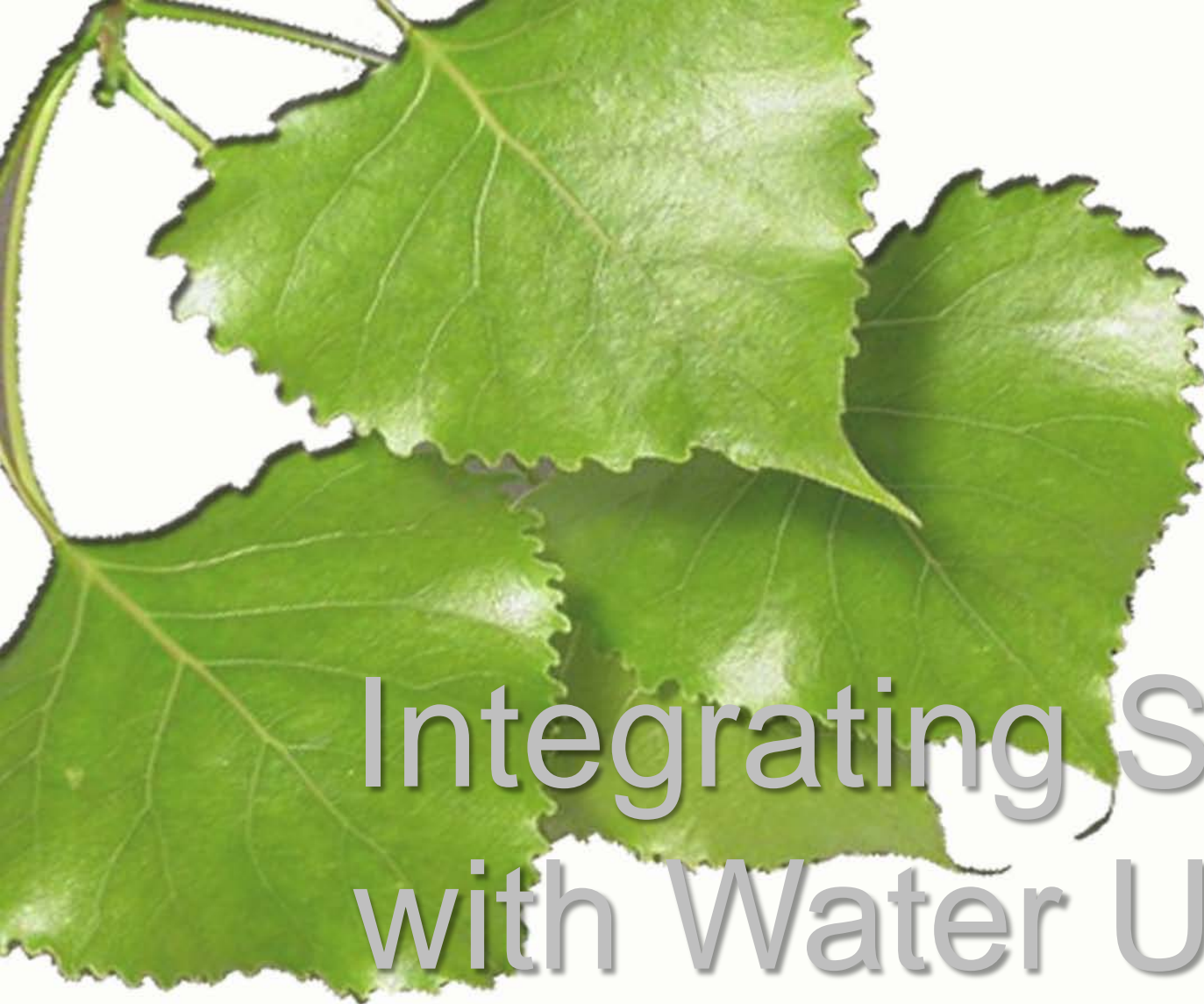


# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)





# Integrating Site with Water Use

*True Sustainability can only be achieved by linking Water with Land Use*

George Radnovich, ASLA



We do not inherit the land from  
our ancestors; we borrow it  
from our children... Native  
American Proverb



# Integrating Site with Water Use – a Model

Apply socio-economic planning, physical design and water management to better integrate complex natural and human-made “systems” in order to create water conservative/sustainable communities.



# Human Impacts on the World

- Human Beings Disturb and Fragment Landscapes and Natural Systems
- In Fact Human Beings are Co-Adapted to Landscape Fragmentation



1950 Aerial View

- Human Populations have increased dramatically, movement is towards urban places



erial



Copyright by Susanne Van Hulst

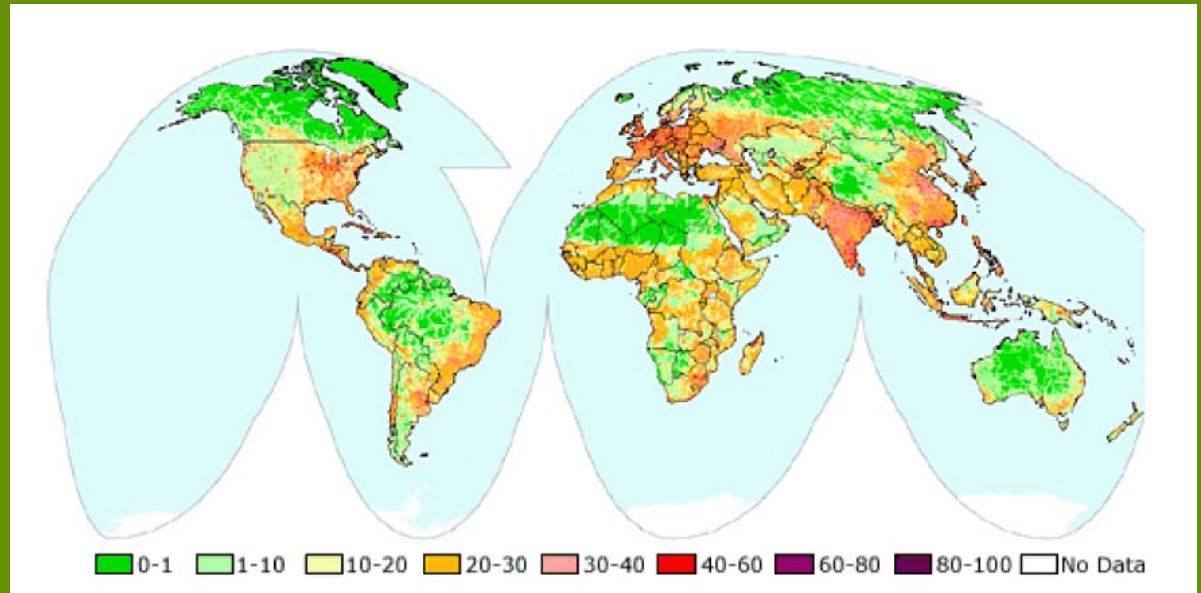


sites  
southwest



# Human Impacts on the World

- The Human Footprint Covers over 83% of the World



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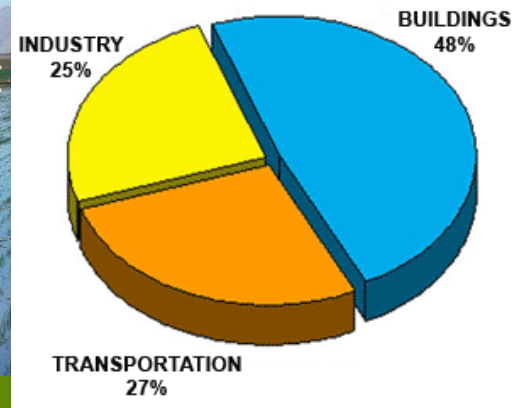
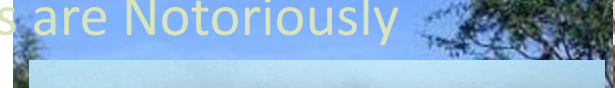
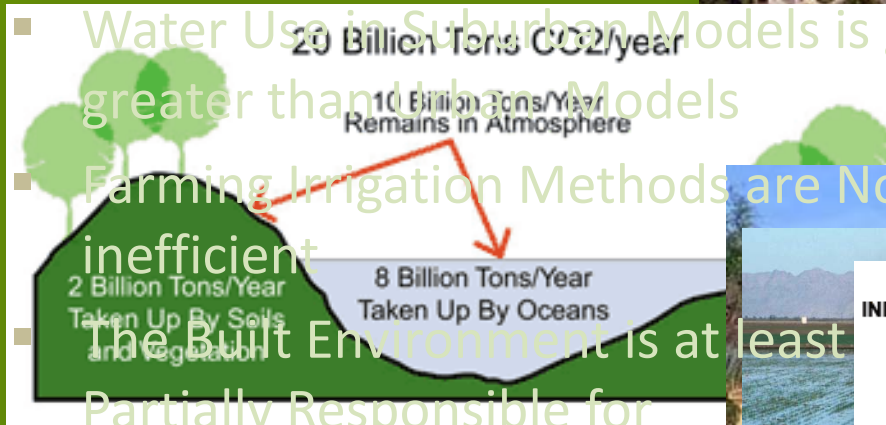
# Human Impacts on the World

- America's West is growing, However we are using outdated resource intensive land use models
- Approximately 37% of Americans live in Suburbia.
- Fossil Fuel Use is increasing our Carbon Footprint Dramatically

■ Water Use in Suburban Models is generally greater than Urban Models

■ Farming Irrigation Methods are Notoriously inefficient

■ The Built Environment is at least Partially Responsible for resource use





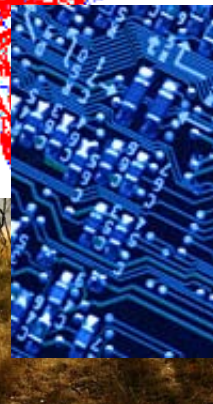
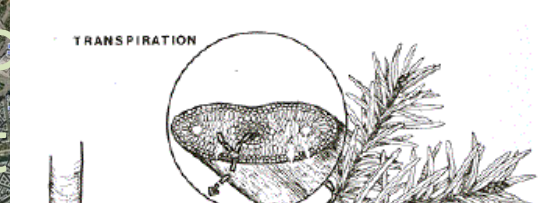
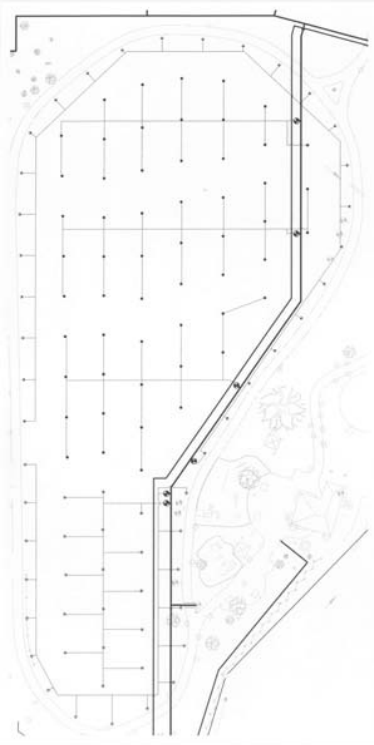
There are Resource Limitations we cannot ignore.....But wise Land use practices can merge Conservation and Development needs

**sites**  
southwest



# The Nature of the World

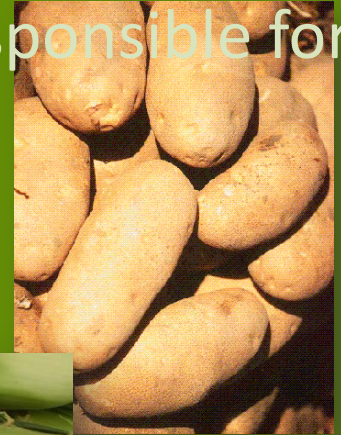
- in Nature are repeated in the Built Environment
- Water moves like energy
- Ecosystem Linkages of the Built Environment





# The Nature of the World

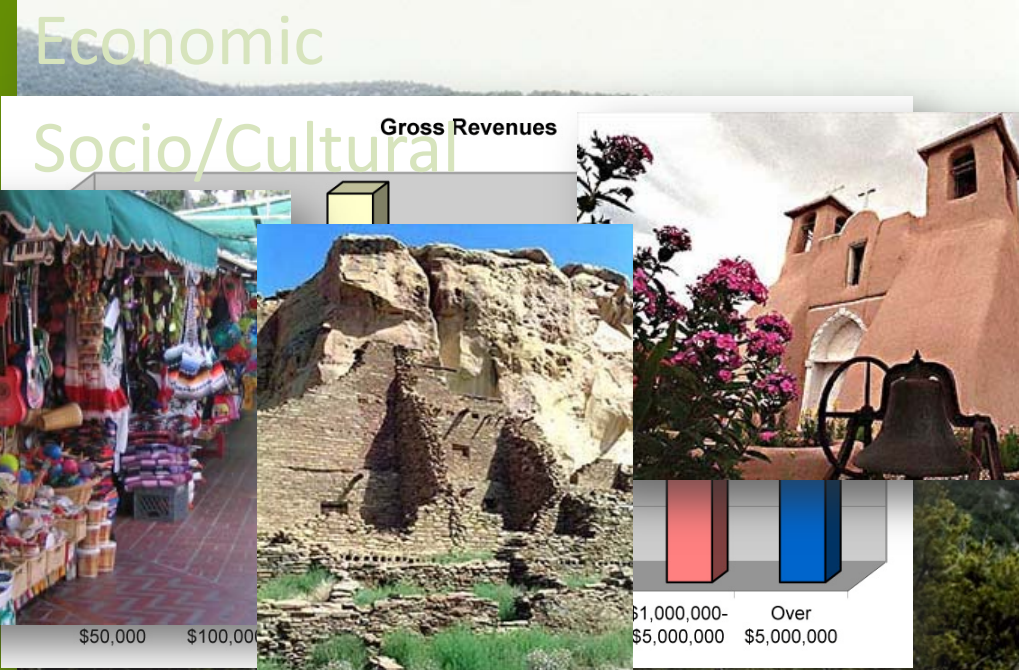
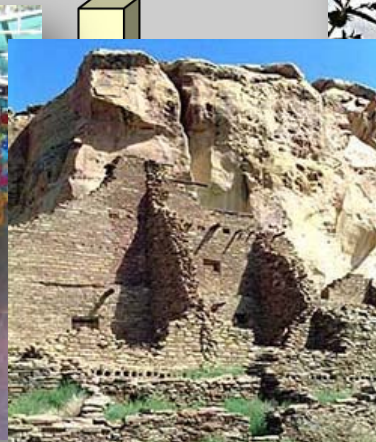
- The basis of survival is food and fiber that came from wild places
- Natural Ecosystems are responsible for
  - air quality,
  - soil production,
  - nutrient cycling,
  - climate moderation,
  - provision of fresh water,
  - breaking down pollution,
  - controlling parasites and disease
- Connectivity of wild places is essential!





# The Nature of Sites

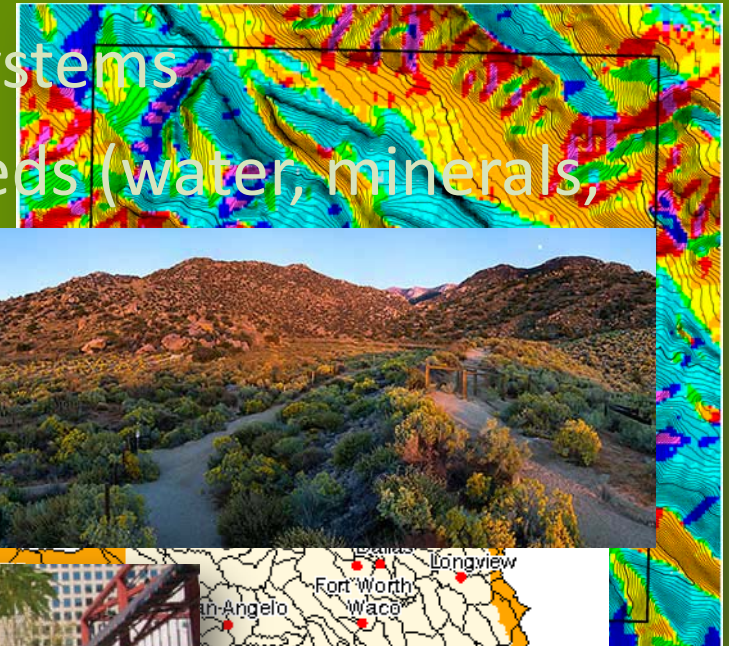
- There are Three Major Influences effecting the Integration of Site and Water Use
  - Natural/Physical
  - Economic
  - Socio/Cultural



sites  
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# The Nature of Sites

- Natural/Physical Characteristics
  - Topography
  - Landscape Systems
  - Resource-Sheds (water, minerals,



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# The Nature of Sites

- Natural/Physical Characteristics
  - Pollution Characteristics
  - Geology and Soils





# The Nature of Sites

- Economic-Systems

- Economies Drive Water Use (industrial, commercial, residential)

- Diverse Markets, including offering



- (al, (pital)

- Diverse Markets, including offering



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# The Nature of the Sites

- Socio-Cultural Systems are responsible for
  - Societal Satisfaction and Retaining Culture
  - Arts and Creativity
  - Water



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# Integrated Sites Ideas and Concepts

- Research and Review
- GIS Analysis and Modeling
- Three Perspectives Review (physical, economic, socio-cultural)
- Sustainability Planning – Improve Codes to a more Sustainable Level
- Respect Wildlife and Wild Places



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# Integrated Sites Ideas and Concepts

- Corridor Ecology: Connect Parks, Waterways, Open Spaces and Wild Places
- Localize Energy Production and Water Conservation
- Increase Diversity of Land Use and environment in the Urban Places
- Connect with Transit and Multi-Modal Transportation Systems



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# Best Practices for Integrated Sites

- Recognize the potential for site-specific solutions like cisterns and green-roofs



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A cluster of vibrant green leaves with serrated edges, positioned in the top-left corner of the slide.

# Case Studies

- The Natural World: Rio Grande Bosque Master Plan
- The Suburban World: High Desert Community
- Urban Watershed: Hahn Arroyo

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# Bosque Restoration Project



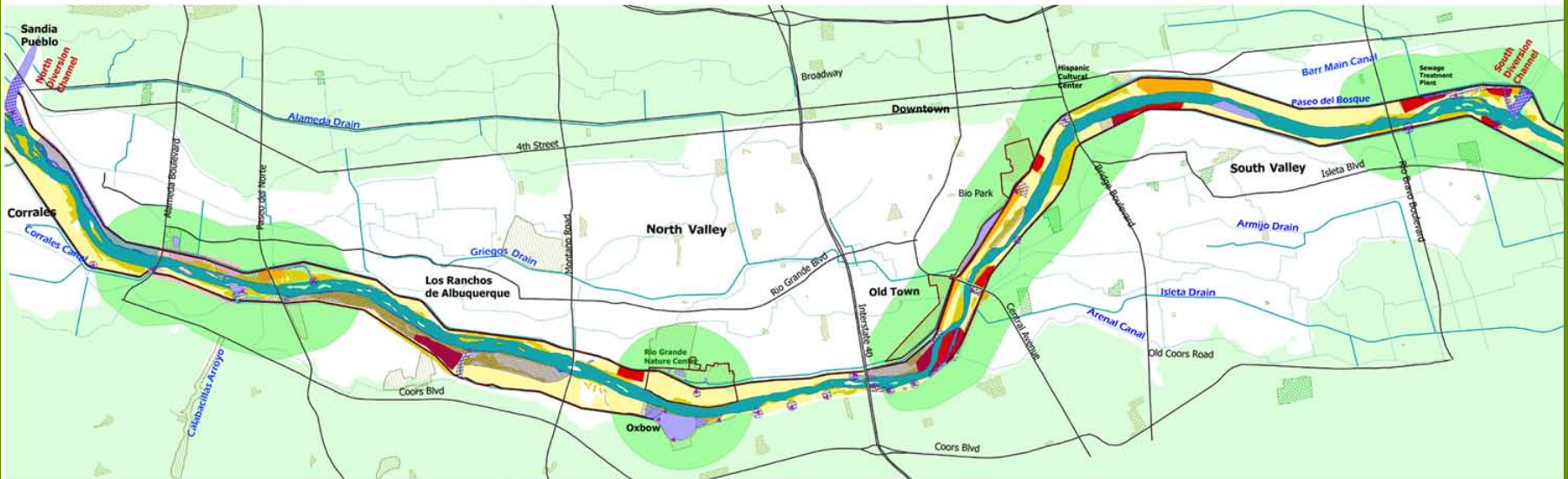
# Concepts

- Bosque as Park/Open Space
  - Green oases in the urban landscape
  - Passive Recreation
  - Closed to vehicles
  - “Heart of the city”
  - Bigger than “Central Park”
  - A place for conservation/habitat



Central Park  
Footprint





Wetland Restoration: Restored Channel



Wetland Restoration: Excavating Channel



Wetland Restoration: Willow Swales



Woodland Restoration: Clearing and Removal



Woodland Restoration: Community Involvement in



Woodland Restoration: Pole Planted Trees getting Established



Woodland Restoration: Cleared of downed trees, exotics and restored woodland

### Legend

#### Areas for Wetland Restoration

- Constructed Wetlands
- Outfall/Wetland
- Overbank Area
- Side Channel/Willow Swales

#### Areas for Clearing and Revegetation for Bosque Restoration

- Priority 1-Burn Sites
- Priority 2-Dump Sites
- Priority 3-Exotic Dominant Patches
- Priority 4-Mixed Exotic/Native Patches

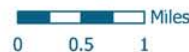
#### Existing Structures

- Outfall
- Levee
- Drains and Wasteways
- Existing Wetlands
- Rio Grande

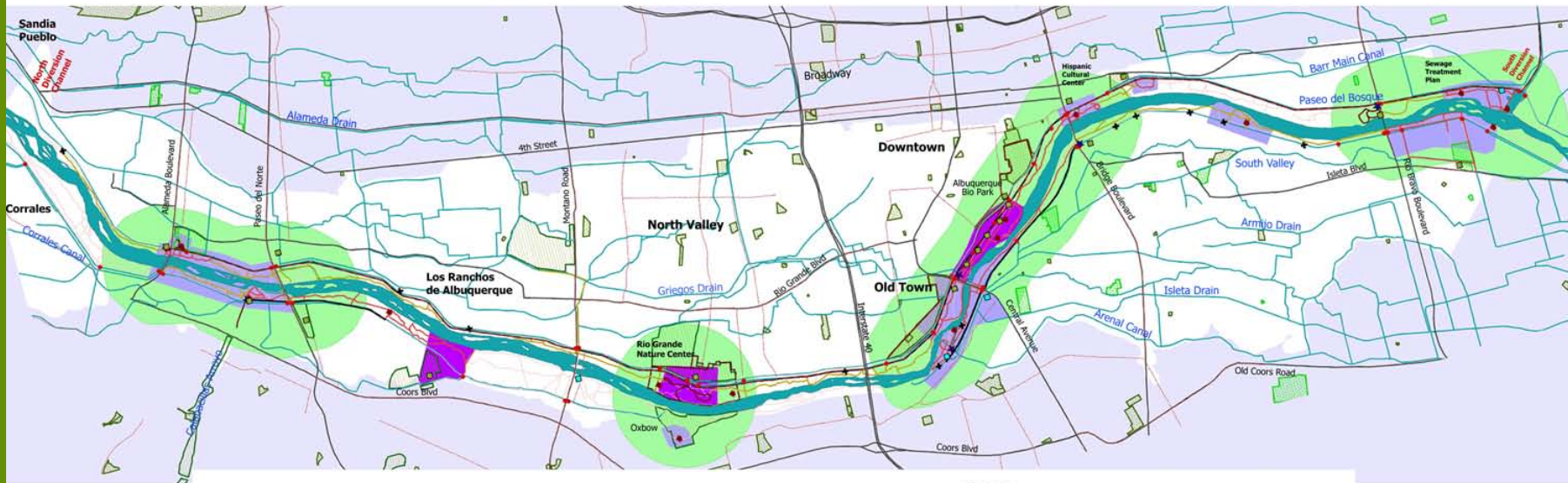


# Restoration Opportunities for Further Study

# Bosque Restoration







### Wildlife Viewing



Wildlife Viewing Area



Water Access: Fishing Pier



Wildlife Viewing Platform



Stabilized Trail with Bench



Public Art recycling of Debris



Boardwalk for Up-Close Experience of Wetlands



Interpretive Strategies and Facilities

Existing		Proposed	
<b>Facilities</b>			
●	Public Access Points	★	Put in/Pull out Water Access
■	Existing Parking	◆	Public Access Bridges
		●	Wildlife Viewing
		■	Proposed Parking
<b>Trails</b>			
—	Paved Trails	—	Paved Trails
—	Stabilized Trails	—	Stabilized Trails
- - -	Bike Lanes	—	Maintained Soft Trails
		—	Existing Trails Reclaimed
<b>Interpretive Areas</b>			
■	Existing and Funded	■	Proposed Areas



# Educational & Recreational Enhancements for Further Study

# Bosque Restoration



# High Desert Project



# Reuse of Natural Resources

- Boulders/Cobble
- Tree Transplanting
- Save and Reuse Topsoil
- Seeding & Mulching

- Seed Mix Rates should be High
- Use native wildflowers for germinations and “cover crop” strategy
- Timing Important

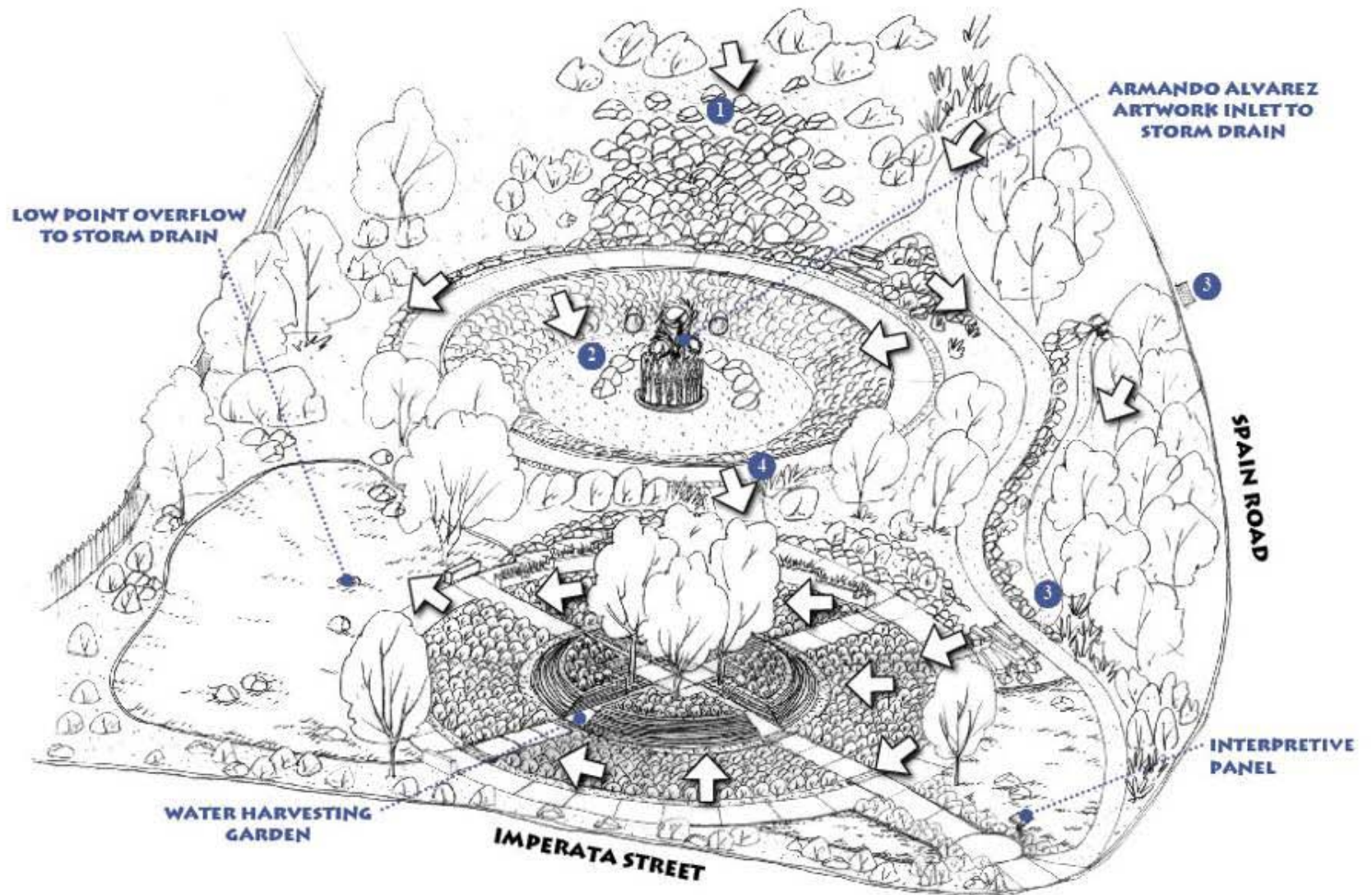


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# Water Harvesting

- Use Water from adjacent Properties
- Consider drainage from roadways and other land uses





**WATER HARVESTING SYSTEM LOOKING EAST TOWARDS SANDIA MOUNTAINS  
(ARROWS INDICATE DIRECTION OF WATER FLOWS)**



# Hahn Arroyo



*Deteriorating Channel*



*No Storm Water Quality Feature*



*Unimproved Walking Path*



*Unsafe Pedestrian Crossing*

***Existing Conditions*** - *Ageing Flood Control, No Storm Water Quality & Underutilized Drainage Corridor*



*Improved, Tinted Concrete Channel*



*Stormwater Quality Feature*



*Landscaped Walking Path*



*Pedestrian Refuge*

***Proposed Conditions*** - *Improved Flood Control, Stormwater Quality & Harvesting, Aesthetics & Multi-Use Corridor*

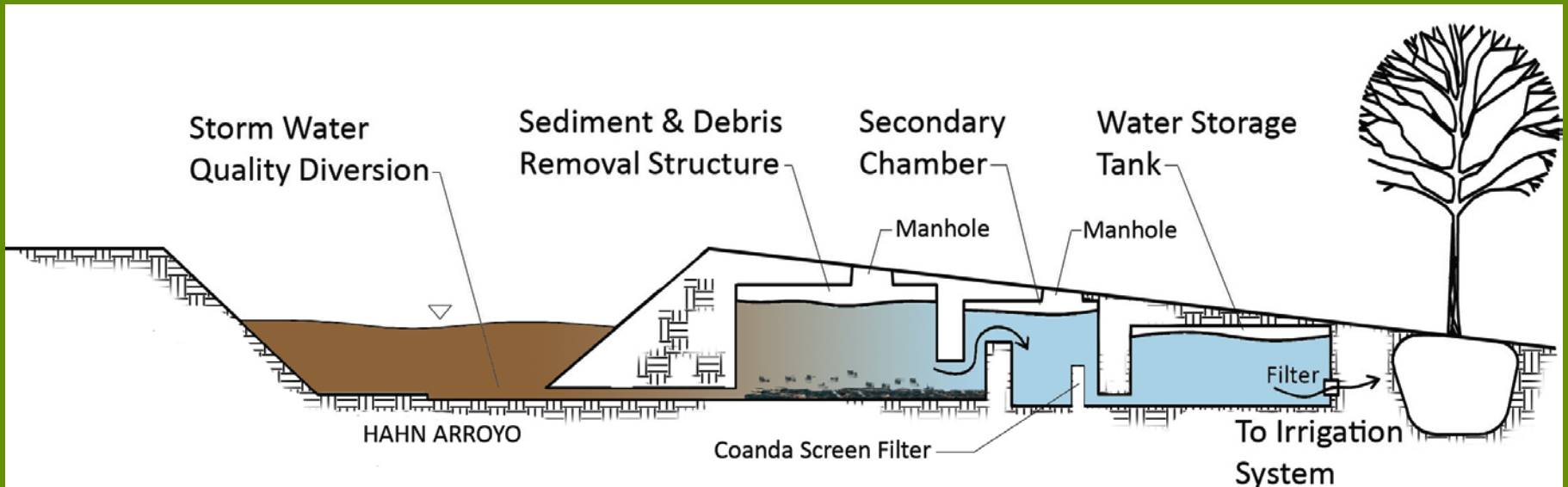
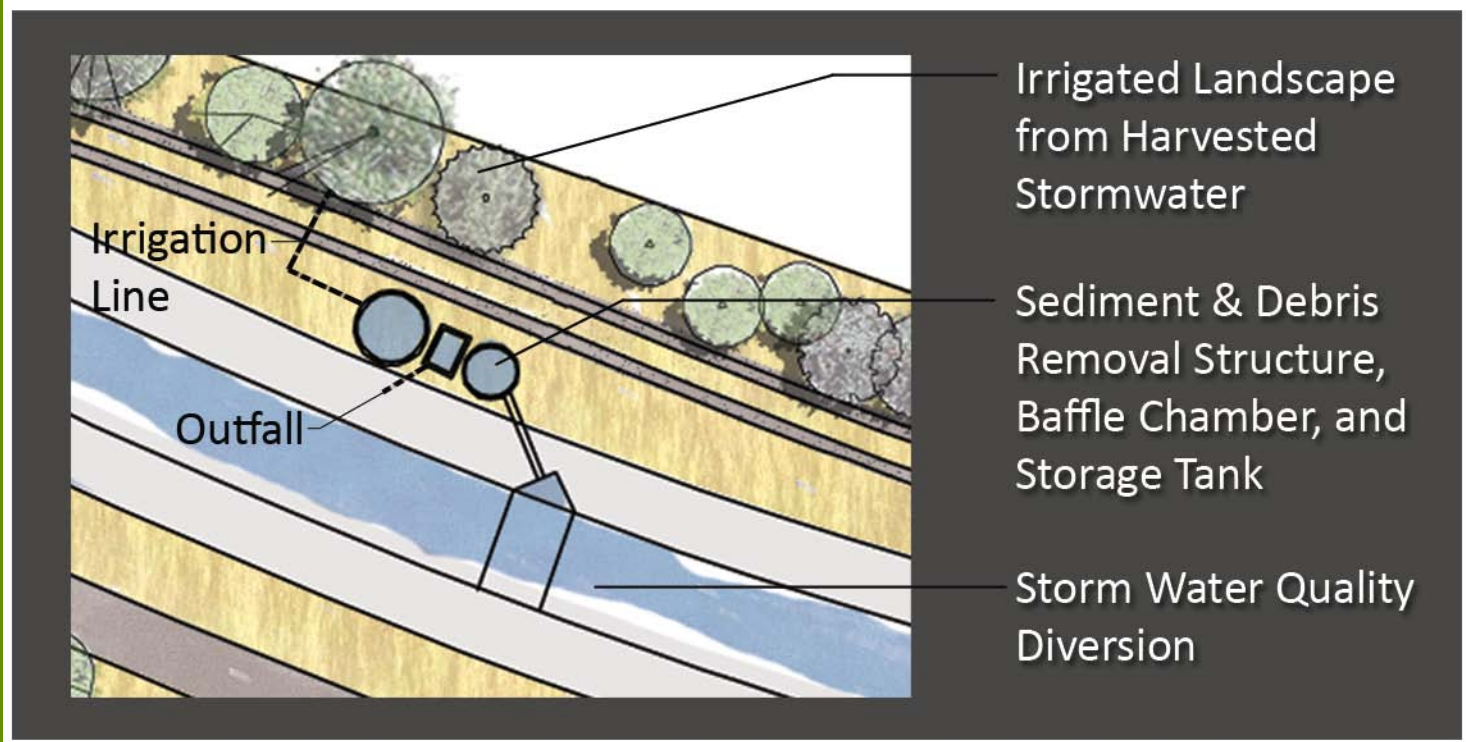
# Hahn Arroyo

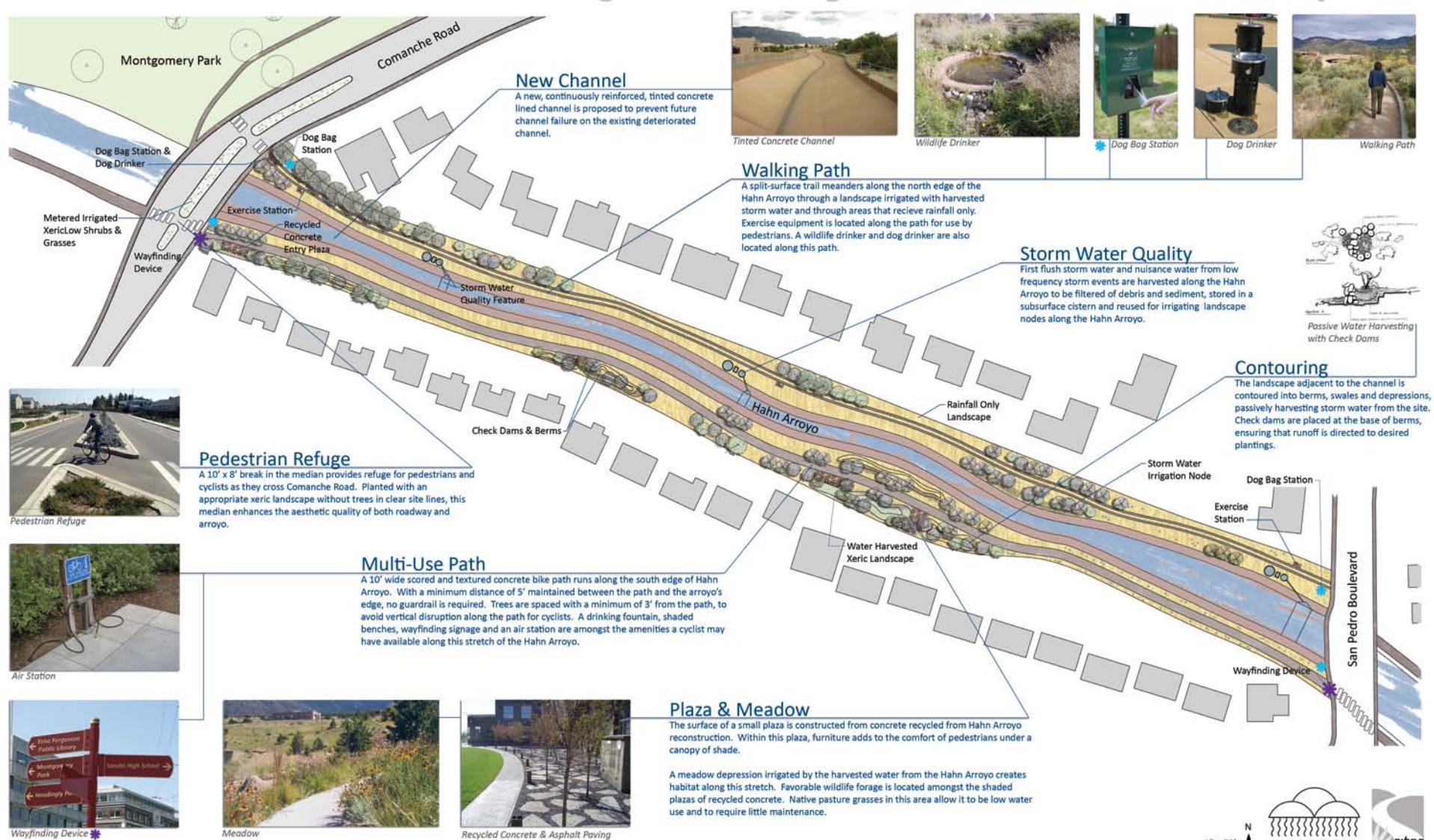


## Legend

-  Bike Route
-  Bike Lane
-  Multi-Use Corridor







### New Channel

A new, continuously reinforced, tinted concrete lined channel is proposed to prevent future channel failure on the existing deteriorated channel.



Tinted Concrete Channel



Wildlife Drinker



Dog Bag Station



Dog Drinker



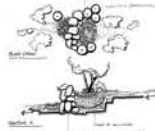
Walking Path

### Walking Path

A split-surface trail meanders along the north edge of the Hahn Arroyo through a landscape irrigated with harvested storm water and through areas that receive rainfall only. Exercise equipment is located along the path for use by pedestrians. A wildlife drinker and dog drinker are also located along this path.

### Storm Water Quality

First flush storm water and nuisance water from low frequency storm events are harvested along the Hahn Arroyo to be filtered of debris and sediment, stored in a subsurface cistern and reused for irrigating landscape nodes along the Hahn Arroyo.



Passive Water Harvesting with Check Dams

### Contouring

The landscape adjacent to the channel is contoured into berms, swales and depressions, passively harvesting storm water from the site. Check dams are placed at the base of berms, ensuring that runoff is directed to desired plantings.

### Pedestrian Refuge

A 10' x 8' break in the median provides refuge for pedestrians and cyclists as they cross Comanche Road. Planted with an appropriate xeric shrubs without trees in clear site lines, this median enhances the aesthetic quality of both roadway and arroyo.



Pedestrian Refuge

### Multi-Use Path

A 10' wide scored and textured concrete bike path runs along the south edge of Hahn Arroyo. With a minimum distance of 5' maintained between the path and the arroyo's edge, no guardrail is required. Trees are spaced with a minimum of 3' from the path, to avoid vertical disruption along the path for cyclists. A drinking fountain, shaded benches, wayfinding signage and an air station are amongst the amenities a cyclist may have available along this stretch of the Hahn Arroyo.



Air Station

### Plaza & Meadow

The surface of a small plaza is constructed from concrete recycled from Hahn Arroyo reconstruction. Within this plaza, furniture adds to the comfort of pedestrians under a canopy of shade.

A meadow depression irrigated by the harvested water from the Hahn Arroyo creates habitat along this stretch. Favorable wildlife forage is located amongst the shaded plazas of recycled concrete. Native pasture grasses in this area allow it to be low water use and to require little maintenance.



Meadow



Recycled Concrete & Asphalt Paving



Wayfinding Device



## Three Landscape Planting Schemes

### Metered Irrigation

Irrigated shrubs and grasses in widened medians provide refuge for pedestrians and cyclists at major street crossings. Suggested species: arizona ash . pistache . honey locust . cottoneaster . cherry sage . rosemary . red yucca . deergrass



### Water Harvested Xeric

First flush storm water and nuisance water from the Hahn Arroyo is filtered and stored to irrigate a landscape adjacent to the channel. Suggested species: pinion pine . mountain mahogany . silver buffaloberry . new mexico olive . vitex . three-leaf sumac . apache plume . agave . yucca . wheatgrass . muhly grass



### Rainfall Only

In between irrigated nodes are open meadows and drought tolerant trees. Contouring the land into berms, depressions and swales in these areas will allow for all rain water that falls on site to remain on the site. Suggested species: desert willow . mesquite . one seed juniper . chamisa . salbush . prickly pear . native grass seed mix



# Questions and Answers?

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