

Master Plan for Black Arroyo Wildlife Park

An Environmental Mitigation Area and Multi-Use Open Space



Prepared for:



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Southern Sandoval County Arroyo Flood Control Authority



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BLACK ARROYO WILDLIFE PARK MASTER PLAN

The Master Plan for the Black Arroyo Wildlife Park was accepted by the SSSCAFCA Board of Directors on May 17, 2013.

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Executive Summary

In many ways the Black Arroyo Wildlife Park is a precursor of what the future holds in terms of multiple use facilities that are meant to improve our Quality of Life and Watershed Function in the Southwest. The Park will provide a protected open space within an urban area that is safe, educational, well planned and sustainable as well as relaxing for the user. This 72 acre contiguous parcel is located near SSCAFCA's offices in the heart of Rio Rancho's most developed lands. It will provide a respite and an educational feature for residents, students within the school system, workers from nearby commercial facilities and other visitors, and it will show how drainage facilities can work in conjunction with open space needs. SSCAFCA's forward thinking approach to the development of this Watershed and Park will demonstrate to other agencies that in the future multiple use of facilities are the only real way to plan an open space that provides a flood control function while offering passive recreational opportunities in a cost effective and functional manner.

The Black Arroyo Wildlife Park Master Plan was developed by reviewing past planning information that relates to it in terms of flood control, passive recreation and the other aspects of the Park. It was also the subject of field study; our landscape architects, engineers and biologists conducted surveys and documented conditions which were also used in the development of this Master Plan to ensure that the planning considered the existing conditions and mirrored existing landscape and drainage functions. As part of the surveys we also noted how residents and users of the current lands make use of it; whether it was the disturbance caused by ATV's or the somewhat more passive disturbances caused by hiking and dog walking. This information provided the basis for our Master Planning. After aggregating all of this pre-planning information we assessed it through a basic Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis. This analysis assessed the information and tried to determine the best programmatic paths to take for the Master Plan.

The Planning Team also conducted an extensive series of public and stakeholder meetings which also included SSCAFCA Board Meetings to present information but more importantly to hear from the constituents of the Park. These meetings offered the Team insights into the desires of those interested and provided direction for the Master Plan as well.

Following all of the investigation and analysis of the policies, the land and the constituents the Master Plan for Black Arroyo Wildlife Park was developed. Within the Master Plan this Park was divided into four basic zones or landscape typologies: the Environmental Mitigation Zone, Open Space, Educational Oriented Open Space, and the Future Dam Pool. The Environmental Mitigation Zone (EMZ) was designated by a US Army Corps of Engineers 404 Permit to protect this land from the intrusion of people and set it aside for wildlife habitat and native plant communities. This zone will be untouched as much as possible and enhanced with further protections like trails to direct users along proper alignments, informative signage and access control devices. The Open Space Zone will be handled similarly to the EMZ in terms of land improvements but with somewhat more amenity and somewhat relaxed protections. This Zone will include trails with trailheads and bridges, signage, shade structures, a par course, wildlife drinkers fed through water harvesting, and furniture for users to relax. It also includes berms and landscape buffers to help protect the Park from visual and noise intrusions. The Education Oriented Open Space is the most intensely developed Zone in the Park. It will include trails, outdoor classrooms focusing on the natural world, a small amphitheater and three subzones including an Experiential Habitat (for ecosystem learning activities); a Natural Play Area (for more active play in a natural landscape); and the Outdoor Classroom Area (for learning activities in groups and class settings). Interpretive signage will guide the students and this portion of the open space will be access controlled through fencing to orient it primarily towards Maggie Cordova School.

The Black Arroyo Wildlife Park when developed will be an amenity to the community that goes far beyond the confines of Southern Sandoval County or the City of Rio Rancho. It will provide Open Space for central New Mexico and a learning environment for users of all ages and abilities, one that SSCAFCA and the residents of our state can be proud of.



1. Mission, Purpose and Goals

The Black Arroyo Wildlife Park is located near the intersection of Unser Boulevard and Southern Boulevard, and very close to Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) offices (see existing site aerial on Page 3). This Master Plan will create a model for this Open Space that serves the dual functions of flood control and passive recreation. The Master Plan will follow SSCAFCA's basic mission. That mission has six tenets related to the protection of citizens and property by implementing proven flood control solutions as follows:

- Manage Watersheds Prudently for Future Generations
- Enhance the Quality of Life for the Residents of Southern Sandoval County
- Create the Most Appealing Multi-Use Facilities
- Set an Example of Quality, Integrity, Leadership, and Professionalism
- Educate the Public Concerning Flood Hazards
- Administer Public Funds Prudently

The purpose of the Master Plan for the Black Arroyo Wildlife Park is to provide Open Space that allows constituents to safely utilize the open space with respect to flooding while providing alternative passive recreational uses for the site. It is also to provide protection for the existing high desert lands along with enhancement through restoration and revegetation efforts intended to improve the environmental health of the Open Space. Because the site is so close to the Maggie Cordova Elementary School it will also be important to provide educational and recreational opportunities on the site for the school and citizens at large. The Black Arroyo Wildlife Park is an opportunity to provide an educational tool through the open space itself by illustrating good stewardship of the land and safe and innovative flood control and water harvesting techniques to create a win win for the SSCAFCA and open space users.

- Concepts SSCAFCA started with for the property:
 - Provide a network of trails, including pedestrian arroyo crossing via foot bridge, and features that will provide both educational and recreational elements to the citizens of the area and maximize the usage of the SSCAFCA's property by making it truly multi-use.
 - New trails should be linked, to the greatest extent possible, into local/regional trail networks and existing pedestrian routes of travel.
 - Motorized access within the property, with the exception of service vehicles, will be eliminated.
 - Trails (commuter trail links and internal trails)
 - Bridges and Arroyo Crossings
 - Interpretive Signage
 - Passive Play for School
 - Enhance Habitat
 - Access Control – eliminate motorized vehicles into property (with the exception of service vehicles)

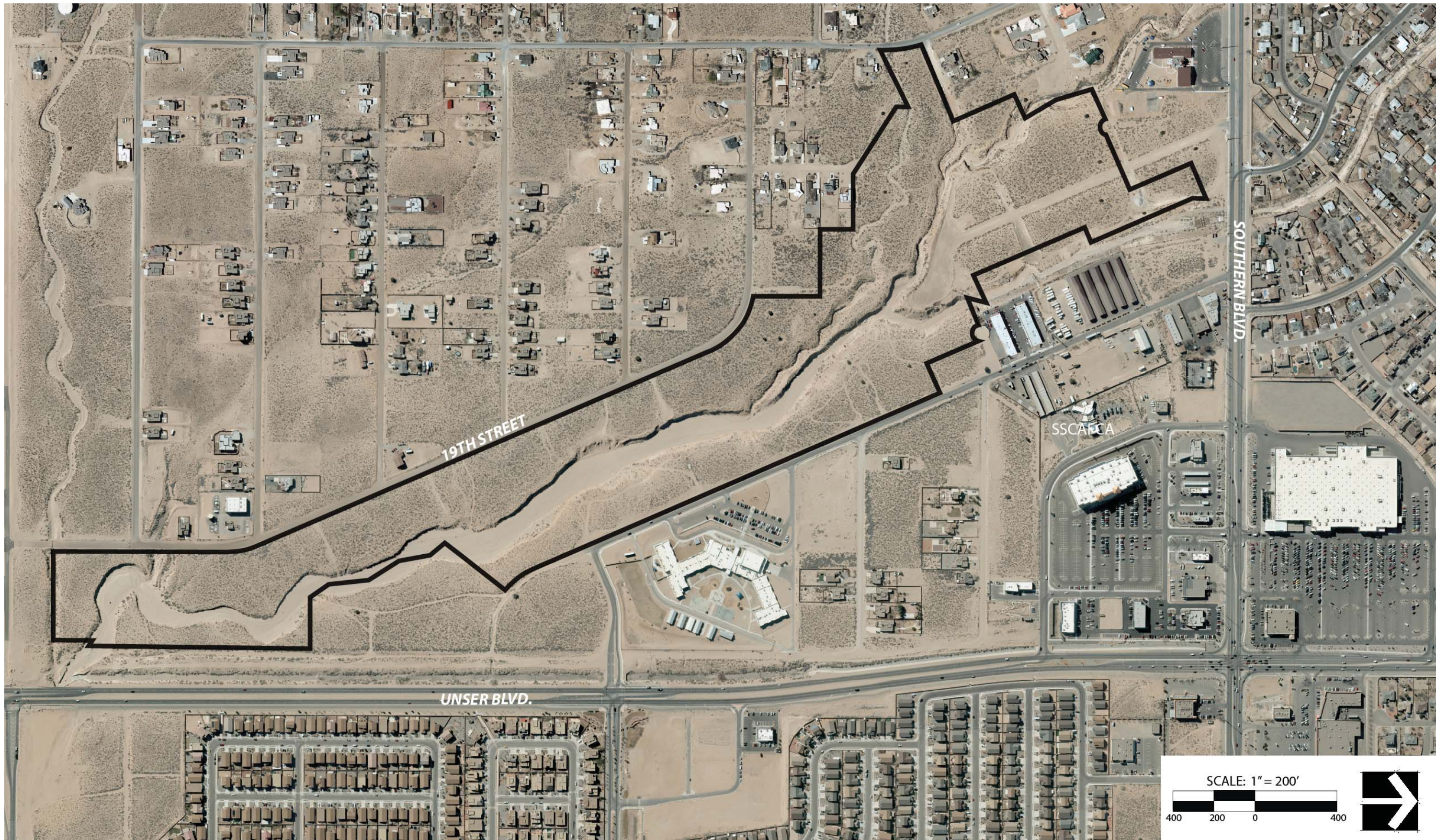


Figure 1. Existing Site Aerial

2. Existing Plans & Policies

The following is a summary of existing planning documents that affect the Black Arroyo Master Plan area. Included in the summary are the various policies, specific recommendations or plans for features that apply to the site.

2.1. Quality of Life Master Plan for Watershed Park, 2006

The Quality of Life Master Plan (QLMP) enables multi-use initiatives for arroyo land utilization in the SSCAFCA service area and offers a broad vision that foresees multi-use of facilities that includes recreation, alternative transportation, outdoor gathering spaces, scenic viewpoints, wildlife habitat and cultural resource preservation. “LEE Line” (Lateral Erosion Envelope) principles define the necessary dimensions of safe arroyo capacity that will prevent flood damage to properties in the vicinity of the watercourses. In some cases, these may be adjusted to fit special circumstances.

Opportunities exist north of AMAFCA’s Black Arroyo Dam, together with areas west of Unser Blvd, and south of Southern Blvd. Potential amenities could include:

- Leisure and recreational facilities such as amphitheaters and other gathering spaces which could be incorporated into planned shopping centers and office plazas at the Unser West Gateway. Amenities typically would be administered by adjacent commercial users or their property owners’ associations.
- Available land within SSCAFCA jurisdiction adjacent to Black Arroyo Dam could be utilized for a variety of passive and pass-through activities such as jogging, biking, workout stations and the like.

The following policies and recommendations of the QLMP are also relevant to the Black Arroyo Master Plan:

- Where possible, more natural solutions for stormwater conveyance should be considered.
- Acquiring land and/or constructing safety barriers along channel edges should be evaluated as a way to retrofit pathway connections into the Black Watershed Park.
- Cooperation with AMAFCA may contribute to joint-use possibilities and regional trail linkages.
- Maintaining capacity to the NMSR528 channel and conveyance to AMAFCA facilities should be evaluated with every proposal that contributed to a change in quantity/quality of stormwater.
- Westside Blvd design plans should include erosion prevention, possible access points for multi-use purposes, and connections to the Cabezon trail systems and recreational amenities.
- Locations for stormwater capture/controlled release facilities should continually be explored.
- Channel improvements west of Unser Blvd should match or approximate the Cabezon community improvements where trail potential exists.
- Integrating Cabezon Park improvements with extended bike path/urban trails.

2.2. Black Arroyo Watershed Management Plan (BLWMP), 2002

The BLWMP establishes a comprehensive plan for flood control and watershed protection to be implemented over time. The BLWMP consists of three major components: Policy Review; Proposed Facilities; and Implementation. The following policies and recommendations are relevant to the current Black Arroyo Master Plan:

- Local ponds developed in conjunction with a specific site or development should conform to the requirements of the BLWMP including Stormwater Quality Best Management Practices.
- Naturalistic conveyance treatment is proposed where conditions are appropriate. The plan envisions a stable non-erosive conveyance, which has the aesthetic characteristics of natural arroyos (with the exception of the environmental mitigation zone).
- Update the BLWMP, or selected sections, whenever major facilities, changes in criteria or other changes are proposed or implemented which are at variance with the BLWMP or which impact ongoing or planned BLWMP improvements.
- Perform an overall review and update of the BLWMP every (10) years to incorporate changing conditions.
- The stormwater quality treatment volume (Vwq) proposed in the BLWMP is the first 0.25 inch of runoff (note this is in conflict with the SSCAFCA DMP which requires treatment of the first 0.46 inches of runoff).
- The LEE shown in Appendix H of the BLWMP is an approximation based on available data. Field confirmation of the LEE by a NM Professional Engineer representing SSCAFCA or local government prior to development within the LEE (or within 300 feet of the LEE) is proposed. The conformation inspection should consider changes in the arroyo since the date of the BLWMP mapping, the specific property location relative to the average arroyo downstream centerline, potential effects of nearby developments and other factors affecting the LEE.
- When updated survey or aerial photography is available, this data should be used to update or supplement the LEE limit.
- Runoff constraints of 0.9 cfs/acre for new development north of Tulip Road and west of Golf Course Road are proposed until downstream facilities have been constructed to avoid increasing downstream risk. This will require interim on-site temporary ponds.
- Temporary sediment de-silting ponds are proposed to limit sediment reaching Black Arroyo Dam.
- Facilities constructed during the implementation period should account for sediment supply, sediment inflow, sediment transport through the system, sediment balance, and potential current and future downstream impacts.

2.3. Rio Rancho Parks and Recreation Master Plan, 2004

The Rio Rancho 2004 Parks and Recreation Master Plan guides the development of its facilities and programming to meet the needs of a growing community in Rio Rancho over a timeframe of 20 years. The Plan includes a recommendation for the development of a total of 89 new facilities throughout the city by 2025 to meet the needs of future Rio Rancho residents. The Master Plan also recommends the development of design guidelines for all parks and recreational facilities.

2.4. Rio Rancho Long Range Bikeway System Map, 2010

Rio Rancho’s 2010 Bikeway System Map details all existing and proposed bike facilities within the city. The Bikeway Map shows no existing or proposed city facilities in within the Master Plan boundary. However, potential connections can be made to existing bike paths along Southern Boulevard and Unser Boulevard. The Master Plan can also serve to establish continuity for regional facilities, such as the proposed bike route along the northern reach of the Arroyo and the proposed bike lane along Westside Blvd.

2.5. Army Corps of Engineers 404 Permit for Black Arroyo, 2006

The 404 Permit was to allow for the abandonment and fill of a 4.4 acre reach of the west branch of the Black Arroyo, and the realignment and replacement of the reach with a concrete channel. In approving the project a number of conditions were established, the most relevant to the Master Plan are:

- The permittee shall not place fill material or conduct other construction activities within the arroyo during the migratory bird breeding season between March 1 and October 1.
- The permittee shall further establish and maintain a 100 yard buffer in any direction from occupied owl burrows and/or bank swallow colonies. This will be done with the understanding that because of the narrow nature of the site this requirement may need to be more lenient (with the concurrence of the US Army Corps of Engineers).
- The permittee shall create (4) artificial burrowing owl habitats within the easement property.
- Prior to construction activities, the permittee shall monitor existing burrows for the presence of burrowing owls. A qualified biologist shall conduct the monitoring. Monitoring and relocation shall be conducted in accordance with the following guide: "Guidelines and Recommendations for Surveying Burrowing Owls and Mitigation if they are Found, May 2007."
- The permittee shall prevent the growth and/or proliferation of noxious/invasive weeds within the project and mitigation site boundaries in accordance with the City of Rio Rancho's vegetation ordinance (Ord. 97-032).
- The permittee shall revegetate disturbed and bare ground in the project area with native vegetation. Successful revegetation will be determined as 80% successful growth after 3 years. An annual monitoring report plan shall be required within 60 days of the issued permit date. The plan shall be developed in accordance with the District's monitoring report guidelines.

2.6. City of Rio Rancho Comprehensive Plan, 2010

The Rio Rancho Comprehensive Plan is designed to express the direction of how the city will grow over the next 20 to 25 years. The comprehensive plan serves both a practical need and a legal need by being a statement of policy. The Comprehensive Plan is broken into elements that discuss specific topics such as land use or public facilities. Key elements of the Plan's vision include the preservation and enhancement of arroyos as open space corridors. This will allow citizens the opportunity to connect with the natural environment and benefit the City by creating multi-use facilities. Another aspect of the Plan's vision is to link trails to community facilities in order to increase Rio Rancho's walkability.

The following Goals, Policies, and Actions included in the 2010 Comprehensive Plan have been determined to relate specifically to the Black Arroyo Master Plan:

POLICY PR-6: Develop partnerships with Rio Rancho Public Schools, public agencies, and private groups to coordinate and co-locate facilities to meet the open space and recreation needs of the city.

POLICY PR-7: Develop a culture of sustainability by designing and constructing facilities that maximize long term conservation and stewardship of the city's human, financial and natural resources.

2.7. City of Rio Rancho Zoning Code, 2012

Chapter 154 of the City Code deals with Zoning. The intent of this chapter is to promote the general health, safety, morals, convenience, and welfare of the people of the city. The regulations are required to encourage the most appropriate use of land; and to conserve and stabilize the value of property. Because there is a potential for re-zoning the Master Plan area as Open Space or Parks, Subsections 154.29 and 154.30 are most relevant.

154.29 OS: OPEN SPACE DISTRICT

Permissive uses within the Open Space District are: Natural areas designated for recreation, wildlife/ habitat enhancement, natural and cultural resource preservation; Land undergoing restoration; Regional preserves; Lakes, waterways, flood water storage areas, and other public facilities for handling flood water, all designed in such a way as to be considered a visual and/or physical amenity in the community; Structures and facilities incidental to the above uses, provided that such incidental buildings do not cover more than 5% of the ground area; Roads and public utilities.

While parks and plazas are not permissive uses in the Open Space District, they are considered Conditional Uses.

154.30 PR: PARKS/RECREATION DISTRICT

Permissive uses within the Parks/Recreation District are: Parks and plazas; Botanical gardens, arboretums and gardens open to the public; Roads and public utilities.

Conditional uses within the PR District are: Golf courses; Cemeteries including columbariums, mausoleums, or crematories; Natural areas designated for recreation, wildlife/habitat enhancement, natural and cultural resource preservation; Land undergoing restoration; Regional preserves; Lakes, waterways, flood water storage areas, and other public facilities for handling flood water, all designed in such a way as to be considered a visual and or physical amenity in the community; Structures and facilities incidental to the above uses, provided that such incidental buildings do not cover more than 5% of the ground area.

2.8. SRTS Action Plan, Rio Rancho Public Schools, 2011

The Rio Rancho Public Schools (RRPS) Safe Routes to School (SRTS) Action Plan provides a general overview of SRTS programs and projects that are applicable to any school in the Rio Rancho Public School (RRPS) District. RRPS is dedicated to safer, more sustainable, alternative intermodal transportation for school students, and has taken measures to encourage students to bike and walk to school. The Action Plan identifies recommended physical improvements and operational measures for three elementary schools in the district: Cielo Azul, Puesta del Sol and Sandia Vista. The secondary goal of this Action Plan is to progress the three schools into Phase 2 funding and earn the next two schools, Maggie Cordova Elementary and Lincoln Middle School the opportunity for Phase 1 funding.

As part of the SRTS programming, increased coordination with local, state and federal agencies to increase multimodal transportation opportunities is recommended. The West Branch Black Arroyo improvement project by SSCAFCA offers a unique opportunity to support the SRTS program goals. A portion of the improvement project will be to install educational signage, overlooks, and trails. Also possible is the installment of a pedestrian bridge that can provide pedestrian or bike access from the residential area west of the arroyo to Maggie Cordova Elementary School.

3. Existing Conditions

Surrounded primarily by residential development with a school (Maggie Cordova) and some office/commercial property, the 72 acre site is valuable as an open space amenity to local residents. The dominant character of the site is that of a broad, high desert, and expansive open space, with impressive views of the Sandia mountains to the southeast (Photo 1 and Photo 2). A homogenous blanket of mostly native shrubs and grasses provides wildlife habitat above the arroyo banks, while sand dunes build against some of the denser vegetative clusters (Photo 3 and Photo 4).

Initial site visits revealed limited use of the site as a dumping ground for waste / refuse (tires, electronics, construction materials, etc.). However, for the most part the dumping occurs on the western side of the channel near the residential neighborhood (Photo 5), and in the arroyo itself. Numerous tracks and sightings indicate that the site is heavily used by hikers, dog-walkers, and ATV's and other off-road vehicles, both in and above the arroyo (Photo 6).

3.1. Physical Conditions

The planning area slopes to the southeast (in the direction the arroyo is oriented) with slopes averaging 3-6 percent. Soils are sandy and highly erodible which is evident along the banks of Black Arroyo and its tributaries and associated drainages. Much of the Black Arroyo watershed within the planning area is deeply incised and actively sloughing (Photo 6).

3.2. Vegetation & Wildlife

The planning area is dominated by a four-wing saltbush (*Atriplex canescens*) – sand sagebrush (*Artemisia filifolia*) community. Subdominants include snakeweed (*Gutierrezia sarothrae*), Russian thistle (*Salsola kali*), prickly pear (*Opuntia* spp.), soap tree yucca (*Yucca elata*) or soapweed yucca (*Yucca grauca*), scattered one-seed juniper (*Juniperus monosperma*), and Indian rice grass (*Oryzopsis hymenoides*).

Wildlife observed during the field surveys included mourning doves (*Zenaidura macroura*), English house sparrows (*Passer domesticus*), rock doves (*Columba livia*), white-crowned sparrows (*Zonotrichia leucophrys*), common ravens (*Corvus corax*), black-tailed jack (*Lepus californicus*), scaled quail (*Callipepla squamata*), coyote (*Canis latrans*) tracks/scat, and woodrat (*Neotoma* spp.) middens. Burrows were abundant within the planning area. At the time of the survey, these appeared inactive and very small, and most are likely inhabited by small mammals (Photo 7). Multiple areas along the northern and eastern facing arroyo walls had evidence of bank swallows (*Riparia riparia*) inhabitation, however, all colonies seemed to have been inactive for at minimum, several months (i.e. no feathers around, no “mud” packed around holes, and no droppings found), and many of the individual cavities had begun to collapse (Photo 8).



Photo 1. View of Sandias



Photo 2. View of Arroyo and Sandias



Photo 3. Native Vegetation



Photo 4. Sand Dunes



Photo 5. Dump Area



Photo 6. Tracks on Site



Photo 7. Burrows



Photo 8. Collapsed Cavities



Photo 9. Bird Perches



Photo 10. Existing Well



Photo 11. Well Discharge



Photo 12. Young Cottonwoods

It should be noted that definitive determination of active burrowing owl burrows and bank swallow burrows cannot be made during the winter months. If a definitive determination is needed, species-specific surveys are recommended in the spring/ early summer months. Some burrowing owl populations in New Mexico are migratory and others are not; therefore surveys should be conducted during the breeding and nesting period to determine nest occupancy.

The few junipers scattered around the site had evidence of wood rats, as debris was piled up around the root collar of the tree to a significant depth. A fence abutting the arroyo behind the elementary school had evidence that the posts were being used as perches; this was the one spot in the project area that had substantial whitewash from bird perching (Photo 9).

At the southern-most part of the planning area, within a tributary of the Black Arroyo, the City of Rio Rancho has a well (Photo 10) that discharges up to 10,000 gallons of well flush water every other day (Photo 10 and Photo 11) (Personal communication with Dave Gatterman of SSCAFCA, 2013). At this location, running water was evident from a discharge pipe. As a result, a few young cottonwoods (*Populus deltoides*) have been recruited into the side-channel (Photo 12).

3.3. Strengths & Opportunities

The Opportunities and Constraints Map (Figure 2, illustrates Strengths, Weaknesses, Opportunity's and Threats (SWOT) for the Black Arroyo Wildlife Park. The majority of the conditions identified on the map have to do with the effect of noise, detritus and human impacts. There are also some access issues such as providing entrances for open space users and for those with parcels that may need access through the site. There are also quite a few existing trails and some of those will be used because there is already a desire path there and others will be reclaimed. Lastly, we have identified some locations for amenities such as viewsheds and opportunities to place buffers. Below we offer some specific items from our SWOT.

Well Water Discharge and Potential for irrigation

- **Well Water** - The City of Rio Rancho well water discharge area -- at 10,000 gallons every other day -- could be used within the project area to irrigate ornamental plants along a trail system at the southern end of the planning area. This water could also be mechanically pumped or gravity fed north of the facility to irrigate for a number of scenarios, including shade trees, a grow-out nursery (suggested by City of Rio Rancho Parks and Recreation and Community Services), ornamental plantings, and possible recreational use.

Ephemeral/ seasonal water harvesting areas

- **Adjacent to trails** - Pumice wicks could be located along trails to harvest sheet flow water and facilitate localized water retention, which would increase survival of plantings and/or enhance recruitment of native seeds already present on the site.

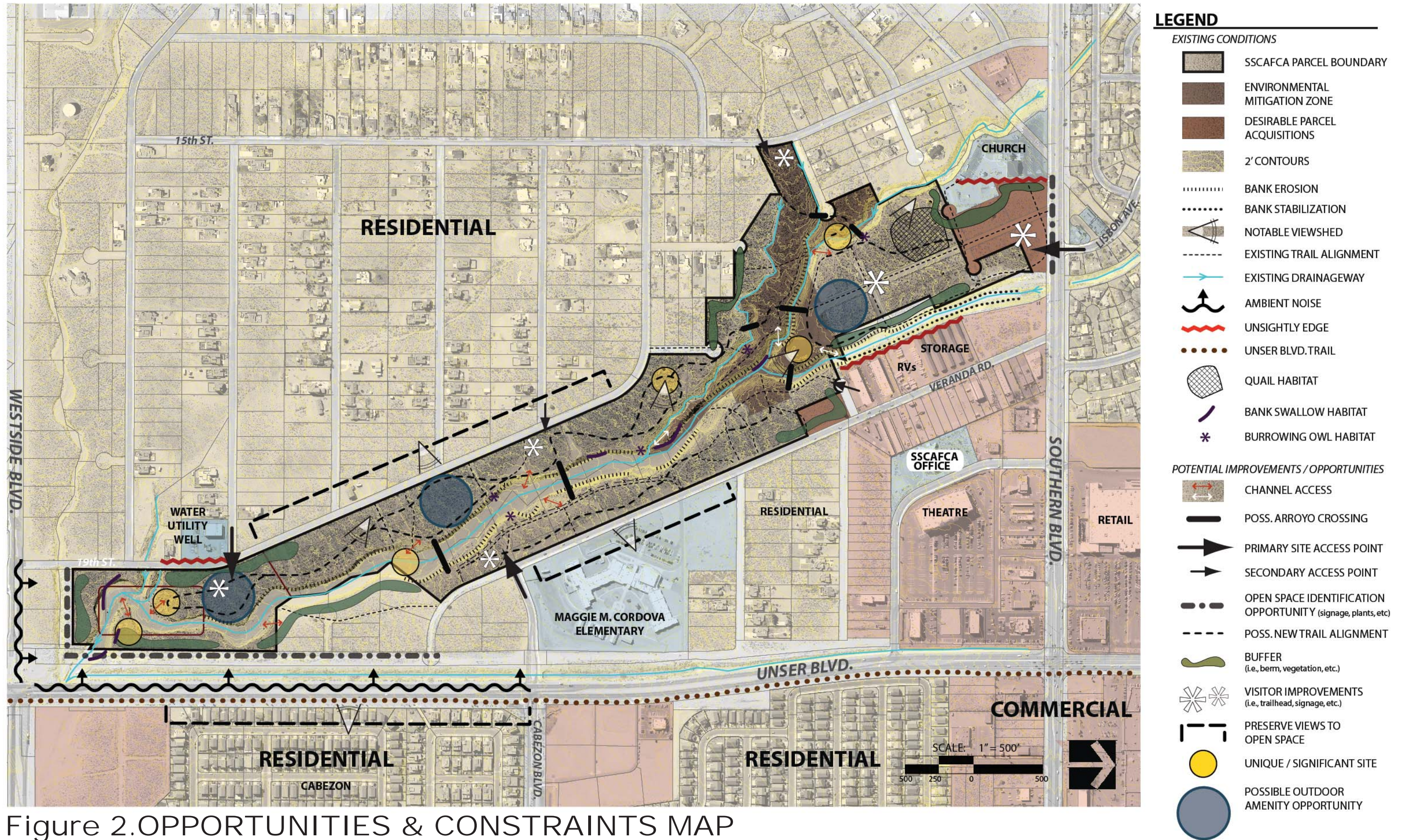


Figure 2. OPPORTUNITIES & CONSTRAINTS MAP

- **Quail and Burrowing Owl habitat enhancement** - Harvested water could be made available to the quail population on the northern part of the site, since their presence seems to already be quite strong. This would also improve the habitat and foraging opportunities for potential burrowing owls that could recolonize the existing burrows. These concepts could be achieved by focusing local ephemeral (or perennial) drainage to a small designed pond area with a geosynthetic liner or sodium bentonite clay liner for wildlife drinkers or using well flush water.
- **Lateral drainages to Black Arroyo** - Small grade control structures, like small Zuni bowls, could be installed at the heads of many of these small side-drainages to facilitate water retention and percolation, and promote vegetation establishment and habitat.

Native wildlife and vegetation signage and plantings

- **Signage** - Educational signs could be located in specific areas that currently contain a robust native vegetation community, or in areas where natural drainage patterns are conducive to water harvesting. This signage and plantings could highlight the relationship between plants and animals like hummingbirds, bats and pollinator insects. This could be very successful, especially along trails.

Local school

- **Education** - The site nearest the school could be enhanced for education process or potentially adopted by the Maggie Cordova Elementary school to ensure the area remains clean, report any vandalism, and engage in environmental studies with students.

Trails

- **Trail enhancements** – There are a substantial amount of informal trails existing on the site some of which could be improved and used as a more pleasant ride than that along Southern or Unser Boulevards. These trails could be utilized and more hardened surfaces could be used to decrease erosion. Also, these trail corridors could be enhanced with amenities.

Viewsheds

- **Viewshed enhancements** – There are a number of viewsheds on the site that could be used for sitting areas to view the Sandia Mountains, the city lights of Rio Rancho and Albuquerque and potentially the site could be used for star parties at night.

3.4. Threats and/or Weaknesses:

- **Habitat** - Keep trails out of eyesight of burrowing owl nests (dogs have been shown to decrease nesting success where they harass owls).
- **Nest Boxes** - Avoid artificial burrowing owl nest boxes, or artificial bank swallow nest construction (these are generally low-success strategies and not worth the effort/cost).
- **Technology** - Avoid mechanized pumping (unless pumping becomes necessary) to minimize the need for future repairs, and increase the sustainability of the project. Focus on gravity-fed irrigation from the City of Rio Rancho well water discharge.
- **Arroyo Crossings** - Keep trails, arroyo crossings, and any new infrastructure away from known bank swallow burrows and burrowing owl nests to avoid harassment by people and dogs.
- **ATV's** – there is a substantial amount of ATV use on the site, access control should be employed by unitizing fences, boulders and other devices. Walkovers should be used at pedestrian access points (Photo 13).
- **Domestic Animals** – educational signage illustrating the extreme problem of animal feces in drainageways should be deployed and dog poop stations should be installed in the Open Space.
- **Viewsheds** – There are very poor viewsheds such as the ones to the east near the self storage units and offices which should be screened. It is also important to use Crime Prevention Through Environmental Design methodologies to be watchful of creating blind spots within the open space which could prove dangerous.



Figure 3. Black Arroyo Survey Area



fourwing saltbush



sand sage



snakeweed



russian thistle



prickly pear



yucca



one-seed juniper



indian ricegrass



mourning dove



white-crowned sparrow



english house sparrow



rock dove



common raven



black-tailed jack



scaled quail



coyote



woodrat



burrowing owl



swallow

4. The Master Plan

The Master Plan for Black Arroyo Wildlife Park proposes four key zones into which the site will be organized: the Environmental Mitigation Zone, Open Space, Education-oriented Open Space, and the future Dam Pool. Each zone has specific characteristics such as described below:

Environmental Mitigation Zone (EMZ)

- This zone of the site is to be protected from disturbance by site visitor activity so as to encourage the health of native flora, fauna, and natural processes relating to water and soil. Where circulation routes are required through this zone, access control devices will be used along trail edges.

Open Space Zone

- The goal of the Open Space zone designation is to preserve the existing site character as a resource to the greatest extent possible, including the protection and maintenance of existing site conditions. Restoration / revegetation efforts will likely be minimal. All drainage control is planned as naturalistically as possible. New plant materials will be added only at key locations, such as at trailheads or buffers at site boundaries or where needed due to past disturbance. This zone will include some interventions that are intended to improve site visibility.

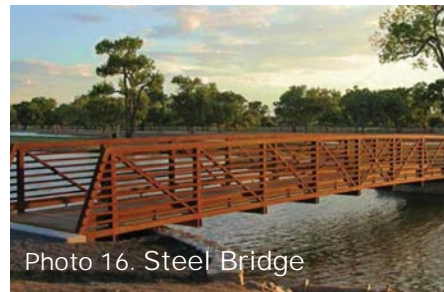
Education-oriented Open Space Zone

- The proximity of Maggie Cordova Elementary school provides the opportunity to engage children and educators in the natural processes occurring throughout the site but within this zone dedicated to students. Natural play areas are encouraged, as are elements to facilitate interaction with the site, such as outdoor classrooms, an amphitheater, interpretive signage, etc. Structures and equipment, where necessary, will be designed to blend naturalistically with site character.

Future Dam Pool Zone

- At the southeastern corner of the site, the channel is planned to be widened and dammed to create a holding structure that will allow for the regulated release of stormwater. This area will host unique infrastructure and educational opportunities associated with local hydrological and geomorphological processes, and suggested design elements within this zone are intended to capitalize on their presence. This zone will also be the home to more functional uses such as a small tree farm.

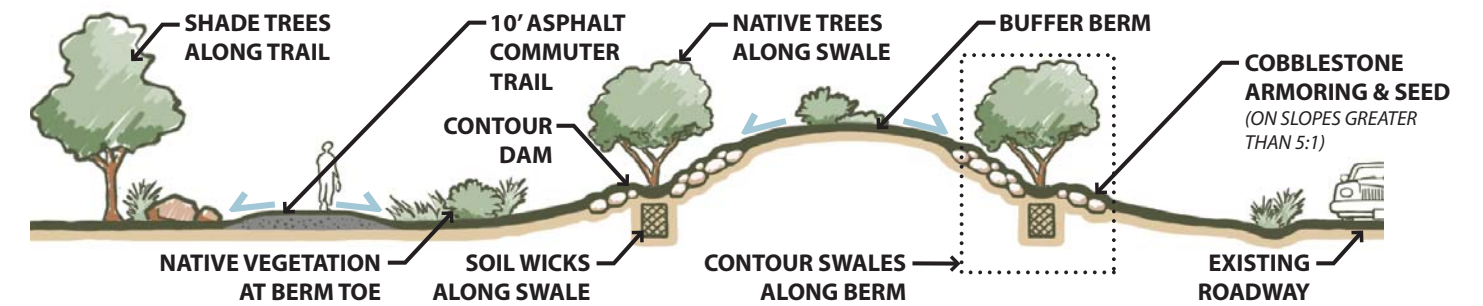
Specific plan elements have been developed to respond to the site's processes and character, public input, and SSCAFCA's maintenance and program goals, and have been grouped into the following categories: Trail System & Access Control, Educational & Interpretive Strategies, Habitat Restoration & Water Quality, & Site Furniture and Amenities.



4.1. Trail System and Access Control

Existing trails will be integrated into a comprehensive site-wide network of connective paths organized around a central "commuter trail" spine (Photo 14). This wider trail (8-10' wide) will be paved with a firm walking surface to accommodate bicycles, strollers, wheelchairs, etc. (see Berm & Commuter Trail Section graphic below). It will run north to south, connecting to existing paths at Southern Blvd., on the north end of the site, and at Unser/Westside Blvd. at the southern end. Smaller, natural trails will branch off from the commuter trail, winding through the site to allow more intimate access to specific site features and viewsheds throughout. Where possible, these smaller trails should be ADA accessible and may feature interpretive signage (Photo 15) (see Section 4.2), but should otherwise blend materially and aesthetically into the natural landscape (Photo 15). Where trails must cross the arroyo in order to maintain connectivity throughout the site, steel bridges may span the channel with minimal environmental impact or cost (Photo 16). Smaller site drainages may require wooden footbridges for access (Photo 17).

Access control around the site perimeter will be implemented in order to protect the open space and environmental mitigation efforts along the arroyo. Current recreational use of the site by ATVs and other off-road vehicles exacerbates existing erosion and compaction issues, disrupts vegetative and wildlife habitat, and poses a potential liability for SSCAFCA. Restricting this type of use is therefore desirable, and may be achieved through a variety of measures, including tensile fencing and strategic placement of boulders (Photo 18 and Photo 19), plant materials, and landforms. Fencing is recommended to be of the high-tension wire type, installed with signs warning of physical dangers of cutting the fence to gain unauthorized access. Vehicular access to the site will be limited to a small number of parking facilities dispersed along the site edge, while pedestrian, bicycle, and ADA access will be allowed at other points through either bollards, chicane/hiker gates (Photo 20), horse stiles, or some combination of the three (Photo 21). To discourage vehicles coming onto the site from further up the arroyo, a concrete or grouted boulder drop structure (or similar construction) should be located where the upstream arroyo meets the site boundary access control (Photo 22).



Berm & Commuter Trail Section

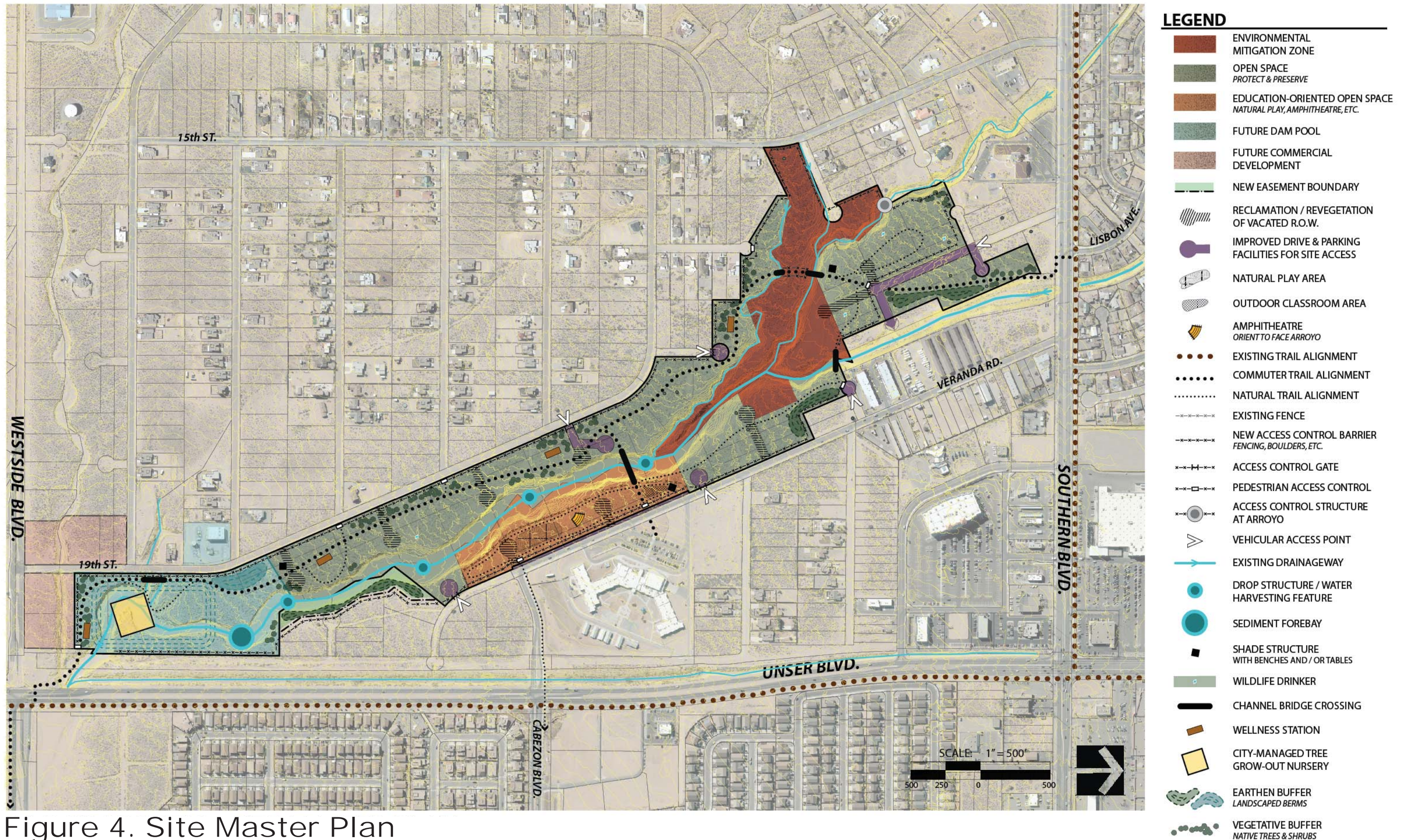


Figure 4. Site Master Plan

4.2. Educational and Interpretive Strategies

Opportunities for education relating to wildlife, vegetation and natural processes are abundant throughout the site. The master plan proposes taking advantage of these in two significant ways. The first is the creation of an Education-oriented Open Space (EOS) along the eastern shoulder of the arroyo, between the Maggie Cordova Elementary School and the channel itself (Photo 23). The northern half of this zone features a trail connection from the front of the school traversing through the open space and across a bridge to an informal drop-off site on the western side of the arroyo (Figure 5). This trail will also service an outdoor classroom area (Photo 24) and shade structure. Midway down the site will include an amphitheater, oriented so that it looks out over the arroyo and to views of the open space (Photo 25). This amphitheater could be optimized for performances, assemblies, or additional outdoor classroom space. It might also be a community asset, used by local residents as a gathering spot. The southern half of the Education Zone is given over to natural play, integrating natural and artistic elements (Photo 26) into the landscape to provide a place for children to run, explore, create, and learn, all within a natural environment. The entirety of the EOS should be bounded by access control measures, in addition to the existing fence along the west side, both for the safety of the children and teachers, and the protection of the open space and its associated amenities (Figure 6).

The second educational strategy is the installation of interpretive signage throughout the site. Some signage stands currently exist, though without being used, along the fence west of the school. These should be employed, along with new signs, to tell the story of the site. Where possible, signage design should be artistic and context-sensitive (Photo 27 and Photo 28). For example interpretive signage could include:

- **Vegetation:** Describe existing plants on site, how these differ from historical conditions, compare/contrast exotic and native species, what the ecological functions of different plants are, etc.
- **Wildlife:** Describe existing animals on site, what their characteristics and needs (diets/lifecycles/migratory patterns, etc.) are, what their relationship with other site wildlife is, whether they are protected or not (and why) and how to spot tracks, scat, etc.
- **Watersheds:** What is a watershed, where does this water come from, where is it going, what does it do along the way? What are the historical needs / uses / rights / availability of this water?
- **Arroyo geomorphology:** How do arroyos form, how do they change course, deepen, or aggrade? What role does soil quality and organic matter play? What is a healthy arroyo?
- **SSCAFCA mission statement:** Discuss what the Authority does. Why is this property important to SSCAFCA's mission?
- **Reclamation processes:** Discuss all the forces that result in the need for reclamation (compaction, drought, erosion, chemical seepage, dumping, etc.), what reclamation means, what it actually requires, how long reclamation processes take, etc.
- **Water harvesting:** Discuss how water harvesting can aid in water conservation (see section 4.4)

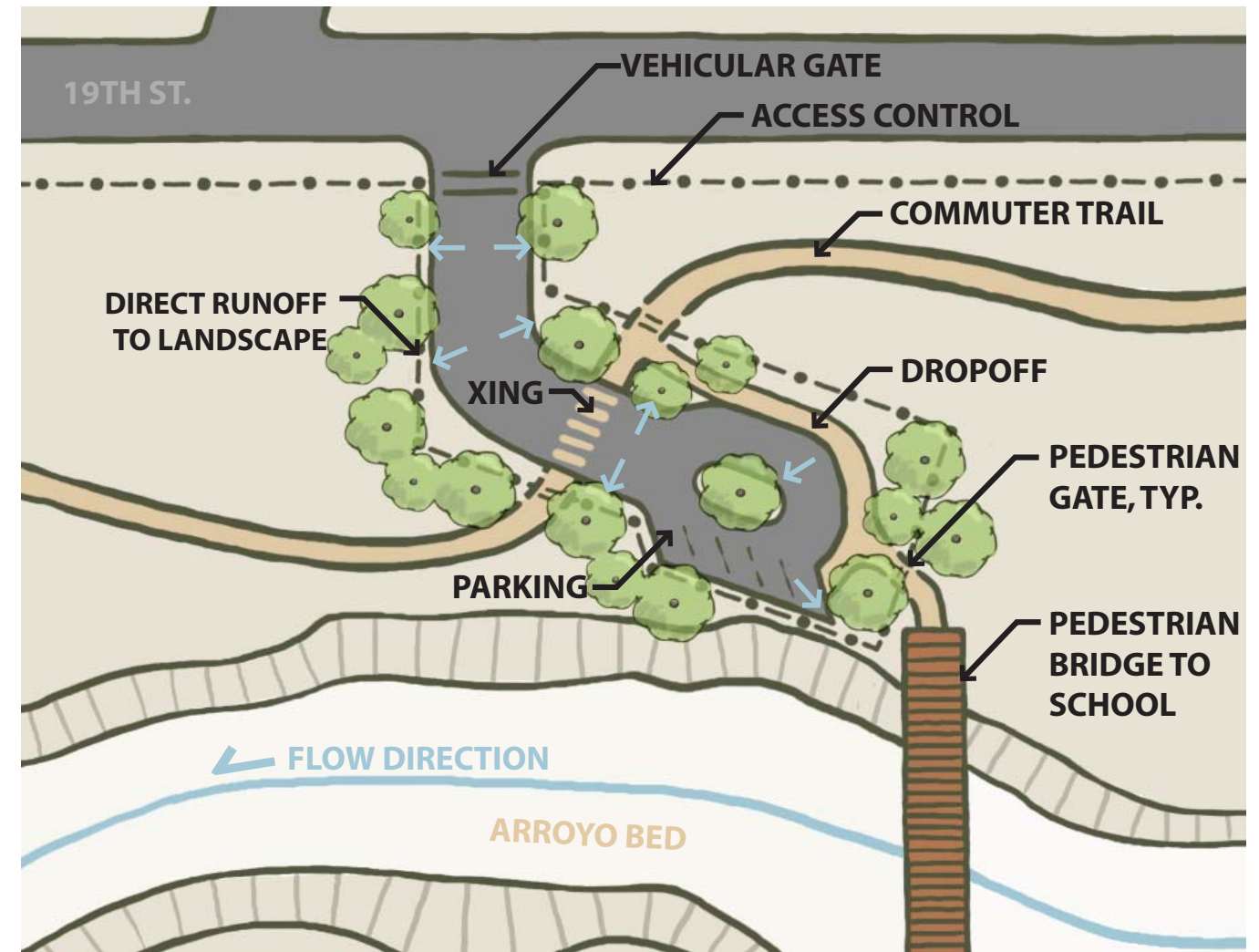
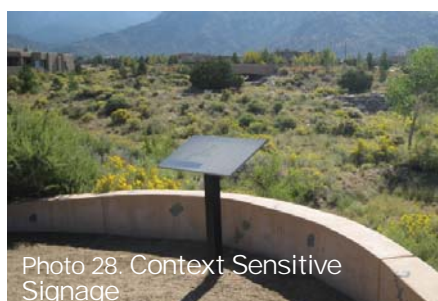
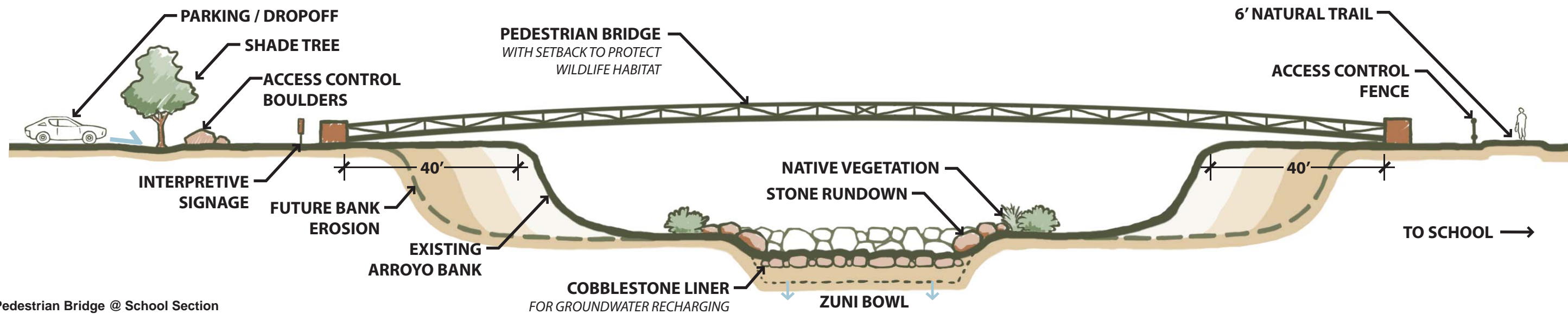


Figure 5. Parking Area



Pedestrian Bridge @ School Section

EXPERIENTIAL HABITAT

- RECLAMATION & REVEGETATION ACTIVITIES
- GEOCACHING
- ECOLOGICAL, BOTANICAL & BIOLOGICAL STUDY
- ENVIRONMENTAL MONITORING PROGRAM (SIMILAR TO BEMPs IN BOSQUE)
- NATURAL FRUITING TREES AND SHRUBS

NATURAL PLAY AREA

- ACTIVE PLAY (CLIMBING, BUILDING, EXPLORATION, ETC.)
- NATURAL PLAY STRUCTURES
- ARCHAEOLOGICAL "DIGS"

OUTDOOR CLASSROOM

- LECTURES, PERFORMANCES & OTHER EVENTS
- COMPOSTING AND GARDEN PLOTS
- BIRD HOUSES / BAT BOXES
- EROSION CONTROL DEMONSTRATION
- BUTTERFLY GARDEN
- STAR PARTIES

EXPERIENTIAL HABITAT

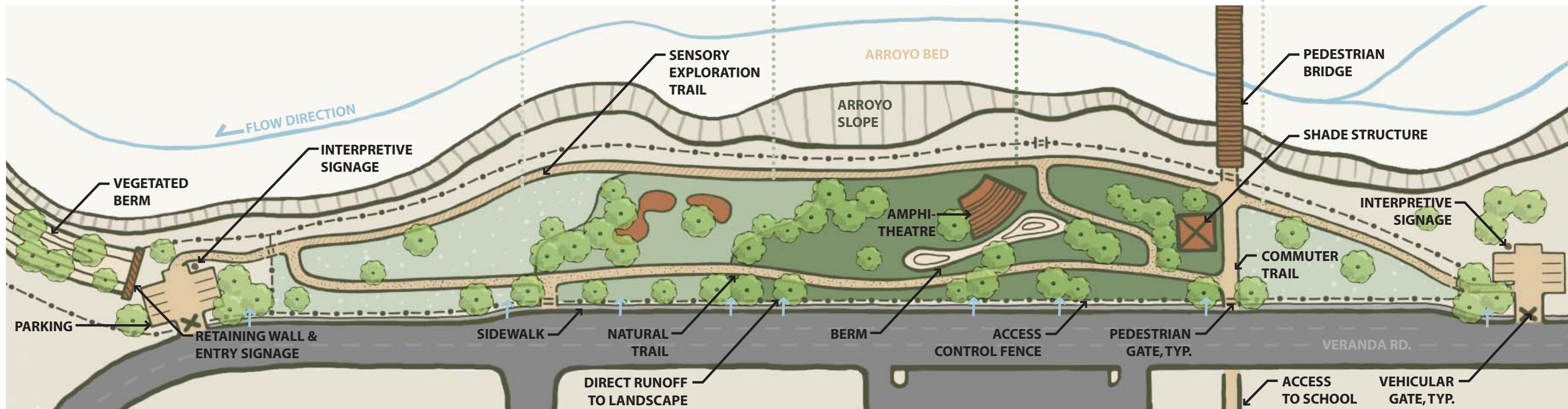


Figure 6. Education Area

4.3. Site Furnishings and Amenities

To encourage the use and enjoyment of the site, a number of amenities could be installed along the trail network to allow visitors to stop and rest, get out of the sun, have a picnic, or even get some exercise. Below we offer these concepts:

- Shade structures (Photo 29) have benefits even beyond providing much-needed shade; they can also collect rainwater and serve as landmarks / destinations along a trail. The aesthetics and construction of a structure can also reinforce an environmentally-conscious message related to the site. To illustrate this idea we have provided a drawing of a shade structure prototype that SCAFCFA intends to build at multiple sites throughout its watershed including the Black Arroyo Wildlife Park (see Figure 9).
- Site furnishings (Photo 30 and Photo 31) have similar qualities; by (re) using on-site (recycled concrete in photo) or contextually appropriate materials, the overall site character is maintained and even enhanced.
- Health and Wellness stations (Photo 32) at various points along the trail can encourage individuals or groups to participate in a variety of health-oriented activities, including stretching, plyometric, and body weight resistance exercises as well as yoga, Tai chi and other pursuits. These stations should also be materially and aesthetically integrated into the site as much as possible, using materials like concrete, wood, metal and crushed gravel.
- Trailheads (Photo 33) should be located at every vehicular access point to give visitors a point of entry, a memorable landmark, trash bins and dog stations to minimize site litter, and informational signage about/ maps of the site (Photo 34).
- Distance markers on trails could also be used to mark distances travelled by trail users.

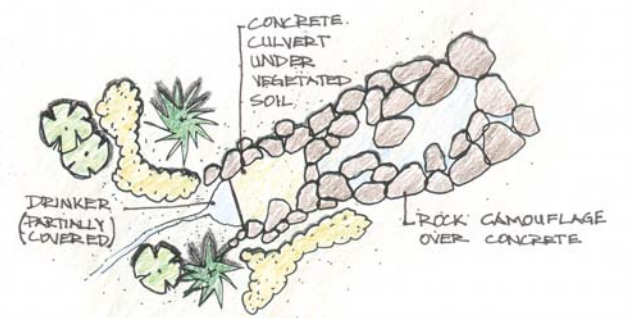


Figure 7. Wildlife Drinker

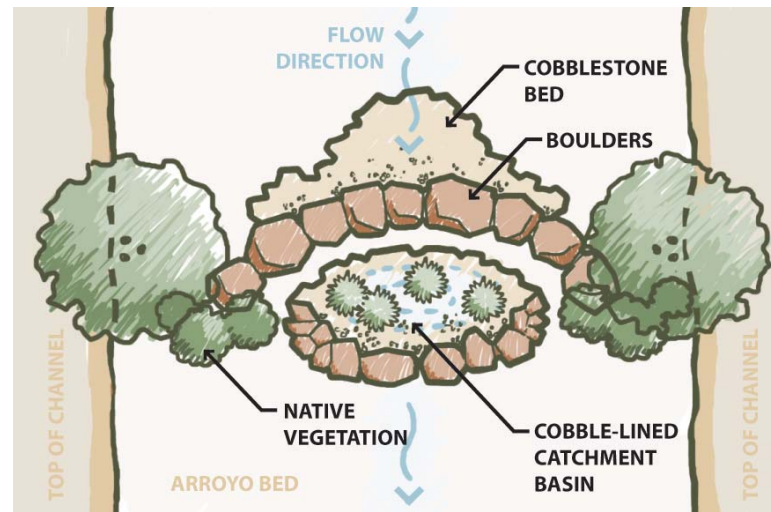


Figure 8. Zuni Bowl

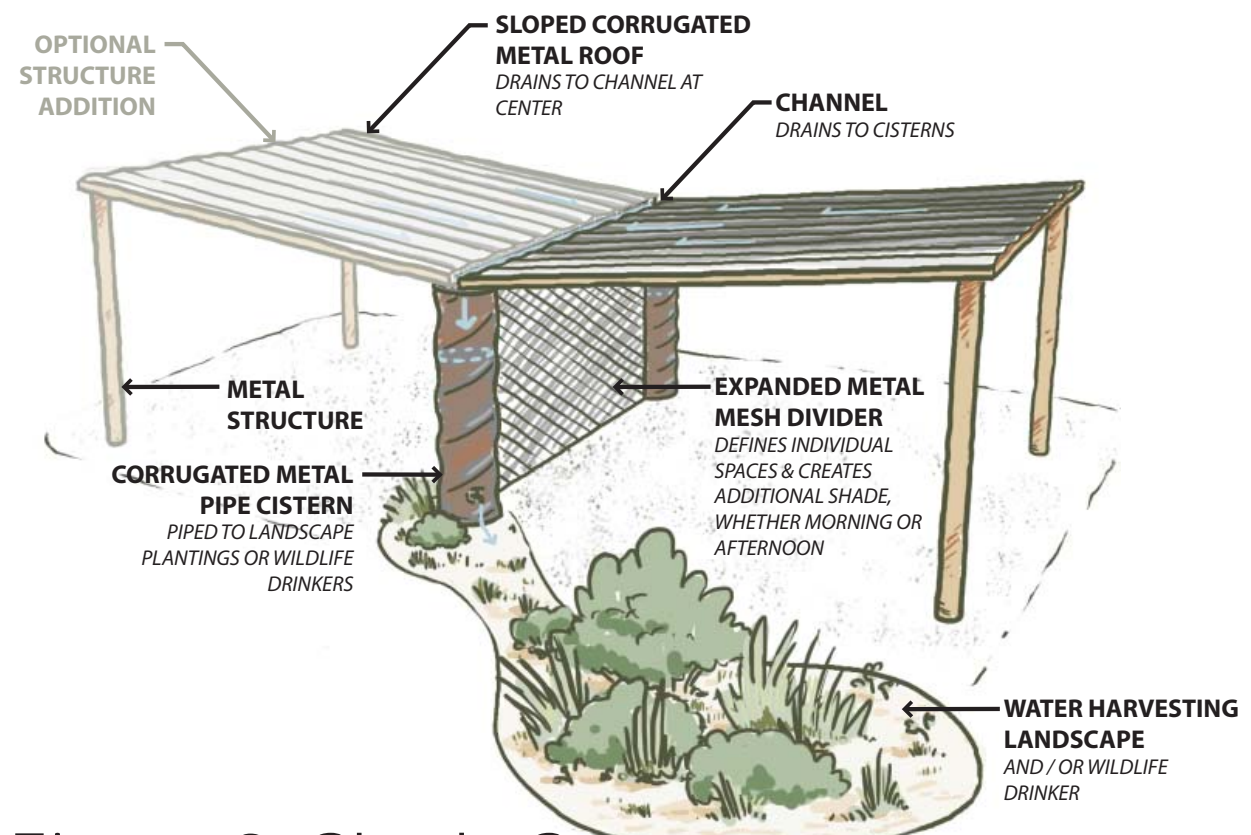


Figure 9. Shade Structure

4.4. Habitat Restoration and Watershed Management

This plan recognizes the environmental and aesthetic importance of maintaining Black Arroyo's natural character. However, current issues of erosion and disturbance indicate that targeted mitigation efforts are almost certainly required in order to maintain the health of the watershed and ecosystem. The addition of water harvesting features at a few key points along the channel could support additional vegetation and reduce arroyo bank erosion, all without necessitating more intrusive bank stabilization methods. "Zuni bowls (Figure 8)," and cross-vanes to mention a few, along with appropriately scaled check dams and drop structures that utilize green technologies to advance the mitigation efforts will help. Other concepts include scalable weir structures that help dissipate water energy, and that can be modified to allow for enough water saturation to support plant life along the sides of the bowl (Photo 35). Similar structures would also be beneficial where adjacent site runoff drains into the arroyo, as a number of erosive headcuts have formed along the arroyo banks and are threatening long-term channel stability.

“Wildlife drinkers” (Photo 36 and Figure 7) located at key points throughout the site could also serve local animal populations, as well as provide a venue for visitors to observe quail, rabbits, and others. Additionally, if constructed using water-harvesting and storage methods, these drinkers would be largely self-sustaining.

In the future SSCAFCA is currently planning to regrade the southeastern-most portion of the site along the arroyo, creating a large dam pool for increased water management capability (Figure 10). In conjunction with the dam project, specific site improvements and amenities could be installed to both decrease long-term maintenance and increase the efficiency of resource usage:

- A sediment forebay and cross vane structure just upstream of the dam pool will trap and settle sediment, debris, and heavy pollutants before they enter the basin, allowing for ease of maintenance over time. This pretreatment feature could be designed such that it integrates visually with the arroyo and with the smaller “Zuni Bowl” drop structures suggested elsewhere using natural boulders and rockwork indigenous to the westside.
- A “Grow-out” Nursery (Tree Farm Island) located within the dam pool itself could utilize the regular well water discharge to irrigate trees for parks and other facilities throughout the city. The suggested layout (Figure 10) would include a ring of mature trees to shade and protect saplings as they grow, and could potentially be integrated with the commuter trail to provide an inviting place to stop and rest along the way. SSCAFCA would likely need to coordinate responsibility for operations and maintenance of this facility with the City.

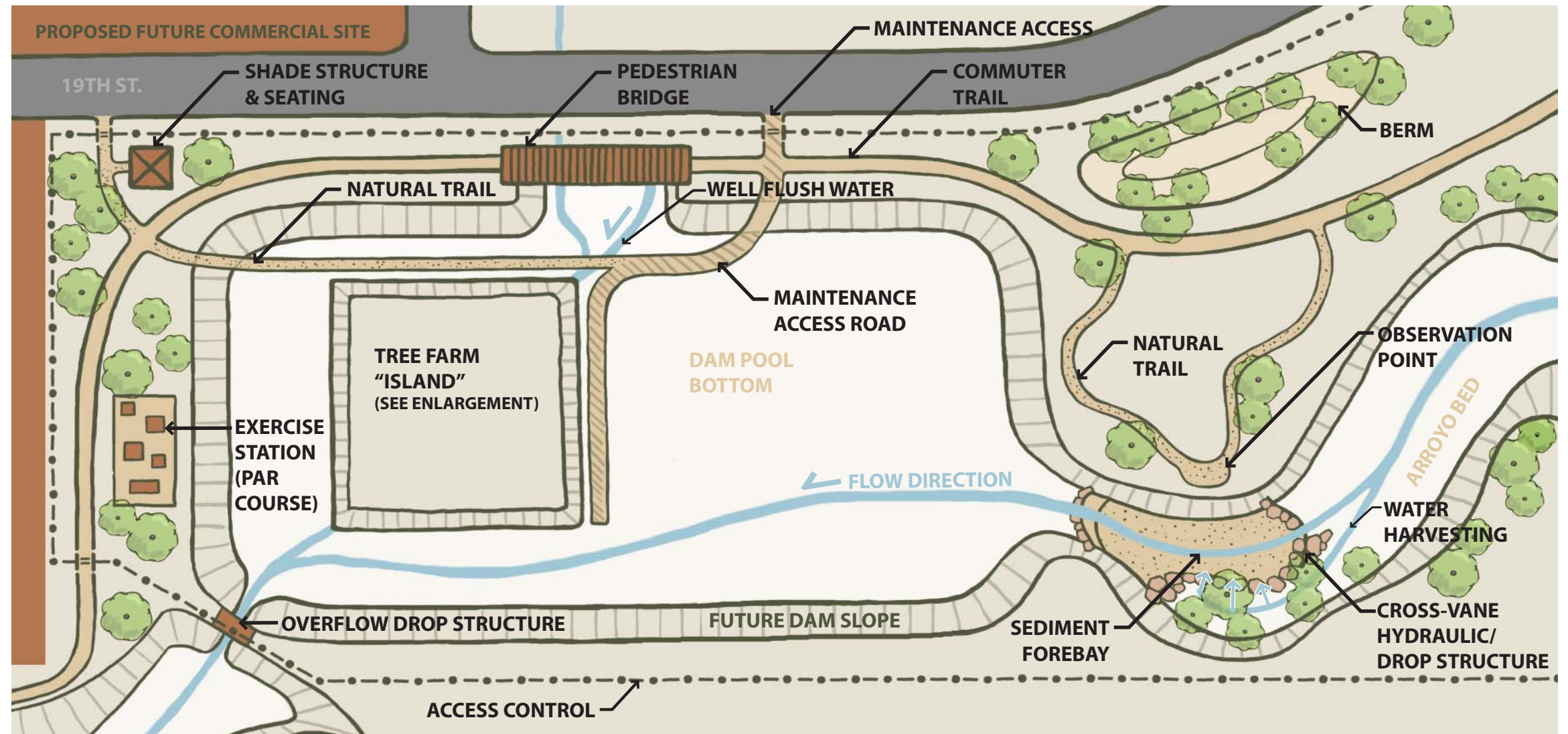
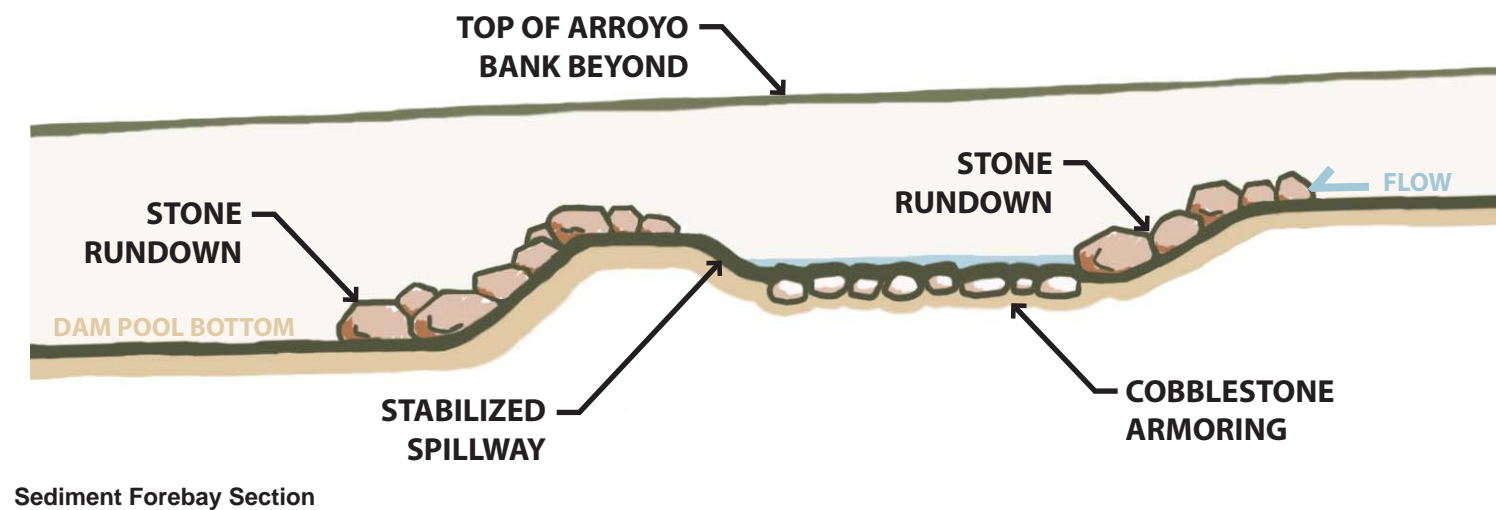
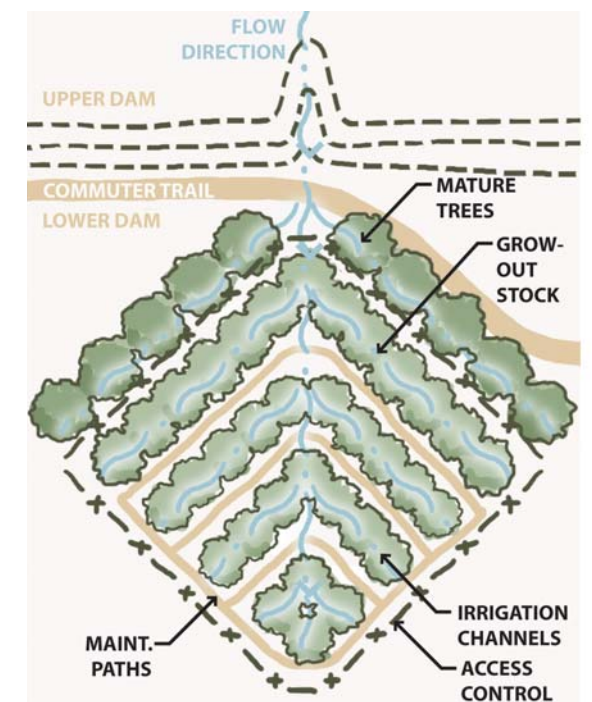


Figure 10. Dam Area



Sediment Forebay Section



Grow Out Nursery

5. Public Process

5.1. Identification of Public Interests

During the course of the project there were six stakeholder and public meetings held to inform the SSCAFCA Board and their constituents of the Master Plan and the Project. These meetings consisted of four Public/Stakeholder Meetings and two SSCAFCA Board Meetings. There was a substantial amount of interest in the project primarily from local residents, local developers and two departments from the City of Rio Rancho: Public Works; and Parks, Recreation and Community Services. During the meetings a number of concerns and directions came from attendees and we have included that input in aggregate below.

Trails

- Connect to existing trails and bikeways, including paved trail along Southern Boulevard, Cabezon subdivision trails, pedestrian facilities by Rust Med Center, and the informal trail along the arroyo bottom near 14th St.
- Create a Loop around the entire open space and cross the arroyo in places with a smaller ADA loop near the school. Some should be wider and more formal, others narrow and more interpretive. Dog walking trails would be good too.
- Crusher fines material would be good with portions of the trails using compacted fines for an ADA loop.
- Amenities could include dog buckets, benches, and shade structures.
- Landscaping of the trails is important for aesthetics but also for protecting people from the sun.
- Could there be a possible off-leash dog area?

Pedestrian access

- Pedestrians should be provided access across Unser and Southern (bridge or underpass?).
- Old cul-de-sacs should be reclaimed or gravelled.
- Should consider a pedestrian bridge over Unser for Cabezon.

Bridges over arroyos

- At least two bridges should be included in planning.
- One bridge should be right across from the school to provide access from the neighborhood to the west.

Interpretive features

- Include outdoor classroom areas
- Include interpretive signage and kiosks
- There should be arroyo overlook areas
- Should include wildlife blinds
- There should be art / sculpture

Wildlife habitat areas

- Primary area for wildlife is at north end of park in the proposed wildlife mitigation area.
- Burrowing Owls and the Bank Swallows live all along the arroyo – a large number of bank swallows down near Unser should be protected as a wildlife habitat area.
- Include bat houses
- There should be educational zones for the schools.

Recreational playing field down in area where new dam is planned

- Could there be volleyball area or soccer field – more of the latter are needed in Rio Rancho.
- Figure out how to use well flush water from water facility for irrigation.
- What is the role for the Rio Rancho Parks & Recreation?
- Acceptable uses should be defined.
- Playgrounds would not be acceptable.

Parking

- Could the cul-de-sacs be vacated?
- Will there be trailheads for users coming from outside the neighborhood?

Concerns

Coyotes

- Can we limit them into open space?

ATVs and fencing

- Natural fencing or boulders may be better than fencing that is too high-tech looking.
- ATVs are not wanted in the arroyos. The difficulty is keeping them out of the arroyo itself, not from the roads - they come up and down from other parts of the arroyo system. Currently city law allows ATVs!
- Use high tensile fencing from New Zealand

Maintenance

- Neighborhood associations are willing to help with maintenance.
- Keep Rio Rancho Beautiful should be enlisted with educational programs.
- Will Rio Rancho Parks and Recreation help out?
- Maggie Cordova is willing to help with maintenance through PTO.
- Blowing Sand – will it cover over the trails during spring?

Other Concerns

- Securing additional in-holding parcels and other arroyo bottom parcels, and restricting any further development within the open space area is important.
- Geo-Caching should be set up somewhere in the open space
- Water guzzlers should be installed
- Could Frisbee Golf be included?
- The Mitigation Zone must be protected
- Utilities: no utilities or pipelines should be allowed to go through the open space
- Keep arroyos natural!
- City would like a Grow-Out-Nursery

6. Implementation

6.1. Phasing

It is very possible that with enough support the Black Arroyo Wildlife Park could be designed and built as a single project perhaps with some cost sharing by agencies like the City of Rio Rancho and Rio Rancho Public Schools. However, due to the tight budgets and today's economy it is likely that the project will be completed as individual phases of work and as money becomes available the Open Space Park will be built. For that reason we have divided the implementation of the Park into discreet phases of work that can be built over time. Each phase was planned to work together to create as little overlap of construction as possible and the least amount of inter-phase disturbance. Following are the Phases of the project and included is a plan that illustrates phasing:

- **Phase I** – Phase I will include an entrance road with a drop off and parking area off of 19th Street along the west side of the Park. The phase of work will also include a hard surfaced commuter trail to school and the largest pedestrian bridge in the project. The funding for this phase of work is already in place and will likely be implemented in 2013.
- **Phase II** – it will be very important for the long term health of the Park to control access and buffer the facility from detrimental outside influences. For this reason Phase II will include access control devices (fencing and boulders), berms and naturalistic landscaping and the reclamation of cul-de-sacs that have already been graded in the past but not used for access as recommended in this Master Plan.
- **Phase III** – following protection of the Park it will be important to create the trail network recommended in the Master Plan to further protect interior spaces of the Park from detrimental activities and the un-directed and haphazard use of the facility. Phase III will include the design and construction of the Parks trails, the par course, the additional bridges associated with the trails, and wildlife drinkers (outside of the arroyo bed) and amenities such as signage and shade structures.
- **Phase IV** – the Arroyo system within Black Arroyo Wildlife Park is controlled by both upstream and downstream structures. Therefore the last improvements to be built in the Park will be the naturalistic channel enhancements such as the Zuni Bowls, Cross Vanes, the Forebay and likely the Dam Improvement project that will be built in the future for flood control (since the dam has not been planned as yet we have not included its cost in the cost estimate section of the Master Plan following).
- **Phase V** – the last phase of the Wildlife Park will be the Education Oriented Open Space. It is possible that this portion of the project specifically would be cost shared with Rio Rancho Public Schools because of the obvious connection to Maggie Cordova Elementary. This work would include parking and trails, the various subzones within the educational space, the amphitheater and the outdoor classrooms.

6.2. Cost Estimate

On this page we have provided a preliminary cost estimate of project improvements based on the master plan. We have divided the estimate into the phases of project implementation described in the previous section of the Master Plan.

Phase 1: Pedestrian Bridge and Drop-off Improvements

Project Initiation:	\$12,000
Landscape and Landform:	\$19,000
Hardscape & Other:	\$11,000
Architectural:	\$120,000
Subtotal:	\$162,000
20% Contingency	\$32,000
GRT (7.4375%)	\$14,000

Phase 1 Total: \$208,000

Phase 2: Access Control, Perimeter Landscape and Berms

Project Initiation:	\$31,000
Landscape and Landform:	\$117,000
Hardscape & Other:	\$295,000
Subtotal:	\$443,000
20% Contingency	\$89,000
GRT (7.4375%)	\$39,000

Phase 2 Total: \$571,000

Phase 3: Site Amenities

Project Initiation:	\$11,000
Landscape and Landform:	\$21,000
Hardscape & Other:	\$282,000
Architectural:	\$230,000
Subtotal:	\$544,000
20% Contingency	\$109,000
GRT (7.4375%)	\$48,000

Phase 3 Total: \$701,000

Phase 4: Arroyo Improvements

Project Initiation:	\$9,000
Landscape and Landform:	\$75,000
Hardscape & Other:	\$50,000
Subtotal:	\$134,000
20% Contingency	\$26,800
GRT (7.4375%)	\$11,960

Phase 4 Total: \$173,000

Phase 5: Education-Oriented Open Space

Project Initiation:	\$14,000
Landscape and Landform:	\$36,000
Hardscape & Other:	\$463,000
Architectural:	\$55,000
Subtotal:	\$568,000
20% Contingency	\$114,000
GRT (7.4375%)	\$50,000

Phase 5 Total: \$732,000

Grand Total: \$2,380,000

Extended version of cost estimate is included as Exhibit 1 on the following page.

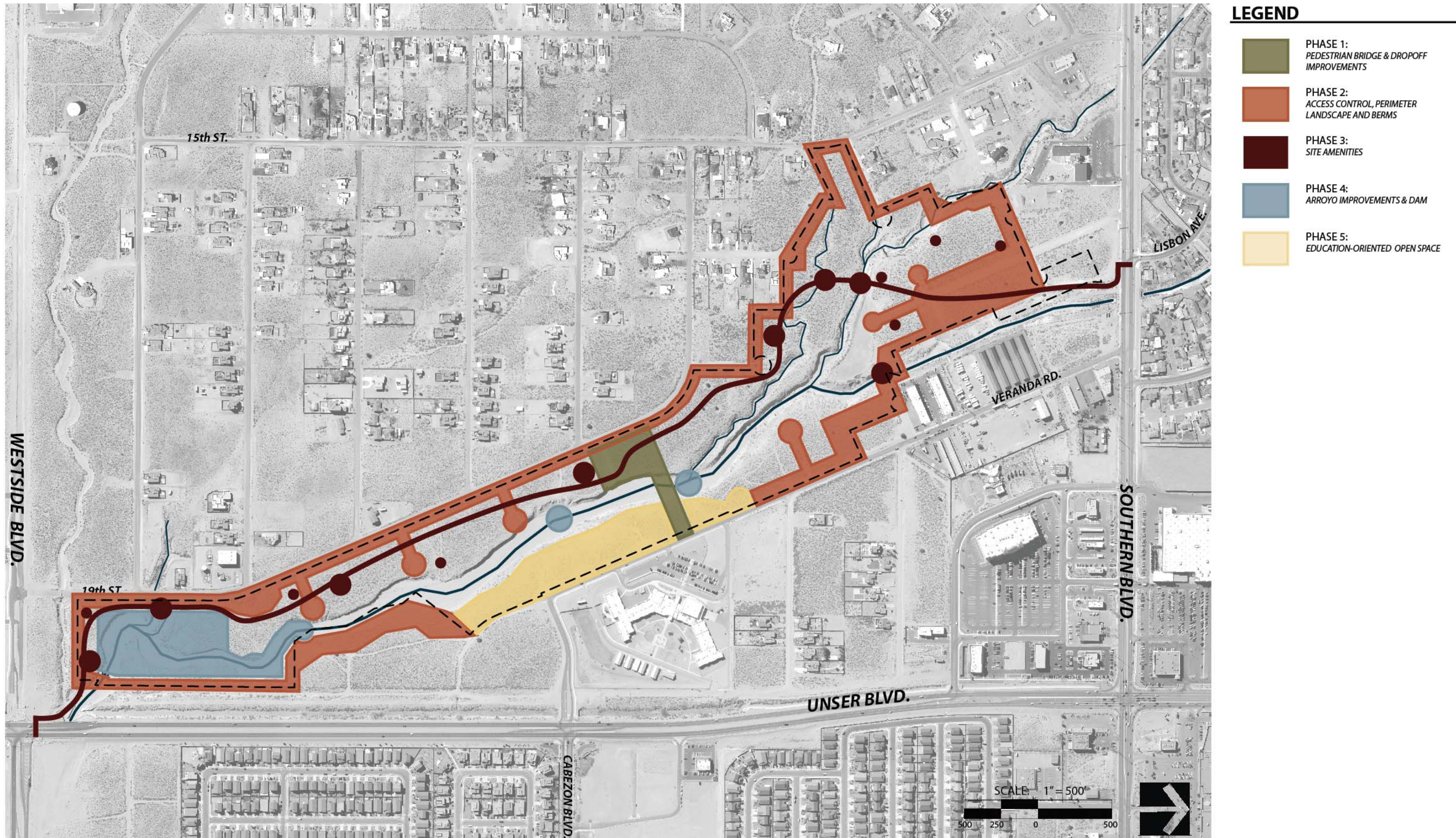


Figure 11. Phasing Diagram

Exhibit 1. Preliminary Cost Estimate

Item Description	Unit	Estimated Quantity	Unit Cost	Total Cost
PHASE 1 - PEDESTRIAN BRIDGE & DROPOFF IMPROVEMENTS				
GENERAL PROVISIONS				
1 MOBILIZATION	LS	1	\$ 4,000.00	\$ 4,000.00
2 NPDES Compliance, CIP (SWPPP)*	LS	1	\$ 4,000.00	\$ 4,000.00
DEMOLITION				
3 Remove and Dispose Existing Materials	SF	1,600	\$ 1.50	\$ 2,400.00
4 Clearing and Grubbing	SF	4,000	\$ 0.25	\$ 1,000.00
GRADING				
5 Regrade new drive and additional disturbed areas	CY	1,200	\$ 9.00	\$ 10,800.00
ARCHITECTURAL				
6 Pedestrian bridge (bridge, abutments and arch. Reticulation) @ arroyo, C.I.P.	LS	1	\$ 120,000.00	\$ 120,000.00
HARDSCAPE				
7 Base Course Drive and Parking	SF	2,000	\$ 2.00	\$ 4,000.00
8 Asphalt Commuter Trail	SF	2,800	\$ 2.50	\$ 7,000.00
PLANTING				
9 Trees, 2" caliper	LS	1	\$ 6,000.00	\$ 6,000.00
10 Native Grass Revegetation Seeding	SF	4,500	\$ 0.20	\$ 900.00
IRRIGATION				
11 Driwater Irrigation Allowance	LS	1	\$ 1,500.00	\$ 1,500.00
				Subtotal*** \$ 161,600.00
				20% Contingency \$ 32,320.00
				Subtotal \$ 193,920.00
				GRT 7.4375% \$ 14,422.80
				PH 1 GRAND TOTAL \$ 208,342.80
PHASE 2 - ACCESS CONTROL, PERIMETER LANDSCAPE & BERMS				
GENERAL PROVISIONS				
17 MOBILIZATION	LS	1	\$ 6,000.00	\$ 6,000.00
18 NPDES Compliance, CIP (SWPPP)*	LS	1	\$ 4,000.00	\$ 4,000.00
DEMOLITION				
19 Remove and Dispose Existing Materials at Cul-de-sacs	SF	9,500	\$ 1.50	\$ 14,250.00
20 Clearing and Grubbing	AC	5	\$ 1,300.00	\$ 6,500.00
GRADING				
21 Regrade Disturbed Areas	SY	15,000	\$ 0.50	\$ 7,500.00
22 Berm Grading	CY	2,500	\$ 15.00	\$ 37,500.00
HARDSCAPE / OTHER				
23 3-Strand Smooth Wire Fencing**	LF	6,500	\$ 6.25	\$ 40,625.00
24 Access Control Landscape Boulders**	EA	1,200	\$ 200.00	\$ 240,000.00
25 Pedestrian Access Control Gates	EA	11	\$ 500.00	\$ 5,500.00
26 Vehicular Access Control Gates	EA	6	\$ 700.00	\$ 4,200.00
27 Arroyo Access Control Structure, concrete	EA	1	\$ 4,000.00	\$ 4,000.00
PLANTING				
28 Trees, 2" caliper	LS	1	\$ 30,000.00	\$ 30,000.00
29 Native Grass Revegetation Seeding	SF	110,000	\$ 0.20	\$ 22,000.00
IRRIGATION				
30 Driwater & Wicks Irrigation Allowance	LS	1	\$ 20,000.00	\$ 20,000.00
				Subtotal*** \$ 442,075.00
				20% Contingency \$ 88,415.00
				Subtotal \$ 530,490.00
				GRT 7.4375% \$ 39,455.19
				PH 2 GRAND TOTAL \$ 569,945.19

PHASE 3 - TRAILS, BRIDGES, SHADE STRUCTURES & WELLNESS STATIONS				
GENERAL PROVISIONS				
36 MOBILIZATION	LS	1	\$ 6,000.00	\$ 6,000.00
37 NPDES Compliance, CIP (SWPPP)*	LS	1	\$ 4,000.00	\$ 4,000.00
DEMOLITION				
38 Clearing and Grubbing	AC	0.5	\$ 1,300.00	\$ 650.00
GRADING				
39 Grading for trails and amenities	SY	18,000	\$ 0.50	\$ 9,000.00
HARDSCAPE / OTHER				
40 Stabilized Crusher fines (ADA Multi-Use Nature Trail)	SF	36,000	\$ 2.50	\$ 90,000.00
41 Asphalt Commuter Trail	SF	72,000	\$ 2.50	\$ 180,000.00
42 Water Harvesting Shade Structures	EA	3	\$ 20,000.00	\$ 60,000.00
43 Wellness Stations, C.I.P.	LS	1	\$ 50,000.00	\$ 50,000.00
44 Bridges	EA	3	\$ 40,000.00	\$ 120,000.00
45 Wildlife Drinkers	EA	4	\$ 1,000.00	\$ 4,000.00
46 Interpretive Signage	EA	10	\$ 800.00	\$ 8,000.00
PLANTING				
47 Water Harvesting Landscape (shrubs and grasses), incl. Driwater Irrigation	SF	1,800	\$ 1.00	\$ 1,800.00
48 Native Grass Revegetation Seeding	SF	50,000	\$ 0.20	\$ 10,000.00
				Subtotal*** \$ 543,450.00
				20% Contingency \$ 108,690.00
				Subtotal \$ 652,140.00
				GRT 7.4375% \$ 48,502.91
				PH 3 GRAND TOTAL \$ 700,642.91

PHASE 4 - ARROYO IMPROVEMENTS				
GENERAL PROVISIONS				
54 MOBILIZATION	LS	1	\$ 4,000.00	\$ 4,000.00
55 NPDES Compliance, CIP (SWPPP)*	LS	1	\$ 4,000.00	\$ 4,000.00
DEMOLITION				
56 Clearing and Grubbing	AC	0.25	\$ 1,300.00	\$ 325.00
GRADING				
57 Regrade Arroyo Drainage (at location of improvements)	CY	4,500	\$ 15.00	\$ 67,500.00
HARDSCAPE / OTHER				
58 Zuni Bowl Construction, C.I.P.	EA	4	\$ 5,000.00	\$ 20,000.00
59 Sediment Forebay (and Cross-Vane Structure), C.I.P.	EA	1	\$ 30,000.00	\$ 30,000.00
PLANTING				
60 Trees, 2" caliper	LS	1	\$ 2,000.00	\$ 2,000.00
61 Shrubs, 5 Gal.	LS	1	\$ 2,000.00	\$ 2,000.00
IRRIGATION				
62 Driwater Irrigation Allowance	LS	1	\$ 3,000.00	\$ 3,000.00
				Subtotal*** \$ 132,825.00
				20% Contingency \$ 26,565.00
				Subtotal \$ 159,390.00
				GRT 7.4375% \$ 11,854.63
				PH 4 GRAND TOTAL \$ 171,244.63

PHASE 5 - EDUCATION-ORIENTED OPEN SPACE				
GENERAL PROVISIONS				
68 MOBILIZATION	LS	1	\$ 5,000.00	\$ 5,000.00
69 NPDES Compliance, CIP (SWPPP)*	LS	1	\$ 4,000.00	\$ 4,000.00
DEMOLITION				
70 Remove and Dispose Existing Materials	SF	2,400	\$ 1.50	\$ 3,600.00



GRADING						
72	Regrade new drives and additional disturbed area	SY	1,800	\$	0.50	\$ 900.00
73	Berm @ Amphitheatre	CY	400	\$	15.00	\$ 6,000.00
ARCHITECTURAL						
74	Amphitheater	EA	1	\$	15,000.00	\$ 15,000.00
75	Water Harvesting Shade Structure	EA	1	\$	20,000.00	\$ 20,000.00
76	Natural Play Structures	LS	1	\$	20,000.00	\$ 20,000.00
HARDSCAPE / OTHER						
77	Base Course Drive and Parking	SF	3,000	\$	2.00	\$ 6,000.00
78	Stabilized Crusher fines (Multi-Use Trail)	SF	168,000	\$	2.50	\$ 420,000.00
79	Asphalt Commuter Trail	SF	1,400	\$	2.50	\$ 7,500.00
80	Access Control Fencing	LF	1,600	\$	6.25	\$ 10,000.00
81	Pedestrian Access Control Gates	EA	4	\$	500.00	\$ 7,500.00
82	Retaining Wall @ Berm	LF	50	\$	50.00	\$ 7,500.00
83	Interpretive Signage	EA	4	\$	800.00	\$ 3,200.00
PLANTING						
84	Trees, 2" caliper	LS	1	\$	20,000.00	\$ 20,000.00
85	Native Grass Revegetation Seeding	SF	14,000	\$	0.20	\$ 2,800.00
IRRIGATION						
86	Driveway Irrigation Allowance	LS	1	\$	6,000.00	\$ 6,000.00
87					Subtotal***	\$ 565,650.00
88					20% Contingency	\$ 113,130.00
89					Subtotal	\$ 678,780.00
90					GRT 7.4375%	\$ 50,484.26
91					PH 5 GRAND TOTAL	\$ 729,264.26
92					GRAND TOTAL (All Phases)	\$ 2,379,439.80

93 **Assumptions:**
 * SWPPP only necessary if more than 1 acre disturbed.
 94 ** Access control assumes boulders at 50% and post/wire fence at 50% of total perimeter length.
 95 *** Design and Survey Fees not included in estimate
 96 Cost for Dam improvements not included. Dam improvements will be the subject of a future study.