PRELIMINARY ENGINEERING REPORT
LOWER MONTOYAS WATER QUALITY FEATURE

Prepared by:
Southern Sandoval County Arroyo Flood Control Authority

Date: January 7, 2014

TABLE OF CONTENTS

List of Figures:

List of Tables:

List of Appendices:

1.0 Project Planning

The Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) is a quasi-governmental agency formed in the early 1990s for the purpose of flood control in the rapidly growing urban area contained in the southeastern corner of Sandoval County. The geographic boundaries of SSCAFCA's jurisdiction are bounded by the Bernalillo-Sandoval county line to the south, the Rio Grande to the east, U.S. Highway 550 to the north, and the boundary between the Rio Puerco and Rio Grande watersheds to the west.

The vast majority of the infrastructure under SSCAFCA's jurisdiction is unlined arroyo in its natural condition. Development within the various watersheds under SSCAFCA's jurisdiction has caused the natural arroyo system to degrade as stormwater flows increased in both velocity and quantity due to additional impervious surface within each watershed. This is aggravated by the changing nature of the storm flows as well, as flows from developed areas tend to carry less sediment and more man-made contaminants.

From our inception as the Corrales Watershed District, SSCAFCA has long held the goal of maintaining the arroyo systems in their natural state as much as possible, which is reflected in our Mission Statement and in the facilities that have been constructed to date. Of all the facility improvements completed to date, SSCAFCA only owns a total of 7,000 linear feet of traditional concrete hard-lined channel, which was constructed by the Soil Conservation Service and turned over to our stewardship in 1988.

SSCAFCA has also long been a proponent of using Low Impact Development (LID) components within the watersheds under its jurisdiction as a means for controlling the destructive nature of stormwater and putting stormwater to beneficial use by watering landscaping and providing additional habitat for wildlife. To SSCAFCA's knowledge, the usage of LID on a large scale within a large arroyo to provide flood protection has not been attempted in New Mexico. The proposed project is an attempt at providing flood protection using this type of methodology.

1.1 Location

The proposed project is located in the northwest quarter of the Village of Corrales, Sandoval County, New Mexico. The approximate center of the western (upper) tract of land in the project is 35.2559^{o} latitude and -106.6289^{o} longitude. The approximate center of the eastern (lower) tract of land in the project is 35.2568^{o} latitude and -106.6178^{o} longitude. A roadmap to the project site is located in Figure 1.

Figure 1: Roadmap to site

1.2 Environmental Resources Present

A complete copy of the Biological and Cultural Resources Report is located in Appendix A of this document. The following excerpts have been taken from the Biological and Cultural Resource Report authored by Marron and Associates for SSCAFCA which summarize the project area description and the conclusions of the biological and cultural surveys:

> "The SSCAFCA project area lies within the Mexican Highland Section of the Basin and Range Physiographic Province. The area is part of the Albuquerque Basin of Central New Mexico. It is transected by the Arroyo de los Montoyas, one of several substantial arroyos draining to the Rio Grande. The project area has an arid, continental climate characterized by low rainfall, warm summers, and mild winters. The average elevation is approximately 1,586 m (5,205 ft) above mean sea level.
>
> There are two soil associations in the project area. One is the Sheppard loamy fine sand with 8 to 15 percent slopes, and the other is Sheppard loamy fine sand with 3 to 8 percent slopes. The Sheppard loamy fine sand with 8 to 15 percent slopes makes up approximately one percent of the project area. It occurs in dunal areas and consists of aeolian sands derived from sandstone. This soil is deep and somewhat excessively drained. The Sheppard loamy fine sand with 3 to 8 percent slopes makes up approximately 99 percent of the project area. This soil also occurs in

dunal areas, consists of aeolian sands derived from sandstone, and is deep and somewhat excessively drained.

The project area occurs adjacent within a disturbed Plains Mesa Sand Scrub vegetation community. Much of the project area is denuded of vegetation. Within vegetated areas, the dominant plant species present are sand sage (Artemisia filifolia), four-wing saltbush (Atriplex canescens), rabbitbrush (Ericameria nauseosa), yucca (Yucca glauca), broom dalea (Psorothamnus scoparius), and snakeweed (Gutierrezia sarothrae).

Formerly, the Rio Grande and its associated marshes (approximately 1.13 miles to the east of the project site) supported to a wide variety of fish and aquatic birds and mammals. The river valley is a central flyway for migratory birds such as ducks, geese, shorebirds, and wading birds. Raptors, such as hawks, owls, and eagles, hunt the valley. Various mammalian species, including cottontail, jackrabbit, prairie dog, beaver, muskrat, coyote, fox, raccoon, badger, and mule deer, occur in the area.

Marron and Associates (Marron) conducted biological surveys of the lower segment (17.59 acres) on January 11 and 25, 2013. Subsequently, Marron completed biological surveys of the upper segment on March 8, 2013 (Figure 10). The purpose of these biological surveys was to identify biological resources that may be impacted by the project. Examples of such biological resources include Federal or State of New Mexico protected plant and wildlife species, migratory birds, and general vegetation or wildlife concerns. References and databases containing information on biological resources in the project area were reviewed prior to the survey, including lists of federal and state protected species.

The conclusions and recommendations of the biological surveys are as follows: The project area covers approximately 36.36 acres. Approximately 75 percent of the lower segment is devoid of vegetation. Approximately 40 percent of the upper segment is also devoid of vegetation. Both plant and wildlife diversity was very low. However, a probable colony of bank swallows was detected within the upper segment. There are no federal or state protected or monitored species within the project limits, but a large number of burrows suitable for use by western burrowing owl occur within the upper segment. Although no western burrowing owls were present at the time of the survey, these burrows could be utilized in the upcoming spring or summer. Suitable habitat for the Rio Grande silvery minnow and the Rio Grande sucker exists a little more than a mile downstream of the lower segment and could be indirectly affected if accidental spills of petrochemicals occurred during construction.

Marron conducted cultural resource survey of the project area on January 23 and March 12, 2013. The work was conducted under New Mexico State Permit No. NM 13-160-S. Marron also searched existing inventory. The findings of the survey are as follows:

- Sites discovered and registered: 0
- Sites discovered and NOT registered: 0
- Previously recorded sites revisited: 0
- Previously recorded sites not relocated: 0

- Total Sites Visited: 0
- Total isolates recorded: 0
- Total structures recorded: 0

The site file search indicated two previously recorded sites in the area. Also, ten previous surveys were completed within 500 m of the project area. The previously recorded sites are outside the project area and will not be affected.

Three isolated occurrences were observed within the project area. The isolated occurrences are either flakes or a core, and all are made of chalcedony. No further treatment is recommended.

1.3 Population Trends

Corrales has experienced substantial population growth since 1970 (Table 1). In 1970, the village's population was 1,776. Within the next decade, Corrales added more than 1,000 people to attain a population of 2,791 in 1980. The following decade had another large increase of more than 2,600, reaching a population of 7,334. Much of this increase was due to large village annexations in the western and southern parts of the village. The population is expected to exceed 10,000 by the year 2030. Future population growth should not be as rapid as the past decades since the availability of vacant land for development is limited.

Table 1 : Corrales Population Trends 1970 - 2030

Year	Population
1970	1,776
1980	2,791
1990	5,453
1995	6,873
2000	7,334
2010	8,329
2030	10,126

Source: U.S. Census Bureau (2013); Village of Corrales (2012) ”

1.4 Community Engagement

The proposed project is part of a three component solution to potential flooding issues along the Montoyas Arroyo as it runs through the Village of Corrales (Corrales). The components of the comprehensive improvements plan to mitigate the flooding issue are the *Harvey Jones Channel (HJC) Improvements* at the east end of the Montoyas Arroyo, the *Lower Montoyas Water Quality Feature* (**this project**) at the west end of the concrete lined HJC, and the *Dulcelina Curtis (aka Lomitas Negras) Water Quality Feature* on the Lomitas Negras tributary arroyo north of this proposed project. All three of these projects are necessary to complete the comprehensive strategy for mitigating flooding potential in Corrales. See Figure 2.

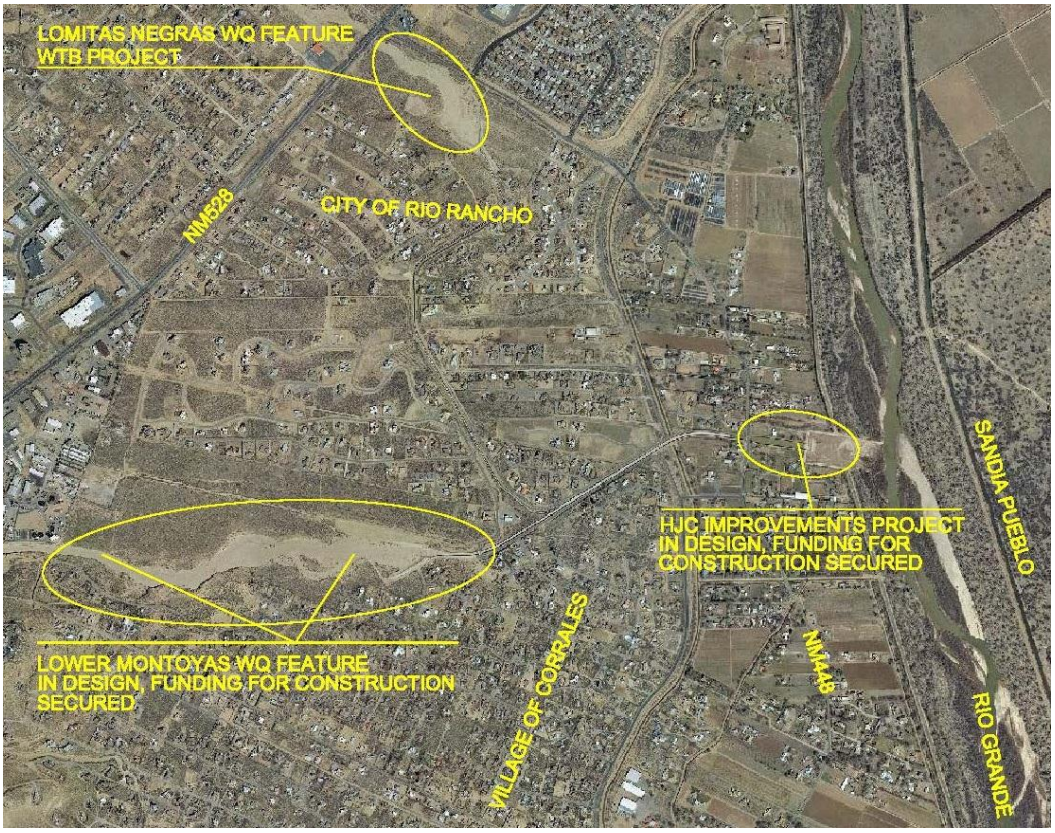

Figure 2: Facilities required to implement Montoyas Arroyo strategy

The first component of the strategy that SSCAFCA addressed was the reconfiguration of the HJC at the east end of the channel. A comprehensive public outreach campaign was initiated to discuss not just that particular component of the strategy but to also discuss the complimentary two projects (Lower Montoyas and Lomitas Negras water quality features) to help mitigate flooding potential in Corrales.

On November 26, 2012, SSCAFCA hosted an agency coordination meeting on the HJC project. Twelve agencies, including the Mayor of the Village of Corrales, with interest in the project attended the meeting. In addition to discussions about the HJC project in particular, the complimentary water quality projects were presented to the gathered agencies. All agencies appeared to agree with the overall strategy of removing sediment from stormwater flows (via the proposed water quality features). A sign-in sheet for this meeting is located in Appendix B.

On December 12, 2012, SSCAFCA hosted a public meeting at the Village of Corrales Village Hall. The comprehensive strategy for mitigating flooding along the Montoyas Arroyo was discussed at this meeting along with the project particulars of the HJC improvement project. All persons attending the meeting appeared in favor of the comprehensive approach to dealing with the potential flooding issue. The public advertisement for this meeting is located in Appendix C.

On July 30, 2013, SSCAFCA staff attended a work-study session with the Corrales Village Council and briefed the Council on the status of the projects associated with implementing the strategy along the

Montoyas Arroyo. The Council was pleased with the progress SSCAFCA had made on all of the proposed projects associated with implementing the comprehensive strategy along the Montoyas Arroyo.

On August 9, 2013, SSCAFA's consulting engineers presented the alternatives analysis to the SSCAFCA Board of Directors in their regularly scheduled public Board meeting. The agenda for this meeting is located in Appendix D.

In mid-January 2014, SSCAFCA is planning on holding a second public meeting at the Corrales Village Hall on the HJC improvements project, where the comprehensive strategy, including the Lower Montoyas Water Quality facility project, will be discussed with the public a second time.

In late January 2014, SSCAFCA is planning on holding a public hearing on the proposed Lower Montoyas Water Quality Feature project. Public input on the project will be taken at that time and responses to any public input will be made part of the record for this project.

2.0 Existing Facilities

2.1 Location Map

The proposed project is located in the northwest sector of the Village of Corrales. Currently, there are no existing constructed facilities within the project location, aside from the constructed concrete inlet to the HJC. There are no proposed modifications to the inlet to this channel as part of the Lower Montoyas Water Quality feature project. However, it should be noted that the concrete structure at the inlet to the HJC was constructed in 1988 by the U.S. Soil Conservation Service and that it is excellent condition. A map of the project location is contained in Figure 2, above.

2.2 History

The proposed project site is currently a natural arroyo channel. Aside from the inlet to the HJC, there have been no modifications to the arroyo along this reach. Photographs if the project site are located in Figures 3 through 5.

Figure 3: Western project area looking east

Figure 4: Eastern project area looking southeast

Figure 5: Eastern project area facing southwest

2.3 Condition of Existing Facilities

The existing, unimproved arroyo channel is a wide, sandy bottom arroyo. The capacity of the channel is sufficient to convey the 100-year, 24-hour storm event flows. However, the flows from this level of event currently carry a large amount of sediment within the stormwater stream. The sediment passing through the channel causes significant issues with conveying stormwater through the eastern portion of the Harvey Jones Channel.

In December 2011, SSCAFCA completed an update to the Montoyas Arroyo Watershed Park Management Plan. This publically reviewed plan identifies projected flow rates in the watershed for the design storm event, in this case the 100-year, 24-hour storm event using a U.S. Corps of Engineers design software called HEC-HMS. With this flow rate information in hand, recommendations on improvements to existing facilities are identified in the plan to meet identified deficiencies in flood control facilities. The Lower Montoyas Water Quality Feature is identified in the plan as a high priority facility needing to be constructed to mitigate flooding potential in Corrales.

In addition to the need to mitigate flooding potential, the Environmental Protection Agency has recently issued a draft Watershed Based NPDES permit for Municipal Separate Storm Sewer Systems (MS4s) in the middle Rio Grande valley. The draft MS4 permit specifically identifies sediment reduction in stormwater as a requirement.

2.4 Financial Status of any Existing Facilities

Since there are currently no constructed facilities in the project area, aside from periodic clearing of sediment at the inlet to the HJC, there are no other maintenance activities needed at this facility. Prior to each monsoon season and after each monsoon season, SSCAFCA clears any sediment accumulated at the inlet to the channel. The approximate cost for this routine maintenance is $3,000 per year. SSCAFCA maintains an operational budget for clearing sediment from all of its facilities.

In addition to the periodic, scheduled maintenance, SSCAFCA clears sediment from the inlet after each significant storm event. SSCAFCA maintains a $1,000,000 reserve fund for large storm clean-out activities.

SSCAFCA has fee simple ownership on the lower project area and has a drainage and maintenance easement from the Village of Corrales on the upper portion of the project area.

2.5 Water/Energy/Waste Audits

Not applicable to this project.

3.0 Need for Project

3.1 Health, Sanitation and Security

The primary need for this project is to ensure that the HJC continues to have capacity to pass stormwater flows from the upper reaches of the watershed through the Village of Corrales to the Rio Grande. One of the primary issues that may interfere with this ability is the large volume of sediment that can become trapped within the channel near the outfall of the channel. As demonstrated in storm events in 2006 (See Figures 6 and 7), again in 2010 (See Figures 8 and 9), and most recently in 2013 (See Figured 10 and 11), once sediment enters the HJC, it can quickly degrade the hydraulic capacity of the channel to convey the stormwater safely to the Rio Grande.

Figure 6: 2006 – Hydraulic jump occurring at Corrales Road bridge

Figure 7: 2006 – Post storm sediment removal at Corrales Road bridge

Figure 8: 2010 – Sediment deposition under Corrales Road bridge

Figure 9: 2010 – Sediment removal upstream of Corrales Road bridge

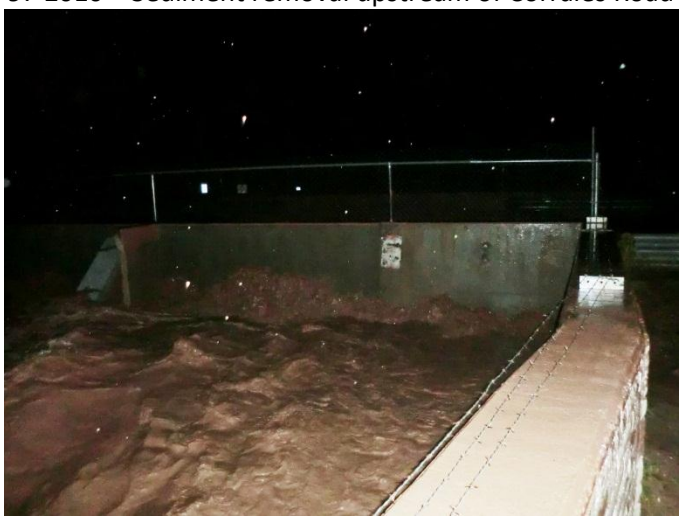

Figure 10: 2013 – Hydraulic Jump into Corrales Road bridge

Figure 11: 2013 - Sediment deposition under Corrales Road bridge

3.2 Aging Infrastructure

The proposed project location contains no existing infrastructure. The existing natural channel has sufficient capacity to convey the 100-year, 24-hour storm event to the inlet of the HJC. However, with development occurring in the upper portion of the watershed, stormwater flows and velocities have increased. This increase in flow velocities allows the stormwater to pick up more sediment in the stormwater flows. As sediment enters the HJC, it is conveyed downstream to the lower portion of the channel, where it is deposited at the Corrales Road bridge in the developed core of the Village. The location of sediment deposition is made worse by the bridge, which adds a vertical constraint on the channel capacity, creating the potential for flooding within Corrales.

The intent of the proposed project is to enhance the sediment removal capability of the arroyo prior to stormwater flows entering the concrete HJC. By removing the sediment in a targeted location, the sediment plug at the east end of the channel can be avoided and clearing of sediment operations can be conducted in a location more conducive to efficient removal operations.

3.3 Reasonable Growth

The proposed project will be designed to meet the fully developed, ultimate conditions identified in the Montoyas Arroyo Watershed Park Management Plan. Fully developed, ultimate conditions assumes that all developable land within the watershed has been developed according to current zoning and that flow rate potential has reached its maximum. SSCAFCA believes that using these flow rates for design purposes allows for the long-term viability of the facility.

4.0 Alternatives Considered

4.1 Description

Alternative A: No Action

The no action alternative would leave the site in its existing condition. However, this option continues to leave the Village susceptible to flooding as no means for removing sediment above the HJC has been installed and provides for none of the groundwater recharge benefits and habitat creation that will occur under the Preferred Alternative. The HJC, with its limited capacity to handle sediment deposition will continue to function as designed during the annual storm event and the existing arroyo alignment will continue to convey stormwater toward the inlet to the Harvey Jones Channel. SSCAFCA will continue its periodic maintenance activities of clearing sediment from the channel, as needed, in an attempt to maintain the capacity of the HJC to convey stormwater flows to the greatest degree possible by the limiting factors of the channel geometry.

For example, in 2006, a series of large storms created an emergency situation in the Village of Corrales as these storms swept significant amounts of sediment into the hard-lined Harvey Jones Channel, clogging this channel and causing stormwater to overtop the channel and flow into the Village. In order to minimize this flooding, the road had to be closed and the guard barriers had to be removed from the bridge to allow stormwater to flow over the road.

In 2010, a single large storm event swept large amounts of sediment into the Channel, once again clogging it. Had there been a subsequent storm that year, it is likely that significant flooding would have occurred in the Village.

In 2013, a series of storm events once again swept large amounts of sediment into the channel, plugging the existing concrete box culverts at the NM448/Harvey Jones Channel crossing. Further rainfall after the event occurred could have created a flooding situation in the Village of Corrales.

In the current configuration, there is no provision for the elimination of gross pollutants (trash) from stormwater flows as they pass thru the HJC, which is potentially in conflict with requirements of our MS4 Stormwater Permit (NMR040000).

Alternative B: In-Channel Water Quality Facility – green infrastructure/sediment reduction balanced approach

This alternative provides a balance of landscaping areas, naturalistic features and sediment removal capabilities. Sediment/infiltration basins are proposed in the upper area as well as the lower area, providing 65,000 cubic yards of sediment removal. The upper sediment/infiltration basin will minimize the impact of sediment deposition in the landscape areas and provide ease of maintenance. Below is a description of the concepts for the upper and lower areas:

Upper site area– We propose a balance of sediment removal, natural channel treatment, naturalistic braided channel and landscape areas. It will take advantage of the natural oxbows for landscaping but also provides for sediment and debris removal. We propose to establish the equilibrium grade of the channel to provide reduced velocity and a lengthened stretch of channel where sediment will be

deposited in the curves. This allows the sediment transported through this area to be captured upstream of the native vegetation areas. A dry well is proposed at the Dam #1 outfall into the Montoyas arroyo for this alternative to promote groundwater recharge.

Lower site area- the concept for this area consists of a braided channel on the upstream end of the property with a sediment/infiltration basin just west of the Harvey Jones Channel inlet. Dry wells to promote groundwater recharge are proposed within the sediment/infiltration basin. The area is proposed to be separated from the Harvey Jones Channel by a naturalistic water quality structure utilizing inclined pipes for maximum sediment and debris removal capabilities

Alternative C: In-Channel Water Quality Facility – emphasis on green infrastructure

This is the most naturalistic in-channel treatment alternative, utilizing the natural oxbows along the arroyo for landscape areas and providing 55,000 cubic yards of sediment removal. One small sediment/infiltration basin is located within the upper area and a larger sediment/infiltration basin is located in the lower area just upstream of the Harvey Jones Channel inlet. Combined, the two sediment/infiltration basins provide the minimum sediment removal capacity as established for the project. This alternative has the most opportunity for landscaping compared to other alternatives but provides the least amount of sediment removal. Below is a description of the concepts for the upper and lower areas:

Upper site area– We propose a combination of natural channel treatment, a small sediment/infiltration basin and a braided channel. At the upstream end of the property, a drop structure is proposed, followed by a naturalistic channel with depressed landscape areas in natural oxbows. Stormwater would pass through a backwater structure and flow downstream to a small sediment/infiltration basin to remove sediment and debris. A braided channel is proposed at the downstream end of the upper property boundary. We propose to establish the equilibrium grade of the channel utilizing drop structures to provide reduced velocity and a lengthened stretch of channel where sediment will be deposited in the curves. This will allow the sediment transported through this area to be stabilized and provide opportunities for native vegetation establishment in the oxbow areas. In addition, we propose to collect stormwater runoff from adjacent surrounding areas and convey it to the landscape areas via grouted boulder/shotcrete rundowns to take advantage of stormwater for irrigation. Vegetation also provides pollutant removal functions by reducing flow velocities, increasing deposition and infiltration, and providing nutrient uptake and organic matter for pollutant transformation. The tiered profile grade allows the design to conform closer to existing topography and minimize the earth moving required for the project. Dry wells are proposed within the landscape area located at the Dam #1 outlet to promote infiltration and groundwater recharge.

Lower site area- This alternative consists of a braided channel on the upstream end of the property with a sediment/infiltration basin just west of the Harvey Jones Channel inlet. The braided channel provides an opportunity to add arid riparian areas with natural grasses and other native vegetation on islands separating the braided channel flow paths. The vegetation can provide additional water quality treatment and erosion control opportunities on the banks of the arroyo. A sediment/infiltration basin with dry wells to promote groundwater recharge is proposed at the throat of the Harvey Jones Channel inlet. The area is proposed to be separated from the Harvey Jones Channel by a naturalistic water quality structure utilizing inclined pipes for maximum sediment and debris removal capabilities.

Alternative D: In-Channel Water Quality Facility – emphasis on sediment reduction

This in-stream treatment alternative provides for the most sediment removal capabilities, with a large sediment/infiltration basin in the upper area as well as the lower area, providing 75,000 cubic yards of sediment removal. Given the larger area required for sediment removal, this alternative has the least opportunity for landscaping compared to other alternatives but provides the maximum amount of sediment removal. Below is a description of the concepts for the upper and lower areas:

Upper site area– We propose a sediment/infiltration basin utilizing the largest area of the site for maximum sediment removal with a water quality structure at the downstream end. This basin would provide the most capacity for sediment pre-treatment and the ease of removal for maintenance purposes. The water quality structure would be designed to remove approximately 35,000 cubic yards of sediment and release the design flow of 4,163 cfs over the weir. The design would hold water in the basin for up to 96 hours to promote infiltration and ground water recharge. Two drop structures are proposed upstream of the basin separated by a braided channel with another drop structure at the downstream end of the upper area for grade control. This option would require the largest modification of the existing terrain.

Lower site area- Similar to Alternative B, this concept consists of a braided channel on the upstream end of the property with a sediment/infiltration basin just west of the Harvey Jones Channel inlet. The primary difference would be a drop structure located at the upstream end of the property in order to establish the equilibrium grade between the upper and lower property boundaries of the project. A sediment/infiltration basin with 2 dry wells to promote groundwater recharge is proposed at the throat of the Harvey Jones Channel inlet. The area is proposed to be separated from the Harvey Jones Channel by a naturalistic water quality structure utilizing inclined pipes for maximum sediment and debris removal capabilities.

Alternative E: Traditional Dam Structure

The installation of a traditional dam-type structure would provide the desired effect of limiting impacts on the Village of Corrales during the 100-year storm event. These types of structures typically have a large footprint to accommodate the volume of water seen during the 100-year storm event. This type of structure would also provide for sediment removal by virtue of slowing down the stormwater flows and providing the opportunity for settling of sediment prior to being discharged to the HJC.

The proposal for Alternative E is to place an embankment across the lower project area that would serve as the primary dam structure. In addition to the embankment, a principal spillway and emergency spillway would need to be constructed. In a preliminary assessment of the alternatives on this project, the volume of sediment desired to be retained before stormwater enters the HJC was 55,000 cubic yards minimum, equating to 34.1 acre-feet of sediment. Considering the need to maintain dam pool capacity beyond the sediment storage, a dam with a flood pool in excess of 50 acre-feet is likely, making the facility a jurisdictional dam per New Mexico State Engineer requirements. A similar proposed structure in the SSCAFCA jurisdiction has a preliminary cost estimate of $4.4 million, which exceeds the amount of funding available for this project.

In addition to the cost issues presented by a dam structure, the basic purpose of a dam is in conflict with the purpose of the proposed project. A dam is typically used to retard the runoff hydrograph, metering out water at a controlled rate to ensure downstream constrictions are not overwhelmed. The purpose of this project is not to meter out the hydrograph but rather to improve the quality of water entering the HJC by removing the sediment load and then immediately discharging the water to a concrete lined channel where sediment can no longer be re-suspended into the storm flow. This option would also require acquisition of additional ROW to accommodate the dam footprint, which is in conflict with the proposed design criteria, listed in the next Section.

Due to the issues presented above, SSCAFCA discontinued consideration of Alternative E beyond this theoretical examination.

4.2 Design Criteria

All proposed alternatives, except the No Action alternative, were required to meet the following design criteria:

- Facility must be designed to handle the 100-year, 24-hour storm event, approximately 4,200 cubic feet per second of stormwater flow.
- Sediment removal capacity, minimum needed is 55K Cubic Yards (CY), 75K CY is preferable.
- Require no additional right-of-way.
- Facilitate maintenance of facilities after storm events to ensure continuing proper operation of the facilities.
- Green Infrastructure shall be integral to the treatment process using Arid Low Impact Development (AridLID) techniques .
- Maintain a profile lower than existing HJC inlet structure.
- No water shall be impounded for more than 96 hours to meet Office of State Engineer's requirements (72-5-32.D NMSA 1978).

4.3 Map

Proposed layouts for Alternatives B, C, and D are located in Figures 10, 11, and 12 respectively.

4.4 Environmental Impacts

In order to identify potential Environmental Impacts from the proposed project, SSCAFCA contracted with a private environmental consulting firm to survey the proposed project area for biological and cultural resources that may be impacted by the project. From this report, the only identified environmental impacts from this project are the excavation along the arroyo banks during construction which will have a temporary impact on wildlife in that area. Complete copies of this report are located in Appendix A of this document.

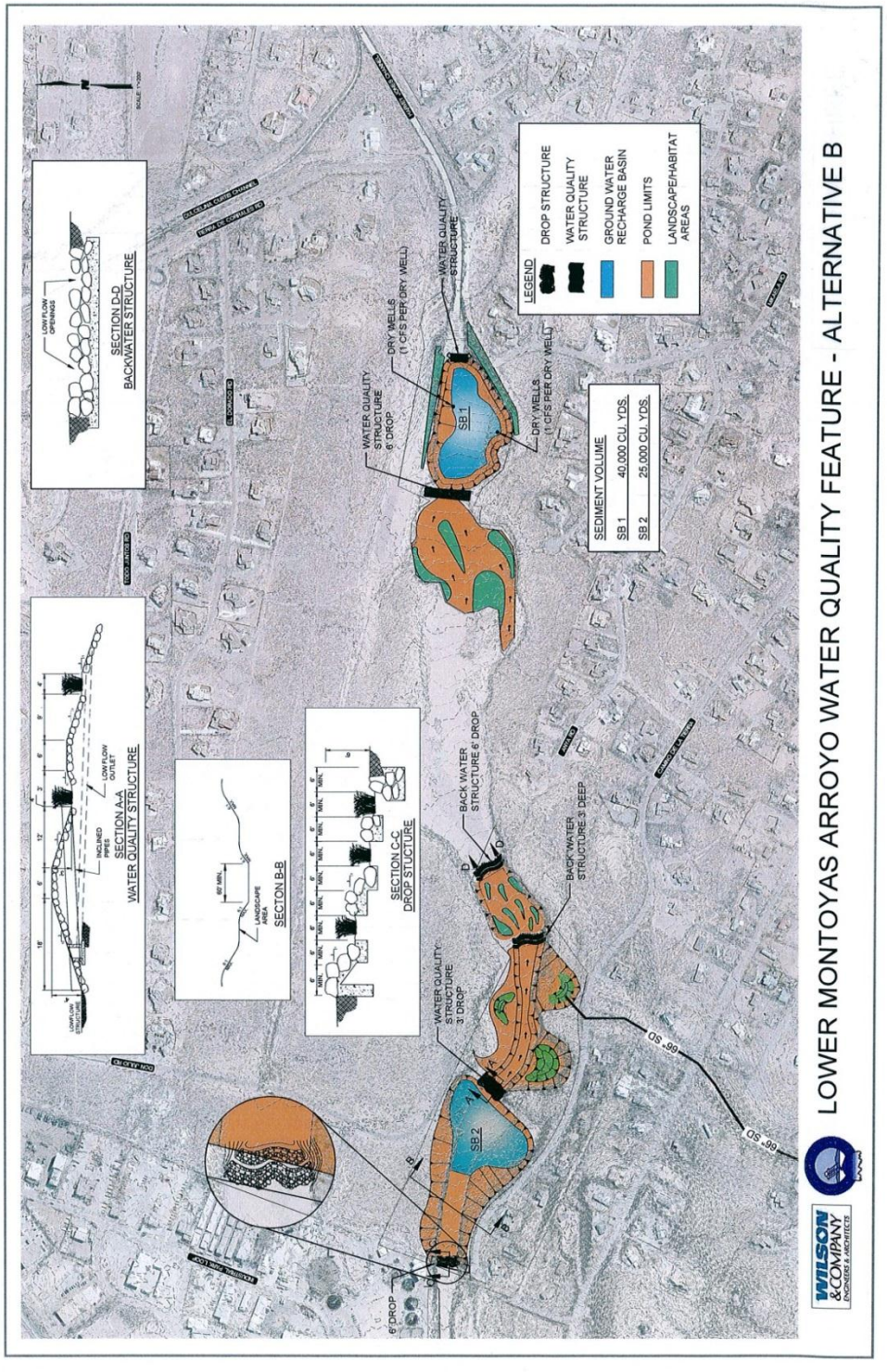

Figure 12 – Map of Alternative B

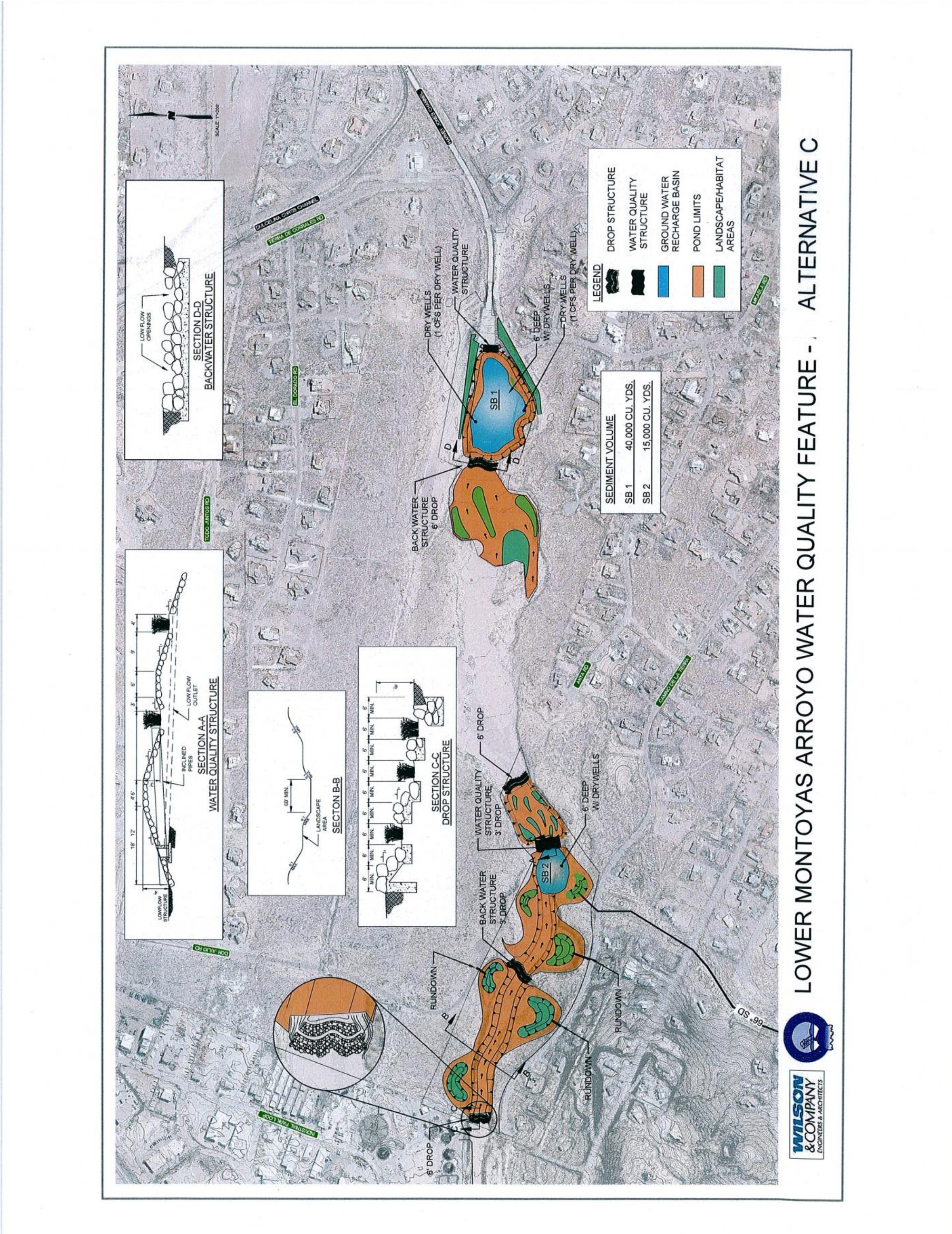

Figure 13: Map of Alternative C

Figure 14: Map of Alternative D

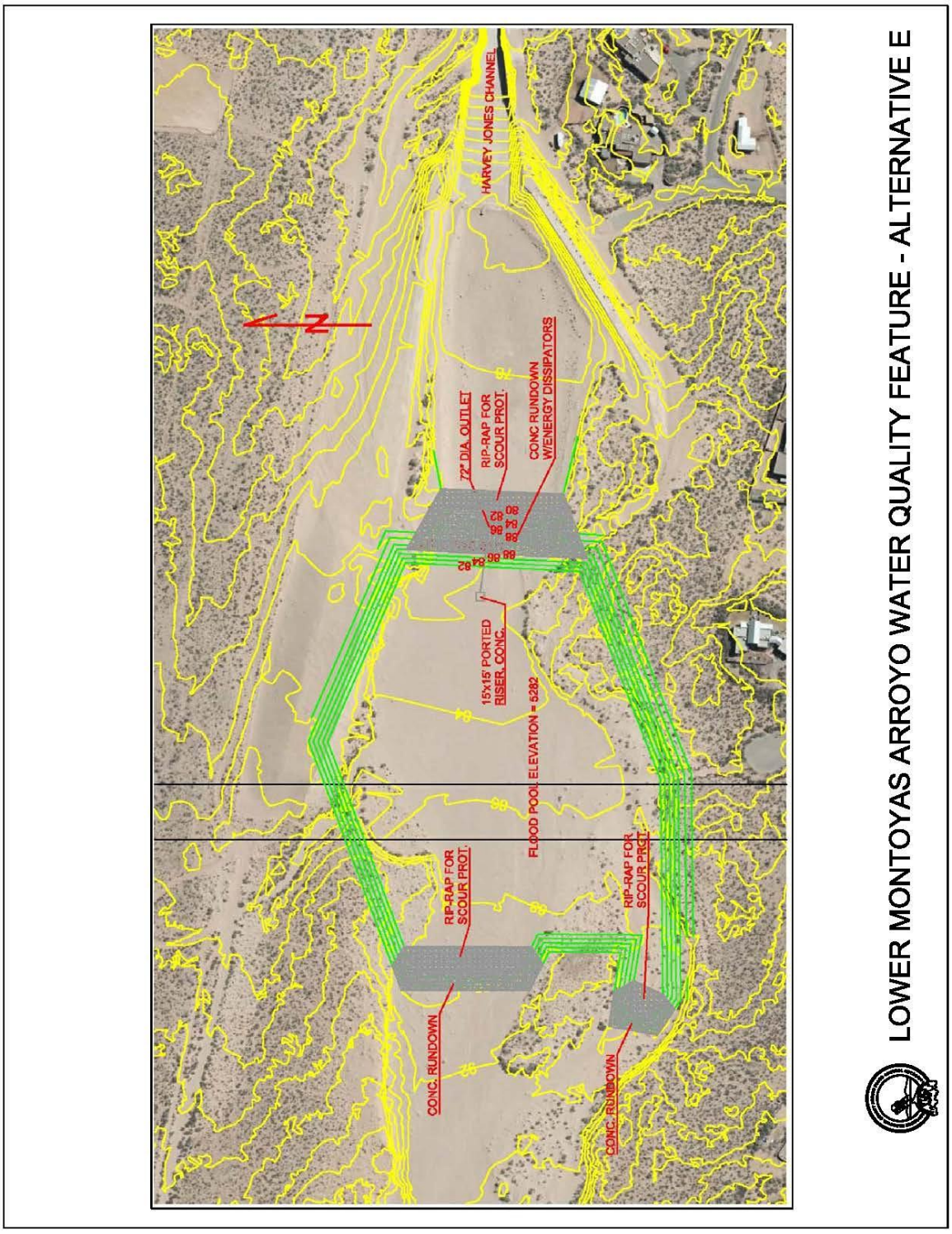

Figure 15: Map of Alternative E

4.5 Land Requirements

One of the design parameters for the proposed facility is that whatever alternative is selected, it must fit within the footprint of the SSCAFCA-owned fee title land and SSCAFCA-owned easement across Village of Corrales owned land (Figure 10).

The preferred alternative, Alternative B, along with Alternative C & D, all comply with this requirement. Construction will be limited to the areas shown in red below.

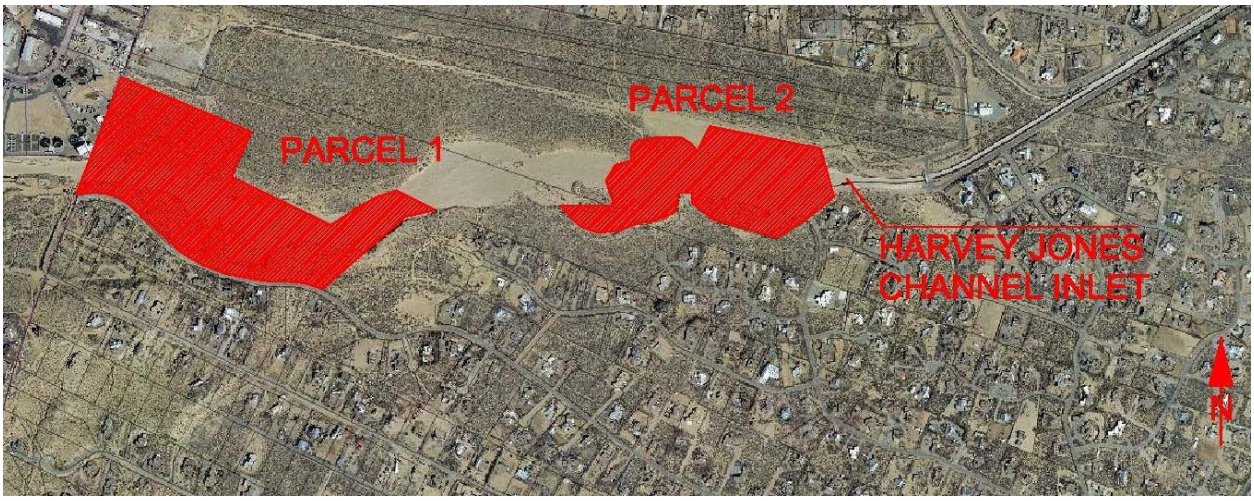

Figure 15: Project right-of-way

4.6 Potential Construction Problems

No potential construction problems were identified in any of the alternatives during the alternatives analysis phase of this project. However, the Montoyas Arroyo is an active arroyo that drains a large area. Although construction is being proposed during the "dry season", it is still possible to receive a large rainfall event which could negatively impact construction. During the construction pre-bid process, all bidding contractors will be made aware of the possibility and will be required to manage the construction accordingly.

4.7 Sustainability Considerations

4.7.1 Water and Energy Efficiency

Not applicable to this project

4.7.2 Green Infrastructure

All alternatives considered during the alternatives analysis phase of the project used some level of AridLID concepts as integral elements in the each design concept. The difference between each alternative was the number of AridLID elements that would be included.

Alternative B, the preferred alternative, provides a balance between AridLID elements and larger sediment removal facilities. Alternative B provides for the median amount of sediment storage between the three alternatives evaluated. This Alternative preserves the braided channel geometry at both the upper and lower project areas, provides a good degree of groundwater infiltration/sediment removal at both the upper and lower project areas, provides for off channel storage/infiltration of stormwater and maintains the usage of vegetation within hardened elements of the project.

Alternative C included the greatest number of AridLID elements, including extensive landscaping, off channel water storage for large storm event flows, braided channel configurations at the east end of the upper project area and the beginning of the lower project area, infiltration of surface water to ground water in sediment settling basins, and integration of vegetation into hardened structures (e.g. backwater structures and water quality structures). This alternative has the smallest amount of sediment storage.

Alternative D incorporated the least number of AridLID elements. This alternative includes much larger sediment retention basins at both the upper project area and the lower project area. This alternative provides for the largest amount of sediment storage between all alternatives evaluated. The braiding of the channel at the east end of the upper project area has been eliminated in lieu of the larger sedimentation basin and landscaping is much more limited as a functional element of the water quality feature. The alternative provides for integration of vegetation into the backwater and water quality hardened elements.

Alternative E provides for groundwater infiltration via the bottom of the flood pool for the traditional dam structure. However, no vegetative material is typically used in these types of structures. All floatable trash removal will be accomplished using traditional engineering techniques such as inverted ported risers.

4.8 Cost Estimates

Table 2 provides a comparative, general cost estimate of the proposed alternatives. Alternative A, the "No Action" alternative, has no cost associated with it. A detailed cost estimate of the preferred alternative is located in Table 3.

Cost Estimates for Alternatives B - E				
Construction Costs	*Alternative B*	*Alternative C*	*Alternative D*	*Alternative E*
Direct Construction Costs (DCC)	$1,253,675.00	$1,199,825.00	$1,399,111.00	$2,010,151.93
10% Contingency	$125,367.50	$119,982.50	$139,911.10	$201,015.19
Tax @ 7.4375%	$102,566.29	$98,160.68	$114,464.77	$164,455.55
Total Construction Cost	***$1,481,608.79***	***$1,417,968.18***	***$1,653,486.87***	***$2,375,622.68***

Non-Construction Costs				
Landscaping	$150,000.00	$240,000.00	$40,000.00	$0.00
Mobilization @ 10% DCC	$125,367.50	$119,982.50	$139,911.10	$201,015.19
Staking @ 0.271% DCC	$3,397.46	$3,251.53	$3,791.59	$5,447.51
NPDES Permitting @ 0.63% DCC	$7,898.15	$7,558.90	$8,814.40	$12,663.96
Testing (soil fill, materials) @ 0.5% DCC	$6,268.38	$5,999.13	$6,995.56	$10,050.76
Construction Observation @ 7% DCC	$87,757.25	$83,987.75	$97,937.77	$140,710.64
Engineering Design @ 10% DCC	$125,367.50	$119,982.50	$139,911.10	$201,015.19
Total Non-Construction Cost	***$506,056.24***	***$580,762.30***	***$437,361.52***	***$570,903.25***
Total Project Cost	**$1,987,665.02**	**$1,998,730.48**	**$2,090,848.38**	**$2,946,525.93**
30-year life cycle costs	*$1,208,096.00*	*$1,191,980.00*	*$1,360,246.00*	*$1,240,175.00*

Table 2: Alternatives Comparative Cost Estimate

5.0 Selection of an Alternative

5.1 Life Cycle Cost Analysis

Many of the factors typically associated with a life cycle cost analysis (e.g. utility expenses, equipment operation and maintenance, wear and tear, etc.) are not applicable to the proposed project. The proposed project consists primarily of static facilities designed to change the velocity and direction of the water as it travels down the drainage of the Montoyas Arroyo toward the Harvey Jones Channel. Based on SSCAFCA's experience with similar facilities, there are two primary recurring expenses associated with these facility types. The first is sediment removal to restore the geometry of the site to design. The second type of maintenance for this facility will be the maintenance of the landscaping, including watering, trimming, clearing of debris, and replanting of vegetation when necessary.

With respect to sediment removal, SSCAFCA currently removes sediment from the small depression at the west end of the Harvey Jones Channel and from the outlet (east end) of the channel. The expenses currently associated with removal of sediment at the east end of the channel will be transferred to the west of the channel within the new facility. SSCAFCA believes that due to the relative ease of sediment removal operations within the proposed project, overall sediment removal costs for the entire Montoyas Arroyo system will be reduced.

Maintenance of the landscape within the water quality feature will be an increased burden on the maintenance budget above and beyond current sediment removal operations. As with all new landscaping, the belief is that the first three years of the project will require a higher level of attention to the landscaping until the native plantings are established. Supplemental watering, whether by an automated system using reclaimed water for the City of Rio Rancho's water reclamation facility or by hand watering planting beds, will require additional resources to be dedicated during the "start-up" phase of the facility. For the life cycle cost analysis, after the initial three year start-up period, SSCAFCA assumes that during years with normal, annual rainfall events, only a base level of landscaping services would be needed to clear debris, ensure dead material is removed and, if needed, replace damaged vegetation, etc. As larger rain events impact the facility, additional funds will be needed to clean or restore landscaping.

The table containing the life-cycle analysis for Alternative B is located in Appendix E.

5.2 Non-Monetary Factors

One of the non-monetary factors contemplated by SSCAFCA during this process is to maintain the ability for the future installation a multi-use amenity (e.g. trail). One of SSCAFCA's philosophies is that land owned by the agency should have, if at all possible, the potential for usage by the public for recreation appropriate to the site. This philosophy is described in SSCAFCA's Quality of Life Master Plan, available on SSCAFCA's website.

Another non-monetary factor considered during the alternative selection process was the ease of maintenance for clearing sediment from the facility and restore the facility geometry to design levels. Alternative B, with its larger sediment reduction facility at the east end of the facility provides for the removal of sediment to an existing access to the site, Don Julio Road. This road has recently been

connected to NM528 and provides direct access to the site for dump trucks and heavy equipment to remove sediment from the site. Additionally, sediment can be efficiently hauled off site for disposal. Alternative D contained similar access conditions to the western-most sediment removal component of the site, however, the relative lack of AridLID components was not viewed favorably.

6.0 Proposed Project (Recommended Alternative)

SSCAFCA recommends the selection of Alternative B. This alternative provides for an equivalent level of green infrastructure without compromising sediment removal capabilities of the facility, integration of landscape elements into hardened structures, significant potential for groundwater recharge (due to enlarged sedimentation/infiltration basins), a reasonable balance between softer "green" elements of the project and hardened elements, and the braided channel geometry at both the upper and lower project areas to facilitate both floatable solids removal and channel restoration. These combined factors provide for both a functional facility that will provide for a long-term sustainable solution flood protection for the Village of Corrales as well as provide for habitat enhancements along the arroyo corridor.

6.1 Preliminary Project Design

The proposed preliminary layout of the Montoyas Water Quality project is located in Figure 11. In order to ascertain the hydraulic capabilities of the proposed new facility, Wilson developed hydraulic models of the arroyo under existing and proposed conditions. The topography used for the model was obtained using LIDAR. The model was constructed using the United State Corps of Engineers Hydraulic Engineering Center River Analysis Software (HEC-RAS). The purpose of the HEC-RAS software was to identify changes to the water surface elevation to ensure that the proposed project does not cause an overbank situation that could create a flooding potential in the Village of Corrales. Additionally, the software was used to verify that the project does indeed create zones where sediment has a greater potential for settling. These areas are identified by long segments of the arroyo where a relatively low Froude number is obtained.

The results of the HEC-RAS modeling are located in Appendix F. These results include a water surface elevation profile, tabular data for each river station inserted into the model, and water surface cross-sections at each river station.

6.2 Project Schedule

Upon approval of this Preliminary Engineering Report, SSCAFCA will continue our Public Outreach process by scheduling the Public Hearing for the project in April 2014. Upon completion of the public outreach and consultation with stakeholder agencies, SSCAFCA will award the design element of the project at our February 2014 Board Meeting. Assuming a three month design timeline, SSCAFCA is projecting a final design being available in July 2014. Upon design completion, SSCAFCA will submit the Pre-Construction Notification to the United States Army Corps of Engineers (USACE) for 404 Permit coverage, requesting coverage under Nationwide Permit 43. Preliminary discussions with the USACE have indicated that this type of coverage is available. Concurrent with the USACE permitting process, SSCAFCA will be coordinating with the Village of Corrales Floodplain Administrator regarding Federal Emergency Management Agency (FEMA) floodplain requirements

SSCAFCA will initiate the Invitation to Bid process during the summer of 2014. Contract award for construction is anticipated for September 2014 with initiation of construction activities occurring in

October 2014, following the monsoon season. The construction timeframe for this project is approximately five months, reaching substantial completion by the end of February, 2015.

6.3 Permit Requirements

Regardless of which alternative is selected, this project will require the U.S. Corps of Engineers 404 permit as the project will be constructed within an arroyo bed. Additionally, concurrence with the Village of Corrales Floodplain Administrator regarding the effect on the on the base flood elevation from the newly constructed project will need to be obtained.

6.4 Sustainability Considerations

6.4.1 Water and Energy Efficiency

Not applicable to this project.

6.4.2 Green Infrastructure

All alternatives considered during the alternatives analysis phase of this project entailed the usage of green infrastructure. However, the preferred alternative provides for the usage of all identified potential green infrastructure elements as well as providing significant sediment reduction capabilities.

6.5 Total Project Cost Estimate

The Engineer's Opinion of probable cost for the preferred alternative is located in Figure 14. As part of this project development, SSCAFCA contracted with Wilson to develop the detailed cost estimate.

6.6 Recommended Environmental Mitigation Measures

Numerous recommendations to reduce effects to biological resources were developed by SSCAFCA's Environmental consultant. Specifically, these recommendations are:

- Require the contractor to construct during the low flow season (after monsoon flows and prior to snow melt).
- Require the contractor to develop and implement a sediment and erosion control plan to prevent surface water quality and turbidity impacts. Disturbed upland areas should be re-vegetated to reduce surface erosion.
- Require that equipment refueling, storage, and maintenance activities occur in designated areas outside of the Arroyo de los Montoyas floodplain.
- Clean all heavy equipment used in the project area prior to the start of the project and inspect all equipment daily for leaks. Leaking equipment must not be used in or near any watercourse.
- Report any spills immediately to the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and the Surface Water Quality Bureau of the New Mexico Environment Department.

- Replant open disturbed areas with native vegetation.
- Avoid (if possible) the probably bank swallow colonial nest site in the project area near the upper segment.
- Inspect all suitable burrows for use by western burrowing owl in the project area prior to construction. This provision would extend into the winter months as a small number of western burrowing owls overwinter in the Central Rio Grande Valley.

SSCAFCA agrees with these recommendations and will incorporate them into design documentation.

6.6 Annual Operating Budget

6.6.1 Income

SSCAFCA derives its operating budget from property tax mil levy imposed on all property owners within the jurisdiction. Property taxes are collected by the Sandoval County Assessor and then distributed to SSCAFCA based on the approved mil levy. Annually, this levy provides approximately $5 million in revenues to the agency.

6.6.2. Annual Operations and Maintenance Costs

SSCAFCA budgets approximately 40% of its overall annual revenue for operations and maintenance activities throughout its jurisdiction. Typical operations and maintenance activities include removal of sediment accumulated within facilities, management of landscaping and vegetation within facilities, and repair and maintenance of fencing and/or gates surrounding facilities. The sediment removal component of maintenance is highly dependent on rainfall, as more intense rainfall events typically generate larger sediment volumes within facilities. In order to account for the variable nature of the rainfall events, and in turn our sediment removal activities, SSCAFCA has established a reserve fund dedicated to large storm event response. This fund, which has a targeted value of one million dollars, is maintained in addition to our annual operations and maintenance budget. Funding from this reserve may be accessed by SSCAFCA with concurrence of SSCAFCA's Executive Engineer and the Board of Directors.

6.6.3 Debt Repayment

All debt incurred due to this project will be repaid using the debt service component of our property tax levies.

6.6.4 Reserves

SSCAFCA has a statutory requirement to maintain a reserve of 1/12 of our operating budget expenditures. SSCAFCA exceeds this statutory requirement by maintaining a 20% reserve account.

Lower Montoyas Arroyo Water Quality Project

Concept Level Cost Estimate

Alternative B

No.	Item	Quantity	Unit	Unit Cost	Item cost
1	Site Clearing & Grubbing, compl	37	Ac	$ 1,200.00	$ 44,400.00
2	Unclassified Excavation	130000	CY	$ 2.50	$ 325,000.00
3	Export	65000	CY	$ 7.00	$ 455,000.00
4	Remove & Dispose Existing Outlet Structure (Dam#1 outlet)	30	CY	$ 160.00	$ 4,800.00
5	Remove & Dispose existing 66" storm drain	200	LF	$ 50.00	$ 10,000.00
6	Drop Structure 1 - Grouted boulder/shotcrete	700	SY	$ 87.50	$ 61,250.00
7	Backwater structure 1 - Grouted boulder/shotcrete	700	SY	$ 87.50	$ 61,250.00
8	Backwater structure 2 - grouted boulder/shotcrete	700	SY	$ 87.50	$ 61,250.00
9	Water quality structure 1 - grouted boulder/shotcrete	700	SY	$ 87.50	$ 61,250.00
10	Water quality structure 2 - grouted boulder/shotcrete	250	SY	$ 87.50	$ 21,875.00
11	Bank stabilization, grouted boulder/shotcrete	944	SY	$ 87.50	$ 82,600.00
12	Dry wells, CIP	3	LS	$ 15,000.00	$ 45,000.00
13	Dam #1 outlet structure to arroyo (shotcrete/grouted boulder)	1	LS	$ 20,000.00	$ 20,000.00
	SUBTOTAL : Direct Construction cost (DCC)				***$ 1,253,675.00***
14	Contingency @ 10% direct constr costs	1	%	10.00%	$ 125,367.50
15	NMGRT @ 7.4375	1	%	7.4375%	$ 102,566.29
	Subtotal:				***$ 1,481,608.79***
16	Mobilization & Overhead @ 10% direct constr costs	1	% DCC	10.00%	$ 125,367.50
17	Construction Staking @0.271%	1	% DCC	0.27%	$ 3,397.46
18	NPDES Permitting @ 0.63%	1	% DCC	0.63%	$ 7,898.15
19	Testing (soil fill, materials, compl) @ 0.5%	1	% DCC	0.50%	$ 6,268.38
20	Constr Obs & Oversight @ 7% direct constr costs	1	% DCC	7.00%	$ 87,757.25
21	Engineering @ 10% of direct constr costs	1	% DCC	10.00%	$ 125,367.50
22	Landscaping, CIP	1	LS	$ 150,000.00	$ 150,000.00
	Estimated Project Cost				**$ 1,987,665.02**

Table 3 – Alternative B Estimate of Probable Costs

7.0 Conclusions and Recommendations

Based on the hydraulic information developed by Wilson and the conceptual level sediment storage volumes that can be achieved at the facility, SSCAFCA believes that Alternatives B, C, and D will all meet the minimum design criteria identified in Section 4.2 of this document.

However, in an attempt to provide a more significant margin of safety with respect to sediment retention within the project limits as well as maintain a significant level of appropriate green infrastructure to help in the removal of floatable solids, SSCAFCA is recommending Alternative B as the proposed project. SSCAFCA believes that Alternative B strikes the optimum balance between providing sufficient sediment storage and providing green infrastructure for floatables removal.

APPENDIX A

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

APPENDIX F