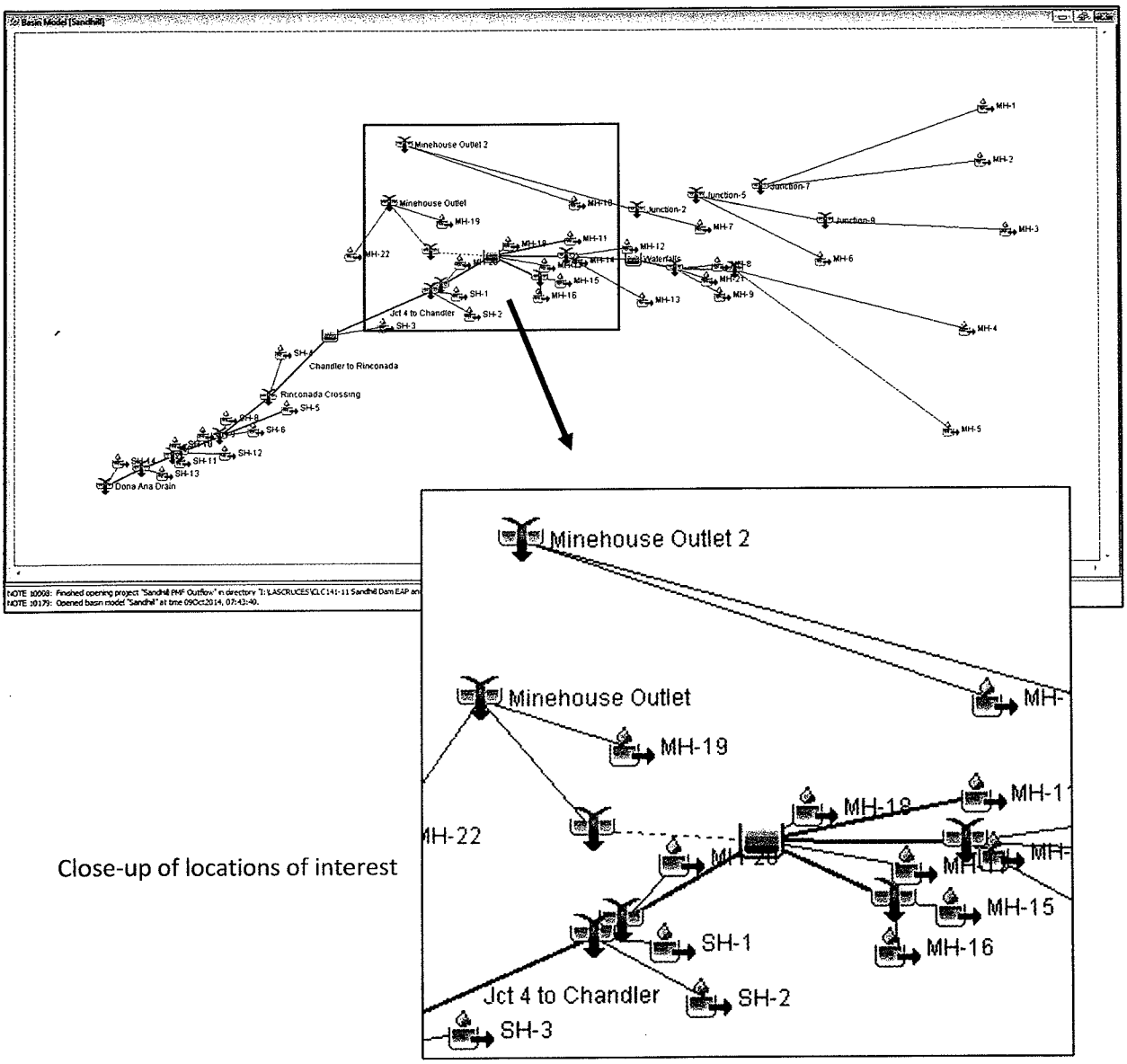
Using GIS mapping software, the aerial extent of water at the 100-year and 500-year storm could be evaluated for the presence of wildlife, proximity of a parcel to other identified open space, existing infrastructure like roads, power lines, water lines, gas, etc., and proximity to existing developments and privately owned parcels within the 100-year flood zone. Existing and proposed zoning may also be evaluated. Although HEC-HMS and HEC-RAS are free software tools that are publically available and frequently used in this type of work, there are many other available software packages that can perform the same analysis.

The Sandhill Arroyo area is used in the following example.



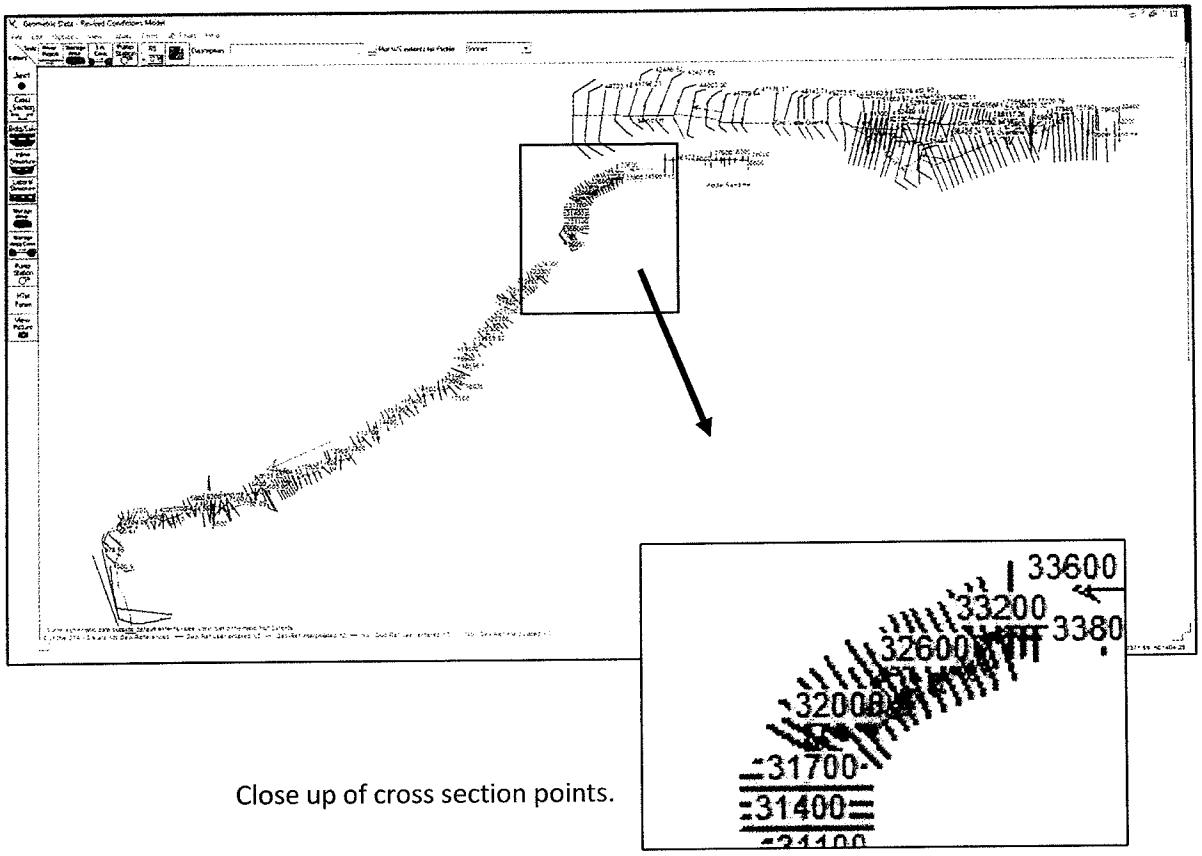
This image shows part of a watershed basin map for the Sandhill Arroyo in Las Cruces. A watershed basin map utilizes the best contour data available to map the entire watershed associated for a particular arroyo. Two-foot contours are used in this model.

The watershed is a drainage basin and its topography dictates the direction of stormwater flows and ultimately where the arroyo stormwater eventually reaches. The red lines represent the sub-basin boundaries which are individual basins isolated based on contour data. The blue lines represent the flow line within that sub-basin.



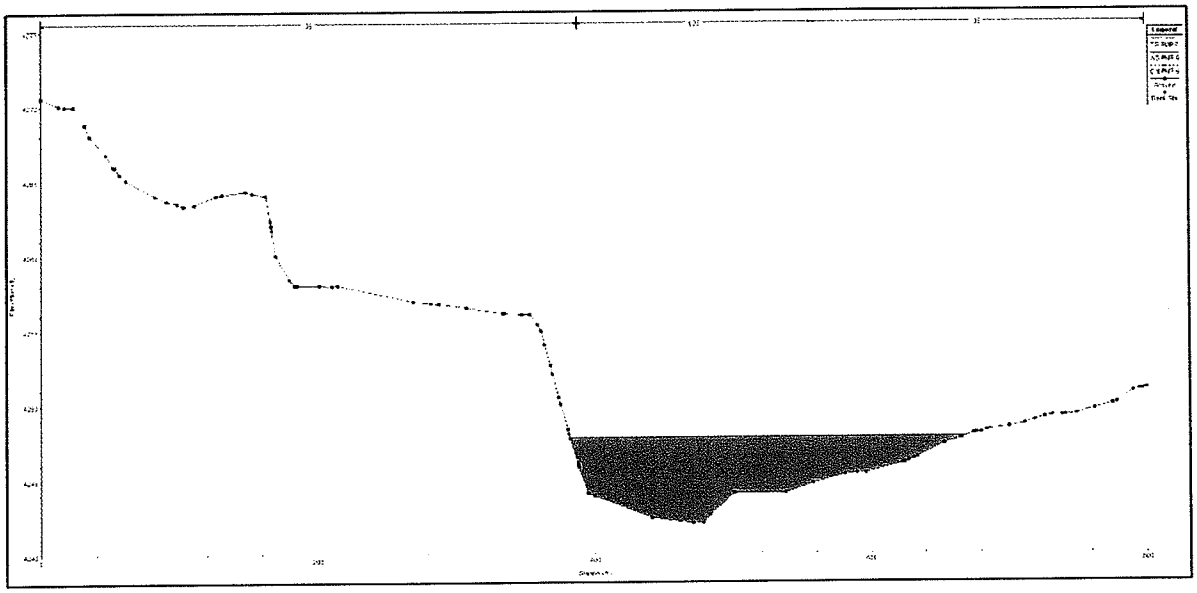
Close-up of locations of interest

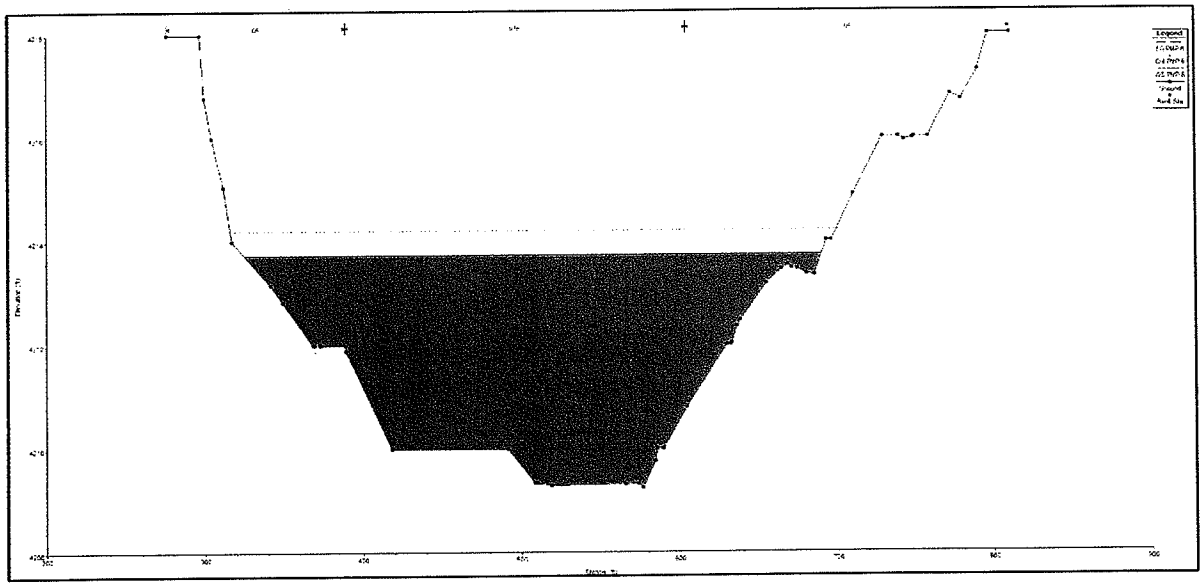
A model can be developed to represent the arroyo being analyzed. This allows engineers to use different values to determine the peak runoff rates and volumes of stormwater at different locations of interest along an arroyo. The engineer can analyze for different storm events based on storm data available, and can compare different storm analysis methods if desired. Elements are added to the model to represent a sub-basin, dam, pond, junction etc.



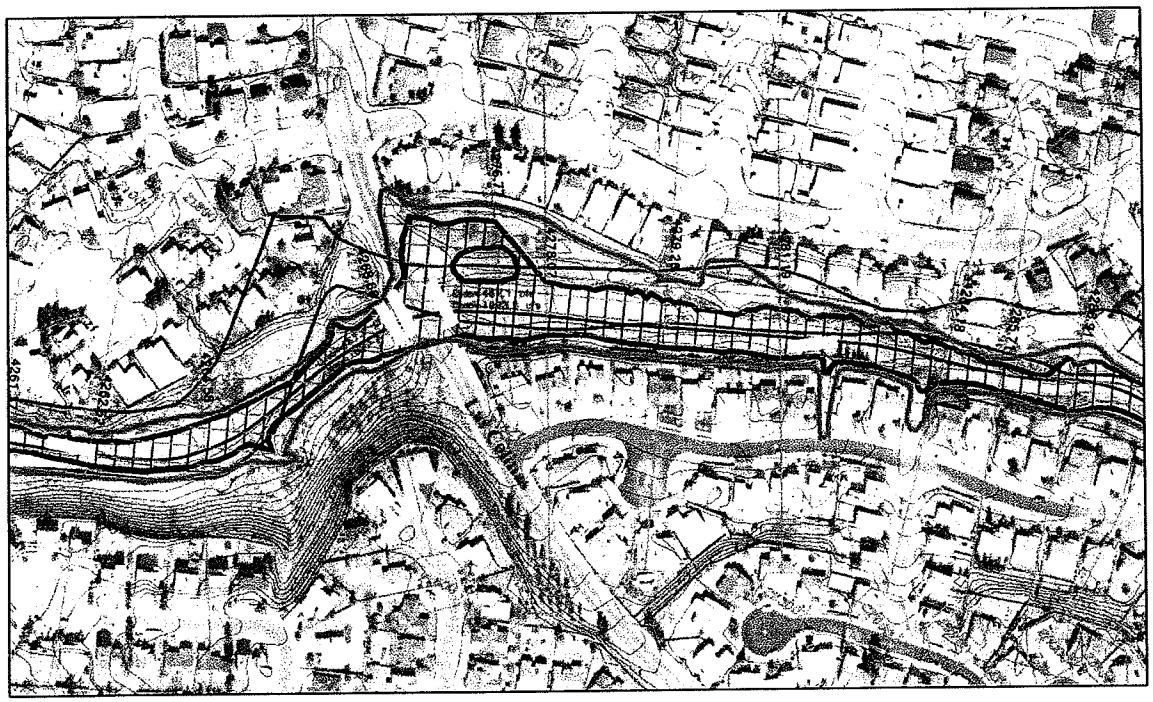
Close up of cross section points.

Evaluating the characteristics of runoff is the next step towards determining a flood zone boundary after the flow rates are determined. This image shows the cross sections that are inputted into the model. Each green line represents a cross-section of the arroyo, while the red line represents the arroyo flow path. A cross-section basically shows what the arroyo would look like if you were to stand in the arroyo and look either upstream or downstream. This information is needed so the flow limits can be modeled.





These images show the flow limit results in the model. The blue is an illustration of what the water level would theoretically look like if the arroyo carries flow as a result of the hypothetical storm analyzed in the model. Each one of the cross sections will have its own water level determination. These cross sections are plotted on a graph showing the lengths horizontally and vertically, to give the viewer an idea of the amount of water in the arroyo. The edges of the blue would be considered the flood zone boundary for that specific storm.



These images show the flood zone determination. The arroyo peak flow rates at different points along the arroyo determined for the 100-year storm are inputted into the model along with cross-section data to determine the flood zone boundary. Once the flow is modeled, the results for the flood limits are traced onto the aerial photo to determine the flood zone. The red lines represent the old 100-year flood zone. The dark blue lines represent the new 100-year flood zone based on the study. The light blue lines represent the 500-year flood zone as a result of the study.

CITY OF LAS CRUCES
ARROYO MANAGEMENT PLAN

END

City of Las Cruces
PEOPLE HELPING PEOPLE

EXHIBIT "B"

FINDINGS AND COMPRENSIVE PLAN ANAYLYSIS

The following findings of fact are relevant to the case:

On October 28, 2014, the Planning and Zoning Commission voted (5-1-0 with one absence) to recommend adoption of the Arroyo Management Plan with the following conditions:

- Correct a factual error in the Geology and Soils section of Chapter 3, Regional Characterization;
- Include conditions of arroyo modeling, i.e. an explanation, as detailed in Appendix 4, Arroyo Modeling, as an addition section of the plan narrative in Chapter 4, Issues, Challenges and Opportunities;
- Better define "buffers;"
- Clarify in the plan narrative how buffers would be determined including options for buffer uses and/or compensations to property owner.

While NMSA Article 17 Sections 72-17-1 through 72-17-103 (1968) enables the City to collect $0.50 per $1000 (0.5 mill) of net taxable value for flood control projects, earlier legislation, NMSA Article 41 Sections 3-41-1 through 3-41-5 (1965), enables the City to collect up to $5 per $1000 (5 mill) net taxable value for flood control projects. The City currently collects only $2 per $1000.

Several adopted City plans and ordinances support the adoption of an arroyo plan, most importantly:[1]

- Article I Section D of An Ordinance for the Purpose of Flood Damage Prevention (1987) calls for controlling the alteration of natural floodplains stream channels and natural protective barriers which are involved in the accommodation of flood waters; controlling filling, grading, dredging, and other development which may increase flood damage; and preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.

- The Storm Water Management Policy Plan of 1992 states as a goal to develop an overall City water system that promotes aesthetics and multiple-use activities through the use of "natural" arroyos or linear park systems, preservation of open space, and visual enhancement and calls for the adoption of an arroyo plan that would identify land use, transportation, recreation, and drainage characteristics.

- The Parks and Recreation Master Plan (2013) includes *Goal 3: Acquire and develop a high-quality, diversified system of parks, recreation facilities and open spaces that provides equitable access to all residents.*

[1] A complete review of plans and ordinances relevant to the plan may be found in Appendix 2 Planning Background.

- Comprehensive Plan 2040:
  - GOAL 10: Provide multiple mobility options and connections to move within and outside Las Cruces.
  - GOAL 12: Protect environmentally-sensitive areas, habitats, and valuable features of the existing natural environment.
  - GOAL 22: Protect those natural resources and features unique to the region.
  - GOAL 49: Establish procedural and development requirements.
  - GOAL 50: Use Best Management Practices to address stormwater run-off.

The Arroyo Management Plan integrates issues related to flood control, stormwater management, open space protection and community facilities in one document.

The New Mexico State Land Office and U.S. Bureau of Land Management have reviewed the plan and provided comments (found in Attachment "D," Public engagement compilation, June 24, 2014 to present).

Attachment "A"

City of Las Cruces

Community Development
Memorandum

TO: Robert Garza, City Manager

FROM: Carol McCall, Planner

SUBJECT: Adoption of the Arroyo Preservation Plan

DATE: November 12, 2014 File No.: M-14-229

Healthy arroyo systems impact many aspects of life in Las Cruces. The drafting of an arroyo plan has been proposed in many already-adopted City plans, including the City's Storm Water Management Policy Plan and Comprehensive Plan 2040, to further goals related to open space protection, sound stormwater management and flood control. The Arroyo Management Plan (AMP) includes policies that will support systematic flood control & drainage functions, protect arroyos in their natural state; help protect private property and accommodate and protect essential utility installation and maintenance.

The plan also proposes many quality of life benefits such as open space, trails and recreational opportunities, and view corridors of the Organ Mountains, as well as protection of wildlife habitat and natural vegetation. This policy document will guide decisions that will mostly impact undeveloped lands adjacent to the major arroyos, which include the Alameda, Las Cruces and Sandhill Arroyos among others.

The challenge in developing a comprehensive policy document for arroyo management is the ability to interconnect many different issues. Public safety, stormwater management, connectivity between recreational uses, maintenance and operations, and transportation corridors that bisect major arroyos are a few examples of the complexity of policy consideration that must take place.

Many agencies are beginning to look at arroyo management from a broader perspective -- as a watershed management strategy that integrates solutions to all of these issues, not only flood control. This approach improves sustainability and resilience, both of which are becoming common goals in land use planning. Although the City has adopted many plans with policies addressing different aspects of arroyo management, the AMP is the first plan to suggest an integrated approach.

The AMP includes seven chapters. Chapter 1, Introduction, explains the purpose of the plan and summarizes the numerous goals and policies from past plans and ordinances addressing arroyos. Chapter 2 is a glossary of terms. Chapter 3, Regional Characterization, describes our region in current terms regarding geography, climate,

watersheds, geology and soils, vegetation, wildlife, the differences in character of the East Mesa and West Mesa, the flood control dams, stormwater management and drainage, utilities, and parks and open space.

Chapter 4, Issues, Challenges and Opportunities, examines these components more closely and describes some of the problems associated with managing them successfully. Chapter 5, Goals and Policies, includes broad statements that would bring us closer to a more integrated approach to arroyo management, and offers options (policies) that can help us achieve this. Chapter 6, Administration and Implementation, takes these policies a step further and offers specific actions that, if carried out, will help achieve these goals. Chapter 7, Conclusions, summarizes the major points, goals and implementation steps in the plan.

The goals are separated into four categories: Land Use; Environment; Community Facilities; and Utilities and Stormwater Management. The AMP goals are:

Goal 1. Take a proactive approach to watershed management that takes into account existing drainage conditions as well as conditions affected by future development.

Goal 2. Improve the safety of the flood control dams and restore native vegetation in the storage pool areas.

Goal 3. Improve road crossing infrastructure.

Goal 4. Protect and maintain natural vegetation within arroyo systems and mitigate damage that may result from development.

Goal 5. Manage arroyos to retain wildlife corridors.

Goal 6. Minimize impacts created by development and human activities.

Goal 7. Create a plan for a continuous system of regional trails (MPO).

Goal 8. Create design guidelines for trails and trail crossings (MPO).

Goal 9. Create safe and effective engineering standards for flood control and conveyance.

Goal 10. Minimize soil and slope instability, erosion, sedimentation and water run-off.

Goal 11. Improve the safety and efficiency of utilities installation.

Within the planning area, arroyos and the lands adjacent to them are owned by many parties, primarily the New Mexico State Land Office, U.S. Bureau of Reclamation, City of Las Cruces and numerous private owners. While some of the policies in the plan may impact maintenance efforts in already-developed areas, the plan is primarily intended as guiding policy for public and privately-owned lands that are undeveloped.

Although land owners follow the regulations in place at the time of development (such as zoning, drainage/stormwater standards, subdivision standards, etc.), in the absence of regulation, plan policies are not binding, but can guide decision making. A central feature of the AMP is the recommendation that arroyos be studied individually at a more

detailed level using computer modeling that integrates flood control data with various geographic features of the arroyo. This would help determine appropriate arroyo protection and mitigation measures, such as buffers or other erosion control, vegetation protection, slope stabilization, etc.

The AMP includes a policy suggesting that a model be developed (Policy 1.1.) and explains what information it could provide. The plan is not intended to contain specifics about arroyo management or specific arryo protection treatments; this is something that will require various stormwater data and is more detailed than plan policy could dictate. The arroyo management modeling also takes time, and would be done on a case by case basis as funding becomes available or at the time of development.

Modeling would give engineers, developers and decision makers an up-to-date and more thorough understanding of an arroyo's character and could help predict where flood zones are, what areas are more susceptible to erosion, where development should be avoided and, as such, whether these areas may benefit from additional protection measures.

A buffer, for example, is an area adjacent to an arroyo where development may not occur or may be reduced in intensity. It would be determined starting at the boundary of the 100-year flood zone and measured laterally from that point. Over the arroyo's length, the buffer may vary, depending on the hydrology, natural vegetation, wildlife corridors, the slope of the sides of the arroyo, soil type, etc.

The Federal Emergency Management Agency (FEMA) issues maps that show the 100-year flood zone. A 100-year storm is one whose precipitation within a given period of time and resulting runoff has a one-percent (or one time in a hundred) chance of being equaled or exceeded in any given year. But these maps are based on data modeling that may not be current, and their boundaries don't go far enough east (or west, in the case of the West Mesa) to address newer development potential.

When a development is proposed, applicants must do drainage studies that pick up where the FEMA maps leave off. The process uses computer modeling that predicts certain characteristics of a hypothetical storm. Usually, topography, rainfall and soil type data are used. These are free software tools that are publically available and are frequently used in this type of work.

By adding information about the movement of sediment in the stormwater runoff, the arroyo management model can help predict erosion along arroyos and adjacent areas. Coupling this modeling with GIS mapping software, an area could be evaluated for the presence of wildlife, pockets of vegetation outside the 100-year flood zone, proximity of a parcel to other identified open space, existing infrastructure like roads, power lines, water lines, gas, etc., and proximity to existing developments and privately owned parcels within the 100-year flood zone. These results would further inform development decisions and could help determine whether a buffer might be necessary in specific areas. An ancillary benefit would be their use for open space, trails, and parks.

The determination of buffers and how wide they may be has been a major concern expressed by members of the development community. In reality, very little private land would be impacted. According to our most recent GIS data, public undeveloped land on the East Mesa comprises about 75% of the total undeveloped acreage, while privately-held undeveloped land comprises only about 25%. Of this 25%, about half – or 12.5% -- is held by development companies, and specific buffer acreages would probably impact an even smaller percentage.

The AMP proposes that protective buffers be withheld along with arroyos when the New Mexico State Land Office or the U.S. Bureau of Land Management choose to release land for development. The protected land may be retained by these respective agencies or may be dedicated to the City. Either way, the arroyos and buffers would become part of the protected open space on the East Mesa, and in years to come, on the West Mesa.

If privately held, a buffer could take the form of a linear park or trail if feasible, or a conservation easement, all of which could be offset by various incentives such as allowing density bonuses farther away from the arroyo, federal tax break, or park credits. Any of these options would be of enormous benefit to the City of Las Cruces and our community in general.

The Arroyo Management Plan proposes to establish appropriate land use practices that balance the rights of landowners with the protection of the region's unique landscapes, arid vegetation and natural wildlife habitat. It also proposes to understand the potential impacts of human actions on a regional and watershed perspective. By looking broadly at the watershed level we can help to ensure that the full potential of arroyos as a community asset is realized and in doing so, maintain the desert's ecological health over time.

Thank you.

cc: Brian Denmark, ACM/COO
Dave Weir, Community Development Director DW
Vincent Banegas, Deputy Director
Srijana Basnyat, Senior Planner SB

Attachment "B"

City of Las Cruces®
PEOPLE HELPING PEOPLE

MEMORANDUM

TO:	**Carol McCall, Community Development Department Planner**
FROM:	**Marcy Driggers, Assistant City Attorney**
SUBJECT:	**Arroyo Management Plan**
DATE:	**November 16, 2014**

When you requested my review of portions of the draft Arroyo Management Plan, I did not realize that the Planning and Zoning Commission had recommended the Plan for approval by the City Council. I would suggest Plan revisions for Council consideration for the reasons set forth below, and believe that the wording that we discussed could implement the suggested revisions as amendments to the Plan approved by the P & Z Commission:

A. I suggest setting forth the historical and statutory evolution of (1) NMSA Sections 3-41-1 through 3-41-5 (1965) entitled "Flood Control" and (2) NMSA Sections 72-17-1 through 72-17-103 entitled "Las Cruces Metropolitan Arroyo Flood Control Act" (1967), hereafter referred to as "LCMAFCA". Both state statutes provide funding sources for constructing flood control structures inside and outside of municipal boundaries but, in my opinion, LCMAFCA, which is specific to Las Cruces, is overly complicated and potentially creates an entity that City tax payers would fund but outside of City Council control. The more generalized Flood Control sections apply to all cities in New Mexico and have more taxing authority at 5 mills than LCMAFCA does at 0.5 mill. LCMAFCA creates an independent authority whose initial Board of Directors is appointed by the Governor then subsequently elected by the taxpaying electors at the same time that a proposal to incur debt is submitted to those electors.

B. I further suggest researching how much money the City has been collecting for flood control purposes. I understand that we are presently collecting a 2 mill tax levy in compliance with NMSA Section 3-41-2 and as approved by voters on October 6, 1970. SEE City Commission Resolution No. 71-63 referencing the 2

mill tax levy. Section 3-41-2 provides for a tax levy up to 5 mills and, with voter approval, could provide additional revenue for flood control purposes beyond the 2 mills currently being collected. For your easy reference Sections 3-41-1 through 3-41-5 are attached.

Enc. as noted

by the inhabitants of the municipality, from any person, corporation or organization owning, controlling or maintaining the cemetery.

B. Any cemetery accepted by the cemetery board as provided in this section shall become part of the municipality and shall be governed as any other municipal cemetery is governed.

History: 1953 Comp., § 14-41-8, enacted by Laws 1965, ch. 300.

3-40-8. Deeds to burial lots; execution.

The municipality in disposing of a burial lot may execute a deed conveying title to a purchaser. The deed is to be executed by the mayor and attested to by the clerk and bear the seal of the municipality.

History: 1953 Comp., § 14-41-9, enacted by Laws 1973, ch. 395, § 7.

Repeals and reenactments. — Laws 1973, ch. 395, § 7, repeals 14-41-9, 1953 Comp., relating to execution of deeds to burial lots, and enacts the above section.

Am. Jur. 2d, A.L.R. and C.J.S. references. — Personal representative or heir, right to sell burial lot owned by deceased, 76 A.L.R. 1371.

Rights and remedies as between cotenants of cemetery lots respecting burials therein, 10 A.L.R.2d 219.

To whom does title to burial lot pass on testator's death, in absence of specific provision in will, 26 A.L.R.3d 1425.

3-40-9. Acquisition or condemnation of an existing cemetery.

A. No municipality shall acquire or condemn any cemetery or part thereof unless a detailed audit listing all the assets and liabilities of the cemetery is prepared by a certified public accountant and submitted to the governing body. The municipality shall not be held liable for any liabilities not shown in the audit.

B. Any person, estate, trust, receiver or other group acting as a unit shall transfer to the municipality all records, property, trusts and other relevant material pertaining to the cemetery or part thereof acquired or condemned by the municipality. The acquisition or condemnation and transfer of a cemetery or part thereof shall be in compliance with the Endowed Care Cemetery Act [58-17-1 to 58-17-17 NMSA 1978] and other provisions relating to cemeteries or any part thereof.

History: 1953 Comp., § 14-41-10, enacted by Laws 1973, ch. 395, § 8.

Repeals and reenactments. — Laws 1973, ch. 395, § 8, repeals 14-41-10, 1953 Comp., relating to acquisition or condemnation of an existing cemetery, and enacts the above section.

ARTICLE 41
Flood Control

Sec.
3-41-1. Flood control; authorization.
3-41-2. Flood control; tax levy; limitations; election; result; bond issue may supplement; levy.
3-41-3. Flood control; eminent domain; condemnation.
3-41-4. Flood control; right of entry; obstructing.
3-41-5. Flood control; cooperation with other public agencies.

3-41-1. Flood control; authorization.

A. For the purpose of protecting its inhabitants from damage by flood waters, a municipality may construct and maintain within or without the municipality:

(1) dikes;
(2) dams;
(3) embankments;
(4) ditches;
(5) storm sewers;

(6) structures; or

(7) excavations necessary to prevent flood waters from damaging property or threatening human lives within the municipality.

B. The municipality may change, extend, widen, deepen and raise the natural channel of any stream within or without the municipality or remove any obstruction in any stream within or without the municipality for the purpose of opening a channel and diverting flood waters.

History: 1953 Comp., § 14-42-1, enacted by Laws 1965, ch. 300.

Cross references. — For municipal powers regarding flood and mudslide hazard areas, see 3-18-7 NMSA 1978. For county flood control, see 4-50-1 NMSA 1978 et seq.

Law reviews. — For article, "Existing Legislation and Proposed Model Flood Plain Ordinance for New Mexico Municipalities," see 9 Nat. Resources J. 629 (1969).

Am. Jur. 2d, A.L.R. and C.J.S. references. — 50 Am. Jur. 2d Levees and Flood Control §§ 2, 4.

Flood protection measures, 5 A.L.R.2d 57.

Right of riparian owner to construct dikes, embankments, or other structures necessary to maintain or restore bank of stream or to prevent flood, 23 A.L.R.2d 750.

Injunctive relief against diversion of water by municipal corporation or public utility, propriety of, 42 A.L.R.3d 426.

Liability of governmental entity for issuance of permit for construction which caused or accelerated flooding, 62 A.L.R.3d 514.

52A C.J.S. Levees and Flood Control §§ 3, 4.

3-41-2. Flood control; tax levy; limitations; election; result; bond issue may supplement; levy.

A. A municipality may levy a tax upon all property subject to property taxation within the municipality for such length of time as is necessary to accomplish the purpose authorized in Sections 3-41-1 and 3-41-3 NMSA 1978. The rate of the tax authorized by this subsection shall not exceed five dollars ($5.00), or any lower maximum amount required by operation of the rate limitation provisions of Section 7-37-7.1 NMSA 1978 upon a tax levied under this section, on each one thousand dollars ($1,000) of net taxable value, as that term is defined in the Property Tax Code [Articles 35 to 38 of Chapter 7 NMSA 1978].

B. Before levying the tax, the municipality shall submit to the qualified electors of the municipality the question of levying the tax. The question may be submitted at any regular or special municipal election called for that purpose. Notice of the election shall be given as provided in the Municipal Election Code [Chapter 3, Articles 8 and 9 NMSA 1978] for special elections.

C. The municipality shall print the words "For tax levy for flood protection purposes" and "Against tax levy for flood protection purposes" or words of like import. The vote upon the question shall be separately canvassed as other municipal elections are canvassed.

D. If a majority of the votes cast favor the levy of the tax, the governing body shall levy and certify the levy as any other tax is levied for municipal purposes.

E. Nothing in this section shall be construed as prohibiting the issuance of negotiable bonds as authorized in Section 3-30-5 NMSA 1978 to pay the cost of preventing flood damage.

F. If a county has levied a tax for flood control purposes as authorized in Sections 4-50-1 through 4-50-9 NMSA 1978 or any other law, the municipality is not prohibited from levying a tax as authorized in this section.

History: 1953 Comp., § 14-42-2, enacted by Laws 1965, ch. 300; 1981, ch. 37, § 56; 1985, ch. 208, § 118; 1986, ch. 32, § 1.

The 1985 amendment substituted "the Municipal Election Code for special elections" for "Section 3-8-2 NMSA 1978" at the end of Subsection B.

The 1986 amendment, in the catchline, substituted "limitations" for "limitation"; in Subsection A, substituted "upon" for "not exceeding in any one year five mills on the dollar of the net taxable value, as that term is defined in the Property Tax Code, of" in the first sentence and added the last sentence; in Subsection B, substituted "tax" for "taxes" in the first sentence.

County construction within city limits. — Sandoval County could use county flood funds to construct flood control structures located within the county and within the drainage area as set forth in 4-50-2 NMSA 1978, when necessary to prevent flood waters from rivers or streams from damaging life and property, even if the structures lay within the Rio Rancho city limits. 1988 Op. Att'y Gen. No. 88-30.

Am. Jur. 2d, A.L.R. and C.J.S. references. — 70 Am. Jur. 2d Special or Local Assessments §§ 30, 31.

52A C.J.S. Levees and Flood Control §§ 28 to 40.

3-41-3. Flood control; eminent domain; condemnation.

A. A municipality may acquire by condemnation land, easements and right-of-way within or without the municipality for any construction as authorized in Section 3-41-1 NMSA 1978, or the removal of any obstruction in a stream.

B. The proceedings for condemnation shall be as authorized by law. If the governing body determines that the compensation awarded by the commissioners, as provided in Section 42-1-3 NMSA 1978 is more than the municipality should pay or is able to pay, the municipality, before taking possession of the property or removing any obstruction, may dismiss the proceedings for condemnation and is relieved of any obligation to pay compensation.

History: 1953 Comp., § 14-42-3, enacted by Laws 1965, ch. 300; 1969, ch. 251, § 10.

Compiler's notes. — Section 42-1-3 NMSA 1978, referred to in Subsection B, was repealed by Laws 1981, ch. 125, § 62. For present provisions concerning condemnation, see 42A-1-1 to 42A-1-34 NMSA 1978.

Am. Jur. 2d, A.L.R. and C.J.S. references. — 26 Am. Jur. 2d Eminent Domain § 65.

Compensation for diminution in value of the remainder of property resulting from taking or use of adjoining land of others for the same undertaking, 59 A.L.R.3d 488.

29A C.J.S. Eminent Domain § 39.

3-41-4. Flood control; right of entry; obstructing.

A. An employee or representative of a municipality has free and unobstructed ingress and egress on any land or premise if such ingress or egress is necessary to carry out the provisions of Sections 3-41-1 through 3-41-5 NMSA 1978, and is not liable for damages because of such entry except for wanton and malicious injury. Any person obstructing such ingress or egress is guilty of a misdemeanor.

B. If the state engineer files a written objection with the governing body, no dike, embankment, dam, ditch, structure or excavation shall be constructed or maintained in any public stream except in a manner approved by the state engineer.

History: 1953 Comp., § 14-42-4, enacted by Laws 1965, ch. 300.

3-41-5. Flood control; cooperation with other public agencies.

A municipality may cooperate with:

A. any other municipality;

B. any county or any flood control authority;

C. the state of New Mexico; or

D. any agency of the United States, in carrying out the objectives of Sections 3-41-1 through 3-41-5 NMSA 1978.

History: 1953 Comp., § 14-42-5, enacted by Laws 1965, ch. 300.

ARTICLE 42

Franchises to Public Utilities

Sec.

3-42-1. Franchises; authorization.
3-42-2. New municipality required to grant franchise when right-of-way granted by county commissioners.

3-42-1. Franchises; authorization.

A. A municipality may grant, by ordinance, a franchise to any person, firm or corporation for the construction and operation of any public utility.

Attachment "C"

CITY OF LAS CRUCES
ARROYO MANAGEMENT PLAN

"Tracked changes"

November 12, 2014

Tracked changes in this document, Attachment "A," reflect the following revisions:

Planning and Zoning Commission conditions from October 28, 2014 public hearing:

- Correct a factual error in the Geology and Soils section of Chapter 3, Regional Characterization
  - Pages 23-24

- Include conditions of arroyo modeling, i.e. an explanation, as detailed in Appendix 4, Arroyo Modeling, as an addition section of the plan narrative in Chapter 4, Issues, Challenges and Opportunities
  - Pages 35-36

- Better define "buffers" and clarify in the plan narrative how buffers would be determined including options for buffer uses and/or compensations to property owner
  - Pages 9-10
  - Pages 35-36
  - Pages 37-38
  - Page 69
  - Pages 76-77

In addition, the City's Legal Department has recommended the following revisions:

- Additional information on history of flood management legislation in the Planning Background section of Chapter 1, Introduction
  - Page 6
- Revise proposed actions regarding funding strategies and regional stormwater management strategies in Chapter 6, Administration and Implementation
  - Pages 70, 71, 74

ACKNOWLEDGEMENTS

CITY COUNCIL

Mayor: Ken Miyagishima
District 1: Councillor Miguel G. Silva
District 2: Councillor Greg Smith, Mayor Pro-Tem
District 3: Councillor Olga Pedroza
District 4: Councillor Nathan Small
District 5: Councillor Gill Sorg
District 6: Councillor Cecelia Levatino

PLANNING AND ZONING COMMISSION

District 1: William Stowe, Vice-Chair
District 2: Charles Beard, Secretary
District 3: Ruben Alvarado
District 4: Godfrey Crane, Chairman
District 5: Joanne Ferrary
District 6: Kirk Clifton
Mayoral Appointee: Charles Scholz *(until February 2014);* Harvey W. Gordon

CITY MANAGER

Robert Garza, P.E.

ASSISTANT CITY MANAGERS

Brian Denmark, AICP - ACM/COO
Mark Winson, P.E. - ACM/CAO

COMMUNITY DEVELOPMENT DEPARTMENT

David Weir, AICP - Director
Vincent M. Banegas, AICP - Deputy Director
Paul Michaud, AICP, Senior Planner *(until March 2014)*
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CHAPTER 1. INTRODUCTION

Arroyos are recognizable geographic features of the southwestern Chihuahuan Desert surrounding Las Cruces, New Mexico. Arroyos provide natural pathways for surface water runoff to flow from higher elevations to low-lying lands and ultimately the Rio Grande. Vegetation in and adjacent to arroyos provides habitat for many Chihuahuan Desert wildlife species. Arroyos are non-static, living systems and their shapes, sizes, depths and directions change in response to the frequency and intensity of storm events. As both urban and rural development increases, many arroyos have been rerouted, channelized, or dammed to protect property and increase useable land. These actions have altered natural drainage function, wildlife connectivity, and the propagation of vegetation in some areas.

Surrounding Las Cruces, development and open spaces exist together, and the natural terrain is part of the community character. It has often been the practice to carve out development and leave the rest for open space, but planning for open spaces first may prove to be more valuable for property owners and the desert environment in the long run. Through sound development standards, new land uses can incorporate characteristics of the existing natural environments – topography, soils, vegetation, geology, and hydrology – so that ecologically-sensitive[1] and dynamic lands are protected. Safe and effective engineering standards for flood control, utilities, stormwater conveyance, and water storage are important factors for all development. But specifically in arroyo environments, development designs can be implemented to maintain the natural character of the arroyo. It is also important to maintain

[1] One Valley One Vision 2040 describes critical and sensitive land as "land that generally should be conserved in its natural state (e.g., surface water, floodplains, wetlands, arroyos, steep slopes, protected wilderness, wildlife habitat, tree stands, and cultural areas) in a manner that reasonably compensates, provides incentives, maintains similar existing property rights, or balances the public and property owner interests."

arroyos to ensure historical drainage patterns adhere to water quality regulations administered by the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permit program.

Arroyos can also provide a variety of recreational opportunities. Proper design of trails, trail amenities, connectivity, equestrian facilities, street crossings, parking, signage, etc. can result in opportunities that meet the needs of all users. Economic development is also impacted by how our arroyo systems are managed, as quality of life and a community's green industry become larger considerations when businesses and people choose where to relocate.

Purpose of the Arroyo Management Plan

The City of Las Cruces wants to protect the major arroyos as open space and encourages private property owners to preserve smaller tributaries where ever possible when designing new neighborhoods. Healthy arroyo systems impact many aspects of life in Las Cruces and the AMP provides policy guidance designed to improve quality of life and help accomplish the following goals:

- Protect and manage major arroyos in their natural state;
- Allow maintenance of historic flows in arroyos;
- Protect private property;
- Improve flood control & drainage functions;
- Accommodate and protect essential utility installation and maintenance;
- Improve stormwater quality;
- Strengthen compliance with the NPDES permit;
- Protect native vegetation and wildlife habitat;
- Encourage responsible and profitable development;
- Increase protected open space; and
- Increase trails, trail connectivity, and recreational opportunities.

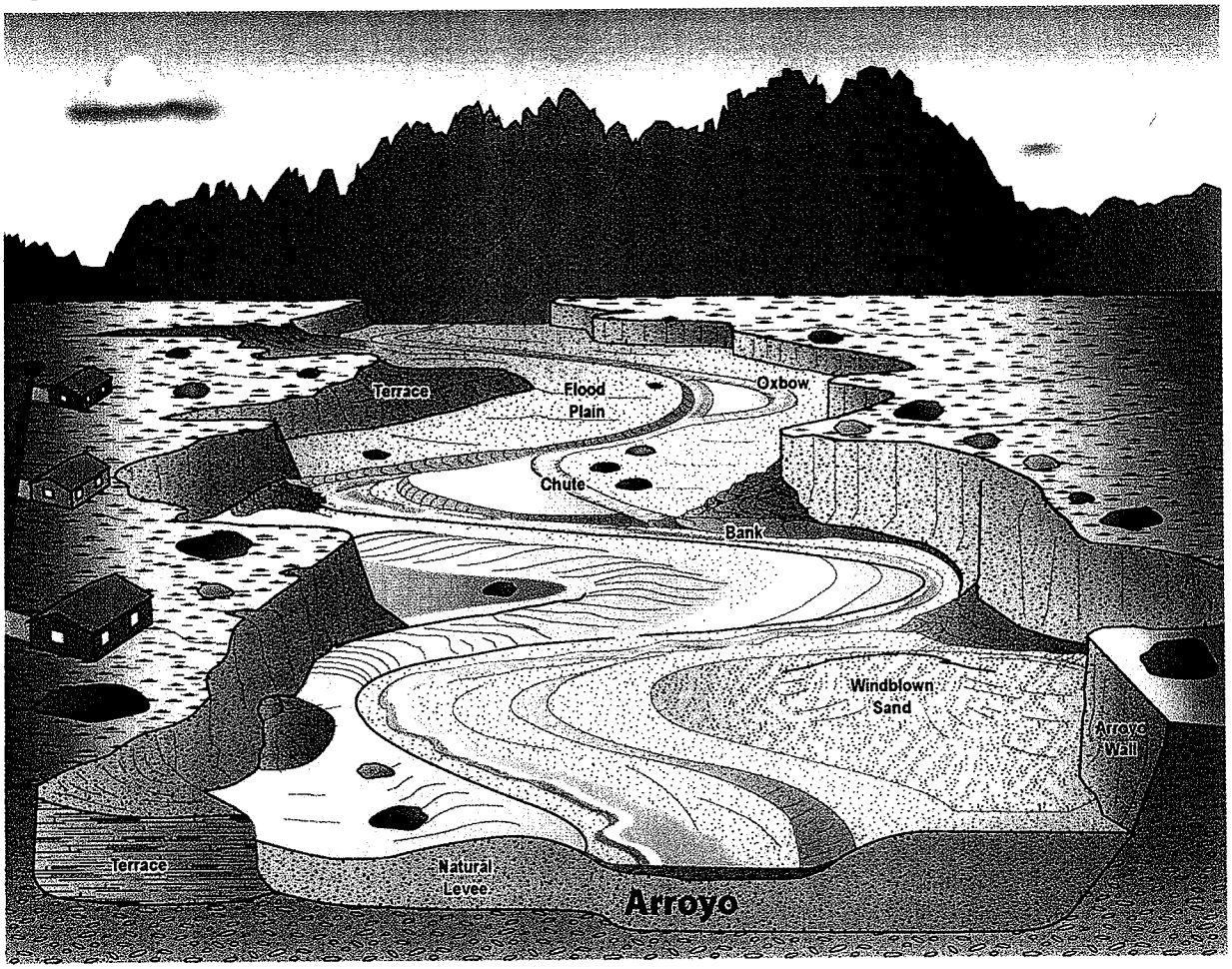
The City of Las Cruces Arroyo Management Plan will be used by the City to help guide regulations in the Development Standards, Subdivision Code (Chapters 32 and 37 respectively of the Las Cruces Municipal Code) and all other relevant codes as amended. It will guide design and development adjacent to arroyos on the East and West Mesa areas in a manner that adheres to the Comprehensive Plan, Storm Water Management Plan, Mesilla Valley MPO Transportation Plan, Parks and Recreation Master Plan, and other related plans adopted by the City. Any future action or activity that stems from the AMP policies will have a common basis for drainage management throughout the city by reducing flooding, improving water quality and mimicking the pre-development hydrologic conditions. This in turn protects the health, safety and welfare of the general public.

Geographically, the AMP includes major arroyos on the East and West Mesas, undeveloped floodways, unnamed 100-year flood zones, including areas in the Extraterritorial Zone (ETZ), and largely native areas on the West Mesa escarpment. Because most of the development in the Las Cruces area has been directed east toward the Organ Mountains, numerous studies have been completed addressing stormwater, watershed management, soils, vegetation, etc. For this reason, much of the information presented in this document is based on data collected for the East Mesa. But the AMP will guide development on the West Mesa in the same way it will on the East Mesa, and the same goals and policies will be relevant as the community grows to the west. Additional policies will address the West

Mesa escarpment where drainage to the Rio Grande varies greatly from drainage on the East Mesa. Map 1, below, shows the AMP Planning Area and the major arroyo systems.

Within this planning area, arroyos and the lands adjacent to them are owned by many parties, mainly the New Mexico State Land Office, U.S. Bureau of Reclamation, City of Las Cruces and numerous private owners. While some of the policies in the plan may guide maintenance efforts in already-developed areas, the plan is primarily intended as guiding policy for public and privately-owned lands that are undeveloped. Historically, developers have followed the regulations in place at the time of development. In the absence of regulation, plan policies are not binding, but can guide decision making. Appropriate land use practices must balance the rights of landowners with the protection of the region's unique landscapes, arid vegetation and natural wildlife habitat. It is also critical to understand the potential impacts of human actions on a regional and watershed perspective. By managing arroyo systems holistically – looking broadly at the watershed level – we can help to ensure that the full potential of arroyos as a community asset is realized and in doing so, maintain the desert's ecological health over time.

Figure 1 Arroyo Characteristics



Although every arroyo is different, this diagram shows the many elements an arroyo may have, depending on location, soils, width and the slopes of its edges.[2]

[2] Graphic by P. Bennett, after http://geochange.er.usgs.gov/sw/impacts/geology/puerco1

Map 1. AMP Planning Area

Planning Background

During the first half of the 20th century, Las Cruces was a small community and was situated in the mostly flat valley floor and stormwater runoff was easily contained on site. But capacity overload was common, resulting in frequent damage to property. This led to the more formal implementation of on-lot ponding to reduce excessive runoff in roadways. While the City recognized the need for flood control and drainage, Article 4.5 of the *Rules and Regulations Governing the Subdivision of Land within the City of Las Cruces,* adopted in 1956, makes only one indirect reference to arroyos: "The developer should keep in mind that natural watercourses can be an attractive asset to his subdivision as well as to the community and, where possible, should improve and beautify the watercourses to this end."

[The following revision, including the strikethrough and footnote, have been recommended by the City's Legal Department.]

In 1965 the New Mexico legislature enacted NMSA Sections 3-41-1 through 3-41-5, entitled "Flood Control." This legislation allows all New Mexico cities to tax property within their city limits to pay for authorized flood control structures within and without the municipal boundaries up to $5 per $1000 net taxable value (5 mill) with voter approval. Then in 1967, for unknown reasons, the New Mexico legislature cloned the Albuquerque Metropolitan Arroyo Flood Control Act and enacted NMSA Sections 72-17-1 through 72-17-103, entitled the "Las Cruces Metropolitan Arroyo Flood Control Authority," which created an independent Authority to operate a flood control system throughout the Las Cruces area. The Authority had less taxing authority than provided in the 1965 municipal Flood Control statute and there is some uncertainty as to the historical status of the Authority. Some individuals remember there being an Authority Board created but eventually it ceased meeting.[3]

~~inspired by the success of the Albuquerque Metropolitan Arroyo Flood Control Act of 1967, the City Commission (as it was known at that time) asked the New Mexico legislature to draft one for Las Cruces. Delegated through state statute, the Las Cruces Metropolitan Flood Control Authority (LCMAFCA, 1968) was formed to administer stormwater management throughout the Las Cruces area. Apparently the taxing provisions provided in the legislation were not adequate for what Las Cruces wanted and the organization was never formed.~~

The City's 1968 *Comprehensive Plan* described the conditions of the drainage system at that time: a system that "includes major drains and laterals developed for irrigation purposes and used to carry stormwater, retention dams, collection basins, open ditches, storm drainage and the major arroyos. The existing storm drainage facilities are not adequate" because the dams were not designed for high hazard duty, and the open ditches were primarily agricultural drains designed for water table control, not high storm water flows. The excessive surface flow resulted in street flooding, washing out of unpaved streets and property damage. According to the plan, "the open ditches and storm drains that are available offer some protection to the areas they serve, but even these facilities are generally inadequate or create problems where a ditch ends and the water must revert to surface flow." The Capital Improvement Program section of the plan addressed these problems by proposing storm sewer improvements and a major retention dam along the east side of Interstate 25. Now known as the Las

[3] The 1965 legislation provides up to $5 per $1000 (5 mill) taxing authority. Currently, the City of Las Cruces is collecting $2 per $1000 (2 mill) net taxable value for flood control purposes. By comparison, the 1967 Authority legislation enables the City of Las Cruces to tax properties within the boundaries of the authority only up to $0.50 per $1000 (0.5 mil) of net taxable value per NMSA Section 72-17-22(J) as indicated by the City Attorney's office.~~Email, Marcy Driggers, 4/21/2008~~

Cruces Flood Control Dam, it was a joint project between the City of Las Cruces and the U.S. Army Corps of Engineers and was completed in 1975.

The 1975 *City of Las Cruces Land Subdivision Regulations* also included a design standards section that dealt with drainage issues. However, the standards don't include specific requirements for construction and as growth increased, developers, builders, property owners, City officials, etc., found them inadequate to regulate development. Arroyos are not specifically mentioned in these regulations.

The City continued addressing stormwater management by adopting an ordinance in 1987 that established more detailed regulations for flood control. *An Ordinance for the Purpose of Flood Damage Prevention* called for: restricting or prohibiting uses that were dangerous to health, safety or property in times of flood or that would cause excessive increases in flood heights or velocities; controlling the alteration of natural floodplains, stream channels and natural protective barriers; and regulating the construction of flood barriers which may unnaturally divert flood waters or which may increase flood hazards to other lands.

Flood control standards continued to evolve in the 1990's. The City's *Storm Water Management Policy Plan* (November 1992) states as a goal, to "develop an overall City storm water system that promotes aesthetics and multiple-use activities through the use of 'natural' arroyos or linear park systems, preservation of open space, and visual enhancement." It identified the following arroyos as suitable for open space corridors: Fillmore Arroyo, Telbrook Arroyo, segments of Little Dam Arroyo, North and South Fork Las Cruces Arroyo, Alameda Arroyo, a segment of Sandhill Arroyo and unnamed major arroyos as identified on the Major Arroyo Corridor Identification Map. The Storm Water Management Policy Plan also calls for a Major Arroyo Plan, which would identify how each major arroyo would be used. A plan was not drafted at that time.

The City's 1999 *Comprehensive Plan* addressed arroyo preservation in a more meaningful manner. It called for the creation of a major arroyo plan with policies to protect and maintain the existing natural environment and to minimize impacts created by development. It addressed safe hillside and escarpment development, and the use of arroyo systems as trails and trail connections. Also, for the first time in the City's comprehensive plan, the topic of the physical health of residents was addressed: the 1999 Plan included policies that supported ways to promote physical activity thereby improving the overall health of our communities. The *Draft Storm Water Management Plan* (SWMP), adopted in 2009, outlines the City's 5-year program to comply with the EPA's Final NPDES General Permit for Small Municipal Separate Storm Sewer Systems (MS4s) in New Mexico to improve stormwater quality in accordance with the Clean Water Act of 1972. The SWMP describes six minimum control measures, which if carried out, would significantly reduce pollutants being discharged into the stormwater drainage system, and ultimately the river. The City's Public Works Department adopted the EPA's Best Management Practices (BMP) to address each of the six areas. They include public education and involvement, discharge detection and elimination, construction site storm water runoff control, post-construction stormwater management, and pollution prevention for municipal operations.

The Mesilla Valley Metropolitan Planning Organization's (MPO) *Transport 2040 Transportation Plan*, adopted in June 2010, includes policies to identify major arroyos in the Las Cruces area as potential trail corridors. Its Trail System Priorities map contains text on a tiered network of trails, examples of improved and unimproved trail facilities, and a discussion of potential pavement types. The aim of these policies is to provide a variety of transportation choices that serve all users by developing safe, reliable, and convenient non-motorized transportation modes, i.e. pedestrian and bicycle facilities.

The *One Valley One Vision 2040 Regional Plan*, adopted in 2012, reinforces various arroyo policies found in the *1999 Comprehensive Plan* and *Transport 2040*. It calls for the preservation of open space; improving our water supply by better management of stormwater and the effects of erosion; providing an adequate network of corridors for wildlife (e.g., buffer zones adjacent to arroyos or wildlife over/under passes); developing strategies for low-impact recreation along arroyo buffers; and increasing access to non-motorized transportation options to promote healthy living and provide mobility alternatives. *One Valley One Vision 2040* also supports an arroyo and open space management plan that would "help protect our sensitive environmental resources".

The *Parks and Recreation Master Plan*, updated in 2013, suggests integrating the siting of proposed trail segments into the development design process and requiring development projects along designated trail routes to incorporate the trail as part of the project. It also supports the MPO's *Transport 2040's* Trail Plan by calling for a comprehensive parks and trails facilities mapping program that promotes active lifestyles in Las Cruces and integrating arroyos into the trail system. Additional policies address trail accessibility for all users and promote an open space protection program.

The 1999 Comprehensive Plan was amended in 2013 as *Comprehensive Plan 2040* and carries these policies forward to present day. In addition, the Future Concept Map in the amended plan specifically calls for "conservation areas" consisting of areas of historical, cultural, environmental value or open areas that could become community assets and are worth conserving, such as arroyos (Goal 35, Policy 35.1). At present, the 2001 Zoning Code as amended has three zoning districts related to open space and arroyos: Flood Control (FC); Open Space-Recreation (OS-R); and Open Space-Natural/Conservation (OS-NC).

For a comprehensive listing of the goals and policies in the plans and ordinances noted above, see Appendix 2, Planning Background.

CHAPTER 2. GLOSSARY AND ACRONYMS

Access points: Low impact areas that form entrances into the arroyo buffer from adjacent urbanization. These points provide access for pedestrians, cyclists, equestrians, and, occasionally, motor vehicles for purposes of maintenance and operations.

Alluvial fan: A fan-shaped pile of sediment that forms where a rapidly flowing watercourse enters a relatively flat valley. As water slows down, it deposits sediment (alluvium) that gradually builds the fan shape.

Arroyo: The American Geological Institute Glossary (1972) defines an arroyo as "a deep, flat-floored channel or gully of an ephemeral stream or of an intermittent[4] stream usually with vertical or steeply cut banks of unconsolidated material at least 60 centimeters *(2 feet)* high, that is usually dry, but may be transformed into a temporary water course or short lived torrent after heavy rains." Also called a wash or draw.

Major arroyo means any channel whose watershed exceeds 320 acres in a 100-year design storm, whether the watershed is in its natural or unaltered state or has been altered by development, runoff diversions, or detention facilities.[5]

Natural arroyo is an arroyo that has not been directly altered by human intervention.

Naturalistic arroyo corridor is an arroyo that has been directly altered by human intervention and in which non-continuous or limited erosion protection measures have been installed to prevent damage to infrastructure while maintaining the natural bed and bank materials.

Arroyo boundary: The elevation line on the banks of an arroyo that represents the lateral reach and depth of water calculated from a 100-year flood event.

Arroyo buffer: The area adjacent to an arroyo where development may not occur or may be reduced in intensity. It would be determined starting at the boundary of the 100-year flood zone and measured laterally from that point. ~~, usually extending laterally beyond the 100-year flood~~

[4] Ephemeral flows carry water only during and immediately after a rain, and intermittent flows carry water for only part of the year.

[5] Las Cruces Municipal Code, Chapter 32 Design Standards

~~zone.~~ Over the arroyo's length, the buffer may vary, depending on the hydrology, natural vegetation, wildlife corridors, the slope of the sides of the arroyo, soil type, etc. Buffer distances could be determined using similar computer modeling software that is used to determine flood zone boundaries and buffer widths would be identified on a case by case basis.

Arroyo system: A major arroyo, its buffers and tributaries that, integrated, form an unaltered, natural drainage area.

Best Management Practices (BMPs): Management measures or practices used to protect air, soil, or water quality or reduce the potential for pollution associated with storm water runoff. BMPs may be a structural device or non-structural practice, including processes, land use alternatives, activities, or physical structures.

BMPs, structural: Engineering solutions to stormwater management. Structural BMPs are used to treat stormwater at the point of generation, the point of discharge, or at any point along the stormwater "treatment train." Structural BMPs can serve many different functions based on their design. Common examples of structural BMPs usually found within urban areas include stormwater ponds and open channels (swales).

BMPs, non-structural: Those BMPs in which there are no physical structures associated. Nonstructural BMPs are designed to limit the amount of pollutants available in the environment that would potentially end up in stormwater runoff, and typically lessen the need for the more costly structural BMPs. Natural elements include floodplains, wetlands, forests and riparian buffers. Nonstructural BMPs may also be achieved through such things as education, management, and development practices.

Buffer: See "Arroyo buffer"

Channel: Any arroyo, stream, swale, ditch, diversion, or watercourse that conveys storm runoff, and including structural facilities.

Channel stability: A condition in which a channel neither degrades to the degree that structures, utilities or private property are endangered, nor aggrades to the degree that flow capacity is significantly diminished as a result of one or more storm runoff events or moves laterally to the degree that adjacent property is endangered.

Channel treatment measure: A physical alteration of a channel for any purpose.

Climate change: Any substantial change in measures of climate (such as temperature or precipitation) lasting for an extended period (decades or longer). Climate change may result from natural factors and processes or from human activities.

Design storm: A storm that deposits a stated amount of precipitation within a stated period over a defined area and which is used in calculating storm runoff and in designing drainage control, flood control and erosion control measures.

Detention facility: Basin whose outlet has been designed to detain stormwater runoff for some minimum time (e.g., 24 hours) to allow soil particles and associated pollutants to settle. Unlike retention ponds, these facilities do not have a large permanent pool of water.

Disturbed area: Any area in which the soil will be altered by grading, leveling, scraping, cut and fill activities, excavation, brush and timber clearing, grubbing, and unpaved soils on which vehicle operations and/or movement will or has occurred.

Drainage: Movement of waters through a watershed that is collected from higher elevation or surrounding lands, eventually reaching a lower elevation waterbody like a river or ocean.

Drainage course: A natural watercourse for the drainage of surface waters.

Drainage plan: A plan indicating an on-site drainage proposal for developed land, outlining the passage of stormwaters through the development and safe discharge of runoff onto adjacent lands or into storm drainage facilities. Also, a drainage plan provides a comprehensive analysis of (i) the existing storm drainage conditions of a proposed development, and (ii) the detention/retention of the increased runoff which is generated by the development.

Easement: The right, liberty, advantage or privilege that one individual or entity has in land of another, either express or imputed (utility, grant, or necessity).

Encroachment: Any man-made obstruction in the floodplain that displaces the natural passage of flood waters.

Erosion: The transport of soil particles, or mass movement of soil. Caused by water, wind, or mechanical means.

Erosion control:	Treatment measures for the prevention of damages due to erosion and soil deposition from the ten-year design storm runoff.
Escarpment:	A long, steep slope, such as a slope at the edge of a plateau or separating areas of land at different heights.
FEMA:	Federal Emergency Management Agency. FEMA's primary purpose is to coordinate the response to a disaster that has occurred in the United States, such as flood events.
Finger:	A small arroyo or gully that forms a fan-shaped extension at the head of a system of arroyos.
Flood control:	Treatment measures necessary to protect life and property from the 100-year design storm runoff.
Flood hazard area:	An area inundated by a flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA).
Floodplain:	A relatively flat or low land area adjoining a river, stream or watercourse that is subject to partial or complete inundation by floods.
Floodway:	The channel of a river or watercourse and adjacent areas that must be reserved from development in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than one foot (cumulatively one foot for all changes).
Flood zone:	Geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. These zones are depicted on the published Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map (FHBM). For the purposes of this document, flood zone is used to describe an area subject to inundation from the 100-year design storm runoff.
Green infrastructure:	Infrastructure associated with stormwater management that utilizes low impact development techniques to infiltrate, evapotranspire, capture, and reuse stormwater to maintain or restore pre-development hydrology.
Historic flows:	Those flows naturally present in the drainage area prior to any disturbance by development within the upstream watershed.

Hydrology, pre-development: The combination of runoff, infiltration, and evapotranspiration rates and volumes that typically existed on a site before human-induced land disturbance occurred (e.g., construction of infrastructure on undeveloped land such as meadows or forests).

Las Cruces Municipal Codes (LCMC): Las Cruces Municipal Codes found at: www.municode.com/library/nm/las_cruces

Low impact development (LID): A stormwater management approach that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives.

Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances (including roads and municipal streets with drainage systems) which is used for collecting and conveying storm water and that is owned or operated by a public entity that is a designated and approved management agency under Section 208 of the Clean Water Act. Operators of MS4s can include municipalities, local sewer districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities.

Native plants: Plants that are indigenous to the region or are from other places that have become established in wild lands without cultivation.

Natural cover: Vegetation, exposed rock, or barren ground that exists prior to commencement of earth-disturbing activities or vegetation achieved through restoration back to a natural state.

National Pollutant Discharge Elimination System (NPDES): The national permit program for administering and regulating Sections 307, 318, 402, and 405 of the Clean Water Act. The program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES General Permit specifies by what conditions construction activities may discharge stormwater.

One hundred-year flood (100-year): A storm whose precipitation within a given period of time and resulting runoff has a one-percent (or one time in a hundred) chance of being equaled or exceeded in any given year. It is also referred to as 100-year design storm.

Open space: The area of a lot, tract, or parcel not devoted to any building or structure, driveway, parking lot or stall, or

street. The term generally refers to natural or undeveloped land.

Path: See "Trail"

Retention facility Constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season). Ponds treat incoming stormwater runoff by allowing particles to settle and algae to take up nutrients. Also called wet ponds, and are used as a common stormwater management BMP.

Scenic corridor: A single-loaded street that abuts open space lands such as arroyos, the Organ Mountains, the Rio Grande, or designated protected lands such as an area of critical environmental concern (ACEC) as defined by the U.S. Bureau of Land Management, and provides a scenic view.

Sediment: Loose particles of sand, clay, silt, and other organic substances that settle at the bottom of a body of water. Sediment can come from the erosion of soil or from the decomposition of plants and animals.

Setback: The minimum distance from the property line to where a structure may be built, as regulated by zoning statutes or restrictions in the deeds in various locales.

Site planning: Analysis of a proposed development area to ensure that stormwater management and impact to environmental features are considered early in the development process.

Slope: An inclined piece of land, three feet or higher vertical rise, with a five horizontal to one vertical incline or greater.

Soil cement: A mixture of sandy soil excavated on site with Portland cement. The mixture is compacted in place like earth fill and over time hardens to the consistency of sandstone.

Trail: A paved or unpaved right-of-way or grade-separated right-of-way for which primary purposes are to provide a place to walk, cycle or horseback ride, and to provide access to other areas, such as recreational facilities, neighborhoods, schools, commercial areas, etc.

Transect: A geographical cross-section of a selected environment and a master planning tool that guides the placement and form of buildings and landscape, allocate uses and densities, and may detail civic spaces. The result is a natural gradient of development that moves from large, rural lots to more compact mixed-use main streets.

Viewshed: The natural environment that is visible from one or more viewing points.

Wash: Another term for arroyo or gully.

Watershed: A basin-like landform defined by upper elevation ridgelines that descend into lower elevations and stream valleys. A watershed acts as a drainage basin and carries precipitation (either from rainfall or snowmelt) to stream tributaries making its way to larger rivers and groundwater aquifers.

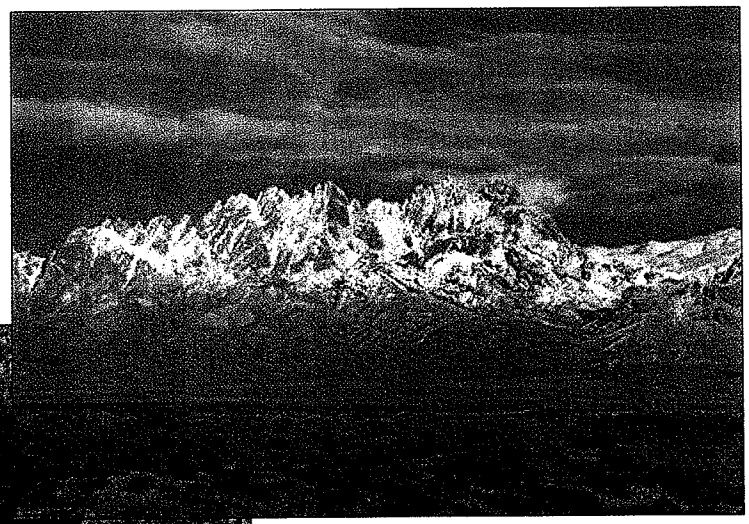
Wetland: An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

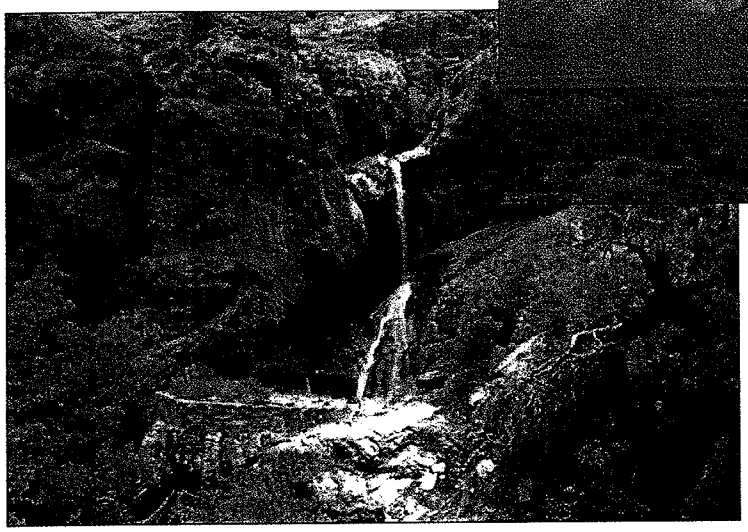
CHAPTER 3. REGIONAL CHARACTERIZATION

Las Cruces is situated in the central portion of Doña Ana County in south central New Mexico. The Organ Mountains flank the eastern part of the city, and on the north, south, and west, agriculture and open space. The area is located within the northern reaches of the Chihuahuan Desert which extends north from approximately Zacatecas, Mexico to Socorro, New Mexico, about 220,000 square miles in total area. The Chihuahuan Desert is described as a high-elevation desert because a large portion lies above 4000 feet in elevation.[6] Further west, the Rio Grande flows through the Mesilla Valley. Agriculture is one of the historical foundations of the area's culture and is one of the major sources of groundwater recharge in the region.

The Organ Mountains are the scenic backdrop to Las Cruces and are Doña Ana County's most recognizable feature. The Organ Needle is the high point in the county, at about 8,990 feet in elevation.[7] Just three miles to the west the elevation drops to about 4,000 feet, making the Organ Mountains one of the steepest mountain ranges in the western United States.

It is not uncommon to see snow in the Organs as late as May while the rest of the area enjoys milder weather. Photo: http://lascrucesblog.com/.





Dripping Springs Natural Area has over four miles of easy hiking trails that display desert scrub and low elevation pinon-juniper and oak woodlands. The area also provides wildlife viewing opportunities. Photo: www.elpasotimes.com/ living/ci_21498935.

[6] Chihuahuan Desert Nature Center, http://cdri.org
[7] Organ Mountains Desert Peaks National Monument, http://www.organmountains.org

Climate

The climate around Las Cruces is considered mild and arid or semi-arid, which is characterized by fairly hot summers and mild winters with warm spring and fall seasons. The average minimum and maximum daily temperatures in January are 21°F and 57°F, respectively, increasing to 62°F and 96°F in July. Average annual precipitation in Las Cruces is 9.23 inches and over 11 inches in the Organ Mountains. August is the wettest month with an average of 2.12 inches of precipitation and April is the driest month with an average of 0.21 inches of precipitation. The average annual snowfall in the area is 3.7 inches, typically in December, January, and February.[8]

Unlike the Sonoran and Mojave Deserts, the Chihuahuan Desert does not have a winter rainy season. Instead, over 90% of the annual rainfall occurs between the months of July and October, the period of "monsoonal" activity. Locally, "monsoons" are thought of as heavy and continuous storms, but the term refers to a system of alternating winds that shift direction because of differential heating between land and water.[9] The North American Monsoon (NAM) is characterized by shifts in summer wind patterns that occur as Mexico and the southwestern U.S. become hotter. When this happens, the prevailing winds start to flow from moist ocean areas into dry land areas, bringing moist air into Mexico in May then north to Arizona and New Mexico as summer begins.[10] These wind patterns can be erratic which then results in erratic storm activity.

El Niño and La Niña events further influence storms in the Southwest. El Niño occurs when warm water builds up along the equator in the eastern Pacific Ocean. The warm ocean surface warms the atmosphere, allowing moisture-rich air to rise and develop into rainstorms.[11] La Niña occurs when cooler than normal sea surface temperatures form along the equator, slowing cloud growth overhead. The result is usually drier than normal weather in the Southwest.[12]

Within Doña Ana County, storms are usually brief yet deliver an abundance of rain. This results in a high amount of runoff that naturally collects n arroyos and is transported or drained to the Rio Grande. The arroyos are made up of multiple intertwining channels that result from the unpredictable nature of stormwater runoff. Waters flow downhill through the watershed, collecting into larger and fewer channels until they converge in what is referred to as a "major arroyo".

Watersheds

Healthy watersheds provide three major functions. First, they transport and store water, sediment, pollutants, and organisms. Second, watersheds cycle and transform elements such as carbon, nitrogen, and phosphorus. And finally, they provide ecological succession through changes in vegetation due to movement of a watershed's energy, water, and materials. Through these functions, a watershed can provide habitats for aquatic and terrestrial organisms, and convey runoff and sediment loads out of each stream's watershed. The complex system of streams within a watershed is commonly referred to as the drainage net. Within drainage nets, small streams join or come together to form successively larger ones. This relationship, although variable in detail, holds true for watersheds of any size or extent.

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[8] National Weather Service: www.weather.gov
[9] Arizona Cooperative Extension: http://cals.arizona.edu/pubs/natresources/az1417.pdf
[10] University of Arizona Climate Assessment for the Southwest: www.climas.arizona.edu/sw-climate
[11] NASA Earth Observatory: http://earthobservatory.nasa.gov/Features/WorldOfChange/enso.php
[12] www.climas.arizona.edu/sw-climate

A watershed acts as a drainage basin and carries precipitation (either from rainfall or snowmelt), which is then channeled to stream tributaries making its way to larger rivers and groundwater aquifers. Watersheds also transport sediment, pollutants (both natural and anthropogenic), and aquatic organisms. The structure of a watershed can change over time due to shifts in soils and alluvial fans depending on hydrologic forces, land cover, and surface characteristics. In the Las Cruces area, the receiving surface water body is the Rio Grande; groundwater aquifers also receive water through seepage and infiltration. [13]

The Southwest has experienced severe drought since 2002, and questions regarding how much water is available in the region and how it will be used influence development, economic growth and every other aspect of community life. In Doña Ana County, water is strictly controlled for agricultural, domestic and industrial use, and many agencies are involved in its management. They are primarily the United States Section of the International Boundary and Water Commission (USIBWC), U.S. Bureau of Reclamation (BOR), the New Mexico Office of the State Engineer (OSE), and Elephant Butte Irrigation District (EBID). Other entities involved in water management include the New Mexico Interstate Stream Commission, the Lower Rio Grande Water Users Organization (LRGWUO), the Paso del Norte Watershed Council (PdNWC), and the South-Central New Mexico Stormwater Management Coalition.[14]

Characteristics such as land use, geology, soil type, amounts of deposited sediment and debris, and hydrologic interactions, all play a role in how a watershed drains to major rivers and aquifers. Channels can be altered considerably over time depending on hydrologic conditions. The relationship between alluvial fans and the greater watershed is significant, because extreme stormwater events can alter channel formation.

Alluvial fans are gently sloping, fan-shaped landforms common at the base of mountain ranges in arid and semiarid regions. Alluvial fans develop where streams or debris flows emerge from steep reaches to relatively straight, narrow channels then to zones that are wider and flatter. These conditions develop where there are major breaks in gradient or channel confinement, allowing both deposition of sediment and the lateral movement of channels to spread the sediment into fan-shaped landforms. An undisturbed upstream alluvial fan is important to the health of the entire arroyo system. Proper infiltration and drainage within the alluvial fan can lead to more natural and consistent downstream tributary flows.

Alluvial fans are made of sediments that are deposited where a stream or river leaves a defined channel and enters a broader and flatter floodplain. As the flow path spreads out, conveyance is reduced and active erosion, sedimentation, deposition and unpredictable flow paths can inundate the low-lying areas. Alluvial fans can convey high flood risk and be even more dangerous than the upstream canyons that feed them. Their slightly convex perpendicular surfaces cause water to spread widely until there is no zone of refuge. [15] If the gradient is steep, active transport of materials down the fan creates a moving substrate that is inhospitable to travel on foot or wheels. But as the gradient diminishes downslope, water comes down from above faster than it can flow away downstream, and may pond to hazardous depths. When the stream repeatedly deposits sediment into its floodway and channel bed, the conveyance capacity of the channel is quickly exceeded resulting in overbank flooding, erosion and the

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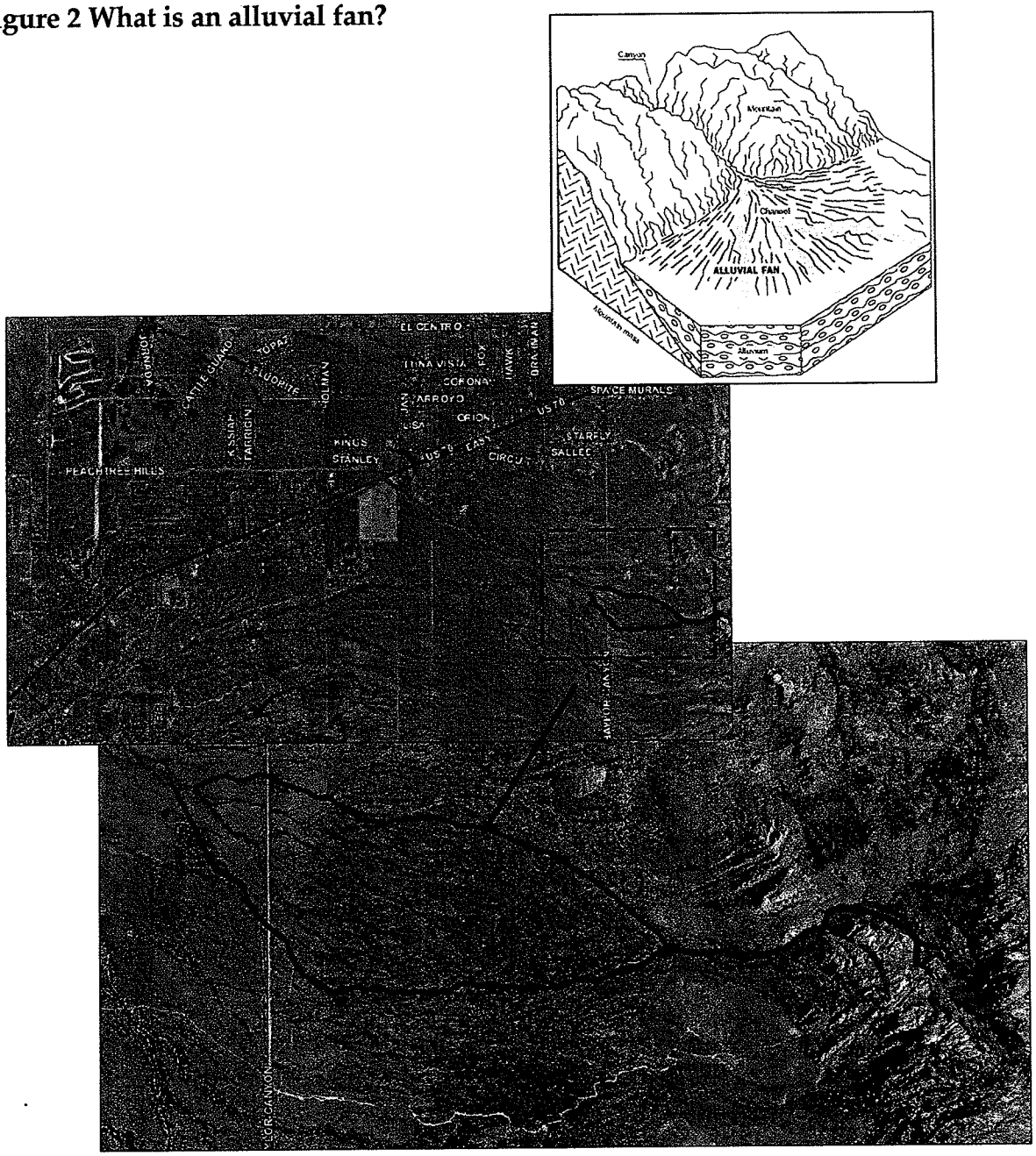
[13] Paso del Norte Watershed Council, www.pdnwc.org

[14] *One Valley One Vision 2040* Regional Plan

[15] Alluvial Fan Flooding. National Research Council Committee on Alluvial Fan Flooding, Washington DC. 1996.

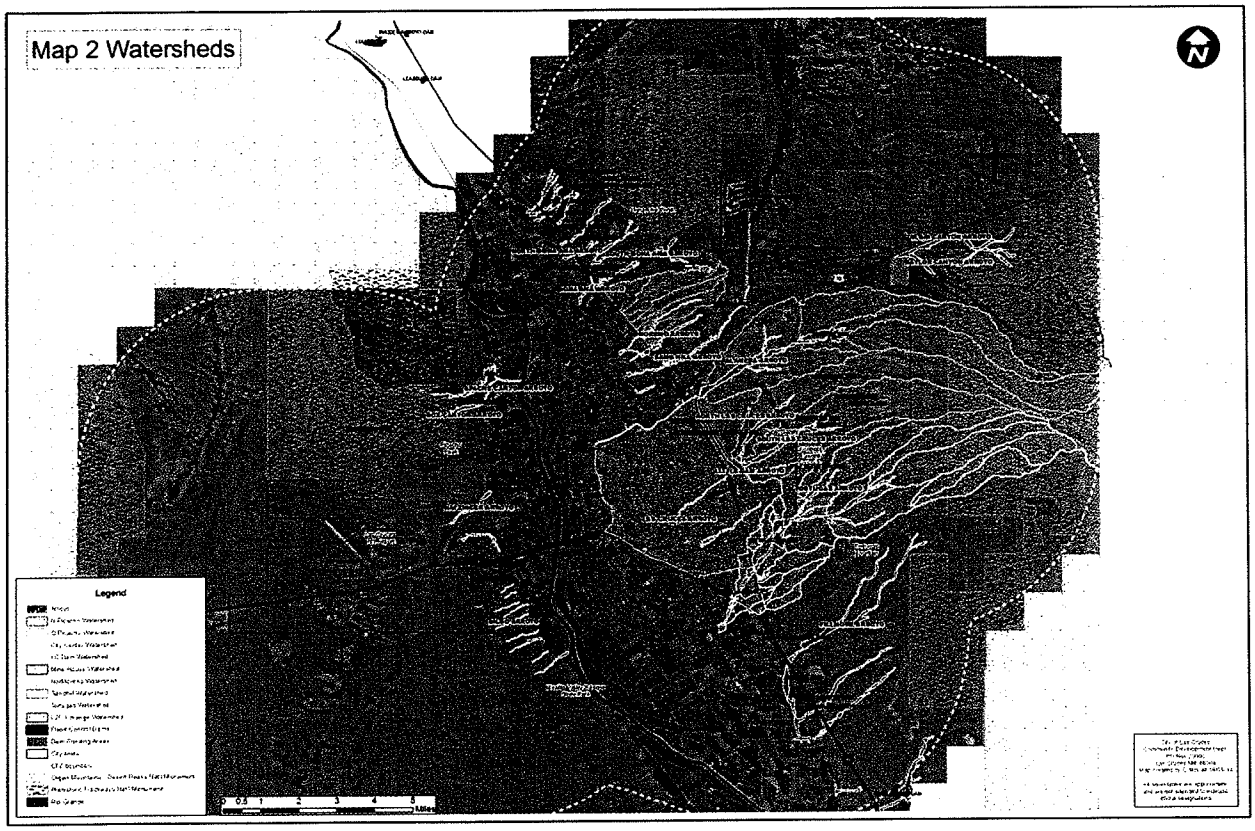
formation of a new channel. Alluvial fans are also dangerous because the stream channel will slowly erode the soft sediments and meander outside of the mapped 100-year flood zone.

Figure 2 What is an alluvial fan?



These images show the general path of the Sandhill Arroyo in 2010. The well-defined portion of the flow path within the Organ Mountains is delineated in blue. As the arroyo drops out of the mountains into the relatively flatter alluvial plain below many fingers begin to form as the flow fans out. This area is roughly indicated in red. As flows continue to the valley floor, these smaller fingers generally come back together again into a well-defined channel. The well-defined downstream portion is indicated in green. Graphic by Mary Evans

Map 2 Watersheds in the Planning Area



East Mesa

On the East Mesa, there are several major arroyos that cross Las Cruces from east to west. All of the major arroyos are well defined from the Organs but as the arroyos cross into flatter alluvial fans and urban and agricultural areas, they become more poorly defined.[16] Many of the larger arroyo systems on the East Mesa were dammed because they were the source of damaging flooding and sediment deposition on the valley floor where agriculture and older development were located. The Alameda and Las Cruces (north and south forks) Arroyos caused flooding in the city center prompting the construction of the Las Cruces Dam in the early 1970s. The City of Las Cruces manages these and the Sandhill Arroyo, which play an integral part in flood control and public safety in the community.

Under natural conditions, arroyo channels meander within their floodplains, shifting locations in response to unpredictable storms and their runoff. Severe summer storms sometimes produce high flows that erode the channels, dramatically changing the slope and paths of the arroyos. Development impacts to the natural drainage system have increased the likelihood of flooding within an arroyo because the rain falls on impervious surfaces such as rooftops, driveways, parking lots, sidewalks and streets. This runoff is more rapid and concentrated, adding more water in a shorter time to the arroyo than would be the case under historic flows. This rapid surge increases the quantity of water in the arroyo making it capable of forcing changes to its channel and to the surrounding land. When the

[16] City of Las Cruces Storm Drain Master Plan, 2006. Bohannan Huston, Inc.

existing channels cannot accommodate the flow by cutting wider and deeper, the stream overflows its banks, flooding the surrounding area and sometimes changing its boundaries.

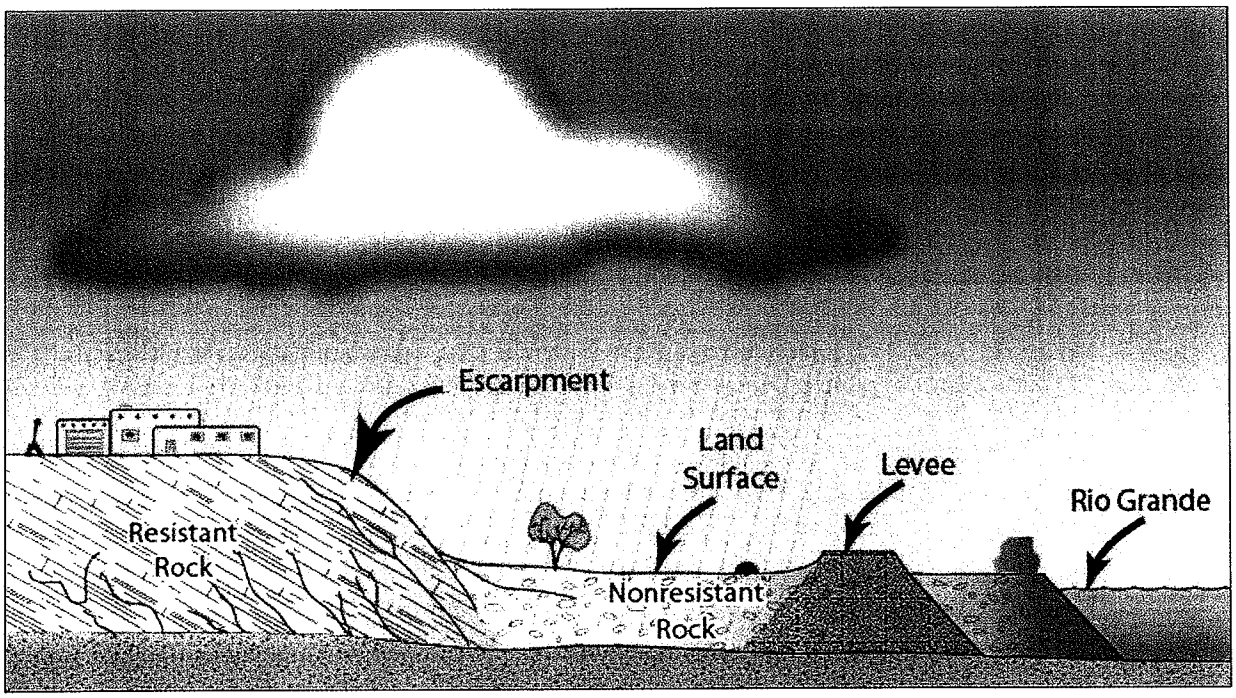
Other intrusions by development within the floodplain of an arroyo also impact the balanced relationships between the flow of flood waters and their erosion of the channel soils. Historically such changes to the channel increase the velocity of the drainage water, increasing erosion, which transports sediment and causes downstream deposition that alters the natural channel. These impacts start a series of adjustments in which a new equilibrium within the channel is sought. Such adjustments, once started, may require tens or hundreds of years to reach a new equilibrium. Conversely, to slow the drainage water down in an arroyo channel to a velocity below its historic equilibrium velocity could lead to an early deposition of sediment that would start the formation of a sandbar, further restricting or deflecting the flow of the captured water. The least impact to the arroyo drainage is to maintain the naturally established system that forms the arroyo flood zone and its channel.

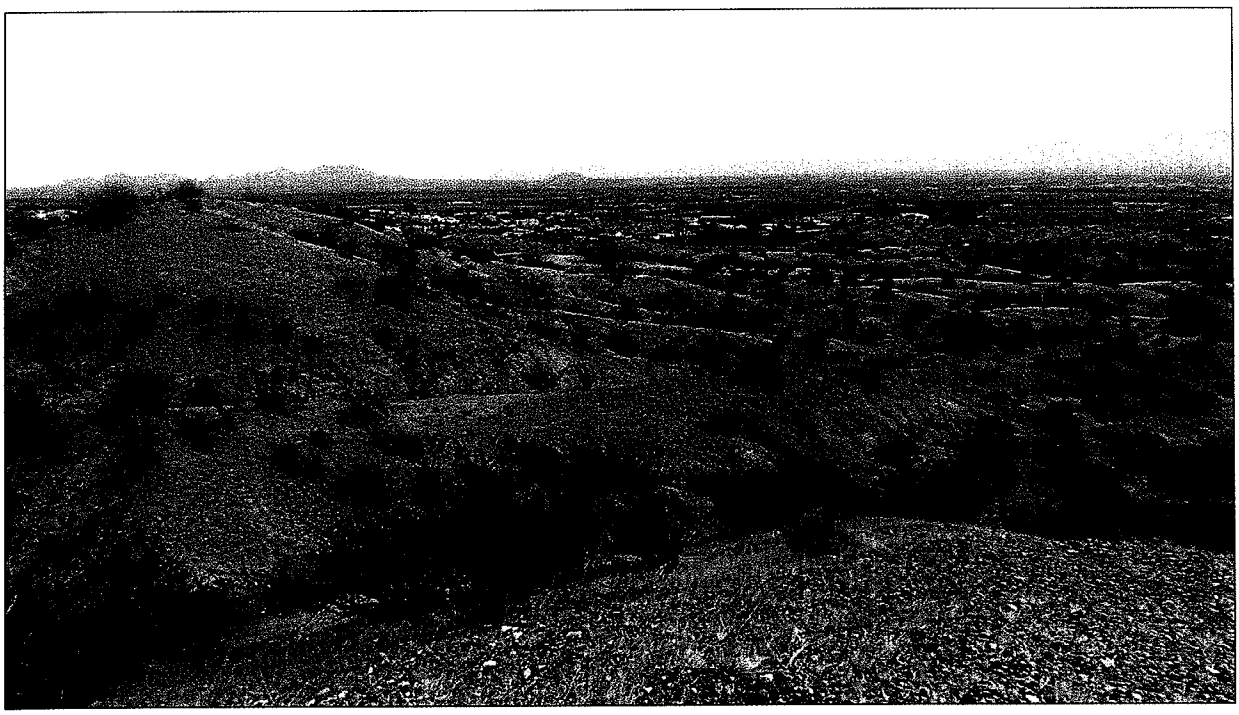
West Mesa

On the West Mesa, Picacho Hills and Picacho Mountain developments have added several hundred residences in recent years, but with the exception of these neighborhoods, there is very little development to date that impacts arroyo function. The West Mesa continues along the valley much further south than the East Mesa with few flood protection structures and affords much greater opportunity for natural flood protection without dams if development is planned properly.

On the West Mesa, rather than gradually sloping from the mountains, the Apache Canyon, Box Canyon, Nafzinger, and Bilbo Arroyos drop down an escarpment then flow to the Rio Grande. An escarpment is an area where elevation changes suddenly; it usually refers to the bottom of a cliff or a steep slope (see Figure 3). On the West Mesa, elevation can drop 200-500 feet in as little as a mile, depending on location. Escarpments and hillsides present unique challenges to arroyo protection as well as to development, including extreme slopes, lack of soil stability, infrastructure and roadway development impediments, and wildlife habitat protection. These unprotected arroyos are very dynamic in nature and it will prove difficult to avoid engineer solutions unless development is planned to avoid the need to control the numerous arroyos. While this area is largely outside of the city, it is important to maintain a watershed-based perspective. In these instances, increased focus needs to be provided to protect views, surface integrity, and other issues related to constructing along hillsides and escarpments.

Figure 3 Escarpment diagram[17]





Issues on the West Mesa escarpment include roadway development impediments and unstable soils due to steep slopes and erosion.

[17] Graphic by Peter Bennett, after: Guidebook to the Geology of Travis County, University of Texas-Austin, 1977.

Geology and Soils

The geology of the Las Cruces area is extraordinary and diverse. Las Cruces is located in the Mexican Highland Section of the Basin and Range Physiographic Province.[18] Landforms consist of alluvial and terrace deposits that occur along the Rio Grande Valley west of the Organ Mountains. Geologic formations in Las Cruces are Quaternary piedmont and the Upper Santa Fe Group.[19] The underlying geology of an area determines the soil types found toward the surface.

Doña Ana County is characterized by 70 different soil types.[20] For the most part, the soils of the arroyos and surrounding areas are gravelly sand with some cobblestones, boulders and un-weathered bedrock. The sandy soils extending east from the Las Cruces Dam to the Organ Mountains generally become more gravely closer to the mountains. The terrain on the East Mesa is nearly level, then slopes gradually upward, becoming very steep on the approach to the Organ Mountains.

Closer to Las Cruces the gradation of the soils gradually increase in their small particle contents in both silt and clay size. Within the intervening areas various alluvial deposits can be found which typically exist as thin beds of horizontally stratified sands or other soils probably deposited during historic storm or tectonic events. Further west into the middle of Las Cruces, the soils also start showing past sorting by the Rio Grande historic flood events. In these locations, and extending to the Rio Grande, an increased content of clay-like soils are found. There is also a decreased aggregate content.

Soils located in arid and semi-arid regions are subject to more extreme cycles of expansion and contraction than those located in more consistently moist areas, and ~~G~~great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding; they may be shallow to bedrock; or they may be too unstable to be used as a foundation for buildings or roads. Very claylike soils have a high water-holding capacity and do not promote infiltration or movement to groundwater. Conversely, very sandy soils provide a porous environment which provides better infiltration but are more susceptible to erosion. ~~Generally, clay soils are better suited for development foundations, and sandy soils are well-suited for stormwater management projects requiring infiltration (along with erosion control).~~

Whether soils expand or collapse under varying conditions also impacts infrastructure. Collapsible soils consist of loose, dry, low-density materials that collapse and compact under the addition of water or excessive loading. These soils are distributed throughout the southwestern United States, specifically in areas of young alluvial fans, debris flow sediments, and wind-blown sand/silt sediment deposits. Collapsible soils are most often encountered in arid climates, where wind and intermittent streams deposit loose sediment. Expansive soil and rock are characterized by clayey material that shrinks and swells as it dries or becomes wet, respectively. Problems often associated with expansive soils include foundation cracks, ruptured pipelines and heaving or cracking of sidewalks and roads. Similar to expansive soils, collapsible soils result in structural damage such as cracking of the foundation, floors, and walls in response to settlement. But human activities can sometimes facilitate soil collapse, notably water impoundment, irrigation or changing the natural drainage of a site.[21]

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[18] Williams, J. L. 1986. *New Mexico in Maps, Second Edition.* Albuquerque, NM: University of New Mexico Press.
[19] New Mexico Bureau of Geology and Mineral Resources. 2003. *Geologic Map of New Mexico.* Socorro, NM: New Mexico Institute of Technology and USGS.
[20] Ibid
[21] Association of Environmental and Engineering Geologists, http://www.aegweb.org/

The level of the water table is also a factor for infrastructure placement and design. A high water table is not suitable for subsurface installations and erosion must be accounted and managed for. Soil type analysis is an important step in the design and placement of any infrastructure in our desert environment.

Soil formation is largely controlled by five major factors:

1. The physical and mineralogical nature of the parent material (underlying bedrock),
2. Plant and animal life,
3. Topography,
4. Present and past climatic conditions, and
5. Time.

Dynamic factors like climate and organisms alter soil's parent material over time, resulting in more or less distinct soil layers. No single factor dominates the soil-forming process except in extreme cases. Rather, the effect of any one factor is either enhanced or hindered by the others. For example, topography can modify the effect of rainfall by influencing drainage and surface runoff. Likewise, rainfall and temperature together can stimulate the effect of vegetation in soil formation. These and other interactions give rise to the different soil characteristics found within any given landscape.[22] Soil type is a primary factor in determining drainage and surface runoff, and often a main factor for a site's topography.

Vegetation

Although much of this area was at one time covered in Chihuahuan Desert grasses such as sideoats grama, black grama, fluffgrass, vine mesquite, tobosa, burro grass, alkali mallow and cane bluestem, desertification has caused a transition to scrubland.[23] The East Mesa holds relatively sparse vegetation in the overland areas and larger, denser vegetation along the beds of the arroyos. An arroyo is technically an ephemeral stream, but the vegetation is basically upland desert vegetation. Shrubs, stem succulents, cacti, and grasses; creosote bush and tarbush are dominant.[24] On much of the East Mesa, desert willow, little-leaf sumac, Apache plume, and cut-leaf bricklebush are good indicator species for significant arroyo corridors since these plants require the additional water carried by arroyos. In the upper reaches of the major arroyos on the East Mesa dense stands of the small tree known as Western Soapberry can also be found. Many of these plants, especially the Apache plume, bricklebush, and soapberry reproduce readily through root-sprouting, creating dense stands with tightly packed stems and underlying root systems that are very good at stabilizing soils. The dense growth forms and low overhanging branches of desert willows and little-leaf sumac also result in thick vegetation at ground level, allowing these plants to reduce the erosive force of floods by slowing the flow of stormwater and capturing sediment and other debris carried by floods.[25]

Other typical plant species found in this area include snakeweed, whitethorn acacia, Mormon tea, Sand sagebrush, Soaptree Yucca, Giant and Mesa Dropseed, Fourwing Saltbush, lechuguilla, sotol, and various

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[22] Soil Survey of Doña Ana County Area, New Mexico, 2007. www.nrcs.usda.gov
[23] USACE East Mesa Watershed Study
[24] Asombro Institute for Science Education: http://asombro.org
[25] Nancy Stotz memo, April 29, 2014

types of yuccas. Other common shrubs include mimosa, acacia, mariola, tarbush, javelina bush, skeleton leaf goldeneye, allthorn, and ocotillo.[26] Perhaps one-fifth of all the world's cacti – as many as 350 of the 1,500 known species – occur in the Chihuahuan Desert.[27] Common cacti include the prickly pear, hedgehog, living rock, nipple cacti, and cory cacti. The night blooming cereus, a cactus, has been observed and is state endangered. Other species of concern and State-endangered species include various pincushion cacti.[28]

Vegetation has a direct impact on the health of arroyos. In addition to root systems that hold water and prevent erosion, the plants themselves provide habitat and protection for wildlife. It takes many years for vegetative species to establish and stabilize in the Chihuahuan Desert, furthering the need for protecting the arroyo systems from disturbance.

Wildlife

There are approximately 80 species of mammals, 185 species of birds and 60 species of reptiles and amphibians that inhabit this area.[29] But according to the Army Corps of Engineers East Mesa Watershed Study (2007), mammalian wildlife is somewhat limited in the more urbanized areas and animal diversity may be further limited by the lack of permanent or perennial sources of surface water.[30]

No federally listed wildlife species are believed to occur in the Las Cruces desert arroyo areas. In 2007, one state-threatened species, the peregrine falcon, and one USFWS species of concern, the burrowing owl, were observed on the East Mesa.[31] However, according to the U.S. Fish and Wildlife Service and the New Mexico Department of Game and Fish websites, these birds are no longer listed as vulnerable species.[32]

This region is home to several plant and animal species found nowhere else on earth.[33] Military lands to the east and north prohibit public access, which helps protect many sensitive native species. In addition, military land north of Highway 70 protects a critical wildlife corridor between the Organ Mountains and the San Andres National Wildlife Refuge, home to the New Mexico's largest herd of Desert Bighorn Sheep, which are listed as endangered by the state of New Mexico.[34]

Flood Control Dams

There are 37 earthen flood control dams within the Extra-Territorial Zone (ETZ) all varying in size, condition, age and original purpose (see Map 3 and Table 1 below); nine of them are believed to have been constructed by the Civilian Conservation Corps during the years 1936 to 1939. Twelve of these are within the Las Cruces city limits. Most of the dams on the East Mesa were constructed on alluvial fan deposits that originated from the Organ Mountains to the east. There are also several flood control

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[26] University of Texas at El Paso Centennial Museum: http://museum2.utep.edu/chih/chihdes.htm
[27] World Wildlife Fund: http://worldwildlife.org/ecoregions/na1303
[28] U.S. Fish & Wildlife Service: www.fws.gov/endangered
[29] U.S. Army Corps of Engineers East Mesa Watershed Study, 2007
[30] Ibid
[31] Ibid
[32] NM Department of Game & Fish: www.wildlife.state.nm.us/conservation; and www.fws.gov/endangered.
[33] Citizens' Task Force for Open Space Preservation (CTFOSP) *A Vision: Open Space and Trail System*
[34] Ibid

dams on the West Mesa. These structures were built to protect agricultural lands within the Mesilla Valley and were intended as low hazard structures providing protection from a 50-year storm event.[35]

As areas downstream of these structures became urbanized, the hazards and required protection of the structures changed without upgrades or rehabilitation of the structures themselves. Currently a significant number of the dams are approaching or have met the end of their design life, but still protect downstream developments to a small degree. The Las Cruces Dam, which is a flood control pass-through dam, was constructed by the U.S. Army Corps of Engineers (Corps) in 1975 to protect development in Las Cruces by controlling flood flows from the Alameda and Las Cruces Arroyos.

Most dams in Doña Ana County are dry dams and have ungated outlets positioned so that essentially all stored water will drain from the reservoir by gravity, resulting in a normally dry reservoir area. The intent of a dry dam is to capture and slowly release storm water in order to lessen the velocity, flow rate, and sediment load that result from major storms. These dams are currently required by state law to drain their impounded water within 96 hours from the end of the storm. They also allow groundwater recharge by ponding runoff and allowing it to slowly infiltrate into the aquifer. In addition, through cooperative planning, these dams can fulfill other purposes such as habitat restoration, open space preservation, and public recreation.

Flood of August 29-30, 1935.
Boat of International Boundary Commission on Alameda Boulevard. This boat carried several people and personal property to safety.

Flood of August 29-30, 1935.
Professor D.B. Jett standing near Alameda Boulevard and Greening Avenue. Both photos: NMSU Library, Archives and Special Collections, 00941776/00941777. Used with permission.

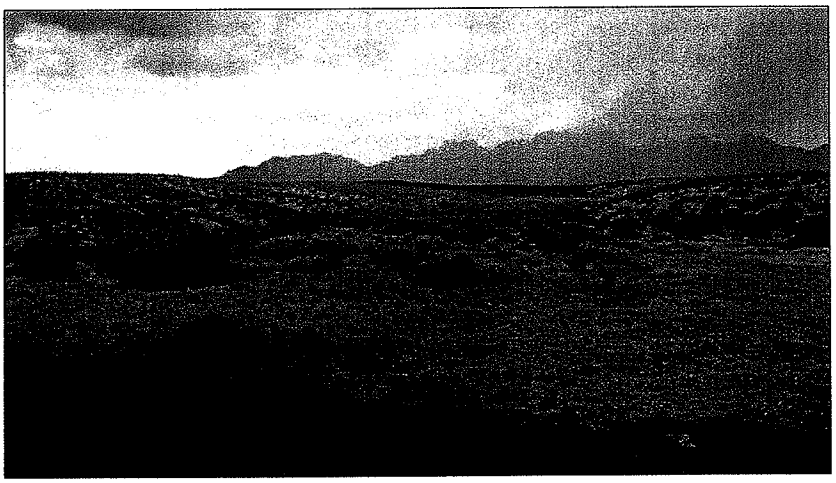
[35] A 50-year storm is an event having a 2 percent chance (or one in fifty) of being equaled or exceeded during any given year.

The New Mexico Office of the State Engineer Dam Safety Bureau requires dam owners to prepare Emergency Action Plans (EAP) for some of these dams (non-Significant Hazard Dams do not require an EAP.) An EAP is critical for protecting the dam and downstream development. It should be noted that the Hazard class will change if development is allowed below the dam. The EAP assists a dam owner in recognizing emergency and non-emergency events and to respond appropriately. It also provides local emergency officials with an inundation map to assist in developing an evacuation map.[36] The dams are owned and operated by a number of entities, including the City of Las Cruces, Dona Ana County, Elephant Butte Irrigation District, New Mexico State University and some private owners.

Table 1 Flood Control Dams

Dams within Las Cruces	Dams within the ETZ but outside the Las Cruces city limits	
Tortugas Site 1 Dam	South Picacho Dam	Alvillar 1-A Dam
Alameda Dam	North Picacho Dam	Alvillar 1-B Dam
North Fork Dam	Apache Dam	Alvillar 1-C Dam
Escondido Dam	Box Canyon Dam	Alvillar 2-A Dam
Redwood Dam	Brahman Channel	Alvillar 2-D Dam
South Fork Dam	North Doña Ana Dam	Alvillar 3-A Dam
McClernon Dam	Doña Ana Dam	Alvillar 4-A Dam
Butler Dam	Doña Ana South Dam	Alvillar 4-B Dam
Cothern Dam	Tortugas Site 2 Dam	Alvillar 4-C Dam
Fairbanks Dam	Fillmore Dam	Alvillar 4-D Dam
Sandhill Arroyo Dam*	Salopek Dam	Alvillar 4-E Dam
Las Cruces Dam*	Lower Fillmore Dam	
Villa Mora Dam*	Apache Arroyo Dam	
	Little Detention Dam	
*City of Las Cruces has management authority for these three dams		

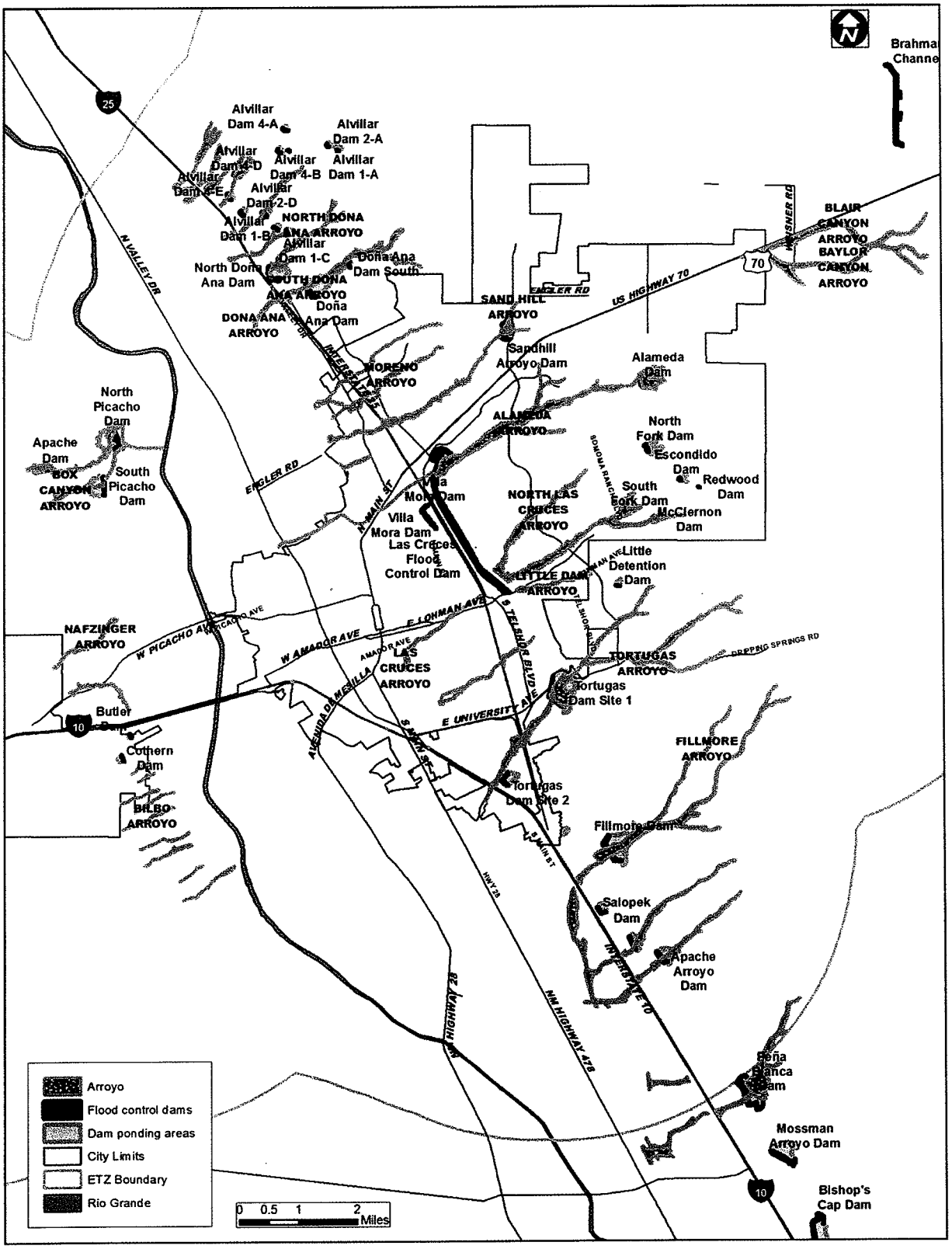
For more detailed descriptions of these flood control dams, including owners and Hazard class, see Appendix 3.



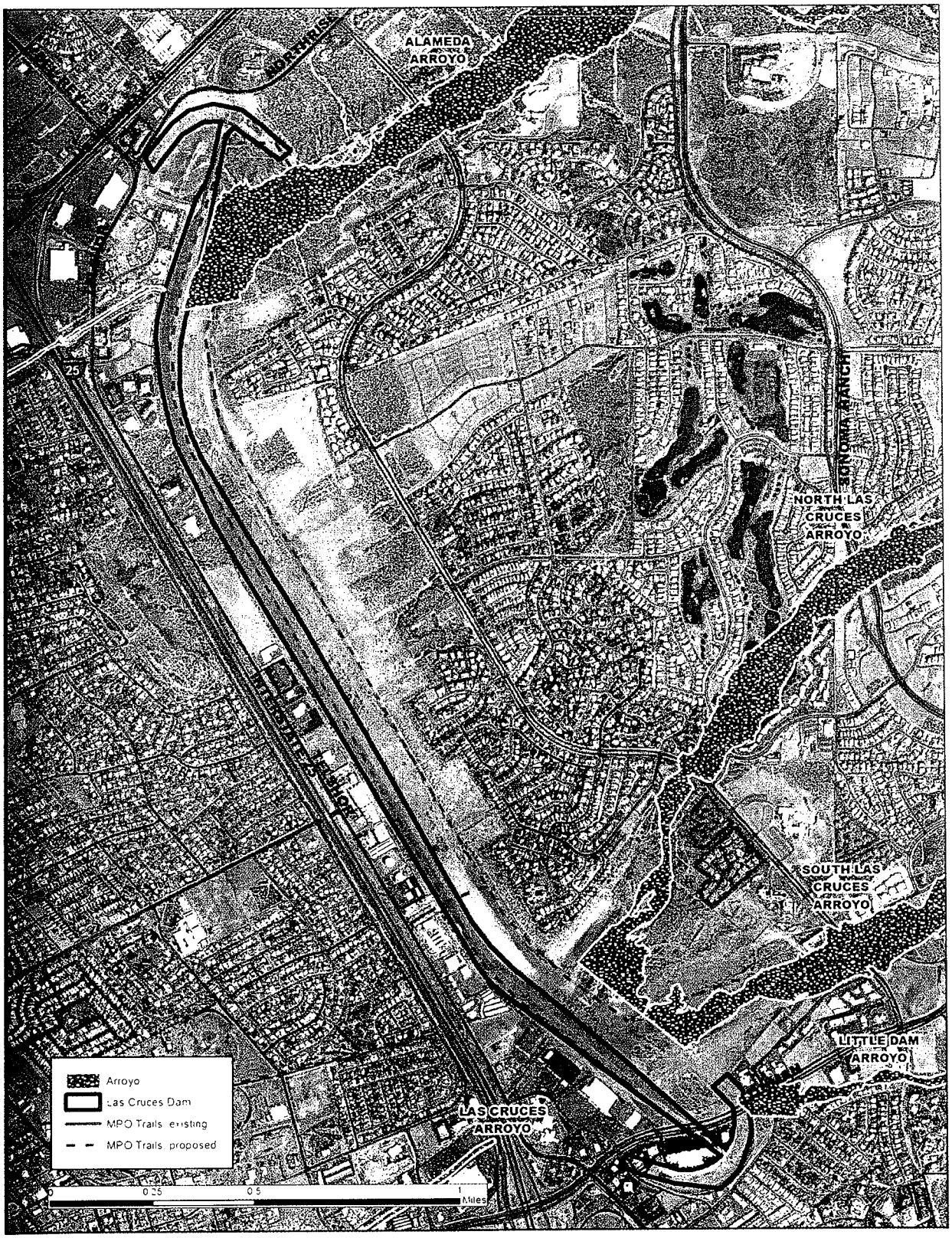
Looking upstream across the flood pool upstream from McClernon Dam. Pooling presents an opportunity for vegetative growth and habitat restoration. Photo: USACE Sediment Transport Analysis Report.

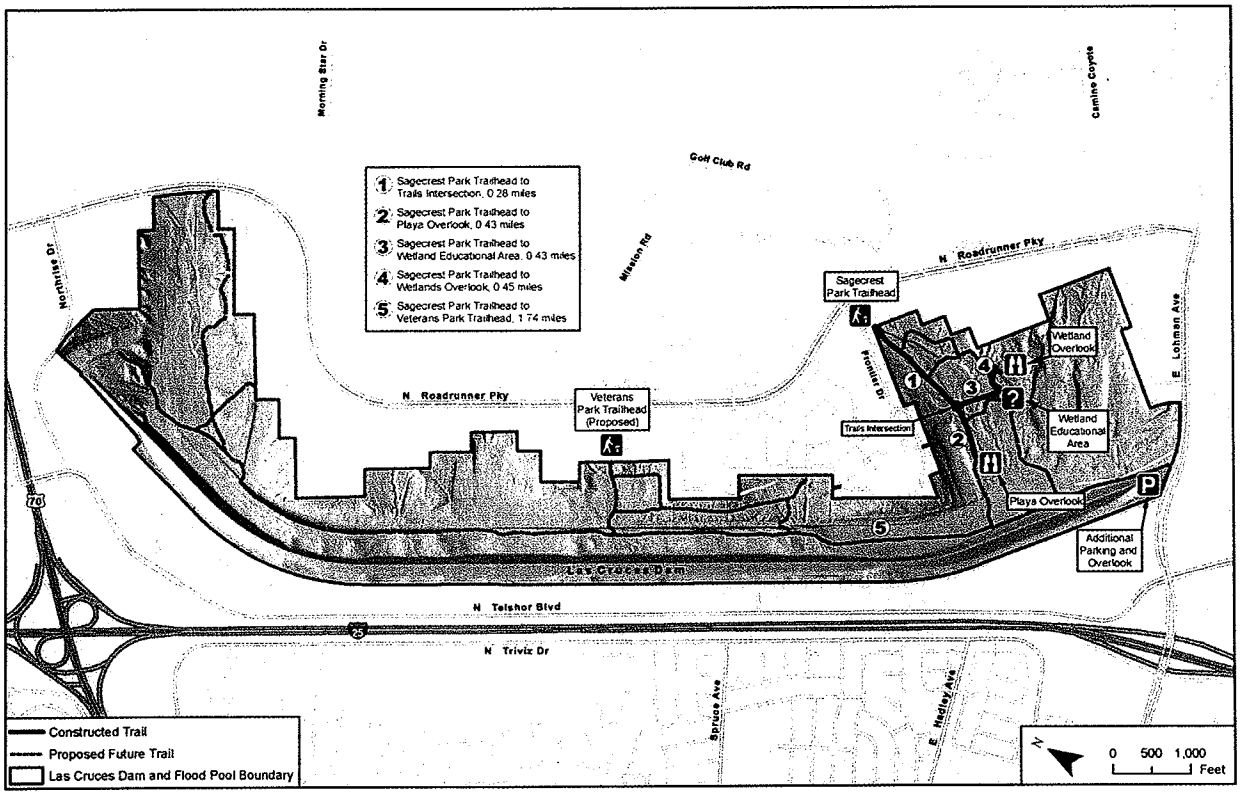
[36] New Mexico Office of the State Engineer http://www.ose.state.nm.us/water_info_dam_safety_info.html

Map 3 Flood Control Dam Locations



Map 4 Las Cruces Flood Control Dam





A partnership between the City of Las Cruces and the U.S. Army Corps of Engineers is sponsoring an environmental restoration project behind Las Cruces Dam. The project includes the creation of trails, viewing blinds, benches, shade structures, pond, a wetland meadow and a variety of riparian vegetation such as Cottonwood trees, grasses and shrubs.

Stormwater Management and Drainage

Floodwater that does not absorb into the ground flows into an arroyo carrying sediment with it until it eventually dissipates into the bed of the arroyo or continues on to the Río Grande. Because of the high sediment load in the floodwater and the amount of erosion and deposition, arroyos often change flow paths creating flooding concerns where none existed previously. Manmade changes to an arroyo system, such as road construction, may also result in unpredictable changes to the arroyo's path.

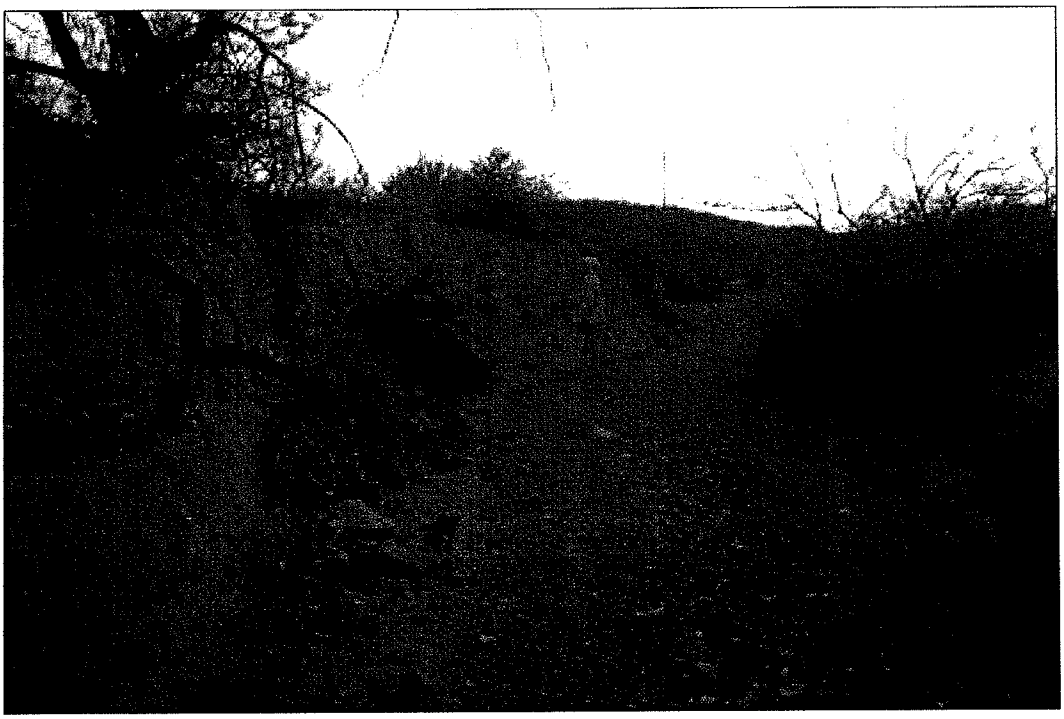
Stormwater management in Las Cruces is accomplished through a storm drain network, which consists of storm drain pipes, inlets/outlets, detention ponds as well as roadways and natural arroyos. There are 17 major detention ponds within the city limits. The stormwater collected through the natural arroyos and in the detention ponds is transported and discharged to the Rio Grande at several locations. In addition to the larger scale detention ponds, individual commercial lots also require their own on-lot ponding to handle storm water runoff. The runoff collected in these smaller on-lot ponds either evaporates, percolates down into the groundwater or adds to the controlled downstream runoff of the area.[37]

The City prepared a Storm Water Management Plan in April 2009 that serves to develop, implement and enforce its stormwater management program. In addition, the City also has a Storm Water Management

[37] City of Las Cruces Storm Drain Master Plan, 2006, Bohannan Huston Inc.

Ordinance in effect (Chapter 34 of the LCMC), which defines means of reducing pollutants from entering the City's municipal storm sewer system. Together with LCMC Chapter 32 Design Standards, the City ensures that its own projects and those of private developers comply with the EPA's NPDES permit program.[38]

As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating point and non-point sources that discharge pollutants into waters of the United States. Most stormwater discharges are regulated under this permit. The program regulates stormwater discharges from three potential sources: municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as arroyos and the Rio Grande.



Looking downstream in typical portion of the incised reach of the Alameda Arroyo about 0.4 miles downstream from Alameda Dam where the left bank is being cut into an alluvial terrace.
Photo: USACE Sediment Transport Analysis Report.

[38] Ibid

Utilities

The majority of City utilities are located in public right-of-way for the purposes of serving customers. Since arroyos are situated in low-lying areas, they naturally become main drainage ways and create ideal spots for locating gravity-driven sewer interceptors (collection lines of ten inches or more in diameter). It is necessary in some instances to place utility lines adjacent to or along the floors of the arroyos, or across arroyos in a perpendicular manner.

According to the City's Utility Standards, City utilities have been buried at minimums of six feet for sewer and five feet deep for water and gas under the arroyo bottom. To avoid erosion after installation, the soil is compacted to 90% of original compaction,[39] which is slightly less than soil compaction required for street construction. With proper design and protection of gravity-driven sewer collection systems within and around arroyos, the need for lift stations is eliminated, therefore reducing operations and maintenance costs.

Parks and Open Space

The City's current park inventory includes numerous parks and trails on the East Mesa that include arroyos in their design. There are three trails that are part of an arroyo trail network shown on the MPO Trail Plan: the Alameda Arroyo Trail (0.78 mi.), the Engler Road Trail (1 mi.), and the Sonoma Ranch Trail (3.64 mi.). In addition, there are several neighborhood and community parks in close proximity to arroyos: Desert Trails Park (34.42 ac.), Sam Graft Park (2.8 ac.), Veterans Memorial Park (8.99 ac.), Sagecrest Park (2.2 ac.), Paseo de Onate (2.5 ac.), Oro Vista Park (18.85 ac.), and Vista de la Montana Park (2.11 ac.). There are also two privately-owned golf courses that include arroyos in their designs: the Red Hawk Golf Course in the Metro Verde development and the Sonoma Ranch Golf Course west of Roadrunner Parkway.

These facilities provide outdoor recreation opportunities. The Parks & Recreation Master Plan (PRMP), updated in 2013, envisions a City park and trail system that will continue to provide high-quality recreational opportunities for residents and visitors during the next decade and beyond. And according to the PRMP, Las Cruces residents would like more of these. During May and June of 2011, the City of Las Cruces Parks and Recreation Department conducted a Community Interest and Opinion Survey. The purpose of the survey was to gather input to help determine parks, trails, open space and recreation priorities for the community.

According to the survey, 42% of respondents said they had used or visited walking, hiking, and biking trails over the past 12 months, 65% said they have a need for walking and biking trails, and 43% said their most important parks and recreation facilities are walking and biking trails. In addition, 64% of respondents indicated that they would be willing to pay at least $10-$19 per year in additional property taxes to build and operate the types of parks, trails, aquatics, sports and recreation facilities most important to their household. Fifty-nine percent (59%) of respondents indicated that they would either "vote in favor" (37%) or "might vote in favor" (22%) if an election were held for a bond issue to be used only for open space and parkland acquisition, construction of amenities and trails development in Las Cruces.[40]

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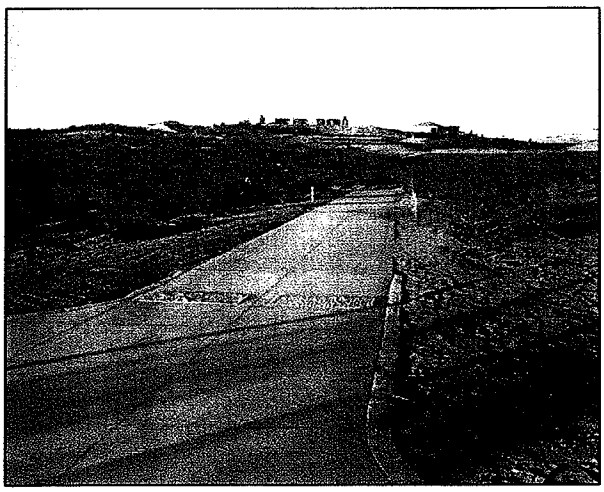
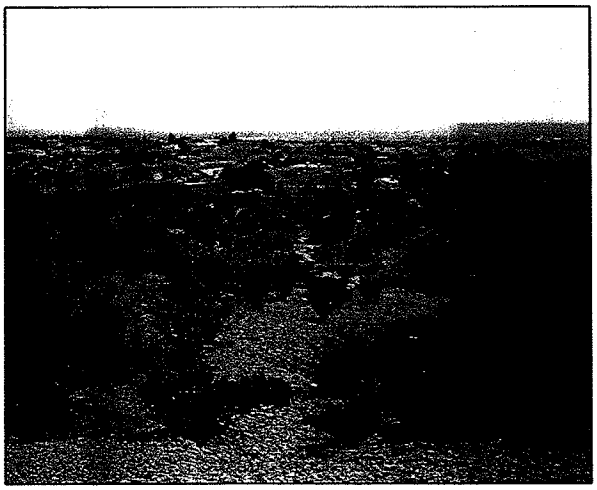
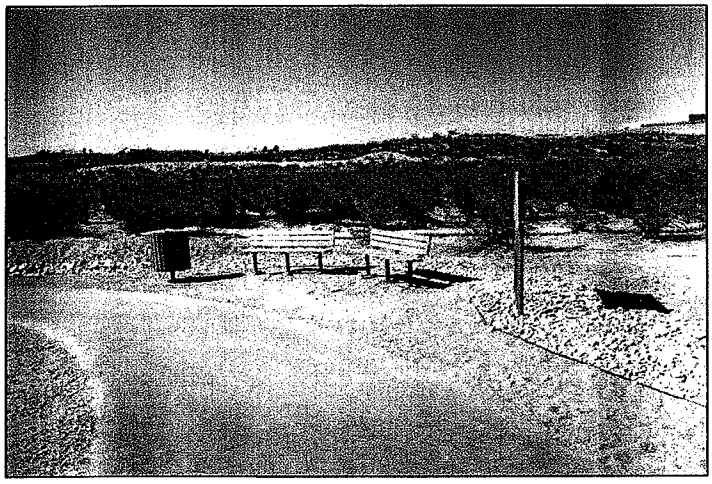
[39] http://www.las-cruces.org/Departments/Utilities

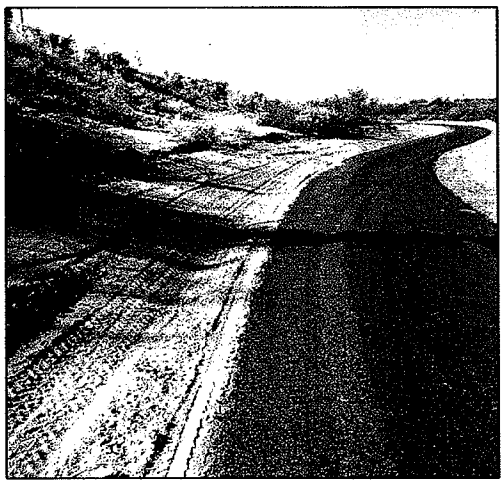
[40] Parks & Recreation Master Plan & Park Impact Fee Update, May 2012.





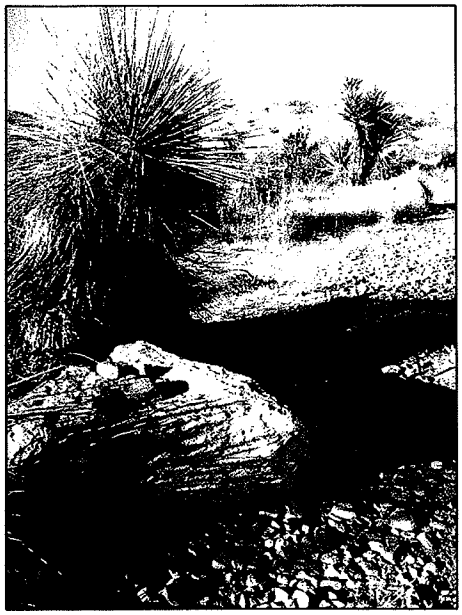
Desert Trails Community Park





Alameda Arroyo Trail

Paseo de Oñate Park



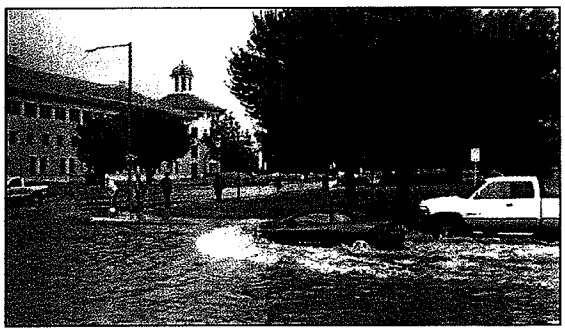
CHAPTER 4. ISSUES, CHALLENGES AND OPPORTUNITIES

There have been many area flood events in recent memory, and in the last decade, severe flooding in 2006 and 2013 are notable. Over 400 homes were affected by flooding in Hatch in September 2006.[41] Four foot-deep waters flooded downtown Hatch damaging homes, businesses and motor vehicles and almost all of Hatch's 1600 residents were forced to evacuate. In addition, the same storm delivered golf ball-sized hail and heavy rains along Interstate 10 and over Las Cruces and Mesilla. Total storm damage was estimated at over $10 million.[42] In September 2013, New Mexico experienced an estimated $6.87 million worth of road and highway repairs alone from heavy rains and floods that hit the state.[43] Two major storms within days of each other delivered more than 8 inches of rain in Doña Ana County, nearly as much as the region usually receives in a year. There are cumulative impacts of multiple storm events that can increase the chance of flooding, risk, and damages

In his 1969 text, *Design with Nature*, Ian McHarg proposed that development plans be based on maps that identified natural resource and landscape constraints. He promoted an ecological view in which the developer analyzed soil, climate, hydrology, etc. and designed the project in concert with the conditions of setting, climate and environment. Harg advocated that the first stage in the planning process is mapping the resources then building where there were the fewest constraining features (either by avoidance or minimization). By definition, mitigation recognizes that something has been built in a dangerous area and seeks to protect against subsequent events. But there is always the chance that mitigation is under-designed, will deteriorate, and fail. As Harg points out, a more appropriate strategy is often avoidance.

The previous chapter, Regional Characterization, described some of the existing conditions in our area – flood control dams, utilities infrastructure, vegetation and wildlife, recreation facilities, stormwater management, and how the general climate of the area impacts arroyo health. This chapter focuses more closely on problems associated with all of these elements and in some cases, offers suggestions for preventing or mitigating them.

[41] "Governor seeks presidential disaster declaration for Hatch, NM," USA Today, August 21, 2006.
[42] "Heavy Rains and Flash Floods Devastate Western Texas and Southern New Mexico," Southwest Weather Bulletin, Autumn-Winter 2006-2007 Edition, National Weather Service El Paso/Santa Teresa.
[43] "Final Cost of New Mexico Flood Repairs Still Unclear," John Guzzon, October 2, 2013. ENR Southwest, http://southwest.construction.com/.



Flooding near New Mexico State University as a result of the September 13, 2006 thunderstorm.
Photo: Dr. Deborah Bathke/NMSU.

High waters from heavy rains breached the Las Placitas Arroyo 3 times during the summer of 2006 resulting in widespread flooding and damage in Hatch and surrounding areas.
Photo: Southwest Weather Bulletin, Autumn-Winter 2006-2007 Edition.

Flooding in La Union, September 13, 2013.
Photo: Shari V. Hill, Las Cruces Sun-News.
www.lcsun-news.com/ci_24087689/rain-continues-soak-southern-new-mexico.

Arroyo Modeling

Most often, development occurs up to the 100-year flood zone boundary. The course of an arroyo changes with time and, as described previously, runoff can migrate out of the existing flowpath simply with sheer force. Development may restrict natural channels for flowpath, which can lead to erosion, landslides and flooding along the bank of the channel. This can ultimately put adjacent development at greater risk. Therefore, it is critical that the City direct growth away from the arroyos and adopt plans and ordinances that will accommodate dynamic arroyo systems.

Several strategies would be effective in this regard. Some would rely on a detailed science-based characterization of the each major arroyo using in-depth modeling that evaluates proposed land uses against arroyo characteristics. Models that have been used for this purpose in Las Cruces are the U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC) Hydrologic Modeling System (referred to as HEC-HMS) and the River Analysis System (HEC-RAS). Some modeling of the arroyos has already been completed as part of the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP).

Modeling proposed under the AMP would not replace the floodplain designations show on the NFIP's Flood Insurance Rate Map (FIRM), but would add to this information base by modeling further upstream and determining flood zones there. These are free software tools that are publically available and are frequently used in this type of work.

This can then serve as a baseline for further analysis of major arroyos. Additional data sets that may be needed include, but are not limited to, land use, vegetation and wildlife, rainfall, and soil type. Using GIS mapping software, the aerial extent of water at the 100-year and 500-year storm could also be evaluated for the presence of wildlife, proximity of a parcel to other identified open space, existing infrastructure like roads, power lines, water lines, gas, etc., and proximity to existing developments and privately owned parcels within the 100-year flood zone.

Once the models are in place and functioning, they could be used to determine areas where upper watershed flood control improvements may provide additional downstream benefits. For instance, upper watershed improvement may help to slow flowpath and increase infiltration, reducing the chance for high velocity flowpaths downstream. Also, a model could help identify areas suitable for buffers or areas that may be appropriate for development with fewer constraints.

A buffer is an area adjacent to an arroyo where development would not occur or where development would be of lesser intensity. It would be determined starting at the boundary of the 100-year flood zone and measured laterally from that point. Over the arroyo's length, the buffer may vary, depending on results from the modeling discussed above. Identified buffer acreage could be dedicated to the City or withdrawn by the New Mexico State Land Office or U.S. Bureau of Land Management prior to selling acreage for development. If privately held, a buffer could take the form of a linear park, trail, or conservation easement, all of which could be offset by various incentives such as higher density farther away from the arroyo, federal tax break, or park credits.

Just as the NFIP maps are intended to help protect the public from the potential negative impacts of flooding, buffers are proposed as part of the AMP to further protect the health, safety and welfare of the public. The use of buffers would be determined by a need for further erosion control, for example by protecting pockets of natural vegetation outside the 100-yar flood zone. An ancillary benefit would be their use for open space, trails, and parks.

Development

According to the *One Valley One Vision 2040 Regional Plan*, a great deal of new growth is expected east of Interstate 25, bringing with it not only residential development but new activity centers and employment opportunities.[44] As we look to the future, the city and county are expected to increase in population by over 50% and 40% by 2040, respectively.[45] Due to an increase in impervious surfaces in these areas, storms that occur as short duration high intensity events are no longer lessened by soil and vegetation but are rapidly discharged into arroyos. The increase in runoff rate and volume from developed areas can overwhelm structures designed to convey a storm with a lower peak discharge. The

[44] One Valley One Vision 2040

[45] The city's population is estimated to increase from its 97,618 Census 2010 population to 150,000 by 2040. The overall population of the county is projected to increase from 210,000 people in Doña Ana County to about 300,000 by 2040. Source: U.S. Census Bureau; University of New Mexico Bureau of Business & Economic Research, 2013 Doña Ana County Snapshot Report.

tremendous growth in the area since the 1980s has put many more people in the path of potential flooding.[46] As Las Cruces has grown, development intensity has increased on the East and West Mesas, areas that historically have been open land or occupied by larger lots and fewer structures.

~~Most often, development occurs up to the 100-year flood zone boundary. The course of an arroyo changes with time and runoff can migrate out of the existing flowpath simply with sheer force. Development may restrict natural channels for flowpath, which can lead to erosion, landslides and flooding along the bank of the channel. This can ultimately put adjacent development at greater risk. Therefore, it is critical that the City direct growth further away from the major arroyos and adopt plans and ordinances that will accommodate dynamic arroyo systems.~~

~~Several strategies would be effective in this regard. Some would rely on a detailed science-based characterization of the main stems of each major arroyo using in-depth modeling that evaluates proposed land uses against arroyo characteristics. Arroyo modeling would integrate hydrologic modeling, hydraulic modeling, and GIS to study, map and analyze arroyos and adjacent areas. Potential modeling products include rainfall-runoff relationship analysis, peak discharge, runoff hydrographs, and flow routing for any major arroyo. These products can be used to inform decision-making such as road development and drainage infrastructure. A model that has been used for this purpose in Las Cruces is the USACE's Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS). This model was designed to simulate the complete hydrologic processes of dendritic watershed systems (resembling the branching patterns of trees). Current HEC-HMS models exist that model portions of the City, but are limited in extent to areas downstream of the flood control dams.~~

~~Once the HEC-HMS and HEC-RAS models are in place and functioning, they could be used along with ArcGIS software to determine areas where upper watershed flood control improvements may provide additional downstream benefits. For instance, upper watershed improvement may help to slow flowpath and increase infiltration, reducing the chance for high velocity flowpaths downstream. Also, a model could help identify areas suitable for linear parks or areas that may be more appropriate for development with fewer constraints. These models could also determine where buffers may be appropriate and how wide they would be to accommodate both development and arroyo systems.~~

~~Some modeling of the proposed areas has already been completed as part of the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP). Modeling proposed under the AMP would not replace the floodplain designations show on the NFIP's Flood Insurance Rate Map (FIRM), but would add to this information base by modeling further upstream and determining flood zones there. For a more complete explanation of arroyo characterization modeling, see Appendix 4.~~

~~A buffer is an area adjacent to an arroyo where development would not occur or where development would be of lesser intensity, usually extending laterally beyond the 100-year flood zone. Over the arroyo's length, the buffer may vary, depending on results from the modeling discussed above. Identified buffer acreage could be dedicated to the City or withdrawn by the New Mexico State Land Office or U.S. Bureau of Land Management prior to selling acreage for development.~~
Arroyo modeling described above may provide additional insight when considering areas suitable for development. Land acquisition and buffer distances ~~would~~ could be prioritized in relation to each parcel's function and importance, as well as the measure of likelihood and immediacy of development

[46] "Recovering from New Mexico's Floods," October 3 2013, New Mexico State University Frontera NorteSur. http://fnsnews.nmsu.edu/recovering-from-new-mexicos-floods.

projects. It is important to note that a buffer is only one of several strategies for arroyo protection and management, and that a buffer may not be needed for all arroyos or for an entire arroyo. If a buffer is found to be needed for erosion control purposes in privately-owned areas, eliminating developable land could come at a high cost to the City. In some cases it may be necessary to purchase the land outright. Alternatively, ~~I~~incentives could play a major role in encouraging private land owners to participate in these strategies. For instance, it may be practical to use buffers as utility easements for access to ~~utility~~ infrastructure where necessary.

A similar process for protecting natural stormwater conveyances has been successfully used for many years by other entities in New Mexico, including Southern Sandoval County Area Flood Control Authority (SSCAFCA) and Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). SSCAFA's use of the Lateral Erosion Envelope (LEE) identifies areas that are susceptible to erosion and protects them from development, allowing them to continue serving their stormwater conveyance functions. AMAFCA's use of the prudent line serves a similar purpose, facilitating development while protecting natural water courses.

As arroyos form at the base of the Organ Mountains, they typically form a single channel but fan out into a larger number of small tributary channels as they move westward over the terrain. These tributary systems take up more square footage of the land, which becomes less suitable for traditional developments that require filling, flattening and clearing of vegetation. Development must be sensitive to existing landforms, and arroyo modeling can assist in this when using detailed information and analysis. Major arroyos that are in city limits have relationships with alluvial fan tributary systems that originate in the upper watershed, outside of the 100-year flood zone. Incorporating upper watershed data such as 2-foot contour lines can increase the precision and clarity in which development and arroyo management decisions are made. Directing development toward relatively flat areas would reduce land disturbance and destruction of vegetation in the uneven terrain of these small channel tributary systems. Another strategy may be to propose a density gradient in a development that would include larger rural lots close to the arroyo and denser, compact mixed-use streets further away from the arroyo (see Figure 4).

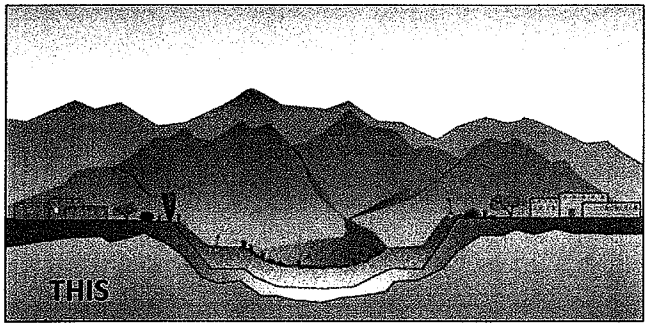
There may be other strategies for development to further incorporate arroyo preservation and management, and to address the financial obligations of land acquisition if the City were to purchase privately-owned land. Some of these options are described below. It is also important to note the relationship between improved arroyo management and costs that are passed on to the home owner, thus directly affect overall housing costs in Doña Ana County. A significant portion of county residents lives at or below the poverty line. Costs for land acquisition and/or maintenance of open spaces are passed onto property owners and in some cases the renters of the property. Policy would need to address incentives, compensation or other means (such as acquisition by the City) to preserve arroyos and other open spaces. Policy would also need to address affordable housing in the land preservation context.

Land trusts are widely recognized as an effective means of conserving natural land and open spaces. Not to be confused with a *land bank*, which seeks to repurpose underused, abandoned, or foreclosed property, a land trust normally has a singular purpose to preserve sensitive natural areas, farmland, ranchland, water sources, cultural resources or notable landmarks. Many different strategies are used to provide this protection, including outright acquisition of the land by the trust. In other cases, the land

remains in private hands, but the trust purchases a conservation easement on the property so that it won't be developed.

Conservation easements are not frequently used in this region, but they offer an effective means of protecting sensitive environmental areas. A conservation easement is a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values. It allows landowners to continue to own and use their land, and they can also sell it or pass it on to heirs. A landowner who donates a conservation easement to a land trust gives up some of the rights associated with the land but it offers great flexibility for the landowner for watershed improvements to be planned, designed and installed. An easement may apply to all or a portion of the property, and need not require public access. Each conservation easement is crafted to meet the needs of the landowner while not jeopardizing the conservation values of the land. The size of the parcel can range from just a few acres, such as a pocket nature preserve, to hundreds or even thousands of acres.

Land protection measures could be used effectively to designate privately-owned buffers as linear parks, buffers or protected open space. Building on only one side of the street (referred to as a "single-loaded" street) allows enhanced views for those purchasing homes across from an arroyo. It also provides opportunities for linear parks and trails, both of which could be credited toward park impact fees. Single-loaded roads increase safety for open space users and nearby property owners by providing visibility for surveillance and monitoring, as well as improving accessibility for park users and improving access for emergency response. Since a developer would be choosing to leave developable land open, the overall costs of developing that area would inevitably be higher. If an arroyo buffer has not already been withdrawn from development and is privately owned, a tax deduction through a conservation easement or some other incentive would have to be determined.



Buffers would allow arroyos to shift and move naturally and would provide many positive outcomes, including: added soil stability; less structural loss due to erosion/flooding; more desirable open space; more wildlife corridors and wildlife viewing opportunities; and preservation of native vegetation.
Graphics: Peter Bennett

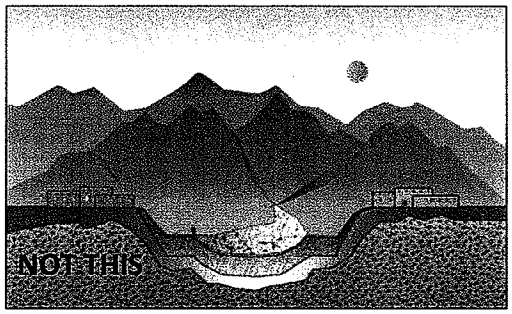
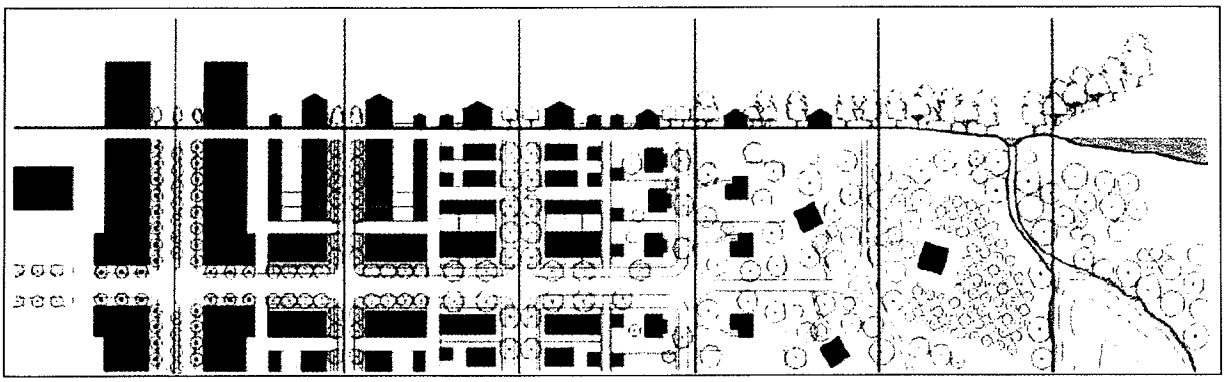
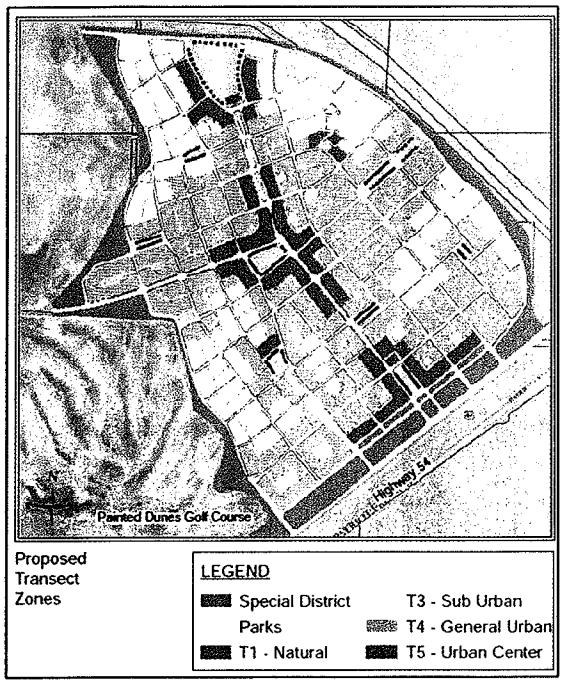


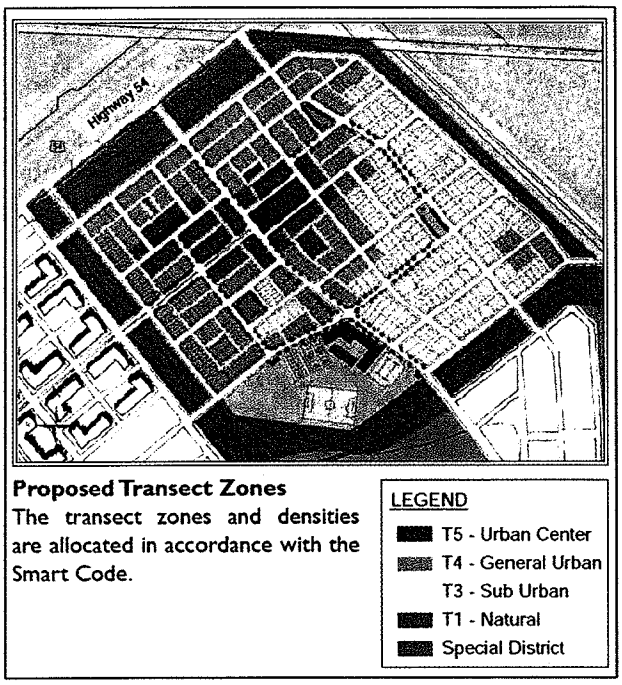
Figure 4 Rural-to-urban transect



The transect is a geographical cross-section of a selected environment and an effective master planning tool that guides the placement and form of buildings and landscape and allocate uses and densities. Many communities are organized this way, providing a natural gradient of development from urban center to natural edge.
Graphic: www.planetizen.com.

Linear parks and trails adjacent to development enhance the views for property owners. A conservation easement could provide a tax break for the owner, a different incentive could be devised, or the acreage could be purchased by the City. This is Pinnacle View Drive adjacent to the Little Dam Arroyo. Photo: Peter Bennett.





These illustrations, from the El Paso Comprehensive Plan (2012), show how transect zones that included protected open space and parks can be applied to individual neighborhoods and sections of the city. Graphic: *Plan El Paso*, volume I.

On the West Mesa, hillside and escarpment developments present several issues that are more complicated than developments on relatively flat land. These include topography and geometry, slope stability, velocity of stormwater runoff, erosion, and access (emergency and non-emergency). Hillsides, mountain terrain, and escarpments are generally unstable landforms to begin with, and disturbance can increase their instability and potentially require additional structural support to ensure infrastructure and slope stability. With many shifts in grade and elevation, density gradients could be used successfully here with denser development to the west on flatter terrain.

The City's *Comprehensive Plan 2040* proposes a 'Future Concept Map' which includes conservation areas consisting of areas with historical, cultural, environmental value or open areas that could become community assets and are worth preserving, such as arroyos and hillsides (Goal 35, Policy 35.1). At present, the 2001 Zoning Code as amended has three zoning districts related to open space and arroyos: Flood Control (FC); Open Space-Recreation (OS-R); and Open Space-Natural/Conservation (OS-NC). However, these are not frequently used as a means to permanently preserve natural environments because they are voluntary options. Providing incentives to expand the use of the OS zoning districts in developments would further accomplish the protection of sensitive areas that have been identified by the public as valuable resources.

Low impact development (LID) and green infrastructure (GI) techniques can reduce the volume of runoff that reaches arroyos. Traditional stormwater management design has been focused on collecting stormwater in piped networks and transporting it off site as quickly as possible, to an arroyo, a constructed channel, a large stormwater management facility (basin), or a combined sewer system flowing to a wastewater treatment plant. LID and GI techniques are newer practices intended to lessen runoff at its source. They address these concerns through a variety of techniques, including strategic site design, measures to control sources of runoff, and thoughtful landscape planning. LID aims to restore natural watershed functions through small-scale treatment by designing hydrologically-functional sites that mimic predevelopment conditions. GI includes approaches and technologies to infiltrate, evapotranspire, harvest, and reuse stormwater to maintain or restore natural hydrologies.[47]

However, some GI/LID practices aren't appropriate in all cases. At times, residential on-lot ponding can be an ineffective strategy. This is because ponds are often filled in or not maintained properly so their water retention and infiltration properties diminish. Increasing education and awareness of the importance of these structures and other GI/LID techniques could improve overall management of arroyo systems by reducing runoff in some cases.

Other communities in the southwestern U.S. have successfully integrated land conservation, water harvesting and other GI/LID techniques, and preservation of the natural terrain into attractive, functional and affordable developments:

- Mesa del Sol in Albuquerque, NM includes parks and other public landscaped areas that have been designed using native, drought-resistant plants and a reclaimed water system that is used for non-potable uses like outside landscaping. Homes include rainwater harvesting and other water-saving features.

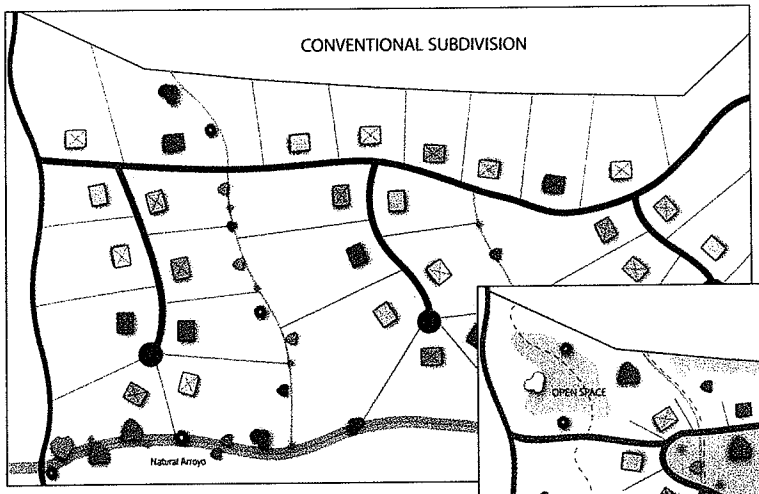
- Village Homes in Davis, CA utilize a natural drainage system that includes a network of creek beds, swales and pond areas to allow rainwater to be absorbed into the ground rather than

[47] EPA NPDES Stormwater Program Overview: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

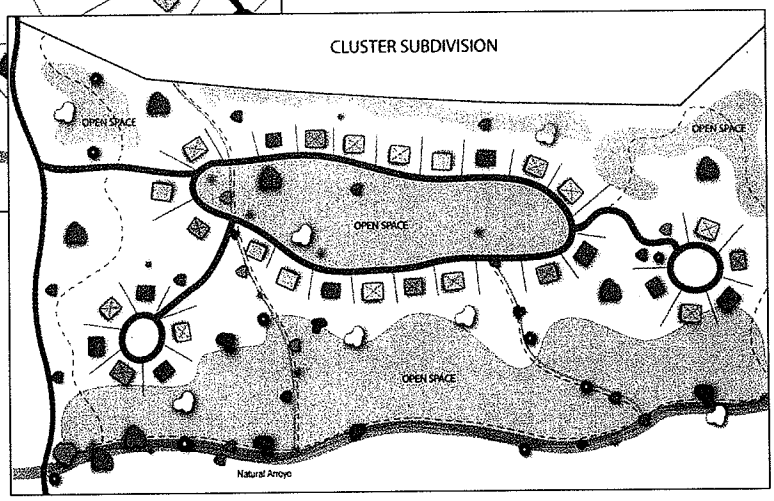
carried away through storm drains or detention ponds. Besides helping to store moisture in the soil, this system provides a visually enhancing backdrop for landscape design.

- The Civano development near Tucson, AZ is based on a tenet for development to tread lighter on the land through innovative design. Civano began by setting aside 35% of the land area for natural or enhanced open space. Community orchards, linear parks, pedestrian trails, bike paths, environmentally friendly recreational facilities, and preserved desert wild lands are all integral to the community's design.

It is important that our community balance the costs, types and quality of development against the long term value gained by preserving landscape views and open spaces associated with arroyo systems. The impact that open space can have on property values may actually underestimate the value of open space, by excluding the nonmarket values associated with passive uses, such as recreation or just knowing that open space exists.[48]



Cluster subdivisions, also referred to as conservation subdivisions, (below) provide efficient use of the land while substantially preserving open space, scenic views, historical features, natural drainage systems, native vegetation, wildlife habitat, viable agricultural land, or other desirable features of the natural environment. Graphics: Peter Bennett.



Watersheds

As a community expands and grows, the amount of impervious surfaces from development changes the nature of watersheds and how they function. Over time, a stream becomes graded, which means that an equilibrium was reached between channel slope (gradient), channel characteristics, available discharge, and load (debris). Stream banks and channels are relatively stable under graded conditions. But this balance can be upset by changes to land cover and surface characteristics of the watershed.

[48] The Economic Benefits of Open Space, Recreation Facilities and Walkable Community Design, Active Living Research, Robert Wood Johnson Foundation, May 2010. www.activelivingresearch.org

Development and other changes to land cover can increase the amount of impervious surfaces, alter the density of arroyo channels, increase the volume and velocity of stormwater, and change the amount and type of material that arroyos convey. Ultimately, these changes can divert much of the surface drainage to underground storm sewers. Stormwater events and resulting floods can strike with little warning, can travel at extremely high velocities, and carry a tremendous amount of sediment and debris. Changes in land cover can also alters the physical configuration and stability of stream channels, changing vegetation patterns and potentially reducing their value as wildlife habitats.

Enhancing and improving existing channels and arroyo systems can allow them to withstand erosion caused by turbulent flood and debris flows. Such enhancements and improvements require careful design, proper implementation and sufficient maintenance in some cases. Development on or near an arroyo should not increase downstream peak flows. Studies can be performed for such development to ensure it does not change the direction of an arroyo or have negative downstream effects. Erosion control techniques like culverts and arches can maintain flow path and protect from erosion. The location of erosion control structures is important: constructing them where a flow path has been or is likely to be altered, or downstream of a road crossing (where increased flow velocity is likely) can assist in maintaining a healthy arroyo system where development has already occurred.

Floodwaters may pass safely through an alluvial fan system if the existing channels and banks are protected. Because alluvial fans represent critical sites of sediment routing in mountainous watersheds, including a fan analysis in an arroyo characterization model may provide a fundamental tool for assessment. In addition, mapping alluvial fans could provide quality risk assessment data and suggest additional mitigation actions that assessing arroyo characteristics may not provide alone.

Stormwater Management, Impacts and Risks

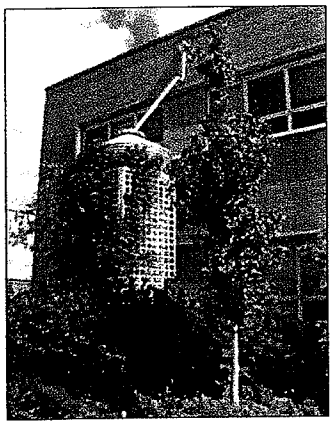
When stormwater is absorbed into the ground, it is filtered and ultimately replenishes aquifers or flows into streams and rivers. In developed areas, however, impervious surfaces such as pavement and roofs prevent precipitation from naturally soaking into the ground in an evenly displaced manner. Instead, water collected from impervious surfaces gathers and flows more rapidly into storm drains, sewer systems, and drainage ditches and can cause:

- Downstream flooding
- Stream bank erosion
- Increased turbidity (muddiness created by stirred up sediment) from erosion
- Habitat destruction
- Changes in the stream flow hydrograph (a graph that displays the flow rate of a stream over a period of time)
- Combined sewer overflows
- Infrastructure damage
- Contaminated water

As runoff flows over the land or impervious surfaces, it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated. In addition, most stormwater discharges are considered non-point sources (NPS) and require coverage under the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permit. Stormwater discharges from construction activities (such as clearing, grading,

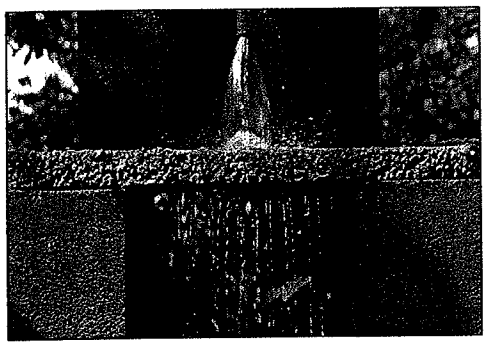
excavating, and stockpiling) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the NPDES stormwater program. The NPDES program requires the City to have a Small Municipal Separate Storm Sewer Systems (MS4s) permit for such construction activities. This includes a USEPA Construction General Permit requirement, where BMPs are mandatory during construction in order to control stormwater discharges; post-construction activities require runoff containment, revegetation or ponding are two ways to accomplish this.

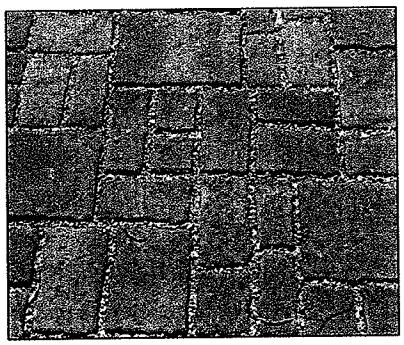
Mitigating stormwater pollution by reducing impervious surface and preserving open space for drainage are examples of green infrastructure techniques. Although many green infrastructure strategies are not approved by the City at this time, developers and contractors understand the need for better stormwater management and have made changes to their practices independently where permitted. As we become more knowledgeable about these techniques and the benefits they bring, the City can incorporate these mitigation practices as acceptable means of drainage design. Studies should be conducted using green infrastructure techniques to gain more confidence in implementing these practices, which can achieve proper drainage performance, flood safety and cost effectiveness.



Cisterns and rain barrels are a cost-effective way to collect and store water for garden and lawn irrigation and would keep the water out of storm drains. Photos: www.epa.gov

Bioswales are vegetated, mulched or xeriscaped channels that provide treatment and retention as they move stormwater from one place to another. Swales slow, and filter stormwater flows. As linear features, vegetated swales are particularly suitable for draining water from streets and parking lots. Photo: Dave Leonard Tree Specialists, www.dlarborist.com





Permeable concrete and pavers allow rain to seep into the ground. Permeable paving can capture and soak in up to 80 to 100 percent of the rain that lands on it and can reduce construction costs for residential and commercial development by reducing the need for drainage features. Photos: www.epa.gov.

Sometimes, BMPs are not implemented properly or sufficient maintenance is not provided following construction. The City has begun to address this by dedicating additional staff and resources to inspection and enforcement of existing regulations. Policies calling for enforcement of BMPs may further improve these practices.[49] The use of structures to protect from flooding is sometimes necessary and even desirable, but structural floodplain management should not be the primary mitigation plan. Because areas exist that are already fully developed and near a flood hazard, it is necessary to thoughtfully explore some appropriate structural methods as part of an overall plan in order to protect existing property.

Upstream debris barriers stop or reduce the movement of debris down a channel system. Debris barriers may be permanent structures in the watershed or constructed as temporarily control measures. Either way, these structures allow flood waters and fine grained sediment to pass through but stop larger sediment, rocks and vegetative material from flowing downstream. Debris barriers are one example of an engineered watershed improvement designed to manage the effects of stormwater.

Like many urban communities, Las Cruces relies on drainage channels, storm sewers, and other expensive infrastructure to deal with localized flooding from sudden storms. Both public and private landowner tax dollars pay to clean up nonpoint-source pollution caused when water transports contaminants from parking lots and other impermeable surfaces. But natural hydrologic systems recharge and cleanse the watershed from NPS pollutants. Undeveloped areas (i.e. natural land) provide a natural nonstructural floodplain management BMP because the land has not yet been altered with structures subject to the effects of flooding. In addition, NPS pollutants in discharge from urban runoff can affect EBID agricultural drains and may put the District's agricultural exemption from NPDES permitting at risk.

At the Rio Grande, the levees are intended to keep flows from leaving the river into the surrounding land during a flood event, that is, away from the river. This hinders runoff from arroyos and watersheds that flows toward the river in times of flooding. Elephant Butte Irrigation District's (EBID) drain and canal system flows mostly north to south, creating multiple impediments to arroyos and channels reaching the river. These drains and canals were not designed for storm flows, and were not designed for the increases in storm flow runoff associated with recent development.

Watershed conservation has proven to be a cost-effective alternative to expensive structural BMPs. Also, water sources can become polluted when sediment, pesticides, oil, animal waste and other contaminants wash into them from impervious surfaces. Conserving land and re-establishing vegetation along the sides of arroyos and other stream beds can help prevent this pollution. Vegetation also assists in bank stability and water quality mitigation within watersheds. Roots of riparian plants filter and remove suspended materials. Plants and algae use and remove such nutrients as nitrogen and phosphorus. Bacteria, fungi, and other microorganisms decompose organic material.[50] These are important functions of a healthy watershed.

The most significant hazard to public safety along incised channel reaches is often related to lateral erosion into infrastructure and adjacent property rather than flooding, because the capacity of the incised channel is typically quite large. All of the soils in Doña Ana County are considered highly

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[49] For the EPA's National Menu of BMPs, go to http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

[50] *"Eco Tipping Points: How a Vicious Cycle Can Become Virtuous."* Amanda Suutari and Gerald Marten. Earth Island Journal 22, no. 2 (Summer 2007).

erodible.[51] Wind, rainfall, soil moisture, the type and size of soil particles, and the condition of the soil surface (e.g. vegetated, barren, or disturbed) all determine how much erosion occurs. The unstable and erosive nature of soils in the arroyos are what makes it so difficult to predict how an arroyo will change in any given flood event. As shown below, unchecked erosion could eventually reach a point at which retaining walls, accessory structures, or infrastructure would have no support and fall away.

Sediment that is eroded during the incision process is carried downstream where it can deposit in low energy zones, decreasing channel capacity and potentially increasing the flood hazard in the depositional zones. Stormwater generally develops a flowpath in the hillside areas and follows existing arroyos that are in its natural path. Just as on the East Mesa, development on our western hillsides creates impervious surfaces and modifies storm flows, which can lead to increased erosion. Excessive incision can also remove natural vegetation and destroy habitat adjacent to the channel.

Besides their unsightly appearance, canalized arroyos increase runoff volume and water velocity, thus contributing to flooding and erosion downstream. This is a section of the South Fork of the Las Cruces Arroyo, east of Roadrunner Parkway.

Natural areas reduce runoff volume while providing wildlife habitat. Most of the arroyos in our region have great potential for restoration and preservation. This is a different section of the South Fork of the Las Cruces Arroyo, further east.
(Photos by Peter Bennett.)

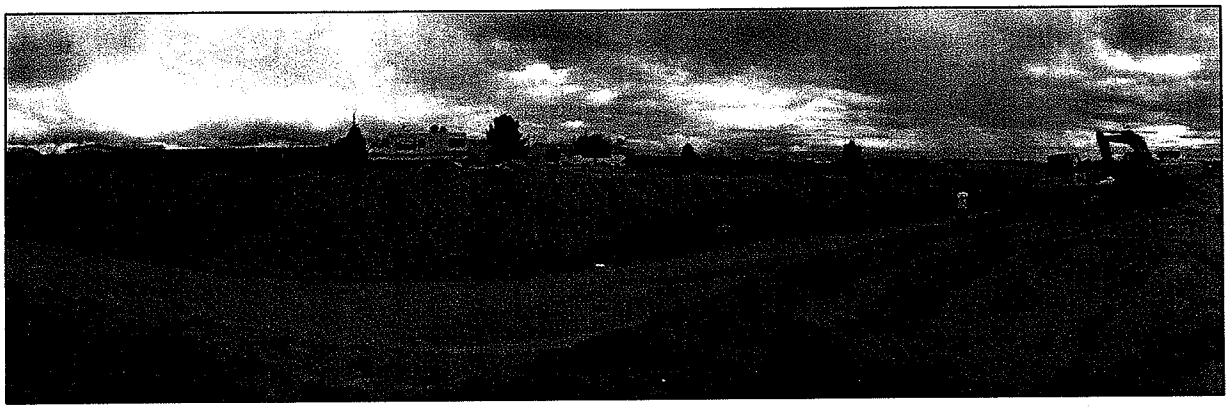
Another problem associated with erosion is damage to culverts under road crossings, usually caused by flood waters eroding culvert entrances or outlets and road embankments, and usually resulting in a full or partial washout, or misalignment of the culvert. Damage or failure of a culvert could be due to insufficient culvert capacity and/or inefficient end sections (mouth of the culvert), so appropriate hydrologic analyses of flood peaks and volumes, and applying appropriate culvert design criteria are both important. It is important to make a careful determination of the cause of the damage, as different

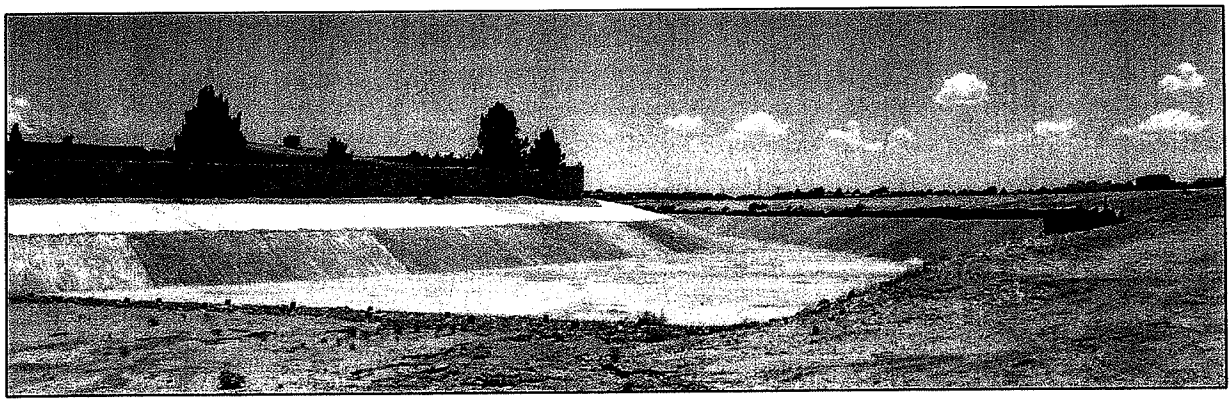
[51] Soil Survey of Dona Ana County New Mexico.

causes require different mitigation. Also, mitigation applied inappropriately could actually increase risk to the facility or other structures in the floodplain.[52]

In its simplest sense, an arroyo is only a drainage path. But with closer inspection it can be seen that the curves, width, and grade are all dynamic properties and continually seek a balance in response to its most recent flood event. For these reasons urbanization along banks inherently carries a higher risk for instability than does development further away. Some of the risks include 1) bank mass failure from bank instability through undercutting erosion or overloading of stormwater through development, 2) weaknesses from previous mass failure events, and 3) water flow regime risks by flooding of zones that have moved downward to place them below a 100-year flood elevation.

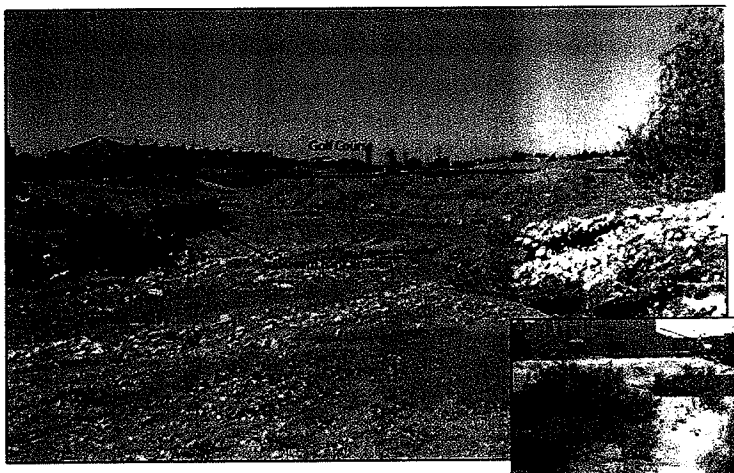
Further analysis of a given arroyo would identify many of the risks of urban development outside its flood zone boundary. This would help determine its inherent stability and likelihood of erosion and erosion speeds, and would identify historic failures within the embankment. This information could be used to help determine any necessary buffer distance for arroyos that have not yet been developed.



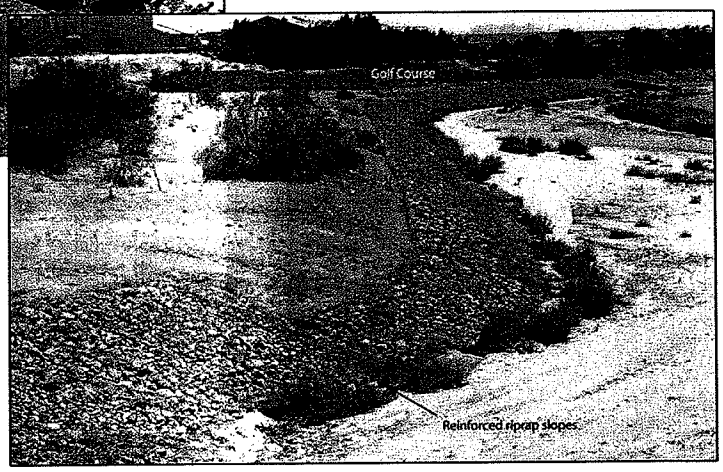


The solution to this severe flooding problem near Rinconada was to broaden the channel and line it with concrete. The banks were seeded with native grasses and an erosion fence was added.

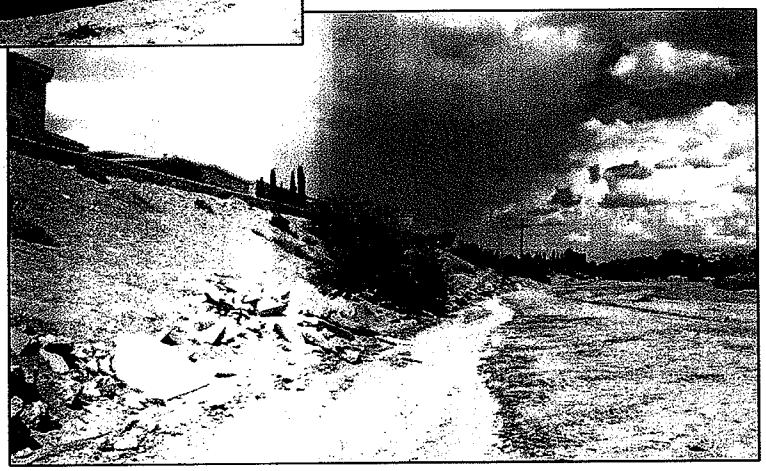
[52] Randolph Langenbach, Conservationtech.com: http://www.conservationtech.com



Flooding near the Sonoma Ranch Golf Course inspired a simple and inexpensive naturalistic erosion measure (below) which preserves natural vegetation and blends in with the surrounding terrain. Both photos: CLC Public Works Dept.



This photo illustrates what can happen when development restricts a natural channel. Continued erosion could eventually reach the point at which the retaining wall would have no support and would fall away. The photo below illustrates a quick and inexpensive (although unsightly) fix for the erosion problem. All photos: CLC Public Works Dept.



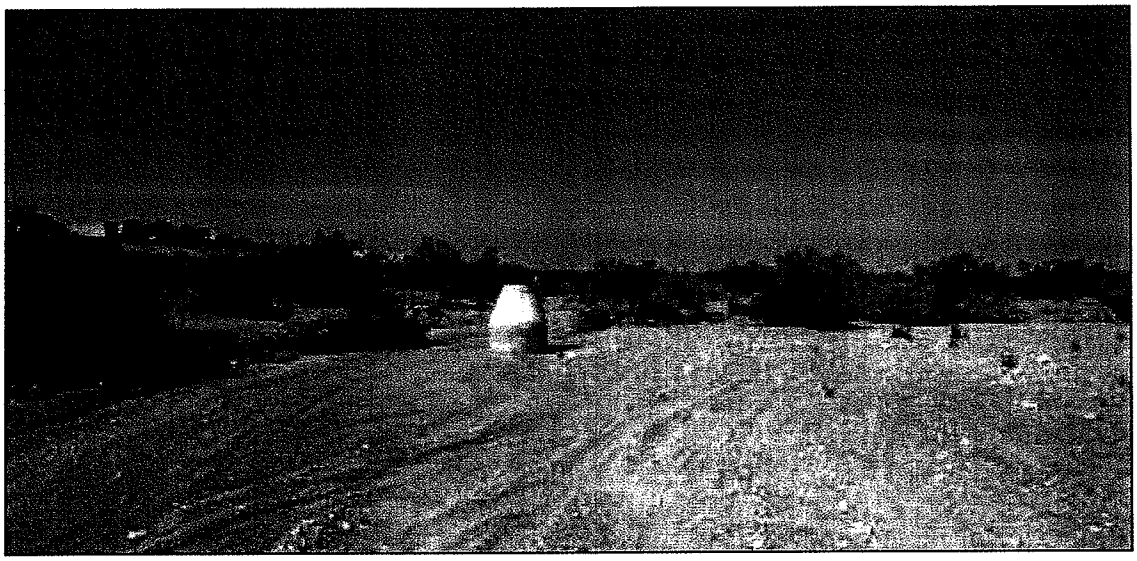
Utilities and Infrastructure

City utilities oftentimes place sewer interceptors in or near arroyos. These interceptors receive flow from a number of other sewer lines for transport to one of the three wastewater treatment plants operated by the City. Challenges with the location of these interceptors in or near arroyos can occur despite the installation of erosion control structures, such as rip-raps or check dams. For instance, since the soil is disturbed to bury the lines, the soil becomes more susceptible to erosion during a flood event and infrastructure may become exposed. Exposure may also occur when stormwater creates higher and faster runoff. In addition, water and gas mains and services are to have 5-foot minimum cover and sewer mains a 6-foot cover, as measured from the bottom, or floor, of the arroyo. But as arroyo floors erode with rain events, there is a risk of exposure, regardless of how deep the pipes were initially buried.

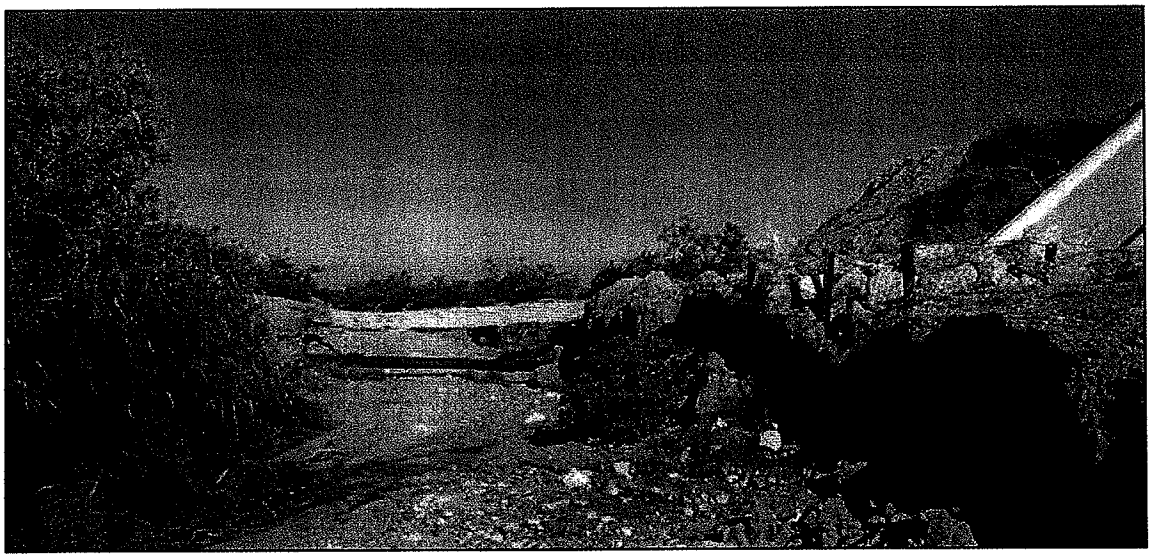
A cost-benefit analysis may warrant the efficiencies gained by locating interceptors or other utilities in or near arroyos. If warranted, updated design and installation procedures could help to ensure the least amount of disturbance to the arroyo environment. For example, when road crossings are constructed, arroyos become semi-closed channels that have limited or restricted access from a bridge or street. Most (if not all) of these bridges do not have large enough culvert openings to drive through, and bridge design typically doesn't include an access ramp for maintenance vehicles or a vactor truck. Without proper design to allow access, arroyo disturbance potentially increases when City staff needs to reach manholes or exposed pipes that cross or lie on the arroyo floor. According to the City's Utilities Standards, manholes must be accessible by 2-wheel-drive vehicles 24 hours a day and must be approachable by a dedicated 15-ft. (minimum) right-of-way or City utility easement.[53] However, this is very often not the case due to space constraints.

On the West Mesa, infrastructure such as utility lines and roads are more expensive to install and maintain due to a more hilly terrain. Access becomes more difficult to provide because hillside roads are generally narrower, do not always provide secondary connection due to physical constraints, and can be easily blocked or narrowed due to on-street parking.

[53] City Utility Standards Sections 504, Sewer Lines Outside of Street/Road Right-of-Way, and 510, Manhole Design Criteria, www.las-cruces.org/Departments/Utilities



Exposure around the manhole indicates incision in this reach of up to 2 to 3 feet in this area. Note that some of the exposure could also be due to lateral movement of the low flow channel. This is the Alameda Arroyo looking downstream (west) from Roadrunner Parkway. Both photos: USACE Sediment Transport Analysis Report



Exposed pipeline in an incised reach of the South Fork Arroyo downstream (west) from Roadrunner Parkway.

Flood Control Dam Functionality

Several of the flood control/detention dams listed on page 29 are within the East Mesa watershed. Some dams were built at the request of residents and were designed to protect those residents, but most were built with a lower hazard in mind and present a potential risk to those who have developed below them since their installation. Maintenance of these structures has been neglected over the past 30-40 years during which time the pool areas have experienced extensive sediment deposition and build-up. This has impeded the primary outfall of most of the dams and diminished their storage capacities. These dams were originally intended to protect agricultural land, not urban or rural development. The City's Storm Drain Master Plan of 2006 found that:

> "Under current conditions, the effectiveness of the Civilian Conservation Corps (CCC) dams as flood control structures is questionable; their main role at this time appears to [be] control and retention of sediment." [54]

According to the Natural Resources Conservation Service (NRCS), many of the dams are approaching the end of their planned service life and will require rehabilitation to continue to function safely. To ignore these dams will eventually place life and property at risk.[55]

The key areas where additional technical information is needed to support dam rehabilitation activities are summarized as:

- Technology for predicting performance of dams during extreme hydrologic events.
- Improved means of characterizing reservoir sediment quantity, quality, and distribution.
- Improved tools and guidance documentation for efficient application of current technology at the field level.
- Improved technology and tools for predicting the environmental impacts of dam failure.
- Improved procedures for predicting the response of channel and reservoir systems to change.
- Improved procedures for evaluating the short and long-term impacts of dam removal.

The Agricultural Research Service (ARS) and the NRCS have cooperated in the development and application of design criteria for flood control structures and channel stabilization measures. Over the past 60 years, achievements such as the development of tools to predict upland erosion, sediment delivery, and stream channel stability have contributed to improved reservoir design. ARS has also worked closely with NRCS in the development of design criteria for flood control project components such as spillways and stilling basins that allow the dams to operate effectively. Joint efforts in the area of software development for technology application are continuing to result in improved tools for design and analysis of dams and systems.

There are different options for dams to provide flood control functionality for Las Cruces. These could range from larger dams and reservoirs just outside developed areas, to a series of smaller dams strategically located through the extent of the arroyo system. These dams also represent the potential for wetlands and habitat where wetlands never existed before, but such repurposing could have impacts on the flood control function of the dams. Assessments on effective and desirable flood control structures would need to be addressed when considering upgrades or rehabilitation of the dams, and would involve the State Engineer's Office of Dam Safety, the NRCS, the Dona Ana County Flood Commission, the USBOR, the, private property owners and many other entities. In addition, the recent designation of the Organ Mountain Desert Peaks National Monument may impact owners' ability to maintain their dams, depending on the management plan created by the U.S. Bureau of Land Management.

Since the City has limited control over the fate of these dams (with the exception of the Villa Mora, Sandhill Arroyo and Las Cruces Dams), policies addressing upgrades and rehabilitation are not included in the AMP. However, the City fully supports a regional stormwater management strategy that fulfills

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[54] City of Las Cruces Storm Drain Master Plan, 2006, Bohannan Huston Inc.

[55] Rehabilitation of Aging Watershed Flood Control Dams. U.S. Department of Agriculture Technology Fact Sheet, May 2001. www.nrcs.usda.gov

the programs of all entities and would participate as a regional partner in efforts to mitigate problems associated with improving dam functionality.

Factors that need to be considered include the costs for rehabilitation (including technology that would aid in decision-making), the values of downstream development which would be at risk due to dam ineffectiveness, and whether or not these flood control dams would be the best way to handle stormwater runoff. Other methods, including larger dams, designed channels to redirect flows where development has taken place downstream or ponds may be more effective. But the Las Cruces, Alameda, North Fork, and South Fork Dams are important to the overall drainage of the East Mesa watershed because they play a major role in the watershed's hydrology.

Weather and Climate Variability

One does not have to accept theories about climate change to understand that the unpredictability of El Niño, La Niña and the North American Monsoon makes it difficult to plan for storm events and flooding, and makes it all the more important. Monsoonal rainfall events in southern New Mexico tend to be short and spotty, with intense, local storms drenching some neighborhoods but not others. Rising temperatures and increased storm activity have occurred simultaneously, although the timing, intensities and frequencies of storms change from region to region and from year to year and may not be related to climate change at all.[56] It is worth noting, however, that the increased droughts, fires, flooding and severity of storms recorded in the last ten years have all occurred with a warming of only 1.3°F [57] and scientists project that Earth's average temperatures will rise between 2 and 12 degrees Fahrenheit by 2100.[58] In the Southwest, temperatures since 2000 have risen about 1.5°F from recorded averages.

Many regions are experiencing more frequent and severe heat waves while experiencing more intense rainfall, as well. Scientists theorize that changing the average global temperature by even a degree or two can lead to serious consequences and predict that for about every 2°F of warming, we can expect to see:

- 3—10% increases in the amount of rain falling during the heaviest precipitation events, which can increase flooding risks.
- 5—10% decreases in stream flow in some river basins, including the Rio Grande.
- 200%—400% increases in the area burned by wildfire in parts of the western United States which increases the likelihood of soil erosion and flooding in burned areas. [59]

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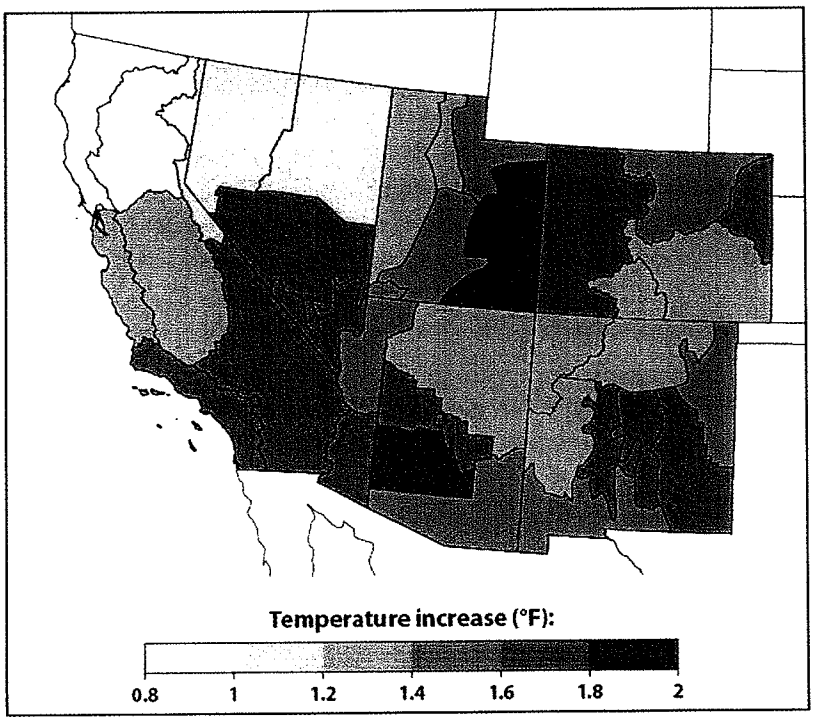
[56] "Understanding the Southwestern Monsoon," Jack Guido. Southwest Climate Network, 2010. www.southwestclimatechange.org

[57] "Understanding Climate Change: A Primer," Woods Hole Research Center, 2014. www.whrc.org

[58] *America's Climate Choices: Final Report*. National Research Council, 2011. The National Academies Press, Washington, DC, USA. http://nas-sites.org/americasclimatechoices/

[59] *Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia*. National Research Council, 2011. The National Academies Press, Washington, DC, USA. http://nas-sites.org/americasclimatechoices/

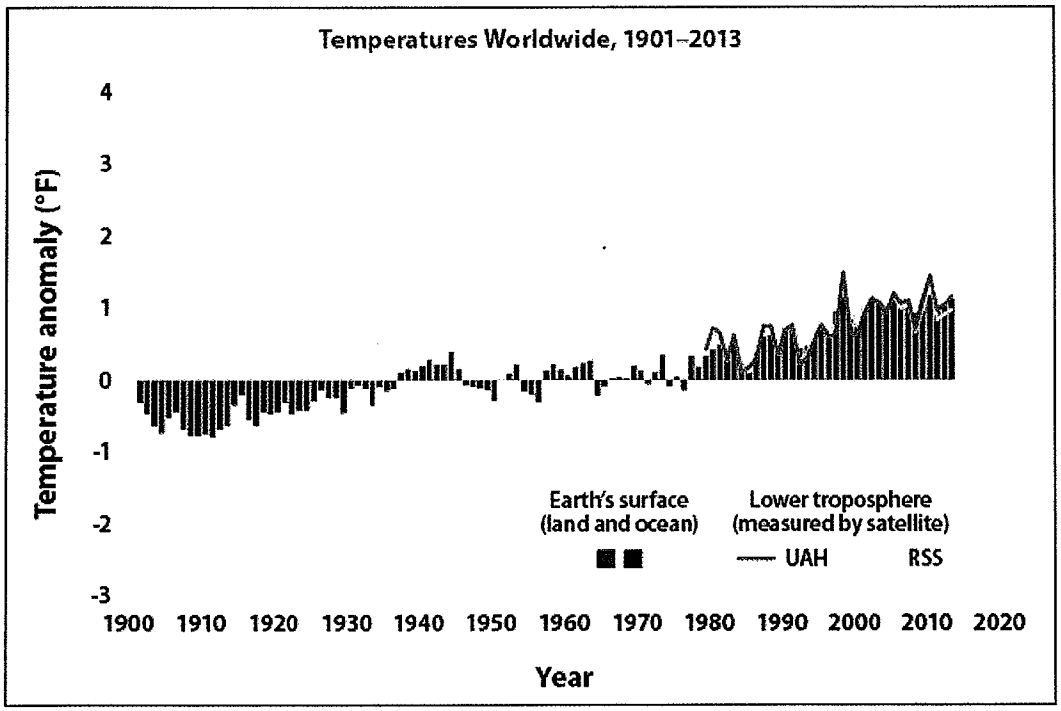


This map shows the average increase in air temperature in the Southwest compared to long-term averages (1901-2013). Southern New Mexico has experienced an average increase of 1.5° F in the last decade. National Climatic Data Center, National Oceanic and Atmospheric Administration (NOAA), 2014. www.ncdc.noaa.gov/oa/ncdc.html

The high costs associated with extreme and variable weather is something to keep in mind during discussions about development and arroyo management. Most climate models indicate that the Southwest will become drier in the twenty-first century, and that there will be increased frequencies of extreme weather events, including drought, flooding, and heat waves.[60] Increasing temperatures are expected to alter precipitation patterns (i.e. volume, frequency, and intensity) and correspondingly alter regional stream flow patterns.[61]

[60] IPCC 2007

[61] Climate Choices for a Sustainable Southwest," from The Assessment of Climate Change in the Southwest United States. Available at http://swcarr.arizona.edu/content/about-report. P 286



This figure shows how annual average temperatures worldwide have changed since 1901, when reliable temperature data began being collected. In the early part of the 20th century, temperatures were slightly below normal. The first significant heat wave occurred in the mid-1930s, but steady and sharp increases in temperature began to occur in the late 1970's. National Climate Data Center, National Oceanic and Atmospheric Administration (NOAA), 2014. www.ncdc.noaa.gov/oa/ncdc.html and www.epa.gov/climatechange/indicators

Typically, arroyo capacity is analyzed with respect to the 100-year storm event, to assure no development occurs within the inundated areas. With predicted increases in intensity and frequency of storms, arroyos will have to carry a greater amount of water than they currently do and will flow beyond the 100-year flood boundary.

Short- and long-term perspectives on disaster risk management and adaptation to weather extremes can be difficult to reconcile. But community vision changes over time and development decisions are framed by tradeoffs between competing prioritized values and objectives. In other words, what we want today may not be what we want tomorrow. A proactive approach would not necessarily commit our community to a different vision, but would simply prepare us for whatever it may be. Planners, developers and elected officials will face choices to react to extreme storms and flood events or to take steps that could help head off some of the more damaging and expensive results of them. In the long run, better planning and erring on the side of caution save money and could simultaneously make our region better able to cope with the coming changes.[62]

A regional stormwater management plan, based on thorough hydrologic modeling, may help identify the most fragile land forms where development should not occur. If we consider potential extreme weather events and climate change in determining locations of critical facilities and systems and more fully incorporate natural systems to help control erosion and manage stormwater, we may be reducing

[62] Melanie Lenart, Southwest Climate Change Network, March 2013. http://www.southwestclimatechange.org/node/16780

disaster risk because we have a better understanding and acceptance of the natural hazards we may face in the future.[63]

Vegetation and habitat

Mitigation measures to restore vegetation disturbed during development can be challenging because vegetation generally takes a long time to establish in the desert environment. Also, since soil is disturbed during construction, it is more likely to erode, making vegetation more vulnerable to destruction.

Vegetation loss and desertification are issues with development as well. More impervious surfaces and narrow channels diverting stormwater to arroyos cause increased velocities and flows. Devices such as rip-rap, check dams and energy dissipaters are not always incorporated at drainage outlets that enter arroyos, causing destruction of downstream vegetation. Those that are incorporated sometimes fail due to poor design or insufficient maintenance.

Construction permitees in New Mexico are required to follow Section 9.4. of the NPDES General Permit for Discharges from Construction Activities, which states that operators in New Mexico have three years to establish a uniform perennial vegetative cover with a density of 70 percent of the native background vegetative cover for all unpaved areas and areas not covered by permanent structures. Other areas of the U.S. are required to revegetate areas in one year, but the EPA recognizes the difficulty in arid desert regions and therefore has allowed a longer time period for this requirement in New Mexico.

According to the Army Corps of Engineers' *East Mesa Watershed Study* (2007), the relative scarcity of perennial grasses that would be expected to occur in this area is a cause for some concern and perhaps presents an opportunity for restoration. Typically native species like sideoats grama, black grama, fluff grass, vine mesquite, tobosa, burro grass, alkali mallow and cane bluestem are very rare or absent altogether across the East Mesa, but could be replanted as part of mitigation efforts following construction.

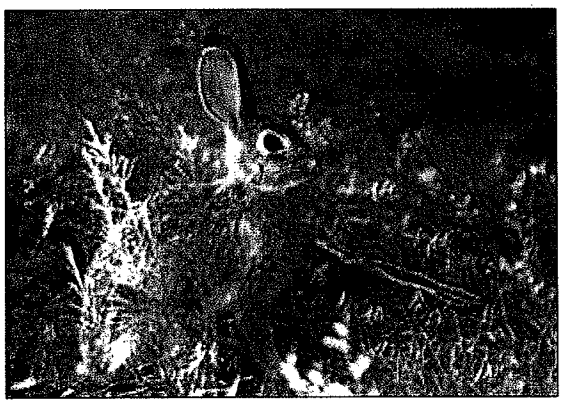
Wildlife

As part of a healthy desert ecosystem, arroyos provide vital wildlife habitat and are natural east-west wildlife corridors. It is important to have intact, unfragmented corridors so that wildlife can access different parts of their home territory without crossing highways or arterial roadways. The East Mesa Watershed has undergone significant changes over time, especially within the past two decades.[64] Before development, the watershed was largely comprised of Chihuahuan Desert vegetation, with Chihuahuan Desert arroyo riparian communities, interspersed in the valley areas and along the arroyos. However, these community types are experiencing increased pressure from development, grazing, and other human uses. With development, wildlife habitats are encroached upon which can force interaction with humans or the elimination of their ranges and areas altogether.

During the Army Corps of Engineers *East Mesa Watershed Study* (2007), many species of wildlife expected to be present in the area were either absent or not observed. It has been speculated that

[63] United Nations Office for Disaster Risk Reduction, www.unisdr.org/we/coordinate/hfa
[64] East Mesa Watershed Study, U.S. Army Corps of Engineers, 2007.

development and competition by other species or predation have caused this decline.[65] Development within the watershed has transformed the wide, uninhibited alluvial fan to a patchwork of subdivisions that have restricted arroyo flows and segmented wildlife corridors and habitat. New roadways and neighborhoods have interrupted connectivity and have made it nearly impossible for wildlife to travel outside a very limited range. Although they have been reduced in size and diversity, some unfragmented wildlife corridors could perhaps be identified and preserved. A requirement for arroyo buffers could also benefit wildlife in appropriate areas.



Wildlife have adapted to changes caused by human presence and are drawn to garbage, gardens, pet food, and backyard bird feeders. Left, Coyote: Albuquerque Journal. Middle, Collared Peccary aka Javalina: Encyclopedia of Life, http://eol.org. Right, Desert Cottontail: New Mexico Tech, http://www.nmt.edu.

[65] Ibid

Parks and Open Space

Arroyos are an important recreational asset. Runners, cyclists, equestrians and walkers use the arroyos the open spaces adjacent to them on a regular basis. Encroaching development has threatened open space recreational opportunities by limiting access to these areas through subdivision design. As an example, subdivisions may reduce or limit pedestrian and bicycle access, may make no provisions for trails and may reduce opportunities for amenities along arroyos due to development that is too close to the 100-year flood zone boundary. This limits the value of arroyo systems as a multi-faceted community asset. In addition to providing more trail possibilities, planning development further back from the 100-year flood zone would also provide more privacy for property owners and would provide greater flooding protection in higher risk areas.

Unfortunately, motorcycles and all-terrain vehicles (ATV) have disturbed vegetation and wildlife and over time, leave a scarred landscape that isn't easily returned to a natural state. Signage and perhaps fencing in specific areas may help with this as will education and raising awareness of the value of the natural environment. Providing dedicated ATV areas may also reduce the overall damage to natural areas.

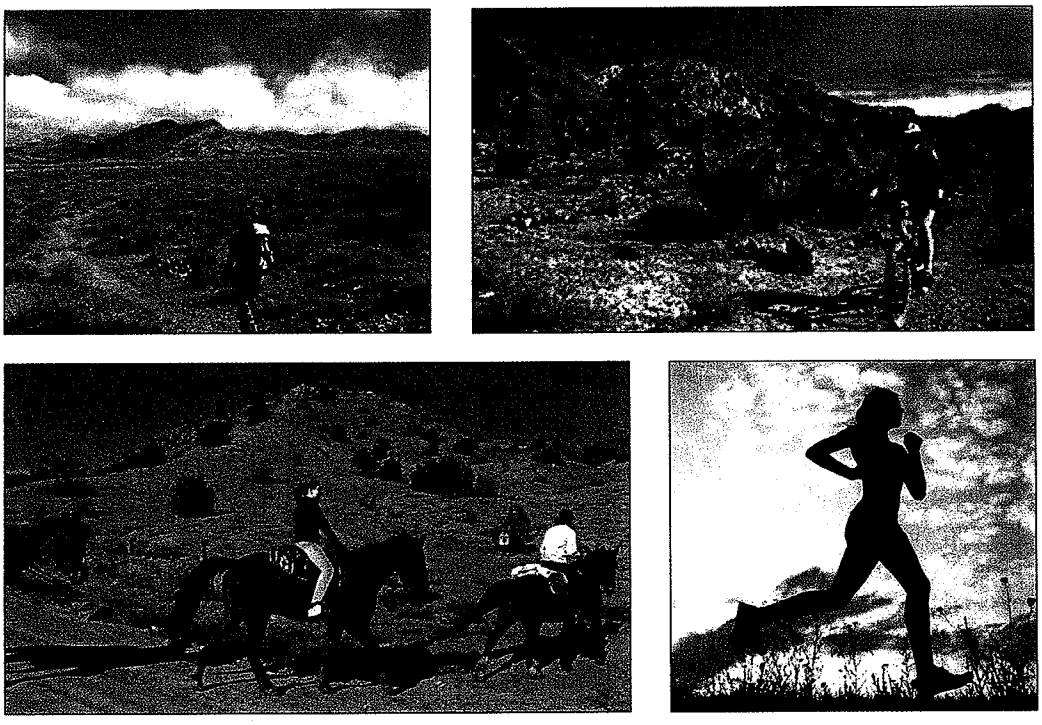
Equestrians often travel along arroyo bottoms but crossing under thoroughfares is difficult because bridges are generally too low to ride under. Increased demand for natural areas, trails and trail connections, and equestrian amenities means there is a need for design standards for trail construction and trail and road crossings that consider the needs of all users. These do not currently exist.

Suitable trails for equestrians have become increasingly hard to find, particularly close to urban areas. Many trails prohibit equestrian use, fearing conflicts with other users and damage to the trail surface. However, with proper design, a multi-use trail can accommodate equestrians while minimizing user conflicts. Hard surfaces (asphalt and concrete) and coarse gravel can injure horse hooves, so loose or compacted dirt trails may be called for in selected locations.

There may be opportunities for east-west linear parks along certain arroyos, but this has not yet been studied in any great detail. Further analysis of arroyos based on geology and soil stability, vegetation, slopes, drainage patterns, etc. will identify suitable areas for such parks. More important, there is a need for an identified funding source so that open space and arroyo buffers may be acquired by the City and to ensure adequate maintenance and repairs are performed.

Buffers along arroyo systems can provide non-motorized transportation for commuting cyclists and pedestrians. Left: This mostly flat paved trail in Tucson follows the banks of the normally dry Santa Cruz River for 9.5 miles.
Photo: www.flickr.com/photos/lasertrimguy

According to the publication *Better! Cities & Towns*, total U.S. driving has dipped then leveled off in recent years, and per capita vehicle miles traveled (VMT) has steadily dropped since 2005. Per capita driving is down 8.75 percent, and is now at 1996 levels.[66] In other words, non-motorized transportation networks are becoming increasingly important. There are very few connections in Las Cruces between schools, neighborhoods, commuter bike routes and major commercial areas. Trails adjacent to arroyos are part of the Mesilla Valley Metropolitan Planning Organization's proposed trail plan and could easily be factored into new development proposals in an effort to provide additional connectivity for non-motorized transportation.



Passive recreation opportunities that incorporate arroyo systems can bring a boost to an area's economy through tourism, sporting events, and quality of life factors. Photos, clockwise from upper left: National Recreational Trails; BLM; Albuquerque Journal; Arizona Foothills Magazine.

The Economy and Quality of Life

Today the U.S. economy is dominated by high technology and service businesses selling knowledge and intellectual expertise. This economic sector is not tied to specific business locations or by the need for certain kinds of transportation facilities or raw materials. With more freedom to choose a site, businesses often select one with a high quality of life – including parks, aesthetics open space, and easy access to the outdoors – in order to compete for highly trained, in-demand workers.[67]

Companies frequently relocate where their top talent wants to live, and that is most often in places of natural beauty. When land is protected, the adjacent properties often increases in value, with homes selling for 10–20 percent more than comparable homes without access to such areas. A survey by the

[66] *Better! Cities & Towns,* Ithaca, NY 14851, June 2013. www.bettercities.net

[67] "Conservation: An Investment That Pays." Trust for Public Land, 2007, http://www.tpl.org

National Association of Realtors concludes that new homebuyers value trails and natural areas above any other amenity.[68]

As quality of life becomes an increasingly important factor for business location, there will be a greater demand for natural areas and passive recreation activities. Frederick Law Olmsted, designer of New York's Central Park, was one of the first people to suggest that parks could be paid for with increasing tax revenues that resulted from rising land values adjacent to the park. In fact, studies conducted by the Trust for Public Land have shown that investments in land conservation and open space return from $4 to $10 for every dollar invested.[69]

Conserved land and open space can provide opportunities for eco-tourism as well. The Bosque del Apache National Wildlife Refuge (NWR), which is located about 130 miles north of Las Cruces, is a protected area with unique wildlife viewing opportunities. Recreational visits generate over $4.5 million in tax revenue for the region. For every $1 of the NWR budget, there is a local economic effect of nearly $8.

One method for estimating the economic value of open space and recreation areas that do not have a market value is through hedonic[70] pricing methods. This statistical approach is used to link a good traded in the marketplace (i.e. a house) with an environmental good (i.e. a nice view) that is not traded in the market. According to a survey done by the Robert Wood Johnson Foundation, various research studies conclude that the average household living half a mile from open space would be willing to pay $4,104 more for a home to live a quarter mile closer to the open space.[71] In addition, traditional neighborhood development concentrates neighborhood density, allowing room for large open space areas. Neighborhoods that feature open spaces, parks and greenbelts have been found to have higher home sale prices, enhanced marketability and often faster sales or leases than conventional development.[72]

Key research results found by the Robert Wood Johnson survey include:

- Open spaces such as parks and recreation areas can have a positive effect on nearby residential property values, and can lead to proportionately higher property tax revenues for local governments.
- In general, urban parks, natural areas and preserved open spaces showed positive effects on property values.
- Environmental protection, greenhouse gas reductions, and mental health benefits, as well as recreational benefits, should be considered as indirect effects.

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[68] The Economic and Tax-Base Benefits of Land Conservation, Land Trust Alliance Factsheet. www.landtrustalliance.org. 2003

[69] Ibid

[70] Hedonic pricing is a model identifying price factors according to the premise that price is determined both by internal characteristics of the good being sold and external factors affecting it. The most common example of the hedonic pricing method is in the housing market: the price of a property is determined by the characteristics of the house (size, appearance, features, condition) as well as the characteristics of the surrounding neighborhood (accessibility to schools and shopping, level of water and air pollution, value of other homes, etc.).

[71] The Economic Benefits of Open Space, Recreation Facilities and Walkable Community Design, Active Living Research, Robert Wood Johnson Foundation, May 2010. www.activelivingresearch.org

[72] Ibid

- Natural area parks, on average, have the largest statistically significant effect on a home's sale price, holding all other factors constant. Value increase to homes located within 1,500 feet of the following types of parks:
    - Natural areas: $10,648
    - Golf courses: $8,849
    - Specialty parks: $5,657
    - Urban parks: $1,214[73]

It is often more cost-effective for a community to maintain open space, which can control flooding, filter water runoff, or help to mitigate air pollution, than to invest tax dollars in expensive infrastructure projects to achieve the same function.[74] For developers, these economic benefits can translate into reduced financial liability, faster sales and ultimately higher profits. The design elements of compact developments may also present cost savings. Watershed areas that are used as a form of natural drainage protection and open space also reduce construction and maintenance costs from stormwater drainage systems.

Conservation easements have been a powerful tool to protect land from development by providing federal tax breaks for donating land development rights. With a conservation easement, a property owner gives some or all of the development rights on the property to a government agency or not-for-profit (there are more than 1,700 local land trusts), and receives a federal income tax deduction for the gift amounting to the difference in the value of the land before and after the easement is in place. The land owner still owns the land and can continue to use it.

The Enhanced Easement Incentive is a temporary measure that was originally enacted by Congress in 2006, and repeatedly extended. The most recent extension, which was in effect until the end of 2013, allowed a non-farmer donor to use a conservation donation deduction for up to 50% of his gross income in any year, up from the normal 30% that is a permanent part of the law. The temporary break also allowed a donor to carry forward any unused write-off for a full 15 years, instead of the normal five. Currently, there is a new measure before Congress which would make the incentive permanent and would allow modest-income landowners to receive significant tax deductions for donating conservation easements that permanently protect important natural or historic resources on their lands.

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[73] , Active Living Research, Robert Wood Johnson Foundation, May 2010. http://activelivingresearch.org.

[74] "Conservation: An Investment That Pays," Kline, J., et al, 2009. Trust for Public Land, www.tpl.org

CHAPTER 5. GOALS AND POLICIES

We are fortunate to be able to enjoy the arroyos for passive recreation activities, wildlife viewing and other fresh air experiences. But it's important to remember that first and foremost, arroyos exist as natural stormwater conveyance systems and are an integral part of the desert ecosystem. In developing policy guidance for arroyo management, our goals must further systematic flood control and drainage functions, allow continuance of historic flows in arroyos, and protect arroyos in their natural state. If those things are done well, we can continue to enjoy open space experiences for years to come.

This chapter is divided into four sections. *Land Use* addresses overarching issues related to development and growth management. *Environment* focuses ways in which the land, vegetation and wildlife can be protected. *Community Facilities* suggests policies to increase the use of arroyo systems as community assets. *Utilities and Stormwater* looks at design standards for more effective and efficient stormwater management, including erosion control, sedimentation, and utilities installation and maintenance.

Goals and Policies describe *what* should be accomplished; Actions explain *how* they will be carried out. The guiding actions to implement the goals and policies are listed in tables in Chapter 6, Administration and Implementation. Many of the policies in this plan are limited to arroyos that are not already privately owned or to arroyo areas that have not yet been developed. This will have to be determined on a case-by-case basis as individual arroyo characterization modeling is carried out. Those that may affect developed areas are limited to maintenance or mitigation issues, since flood control systems are already in place. Some of the policies below will require changes to existing codes, including LCMC Chapter 32 Design Standards and Chapter 37 Subdivisions. However, AMP policies provide guidance for decision making but are not regulatory. As is the case currently, public and private development projects follow codes that are in place at the time of development.

SECTION 1 -- LAND USE

Wise land use practices must balance the rights of landowners with the protection of our region's unique landscapes, arid vegetation and natural wildlife habitat. It is also critical that we increase our ability to manage arroyos holistically by understanding the potential impacts of our actions on a regional and watershed level. Development in the East Mesa area (and eventually on the West Mesa) should logically occur from downstream to upstream so that downstream infrastructure can be in place before upstream development occurs. It is also important that upstream flood control measures be engineered sufficiently so that downstream properties are not adversely affected.

The major arroyos that are most important to the City in the context of stormwater management and open space protection are the Alameda, Sandhill and Las Cruces Arroyos. As development moves further away from the city center, managing other arroyos properly will also become a priority. The Fillmore, Doña Ana, Moreno and Torgugas Arroyos extend into the ETZ and will be impacted as our community grows.

GOAL 1. Take a proactive approach to watershed management that takes into account existing drainage conditions as well as conditions affected by future development.

Policies:

1.1. Complete a detailed characterization of the main stems of each major arroyo so that it may be managed for optimum protection, stabilization and resiliency.

1.2. Work with governmental agencies (BLM, SLO, etc.) to retain or dedicate their arroyos and identified buffer areas to the City or County before public lands are sold for development.

1.3. Identify critical and sensitive environmental areas and contiguous open spaces and protect them from development using conservation easements, incentives, the Open Space (OS) zoning designation, etc.

1.4. Develop public/private partnerships to develop funding strategies for acquisition and maintenance of arroyo systems.

1.5. Clearly outline drainage or flood control modifications to arroyos in PUD concept plans and master plans, and include necessary details in subsequent development processes for review and approval purposes.

1.6. In areas that are in close proximity to arroyos, design and lay out lots and street locations in a way such that the natural characteristics of arroyos, such as vegetation and contours, are utilized. Site specific plans that address these issues rather than a standard design often results in a safer, more cost effective result.

1.7. In new development proposals include intended pedestrian, bicycle and equestrian connections between arroyos, thoroughfares and existing developments.

1.8. Allow green infrastructure techniques in development proposals as a way to manage storm water before it reaches the arroyos.

1.9. Increase the availability of reclaimed (purple pipe) water that could be used for establishing and supplementing native vegetation adjacent to arroyos.

1.10. Identify areas adjacent to arroyos or sections of arroyos that may be suitable for linear parks, trails or scenic corridors and provide incentives to create them.

GOAL 2. Improve the safety of the flood control dams and restore native vegetation in the storage pool areas.

Policies:

2.1. Evaluate conditions of Sandhill, Villa Mora and Las Cruces flood control dams and prioritize them for necessary mitigation, such as seepage and slope stability, pool area and spillway capacity of each dam, etc., and identify responsible City departments for these actions.

2.2. Complete appropriate re-vegetation with Chihuahuan Desert native grasses following any dam rehabilitation or maintenance activities that disturb existing vegetation.

2.3. In development proposals downstream of flood control dams, include an analysis of dam effectiveness and potential flooding impacts to that development.

2.4. Support a regional stormwater management strategy that fulfills the programs of all entities and participate as a regional partner in efforts to mitigate problems associated with improving dam functionality.

2.5. Ensure that development, zoning, and land use changes do not impede flood control dam maintenance or operations.

GOAL 3. Improve road crossing infrastructure to maximize drainage function

Policies:

3.1. Design and/or retrofit existing arroyo crossings to limit or prevent a hydraulic constriction/bottleneck under present conditions and for potential flows under future hydrologic conditions. Failure to do so could lead to incision problems and hazards to adjacent infrastructure and property improvements.

3.2. Make maximum use of existing infrastructure and previously developed road crossings to minimize encroachment into natural areas.

SECTION 2 -- ENVIRONMENT

Many opportunities exist for environmental restoration of riparian ecosystems on the East and West Mesas. While it may be unrealistic to set goals to restore developed areas to historic riparian and grassland ecosystems, it is possible to make significant strides in that direction. Desert riparian communities that will survive with surface water flows along arroyos can be restored within the watershed by various erosion control and arroyo stabilization techniques. Also, there are opportunities for environmental restoration at the dam sites in the watershed.[75] Through sound development standards, new development can adapt to existing natural environments, topography, soils, vegetation, geology, and hydrology so that fragile land forms, natural wildlife habitat and wildlife connectivity are protected.

GOAL 4: Protect and maintain natural vegetation within arroyo systems and mitigate damage that may result from development.

Policies:

4.1. Without compromising engineering design standards, promote flexibility in planning and landscaping development and utility installations that propose to retain the natural characteristics of the terrain or preserve undisturbed tributaries that feed major arroyo corridors.

4.2. When constructing and installing utility components, survey existing vegetation in arroyos and design utility installations to disturb as little vegetation as possible.

4.3. Replace vegetation lost during construction by reseeding with Chihuahuan Desert native vegetation following the requirements in NPDES 9.4.[76]

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[75] ACOE East Mesa Watershed Study 2007

[76] Construction permitees in New Mexico are required to follow section 9.4. of the NPDES General Permit for Discharges from Construction Activities, which states that operators have additional time – up to three years – to establish a uniform perennial vegetative cover with a density of 70 percent of the native background vegetative cover for all unpaved areas and areas not covered by permanent structures. See EPA Construction General Permit, http://cfpub.epa.gov/npdes/stormwater/cgp.cfm

GOAL 5: Manage arroyos to retain wildlife corridors.

Policies:

5.1. Increase valuable desert wildlife habitat by evaluating areas within the watersheds where native plant restoration is feasible.

5.2. Identify and map wildlife corridors so they may be protected from construction activities.

5.3. No fencing or walls may obstruct free flow of waters or debris.

SECTION 3 -- COMMUNITY FACILITIES

Strengthening arroyo systems as a community asset can improve quality of life and bolster our economy. Las Cruces' natural areas attract tourists and new residents to the community. In addition, arroyos already provide occasions for outdoor recreation and non-motorized transportation for current residents. But it is important that in doing so, the privacy and rights of residents living adjacent to the arroyos are respected. Proper design of parks, trails, trail amenities, connectivity, equestrian facilities, street crossings, parking, signage, etc. will result in opportunities that meet the needs of all users. The Mesilla Valley Metropolitan Planning Organization (MPO) includes a Trail Plan map in their long-range transportation plan, Transport 2040. Policies in the Arroyo Management should complement and support the MPO's goals.

GOAL 6: Minimize impacts created by development and human activities to realize the full potential of arroyo systems as a community and economic asset.

Policies:

6.1. Create regional development and conservation guidelines for arroyos that cross jurisdictional boundaries.

6.2. Identify and map those arroyos and open spaces that might serve as natural connections to other public properties.

6.3. Promote neighborhood and subdivision designs that incorporate arroyos as neighborhood amenities. These may include such things as street alignments that are placed between developed areas and arroyos; open space corridors, linear parks, trails, etc.

6.4. Put forth a Quality of Life initiative to help fund community amenities such as open space acquisition.

6.5. Use adopted park impact fees or development waivers as incentives to developers to designate open space, trails and connectivity, or a linear park on a case-by-case basis.

6.6. Work with other City departments and other agencies to develop strategies to prevent illegal dumping in the arroyos, such as sign postings, Neighborhood Watch, Adopt-A-Spot, increased patrols by Codes Enforcement officers, etc.

6.7. Incorporate linear parks adjacent to arroyos into the City's Parks and Open Space Master Plan in areas where an arroyo is suitable for such a park.

6.8. Create a promotional outreach campaign about recreation opportunities, nature and open space experiences, etc. in the Las Cruces area.

GOAL 7: Achieve the goals of the MPO Trail Plan to create a continuous system of regional trails that integrates and connects arroyo systems.

Policies:

7.1. Working from the proposed trails mapped in the MPO Trail Plan, identify areas where arroyo trails may be located.

7.2. Provide adequate distance from residential development to protect privacy of property owners and from roadways to provide safe pedestrian and bicycle passage.

7.3. Construct trails outside the designated 100-year flood zone boundary on an arroyo.

7.4. Update MPO Trail Plan to improve connectivity of trails between arroyos, parks and other public open spaces, such as SLO and BLM land.

7.5. Identify potential trail locations that would be appropriate for accessibility and compliance with ADA standards.

GOAL 8: Work with the Mesilla Valley MPO to create design guidelines that ensure trails suit the characteristics of the arroyo, provide maximum usefulness and address pedestrian, cyclist and equestrian safety.

Policies:

8.1. Develop standards in the LCMC Chapter 32 Design Standards for arroyo trails according to the characteristics of the arroyo and its available buffer area.

8.2. Design arroyo crossings to include appropriate measures such as signage, push button signals or other features that will maximize safety, access and mobility.

8.3. Where applicable during the development design process, meet with adjacent neighborhoods to discuss appropriate trail amenities for pedestrians, bicycles and equestrians.

8.4. Where possible, locate parking, trail heads and amenities in such a way as to support a dual use such as postal cluster boxes, playgrounds, parks, etc.

8.5. In partnership with the MPO, develop standards for park, trail and facilities signage, route and wayfinding signage and an informational brochure identifying existing and planned trail facilities.

SECTION 4 – UTILITIES AND STORMWATER MANAGEMENT

Safe and effective engineering standards for flood control, utilities installation, storm water conveyance and water storage are important. But these designs should maintain the natural character of the arroyo and minimize impacts of development so the arroyos function optimally and natural terrain is not destroyed. This is also important to ensure historical drainage patterns are not altered.

The City promotes flexible design standards when channelizing and storing stormwater for development adjacent to designated arroyos that will enhance the natural arroyo system. It should be noted that the LCMC Chapter 34 (Drainage and Flood Control) may require more than minimum storm water standards if arroyos on a site to be developed or immediately downstream of the site show evidence of increased

flooding, accelerated erosion, channel erosion of sedimentation, as a direct result of conditions on the site. These additional requirements may include buffer zones, re-vegetation of highly eroded areas, and arroyo restoration or other erosion control measures within highly eroded channels.

GOAL 9: Create safe and effective engineering standards for flood control and conveyance while maintaining the natural character of the arroyo and achieving visual harmony.

Policies:

9.1. Keep arroyos in a natural or naturalistic condition to counteract erosion. Naturalistic treatments could include such things as native vegetation and channel stabilization using rock riprap, weirs, weirs, gabions, contouring, etc.

9.2. Do not alter a natural arroyo unless such a modification is shown to be without reasonable hazard and liability, and there are no adverse impacts to public and private infrastructure, habitats and open space. Altering a drainage path may create new and unpredictable flood responses.

9.3. Replace vegetation in areas that are disturbed during construction, in accordance to NPDES 9.4. This includes a well-established mixture of native grasses, forbs, and other ground cover to help reduce sediment movement.

9.4. In laying out adjacent street systems, keep drainage outfall structures to the minimum needed to maintain a naturalistic arroyo treatment.

9.5. Pursue innovative methods of funding storm water management practices. Special funding could include user fees, special taxation, tax incentives, grants, conservation easements, and Public or Private Improvement Districts.

GOAL 10: Minimize soil and slope instability, erosion, sedimentation and water run-off to protect water quality and the natural characteristics of the land.

Policies:

10.1. Use public education to raise awareness level of the general public and the construction/development community in regard to urban runoff, non-point source pollution and other watershed-related issues.

10.2. Strengthen the permitting and inspection process to improve compliance with the EPA NPDES MS4 permit and Construction General Permit

10.3. Do not discharge stormwater runoff directly into arroyos. Direct discharge into a settling pond, impoundment or other solution designed to stop or slow water before it reaches the arroyo. This will assist in bank stabilization by minimizing erosion and promoting growth of native vegetation.

10.4. Extend drainage structures completely into the arroyo bottom, extending to the arroyo flow line, and matching the natural terrain.

10.5. Confirm that a Notice of Intent (NOI) to the Environmental Protection Agency (EPA) has been submitted before issuing grading permits.

10.6. Place fills in such a way that they do not cause encroachment upon arroyos or other natural drainage ways.

10.7. Use Best Management Practices (BMPs) related to NPDES compliance to reduce pollutants from storm water.

10.8. Apply credits to the FEMA/Community Rating System (CRS) program for those projects adopting the management practices in the CRS program plan. This will provide additional flood protection and cost savings.

GOAL 11: Improve the safety and efficiency of utilities installation to better protect the natural environment.

Policies:

11.1. Bury utilities to a depth as determined through a soil stability analysis and to meet requirements outlined in the City Utilities Standards. In some cases this may be deeper than the minimum standard.

11.2. Design utility crossings to minimize damage to flora and fauna and to minimize changes in surrounding natural grades.

11.3. Replace desert vegetation lost during utilities installation as per NPDES 9.4.

11.4. Provide erosion control measures for infrastructure built in arroyos.

11.5. Provide appropriate access provisions to infrastructure and other facilities in arroyos and along their buffers to provide for necessary operation and maintenance.

CHAPTER 6. ADMINISTRATION AND IMPLEMENTATION

The City's comprehensive planning framework begins with broad goals defined in *Comprehensive Plan 2040*, and is referred to as "Level 1" within the framework. More detailed plans, Level 2, include community planning blueprints and neighborhood, corridor and technical plans. The Arroyo Management Plan (AMP) is considered a Level 2 technical plan. In order to accomplish goals and policies in these Level 2 plans, Actions are identified, some of which lead to regulations in our codes, such as the Zoning Code, Development Standards, Subdivision Code and other related chapters in the City's Municipal Code. Goals, Policies and Actions are defined as:

> **Goals** represent an ideal future condition or long-term end state that the City strives to achieve, but which are not necessarily measurable.
> **Policies** are statements that guide action and imply clear commitment toward achieving or advancing a goal.
> **Actions** identify procedures, programs, or techniques City departments and/or other entities accomplish on a day-to-day basis that will make the policies and goals a reality.

The last step is in this process is implementation, during which most of the actions are carried out. Actions in the AMP involve changes to codes, strengthening enforcement of these codes, educating the public, and regulating the City's own practices in such a way that we meet or exceed the minimum requirements. In some cases, regulations and practices that are not already reflected as policies in the AMP will have to be added later as a plan amendment. In this way, policy and practice are consistent and support the same purpose. Listed below are actions that address goals in the Land Use, Environment, Community Facilities, and Utilities & Stormwater Management sections of Chapter 5. In most cases, cooperation among City departments, other governmental agencies and/or the private sector will be critical.

The actions noted below are intended to guide arroyo management and may need to be modified somewhat to reflect the realities of implementation. For example, some measures as written may simply be too expensive to implement or may conflict with existing regulations. In these cases, steps should be taken to remove barriers to implementation, i.e. secure funding, amend existing codes, etc.

As noted earlier, the City supports a regional stormwater management strategy and would participate as a regional partner in efforts to manage arroyo systems. It is important that we look broadly at arroyo systems at the watershed level, and then continue to characterize individual arroyos for specific management needs. This will require the participation and collaboration of many different public and private entities with land and natural resource management responsibilities. Development would then occur systematically and would be based on thorough physical and regulatory analyses of the arroyos and surrounding terrain.

LAND USE

GOAL 1. Take a proactive approach to watershed management that takes into account existing drainage conditions as well as conditions affected by future development.

Actions for Policies 1.1 – 1.10

It is important to understand the potential impacts of human actions on a regional and watershed perspective. By managing arroyo systems holistically – looking broadly at the watershed level – we can help to ensure that the full potential of arroyos as a community asset is realized and in doing so, maintain the desert's ecological health over time. Protecting arroyo systems and improving overall stormwater management begins by amending existing ordinances that would set parameters for these activities. Once amended, a checklist of reports, data or other appropriate information that should be submitted with development proposals ensures that these issues are addressed to the satisfaction of the City.

ACTION	COLLABORATING PARTIES
To characterize individual arroyos, combine existing and new modeling work to include data about hydrology, land use, vegetation, wildlife, soil type, topography, drainage patterns, etc. This complete watershed model would be used to determine buffers, areas appropriate for linear parks, scenic corridors, and areas that are more susceptible to erosion that may require treatments beyond the minimum regulations. ~~Starting with~~Measured laterally from the 100-year flood zone boundary, buffers would be determined based on the characteristics of the arroyo or its banks. For example, a buffer may include bands of indicator species of vegetation and small channels that are apparent outside the 100-year floodplain if the modeling data support those inclusions.	City of Las Cruces all appropriate departments
Carry out appropriate joint agreements to dedicate arroyo systems (arroyo + buffer) to the City of Las Cruces.	City of Las Cruces, NM State Land Office, Bureau of Land Management
Identify long-term funding sources and other strategies for land acquisition, maintenance and other activities. These may include such things as: • Land and Water Conservation Fund (LWCF) funding to acquire new lands and secure conservation easements on private lands. • General obligation bonds could be used for "Quality of Life" amenities including open space acquisition. Generally backed by the City and paid back through property taxes. • Special Assessment District (SAD) distributes the cost of a project to property owners who realize a direct benefit once the improvements are constructed. This could be used for storm drains, sanitary sewers, water service, roadways, sidewalks and other related public infrastructure. •	CLC all appropriate departments

[The following revision, including the deletion and added Action, have been recommended by the City's Legal Department.] • Public Improvement Districts are similar to a SAD in that they provide a means to generate funds for construction and maintenance of public infrastructure. Cost of project is distributed to only those properties that gain a direct benefit. Different from SAD in that funds are placed in a fund that is managed by a board of directors.~~Increasing mil levy for Dona Ana County Flood Commission projects or reconsider the creation of the Las Cruces Metropolitan Flood Control Authority (LCMAFCA).~~ • Other federal funding sources for environmental protection.	
• Prepare a cost benefit analysis of implementing Sections 3-41-1 through 3-41-5, NMSA 1965, entitled "Flood Control," which allows New Mexico cities to tax properties within their municipal boundaries up to $5 per $1000 (5 mill) of net taxable value to pay for authorized flood control structures within and without the municipal boundaries. Include a historical analysis of funding for City Fund #4400 for flood control purposes. This would show the amount acquired annually at the current 2 mill rate ($2 per $1000).	CLC all appropriate departments
Map arroyos and proactively zone major arroyo systems as OS-NC to preserve them as open space.	CLC Community Development
Consider a City development pilot project that adheres to the goals and policies of the AMP to demonstrate the plan's implementation.	CLC all appropriate departments
Amend appropriate chapters of the LCMC to revise requirements for PUD and subdivision proposals to fulfill policies herein.	CLC all appropriate departments
Expand education program about project designs that minimize impact to water quality.	CLC all appropriate departments
Identify areas requiring erosion protection in development proposals and require designs for protective measures, as provided in UTILITIES & STORMWATER MANAGEMENT GOALS in Chapter 5	CLC all appropriate departments
Strengthen enforcement of NPDES Stormwater BMPs for Construction and Post-Construction.	CLC all appropriate departments
Create incentives for developments that zone arroyo buffers or larger contiguous areas of opens space as OS-NC.	CLC Community Development
Increase access to reclaimed water.	CLC Utilities

GOAL 2. Improve the safety of the flood control dams and restore native vegetation in the storage pool areas.

Actions for Policies 2.1 – 2.5:

The initial purpose of East Mesa flood control dams, particularly the Alameda, North Fork, and South Fork Dams, was to provide localized flood and sediment control. These dams are at varying stages of effectiveness and currently serve, mainly, as sediment catch basins. According to the 2006 Storm Drain Master Plan, these three dams are serving to reduce peak discharge rates under both the 100- and 500-year storms. The dams do not have a major impact on the total volume of water that is delivered to each

analysis point as they are designed as detention and not retention facilities; even so, the dams are still valuable for peak reduction and lagging.[77] Additionally, the conditions of the dams have probably changed somewhat since 2006. For example, the Bureau of Land Management has performed rehabilitation work on the Alameda Dam. Updating the dam condition and effectiveness reports may be called for.

There is an opportunity for improving dam safety and bringing them up to current safety standards. Additionally, there is an opportunity for environmental restoration features in the storage pool areas. Las Cruces can participate in a regional effort to address problems related to the flood control dams. But direct responsibilities and actions are limited to the Villa Mora, Las Cruces and Sandhill dams.

ACTION	COLLABORATING PARTIES
[The following deletion has been recommended by the City's Legal Department.] ~~Consider City membership in the South-Central New Mexico Storm Water Management Coalition support watershed-level planning for arroyo management.~~ For dams outside the jurisdiction of the City of Las Cruces, the City encourages participating entities to re-evaluate dam effectiveness and make appropriate decisions about mitigation measures, such as breaching, installing hydraulic structures, rehabilitating, etc. This may include vegetative restoration if disturbed during dam maintenance or rehabilitation. For the City's dams and for dams outside the jurisdiction of the City of Las Cruces, the following measures are suggested: • Install hydraulic structures upstream and increase capacities of those dams identified by the Army Corps of Engineers for such measures. • Utilize the full catalog of storm water management, erosion control, and revegetation options for dam rehabilitation before making the decision to breach those dams which have been identified for such actions. • Implement appropriate restoration measures in the upper reaches of the watersheds to slow flow and decrease sediment loads that reach the dams.	All entities participating in regional stormwater management.

GOAL 3. Improve road crossing infrastructure to maximize drainage function

Actions for Policies 3.1 – 3.2:

[77] City of Las Cruces Storm Drain Master Plan, Section 4, Analysis of the Dams in the East Mesa Watershed, Bohannan Huston, Inc., 2006

ACTION	COLLABORATING PARTIES
Amend Design Standards to require strategies to prevent erosion, sedimentation and constriction problems under roadway crossings, such as installing sediment catch basins upstream of the culvert, debris barriers, energy dissipaters, etc.	City of Las Cruces all appropriate departments
Identify and secure increased funding for regular maintenance of such infrastructure.	

ENVIRONMENT

GOAL 4: Protect and maintain natural habitat & wildlife connectivity within arroyo systems to the greatest extent possible and mitigate damage that may result from development.

Goal 5: Manage arroyos to retain wildlife corridors.

Actions for Policies 4.1 – 5.3:

ACTION	COLLABORATING PARTIES
Amend Landscape Design Standards to include revegetation requirements as per NPDES General Construction Permit Section 9.4., including a list of acceptable/desirable species for revegetation in and/or adjacent to arroyos and dam ponding areas.	CLC all appropriate departments
Work with the local Soil and Water Conservation District to offer programs to encourage planting native vegetation and trees. Outreach to developers and homeowners would demonstrate the importance of establishing vegetation and other measures to control soil erosion.	CLC all appropriate departments
Work with NMSU, U.S. Fish & Wildlife and/or other appropriate organizations to begin a wildlife corridor database project.	CLC, NMSU, USFW, etc.

COMMUNITY FACILITIES

GOAL 6: Minimize impacts created by development and human activities to realize the full potential of arroyo systems as a community and economic asset.

Actions for Policies 6.1 – 6.8:

Since these areas are managed by private and public sector parties, actions that will maximize the public value of arroyo systems and open space must satisfy the policies and needs of all parties. Providing incentives, securing additional funding sources and creating partnership agreements are just some of the ways this can be achieved.

ACTION	COLLABORATING PARTIES
Work with appropriate agencies to establish regional conservation guidelines within city limits and the ETZ area.	CLC all appropriate departments, Doña Ana County (including Flood Commission), SLO, BLM, NMSU, etc.
Identify and map existing and potential open space linkages and zone as OS-NC.	CLC all appropriate departments
Amend appropriate codes to allow transfer of development rights.	CLC all appropriate departments
Intensify Neighborhood Watch, Adopt-A-Spot, and other anti-dumping programs in areas where illegal activity is frequent.	CLC Police (Codes Enforcement)
Advertise local transfer stations and county collection centers to promote proper disposal of waste and reduce trash dumping in arroyos and other open spaces.	CLC all appropriate departments, Doña Ana County
Using the arroyo characterization model, develop criteria to define a linear park and identify arroyo systems suitable for such parks.	CLC all appropriate departments

GOAL 7: Working from the MPO Trail Plan, create a plan for a continuous system of regional trails that integrates and connects arroyo systems.

GOAL 8: Create design guidelines for trails and trail crossings to ensure that the trails suit the characteristics of the arroyo, provide maximum usefulness and address pedestrian, cyclist and equestrian safety.

Actions for Policies 7.1 – 8.5:

Connecting isolated pockets of open space to each other and to existing parks, trails and schools will expand the potential of arroyos systems as a public asset. While some arroyo systems may be perfectly suited for a multi-use trail, others may not due to lack of soil stability or sufficient buffer distances. Trails and trail crossings must be designed according to the type of trail desired and the characteristics of individual arroyos.

ACTION	COLLABORATING PARTIES
Amend Design Standards to reflect policies 7.1 through 8.7. regarding landscaping, trails, trail crossings and trail heads that will meet the needs of bicyclists and equestrians as well as pedestrians.	CLC Community Development, Public Works (Facilities), and Parks
Identify appropriate locations for multi-use trails (accessible) and include them in next updates of the Parks & Recreation Master Plan and MPO Transport 2040.	MVMPO, CLC Community Development, Parks,

	Public Works (Facilities), GIS

UTILITIES AND STORMWATER MANAGEMENT

GOAL 9: Create safe and effective engineering standards for flood control and conveyance while maintaining the natural character of the arroyo and achieving visual harmony.

Actions for Policies 9.1 – 9.5:

These actions are intended to minimize the visual impacts of stormwater management structures adjacent to and in the arroyos and protect the natural landscape as much as possible. While it may first appear difficult or expensive to carry out these methods, most of them are techniques that are already used extensively and will only require small changes.

ACTION	COLLABORATING PARTIES
[The following deletion has been recommended by the City's Legal Department.] ~~Participate in the creation of a regional stormwater utility – an organization complete with its own revenue source that collects, treats and disposes of stormwater. (Legislation to enable the establishment of the Las Cruces Metropolitan Flood Control Authority (LCMAFCA) was passed in XXXX but the Authority was never formed.)~~	~~City of Las Cruces and all entities involved in stormwater management and flood control in the plan area.~~
Consistently follow and enforce Storm Water Management Ordinance requirements.	CLC all appropriate departments
Amend Chapter 32 Design Standards and other relevant codes to reflect policies above.	CLC all appropriate departments
Improve review and inspection of all construction projects, including CLC-initiated projects, for compliance with the MS4 Permit, specifically PART 5 Storm Water Management Program (SWMP).	CLC all appropriate departments

GOAL 10: Minimize soil and slope instability, erosion, sedimentation and water run-off to protect water quality and the natural characteristics of the land.

Actions for Policies 10.1 – 10.8:

ACTION	COLLABORATING PARTIES
Amend development standards in Chapter 32 to create maximums for the amounts and types of cut and fill activity allowed adjacent to and surrounding identified arroyos systems and drainage facilities.	City of Las Cruces all appropriate departments
Amend Design Standards to adhere more closely to National Menu of Best Management Practices (BMPs) to further reduce pollution from stormwater. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm	City of Las Cruces all appropriate departments

GOAL 11: Improve the safety and efficiency of utilities installation to better protect the natural environment.

Actions for Policies 11.1 – 11.5:

ACTION	COLLABORATING PARTIES
Create improved methods for constructing utilities, taking into account proper scour analysis, loss of service risk, and minimizing aesthetic impacts to the arroyos.	City of Las Cruces all appropriate departments
Require revegetation of areas where native vegetation is disturbed, as per NPDES General Construction Permit Section 9.4.	City of Las Cruces all appropriate departments
Develop handbook of appropriate modifications to arroyos for situations in which minimally containing the arroyo would be the most appropriate option. For example, illustrations of acceptable structures, materials, etc.	City of Las Cruces all appropriate departments
Engage the Soil and Water Conservation District to offer programs to encourage planting native vegetation and trees. Outreach to developers and homeowners would demonstrate the potential for soil erosion in the region and the importance of establishing vegetation and other measures to control soil erosion.	CLC Community Development, Public Works (Facilities), Utilities and Parks
Develop an erosion and sedimentation design guide for use by the City, developers and property owners.	CLC Public Works
Require minimum LID techniques in all development proposals and provide incentives for those proposals that exceed minimums.	CLC Public Works, Parks, Community Development

CHAPTER 7. CONCLUSIONS

Since 1956, City of Las Cruces planning documents have called for an approach to development and stormwater management that preserves arroyos in their natural state. In recent years, Comprehensive Plan 2040, the Storm Water Management Plan, Transport 2040, the Parks and Recreation Master Plan, and other related plans adopted by the City have included policies to guide both public and private efforts. The Comprehensive Plan 2040 Future Concept Map specifically calls for "conservation areas" consisting of areas of historical, cultural, environmental value or open areas that could become community assets and are worth conserving, such as arroyos.

As development has increased, arroyos have been rerouted, channelized, or dammed to prevent or mitigate flood damage. In some cases, these actions were the only alternatives to protect downstream property. But in general, this has interrupted natural drainage function, wildlife connectivity and the propagation of vegetation, and have, in several instances, modified historic drainage in negative ways.

Specifically in arroyo environments, development designs can be implemented to maintain the natural character of the arroyo. It is also important to maintain arroyos to ensure historical drainage patterns adhere to water quality regulations administered by the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permit program. In addition, arroyos can provide a variety of recreational opportunities.

Geographically, the AMP includes major arroyos on the East and West Mesas, undeveloped floodways, unnamed 100-year flood zones, including areas in the Extraterritorial Zone (ETZ), and largely native areas on the West Mesa escarpment, as called for in the 1992 Storm Water Management Policy Plan. Within this planning area, arroyos and the lands adjacent to them are owned by many parties, mainly the New Mexico State Land Office, U.S. Bureau of Reclamation, City of Las Cruces and numerous private owners. While some of the policies in the plan may guide maintenance efforts in already-developed areas, the plan is primarily intended as guiding policy for public and privately-owned lands that are undeveloped.

The AMP suggests utilizing "buffers" in certain instances where additional flood protection may be called for. The plan defines a buffer as an area adjacent to an arroyo where development may not occur or may be reduced in intensity. It would be measured laterally from the boundary of the 100-year flood zone. Over the arroyo's length, the buffer may vary, depending on the hydrology, natural vegetation, wildlife corridors, the slope of the sides of the arroyo, soil type, etc. Buffer distances could be determined using similar computer modeling software that is used to determine flood zone boundaries. Additional data could be integrated into the modeling, such as the presence of wildlife, pockets of vegetation outside the 100-year flood zone and other geographical or built features that may inform appropriate buffer locations and distances.

Identified buffer acreage could be dedicated to the City or withdrawn by the New Mexico State Land Office or U.S. Bureau of Land Management prior to selling acreage for development. If privately held, a buffer could take the form of a linear park, trail, or conservation easement, all of which could be offset by various incentives such as higher density farther away from the arroyo, federal tax break, or park credits

Although one may not think immediately of economic development when considering arroyo management, key research results found by a Robert Wood Johnson Foundation survey conclude that open space has a positive effect on residential property values and that environmental protection and the mental health benefits afforded by open space protection should be considered indirect positive effects. In addition, tt is often more cost-effective for a community to maintain open space, which can control flooding, filter water runoff, or help to mitigate air pollution, than to invest tax dollars in expensive infrastructure projects to achieve the same function. For developers, these economic benefits can translate into reduced financial liability, faster sales and ultimately higher profits.

Planning for the possibility of more intense rain storms in the future, protecting vegetation and wildlife habitat, maintaining the flood control dams, and carrying out improved installation and maintenance of utility infrastructure are just some of the considerations that must be kept in mind when planning for future growth in our community. Requiring buffers in specific areas for added erosion protection, proactively zoning land as Open Space-Recreation (OS-R) and Open Space-Natural/Conservation (OS-NC), tightening compliance with stormwater management regulations, opting to go beyond the minimum requirements, and committing to Best Management Practices are a few changes that will further protect the health, safety and welfare of the general public. This integrated approach to development and open space preservation will prevent further damage to our open lands and improve the overall health of our environment.

RESOURCES

EPA Stormwater Home Page -- This website contains technical and regulatory information about the NPDES stormwater program. It is organized according to the three types of regulated stormwater discharges – municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. It also provides links to general stormwater topics and tools available, including Best Management Practices (BMP).
http://water.epa.gov/polwaste/npdes/stormwater/index.cfm

Using Smart Growth Techniques as Stormwater Best Management Practices
http://www.epa.gov/smartgrowth/pdf/sg_stormwater_BMP.pdf

Protecting Water Resources with Higher-Density Development – This report is intended for water quality professionals, communities, local governments, and state and regional planners who are grappling with protecting or enhancing their water resources while accommodating growing populations.
http://www.epa.gov/smartgrowth/pdf/protect_water_higher_density.pdf

Center for Watershed Protection -- The Center for Watershed Protection, Inc. is a 501(c)(3) non-profit organization dedicated to fostering responsible land and water management through applied research, direct assistance to communities, award-winning training, and access to a network of experienced professionals.
http://www.cwp.org/

The **Stormwater Manager's Resource Center** is designed specifically for stormwater practitioners, local government officials and others that need technical assistance on stormwater management issues. Created and maintained by the Center for Watershed Protection, the SMRC has everything you need to know about stormwater in a single site:
http://www.stormwatercenter.net/

Low Impact Development -- LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible.
http://water.epa.gov/polwaste/green/

Low Impact Development (LID) Urban Design Tools Website -- This site provides watershed managers with a new set of tools and techniques that can be used to meet regulatory and receiving water protection program goals for urban retrofits, re-development projects, and new development sites.
http://www.lid-stormwater.net/index.html

Green Infrastructure – GI generally refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate (the return of water to the atmosphere either through evaporation or by plants), or reuse stormwater or runoff on the site where it is generated.
http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm

Municipal Separate Storm Sewer System (MS4) Main Page -- Stormwater runoff is commonly transported through a Municipal Separate Storm Sewer System (MS4), from which it is often discharged untreated into local water bodies such as the Rio Grande. To prevent harmful pollutants from being washed or dumped into an MS4, operators (in our case, the City of Las Cruces) must obtain a NPDES permit and develop a stormwater management program.
http://water.epa.gov/polwaste/npdes/stormwater/Municipal-Separate-Storm-Sewer-System-MS4-Main-Page.cfm

Appendices not reproduced in Attachment "C," the tracked changes version of the document.

CITY OF LAS CRUCES
ARROYO MANAGEMENT PLAN

END

City of Las Cruces
PEOPLE HELPING PEOPLE

PLANNING AND ZONING COMMISSION
FOR THE
CITY OF LAS CRUCES
City Council Chambers
October 28, 2014 at 6:00 p.m.

BOARD MEMBERS PRESENT:

Godfrey Crane, Chairman
William Stowe, Vice-Chair
Charles Beard, Secretary
Joanne Ferrary, Member
Kirk Clifton, Member
Harvey Gordon, Member

BOARD MEMBERS ABSENT:

Ruben Alvarado, Member

STAFF PRESENT:

Katherine Harrison- Rogers, Senior Planner, CLC
Adam Ochoa, Planner, CLC
Carol McCall, Planner, CLC
Susana Montana, Planner, CLC
Ezekiel Guza, Associate Planner, CLC
Mark Dubbin, CLC Fire Department
Robert Cabello, CLC Legal Staff
Becky Baum, Recording Secretary, RC Creations, LLC

I. CALL TO ORDER (6:00)

Crane: Good evening ladies and gentlemen. Welcome to the 28th of October meeting of the Planning and Zoning Commission which is called to order. Let me start with the introduction of Commissioners as we usually do; starting on my far right, Commissioner Clifton who represents District 6. Next to him Commissioner Gordon who is the Mayor's appointee. Then Commissioner Stowe who is also our Vice Chairman. Commissioner Stowe represents District 1. Commissioner Ferrary is with District 5. And finally Commissioner Beard, who is also our secretary, is from District 2. Now we proceed to ask if …

Beard: You.

Crane: Oh yes. Modesty once again has tripped me up. I'm Godfrey Crane, the Chairman, I represent District 4. My wife will never believe that.

Crane: And the Chair votes aye based on findings, discussion, and site visit. The matter passes six/nothing. Thank you all.

Guza: Thank you Commissioner.

2. **Case PA-14-01:** Review of and action on the Arroyo Management Plan, prepared and presented by the City of Las Cruces Community Development Department.

Crane: Next item on our agenda and under old business is Case PA-14-01, review of and action on the Arroyo Management Plan. Carol McCall is here to tell us.

McCall: Thank you Commissioner Crane and Commissioners. This is Plan Amendment 14-01 to consider and recommend the Arroyo Management Plan. I was here in June and reviewed the Plan with all of you and you voted to table the discussion or postpone in lieu of more public engagement and further revisions of the Plan. So what I will present tonight is a summary of the events and activities that have occurred since that date. Just for review, this is the study area. It encompasses the City limits and the ETZ. And I want to review a couple of regulations and plans in the past that are relevant to this project, not all of them, they are reviewed in the Plan itself and in Appendix 2, but I thought that these were very interesting in that they, they were very insightful and provided a lot of forethought I thought for, for the events of the Arroyo Plan now. The 1956 Subdivision Regulations which were the first subdivision regulations called for open drainage channels to be used for protection against flood control and allowing a width of about 20 feet of an easement for erosion control. And the subdivision regs pointed out that natural watercourses can be an attractive asset to the subdivision as well as to the community and could improve and beautify the watercourses. So that was something that was built into the 1956 regulations, and then as I mentioned in June, the 1963 Enabling legislation passed by the State of New Mexico gave the City of Las Cruces the authority to establish a Las Cruces Metropolitan Arroyo Flood Control Authority. It was never established however, but the legislation is on the books. And then in 1992 the Stormwater Management Policy Plan, in addition to many other policies in that document, calls for promoting the aesthetics and multiuse activities through the use of natural arroyos. And this is the first mention in the literature of linear park systems, something that the Arroyo Plan calls for. Another policy calls for encouraging the preservation of open space corridors along the major arroyos on the East Mesa, and preserving and utilizing the major tributaries that feed the major arroyos. And I will talk more about the major stems of the arroyos later when we get into the buffer discussion. And lastly it says encourage the facilitation of a regional stormwater management program. And this, this again is something that

the Plan calls for as we had discussed with Las Cruces growing in every direction, there does seem to be a need for a plan that integrates all of the other policies and goals of the previous plans that have been adopted, such as the Parks and Rec. Master Plan, the Transportation Plan, and this policy Plan, and then there is also another Stormwater Policy Plan that was adopted in, in 2003 I believe, or 2005. And then lastly this Plan calls for the utilization and enforcement of best management practices, and again this is something that the Arroyo Plan calls for and is, is central to the implementation of the Plan.

As part of the public engagement, there were some comments about the Plan purpose and it was suggested to include; encourage responsible and profitable development, so this was included in addition to the other purposes that we've discussed; improving stormwater management, flood control, and drainage functions, and protecting arroyos in their natural state which then leads to protecting vegetation and wildlife habitat, protecting private property from flood damage, protecting utility installation and maintenance, and providing additional recreational opportunities.

For your review, the challenges that ... issues, challenges, and opportunities that the Plan discuss, discusses relate to increases in impervious surfaces due to development, erosion and sedimentation, slopes on the West Mesa which are very different from the East Mesa and require a different type of planning effort. And the flood control dam effectiveness which as I mentioned the dams were built at various times through the previous century, as early as 1939 and going up until 1972, and they're in various states of repair at the moment with discussion on a region-wide basis and involving quite a few different agencies as to how best that can be addressed.

Vulnerable utilities and infrastructure; as we've seen this is an example, a manhole that has the, the terrain around it has eroded and left it exposed. Climate change and erratic, the possibility of erratic rain storms and intensity of storms is likely to increase with further growth and development in both directions we will likely see destruction of vegetation and habitat and a reduction in wildlife corridors. And there has been a lot of public engagement expressing the desire for additional trails and other recreational amenities that utilize the arroyos.

The goals, policies, and actions for the most part have remained the same in terms of themes, land use, environment, community facilities, utilities, and stormwater management. Goal one which I'll just mention briefly because it's a new goal as one of the differences between the June 24th version of the Plan and this Plan is that Goal number one has changed and now reads "Take a proactive approach to watershed management." It takes into account existing drainage conditions as well as conditions affected by future development. And the other goals have stayed the same; to improve the safety of the flood control dams and improve road-crossing infrastructure.

In the environment section protect and maintain natural vegetation and manage arroyos to retain wildlife corridors. In community facilities which is primarily the recreation and amenities component, minimize impacts created by development, create a plan for continuous system of regional parks which is an extension of the MPO Trail Plan, and create design guidelines for trails and trail crossings which are also mentioned in the MPO Trail Plan. And in utilities and stormwater management; create safe and effective engineering standards, minimize soil and slope instability, and improve the safety and efficiency of utility installations. In the implementation chapter, the actions in the implementation section will carry out the policy or goal listed in the Plan and just as examples, I don't believe that this exact wording is in the Plan itself. Amend Chapter 32 Development Standards to implement Plan policies, those that apply that is. Consider a City development pilot project that addresses, adheres to the goals and policies of the Plan to demonstrate the Plan's implementation and build a new trail. That's just an example of how the policies could be implemented.

This is just a review of the stakeholder engagement that has been carried out overall before and after the previous meeting. We had two general meetings, two conservation stakeholder meetings, three engineering meetings which included a joint meeting with development stakeholders, and then three additional development stakeholder meetings, a meeting in discussion with the Paso del Norte Watershed Council, and the Elephant Butte Irrigation District, as well as the International Boundary and Water Commission Rio Grande Citizens forum. And then as a result of all of these meetings I received quite a few e-mails which are in your packet, well in your ... the digital component of your packet. And then lastly the P&Z discussions that we had, the work session on May 20th and the public hearing on June 24th.

So what I would like to do is summarize the stakeholder comments and the, the changes to the plan, and then if you like after my presentation I'm prepared to go back over the changes to the Plan policies in detail if you desire.

So in general people wanted to see improvement to flood managements that affect roads, especially on the East Mesa and roads that are unpaved. There was a, sort of a general feeling that people did not want development to be as close to the arroyos as in the past. People appreciate the open space and natural environment experience. Trails and amenities are important, but not at the expense of the flood control function. And natural drainage function is preferred rather than a, a concrete arroyo. In the conservation stakeholder group it was felt that pockets of vegetation outside the 100-year flood zone should be included when we're talking about buffers or easements. Utility installations should be improved to reduce erosion, and as part of the future modeling efforts, recruit a wildlife biologist to discuss wildlife corridors and habitat. In the development stakeholders there was a sentiment that the Plan is

redundant, that there are other plans that address different components of this Plan, so they did not think that this Plan was needed. It was felt that the Plan will add regulation and cost. And that the maintenance of arroyos is costly and burdensome, this is the sentiment of a number of different people but specifically private property owners that actually have land in the arroyo.

It was the ... during one of the stakeholder meetings that someone suggested creating the pilot project using the Arroyo Plan Policies and they did think that buffers were okay for public arroyos, but not necessarily privately owned arroyos. And in engineering there was a strong sense that regional and watershed approach was a good idea, that the Storm Drain Master Plan and the Design Standards which is Chapter 32 of the Municipal Code should be updated. That the buffers are okay for arroyos that are not yet developed, both public and private, but that new models are needed in order to do the modeling to determine what those buffers might be. And that the flood control dams and how they are managed and maintained and repaired are an important part of a broad watershed approach to stormwater management, because what happens at the dams and how they are repaired will impact downstream development.

And very briefly a review of some of the discussion from this meeting, this body's meeting on the 24th of June, the plan is guiding policy only, not regulation and that is true. The buffer explanation is vague and there was a request to strengthen that in the next revision. The distinction should be made about what affects existing development, undeveloped private land, and public land. And again that is something that is improved I hope, in the current version of the Plan. And a sense that it was unclear from the text when the Plan Policies would apply. So I will address these in the course of the rest of my presentation but if you do have any questions following about any of these, I'd be glad to answer them.

There was also additional input from the New Mexico State Land Office and the Bureau of Land Management and they are in, in full in your stakeholder packet but I did, I did just want to excerpt this component from the Land Office e-mail that I received. There was a discussion of the buffers or easements and they thought that a range of 50 to 100 feet could be accommodated without losing any development potential. And what this would mean is that when there is the possibility for an area to be sold for development that includes arroyos, a distance to be determined at that time would be dedicated to the City along with the arroyo, and then beyond that point the land would be sold for development. So in this way developers aren't purchasing land that they can't build on. The buffer is built into the dedication that goes to the City or that if they choose to retain it in their own for their own purposes. And then similarly the Bureau of Land Management passed along this e-mail which I just received a couple of days ago and they agree like a lot of the other stakeholder groups that it's the implementation, the devil is in the detail I suppose, the implementation will be challenging. And the draft Tri-County Resource

Management Plan that they've been working on for the last few years, they do reference the 100-year flood zone as being where the conservation easement would begin and end and, but then they, they don't rule out the idea of additional buffers depending on whether there's a need, but it would be determined on a case-by-case basis following the modeling and the discussion between the BLM and the City.

I included this map because there was a request on, on the part of the developers to explain how much land we're talking about actually in terms of public versus private and developed versus undeveloped. And I wasn't able to get exact numbers in terms of public and private and developed and undeveloped but I thought this map would give you a pretty good indication. The brown area is all privately owned land. The purple is New Mexico land, the Land Office. And the blue is BLM land. And these red areas represent the arroyos, the pink lines represent a 150-foot buffer around all of the arroyos, and the green lines indicate all of the property that fit that description where there is a boundary within a 150-feet of the arroyo. So I did a little arithmetic and there is over 30,000 acres all together of land that's within that 150-foot buffer. Of that, over 22,000 are publically owned and that includes, even though only BLM and the State Land is represented, are represented here, that includes the City, NMSU, Dona Ana County, the school system, U.S. Fish and Wildlife, and all of the other public agencies that have public land in the County. So that leaves about 8,500 acres of private land just within 150-feet of an arroyo boundary. And on this map although you can't see it real well, these black lines indicate parcels and so you can tell from the green, where it's mostly green to where it's mostly black what is undeveloped and what is developed. And these are the, the three major arroyos within the City limits; the Alameda, the North and South forks of the Las Cruces Arroyo, and the Sand Hill Arroyo. I also included the Moreno Arroyos because they're ... it's in, within the City limits and the Tortugas Arroyo is partly within the City limits. So as you can see there, there is a substantial amount of undeveloped land that would probably for future development purposes be modeled to determine whether an additional easement or buffer might be called for, and I do want to stress again that a buffer is just one of the ways that this could be handled for additional erosion control or for the identification of a linear park or open space corridor, but it is not the only way. So we can come back to this map if you like, if you have any questions about it.

So in general I want to call out the Plan revisions that were made between June 24th and the current revision. I will say that it went, actually went through two revisions; there was a revision in September that was posted on the web and I had additional meetings with the developers and the engineers and EBID and IBWC Rio Grande Citizens Forum, based on that revision, and then there was a further revision dated October 28th, so this is the second one between that time. The policies were reduced from 75 to 60. The actions were reduced from 57 to 38. The arroyo modeling

section was greatly expanded; it was originally within the body of Chapter 4 and I briefly thought it would be a good idea to take it out but now I don't think it is a good idea, so I will be proposing at the end of my presentation reinserting it into Chapter 4. The buffer explanation is clarified somewhat, there isn't a lot, a lot of detail but the plan does point out that it would be for undeveloped arroyos and on a case-by-case basis. And as I said, it's only one way to manage erosion, but not necessarily the only way. There was a request to move, to remove policies that begin with "Enforce" because it was pointed out that that means that the policy or the code already exists and it would be redundant to include it in this plan, so I did that everywhere I could find, find it. There are one or two policies that call for a strengthening the enforcement of, but I left those in. And then there were many many minor revisions made throughout the document to change the policies from passive voice to active voice to improve the readability of the text and the narrative and to correct typos and things like that.

Two different organizations pointed out that some of my information on vegetation types was incorrect and I used riparian where it wasn't appropriate to do so and in some places grasslands, grasses or other types of vegetation that should be used and not shrubs, so I made those kinds of corrections.

In the further explanation of the buffers, I did call out that the State Land Office and the BLM would be involved in any cases to do the arroyo modeling and look at buffer distances. There is, was one small change in a paragraph moving it from one section to another section on low impact development and green infrastructure. And then I found out that, whoops, I found out that at the moment there are a lot of green infrastructure practices that are not allowed by the City because they're, they're not allowed in the code and so I referenced from time to time that they were required or that they were used, they were mandatory and that was incorrect, so I fixed that. And I also added small pieces of text, a sentence or a paragraph here or there to describe the role of agriculture and explain the concerns about canals and the, the irrigation canals and ditches during floods. And the reason that this is an issue is because all of the flood water, all the runoff has to go to the river, that's its ultimate goal and it uses the irrigation canals and ditches to do that. In an intense flood event when there is a lot of water all at once those canals and ditches overflow and so even within the City of Las Cruces in developed areas those canals can overflow and cause flooding in various neighborhoods throughout the City. So how Elephant Butte Irrigation District is involved and how those canals are managed is very central to the overall broader approach to storm water management that this plan attempts to take. And so there were some points added to the plan to talk about this. And in the introduction to Chapter 5 which is the goals and policies chapter, there is a further explanation, again another attempt to strengthen the description and the explanation of the buffers and it does call out that the Arroyo Plan

is only guiding policy, it's not regulation and that any regulations that are in place at the time of development are the ones that the developer follows, not the, not the Arroyo Plan or any other adopted plan for that reason, it's only guiding policy.

As I mentioned before I did change Goal one from manage growth and development in such a way to make sure that the full potential of arroyo systems as a community asset is realized. For the most part, this is the entire purpose of the plan, and I realize that what was missing in the goals is the concept of taking a broader proactive approach to stormwater management and flood control. And so Goal one changes to reflect that; take a proactive approach to watershed management that takes into account existing drainage conditions as well as conditions affected by future development.

And then in Chapter 5 there were various small revisions to the introduction of that chapter, the actions were revised to delete redundancies and this had to do with also deleting policies that were redundant with policies in other plans and there's a long list of potential funding sources for some of the policies and activities that the Arroyo Plan calls for and so those were moved from Goal six to Goal one. And then there was a resource page added at the end of the document and the number of appendices was, were reduced from 10 to four. Those appendices were things like; best management practices, descriptions and examples of low impact development and green infrastructure, some of the stormwater management statutes that are required by the EPA. And what I did instead of just listing those out as lengthy appendices I put where those could be found on the resource page. So we're left with the maps, the detailed maps of each arroyo, the planning background which is a compilation of all of the goals and policies from past plans, a description and explanation of the flood control dams, who owns them and what their class, their flood control capability class is. And then the fourth one at the, at the moment is an explanation of arroyo modeling which I am proposing to put back into the body of the document.

Now I would ... I want to talk in a little bit more detail about the arroyo modeling itself. This caused a lot of concerns at the last meeting and from then until now I enlisted the assistance of two technical writers and a couple of consulting firms which provided the illustrations for this and I think that it actually describes it pretty well, I hope that you will agree. The Army Corps of Engineers has a resource called the Hydrological, Hydrology, I have it written down ... Hydrologic Engineering Center, and their HMS modeling which is Hydrologic Modeling System looks at the processes of any kind of dendritic system which is what an arroyo is, it just means different stems and tributaries of the drainage way. And then the RAS model, stands for River Analysis System, and that looks at the flow of the stormwater itself, the runoff itself, and the sediment load within ... that's being carried by the runoff. What, one thing that changed in, in the text is that I spelled out that the buffers or

the modeling actually would be limited to the main tributaries of the major arroyos, and this is an important difference because there, there are very few main tributaries. They're the ones that reach a certain volume of runoff in a given period of time and these are the ones as it turns out in the Stormwater Policy Management plan in 1992, it was the main stems of the major arroyos that that plan calls out for protecting as open space. So, various points along the major tributaries would be modeled and I have some illustrations that will indicate, that will show that. And that ultimately will tell us or give us a better more accurate indication of what the flood zone is. At the moment the flood zones are based on FEMA maps that were done quite some time ago and they're in the process of being updated but they have not been approved or adopted yet. But, the modeling takes much more current data and determines a flood zone based on the model which again is not real life but it's a close proximity than simply looking at the map and comes up with a flood zone that may or may not look like the one that's on the map. And the other thing that, that the plan suggests is that the modeling extend east beyond the flood control dams which is where the current modelling data stop. So since the City is growing and has already extended in some places east of the flood control dams, this is also an important consideration. So I hope that you will be able to see these, they are in Appendix 4 of the plan.

This is just a section of the Sand Hill Arroyo and what the engineers did was measure several points along the main tributaries of the Sand Hill Arroyo and put them into the HEC/HMS modeling system and came up with these peak flow rates at different times; flow rates and volumes of stormwater at different locations of interest along the arroyo. From that information they look at the cross sections of the arroyos and put those into the HEC RAS model which looks at the flow and the sediment, sedimentation of the runoff itself. So these are places along the arroyo where, where cross sections were taken and here's a close up, going this way, this is an example of ... this is just two of the cross sections. So if you were to continue, if you were looking up stream and you were looking downstream along the Sand Hill Arroyo, at any one of these points you would see something that looks like this and if you go a little bit further you would see something that looks like this, and a little bit further it might be higher or lower just depending on what the, the geography and other factors of the arroyo are. This blue, turquois blue line is the flood zone. And that is what it looks like when it's mapped one section, all of these little hatch marks are these cross sections and this is just a little piece right in here that I *(inaudible)*. The red line represents the existing or the old 100-year flood zone. The blue line represents the new flood zone based on the modeling that was done. And the turquois line represents the 500-year flood zone based on the modeling that was done. And the thing that, that I think is really important here is that there will be cases, there will be situations along any, any of these points on the main stem of a major arroyo where what you thought was in the flood zone isn't, which means

where you thought you could not build you could. At the same time there are going to be places that you thought were not in the flood zone and it turns out they are going to be in the flood zone. So as I said it is on a case-by-case basis. It's technical, there's a lot of engineering and lot of computer work to be done on, on every point that is modeled, but I think that at least when I saw these illustrations and was walked through it step by step, it made a lot more sense to me. And we can come back to this in just a moment unless you have some questions at this time? Okay.

As I mentioned, I would like to return that section of the document which describes the modeling and the buffers in greater detail to Chapter 4, and I would also like to change a paragraph in the soils description under Chapter 3, the regional characterization. This particular text which does describe clay soils and sandy soils and how they, what they might be suited for, is accurate, but it doesn't really relate to the arroyos or stormwater management or flood control and so the technical writer and I came up with some new language that does directly relate to the arroyos and what the Plan is trying to accomplish and would read "Very claylike soils have a high water holding capacity and do not promote infiltration or movement into the ground water. Conversely very sandy soils provide a porous environment which provides better infiltration but is, but are more susceptible to erosion. Generally clay soils are better suited for development foundations and sandy soils are well suited for stormwater management projects requiring infiltration. The level of the water table is also a factor for infrastructure placement and design. A high water table is not suitable for subsurface installations such as utilities and erosion must be accounted and managed for. Soil type analysis is an important step in the design and placement of any infrastructure in our desert environment."

There may be other revisions based on discussion here tonight and then as I mentioned if you would like to go through the policy changes in detail I am prepared to do that. Your options tonight would be to recommend adopting the Arroyo Management Plan; recommending, recommend adopting the Plan with the conditions which would include the two future revisions that I proposed; recommend not adopting the plan. If either of those, any of those three were, was chosen the tentative City Council date is November 17th, and your last option, table or postpone the recommendation and direct staff accordingly. I'll stand for questions. Thank you.

Crane: Thank you Carol. Any Commissioner have a question or comment for Ms. McCall? Commissioner Clifton.

Clifton: Thank you Mr. Chair. Thank you Carol. Just really kind of fundamental question here, you're talking about some revisions that are going to be incorporated into this document, but I don't see where they've actually been made, such as the Chapter 4 revisions you want to put back in. So is it safe to say that the document that we have before us tonight does not

reflect your suggested revisions, nor did the document that went out for public consumption reflect those revisions either?

McCall: Mr. Chair, Commissioner Clifton the, the two revisions that I'm proposing are not in the document that you have. These are changes that I considered after I posted it on the web and after I put your packet together, that's correct. Everything else that was mentioned is in the document that you have.

Clifton: With that said Carol, staff, and our City Legal, you know as a Commissioner I'm personally not real comfortable taking action on an incomplete document. I, I know it wasn't the intent but it's almost kind of misleading in a way and I, I would prefer to have the entire document in one piece before we make a recommendation before it go to Council, cause I mean, what, how, how do we know what gets put in there, what doesn't get put in there. It's just a little bit loose for my comfort zone and I have an issue with making any type of decision other than postponement until we can get a complete document. Thank you.

McCall: Mr. Chair, Commissioner Clifton. You would also be able to if you choose to make a recommendation tonight to recommend adopting the plan as it stands, the October 28th revision that you have, and I would go forward to present those proposed revisions to the City Council along with any other revisions that you suggest.

Crane: So you're suggesting we vote on what we have in front of us literally without those two latter day modifications that you mentioned, but you would put them in when it went to the City Council?

McCall: Mr. Chair.

Crane: Do I understand you correctly?

McCall: Mr. Chair, Commissioners. You would have that option. You could recommend adopting the Plan as it stands or if you choose to go ahead and, and consider the provisions that I'm proposing you could also do that.

Crane: I think it'd be more rational and helpful to the Council if we ask you to put those in, trusted you to do it without our further review and with those made vote on, vote on whether we should forward it with those made does that sound good to you Commissioner Clifton?

Clifton: Mr. Chair, staff, I, I'm still not comfortable. I mean to me it's no different than a master plan being presented to us by a developer and the developer stating that well it's incomplete but we're going to have some revisions at the Council level. There's no way this body would ever

approve a master plan in that nature or that status. I've never seen it and I don't think we'll ever see that and quite frankly you know missing elements, I just think it's more of a solid recommendation to the Council if we have a complete document that went to the public that was complete. I don't know if the stakeholders are aware of these changes, either side of the fence. It, it's irrelevant quite frankly, it's more of a notification issue for me and *(inaudible)*.

McCall: Mr. Chair.

Crane: Okay.

McCall: If I may. Mr. Chair, Commissioner Clifton. I, I would just like to point out that what I'm proposing doesn't constitute, doesn't mean that anything is missing from the Plan or that the Plan is incomplete in any way, the Plan is complete and if those revisions that I'm proposing are not made, it would not diminish the Plan that much.

Crane: Commissioner Ferrary you have a comment.

Ferrary: Yes Mr. Chair, if we were to have suggestions or revisions ourselves to this plan and they were voted on and adopted just as Carol's suggestions were, it's possible to have that so we wouldn't have it complete as we vote on it. So I don't understand why with these revisions she's proposing that we couldn't accept them just as we would our own.

Crane: You repeat that please.

Ferrary: Well if we made changes and we voted on them tonight they wouldn't all be here and we would still be able to vote on them and they go on to the City Council. Carol's changes aren't any different than ours might be as long as we accept them and vote on them as additional conditions.

Crane: You think we're in the position to put in, put in her suggestions in our own wording? Is that what you're suggesting?

Ferrary: No, I'm saying we should be able to accept them as conditions and vote on them just as if we were to insert conditions also and vote on them.

Crane: Which is the situation Mr. Clifton is not very comfortable with as I understand it. You want to see it perfected by Ms. McCall before we vote on it, is that correct?

Clifton: Yes Mr. Chair, I mean I, I'm fully aware that we can make recommendations on top of what Carol presents to us tonight but we act in somewhat of a quasi judicial body and that's much different than a staff

person suggesting changes be made at the ninth hour before it goes forward to City Council. I mean it's, to me it's simply a matter of disclosure and I don't believe that we, you know we have full disclosure here. I don't know who may have not come to the meeting tonight based on this initial document. You know the Chapter 4 that's referenced for additional input into the document, that's a pretty significant change. I mean, I mean we're talking probably one of the most critical elements of this document. And I mean that's, that's a pretty big deal.

Crane: Okay I understand. Any other Commissioner have a point? Commissioner Gordon, you're next.

Gordon: Carol in reading this document it's, it's quite voluminous and it's, it's lengthy in its form, and scattered throughout the document you talk about buffering and I have a, just a question, basically clarification. What happens when an arroyo is designated as such and a buffer is created whatever that number of feet will be determined on either side of the buffer? Then commercial or residential construction is permitted, all right. Because commercial and residential construction is created a lot of times it will change drainage, the route of drainage, the way water flows down hills or through neighborhoods because of the way streets or, or houses are built or whatever. With the change in the current, and if there becomes a change in the current arroyo boundaries that have been designated and the buffer has been created, what happens if flooding occurs because it doesn't go in the area that was expected to go to start with, who becomes, and once it's been determined that building has been allowed and flooding is now occurred, who becomes responsible for the fact that there is now perhaps a new arroyo created by flooding and I've seen it happen, who's responsible for flood control, for mitigation? Is it the City, is it the residents, is it the developer? I don't know. I wasn't able to find that in the document.

McCall: Mr. Chair, Commissioner Gordon, the issue of flooding and who is, who is responsible for making repairs or mitigating that flooding is, is indeed an issue. In the beginning the property owner is, and I don't know the legal ramifications of how that's determined, how they determine what may have caused the flooding. If there were some mistakes made during engineering or if was just a natural thing that happened. If it's something in the, in the drainage study that could be pointed to, those things would have to be determined. I will tell you though that the City on a number of occasions has had to repair damage due to flooding because no one else was there to do it. The private property owner didn't feel responsible for it because it was outside his property boundary and was in the arroyo itself, but the developer and builder were no longer involved and so it fell to the City.

Gordon: But isn't the creation of the buffer zone giving a feeling of comfort either to someone who plans to build a house or put in a business strip close to an arroyo, perhaps maybe 50, 100 feet behind his property and then suddenly boom, we get a tremendous storm and we've had them this year. And it's possible that water flow could now change and that feeling of comfort is now gone and the City has said according to this plan, we've created a buffer that you should be protected. It doesn't specifically say in here, they talked about 100 feet and other methods of determining what that buffer is, but there's no, I don't think I read or perhaps I missed the specific plan to create this zone. I would think that if I was planning to do something I would want to make sure that I would be protected, I don't think it's going to happen tomorrow, maybe it'll take 50 years, but it may happen.

McCall: Mr. Chair, Commissioner Gordon. That's correct, it could happen. We, in the, in one of the public meetings that we had, one of the stakeholder meetings subsequent to the last Planning and Zoning hearing, that issue did come up. First I will say that a buffer wouldn't necessarily be designated in every situation. A drainage study would be done and if it looked like additional erosion control might be called for, then a buffer would be one solution. But the buffer does add a layer of protection but it isn't a be all and end all. If you're, if you have a house that is built up to the 100-year flood zone and there's a storm that washes away or undercuts, the erosion undercuts that bank, then some property will be damaged. If there's a 20-foot or even a 10-foot or however, 50-foot easement there, there is added protection but as you said it may be 50 years but eventually that arroyo will continue to erode. That's very true. That happens now without any additional erosion control and it would happen regardless of what we put there.

Gordon: So then what you're saying is that this is an unwritten part of this document as to be specific?

McCall: Mr. Chair, Commissioner Gordon. The Plan itself isn't intended to have specifics. It's intended as a guiding document to provide a direction so that, it actually calls for the creation of the database, the modeling system that would identify buffers. This is something that currently there is no funding for and we don't know how long it would be before there is funding for it, but it isn't something that would happen immediately and it, it's, by the time all the data are collected and the models are actually up and running could take several years. And in the meantime any development that occurs adjacent to development would follow codes that are in place at the time.

Gordon: Thank you.

McCall: Did that answer your question?

Gordon: I think so. It's just that I have this, this uneasy feeling in a sense that we're talking about something that doesn't have an answer and you're making it part of a document that you want me to approve and it's not specific.

Crane: Commissioner Beard.

Beard: Thank you. Several points, I agree with you Commissioner that, that whatever we agree upon as far as conditions will go forward to the next level and they will have the document, or have the wordage anyway. But I, I tend to favor Commissioner Clifton's point - I would like to have the entire document in front of me. Somebody comes to me and says what was the document that you just passed, I don't know. I'd have to go back and read the minutes in order to figure out what that document is. So I'd kind of like having some of those maps that were not in, in our package in front of me whether I use them ever again but I would like to have them.

I would like to take a look also at a slide, I think it's 33. Yes. I have, I have a little bit of a problem with, with this. This says "Generally clay soils are better suited for development foundations and sandy soils are well suited for stormwater management projects requiring filtration." I thought it was just the other way around. When I built my house it's on clay cause I'm out there in the river basin and in order to keep my house from floating we had to put pillars down to the sand in order to stabilize the house. That's contrary to what I'm reading right here. I agree that, that clay soils are better for erosion possibly than sandy soils, but for building foundations, development foundations, I believe the sand is better than clay. And I might get some opinions from the contractors that are sitting in the audience too on that particular subject. So I kind of, I, I personally disagree with that wording there.

McCall: Mr. Chair, Commissioner Beard. I'm ... the reason that sandy soils would not work for foundations is exactly because water seeps down through them and because they're so much more susceptible to erosion. If you're sitting on clay and you build your foundation on clay water will not seep down, it'll just sit on top. So this is a different kind of example but I, earlier this summer I experienced in the pecan orchards a lot of farmers who have a layer of clay soil above their sandy soil, went to the trouble of digging up their orchards in between every row to pull the sand up and mix the sand and the clay because the water was not going down through the soil and reaching the roots.

Beard: I can, I can agree with that. But I think as a foundation it's, I think that the sand is better than the clay.

Crane: I'd like to interrupt, we have a, at least two engineers wagging their heads this way or that. Sir later you're going to speak, right? I'd just like to suggest that the ... we address this issue when you come up and talk. I know what you're going to say that, impermeability is one thing and absorbing water and going up and down is another. So let's not try to solve the problem just at this moment. I know what you mean too.

Beard: Okay, I would like to have that addressed later on.

Crane: Yeah, we will. I'll make sure we do it.

Beard: Okay, my third, oh excuse me.

McCall: I'm sorry. If you like one of the engineers who helped me put together the arroyo modeling section is here and he may be able to address that. Mr. Scanlon also offered to but ...

Beard: Okay. Okay. Good. As long as we don't drop it.

Crane: Yes, we won't drop it. Can that person speak when we come to the public input, would that suit you? Okay. Thank you.

McCall: Mr. Chair, may I make one more comment.

Crane: Yes.

McCall: I want to point out and, and stress that the appendices are part of the document. Just because I'm proposing that the Appendix 4 that is the description or the detailing of the arroyo modeling be put back into the body of the Chapter 4 of the Plan, but even if it isn't, it will be adopted as ... or if the Plan is adopted the appendices are part of the Plan. So because it isn't in the body of the document doesn't mean that the document is incomplete in that way.

Beard: Okay. I've got a third point here though.

Crane: Go ahead.

Beard: I'm looking at Goals nine, ten, and eleven. I think this sort of goes along with your, your concern and it's part of my concern too. When you look at these goals it says "create," "minimize," and "improve." Who does that? If you look at Goal 11 it says "Improve the safety and efficiency of utility installations." Excuse me. Well that's, if the City's going to be putting in the utilities and we know who's got to do that, but if you go over here and create safe and effective engineering standards for flood control, or you minimize soil and slope instability." Who's doing that? I mean it looks like

it's out there for anybody to do or not to do. I don't know if it's, who it's really applying to.

McCall: Mr. Chair, Commissioner Beard. That's a good question. The City is ultimately responsible for, for implementing the plan and carrying out the policies, so it would be the City. Create safe and effective engineering standards for flood control and conveyance indicates that the design standards and other codes that there, there is a Stormwater Management ordinance and there are design standards and there's a subdivision code that those codes and other applicable codes would be amended and that would have, that would take place by the City, by the Design Standards Review Committee. Goal 10 is actually an extension of that. The soils and erosion, sedimentation and water runoff is a separate category under stormwater management and again that would be carried out through lots of different policies; education and outreach, amendments to the development codes, strengthening compliance with federal mandates, and those are all policies within the, the goals themselves. And for utility installation, that is both public and private, so the policies would eventually reach through some changes in code or educational outreach, the private sector as well as the City and any other public organization, public agency.

Beard: So the ... to me on both nine and ten that could, that would be like if the contractor is doing something the City's going to oversee that he actually creates safe and minimizes these two types of things? I mean it, it sounds, and it actually goes beyond the City because you're including this in the ETZ aren't you? How the ETZ, is that affected here?

McCall: Mr. Chair, Commissioner Beard. The City only has jurisdiction over the arroyos and flood control dams that are within the City limits. And the reason that the entire study area is shown on the map is because the arroyos extend into the ETZ. And any kind of drainage study that's going to be done will be impacted by what happens that's up stream. So specifically and the plan does call this out, we're talking about within the City limits and only what the City has jurisdiction over.

Beard: Okay. But this is really more for the contractor isn't it?

McCall: Mr. Chair, Commissioner Beard. As I said before, the Plan is only guiding policy it's not code. It's not a regulation. So anything that the City puts in effect that relates to the Plan would be put in effect in order to carry out this goal. It's, it's, the over arching goal that everything in the Plan is attempting to do; erosion, sedimentation, and stormwater runoff is just one, you know component of the bigger picture.

Beard: I can see that it's a plan, I just don't know who the plan's for.

McCall: Mr. Chair, Commissioner Beard. It's for everyone in the community.

Beard: Okay.

McCall: And the City is the caretaker of the community.

Beard: Okay. Okay I'll take that. Yeah.

Crane: It'll be for the City to implement if it chooses.

McCall: Mr. Chair that's correct.

Crane: Mr. Clifton.

Clifton: Just a few more points Carol. I know historically the City has oversaw construction projects in particular a sewer line such as in the North Fork Arroyo and that didn't work out too well. So I, I just wonder you know is the government going to take care of us or who's going to take care of us, I'm not sure. I'm not sure what this document does. There's not a very good track record and it's, it's proven and I think Mr. Binns touched on it previous to this. You talk about modeling to be done by a consultant that'll dictate where the flood zone is. I thought FEMA did that. You know I have a hard time every time an individual comes in with a project that, oh let's run it through our model and we'll determine where your boundaries are. I understand that's going to take years to get the funding and what not, but you know I, I'm just again I'm curious, how is this going to work assuming we, let's just say hypothetically we approved it tonight it immediately goes to Council, it appears on November 17th. What happens in December with an application that comes in and you have a policy document, we understand that it's not an ordinance, but you know in everyone of these packets tonight it references a policy document that indicates approval or denial of the project. And I've, I've brought this up multiple times before and I'll continue to bring it up, it, it is going to formulate a recommendation. It is going to influence a decision. It will be utilized much like the Comprehensive Plan to approve or deny a case. And you know I'm not ... quite frankly it's just additional regulation that I don't think we need and I don't know but I think you stated there's 8,500 acres of privately held arroyo systems by individuals. Can you go to that slide?

McCall: Mr. Chair, Commissioner Clifton. That's correct, but keep in mind that that's also within the developed part of the City including the urban center. The arroyo boundaries don't stop at the flood control dams or at undeveloped properties. So I wasn't able to determine the areas that we're talking about, the major arroyos and the main stems of the arroyos,

how much of that acreage we're talking about, but in the entire City over 8,000 acres is privately owned. So that also includes the West Mesa.

Clifton: Well just generally speaking then, I'm not sure what undeveloped land goes for these days, but assuming it was $10,000 per acre, you're looking at 85 million dollars in reparations to private citizens. I don't know if the City has a line item on the budget for 85 million dollars but that's a lot of money.

McCall: Mr. Chair, Commissioner Clifton. I don't understand, I don't understand what that refers to.

Clifton: The point is there has to be compensation, just true fair market value compensation for individuals that won't be able to utilize their land within the buffer areas.

McCall: Mr. Chair, Commissioner Clifton. That's not what the Plan calls for. If you look at the map on any aerial within the City limits you will see that most of that acreage is developed already. The buffers that we're talking about or any particular easement where there may not be any development is only for land that is not yet developed. And in addition as I pointed out before, the Plan doesn't say that a person's land cannot be developed on, it merely suggests that a buffer for added erosion control is one of many possibilities. So if that's not clear in the Plan then that could be a suggestion, a change that, that the Commission suggests, but it doesn't say in the Plan that that's what would happen and I do want to point that out.

Clifton: But, but it, nonetheless it's still a buffer. It's still a line item through the review process. It'll be utilized in a recommendation. A buffer is a buffer, I mean when I hear that, that is an area in which you cannot do something; a landscape buffer. It's a certain width that you can't do anything but landscaping. So it's unclear how will an individual get compensated by being forced to have a buffer through whatever ordinance will come out of this policy document. You know we haven't talked about that. And we don't need to go into the numbers tonight, but you know Commissioner Beard's point, you know I've been around construction development for 20 years and I have never heard of somebody wanting to build on clay. You just don't do that. There's a process called liquefaction.

Crane: Excuse me Commissioner that's going to be taken care of shortly.

Clifton: Just for the record consider Legends West. I think you're familiar with what happened at Legends West.

McCall: Mister, Mr. Chair, Commissioner Clifton, excuse me. I do want to point out again that the Plan isn't going to force anybody to do anything. As has been stated and as all of you know, in the absence of code, a policy document can be used to make a decision but it's not binding and it can be appealed. So unless the policy runs counter to code that's already existing and would create a conflict by using the policy document as a reason to vote for something rather than the code, if those two conflict, the code is binding and the policy is not.

Crane: Commissioner Ferrary.

Ferrary: I think that as a guiding plan this is a wonderful document and as you said it is something that code can be derived from and it does also keep in mind that as land sales are made that they are compensated for buffer zones. If the land were going to be sold to a developer and that would set up the future of having the arroyos protected and also the homeowners that might be in that area as well as wildlife. And I think this document is wonderful and that it shouldn't be delayed any longer.

Crane: I have a question regarding the buffer zone. Considering that this applies only at the moment, can only apply to undeveloped land correct? In relation to the centerline of the arroyo as it stands at this moment, where is this measurement made, this let's say 100 feet to grab a number; from the centerline of the arroyo, from the bank of the arroyo before it drops down to the bed? Where is the measurement taken from, or is it the whole width of the arroyo?

McCall: Mr. Chair, Commissioners. I will let Mr. Ruybalid and Mr. Scanlon address that because I don't know how the flood zones are determined. If I may though, I, Commissioner Clifton asked a question that I didn't, that I didn't respond to regarding the FEMA flood zones. And, but it's also just to say that the model that I showed you, the illustrations that I showed you are from an actual study that was done of the Sand Hill Arroyo that was commissioned by the City. So the FEMA flood zones are indeed in place, but any, any modeling that's done that's more current will be more accurate. So, and beyond that Mr. Ruybalid can answer that question, he's the one that provided the illustrations for me.

Crane: Another further point and as I often do it's a tiny one, but when you come up with your final version to buck to the City Council at whatever point, the pagination of your chapters is off slightly in the contents page, table of contents, and on page 79 your conclusions should be called Chapter 7 to be consistent with the others. Basically I'm only capable of making small points. Okay, any Commissioner have any other questions for Ms. McCall at this moment? All right then we'll ... thank you and ...

McCall: May I Mr. Chair?

Crane: Yes, by all means.

McCall: If I may suggest an option having to do with the proposed changes. If you're uncomfortable with the change in text regarding the soils, you could also choose to leave the plan as it is in that regard.

Crane: Yeah. Thank you. We understand. So now we open this to members of the public. And it's not clear to me whether everybody present in the room is ... wants to speak to this issue, so I see two hands up, may I see hand up for everybody who'd like to speak to this. I see one, two, three, four. Okay. Thank you. Now I know you're an engineer Mr. Scanlon, right? Hang on a minute sir. Are there any developers here that wish to address us? Okay two. Last time we had some presentations with developers and we asked since we had a number of people speaking to limit it to three minutes and I don't remember how long it was but it wasn't three minutes. Please gentlemen make your points as succinctly as possible. If you merely wish to endorse something that somebody else has said, maybe one of the Commissioners or member of the public, just do that, we'll register it. Can you all do this in three minutes? Anybody have a problem with three minutes? One, two, three, four, five. Good. Thank you. Allow our secretary to ... yes sir.

Beard: They were shaking their heads no.

Crane: No I saw nods up. Okay. If you have ...

Beard: Give them five. Okay three.

Crane: If you have problem with three minutes please put up your hand. See they're all going like this.

Beard: Sorry.

Crane: So, I will ask our doughty secretary here to time you and who'd like to be first? Mr. Scanlon would like to be first. Come on up. Oh and we've got to make room for your engineer, right? Yes, who can appear as far as I'm concerned at any point.

Scanlon: Thank you Mr. Chair.

Crane: Tell us who you are for the record and ...

Scanlon: My name is Ted Scanlon and my address is 2540 North Telshor Boulevard in Las Cruces.

Crane: Mr. Scanlon do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Scanlon: I do.

Crane: Thank you, go on please.

Scanlon: Okay. Real quickly to clarify the, the, the confusion over the soil types. Clay soils are what are called high PI soils. High PI soils is the, means that they have a high plasticity index. The higher the plasticity index the more potential they, the soils have to shrink and swell based upon their moisture content. When the soil shrink and swell based upon the moisture content you get a condition in the building foundations called differential settlement. Differential settlement in a building foundation can cause the foundations to crack and break apart and, and damage the structure. So granular soils are more suitable for building foundations than clay soils, period.

Crane: Thank you.

Scanlon: Okay. The other issues that I have are with respect to the buffer areas, in particular I would like it defined like you, you mentioned where the measurement is made from; is it from the centerline of the thread of the stream? Is it from the edge of the 100-year floodplain out? Is it from the edge of the 500-year floodplain out? If that's not clearly defined over, over time the, the administrators that are doing this are going to try to make the strictest and most stringent possible, I'll guarantee you because that's what always happens over time. So I think that that needs to be defined, exactly where that buffer is. Then there needs to be some manner of compensation for the loss of that buffer land. If the person has paid for that land under the anticipation of being able to develop it and is all of a sudden told he cannot develop it because it's in this arroyo buffer, then he needs to be compensated for it somehow, either monetarily, or through density credit which means that he could achieve the same number of units on the remaining land that he could have put on the remaining land plus the buffer. So some method of compensation for the loss of that property needs to be made. That's all I have. Any questions?

Crane: Thank you Mr. Scanlon.

Scanlon: Thank you.

Crane: And you made it under three minutes, right?

Beard: Two and a half.

Crane: Okay, next please, don't be shy. Everybody will get heard. You're number three sir. Please tell us who you are.

Curry: Paul Curry.

Crane: Paul Curry. Mr. Curry do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Curry: Yes I do. Well the first statement is to back up what Mr. Scanlon said regarding the plasticity index. All the buildings we've ever built, all the engineers and architects require us to over excavate out all the clay and bring in granular soil to build on. It's common knowledge throughout the construction industry that you don't build a building on a clay soil. If you do you're going to have trouble with the foundation.

Then the next statement I'd like to make is regard to the 150-foot buffer for the arroyos. If you're doing a large lot subdivision where you have one or two or three or four acre lots it's not an issue, but when you're doing lot, small lot subdivisions 150-feet is a substantial cost taking of a very experience piece of property from a homeowner for a home or landowner or developer that's not going to be reimbursed. So if you want 150-foot, is it from the center or is it from the edge? Cause when you ... 150-feet is a lot of land and you take that from the edge of the arroyo and you go up the side of a hill or back away from it, it's a substantial hardship on the people who are going to buy the ultimate property that's developed, it just raises the price and the cost for the general public in the end. Thank you.

Crane: Thank you Mr. Curry. Gentleman in the light jacket there. Tell us who you are sir.

Hughs: Good evening. My name is Ed Hughs. I live at 5530 Remington Road.

Crane: Mr. Hughs do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Hughs: I do.

Crane: Go ahead please.

Hughs: First of all I'd like to just to compliment Carol McCall and her staff on putting together a very readable document on a very difficult topic. I think they've done an excellent job and conducted a lot of hearings in doing this. I also want to say that I think it's really important that local government use existing arroyos as a natural drainage structures that they are. I think the document does a good job of pointing out issues that have

been caused in the past due to the certain practices that, that we would like to change. A couple, there are about three, three issues I want to address real quickly, one of them is on page two, it's the purpose of the Arroyo Management Plan, bullet number two, it says "Allow maintenance of historic flows and arroyos." I'm not quite sure what that means. It seems like require or some stronger language would be, would be important there. That's bullet point two on page two.

Then on page 40, and Carol has done a, a pretty good job, a good job of discussion modeling and discussing modeling and the needs that we need for more current models and data which I would very much agree with, having dealt with modeling in my professional career. They're only as good as the data you have and many of these models are developed for not our soil types or areas, so I think we very much need much better data to implement these models at all.

But the third item I would like to address which I think is the most important and I think this really has the power to really undo all that is stated in the document is on page 77 under goal nine, and it's the action "Participate in the creation of a regional stormwater utility - an organization complete with its own revenue source that collects, treats, and disposes of stormwater." Stormwater management, it really as the document talks about really is to management, manage the ...

Crane: Excuse me Mr. Hughs.

Hughs: Yes sir.

Crane: Did you say page 77?

Hughs: I did, yes sir. At least on my copy.

Crane: Okay.

Hughs: I hope this doesn't count against my three minutes.

Crane: Is that the first item in the first box on the ...

Hughs: First action item, yes sir. "Participate in the creation of a regional stormwater utility."

Crane: Okay. Yep, thank you.

Hughs: We on the same page? Okay, good. Stormwater management really does not, does not mean to manage all arroyo flows as we've talked about up stream in the ETZ as well as within the City limits. So my question really is, is what power explicitly would the flood control authority have in any stormwater project management, what rights to downstream owners

have on retaining this historic flow? It seems to me that this is a very open-ended power and that this would override any, any private owner's concern downstream. So I think the powers need to be very specifically laid out and any power to interrupt any flow upstream should be clearly delineated and detailed in such a document as this. So I think this, this one item to me has a, has a real significant impact on the, on the whole document. Plus I, I, I just was interested in, in Mr. Scanlon and Mr. Curry's comment about, about the easements and it certainly would take ... 150-feet is quite a, quite a distance. But am I not mistaken in the document and this is a question to Carol, that most of this, the buffer as it applies to land that is not purchased would be the, delineated prior to purchase and the, and the values, values compensated for at that point? Cause a lot of this is public land at this point. One other, one minor comment if I have a second, there were a lot of stakeholder meetings that, that the public, and there were public hearings that we were part of, a lot of stakeholder meetings and I, I would like some further public input after some of those stakeholder meetings which I, I suppose this is it. Thank you very much for hearing me. Mr. Chairman, Members of the Commission. Thanks.

Crane: Thank you Mr. Hughs. Gentleman standing up. Tell us who you are sir.

Moscato: John Moscato, 4935 Ocotillo Road.

Crane: McCarter.

Moscato: Moscato.

Crane: Moscato. Mr. Moscato do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Moscato: Yes.

Crane: Go ahead please.

Moscato: Although Carol has made an attempt to improve the plan, I still think there are lots of defects that haven't been cured since the original version. For instance, there's no clarity as to what land will actually be affected by the plan and the ordinances that flow from it. There's discussion of three arroyos. There's a map of more than a dozen arroyos. There's mention that additional arroyos may need to be managed later on in the plan so from a private property owner's prospective there is no clarity whatsoever on the basic question of what land that I own will be affected by this. As to the buffer, there's no specificity as far as how that buffer will be implemented, how it will be forced upon private property owners, how they might be compensated. None of those questions is answered here. I

think we're going down a slippery slope when you propose approving a plan that the purpose of which is future implementation of, of ordinances. In the meantime staff inevitably will use the plan as the basis for review comments and limiting private property rights. I don't think there's any doubt about that.

I also want to point out one item that I thought was very interesting in the, in the conclusion, I'll just read a sentence of two here. This is the conclusion to, to the plan. It says "As development has increased, arroyos have been rerouted, channelized, and dammed to prevent or mitigate flood damage. In some cases these actions were the only alternatives to protect downstream property." Well I think that's pretty amazing admission in this document because the very rerouting channelization and damming that is admitted here to have been necessary to mitigate flood damage and to be the only alternatives to prevent, to protect downstream property are the very processes that would be prohibited by this plan. So there's no, there's no reality in terms of how this matches up to the, the challenges of development. It, it's just, it's a lot of feel good provisions, plans, policies, goals, but in the end it's just going to have a negative impact on private property owners and we simply don't know what, what the eventual impact's going to be. I think until that kind of clarity is included, Carol mentioned that one of the stakeholder meetings that it would cost upwards of $100,000 to fully model each major arroyo. Where's that funding coming from? If it's so important that this plan be put forward at this time, why shouldn't the modeling be done up front so everybody; the property owners, the Commission, the Council, everyone involved, the general public, they know exactly which property will be effected by this plan and the, and the ordinances that inevitably will, will stem from it. Thank you.

Crane: Thank you Mr. Moscato. Anyone else? Gentleman in the white shirt. Tell us who you are sir.

Chavira: My name is Steven Chavira.

Crane: Mr. Chavira do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Chavira: I do.

Crane: Continue please.

Chavira: Mr. Chairman, thank you for giving me this opportunity to speak. I speak today on behalf of the Las Cruces Home Builders Association as their Chief Executive Officer. And I want to support all the commentary that has been made before me. This plan that you see before you is a, is, as Commissioner Clifton aptly stated is an incomplete plan and the, the

slippery slope that is being introduced to you all tonight is one that I think you all should carefully consider as you make your judgements tonight in your proceedings. This plan is ... although Ms. McCall has done a lot of hard work and really put a lot of effort into this, it's clearly demonstrated by all of the, the slides that we saw that the, the plan is very very broad and it's, it's still even with all the changes and the pages and pages of changes that have been proposed, it's still a very vague plan. It is, I think would be in, in the community's best interest and this Commission's best interest to, to, to exercise your option to not let this go forward. Certainly in the vagueness that it's, that it's showing right now. I think that as we look at this plan and start to, start to really put it all together we realize that you know the private owner rights, the property rights of the owners is really what's at stake here. Looking forward at what we've got to, what is being proposed in a policy document will just create a whole lot of opportunity for ... as it begins, as the development begins to happen, as the progress begins to go, as this plan moves forward, there's a lot of problems that are going to be occurring because of, of this plan moving forward as it is right now. I would agree with Commissioner Clifton that it would not be prudent to put a, an incomplete document forward and you know certainly take a look at that as you go forward. Make the right decision.

Crane: Thank you. Ms. McCall did you have an engineer you wanted to bring in? Okay. Tell us who you are please.

Ruybalid: My name is Jonah Ruybalid.

Crane: Rubles.

Ruybalid: Ruybalid.

Crane: Rubales.

Ruybalid: Ruybalid. It's, it's a tricky one.

Crane: Okay. I got it. Mr. Rubales do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Ruybalid: I do.

Crane: Go ahead please.

Ruybalid: Okay. So I had talked to Carol just about the buffer zones and just to provide a way that they could be developed. Then when we had discussed these buffer zones we hadn't discussed a, a set distance whether it be from the centerline or the outside edge of the arroyo. We

had just talked about how to develop these buffer zones with HEC/HMS or HEC RAS. And so those buffer zones would be based on the output from HEC RAS. And so that you could determine them based on the 100-year storm, 500-year storm, whichever that you preferred, but they would be what was delineated on a map. Okay, so HEC/HMS would be utilized to determine flow rates and volumes that would be put into HEC RAS and then that would give a, I guess you could say flood zone based on whichever storm you used and then that would be delineated on a map and then that could be used as the buffer zone if you wanted to. It wouldn't be necessarily 150-feet from the centerline or 300-feet or anything like that.

Crane: So it remains to be established just what a, how a buffer zone would defined?

Ruybalid: Can you repeat that?

Crane: It remains to be established. You haven't got a firm definition of that at the moment.

Ruybalid: Correct.

Crane: Okay.

Ruybalid: It'd have to be determined based on some further modeling.

Crane: Thank you.

Ruybalid: Yes.

Crane: Anyone else wish to speak to this issue? All right then I'll close it to further public participation. Commissioners? Commissioner Ferrary.

Ferrary: Ms. McCall is the modeling, further modeling to determine where the buffers zone would start or end, is that dependent on what or where that arroyo is? I mean it's future modeling so it's not anything that you can determine now is it, or if you define that now then it would just be used for future modeling.

McCall: Mr. Chair, Commissioner Ferrary. It isn't something that would be determined now, in fact as this example points out it would be, it would be done later on as, as development occurs or as there is a need to determine whether there would be a buffer required or wherever there might need to be a drainage study that, that this modeling could help inform. That's all.

Ferrary: So it means then that something like that can't be concrete. It is something that changes with time and also the arroyo that you're modeling.

McCall: Mr. Chair, Commissioner Ferrary. That's correct. And for the purposes of this plan it also isn't necessary.

Ferrary: Thank you.

Crane: Anyone else?

McCall: Mr. Chair may I make, make a couple of corrections?

Crane: Go ahead please.

McCall: A couple of the speakers referred to a 150-foot buffer and I ... there isn't anything in the plan that discusses any kind of distance.

Crane: I only saw 50 and 100, correct?

McCall: No. Those refer to, well there's the 100-year flood zone. There is reference to a possible easement distance of 50-100 feet in reference to the input that was provided by the State Land Office. And that's the only mention of any concrete distance. And again, as they point out it would be determined in the process of dedicating the arroyos to the City.

Crane: Thank you. Mr. Clifton.

Clifton: One last question Carol, just ... can you walk me through what happens 30 days after this is adopted by City Council' Mr. Scanlon comes in with a development project that is adjacent to one of these arroyos, what happens? I mean what happens to the application, the review process, is there going to be an argument between the City and the development engineer versus the HEC RAS study? What I want to know is what the process is going to be, has that been discussed?

McCall: Mr. Chair, Commissioner Clifton. You had a similar question at the last meeting and the process is the same as any development proposal; it would go through the review process by all of the reviewing parties and all of the departments and then it would come to this body and then if applicable it would go to the City Council.

Clifton: Well I understand, and that's extremely general and really kind of blows over the actual process. But I, I think everybody in this room knows that once it hits that office over there we're going to have a staff packet with recommendations based on that policy document much like the

Comprehensive Plan. And I, I am really struggling with how is that going to play into the recommendation, has that been discussed at the staff level, what happens? I mean it really seems like you're putting the cart before the horse and I, I don't know ... having been on the reviewing side of this I understand that a comprehensive plan, you're going to use it for or against whatever the staff decides. And so once that comes in front of us it's going to put, well some of us in a pickle on a decision.

McCall: Mr. Chair, Commissioner Clifton. I was going to call on Mr. Ochoa to ...

Crane: He's on his way.

McCall: Detail the, to detail the, the current planning application process. I'm not a current planner and I don't have a lot of experience in that, so I'll put him on the spot.

Clifton: Well to save time Carol I don't know that we need to hear that. What I want to know is situational. When ... cause it's going to happen, it will happen. It's not a matter it might or it may, it will happen. I can guarantee you it will happen. There's a lot of arroyos here. There's a lot of private land adjacent to these arroyos. You've heard these gentlemen speak of that. I want to know specifically what happens to that development application that's adjacent to the arroyo prior to the implementation of any ordinances, when you just have this policy document.

McCall: Mr. Chair, Commissioner Clifton. Again I'll call on Mr. Ochoa to answer that.

Crane: Mr. Ochoa you may have missed the beginning of Mr. Clifton's question, it was a very practical one; suppose Mr. Scanlon comes in with a proposal for some development that abuts an arroyo, what would be the process at the point ... I presume Mr. Clifton you're saying that the City, we have approved and the City Council's approved, correct?

Clifton: Yes, what I, you know typically what I'm assuming still happens is it goes to the Development Review Committee which we get the minutes in our packets, and then in that committee meeting they will discuss, well okay we have the arroyo, the buffer, what are we going to do with the buffer? Well there's going to be a contentious disagreement between the developer and the City yet there's no policy document to directly impact that recommendation, so the recommendation's going to be just simply based on policy. Has been thought through?

Ochoa: Mr. Chairman, Commissioner Clifton. I would, I would just guess that this, whatever new submittal that comes in I'm guessing to be something very initial being an annexation or master plan sort of thing, would be submitted

to the City for review. And that review process would take place going to all different varieties of departments at the City for review. That policy, the Arroyo Policy of course will be looked at from a long range planning perspective, from a planning perspective whether what they're proposing in their development, if there are supporting factors within that, in that policy just like the comprehensive plan if you will, maybe Transportation 2040, the El Paseo Corridor, Blueprint Plan, all different policy documents out there to see if there's ways we could support the proposal that is being set forward before us. And then with that as you've seen numerous staff reports, there would be some findings either for support or denial of the proposed project that is before you.

Crane: That help Mr. Clifton?

Clifton: Well I, I think it just demonstrates the problem is all it does and that's all I wanted to get to the surface is just that, that it is a problem. It's a superfluous document that you cannot tie an individual's denial or recommendation then bring it to us to struggle with competing interests in a buffer, wherever that buffer may be, without a codified ordinance substantiating that recommendation. I, I just see a cascading effect of confusion if this thing's adopted as is.

Crane: Ms. Ferrary.

Ferrary: My understanding is that this is a guide and for planning, future planning. If the codes aren't already enacted or they would work with just current codes to make approval or denials, these would be adopted slowly and implemented, not something that would probably affect what is happening in direct applications but in future sales of public land to private, I would see most of that. And I think that you're assuming that this would make dramatic changes right away when it is just for policy, future policy planning.

Clifton: Mr. Chair, I, I understand what you're saying but I respectfully disagree as demonstrated with one previous case tonight, staff recommendation based on findings for approval. One of those findings is based on the City Comprehensive Plan Economic Development, Mixed Use and Infill Development Goals and Objectives and Policies. Okay, in a court of law they're going to ask you what were your findings for the basis of your approval or denial of this project? Okay, the findings in effect establish your recommendation, correct?

Ochoa: That is correct.

Clifton: So within that findings effect the staff is utilizing the policy document and that's my point. Nothing more. That you are in fact using a policy-guiding

document to formulate a recommendation. And without a codified ordinance ...

Crane: I think we see your point sir. Did you have something else to say Carol? I mean I'm not forcing you, but if you have something.

McCall: Mr. Chair, Commissioners. I did just confer with Mr. Ochoa and when there is code in place staff is obligated to recommend approval of the proposal. So if staff came before this body or the City Council with a development proposal and it fulfilled the obligations of the codes that are in place, staff would be recommending approval regardless of what the policy documents say. And this is hypothetical of course.

Basyat: Mr. Chair if I may ... Mr. Chair.

Crane: Yes ma'am.

Basyat: If I may address Commissioner Clifton's ...

Crane: You're not on the mike ma'am. Perhaps you should come up here.

Beard: And get the name.

Crane: And we need your name and *(inaudible)*.

Basyat: Srijana Basyat. I'm the Senior Planner with Community Development, the City of Las Cruces.

Crane: And I'll swear you in. Do you swear or affirm that the testimony you are about to give is the truth and nothing but the truth under penalty of law?

Basyat: I do.

Crane: Go on please.

Basyat: I just wanted to point out that Commissioner Clifton's concern as to, in the situation where you have policy and you don't have code. Okay, I don't want to paraphrase Commissioner, I will just address his concern. The reason you have policy, the reason you need a guiding document before you can have code is that you need that policy support to actually create regulations. So you can't actually have the regulations in place before you have the policy, which is why the Arroyo Plan would come before any sort of codified regulations on buffer distances or specifics.

Crane: Let me ask something to clarify. As I understand it and what you said a few moments ago Ms. McCall, that if there's regulation in place, zoning

regulations in place they take precedence in making a decision over anything else. Mr. Clifton's bringing up is I think, let me paraphrase him and he'll correct me if I'm wrong, that if zoning regulations are in place but the questions arise that Mr. Scanlon's project brings up, they're not covered by zoning regulations, and the only document that exists faintly relevant to that is the Arroyo Plan, what legal, what influence does that plan have subtly and unofficially or unsubtly and completely officially on the decisions or recommendations of the Community Development Department?

McCall: Mr. Chair, Commissioners. In the absence of code a decision maker would look to policy to inform the decision, but the decision maker or decision making body would not be obligated to follow the policy if he or she chose to vote a different way because the policy is not binding. In addition for example, if the decision making body did use the policy to inform their decision and, and voted appropriately, because it isn't binding, because it isn't code, well either way actually the applicant would have the opportunity to appeal that decision. There's always that opportunity.

Crane: Thank you. Mr. Scanlon did I state your question correctly?

Clifton: Mr. Clifton.

Crane: *(inaudible)*. Sorry Mr. Scanlon.

Clifton: I have a little more hair, sorry.

Crane: Of course.

Clifton: You know I don't know that it was such a more of a question than a comment. I mean I understand the order of policy and, and ordinance but nonetheless as I referenced the policy still being used to formulate a recommendation that does have an impact, positive or negative on a property owner and I think that just ... you know that needs to be discussed.

Crane: Okay.

Clifton: Thank you.

Crane: So Commissioners.

McCall: Mr. Chair.

Crane: Yes ma'am.

McCall: I'm sorry. May I make a, a couple of additional comments?

Crane: Go ahead.

McCall: Just based on some of the public comment I, I want to point out some places in the Plan that more specifically describe an opportunity or an option to use a buffer and the cost to the property owner and to the City. And you know what, I, I apologize but when I printed this document out there are no page numbers. But if a buffer is found to be needed for erosion control purposes in privately owned areas, eliminating developable land could come at a high cost to the City. Incentives play a major role in encouraging private landowners to participate in these strategies. For instance it may be practical to use buffers for access to utility infrastructure where necessary. And I, I point this out because as I described before, a buffer or an easement is only one option. If it's determined to be a case in which some additional acreage or distance is needed. Another could be to create a conservation easement that is tax deductible. Another would be to use the acreage for your park credit or to, as the speaker pointed out to have density bonuses in exchange for that property. So there are a number of ways that it could be carried out without the, the property owner necessarily losing his land all together or needing to be paid out right for it. In addition one of the speakers called out in the conclusion the, the history in which arroyos have been rerouted, channelized, or dammed to prevent or mitigate flood damage. There isn't any place in, in the document where it says that these things would be prohibited if this, this plan were adopted. And I just wanted to point that out. In addition, this version of the document is on-line and will remain on-line if you were to recommend or not recommend adoption and it went forward to the City Council, this is an, it's an additional one month public input period in which people would have an opportunity to respond and come to the, to the City Council meeting and make their opinions known. Thank you.

Crane: Thank you. So Commissioners let's come to a vote on this and we have to vote on it in a positive sense. In other words we will, the motion which I hope to hear in a minute will be that this Case PA-14-01 be accepted. May I hear a motion to that effect?

Ferrary: I'd like to move that we adopt Case PA-14-01.

Crane: Thank you. Moved by Commissioner Ferrary. May I have a second?

Beard: I would like to hear some discussion.

Crane: Well we'll have a motion and then we can discuss it. That's the way it's done.

Beard: Okay.

Crane: I think.

Beard: I'll second it.

Crane: So you're seconding. All right, seconded by Mr. Beard. Let me say at this point so we don't have to repeat ourselves, from members of the public and from many Commissioners there have been a number of points which generally have trended in the direction of saying that this is not the best possible final plan we could come up with to send up to the City Council because there's a number of things that we all agree, I think Ms. McCall would agree need some attention. In fact you brought up a couple of those points yourself, so it's something to bear in mind when we come to our decision on how to vote, that if you feel that there is something ... that more polishing needs to be done to bring up a final copy that's worth sending up to the City Council without any ifs, ands, and buts, then we should vote against this. And Ms. McCall has full notes I'm sure and access to the minutes and we're putting a heavy burden on her if we make this extend but we've got to do the best job we can. So that in mind, would anybody else have any points to make? Yes, Ms. Ferrary.

Ferrary: My understanding is that if we do approve this any of those improvements can be made at the City Council level in the suggestions that Ms. McCall had or the City Council.

Crane: At the, at the City, City Council level did you say?

Ferrary: Yes, when they go to approve it.

Crane: But that would mean that we have no opportunity to look at them again and make sure that every little thing that was brought up is implemented would it not? So I *(inaudible)* your point is, okay. Do have a comment on that?

McCall: If you don't mind, Mr. Chair, if you didn't chose that option you would also be free, there seems to be an issue with the, the soils component; one option would be to recommend that the plan be left alone so that that change is not made or that that statement be corrected to read accurately. So as I, as I ...

Crane: It's going to make for ...

McCall: The way the motion is phrased right now, you would be voting on the plan as it is without any further changes. But you can propose that those changes be made and then they would be presented to the City Council.

Crane: Quite. And there was a point of which I was going to suggest, this would be about an hour ago, that we do that, with your two suggestions and maybe a correction regarding the, the wording on the soil because you *(inaudible)* completely wrong in that but it, well you're both right, let's put it that way, but it needs to be modified. However, we went to I think quite a number of other points, the buffer, the size of the buffer and some other things if I am wrong tell me. And it's got to the point of which we would find it very hard to specify in a motion exactly what needs to be fixed or not. Now if any of my fellow Commissioners feel that they can frame a motion in a way that would encompass all the requirements people have brought up, so be it.

McCall: Mr. Chair.

Crane: Right now we have a motion on the floor. Since I was talking to her I'm going to let her answer if she wishes. No, nothing.

McCall: I apologize.

Crane: Mr. Beard.

McCall: No, I do, I do have, Mr. Chair, Commissioners, you said that one of the, one of the things that was proposed to be changed is the buffer distance, but what I want to point out is that there isn't a buffer distance in the plan and there probably never would be because it's case-by-case. It would depend on the development proposal or the dedication of arroyos to the City by the State Land Office or by the BLM. So in this document there cannot, there just would not be a buffer distance stated.

Crane: But would there be a definition of what constitutes a buffer zone. I mean where you measure it from is absolutely crucial. Regardless of size are you measuring from the center of the current ...

McCall: Right.

Crane: Arroyo tract or ...

McCall: That could, that could be added.

Crane: Okay.

McCall: That could be added. That could be clarified.

Crane: Commissioner Beard.

Beard: Well there's going to be a whole bunch of changes made. If we approve this, if we approve this without making any recommendations we're ... you're still going to be making a bunch of changes to this document, true?

McCall: Mr. Chair, Commissioner Beard. I would only make the changes that you include in your conditions.

Beard: But we've gone past that phase.

McCall: And as, by my count it would be the arroyo modeling, correcting the soils statement, and making the point that the ... clarifying where the buffer would be measured from.

Beard: Okay.

Crane: And the two points that you brought up.

McCall: Those, I included those.

Crane: Yeah, okay.

Beard: Okay.

Ochoa: Mr. Chairman if I may interject please? I apologize.

Crane: Mr. Ochoa.

Ochoa: What could happen since there is a motion and a second on the floor, I spoke with legal and a, a, an amendment can be made to that motion to add those conditions at this time.

Beard: Okay.

Crane: Well is everybody on the Commission quite sure that those points that Carol just listed are the, cover everything that was brought up?

Beard: But, but she gave two alternatives to that soil foundation and I would like you to keep the modified one in there and then modify so that it is correct.

McCall: Chair, Commissioner Beard. I understand what you mean and I can do that.

Beard: Okay.

Ferrary: I'd like to amend.

Crane: Commissioner, actually I think Commissioner Clifton had his light on his first and then it's you Commissioner Ferrary.

Clifton: If I could point out something procedurally Mr. Chair, yes we do in fact have a motion but I, I believe Commissioner Beard was kind of, I don't know how to say it, he had to make a second so we could continue the conversation, but I know where he was going and, and I believe you were hesitant because you know you, like me you're not very comfortable with the document incomplete in the nature that it is. But now that we have a motion and second that kind of rules out a, a motion for postponement which should've been a viable motion as well cause that was the third of the three that was presented, so I mean if it gets denied or approved, either way it moves forward with or without our input.

McCall: Commissioners.

Crane: Yes Carol.

McCall: If the motion that's on the floor at the moment is voted down then you can make a new motion to postpone.

Crane: Yes.

McCall: So it, it doesn't, it doesn't necessarily eliminate that option.

Crane: Yeah, we can, Mr. Cabello. We can, can we not, vote the, this motion down and then readdress the issue with the conditions, correct?

Cabello: Correct.

Crane: Yes. So we don't have to tangle ourselves up here. So ...

Beard: I would still like to make another point too.

Crane: Go ahead.

Beard: I'm hoping, I would like to get this to the City Council. I would like to get their opinions and maybe they'll send it back to us with some objectives that we can go by. Right now we're sort of operating all by ourselves and we don't know what the City's thinking or the City Council's thinking. So I would certainly like to get an opinion from the City Council and get this thing to them with our ideas in it.

Crane: Well City Council is not thinking anything because we haven't given them anything to think about.

Beard: Right.

Crane: Now we've got to send them something and I don't know if they can send it back to us for another ...

Beard: Yeah they can.

Crane: They can?

Beard: Yeah.

Crane: All right, well ...

Ochoa: Mr. Chair.

Beard: The, remember the Horizon thing, they sent it back to us twice.

Crane: The which one? Oh yeah.

Beard: The Horizon Tower.

Ochoa: Mr. Chairman, yes sir for clarification, this is Adam Ochoa again, sorry. Yes, the City Council can choose to remand this back to P&Z if they choose to.

Crane: Mr. Clifton, your light's gone out. Are you ... you want to talk about ...

Clifton: Well that is correct, but will they? I mean that's *(inaudible)*.

Crane: Well it's their business. Mr. Gordon.

Gordon: Carol perhaps you could, one other item, you did touch upon it for several solutions to the cost of taking land. I don't want to use that word taking land, but the land that is lost to a buffer. You may want to consider doing some investigation and perhaps putting in some suggestions and following up with it, whoever has to make those decisions tax-wise, cost to the City as part of your presentation.

McCall: Mr. Chair, Commissioner Gordon. Thank you. I'll do that.

Crane: Mr. Beard.

Beard: If we approve this could you give us even though it's been approved, could you send us a copy, a complete copy just for the heck of it?

McCall: Mr. Chair, Commissioner Beard. Yes I can.

Beard: Thank you.

McCall: And not just for the heck of it, but for the real of it.

Crane: What's your definition of a complete copy?

Beard: With the changes that she's going to provide to ... whatever goes to the City Council I would like to have a copy of it.

Crane: Oh, okay.

McCall: Mister.

Crane: You realize if there's any confusion or misunderstandings between us and her about the materials to be put in, it's escaped from us and we never get to fix it, don't you?

Beard: Well we'll have the minutes. I mean we can always refer to the minutes.

Crane: But it's escaped from us. It's gone up to the City Council.

Beard: Yes it has, it has.

McCall: Mr. Chair.

Crane: You're prepared ... yes ma'am.

McCall: I'm sorry. If I may, as I understand it the procedure is that this, the October 28th draft would go to City Council. And what I would do is attach the proposed changes and indicate where they're inserted and then go through that at the City Council meeting. If, Mr. Ochoa can probably confirm this but it's my understanding that the material that you see is the same material that Council would see. So there would not be another complete revision made, but the revisions would move forward with the existing document, is that correct? Or is it possible for me to amend the plan and take another revision forward to City Council.

Crane: For the record Ms. McCall is asking Mr. Ochoa. Go ahead.

Ochoa: I believe it can. I believe you can actually modify that with the, with the conditions as, as stipulated by the P&Z as long as those are done you know as the P&Z instructed if you will.

McCall: Thank you.

Crane: All right our motion stands that the plan as presented to us be approved unless the people who moved and seconded that wish to rescind the motion and make a substitute. Who was it who moved?

Ferrary: I did.

Crane: Okay, how do you feel about that?

Ferrary: I would like to rescind the motion, the first one and make a motion that we adopt Case PA-14-01 with the conditions that we've spoken about and do I need to point them out?

Crane: You had better read them to us, yes, at least in outline form.

Ferrary: Okay. I have that we would include the conditions of the modeling and also the changes to the soil ...

Crane: Statement.

Ferrary: Right or the you know, yes. And then also information about the buffer zone. And the distance, yes.

Crane: Just those three items?

Ferrary: Was there one more?

McCall: Mr. Chair those are the only ones that I recall.

Crane: Okay. Mr. Beard you had your light on.

Beard: When she was hesitating about the soil I was going to say modify, what is it the presentation number 33, slide number 33, so that it is more correct as far as erosion goes. Okay.

Crane: Okay. That's four. Any other Commissioner have a point to make? Mr. Gordon.

Gordon: I think there was one additional point about the fact of, of making some clarification determination of the value of the land that perhaps might've been lost in the buffer.

Crane: Yes, we covered the definition of a buffer zone. Okay. So does that make a fifth one or was that present in yours Ms. Ferrary?

Ferrary: I think that was present in mine with the buffer description and also compensations already kind of described it.

Crane: Yeah, right, right. Okay, so may I have a second to that?

McCall: Mr. Chair.

Crane: Ms. McCall.

McCall: If I may, Ms. Basyat reminded me that the motion regarding the buffer the, as I recall the question was how and where the buffer is measured from, is that correct?

Crane: Well the definition in my view, was that ...

McCall: Okay, that would be included in the definition. I just want to make sure I've got them.

Ferrary: If that's possible cause ...

McCall: Okay.

Ferrary: The modeling changes and ...

McCall: Right.

Ferrary: I don't know how that would actually be defined.

McCall: No that, that, that would be included in the definition, so yeah.

Crane: All right may I have a second for the new motion.

Stowe: I second the motion.

Crane: Seconded by Mr. Stowe. Let's start with a roll call vote from this end. Did we start here before, I can't remember. Mr. Beard.

Beard: I approve based on discussions and the plan that's been presented before us.

Crane: Ms. Ferrary.

Ferrary: I vote aye for discussion and findings.

Crane: Mr. Stowe.

Stowe: I vote aye based on discussions, presentation.

Crane: Mr. Gordon.

Gordon: I vote aye based on discussion and the amendments that were made to the plan.

Crane: Mr. Clifton.

Clifton: I vote no based on a, an incomplete document being submitted to the Planning and Zoning Commission for consideration and furthermore as the perception of improper notification to the public with this incomplete document.

Crane: Chair votes aye based on findings and discussion. So we pass the measure five to one, will go to City Council. Thank you all.

McCall: Thank you.

Crane: Yes, and you did very well. Before we continue may I see whether the remaining members of the public are here for the next item of new business, PUD-14-02? I was going to call a comfort break but I think I'm going to call that anyway. Let's meet again at, I think we make it 25 minutes to nine, okay? That gives us about seven minutes. We're in recess.

BREAK TAKEN 8:28 THROUGH 8:38.

Crane: Okay ladies and gentlemen it's time to restart the meeting in spite of the fact we're short one Commissioner for a moment, but I think we, she left her purse so she's not going far.

VI. NEW BUSINESS

1. **Case PUD-14-02:** Application of Las Cruces Investment Group, LLC, property owner, for a Concept Plan Amendment for a Planned Unit Development (PUD) known as the High Range PUD. The proposed amendment is to increase the maximum density permitted for multi-family development from 16 dwelling units per acre to 24 dwelling units per acre and to permit the use of off-premise development identification signs for the 6.29 +/- acre undeveloped western portion of the original Parcel 1 of the High Range PUD. The subject property is located east of the Las Cruces Dam

PLANNING ZONING COMMISSION
PUBLIC HEARING
6/24/14

NOTE: The full transcript of the June 24, 2014 Planning & Zoning Commission meeting is on the City's website at www.las-cruces.org. These excerpts represent the relevant issues raised. cm]

Speaker	Comments Summary	Notes
Cmsr. Clifton	What is the buffer distance going to be?	The buffer would depend on the characterization of each individual arroyo. A specific arroyo or section of arroyo may not have a buffer. Obviously, in areas where there is already development adjacent to an arroyo, there couldn't be a buffer. So we're talking about areas that haven't yet been developed.
Cmsr. Clifton	When development applications come in,are they going to get held up because they are adjacent to an arroyo and you have to run the characterization model? You don't quite know yet what the buffer's going to be. Are you going to wait till it's codified in the design standards? And that leads into the next question, does staff have a handle on what portions of this plan will be codified and where will they be placed in the various ordinances throughout the city?	Any development proposal that comes in would be subject to the design standards that are in place at that time. The policies in the arroyo plan would only provide guidance for decisions in the absence of any code. But it would only be guidance, not a regulation. If/When the arroyo plan is adopted, the next step would be to amend the code accordingly. Currently, there is a committee currently working to amend Chapter 32 Design Standards so changes to the code that result from plan adoption would be folded into that amendment process.
Cmsr. Ferrary	My understanding is that this is a management plan and it's in the process of being adopted, and as you've explained that if something happens until this is codified then it would just be a suggestion and tried to be followed as a model.	
E. Binns	Probably the most important level is safety and welfare of the community. This is something that has not been addressed in all of these studies. The arroyo system that may go in has got to have some means of protecting the public there and keeping it in a safe order. The fire department's got to have access to these things in some form or fashion. The police department's got to have access, and they've got to have personnel to handle this additional load of this public property. And at this time those entities are stressed financially taking care of the streets and the normal public without an additional burden of trying to take care of the safety in miles and miles of arroyos. In addition to the safety and the welfare, we have an issue of the maintenance of them, i.e. taking care of the trash issues.	The safety and welfare of the community are indeed important concerns. It will be important to look critically at the areas being considered for conveyance since it places such a large responsibility on the City. Safety, maintenance and allowed activities for an arroyo or segment of arroyo would be reviewed on a case-by-case basis.

Attachment "E"

E. Binns	The second major issue on this thing is the funding of it, because this type of program is heavily city oriented. The staff identified that there was over 6,000 parcels in arroyos that are owned by 6,000 different individuals and in trying to acquire those properties it's going to be a major problem to find the financial resources to buy the land, because it is private land. I can foresee and I have the fear that the arroyo issue in a future date will be placed on a developer to dedicate the land in order for him to have the privilege of developing the land adjacent to it.	The plan doesn't call for the City purchasing all of the privately owned property along the arroyos. Arroyos currently under the jurisdiction of the state of New Mexico and the Bureau of Land Management are, for the most part, undeveloped. Depending on the agreements reached, the City might acquire these arroyos and identified buffers prior to the land being released for sale. In this way, developers would not be purchasing land they can't build on.
E. Binns	The boundaries of the flood control require a survey and the survey is done by taking the cross section of the arroyo to calculate the volume flow and then identify the outside boundaries. This is a very complicated effect and to identify the 100-year flood, to the 500-year flood or whatever, it's going to take extensive surveys to identify the real estate that you're speaking of and are going to try to acquire. So that's a major problem. FEMA has maps but they move, arroyos move, arroyos may be at one place this year and next year they may be at the other side, so that they do move around. They're not static. So it does become a major problem in trying to identify and from a property right standpoint an individual has a responsibility to take the water in one side of his property and take it out the other side of his property. And what he does in between if he channelizes or whatever he has a property right and he has the privilege to do whatever he feels is his right to do. So this is something that I can see is being taking away from the property owner.	Mr. Binns accurately describes the regulations regarding runoff. In theory, only what goes in (historic flow) is supposed to come out (post-development flow). Arroyo plan policies serve to strengthen regulations that are already in place and in some cases, add policies that may improve conditions if implemented as code.
J. Moscato	The first test that the Commission should impose on a proposal like this is whether it's really necessary. And if you look at what's currently on the books in terms of drainage requirements, subdivision, construction requirements, there is plenty on the books already. This plan has 75 separate policy recommendations, it has 57 separate actions recommended. I think that's a prescription for over regulation which is simply going to stifle economic development. It's going to raise cost of development. It's going to raise the cost to the city to manage to supervise, to impose its various mandates in connection with all these policies and all these proposed actions. There's a proposal here to try to incentivize single loaded streets along arroyos, well, I'm not sure how you can successfully incentivize a recommendation which would effectively double the cost of development. If you're only developing one side of the street, you have half the lots to develop, but you have the same costs of infrastructure. So I think on so many levels this is unneeded.	The number of policies in the plan has been reduced from 75 to 61, and actions from 57 to 46. Over half (rough estimate) of the policies call for actions by the City, not private property owners. Those that will require code amendments are intended for specific situations and on a case-by-case basis, such as single-loaded streets and buffers, not broadly applied in every situation. These may be called for in certain locations, but not everywhere and not in existing developments where construction already comes to the 100-year flood boundary.

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M. Bower	The proposed ordinance in its current form, the preliminaries, the full potential of arroyos as a community asset was thrown around a lot in there and the plan admittedly discloses that it is unable to quantify the value of this community asset and I have the answer right here, if you want to put it in there. The proposed plan as John pointed out, specifically the buffers will have a very ... it'll have a very negative impact on private property affected by the ordinance. And example, as he's saying, if you have a piece of private property, an arroyo runs through some of it or half of it, again based on tonight's presentation and discussion the proposed buffer of 25 feet is inadequate, it's probably grossly inadequate, in some cases it essentially just doubled the cost of infrastructure because now you have an arroyo, it's in the private land, you create a buffer, you've still got to get a road through there. Half the land is now essentially off the market and ... not to mention you just trampled the private property owners rights pretty significantly right there. But the unintended consequence of this is that you're essentially removing property from the market so that the city at some later date can't benefit from revenue from impact fees, building permits, so on and so forth, you're actually strangling revenue to the city by going with something like this.	The plan sites research showing home buyers would and do pay a higher price for property located adjacent to open space. This wouldn't make up for all of the lost revenue but some. Using that open space as the required park land also allows building in a different area of the development that would have been the park. Conservation easements also provide up to a 50% tax rebate. Perhaps the City would purchase the land. So there are many ways to address this economically. Again, it wouldn't be across the board. It would be in specific locations that are identified as more vulnerable to erosion or contain unique land forms, threatened vegetation, etc. The arroyo characterization model would identify these areas.
S. Chavira	Let's take the time to work this plan. Let's look at it. Let's not push it forward to Council and start the ball rolling or start the water flowing as it is, no pun intended, but let's look at it and let's really figure out what is going to be involved. We do have an economic impact for our community, for our ... for the business community, our city in general, and looking at this policy is important that we take the time and be as equally fastidious as Carol has been to make sure that we look at it all from ... from all areas of the spectrum. That's my recommendation.	

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D. Binns	The buffer zones are not described here. There's no studies here that says okay this buffer zone is going to be here, here, and here, and I think we need to evaluate this plan a lot more. Something else to take into consideration, basically they're trying to keep channelization away from this plan. The Rio Grande River was channelized. It used to meander all up and down the valley. It was channelized for a reason, so people could put farms in, people could put development in. The same thing with arroyos, they can be channelized in a certain manner that the wildlife can still run up and down, we have the aesthetics of an arroyo, but we don't have to let it meander you know one quarter mile one way, one quarter mile the other way, it can be channelized in a smart way but we don't need 400 or 500 foot buffer zones in places. Again you're taking the rights of property owners in your own hands right now. So I would like to recommend if you could not to pass this and not to let it go forward anymore.	Hopefully the 9/21/14 plan revision explains the arroyo characterization model and buffers more clearly. As stated earlier, buffers are not intended to be applied in every situation.
Cmsr. Ferrary	I disagree with all of the naysayers. I think this is a typical response that we have too much regulation, that these are going to cause us all kinds of problems, we need more discussion. I think the discussion has been at ad nauseam and there will still be more discussion when the City Council goes to approve it. I think there has been great compromise with a lot of the suggestions and improvements to the plan. These are planning measures that will provide a future for Las Cruces to have the protections from the damages by arroyos and not being able to flow. And it will also provide a vision for our community and that will provide how Las Cruces will grow in a really great way.	
Cmsr. Beard	It's a very comprehensive subject...is this really a plan that tells people what to do or is this a plan that sort of makes... puts things really up in the air as to what they should be doing? I think postponing it would be a good idea, having more meetings. Just the buffer zone alone, what is the buffer zone going to be for different situations? That's a very hard subject to cover. People should know what it is and maybe we address those things as they come up, I don't know. We need the input from our developers probably more than anybody else. I can't decide that. So I'm really up in the air as to what I would do and if I don't know what I want to do then I don't want to pass it. So that's my ... where I stand.	A plan is a guiding document and is never intended to tell people what they can and can't do. Since it is adopted by resolution not by ordinance, the policies are not regulations.

Cmsr. Crane	Yes, this is an enormously broad and deep task that you've been given Carol and you've done a bang up job. It goes against my grain to say this but I have substantial sympathy for the points made by the five speakers tonight. It still seems to me as it did after the work session that we're probably going to have to write off those sections of arroyo which are at present in developed areas. I don't see how we could retroact if we go back and recommend accept as a general policy but certainly not as a matter of regulation. The people go back and remake the arroyos in the way that we might all like to see them be done. Clear distinction should therefore be made between plans for existing developed arroyos or arroyos that are in developed areas and those that are in what you call developable areas in which all negotiations regarding the land and the cost of it and so on could be done with the idea in mind that the arroyos would belong to the city and the city can dictate how the channels are supposed to be handled.	The 9/21/14 plan revision addresses these issues and if it still doesn't do so adequately, it can be revised again.
Cmsr. Crane	This is more a concept plan of what it would be nice to do to preserve the quality of the arroyos for the benefit of everybody in the future. If we send this up to the City Council I hope they'd read it and think about it and ask questions and maybe get some modifications made, but it still wouldn't be quite regulation. At what point and by whom are regulations going to be written to implement the plan?	If it were to be adopted, then steps would be taken to look at the policies that are in the plan and determine whether there is already a regulation or something in an ordinance that addresses it. If not, how to address it would be the next step, and one possibility would be amending an existing ordinance.
Cmsr. Crane	As I understand it, there will be opportunities in the future for the issues to be addressed, the issue of regulation. Community Development would come up with regulations, in the absence of anything current. Those regulations have to be voted on by Planning and Zoning and City Council.	Yes, plus there would be public input meetings. So stakeholders have many opportunties to review the material and provide comments.
Cmsr. Clifton	You have a policy document that has been adopted by the City Council that is still a guiding document and I echo once again Mr. Beard's comments, this is just so broad. And you have your stakeholders right here. I think we can get at least a couple meetings in before we take any type of action. I'd prefer to see some consensus building amongst the staff and the individuals in this room.	A public meeting was held July 23, 2014 and a stakeholders meeting was held July 30, 2014. Additonal meetings can be scheduled if requested.
K. Harrison-Rogers	Just a point of clarification, I would like to point out if there was private property and let's assume that it was zoned multi-family or commercial and they came in simply for a building permit underneath the auspices of that particular zone, this policy document would not halt that project. They would only be obligated to construct to our minimum standards, which is outlined in our design standards as they currently sit. So, a project of that type wouldn't be delayed because of this policy document. But Commissioner Clifton it is accurate that perhaps the policy document could influence projects that came before this Board, such as a zone change, a planned unit development, things of that nature.	

Cmsr. Stowe	Just a comment that as I understand it at the end of the day there's no funding to implement this plan.	Not at this time.
Cmsr. Beard	We've got to address the buffer zone. Do we actually want to put in a criteria for the various buffer zones or do we ... do we want recommendations that ... that these types of things will be decided later on? The buffer zones happen to be an important subject, how do we want ... how do we want that to be addressed back to us? This plan doesn't really come down to saying this is exactly what we're going to do, yeah or nay on it. It has a lot of recommendations but it doesn't have any ... I don't think, policies. Do we want the policies to be addressed in here?	The plan is not intended to contain specifics about buffer distances or locations. The modeling takes time and is quite technical, and would be done on a case by case basis. The plan only describes how the modeling would be done and what information it could provide.
Cmsr. Ferrary	I don't think we can define those things. This is a management plan. This is something that you know the policies are going to be reviewed and then presented later on even after the plan has been adopted.	
Cmsr. Crane	I don't think we are in a ... at a point yet where we should try to get very specific. We have a motion that this be postponed until Ms. McCall has made adjustments to her plan based on meetings with these three stakeholder groups.	

Arroyo Management Plan Public Input Meeting
07/23/2014 6:00 – 9:00p.m. DACC East Mesa Campus 2800 Sonoma Ranch

COMMENT CARDS

Good suggestion to integrate engineers & developers with general public at stakeholder meetings. Consider taking the presentation to the State, BLM, etc. Thanks!
Many of the questions & how they were answered really depended on if the City wants to preserve or channel arroyos
While it may cost more now, doing nothing may/could cost much more in terms of damage which may result from ignoring the issue/problem.
Overarching goal should be to maintain natural drainage system in perpetuity by any and all means. It is a lot cheaper than built infrastructure
I would like to be on any e-mail lists to get information on this plan as it progresses, if possible. Thanks. janketurtle@hotmail.com
Is there a higher cost to maintain permeable paving? If so, no one would agree to place this paving method.
[Regarding on-lot green infrastructure techniques] Does not guarantee your investment would last due to natural erosion.
Need more control over developers. Also, changing arroyo may move current property to a flood plain.
Major arroyos should remain natural

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Comment	Notes/Response
Question on survey [How important are arroyos for flood control and stormwater management?]: There is a difference in importance between flood control and stormwater management.	Flood control deals primarily with public safety while stormwater management deals with broader themes such as water quality, health of the watershed, conservation, green infrastructure, and aquifer recharge.
Comment on survey [Dumping of trash and waste in the arroyos is a problem.]: There is dumping everywhere not just arroyos.	We are interested in knowing to what extent the public thinks dumping in the arroyos is a problem. This would support policies in the plan that recommend stricter codes enforcement. If you see illegal dumping anywhere in the city, please report it to the Codes Enforcement chief, James Chavez at jchavez@las-cruces.org or 528-4100.
What would the City be responsible for if there were a buffer. Because there is erosion [the buffer would eventually erode also].	If specific arroyos and identified buffers (if any) were conveyed to the City, the City would be responsible for maintenance, codes enforcement, flood control, etc. in the same way that private property owners are. This is why it is important that the City consider this option carefully with regards to cost and resources required. Also, if there was a buffer between the 100-year flood zone and the privately owned property, the City would have the oppportunity to install flood control measures that it wouldn't otherwise be able to do if the property is privately ownered. It's true that if the arroyo has the tendancy to erode, the buffer would eventually erode too. The City would not come back and 'rebuild' the buffer; this sort of engineering is what weakens the arroyo to begin with. But there is comfort in knowing that it's the buffer, and not the private home, that would erode.
Comment on survey question regarding danger of arroyo [How serious would you say the danger of arroyo flooding is where you live?]: Sometimes the danger depends on the arroyo. Some may be over topping while others do no look very dangerous at all.	This is true. And sometimes you may not see evidence of any danger or damage, yet downstream the impact may be greater.
Why doesn't flood insurance go to maintaining arroyos?	The National Flood Insurance Program (NFIP) is run by the Federal Emergency Management Agency (FEMA). It helps homeowners and renters rebuild after a flood occurs. The standard flood insurance policy pays for "direct physical damage" to a home or building. Property owners must buy a separate policy to protect what's inside the buildings. This insurance is intended for disaster assistance and filing a flood-insurance claim is like filing a regular claim on your homeowners insurance or a medical claim on your health insurance. If you have flood insurance and and never file a claim, you don't get your premiums back. Insurance premiums go to the insurance company (NFIP) and are not intended to be a stormwater management fund.
Are the Organ Mountain National Monument amenities controlled by the city?	No, they are under the jurisdiction of the U.S. Bureau of Land Management (BLM). Monument management is a concern to flood control dam owners because of the access needed to maintain the dams. Since some areas of the monument are wilderness, they would be managemend for wilderness characteristics, which means no vehicular access. The BLM is aware of this issue and has stated that when a management plan is drafted, dam owners will be contacted to provide input.

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Is County planning going to do an arroyo preservation plan?	Community Development department staff and Dona Ana County Flood Commission staff have expressed interest in a plan at some point in the future. It's possible they will look to the City's plan, if/when adopted, as a starting point for goals and policies. But conditions in the county, especially outside the ETZ where it is much less populated, are very different and would be managed differently as a result.
You develop a community wide plan with developers and citizens as stakeholders in order to get input from both parties.	Yes, individual property owners, residents, business owners -- in other words, the publc -- are important stakeholders in this process. It's erroneous of staff to consider 'stakeholder input' and 'public input' as different or separate. In revising the plan, all comments will be taken into account and will be weighed evenly.
How does this policy address affordable housing? [Paul Dugie from the DAC Flood Commission further clarified his question: A significant portion of the population of Doña Ana County live at or below the poverty line. I see several of the measures in the arroyo plan adding to the cost of property and the development and maintenance of the property. Several of your power point slides referred to the increased cost to purchase and/or maintain the open space/arroyo. This cost is passed on the property owner and in some cases the people who rent the property.]	This is an excellent point and one that the arroyo plan has not addressed. It's worthwhile including this issue in the plan revision, both in the Issues and Challenges chapter and through policies in the Land Use section. I haven't found studies regarding this so far, so it may only be a mention.
There is a concern about city taking over arroyos. Do arroyos behind plaza belong to BLM or private developers? The outfall arroyo.	The Las Cruces Outfall Channel is an extension of the Alameda Arroyo and mostly goes through the city east to west near the north Main Albertsons. It is the responsibility of the City, but most of the property abutting it is privately owned and is mostly single-family residential. The arroyo behind Arroyo Plaza on Lohman is an extension of the Las Cruces Arroyo and is mostly privately owned as well. If you are interested in more detailed information, please contact me [Carol McCall, cmccall@las-cruces.org].

Why give the arroyos to the city? What is the need for more regulation, "Let's no put more frosting on the cake."	There are a few arroyos in undeveloped areas that are still under the jurisdiction of the NM State Land Office or the BLM. If those agencies convey the arroyos -- and suitable buffers if there are any -- to the City or retain ownership of them prior to selling land for development, the buyer would not be purchasing land that may have limited development potental because of its geographic characteristics. This saves the developer money in the long run and helps protect arroyos in a more natural state. In answer to your second question, it's true there are adopted plans with policies addressing arroyo management. Most of them are at least 10 years old. The city is growing and the boundaries of the ETZ continue to change as new land is annexed. Many agencies are beginning to look at arroyo management from a broader perspective -- as multi-jurisdictional watershed management that is more integrated and regional. This approach improves sustainability and resilience, both of which are becoming common goals in land use planning. Other adopted plans do not take this perspective.
What is the difference between engineered vs. natural arroyos?	According toPublic Works Department staff, you may have a natural arroyo that has been manipulated with engineering design in order to get a desired outcome. A natural arroyo maintains it original alluvial properties such as rock, soil, sand, vegetation and flow. A natural arroyo is allowed to flow and meander without anthropogenic hindrances. Engineered arroyos are channelized and sometimes they are lined. I would add that there is sometimes reference to a 'naturalistic' arroyo, in which certain erosion control measures, such as riprap, are installled, but the arroyo is left unaltered for the most part.
In the East Mesa Porter and Dunn area, the City was going to take care of roads and redirect the water. When the City came in [when the area was annexed], homeowners were drastically affected. Then the City had to come back and fix it. They redirected the flow and it is still going to side streets. How much thought was given into building of infrastructure such as culvert and arroyos? My neighbors are still experiencing problems. Before the City annexes more properties it needs to take these into consideration.	According to current Public Works Department staff, many of those who worked out there after annexation are no longer in the department. The engineering technicians who handle flood management issues don't recall being called to go out there. But they explained that part of the problem is that some roads are privately-owned (or partially privately-owned). They have to be conveyed to the City before the City can fix or maintain them. If only one property owner is not agreeable, it can't be done. As far as I know, there are no plans for further annexation in the near future.
I believe the City needs to do a comprehensive study on arroyos and drainage. This way it does not rely on development to submit drainage studies.	This is the intention of the arroyo characterization model proposed in the plan. The revision will expand on this concept and more clearly describe how it would be used.

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What deficiencies do you see in the design standards?	According to engineering staff in Community Development and Public Works, the design standards cover most technical aspects of development. But some of them could be improved upon and clarified to remove ambiguities. Specifically, they suggested a sediment transport analysis, language that describes buffers, and terrain management standards based on topograhy.
If your policies and action from the plan were implemented what would be the cost? Has the City performed an economic analysis?	No the City has not performed an economic analysis of the costs associated with maintaining arroyos. But since the intent is to maintain arroyos in their natural state, in situations where this is possible possible, engineering and channelization costs would be reduced.
What is the cost of long term on maintaining natural vs. engineered arroyos?	According to staff in the Public Works and Transportation Departments, these types of studies have not been done.
Please include public in stakeholder group meetings.	Yes, as explained earlier, stakeholders and the general public should not be different or separate. In any future meetings, invitations will be extended to everyone who has expressed an interest in attending.

Engineers Developers Stakeholder Meeting
Offices of the Las Cruces Homebuilders Assoc.
7/31/14

In attendance:

Jonah Ruybalid, Molzen Corbin
Hilary Brinegar, Marron Assoc
John Moscato, Sierra Norte Development
Amanda Herrera, Parkhill Smith & Cooper
Jacob Hernandez, Parkhill Smith & Cooper
Paul Pompeo, Southwest Engineering
Steve Chavira, LCHBA
Andrew Guerra, Bohannan Huston
Brigitte Fuller, Wilson & Co.
Eddie Binns, Binns Development
Rocio Dominguez, CLC
Srijana Basnyat, CLC
Carol McCall, CLC
Natashia Billy, CLC
Peter Bennett, CLC
Koting Lee, CLC

COMMENTS	NOTES/RESPONSES
EB [Eddie Binns]: arroyos run across private property with rights and allowed uses. My concerns:	540
• Clarify purchasing arroyos	The plan states that in certain situations, acreage could be purchased by the City. But the intent is not to acquire all land along all the arroyos and the plan does not state that.
• Need to recognize value of real estate	If there is text that diminishes the value of real estate, it is accidental and will be taken out. One of the stated goals of the plan is to help protect private property. Other statements explain the importance of protecting the rights of landowners.
• Policy that says don't discharge run off directly into arroyo – doesn't make sense	The intent of the policy is to reduce the volume and velocity of runoff flowing into the arroyo, which will help reduce erosion and downstream flooding. In the 9/21/14 revision, Policy 10.4. states "Do not discharge stormwater runoff directly into arroyos. Direct discharge into a settling pond, impoundment or other solution designed to stop or slow water before it reaches the arroyo. This will assist in bank stabilization by minimizing erosion and promoting growth of native vegetation."
• Mentions FEMA	[Not clear on intent of comment]
• Current plan draft doesn't give option to channelize. Property owner has the right to make that decision. Property owner shouldn't be lost in the process (of completing the plan)	The introduction to Section 4 Utilities and Stormwater Management in Goals and Policies states "The City promotes flexible design standards when channelizing and storing stormwater for development adjacent to designated arroyos that will enhance the natural arroyo system." There is a policy (9.2)providing the option to channelize given certain protections are in place.

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• Worried that next administration may interpret the plan differently, i.e. more strictly	Yes, there is always the possibility of that in every plan that is adopted.
PP [Paul Pompeo]: Has the City figured out the cost benefit of arroyos in their natural state versus channelized? Section on economic benefits of open space shouldn't be in the plan, or you should include a cost-benefit analysis of acquiring the arroyos.	According to staff in Public Works, the City has not done a cost-benefit analysis of natural vs. channelized arroyos. The data regarding the economic benefits of open space are included in the plan in response to P &Z Commissioners' comments that the benefits of open space are hard to quantify and should be substantiated. This is fully supported by research in the current revision.
SB [Srijana Basnyat]: *[In reference to comment that the City should not dictate what happens on private property and the Arroyo Plan proposed policy suggesting acquisition of adjacent property].* Compromising property rights is very serious. Anytime there is acquisition or dedication decisions, there will be care taken to establish nexus and justification/compensation. There isn't just one way to do it. Buffers are one way, but not the only way. There needs to be a study done at the more technical level.	There would be no acquisition of private property without full compensation. As noted above, acquiring private property would only be proposed in certain situations in which the land contributes greatly to the goals of the City's mission to provide park and open space opportunities for the public.
PP: Regarding dedication of the property...There is a portion of the Sandhill arroyo that's not on the map. City should do the hydrology. CLC doesn't have a hydrology engineer on staff. Needs to go out to engineering firm qualified to do this.	The 9/21/14 plan revision calls for further hydrology upstream from the 100-yr. flood boundaries, and finding the necessary funding to do the studies.
EB: Policy 7.2 on no trails in the 100-yr flood plan. Revise this to clarify. Policy 9.4 on vegetation replacement. Suggests revising policy -- it's very costly and very difficult to revegetate. Often unsuccessful. City would have to do it too, when they're putting in utilities and so on.	The trail policy, now numbered 7.3 has been revised to read "Construct trails outside the designated 100-year flood zone boundary on an arroyo, but may be constructed within the identified buffer area." Policy 9.4 policy serves to strengthen regulations that are already required under the NPDES General Construction Permit (GCP) but expands the time frame for compliance to 3 years. the GCP section 9.4.1.5. says "The area you have seeded and planted must within 3 years provide established vegetation that achieves 70% of the native background vegetative cover for all unpaved areas and areas not covered by permanent structures.
PP: Policy 3.1 "...cost allocation sharing process...for arterial roadway crossings..." This should not just include arterials; should include collectors too.	This policy was deleted since it is already a City requirement. This comment has been passed along to the design standards review committee for consideration.
JM [John Moscato]: Policy 1.9 "Clearly outline drainage...modifications to arroyos in PUD concept plans and master plans..." In PUD concept plans, the drainage study is conceptual only at this stage. A more detailed report would be submitted later in the preliminary plat and final plat stages.	The policy asks for an outline at the concept and master plan stages. It is understood that details are not known at this point.
SB: When is a grading plan required?	
JM: At the construction drawing stage	
?? : Policy 1.11. "...plan, design and layout lots, buildings, service areas and street locations..." Some of this already takes place because you have to take the lay of the land into consideration when you're planning a development.	This policy was deleted.

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?? : Policy 1.14. "...incorporate green infrastructure into development proposals..." Need Public Works buy-in and needs to be added to design standards. We've tried before but without much success.	
SB: Design standards are currently in revision and will address green infrastructure.	
JM: As design standards are revised, it's important for the private sector to be involved at the early stages.	
SC [Steve Chavira]: It's been our experience that input opportunity is too late. At the recommendations stage or adoption stage when everything is almost finished.	
NB [Natashia Billy]: I review drainage plans and I enjoy the open dialogue with engineers who come in to talk about changes in the design standards.	
EB: Everyone needs to speak the same language. The more communication the better.	
SC: We need to be involved when we're early in the process. The plan is too broad.	
SB: What parts of the plan are too broad?	
SC: There are 4 arroyos that flow through town, not all of the major arroyos. Don't want to see park impact fees...	The 9/21/14 plan revision makes note that the City can only address the major arroyos that are in the city limits.
PP: Is there any kind of prioritization? Which arroyos come first for this management plan?	
CM [Carol McCall]: We would look at what's already been approved and is most likely to be developed earlier. Arroyos near those areas would be analyzed first.	
SB: in situations where the state is leasing out the land, we have to have state approval. Economically, highest isn't always best...	
PP: Prioritize the arroyos, do the hydrology first and have the information there ready to go.	
PP: Policy 4.1 "Amend development standards to stress protection of the natural landscape..." It isn't absolute. Sometimes changing the landscape is the best and safest option.	The policy was deleted since current regulations address it.
JM: Policy 6.2 "Link open spaces by maintaining arroyos as much as possible..." As much as possible is too open ended. Policy 6.4 "Utilize adopted park impact fees for designated open space, trails or a linear park." Impact fees can only be used for specific purposes. What does Mark [Johnston] think? Maybe add "case by case."	Policy 6.2 was revised to read "Utilize arroyos and open spaces as a natural connection to other public properties." Policy 6.4 (now 6.6) was revised to read "Use adopted park impact fees or development waivers as incentives to developers to designate open space, trails and connectivity, or a linear park on a case-by case basis."

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CM: Mark has read the plan and reviewed the policies and he's approved the policies related to parks and trails.	Subsequent to this meeting, I talked to Mark Johnston again and he suggested adding "case by case basis" since park impact fees are typically used for neighborhood parks.
EB: Policy 8.2 "Design arroyo crossings ..." Suggests deleting it.	Policy 8.2 was revised to read "Design arroyo crossings to include appropriate measures such as signage, push button signals or other features that will maximize safety, access and mobility." This leaves the decision to the developers and nearby neighbors as to what "appropriate measures" might be called for. This would be based on the location of the development, neighborhood input, presence of trails, etc.
EB: Policy 8.3 "Where designated equestrian trails cross roadways..." Suggests deleting it.	As written, the policy obligates the developer to provide trail amenities. Policy 8.3 was revised to read "Where applicable during the development design process, meet with adjacent neighborhoods to discuss appropriate trail amenities for pedestrians, bicycles and equestrians." Again, this leaves the decision regarding trail amenities up to the developer based on what might be called for given the situation.
EB: Policy 8.4 regarding placement of parking and shared parking. I had to fight for a parking lot at Veterans Park. They didn't want a parking lot – they wanted people to walk to it.	
CM: Policy 9.1 "...in a natural or semi-natural condition..." I'll change "semi-natural" to "naturalistic."	This revision allows for some alterations to the arroyo while maintaining the natural look of the terrain.
EB: Policy 9.2. "Altering a natural drainageway should not be allowed unless..." This eliminates ability for property owner to use his real estate.	This is not the case. As noted in the previous policy and elsewhere, Policy 9.2 provides an "out" when such measures are necessary. The policy was revised to read "Do not alter a natural arroyo unless such a modification is shown to be without reasonable hazard and liability, and there are no adverse impacts to public and private infrastructure, habitats and open space. Altering a drainage path may create new and unpredictable flood responses."
JM: Can have natural outside arroyo path.	
PP: Sandhill Arroyo further upstream, east of Porter, will have to be channelized to handle the flooding problems in that area.	
JM: Policy 9.7 "Retain original alignment of arroyos and natural side channels..." Sometimes you minimize the impact by changing the alignment.	This policy was deleted
?? : Policy 10.4 "Integrate storm water management measures..." Suggestion made to delete it since it is a required part of the submittal process.	This policy was deleted

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Policy 10.6 "Discharge of run-off from adjacent development...." This is similar to Policy 10.5. "Do not discharge stormwater directly into arroyos."	Policies 10.5 and 10.6 were revised to combine the two and now reads "Do not discharge stormwater runoff directly into arroyos. Direct discharge Discharge of run-off from adjacent development should be directed into a settling pond, impoundment or other solution designed to stop or slow water before it reaches the arroyo. This will assist in bank stabilization by minimizing erosion and promoting growth of native vegetation."
EB: Policy 10.8 "Extend drainage structures completely into the arroyo bottom..." USACE and CLC natural terrain	
JM: What do 10.9 thru 10:14 have to do with arroyos?	These policies address GOAL 10: "Minimize soil and slope instability, erosion, sedimentation and water run-off to protect water quality and the natural characteristics of the land." They have to do with stormwater control measures which are already requirements of the CGP (Construction General Permit). Stormwater discharges from construction activities (such as clearing, grading, excavating, and stockpiling) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the National Pollutant Discharge Elimination System (NPDES) stormwater program. These requirements (control measures) protect the integrity of the arroyo and prevent pollutants from entering the arroyo. In addition to the revision of 10.5 & 10.5 (previous comment), the remaining policies were deleted or revised. They now read: 10.5. Extend drainage structures completely into the arroyo bottom, extending to the arroyo flow line, and matching the natural terrain. 10.6. Confirm that a Notice of Intent (NOI) to the Environmental Protection Agency (EPA) has been submitted before issuing grading permits. 10.7. Place fills in such a way that they do not cause encroachment upon arroyos or other natural drainage ways. 10.8. Enforce Best Management Practices (BMPs) related to NPDES compliance to reduce pollutants from storm water. 10.9. Apply credits to the FEMA/Community Rating System (CRS) program for those projects adopting the management practices in the CRS program plan. This will provide additional flood protection and cost savings.
CM: We can revise policies to make them more accurate	
JM: Policy 10.9 "Minimize grading and ...by avoiding drastic cuts and fills." Suggests deleting.	Policy 10.9 was deleted
PP: Policy 10.10 "Avoid premature grading..." Sometimes we need the soil for fill or for future development mitigation. But clearing for the sake of doing it shouldn't be done.	I hope that the policy revision addresses this issue adequately: "Confirm that a Notice of Intent (NOI) to the Environmental Protection Agency (EPA) has been submitted before issuing grading permits." It allows grading when needed but helps clearing for the sake of doing it, as you noted.

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JM: Policy 10.14 "Implement on-lot water harvesting strategies..." Will the City recognize on-lot ponding? Right now they only give a 10% credit.	This policy was revised to read "Enforce Best Management Practices (BMPs) related to NPDES compliance to reduce pollutants from storm water." On-lot ponding (or bioretention) is an EPA Best Management Practice. These aren't required by the City but they are allowed. The issue of credit was passed along to the design standards review committee.
JR [Jonah Ruybalid]: Referring to Policy 9.7 "Retain original alignment of arroyos and natural side channels..." If you don't retain the original alignment, you channelize it. Only way to make sure...	Policy 9.7 read "Retain original alignment of arroyos and natural side channels, in order to minimize the flood impact that new developments may have on existing developments downstream. Altering the drainage path may create new and unpredictable flood responses. This policy was deleted because other policies address the same issue adequately.
EB: The best thing to do is simplify.	

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Developers Comments
Meeting 10/15/14

COMMENT From John Moscato Email 10/09/14:	RESPONSE
1. In a recent meeting with Robert Garza and Brian Denmark, Robert indicated that he believed that the original scope of the plan was limited to major arroyos within public lands. That scope has now widened considerably.	The 1992 Storm Water Management Policy Plan, which is the first document to specifically call for an arroyo plan, lists the Fillmore, a segment of the Sandhill Arroyos, the Alameda, Las Cruces, and Telbrook Arroyos, segments of the Little Dam Arroyo, and "unnamed major arroyos" as identified on the Major Arroyo Corridor Identification Map as those to be included in a major arroyo plan. According to Brian Denmark, he and Robert Garza do not disagree with this list of arroyos included in the current plan. In addition, the next revision of the plan, which will be dated October 28, includes a policy recommending that the City identify the main stems of these major arroyos as being those areas which should be protected, not the entire arroyo. This will further reduce the areas to be protected, thus allowing more development surrounding the smaller tributaries. As we discussed on 10/14/14, I will review the land data and get a better sense of how much of these arroyos are undeveloped private lands. Most of the state land is within the Vistas area, which includes portions of the Alameda and Las Cruces (South Fork) Arroyos. Portions of the Tortugas and Fillmore Arroyos are also on state land. Arroyos that extend into BLM land include the South Dona Ana, Tortugas, and Fillmore. Policies related to buffers or additional erosion control would apply to identified areas of state or BLM arroyos that would be withdrawn from development (probably conveyed to the City) before adjacent land is sold for development. However, there may be specific areas on undeveloped privately-owned lands in which increased erosion protection may be required. This could be accomplished by using it as park land, engineering erosion control treatments, or other appropriate methods.
2. In previous meetings, we have asked for some indication of the cost to the City and to private landowners of implementation of the goals and policies set forth in the plan. Quite simply, if the plan is impractical from a cost standpoint, we question why the plan is being proposed.	The plan is being proposed for several reasons: it takes a broader, more regional approach to flood control and stormwater management, which previous plans lack; it will strengthen existing regulations; Council supports it and has directed staff to bring it forward; and the public supports open space protection and better flood control strategies. The City and private landowners have to follow the same regulations, so strengthening enforcement for one strengthens it for all. Yes, there are always costs involved when engineering a channel, keeping an arroyo in a natural state, preparing a drainage plan or maintaining what is already there. But some of the policies in this plan, if implemented, will also reduce costs associated to repairs due to flood damage.

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3. Many of the policies included in Goals 6 and 10 have the potential of placing unreasonable burdens on development and indicate a misunderstanding of current standards that development must meet.	The individuals on the design standards review committee probably would not agree that they misunderstand the current standards. That said, some of the policies in the plan will require further restrictions than you are accustomed to. Staff will review the policies and revise to be more sensitive to what implementation steps these policies may entail.
From John Moscato email 10/17/14:	
1. We see several inconsistencies with the identification of the arroyos to be covered by the AMP: (a) the map in the AMP includes more than a dozen arroyos; (b) the text on page 66 identifies the "most important" arroyos as the Alameda, Sandhill, and Las Cruces Arroyos; (c) that text also states that "managing other arroyos properly will also become a priority"; (d) you said at our meeting that one of the goals of the AMP will be to map the major tributaries of the major arroyos so that property owners will how if the AMP affects them; (e) you said that there is no schedule covering, and currently no funding for, the "detailed characterization of each major arroyo" referred in Policy 1.1. As a result, we believe that property owners will not know for a long time if—and how—the AMP will affect them. Yet the AMP is moving forward? This sounds a little like, "We need to pass the bill in order to know what's in it."	**(a) - (c)** The map is conceptual and is used for illustritive purposes, not to define the boundaries or categories of the arroyos. I'll add that qualifyer to the map legend. The plan text states "Geographically, the AMP includes major arroyos on the East and West Mesas, undeveloped floodways, unnamed 100-year flood zones, including areas in the Extraterritorial Zone (ETZ), and largely native areas on the West Mesa escarpment." As noted above in #1, there are several arroyos listed as major arroyos in addition to the Alameda, Sandhill and Las Cruces, and this is stated in the plan text. I explained this when we met on October 15. **(d)** In addition, the LCMC Chapter 32 Design Standards has a definition of a major arroyo: any channel whose watershed exceeds 320 acres in a 100-year design storm, whether the watershed is in its natural or unaltered state or has been altered by development, runoff diversions, or detention facilities. If adhering to this definition, not all tributaries of any arroyo would be major; only the main stems. My suggestion to run the modeling at specific points on the main stems of the arroyos makes sense because it would cost less than modeling points along all of the tributaries, it serves the City's stated goal of protecting the major arroyos from development and it reduces the amount of arroyo land that would not be developed. **(e)** The City's funding and project priorities are determined by the Strategic Plan so if/when the plan is implemented will be decided upon by the City Council.
2. Policy 1.3 will attempt to "[i]dentify critical ecological areas and contiguous open spaces and protect them from development." However, there is no criteria included for this identification process, nor is there any indication whether or not these areas will be inside or outside the actual arroyos.	Another individual pointed this out as well, and the policy will be revised.

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3. Policy 1.4 will attempt to "[d]evelop public/private partnerships to develop funding strategies for acquisition and maintenance of arroyo systems." We wonder what experience the City has in developing these kinds of partnerships. How much funding will be needed to implement this policy? Is the success of the AMP dependent on this funding? Might it be a good idea to obtain some commitments toward this funding prior to passage of the AMP?	The intent of the policy is to develop strategies to identify and secure funding. Combining resources toward the same goal is more beneficial than two entities working toward the same goal in isolation. These types of partnerships occur all the time and it isn't unreasonable for the City to plan projects with other entities that carry out the goals of all the partners.
4. You indicated that you would delete the reference in Policy 1.5 to "cluster development." We believe that's a good idea.	Done
5. Policy 1.6 recommends requiring concept plans and master plans to include a level of drainage study that is premature for such an early stage in the development approval process.	An outline doesn't imply a complete drainage study, it is a general description giving the essential features of something but not the detail.
6. Policy 1.7 includes requirements for "pedestrian, bicycle and equestrian connections between arroyos, thoroughfares and existing developments" that appear far beyond the scope of an AMP.	There are proposed trails on many new development proposals, so it's not a stretch to ask developers to give some thought to what kinds of amenities they would like to provide for the neighborhoods they are creating, whether or not those neighborhoods take in sections of arroyos. Trails that actually connect to to something, such as a school, park or street, would be seen as a plus for many people looking to buy a home.
7. Policy 1.8 refers to incorporating LID and green infrastructure that we have found the City's Public Works Department reluctant to approve.	The policy will be revised to address your concern.
8. Policy 4.1 is vague with respect to how it might restrict developments that "are adjacent to" arroyos and how development can proceed if "natural characteristics of the terrain (such as vegetation and contours) are retained." Very often natural contours are incompatible with road and utility design.	You're right, streets and utilities are an important consideration and it's understandable that one would want to plan these as efficiently as possible. Not all developments can be like Las Alteras or Talavera, nor would we want them to be. But there are advantages to planning neighborhoods from time to time that are not completely flat but have some dimension and follow the contours of the land in carefully chosen areas.

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9. Policy 5.1—"[i]ncrease valuable desert riparian habitat"—seems overly ambitious. Who will be responsible for "ecosystem restoration"?	This policy will be revised, as its intent is to support protecting arroyos in their natural state, and in that regard, the arroyo itself is an ecosystem.
10. Policy 6.3 seeks to promote street alignments that are not economically feasible.	These are only examples of ways an arroyo could be a neighborhood amenity and there are probably many others. The policy doesn't make specific street alignments a requirement.
11. Policy 6.4 should differentiate between historical and developed flows.	Policy 6.4 has been deleted for the October 28 revision.
12. Policy 9.3—"[p]rovide aesthetically pleasing solutions to stormwater management"—injects too much subjectivity into the process.	This policy will be revised to more accurately reflect the goal, which is to maintain the natural character of the arroyo. This could be through any number of naturalistic treatments.
13. The funding initiatives in Policy 9.6 seem to be beyond the scope of an AMP.	Stormwater runoff end up in the arroyos, so a primary purpose of the plan is to improve flood control and drainage functions of the arroyos which improves stormwater management overall. These funding mechanisms have been used successfully throughout the country to fund stormwater management programs.
14. Policy 10.1 refers to a "monitoring program" that is overly vague.	You're right. The entire plan is intended to encourage a more proactive approach by looking at stormwater management from the watershed level. The policy will be revised accordingly.
15. Most of the policies included under Goal 10 are included in existing ordinances. There is no need for redundancy.	Some of the policies under Goal 10 were removed in the September 21 revision. I will continue to remove redundancies for the October 28 revision.

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This is not an all-inclusive list of our concerns, but it should give you a good idea of our objections to moving forward with the AMP at this time. Clearly, as we have stated to you several times, our major objections revolve around the issue of uncertainty. Which parts of which arroyos will be covered by the AMP and the regulations and ordinances that might be outgrowths of the AMP? Property owners should be able to know if a plan with such a potentially broad impact as the AMP actually will affect them or not; as of now, they don't. How will the AMP and the regulations and ordinances that might be outgrowths of it affect the rights of a property owner to develop his land? At this week's meeting, you indicated that you might delete references to the requirement for "buffers," but it would still be unclear if private property outside the 100-year flood plain might be "taken" as the goals and policies of the AMP are implemented. What will be the economic impact on private property owners? We can all agree that, while no one knows the answer to that question, the impact will almost certainly be a negative one that will inevitably be passed along to consumers. With the NAHB having recently released a study showing that every $1,000 in housing costs caused by regulations or taxes will lead to 130 families being priced out of the housing market in Las Cruces, we don't know how many families will be priced out of the housing market in the City, but we do know that there will be a considerable number. And what will be the economic impact on the City government? How will the mapping of arroyos be paid for? And what about the costs of "management" of the increased systems, the costs of increased maintenance of new City facilities, and the costs of additional administrative personnel? It seems to us that the choices will be to increase taxes or to decrease funding of other programs. Such sources as "public/private partnerships" are vague hopes, at best. Does it really make sense to approve a plan with such potentially wide-ranging implications but with these basic questions unanswered? At the very least, we recommend that the AMP be limited in scope to cover public lands that might be gradually released for development in the future, rather than deciding now to include private property in the plan without clear knowledge of the impact of the plan on that property.	Community Development staff truly appreciates the time and attention the development community has given to reviewing the Arroyo Management Plan. The October 28 revision will further distinguish between what would affect public lands and what would affect privately-owned undeveloped land since this continues to be a sticking point. Maybe this is the point in time we say, "The plan is at a point where the development community and staff are agreeing to disagree." City Council has asked that policy be developed to address the treatment of arroyos in undeveloped areas. The plan makes those policy statements and lays out expectations for development containing or adjacent to arroyos. If the plan is adopted, and as developers choose to undertake projects, they will need to factor in the policies as part of their due diligence. There has been previous discussion addressing the point at which plan policies would affect decisions. If the plan is adopted, it is guiding policy, not regulation. Developers would continue to adhere to the Development Code (Chapters 30-39 of the Las Cruces Municipal Code) until it is amended to include those standards that would implement the policies in the plan. There is never a clear time frame for code amendments, since funding, staffing, Council priorities and public engagement are all factors in the process. It should be noted that developers and all other stakeholders will be invited to participate in the process for the development of any arroyo delineation and any arroyo protection standards.

Bureau of Land Management (BLM)
Jessica Knopic E-mail 10-16-14

COMMENT	RESPONSE
pg 30. "The New Mexico Office of the State Engineer Dam Safety Bureau requires dam owners to prepare Emergency Action Plan for these Dams." - Currently OSE does not require EAP for non-Significant Hazard Dams. Some dams on the list in the ETZ are currently classified as non-Significant Hazard Dams. - The Hazard class will change if development is allowed below the dam.	Plan revision will reflect this.
pg 72 "Goal 9 9.4 Replace vegetation in all areas that are disturbed during construction, in accordance to NPDES 9.4. This includes a well-established mixture of shrubs or trees, native grasses, forbs, and other ground cover to help reduce sediment movement." - Shrubs and trees are not recommended on or in the area of dams, flow channels or certain other water structures.	Plan revision will reflect this.
The plan is all based around defining the flood area of a design storm event. This will be fairly expensive and an agreeable method and process will have to be accepted. This should be closely done with the guidance of the owners of the aged infrastructure in the arroyos. Is the boundary to be identified with the aging dam structures as they currently exist or during a breach of the structure during there design storm event?	The City will only be addressing dam upgrades or repairs for the dams it owns, the Las Cruces, Villa Mora and Sandhill. As the plan points out, the City has limited control over the fate of the other dams. Idenifying boundaries or specific areas to be investigated will be up to the individual dam owners.

New Mexico State Land Office
Comments by Ray Matthew, Urban and Regional Planner
Email 10/08/14

COMMENT	NOTES/RESPONSE
Thanks for the opportunity to comment on the 9/21/14 draft Arroyo Management Plan. It is a well written plan addressing issues that are relevant for Las Cruces current and future development. The State Land Office has only three additional comments from the previous draft.	
SLO supports the ideas of using density gradients rather than Transferable Development Rights (TDRs). The density gradients can accomplish the same objective as TDRs (preserving land development potential for property owners by density transfer) but would be easier to use by property owners or developers in site plan design.	Reference to TDRs has been removed. Others have commented that TDRs aren't really practical here since there is so much land and density isn't an issue. The concept of a density gradient is very similar to the transect system, which is discussed in illustrations. The text has been revised to include density gradients.
The SLO supports the use of design standards recommended in the plan to preserve the function and character of arroyos/floodplains and buffered areas.	
The SLO does not support fee simple transfer of ownership of State Trust Lands for these purposes but rather the purchase of easements. This can also be advantageous to CLC; if waterways change, easements areas can be moved or re-delineated.	
Text has been added which recognize there are policy implications in the recommendations of the plan. At this point they haven't delineated what the implications are; for example, the CLC fiscal impact from obtaining conveyances of floodplain/buffers and impact of property with the intent to develop whose land is being conveyed.	This is true; there have been no studies done to examine the costs to the City for plan implementation. Dedicating arroyos to the City would have to be worked out in the agreements with the State Land Office or the Bureau of Land Management. Maintenance costs would also have to be factored in.
in the previous version they mentioned easements or purchases of row, the language has been changed to conveyance of SLO arroyo/floodplain/buffer areas to CLC.	
Transferable Development Rights(TDRs) language for environmentally sensitive areas has been dropped, instead the plan calls for use of density gradients with more dense development in areas further from the arroyo/buffer and on flatter land. The areas closer to the arroyo/buffered areas or more varied elevations would have less dense development. The west mesa escarpment area is an area where there is a lot of shifts in grade and elevation. The density gradient approach accomplishes the same thing as TDRs in moving dense development away from sensitive areas but can be easier to implement by both CLC and developers.	

New Mexico State Land Office
Comments by Ray Matthew, Urban and Regional Planner
Email 10/08/14

The CLC Planning and Zoning Commission is scheduled to review the draft on Oct. 28. Any Council action at earliest would be in November. Given the environmental constraints with any arroyo/floodplain commercial development generally is not feasible. I haven't been to this area years but I think the view sheds and proximity to prime natural resource areas like Organ National monument would make a development like Mesa Del Sol and attractive option. The Plan does reference Mesa Del Sol as a preferred design option for development in areas with arroyos. At this point we do not know the size of buffered areas. SFCC District uses 50 feet. It's quite possible a range of 50 -100 feet could be accommodated without any loss of development potential by the site plan design recommendations.

Elephant Butte Irrigation District
Dr. Phil King Zach Lubbin email 10/10/14

Submitted by
Zack Libbin, District Engineer, Elephant Butte Irrigation District
J. Phillip King, P.E., Ph.D., Professor of Civil Engineering, NMSU & Consultant to EBID

The comments presented here are the opinions of the authors, Zack Libbin and Phil King, and do not represent the position of either EBID or NMSU. These comments are based on the September 21 2014 draft revision of the Arroyo Management Plan.

The plan as presented is quite general and aspirational in nature. It recognizes the extreme variation in conditions among arroyo systems, and within a given arroyo system. As the policies and BMPs proposed are so general and do not apply universally, specific strategies for development along arroyos will need to be crafted for the specific conditions along each arroyo. The plan proposes this type of future work for specific arroyos, and that is where the real policies and decisions will be made. The over-arching goals presented in this plan are certainly worthwhile, but of course the devil is in the details, and as more detailed plans are developed for each arroyo system, engineering expertise specific to the tasks at hand will need to be employed.

We also note that the City's boundaries contain very few complete arroyo watersheds. One of the failures of storm water drainage planning and infrastructure development in the area has been that institutional boundaries have prevented coherent drainage master planning, and any new arroyo management plan should provide a framework whereby this shortcoming can be addressed. The East Mesa arroyos in question generally arise east of City limits and some of the area is now has National Monument status. The arroyos cross the alluvial fan, then drop into the valley floor. At this point, they are often channelized or dropped into EBID conveyance or drainage facilities for conveyance to the Rio Grande. Management and policy must look at the arroyos on both mesas at a watershed scale, from headwaters to the discharge point in the Rio Grande. An illustrative example of the short-sightedness of ignoring institutional boundaries on an arroyo system occurred in 2008, when the remnants of Hurricane Dolly brought heavy rains to the region. The Las Cruces Dam functioned as designed, releasing water through its primary spillway into the outfall channel that conveys storm water about five miles to the Rio Grande. The release was well within the capacity of the outfall channel, but the channel overtopped around Mayfield High School nonetheless. While the channel was well-maintained for the five mile run through the City, the last 300 feet, between the river levee and the channel of the Rio Grande was completely choked with vegetation, backing up the water in the outfall channel and producing the flooding. The City expected the International Boundary and Water Commission (IBWC) to clean it, and the IBWC expected the City to clean it. The lack of coordination resulted in flooding that was completely preventable. This plan aspires to take a holistic approach to arroyo management, which we wholeheartedly support, but the approach must view the arroyo from the top of the watershed to the discharge at the Rio Grande, or it is continuing the mistakes of the past.

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We note that much of the development that has already taken place on the mesas, both within and outside City limits, will present much bigger arroyo management challenges than future development. Perhaps this is a suitable topic for a separate study.

We are both engineers, and we emphasize that engineering is a creative and flexible act. While we can use hydrologic and hydraulic data and analyses to design systems "for flood control, utilities, storm water conveyance, and water storage are important factors for all development," engineering also extends to using the agronomic characteristics of vegetation, sediment properties and transport processes, and aesthetic values to create storm water management systems that meet diverse objectives. Engineered is not a bad word. "Naturalistic" seems to be a euphemism for engineered with diverse objectives. It is also critical that the legitimate need for flood control is not neglected or demonized because development has already taken place without proper planning, and will continue to take place with or without proper planning.

Elephant Butte Irrigation District
Dr. Phil King Zach Lubbin email 10/10/14

Some of our specific comments are:	NOTES/RESPONSE
Page 2: Add bullet: Encourage responsible and profitable development with design standards, incentives, and BMPs to encourage arroyo buffers and linear parks.	Abbreviated version added: Encourage responsible and profitable development
Page 6, first paragraph: "During the first half of the 20th century, Las Cruces was a small community and was situated in the mostly flat valley floor and stormwater runoff was easily contained on site." Storm water was intended to be stored on site, but capacity overload was common, resulting in frequent damage to property.	Revised
Page 6, paragraph 3: The reason that the dams and open ditches were inadequate is that the dams were not designed for high hazard duty, and the open ditches are primarily agricultural drains designed for water table control, not high storm water flows.	Revised
Page 7, third full paragraph: EBID remains very concerned that the discharge of urban runoff into its agricultural drains may put the District's agricultural exemption from NPDES permitting at risk.	Noted in Ch. 4
Page 17: A useful description of the City's setting is that it is flanked on the east by the Organ Mountains, and on the north, south, and west by agriculture.	Revised
Chapter 3 could also be improved with a description of the area's agriculture, which is key to its economy, culture, and hydrology.	Noted
Also in Chapter 3: Many of the larger arroyo systems on the East Mesa were dammed because they were the source of damaging flooding and sediment deposition on the valley floor where the agriculture and older development sits. The West Mesa continues along the valley much further south than the East Mesa with few flood protection structures. The West Mesa affords much greater opportunity for natural flood protection without dams if development is planned properly. These unprotected arroyos are very dynamic in nature and will prove difficult to avoid having to engineer solutions unless development is planned to avoid the need to control the numerous arroyos. While this area is largely outside of the City, we need to maintain a watershed-based perspective.	Revised
Chapter 3, page 26, re Vegetation: The vegetation on the alluvial fans is really not riparian. An arroyo is technically an ephemeral stream, but the vegetation along the banks on the alluvial fan is basically upland desert vegetation. It does serve an important function in arroyo bank stabilization, and can have major effects on the nature of channel course development and avulsive events.	Revised
Chapter 3, Flood control dams: As areas downstream of these structures became urbanized, the hazards and required protection of the structures changes without upgrades or rehabilitation of the structures themselves. This phenomenon is known to dam owners as "hazard creep." Hazard creep indicates a lack of public awareness of the flooding issues that once plagued the arroyos and valleys before these structures were built. Some dams were built at the request of residents and were designed to protect those residents, but most were built with a lower hazard in mind and present a potential risk to those who have developed below them since their installation.	This text is used in Chapters 3 & 4
Page 29: "... resulting in a normally dry reservoir area." These dams are currently required by state law) to drain their impounded water within 96 hours from the end of the storm. These dams represent the potential for wetlands and habitat where wetlands never existed before, but such repurposing could have impacts on the flood control function of the dams.	This text is used in Chapters 3 & 4

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Elephant Butte Irrigation District
Dr. Phil King Zach Lubbin email 10/10/14

Page 33: Describe the problems associated with returning arroyo water to the river, unless channelized like the Las Cruces Arroyo, because of the IBWC levees. The levees are intended to keep flows from leaving the river canalization project into the surrounding land without much regard for the arroyos and watersheds that may need to reach the river in times of flooding flowing the other direction. EBIDs drain and canal system also flows mostly north to south, creating multiple impediments to arroyos and channels reaching the river. These drains and canals were not designed for storm flows, and were certainly not designed for the increases in storm flow runoff associated with recent development.	Noted in Ch 4
Page 40: Discussion suggests buffer requirements are clearly not enforceable. Why would a developer sacrifice developable land? We need to create incentives.	Revised
Page 76, Goal 2: Include a statement that development, zoning, and land status should not impede flood control dam maintenance or operations.	Revised
In Goal 2 action, note that all non-federal dam owners outside of city limits participate in the South-Central New Mexico Storm Water Management Coalition. City of Las Cruces involvement in SCNM Storm water coalition would improve area communication and could be an action item. This would support watershed-level planning for arroyo management.	Revised

EMail Responses
6/24/14 - Present

COMMENT	NOTES/RESPONSE
Roseann Thompson email 6/26/14 Just wanted to thank you for all the hard work that has gone into this. I was very, very glad to see equestrian activities taken into account.	Thank you!
Conrad Keyes Jr. email 6/27/14 I really think that the NM State Engineers Office will be controlling many of the arroyos in Dona Ana County, which Las Cruces seems to be located within. Those old dams need to be resolved with BLM, NRCS, and the sponsoring agencies before the Real Updates are to be known; but a Plan with adequate Updating Capability is worthy of the development at this time.	The plan policies make it clear that the City of Las Cruces can only address problems with the Las Cruces, Villa Mora and Sandhill Dams, and would participate in regional efforts for better flood control.
John Kutney email 7-14-14 Item 1.4 – it would be more prudent to develop a more detailed definition of what constitutes a "critical ecological area" to protect the rights of private property and individual access. There has been reported evidence of governmental overreach in many areas of the USA including New Mexico.	Thank you for pointing this out. As it turns out, the United Nations developed a specific term, "ecologically critical area," to mean an environmental protection zone in Bangladesh where ecosystems are considered to be threatened to reach a critical state. Obviously the wrong continent. The One Valley One Vision 2040 regional plan describes critical and sensitive environments as land that "generally should be conserved in its natural state (e.g., surface water, floodplains, wetlands, arroyos, steep slopes, protected wilderness, wildlife habitat, tree stands, and cultural areas) in a manner that reasonably compensates, provides incentives, maintains similar existing property rights, or balances the public and property owner interests." I will change the wording in the plan.
Item 1.12 "Non-motorized transportation connections" should be detailed; this could be nothing more than sidewalks which are noticeably missing in many developed areas of LC and the County. In fact, I have seen wheel chair access curbs being placed in areas where there are no sidewalks. These transportation paths should be part of the original development costs and not the tax burden of existing citizens.	This was ambiguous for other readers, too. The policy has been revised as 1.7 and reads: In new development proposals include intended pedestrian, bicycle and equestrian connections between arroyos, thoroughfares and existing developments.
Item 6.3 – this should be restricted to open space and should not include buildings or non- related open space considerations such as libraries, museums etc.	[Policy 6.3 text reads: 6.3. Design neighborhoods and subdivisions to promote arroyos as neighborhood amenities.] Yes, examples of this would be open space corridors, linear parks, trails, etc., not public institutions that would require infrastructure.

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Item 7.1 - 25 feet seems rather small, I wouldn't want people traffic that close to a residence for easy access and digress (criminal). Don't have a suggested minimum but this should be definitely agreed upon by the affected residents.	25 feet was only used as an example. Other people have also commented that this distance wouldn't be adequate for separation between private property and a trail. Specific distances were deleted in the revision.
Items 8.2 & 8.3- use of flashers and push button signals seems to defeat the purpose of nature trails. This should be considered if and only if there have been complaints by users of such trails for safety or traffic congestion purposes. Posting reduced speed limits for auto traffic (15mph in all conditions) should be satisfactory as an initial measure.	These signals would only be considered in the rare situation that an equestrian trail crosses a busy roadway. This wouldn't occur in a natural area. Even in more congested areas, the intent would be to the design the road crossing in such a way that horses could go under the road, not on it.

Jonah Ruybalid, CFM, MolzenCorbin email 8/18/14 Dumping of trash in arroyos is an issue. The City of Las Cruces has a transfer station on West Amador Avenue that is open 7 days a week. There are also County Collection centers including one at 9293 Del Rey Blvd as well as one in the Butterfield Community at 4925 Eason Lane. Maybe some advertising of these locations and their easy access for solid waste could help deter people from driving out to arroyos to dump.	Policy 6.7 addresses this issue by suggesting signage, education and greater enforcement.
How can the design standards be enforced? More experienced engineers may be better for permit and drainage study reviews, as they have more experience and can see problems that might get by the standard check list.	This is indeed a dilemma. Even City staff admit that enforcement needs to be strengthened. The problem has many variables: expedited plan review that results in hasty decisions; last minute changes in the field that don't follow the plan; staff shortages; political pressure; the rare situation in which standards are ignored; and Mother Nature herself, who has a blatant disregard for rules. Many of the policies in the plan call for stronger enforcement, and it will be up to each respective department to determine how to achieve this.
Expand BHI HEC HMS Model past the dams? HEC HMS is a great tool for hydrology, though it might not be the best as one large HEC HMS file, as it may assume a uniform storm over the entire area instead of a more localized storm which is more realistic. More research may need to be done, but the BHI model can be used to develop individual models for the major arroyos.	In the October 28 revision, there will be a better example of how the HEC-HMS and HEC-RAS models can be used upstream. Modeling will have to be carried our in specific areas, since it would be too expensive to model large areas, especially those that are not likely to be developed at all.

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Buffer Zones. Arroyos can be analyzed using HEC HMS to determine a buffer zone. HEC HMS can be used to determine a buffer zoned based on the 100 or 500 yr storm. The buffer zones can be based on depth or it can include everything that gets "wet." FEMA Flood Insurance Rate Maps can be used to help determine buffer zones, though they only include major arroyos and may not be mapped out far enough. The current effective flood maps became effective on September 27, 1991 and are due for update.	The plan revision describes the modeling process in more detail and explains how it can be used.
Erosion Control. Arroyos can be kept as natural as possible. If a development such as a subdivision is to be built and an arroyo runs through that subdivision, then the peak flows downstream should not be increased. If crossings are to be put in across the arroyo, a study should be done to ensure that this crossing does not change the direction of the arroyo or have negative effects downstream. Arches can be used to allow for the different flow lines to continue flowing the direction that they have always flowed, or culverts with erosion protection etc. Erosion control can be constructed in areas where head cutting is observed or is likely, such as on the outside of a curve in the flow path. Erosion control can also be used immediately downstream of a crossing where velocities are likely to be increase.	The plan revisions incorporates some of your suggestions.

John Moscato, Sierra Norte Land Holdings, LLC email 8/27/14 The Plan should apply only to public land (including public land that might be released for private development at a later date). Private land would continue to be subject to the drainage section of the City's Design Standards.	The revision makes it more clear which policies apply to public land and which ones apply to privately-owned land.
Alternatively, no "buffer" requirement/proposal pertaining to private land would extend beyond the limits of the 100-year FEMA flood zone. (Note: The 100-year FEMA flood zone includes far more land than just the arroyo bottom; it also includes the arroyo slopes and sometimes level land beyond the slopes. See, for example, The Pueblos, where development occurred right up to the boundary of the flood zone.)	Although there are designated flood zones, everyone knows that floods occur outside those zones. Arroyo modeling would identify areas in which the land is more susteptable to erosion and propose an added distance beyond the flood zone. This isn't a bad thing -- it provides additional protection from erosion. The plan points out that buffers are not the only method of providing additional flood protection. A developer would be free to choose a different strategy.
If neither of the suggestions above is included in the Plan, it would be important to include as background to the Plan an estimate of the cost to the City of the total payments to owners of private land for the "taking" of their land as a result of future implementation of the Plan.	

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The concept of negotiating higher density in return for buffers sounds a lot like "contract zoning," which is illegal in many jurisdictions.	Within the city limits, development proposals frequently request higher densities in return for a public benefit of some kind. This is one advantage of the Planned Unit Development -- development standards can be changed from those stated in the Zoning Code. It is not an uncommon practice here.
The Plan should apply only to the small number of major arroyos in and around the City and not to the lesser arroyos shown on the maps in drafts of the Plan.	The major arroyos include the Fillmore, a segment of the Sandhill Arroyo, the Alameda, Las Cruces, and Telbrook (not on the map) Arroyos, segments of the Little Dam Arroyo, and "unnamed major arroyos" as identified on the Major Arroyo Corridor Identification Map in the 1992 Storm Water Management Policy Plan.

Kimball Hakes, LCHBA, email 8/27/14 I concur with John's points. When we met with Robert Garza and Brian Denmark, they both seemed to think that the arroyo plan was intended only to apply to public lands that have not yet been made available for development. We would feel much better about the plan if this were the case. If not, then John's other points would be important for consideration. The Pueblos development is an excellent example of what can be done to develop areas adjacent to arroyos. This development is adjacent to the FEMA flood zone and yet provides an attractive residential layout that preserves the arroyo. I hope the new plan will permit similar developments.	The October 28 revision further clarifies what would apply to public lands and what would apply to privately-owned lands.

Dale Schueller, Schueller Homes, email 10/13/14 In my view the city could/should demonstrate a willingness to provide buffer acquired either from state, BLM or other governmental sources. By this I mean PAY for those lands that are determined to be of public benefit without impacting a developer's usable land base. I also mean to infer that the city would intercede on lands that are asked to be incorporated within the city, annexed, by using its municipal powers to request these properties be directly transferred to CLC holdings, for public benefit. This provides a clear direction for the city to go in and clear understanding of what remains for the developer to develop. Without this type of language it is literally a crap shoot on what will remain in various sections of land for actual development.	The plan revision clarifies that any necessary buffer areas be part of an agreement between the City and the state land office or BLM in which the agreed upon buffer area would be conveyed to the City prior to the adjacent land being released for development. The result would be developers wouldn't pay for land that may not be developable.

Emails received

Carol McCall

From: Roseann Thompson <rethomps@ad.nmsu.edu>
Sent: Friday, June 27, 2014 3:36 PM
To: Carol McCall
Cc: Ken Miyagishima
Subject: RE: Arroyo Plan Status

Hi Carol –

Just wanted to thank you for all the hard work that has gone into this. I was very, very glad to see equestrian activities taken into account.

Roseann Thompson

From: Carol McCall [mailto:CarolM@las-cruces.org]
Sent: Friday, June 27, 2014 2:24 PM
Subject: Arroyo Plan Status

On Tuesday night, the Planning & Zoning Commission voted to postpone their recommendation to the City Council regarding adoption of the Arroyo Management Plan. Everyone agreed the planning process would benefit from further input by the public and stakeholder groups. I will be scheduling meetings for mid-July and will send out another announcement to let you know when and where they will be held.

In the meantime, I encourage you to get acquainted with the City's new public opinion tool, MindMixer, which allows you to comment, ask questions, respond to comments by others and post pictures. You can log on using your Facebook account, if you have one, or simply sign up and post directly to MindMixer. The City will frequently be posting questions regarding City services, so it will be a good way to register your opinion on a variety of topics in the coming months. Please go to http://lascruces.mindmixer.com/ to get started. MindMixer is a fun, interactive way to give us your opinions and read those of others in the community. The first question posted is *"What is your biggest concern regarding managing the arroyos in and around Las Cruces?*

Thank you again for your interest in the City's Arroyo Management Plan!

Carol McCall, AICP
Planner, Community Development Dept
City of Las Cruces
700 N Main Street
Las Cruces NM 88001
575.528.3209
575.528.3155 fax
cmccall@las-cruces.org

What is MindMixer? An online way to engage our citizens and solicit feedback on current City of Las Cruces projects. Suggest ideas and leave your comments. Posts will be reviewed by stakeholders to help guide decision-making on a variety of issues. Go to: ***Engage Las Cruces.*** Share your ideas. Be heard. Build a better community.

From: Conrad Keyes [mailto:cgkeyesjr@q.com]
Sent: Friday, June 27, 2014 2:40 PM
To: Carol McCall; Amy SPA Louise
Subject: Re: Arroyo Plan Status

Carol - Thanks, it seems to be the correct action at this time.

I really think that the NM State Engineers Office will be controlling many of the arroyos in Dona Ana County, which Las Cruces seems to be located within. Those old dams need to be resolved with BLM, NRCS, and the Sponsoring agencies before the Real Updates are to be known; but a Plan with adequate Updating Capability is worthy of the development at this time.

Conrad Keyes Jr., 801 Raleigh Road, Las Cruces, NM, 88005, 575-523-7233

Sent: Friday, June 27, 2014 2:23:35 PM
Subject: Arroyo Plan Status

On Tuesday night, the Planning & Zoning Commission voted to postpone their recommendation to the City Council regarding adoption of the Arroyo Management Plan. Everyone agreed the planning process would benefit from further input by the public and stakeholder groups. I will be scheduling meetings for mid-July and will send out another announcement to let you know when and where they will be held.

In the meantime, I encourage you to get acquainted with the City's new public opinion tool, MindMixer, which allows you to comment, ask questions, respond to comments by others and post pictures. You can log on using your Facebook account, if you have one, or simply sign up and post directly to MindMixer. The City will frequently be posting questions regarding City services, so it will be a good way to register your opinion on a variety of topics in the coming months. Please go to http://lascruces.mindmixer.com/ to get started. MindMixer is a fun, interactive way to give us your opinions and read those of others in the community. The first question posted is *"What is your biggest concern regarding managing the arroyos in and around Las Cruces?*

Thank you again for your interest in the City's Arroyo Management Plan!

Carol McCall, AICP
Planner, Community Development Dept
City of Las Cruces
700 N Main Street
Las Cruces NM 88001

Carol McCall

From: john kutney <john.kutney@hotmail.com>
Sent: Monday, July 14, 2014 1:49 PM
To: Carol McCall
Subject: Arroyo Mgmt Plan

Received a note in mail about the Arroyo Management Plan Public Input Meeting. I will not be able to attend the meeting but have included a few comments about the Plan.

First of all it is a very through and well written plan, kudos to all involved.
I have some comments about the goals included in the report as follows:

Starting on Page 62

Goal 1:

Item 1.4 – it would be more prudent to develop a more detailed definition of what constitutes a "critical ecological area" to protect the rights of private property and individual access. There has been reported evidence of governmental overreach in many areas of the USA including New Mexico.

Item 1.12 "Non-motorized transportation connections" should be detailed; this could be nothing more than sidewalks which are noticeably missing in many developed areas of LC and the County. In fact, I have seen wheel chair access curbs being placed in areas where there are no sidewalks. These transportation paths should be part of the original development costs and not the tax burden of existing citizens.

Goal 6:

Item 6.3 – this should be restricted to open space and should not include buildings or non- related open space considerations such as libraries, museums etc.

Goal 7:

Item 7.1 - 25 feet seems rather small, I wouldn't want people traffic that close to a residence for easy access and digress (criminal). Don't have a suggested minimum but this should be definitely agreed upon by the affected residents.

Goal 8:

Items 8.2 & 8.3- use of flashers and push button signals seems to defeat the purpose of nature trails. This should be considered if and only if there have been complaints by users of such trails for safety or traffic congestion

purposes. Posting reduced speed limits for auto traffic (15mph in all conditions) should be satisfactory as an initial measure.

Thanks you for your consideration and asking for public input.

John Kutney
5613 Mira Montes
Las Cruces, NM

Carol McCall

From: Jonah Ruybalid <jruybalid@molzencorbin.com>
Sent: Monday, August 18, 2014 11:48 AM
To: Carol McCall
Cc: Jerry Paz
Subject: RE: Arroyo Management Plan
Attachments: AMP Policy comments.xlsx

Good morning Carol,

I have attached some comments on the Arroyo Management Plan Policies. I also have some comments in regards to some questions or topics brought up at the last public meeting.

- Dumping of trash in arroyos is an issue
  The City of Las Cruces has a transfer station on West Amador Avenue that is open 7 days a week. There are also County Collection centers including one at 9293 Del Rey Blvd as well as one in the Butterfield Community at 4925 Eason Lane. Maybe some advertising of these locations and their easy access for solid waste could help deter people from driving out to arroyos to dump.
- How can the design standards be enforced?
  More experienced engineers may be better for permit and drainage study reviews, as they have more experience and can see problems that might get by the standard check list.
- Expand BHI HEC HMS Model past the dams?
  HEC HMS is a great tool for hydrology, though it might not be the best as one large HEC HMS file, as it may assume a uniform storm over the entire area instead of a more localized storm which is more realistic. More research may need to be done, but the BHI model can be used to develop individual models for the major arroyos.
- Buffer Zones
  Arroyos can be analyzed using HEC HMS to determine a buffer zone. HEC HMS can be used to determine a buffer zoned based on the 100 or 500 yr storm. The buffer zones can be based on depth or it can include everything that gets "wet." FEMA Flood Insurance Rate Maps can be used to help determine buffer zones, though they only include major arroyos and may not be mapped out far enough. The current effective flood maps became effective on September 27, 1991 and are due for update.
- Erosion Control
  Arroyos can be kept as natural as possible. If a development such as a subdivision is to be built and an arroyo runs through that subdivision, then the peak flows downstream should not be increased. If crossings are to be put in across the arroyo, a study should be done to ensure that this crossing does not change the direction of the arroyo or have negative effects downstream. Arches can be used to allow for the different flow lines to continue flowing the direction that they have always flowed, or culverts with erosion protection etc. Erosion control can be constructed in areas where head cutting is observed or is likely, such as on the outside of a curve in the flow path. Erosion control can also be used immediately downstream of a crossing where velocities are likely to be increase.

I hope this helps, please let me know if you have any questions.

MOLZENCORBIN

Jonah Ruybalid CFM

Carol McCall

From: John Moscato <info@brightviewland.com>
Sent: Wednesday, August 27, 2014 6:33 AM
To: Carol McCall
Cc: Kimball Hakes; Steve Chavira
Subject: Re: Notes from meeting 7/31/14

Hi Carol,

Here are some suggestions/observations:

1. The Plan should apply only to public land (including public land that might be released for private development at a later date). Private land would continue to be subject to the drainage section of the City's Design Standards.

2. Alternatively, no "buffer" requirement/proposal pertaining to private land would extend beyond the limits of the 100-year FEMA flood zone. (Note: The 100-year FEMA flood zone includes far more land than just the arroyo bottom; it also includes the arroyo slopes and sometimes level land beyond the slopes. See, for example, The Pueblos, where development occurred right up to the boundary of the flood zone.)

3. If neither of the suggestions above is included in the Plan, it would be important to include as background to the Plan an estimate of the cost to the City of the total payments to owners of private land for the "taking" of their land as a result of future implementation of the Plan.

4. The concept of negotiating higher density in return for buffers sounds a lot like "contract zoning," which is illegal in many jurisdictions.

5. The Plan should apply only to the small number of major arroyos in and around the City and not to the lesser arroyos shown on the maps in drafts of the Plan.

John Moscato
Sierra Norte Land Holdings, LLC
3590 W. Picacho Avenue
Las Cruces, NM 88007
575-496-7115

From: Carol McCall <CarolM@las-cruces.org>
Date: Monday, August 25, 2014 at 12:46 PM
To: "'jruybalid@molzencorbin.com'" <jruybalid@molzencorbin.com>, "'hilary@marroninc.com'" <hilary@marroninc.com>, John Moscato <info@brightviewland.com>, "'aherrera@team-psc.com'" <aherrera@team-psc.com>, "'jhernandez@team-psc.com'" <jhernandez@team-psc.com>, "'paulp@qwestoffice.net'" <paulp@qwestoffice.net>, "'steve@lchba.com'" <steve@lchba.com>, "'aguerra@bhinc.com'" <aguerra@bhinc.com>, "'brigitte.fuller@wilsonco.com'" <brigitte.fuller@wilsonco.com>, "'ebinns@zianet.com'" <ebinns@zianet.com>, Rocio Dominguez <rdominguez@las-cruces.org>, Srijana Basnyat <sbasnyat@las-cruces.org>, Carol McCall <CarolM@las-cruces.org>, Natashia Billy <nbilly@las-cruces.org>, Peter Bennett <pbennett@las-cruces.org>, Koting Lee <klee@las-cruces.org>
Subject: Notes from meeting 7/31/14

Hello, Everyone – attached please find a draft of our discussion on July 31 at the LCHBA offices. I know it's been awhile, but if you remember details from the meeting, please add them to what is here. There are a few

Carol McCall

From: Kimball Hakes <kimball@hakesbrothers.com>
Sent: Wednesday, August 27, 2014 8:52 AM
To: John Moscato
Cc: Carol McCall; Steve Chavira
Subject: Re: Notes from meeting 7/31/14

Hi Carol, I concur with John's points. When we met with Robert Garza and Brian Denmark, they both seemed to think that the arroyo plan was intended only to apply to public lands that have not yet been made available for development. We would feel much better about the plan if this were the case. If not, then John's other points would be important for consideration.

The Pueblos development is an excellent example of what can be done to develop areas adjacent to arroyos. This development is adjacent to the FEMA flood zone and yet provides an attractive residential layout that preserves the arroyo. I hope the new plan will permit similar developments.

Thanks for all you do.

Kimball

On Wednesday, August 27, 2014, John Moscato <info@brightviewland.com> wrote:

Hi Carol,

Here are some suggestions/observations:

1. The Plan should apply only to public land (including public land that might be released for private development at a later date). Private land would continue to be subject to the drainage section of the City's Design Standards.

2. Alternatively, no "buffer" requirement/proposal pertaining to private land would extend beyond the limits of the 100-year FEMA flood zone. (Note: The 100-year FEMA flood zone includes far more land than just the arroyo bottom; it also includes the arroyo slopes and sometimes level land beyond the slopes. See, for example, The Pueblos, where development occurred right up to the boundary of the flood zone.)

3. If neither of the suggestions above is included in the Plan, it would be important to include as background to the Plan an estimate of the cost to the City of the total payments to owners of private land for the "taking" of their land as a result of future implementation of the Plan.

4. The concept of negotiating higher density in return for buffers sounds a lot like "contract zoning," which is illegal in many jurisdictions.

5. The Plan should apply only to the small number of major arroyos in and around the City and not to the lesser arroyos shown on the maps in drafts of the Plan.

John Moscato
Sierra Norte Land Holdings, LLC
3590 W. Picacho Avenue
Las Cruces, NM 88007
575-496-7115

Carol McCall

From: John Moscato <info@brightviewland.com>
Sent: Thursday, October 09, 2014 8:53 AM
To: Carol McCall
Cc: Kimball Hakes; Steve Chavira; JASON CLARK; 'MIKE GRAY'; Oscar@spiritviewhomes.net; 'ROBIN HARDER'; 'BEN RAWSON'; 'MAX BOWER'; ebinns@zianet.com; davebinns@msn.com; Dale Schueller
Subject: Arroyo plan

Carol,

Members of the LCHBA Government Affairs Committee would like to meet with you next week to discuss the latest AMP revision. Are you available to meet with us on Tuesday, October 14, at 2:30 at the LCHBA building?

Below is a brief summary of some of our concerns:

1. In a recent meeting with Robert Garza and Brian Denmark, Robert indicated that he believed that the original scope of the plan was limited to major arroyos within public lands. That scope has now widened considerably.

2. In previous meetings, we have asked for some indication of the cost to the City and to private landowners of implementation of the goals and policies set forth in the plan. Quite simply, if the plan is impractical from a cost standpoint, we question why the plan is being proposed.

3. Many of the policies included in Goals 6 and 10 have the potential of placing unreasonable burdens on development and indicate a misunderstanding of current standards that development must meet.

We look forward to discussing these and other items with you.

Thank you.

John Moscato
Sierra Norte Land Holdings, LLC
3590 W. Picacho Avenue
Las Cruces, NM 88007
575-496-7115

Carol McCall

From: Knopic, Jessica <jknopic@blm.gov>
Sent: Thursday, October 16, 2014 10:04 AM
To: Carol McCall
Subject: Re: CLC Arroyo Plan Webpage

Comments

pg 30. The New Mexico Office of the State Engineer Dam Safety Bureau requires dam owners to prepare Emergency Action Plan for these Dams.
- Currently OSE does not require EAP for non- Significant Hazard Dams. Some dams on the list in the ETZ are currently classified as non-Significant Hazard Dams.
- The Hazard class will change if development is allowed below the dam.

pg 72 Goal 9 9.4 Replace vegetation in all areas that are disturbed during construction, in accordance to NPDES 9.4. This includes a well-established mixture of shrubs or trees, native grasses, forbs, and other ground cover to help reduce sediment movement.
- Shrubs and trees are not recommended on or in the area of dams, flow channels or certain other water structures.

The plan is all based around defining the flood area of a design storm event. This will be fairly expensive and an agreeable method and process will have to be accepted. This should be closely done with the guidance of the OSE and owners of the aged infrastructure in the arroyos. Is the boundary to be identified with the aging dam structures as they currently exist or during a breach of the structure during there design storm event?

Thanks
Jessica Knopic
BLM
525-4346

On Fri, Oct 3, 2014 at 10:42 AM, Carol McCall <CarolM@las-cruces.org> wrote:

Hello – I have made some additions to the Arroyo Management Plan webpage. I've added the revised maps and Appendices 2 & 3. By Monday, I hope to have the compilation of stakeholder input since 6/24/14 that includes responses by staff and answers to questions raised during the input process. The page is at **www.las-cruces.org/protectarroyos**

If you would like to make comments on the plan, please do so as soon as possible. I am scheduled to present the plan to the Planning and Zoning Commission for consideration at their public hearing October 28, 2014. I will make another revision prior to that time and post it on the website approximately October 17. Any comments I receive prior to that time will be incorporated into the revision. This includes suggested changes to the maps and appendices.

I would be glad to meet with you to discuss the plan revisions if requested.

Carol McCall

To: Carol McCall
Subject: RE: Las Cruces Arroyo Management Plan

From: Matthew, Ray [mailto:rmatthew@slo.state.nm.us]
Sent: Wednesday, October 08, 2014 10:16 AM
To: Carol McCall
Cc: Johnson, Craig
Subject: FW: Las Cruces Arroyo Management Plan

Hi Carol:

Thanks for the opportunity to comment on the 9/21/14 draft Arroyo Management Plan. It is a well written plan addressing issues that are relevant for Las Cruces current and future development. The State Land Office has only three additional comments from the previous draft.

- SLO supports the ideas of using density gradients rather than Transferable Development Rights (TDRs). The density gradients can accomplish the same objective as TDRs (preserving land development potential for property owners by density transfer) but would be easier to use by property owners or developers in site plan design.
- The SLO supports the use of design standards recommended in the plan to preserve the function and character of arroyos/floodplains and buffered areas.
- The SLO does not support fee simple transfer of ownership of State Trust Lands for these purposes but rather the purchase of easements. This can also be advantageous to CLC; if waterways change, easements areas can be moved or re-delineated.

If you have any questions or concerns on these comments please contact me.
Ray

Ray Matthew
Urban and Regional Planner
New Mexico State Land Office, Commercial Resources
310 Old Santa Fe Trail
P.O. Box 1148
Santa Fe, New Mexico 87504-1148
Office: (505) 827-4095
Fax: (505)827-6157
rmatthew@slo.state.nm.us

From: Matthew, Ray
Sent: Tuesday, October 07, 2014 11:29 AM
To: Johnson, Craig
Subject: Las Cruces Arroyo Management Plan

Hi Craig:

I thought the following might be helpful when we get a chance to talk about the Arroyo Management Plan.

Significant changes in the version of the plan are:

1) text has been added which recognize there are policy implications in the recommendations of the plan. At this point they haven't delineated what the implications are; for example, the CLC fiscal impact from obtaining conveyances of floodplain/buffers and impact of property with the intent to develop whose land is being conveyed.
2) in the previous version they mentioned easements or purchases of row, the language has been changed to conveyance of SLO arroyo/floodplain/buffer areas to CLC.
3) Transferable Development Rights(TDRs) language for environmentally sensitive areas has been dropped, instead the plan calls for use of density gradients with more dense development in areas further from the arroyo/buffer and on flatter land. The areas closer to the arroyo/buffered areas or more varied elevations would have less dense development. The west mesa escarpment area is an area where there is a lot of shifts in grade and elevation. The density gradient approach accomplishes the same thing as TDRs in moving dense development away from sensitive areas but can be easier to implement by both CLC and developers.

The CLC Planning and Zoning Commission is scheduled to review the draft on Oct. 28. Any Council action at earliest would be in November. Given the environmental constraints with any arroyo/floodplain commercial development generally is not feasible. I haven't been to this area years but I think the view sheds and proximity to prime natural resource areas like Organ National monument would make a development like Mesa Del Sol and attractive option. The Plan does reference Mesa Del Sol as a preferred design option for development in areas with arroyos. At this point we do not know the size of buffered areas. SFCC District uses 50 feet. It's quite possible a range of 50 -100 feet could be accommodated without any loss of development potential by the site plan design recommendations.

Ray

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For more information please visit http://www.symanteccloud.com