

WRITTEN SUMMARY  
of  
FINAL SITE DEVELOPMENT  
MASTER PLAN  
for the

REEMS ROAD CHANNEL  
AND  
BASIN PROJECT



FLOOD CONTROL DISTRICT  
of  
MARICOPA COUNTY

Olsson Associates Project No. 04-0804

**April 2005**



## **Reems Road Flood Control Basin and Channel**

### **Project Description**

The project boundary is defined by Peoria Avenue to the North and the North Property of Falcon Dunes Golf Course to the South. The project falls within the jurisdiction of Maricopa County and is not, at this point, formally annexed by any of the adjacent municipalities. A flood control channel will be constructed west of Reems Road. A detention basin will be constructed approximately ¼ mile south of Peoria Avenue. The Reems Road ROW will define the east boundary of the basin while the west boundary will be defined by the noise contour data derived from the flight patterns from Luke Air Force Base. The southern boundary is defined by a farm access road. The approximate total land area for the basin is approximately 54 acres, excluding the channel alignment.

### **Planning and/or Land Use Studies**

#### **Area Drainage Master Plan**

The Flood Control District of Maricopa County Loop 303/White Tanks Area Drainage Master Plan Update, prepared by URS, May 2003 provided a comprehensive study of multiple flood control alternatives both existing and proposed within the Loop 303 project area boundary. The Loop 303 Area Drainage Master Plan covers an approximate 220-square-mile watershed area. The study area boundary is defined by the ridgeline in the White Tank Mountain on the west, the Gila River to the south, the Aqua Fria River to the east, and the McMicken Dam/Deer Valley Road to the north.

#### **Water Course Master Plan**

The West Valley Rivers Master Plan is a proposed 42-mile, shared-use trail network to be developed for bicyclists, pedestrians, equestrians, and other non-motorized trail users in the West Valley. The New River and Lower Aqua Fria River corridors serve as the trail boundaries extending as far north to the unincorporated community of New River and south to the confluence of the Lower Aqua Fria River with the Gila River.

A Master Plan and Final Action Plan have been prepared to outline the strategies and funding opportunities for implementation. The proposed trail master plan map identifies three major corridor character areas along the river known as reaches. The Northern Reach, approximately 16.0 miles, The Central Reach approximately 15.0 miles, and the Southern Reach, approximately 11.0 miles.

The West Valley Rivers Master Plan serves to link the communities of Avondale, Glendale, Phoenix, Peoria, and Maricopa County.

## **Landscape Aesthetics**

The Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment prepared by Logan Simpson Design, Inc., October 28, 2003 provides an overview of the landscape aesthetics and multi-use opportunities in the project area of the Loop 303 Area Drainage Master plan. This report documents data collected throughout the project boundary area to identify features, assessments, and analysis of ways to provide aesthetic treatment and landscaping of existing flood control projects. This report is used for reference only.

## **Multi-Use Opportunities Assessments**

The Multi-Use Opportunities Assessment section of the the Loop 303 Area Drainage Master plan prepared by Logan Simpson Design, Inc., October 28, 2003 provides an inventory of existing and future multi-use opportunities identified within the project boundary area, research from several municipalities adopted general plans, and implementation guidelines for the integration of multi-use opportunities within flood control basins, and channels. This report is used for reference only.

## **Pre-Design Studies encompassing the Project Area**

Existing Community Development Plans were researched within a one mile radius of the Reems Basin and Channel boundaries. There are several private development projects existing and proposed to the north and west of the site.

The Rancho Gabriela Phase 4A Master Planned Community lies to the north of Peoria Avenue and to the east of Reems Road. This master planned community contains single-family dwellings, open space areas, streetscape theme elements, and character theme elements implemented throughout the community. An entry monument utilizing stone veneer and painted stucco walls adds interest to the intersection. A lush, tropical landscape theme has been established at the community's entry monument and entry points.

A proposed private development project by Richmond American Homes is currently being constructed at the NW corner of Peoria Avenue and Reems Road. The Greer Ranch South Parcel 18 and Greer Ranch South Parcel 14 Development plans for the community were obtained from the private developer and the Maricopa County Assessor GIS mapping site.

The Greer Ranch development contains single-family dwellings, open space areas, streetscape theming, retention basin areas and an entry monument has been planned for the community. The community has started construction on the Reems Road Channel extending north of Peoria Avenue. The amount of ROW

dedicated to the channel limits the opportunity for varying side slopes, channel alignment, and/or maintenance road alignment.

The parcels to the west, south and east of the site are agricultural. A residential development has been planned for the parcel to the west of the Reems Basin and Channel site boundary. The private developer is in the process of implementing a Development Master Plan, which includes one-acre single family lots, which provides a low density residential setting adjacent to the site.

### **Existing Agency Development Plans, Guidelines, and Reports**

The Luke Air Force Base Plan Review Criteria was obtained from the Luke Air Force Base website. It is recommended that the conceptual site plans for the selected alternative be submitted for review and compliance in regards to the 1988 JLUS noise contours and accident potential zones review process.

The Arizona Military Regional Compatibility Project, Western Maricopa County/Luke Air Force Base prepared in March 2003 is to facilitate the implementation of compatible land uses around Luke Air Force Base (AFB) through a cooperative coordinated program among the affected jurisdictions in Maricopa County. The plan's study includes twelve jurisdictions in the Western Maricopa County municipalities that regulate development around Luke AFB, including seven cities, two towns, Maricopa County, the State, and the Base itself. This document is for reference use only.

The Maricopa County Regional Trail System Plan Phase One Executive Summary, Adopted September 4, 2002 plans to develop a regional trail system to connect the County Park System, link recreational corridors around the Valley, and help preserve open space in the community. Phase One will serve as a template for the entire trail system. It includes basic trail design guidelines and an implementation plan that will guide future development of the trail. There is no indication from this document that a future trail would be located near the Reems Road alignment.

### **MAG Regional Transportation Plan, West Valley, Revised May 10, 2004**

The Northwest Area Transportation Study Final Report, prepared for Maricopa Association of Governments, prepared by Parsons Brinckerhoff, September 2003 is an intensive study to identify transportation needs within the study area and develop a prioritized list of major transportation projects to address those needs. This comprehensive plan suggests funding programs, an implementation plan, and a long-range (Twenty year) transportation program for the region's transportation buildout network system. Reems Road will likely be extended to a four lane divided road in the future as development moves into this area. No other plans for vehicular and/or multi-model opportunities were identified in this study.

Maricopa Department of Transportation is considering the implementation of a "Super Road" running East/West located half way between Northern and Olive, just north of Falcon Dunes Golf Course. The roadway is in the very preliminary planning stages. Therefore, alignment, size and potential timeline for construction have not been fully developed.

### **Private Development Plans**

The following private development plans were obtained from various municipalities surrounding the project site.

Gabriella Phase IV Development Plan  
Greer Ranch Development Plan

### **Existing Data Review and Documentation**

#### **Flood Protection Functional Requirements**

The Flood Control District (FCD) Reems channel has several basic requirements and guidelines as identified by the FCD. These are as follows:

1. The channel has a required depth of 8 feet.
2. The target n factor is .04 or below.
3. It would be beneficial to the cost of the project if the primary goal of conveyance followed by the goal of providing a facility that responds to a "kinder and gentler" environmental and visual impact was accomplished in a 220' ROW north of the Basin and 150' south of the basin.
4. A 200' long weir is provided for a spillway into the basin.
5. Drop structures, other FCD structures, and slopes for the channel respond to the 30% civil engineering plans developed by URS. Deviations from these documents are to be identified and discussed.
6. The minimum bottom width of the channel north of the basin shall be 70' wide.
7. The minimum bottom width of the channel south of the basin shall be 20' wide.
8. The side slope for the channel shall vary between 4:1 and 8:1.
9. Provide a minimum of one 12' maintenance road along the channel. It would be beneficial to provide a 12' maintenance road on both sides given that the primary goals of conveyance and aesthetics can be maintained.

The FCD basin has similar requirements and guidelines to respond to and are listed as follows:

1. The facility shall store a minimum of 165 acre-feet of storm water.

2. Provide a 12' wide maintenance road along the top of the basin.
3. The side slope for the basin shall not exceed 4:1.
4. Provide the primary goal of storage and bleed-off followed by providing a facility that responds to a "kinder and gentler" environmental and visual impact within the 54-acre area designated.

The FCD has several secondary goals that follow the requirements of conveyance and storage, yet are essential to the successful response to a "kinder and gentler" approach and cost effective development of Flood Control Projects. These goals are as follows:

1. Minimize the need to export soil by providing a design that focuses on balancing cut and fill.
2. Provide an opportunity for partnering with a municipality by providing a basin and channel design that can easily be manipulated to accommodate future recreation programming needs. Long term maintenance on this site can be mitigated through an IGA with a municipality that may provide ongoing maintenance for the project in return for the use of the site as a facility that can be used to satisfy their programming needs.
3. Provide a design that implements visual mitigation techniques such as land form variation through depressions and berming, variation in the horizontal alignment of the basin and channel edge to minimize a bathtub basin or trapezoidal channel appearance, toe of slope horizontal variation, side slope variation, use of differing types of inert groundcover, and use of plant materials to effectively soften, buffer, and accent.
4. Provide a hardscape vernacular and theme that can be implemented in/on flood control structures. The theme shall respond to the site and its surrounding environment and shall be applied in a way that is appropriate to the primary requirements of the site.

Two scenarios of the channel and the basin will be developed to respond to each of these requirements and guidelines. Deviation from any of these guidelines will be identified in the discussion of each of the scenarios.

## **Site Analysis**

### **On -Site Reconnaissance**

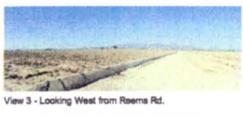
A thorough on-site reconnaissance was provided to determine existing on-site opportunities and constraints of the property with respect to the development of the FCD channel and Basin. Existing roadway conditions, roadway crossing alignments, railroad crossings, irrigation canals, farmstead locations, and other existing conditions were analyzed and documented via photo log. Points of visual interest were documented and surrounding land uses were identified see Figure (1).



View 1 - North West Reems Rd. from Peoria Ave.



View 2 - North East Reems Rd. from Peoria Ave.



View 3 - Looking West from Reems Rd.



View 4 - Looking South from Reems Rd.



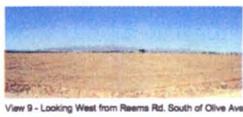
View 5 - Looking North West from Reems Basin



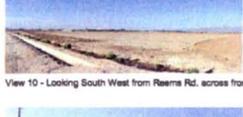
View 6 - Looking South from Reems Basin



View 7 - Looking North from Olive Ave.



View 8 - Looking North from Reems Rd. South of Olive Ave.



View 9 - Looking West from Reems Rd. South of Olive Ave.



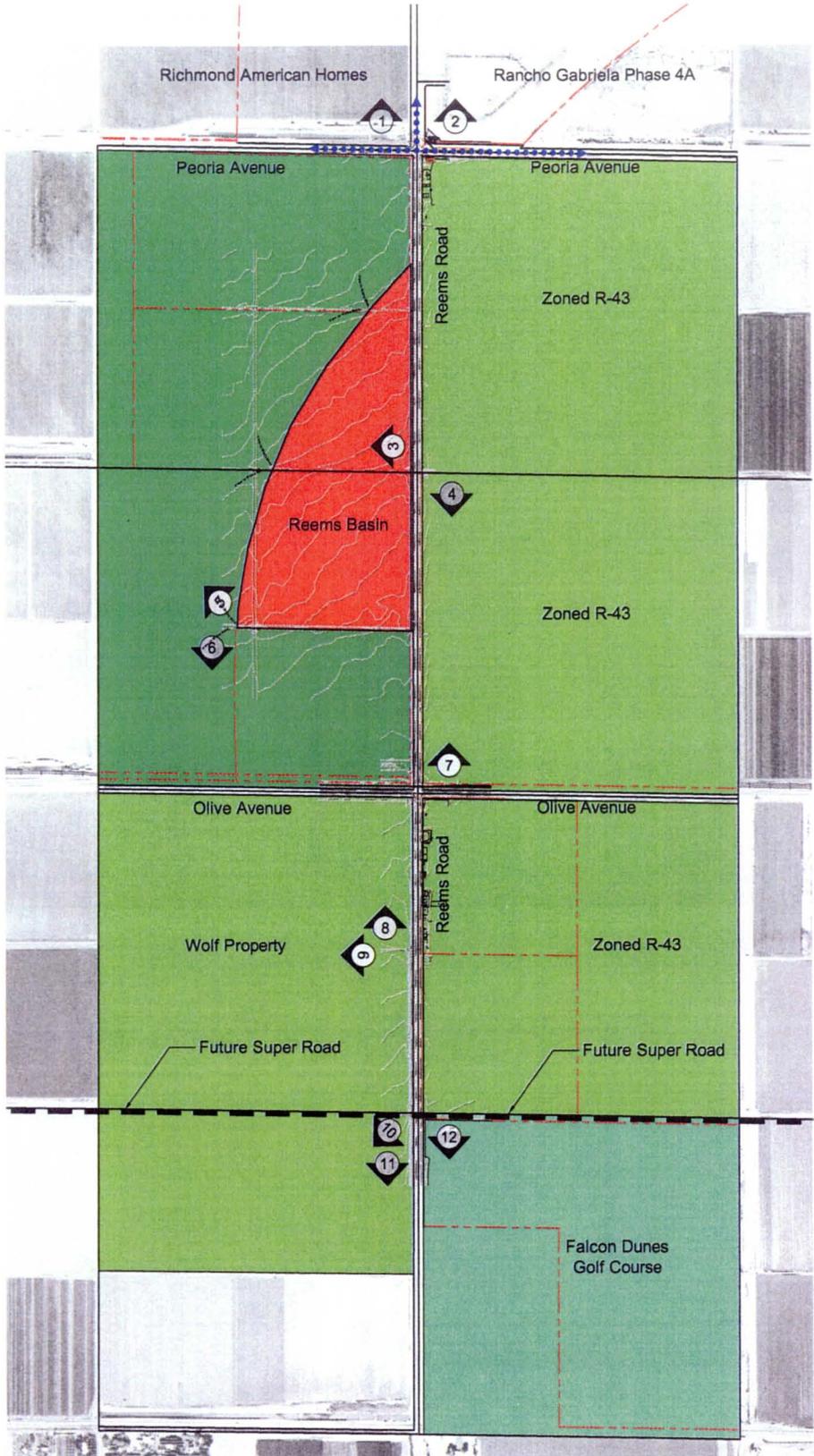
View 10 - Looking South West from Reems Rd. across from Falcon Dunes



View 11 - Looking South from Reems Rd. across from Falcon Dunes



View 12 - Looking South from Reems Rd. next to Falcon Dunes



# Reems Road Basin and Channel Project

Figure 1

## **Photo Documentation**

A complete and thorough photo documentation analysis and report has been prepared to document the current site conditions, land uses, and visual impacts surrounding the site. The photo log is available in the appendix of this document.

## **Existing Land Uses**

The site existing land use throughout is agricultural. According to the Maricopa County 2020 Comprehensive Plan the identified land use is Rural Residential. The land adjacent and to the west is under design for development as one-acre lot residential. Due to the existence of noise contours related to Luke Air Force Base, and the land use steering suggested by the Arizona Military Regional Compatibility Project, land use for the near future to the east is not anticipated to change from agricultural.

## **Zoning**

The site is currently zoned as Rural-43 Residential according to the Maricopa County 2020 Comprehensive Plan.

## **Existing Conditions**

The site, including the channel and basin areas, is predominately agricultural farmlands. The length of the project is bisected with existing and operational irrigation channels. Implementation of the channel and basin will require the coordination of the realignment, rerouting, and/or discontinued use of irrigation channels.

## **Vehicular Circulation**

Reems Road from Peoria Avenue to Northern Avenue is a two lane paved road with a gravel shoulder. It is anticipated that Reems Road will be further developed to include a four lane divided roadway and the ROW will extend from 53' half street width to 65' half street width. Spaced evenly at approximately 1300' on center, there are several dirt roads connecting farmland to the existing farmsteads found along the length of the project. Farmsteads and equipment storage are typically found west of Reems Road. The agricultural land to the west of the project appears to be accessed from these equipment storage areas. Therefore, it will be important to maintain access for farming across the channel.

An existing and operational railroad track is located north of and parallel to the Olive Avenue alignment. A channel crossing will need to be constructed at Olive

Avenue and the railroad tracks and across Reems Road at the outfall of the channel into Dysart Drain. Construction of the box culvert at Peoria Avenue will also be included in the project.

### **Traffic Control**

There are four way stop signs at the major intersections located on Reems Road from Peoria Avenue to Northern Avenue.

### **Parking**

There are no existing parking areas on or adjacent to the site.

### **Trails Systems**

There are no existing trail systems adjacent to the site. The City of Glendale 2025 The Next Step General Plan has no trail connection planned in the area. The City of Surprise General Plan 2020 has identified Reems Road and Peoria Avenue, within their boundaries, to have proposed bike paths (on-street), and the Proposed Trail alignment, McMicken Dam, as identified in the Maricopa County Regional Trail System Plan, is the nearest proposed Regional Trail system in the area. The proposed 19 mile McMicken Dam trail alignment begins at the White Tank Regional Park and connects to the Lake Pleasant Regional Park. Peoria Avenue provides an excellent opportunity to provide a trail from the McMicken Dam to the Aqua Fria River to the east.

The City of Surprise and Maricopa County working closely together to implement a Trails Master Plan along the Peoria Avenue alignment would support both commuter and recreational bicyclists with local and regional links.

### **Street Crossings**

There are two major street crossings within the project boundary, Reems Road and Peoria Avenue to the north and Reems Road and Olive Avenue at the approximate midpoint of the project. A box culvert will be constructed at the street crossings.

### **Public Recreational Facilities**

There are no existing public recreational facilities within a mile of the project area. However, 3 public golf courses have been identified within 6 miles of the project. Pueblo El Mirage Public Golf Course located in the City of El Mirage is located approximately 5.5 miles to the northeast of the site. Fowler Park in the City of Glendale boundary is located approximately 3.25 miles to the southeast of the site. Falcon Dunes Public Golf Course, Maricopa County, is located approximately 3 miles to the south of the project.

### **Private Recreational Facilities**

Falcon Dunes Private Golf Course, Maricopa County, is located directly to the south of the project.

### **Utilities**

The above ground utilities include overhead power lines, transformers, street lights, and cable boxes.

The below ground utilities include gas lines, and private water lines. There are no public water main lines in the project area.

### **Topography**

The existing topography throughout the site slopes from northwest to southeast and has an average slope of under 0.5%. The only variations from this are the farm roads, irrigation ditches, and irrigation berms.

### **Existing Vegetation**

The land within the project area has been cultivated to agricultural fields. Recent crops have included carrots or roses.

### **Drainage Features**

The Single Family Development located on the west side of Reems Road and north of Peoria Avenue has constructed the Reems Road channel north of Peoria Avenue. The design of this channel is trapezoidal in layout and has very little variation in side slope or alignment. The overall appearance of this channel indicates that aesthetics and landform were not primary goals of this project.

## **Scenery Resource Assessment**

### **Existing Scenic Character**

The project site and land directly adjacent to the project site, excluding Falcon Dunes Golf Course, is agricultural land and has little unique visual interest in terms of land-form or prominent architectural features. Many of the fields adjacent to the site are planted with roses providing a pleasant variation of flower colors at the time of season when they are in bloom.

Existing focal points directly adjacent to the property are limited to Falcon Dunes Golf Course. The golf course is located on the Northeast corner of Reems Road and Northern Avenue. Due to the variation in elevation of earthform of over 15' above existing grade in an area that has little natural vertical elevation difference, the golf course mounding can be seen from over a mile away. Further, the mounding is exaggerated with the addition of tree massings along the top and the side slopes. In an area surrounded by agriculture, this provides a visual focal point from the northern most part of the project to the southern most portion of the project. No other points of visual interest were identified along the travel way directly adjacent to the project.

Located several miles away, the White Tank Mountains dominate the background view to the west. Development of rest areas, interpretive areas, and activity nodes should be oriented to take advantage of the natural beauty of the White Tank Mountains.

The site is directly adjacent to a major landing pattern for Luke Air Force Base. The southern boundary of the basin and this flight pattern are relatively close in proximity. This provides a unique opportunity to watch aircraft as it approaches Luke for landing. Development of this site should take into account the possibility of Interpretive areas and overlooks to provide a viewing and educational area to gain a better understanding and appreciation for the aircraft utilized by the Air Force.

### **Concept Development**

#### **Channel North of the Basin Weir**

The given minimum channel dimensions based upon a 220' ROW are as follows:

1. Bottom width of 70'.
2. Channel Depth of 8'.
3. Minimum side slopes of 4:1, Maximum side Slopes of 8:1.
4. Minimum of one 12' wide maintenance road on one side of the channel shall be provided. If room is available, the FCD prefers a maintenance road on both sides of the channel.
5. An n factor of 0.04 or less is preferred.
6. Variation in the channel width, side slope, toe of slope alignment, and overall channel alignment is preferred to provide a kinder and gentler environmental and visual impact.

Under the most restrictive visual design solution with side slopes of 4:1 on each side, a bottom of 70', and a 12' wide path on both sides of the channel, the horizontal spatial demand within the ROW is 158', leaving a surplus of 64'. Loosening the restrictions by increasing the average slopes to 6:1 on either side, the horizontal spatial demand within the ROW increases to 190', and the surplus is reduced to 30'. The surplus ROW left over provides the opportunity to

implement visual mitigation techniques such as over bank berming and depressions, variations to the alignment of the channel, horizontal and vertical movement to the maintenance roads, further variation in the side slopes of the channel, and varying the bottom width.

The land in this area has been acquired as ROW and the adjacent land is under design development for housing subdivision of 1-acre lots. The opportunity to acquire additional land in this area to provide adequate visual mitigation is limited and, likely, cost prohibitive. Therefore, it is the recommendation of this design team that the Flood Control District work within the previously acquired ROW north of the Reems Road Basin to achieve the primary goal of water conveyance and mitigate the appearance of a trapezoidal channel to the extent possible using the techniques described above.

According to the Policy for Aesthetic Treatment and Landscaping of Flood Control Projects, the landscaping cost ceiling per acre of rural land is \$12,000 and the cost ceiling per acre of suburban land is \$40,000. The current surrounding land use is agriculture. However, land throughout the area is under design development to become residential subdivisions. Due to the conversion of this land in the short term, it is suggested by this team that the land be designated as suburban. The total acreage of the channel north of the basin weir is approximately 12.4 acres. The landscape cost ceiling for suburban land for the channel north of the weir area is approximately \$496,000. Based upon a native seed mix, use of decomposed granite in the bottom of the basin, and 10 trees per acre, the approximate cost for landscape and irrigation is approximately \$348,500. Please see the Preliminary Opinion of Probable Cost in the appendix for further detail on the anticipated line item costs.

### **Channel South of the Basin Weir**

The given minimum channel dimensions based upon a 150' ROW are as follows:

1. Bottom width of 20'.
2. Channel Depth of 8'.
3. Minimum side slopes of 4:1, Maximum side Slopes of 8:1.
4. Minimum of one 12' wide maintenance road on one side of the channel shall be provided. If room is available, the FCD prefers a maintenance road on both sides of the channel.
5. An n factor of 0.04 or less is preferred.
6. Variation in the channel width, side slope, toe of slope alignment, and overall channel alignment is preferred to provide a "kinder and gentler" environmental and visual impact.

Under the most restrictive visual design solution with side slopes of 4:1 on each side, a bottom of 20', and a 12' wide path on both sides of the channel, the horizontal spatial demand within the ROW is 108', leaving a surplus of 42'.

Loosening the restrictions by increasing the average slopes to 6:1 on either side, the horizontal spatial demand within the ROW increases to 140', and the surplus is reduced to 10'. The surplus ROW left over provides the opportunity to implement visual mitigation techniques such as over bank berming and depressions, variations to the alignment of the channel, horizontal and vertical movement to the maintenance roads, further variation in the side slopes of the channel, and varying the bottom width. Figures (2 & 3) shows the amount of visual mitigation that can be achieved within the 150' ROW given the size and depth requirements of the channel.

The 150' wide ROW will fulfill the primary requirement of conveyance, but does not address the need for visual mitigation effectively due to the amount of space required by the channel and maintenance access road(s). The design team researched the visual benefits by acquiring a total of 225' of ROW as shown in Figures (2 & 3). The additional 75' provides ample opportunity to provide over bank berming and depressions, variations to the alignment of the channel, horizontal and vertical movement to the maintenance roads, further variation in the side slopes of the channel, and varying the bottom width in concert providing a successful visual mitigation of the channel. The additional ROW, accounting for an additional 6.5 acres, provides further opportunities to spoil excess dirt resulting from the excavation of the channel and basin. It is for these reasons that the design team recommends that the Flood Control District acquire the additional 6.5 acres land to increase the ROW width from 150' to 225' south of the Reems Basin to the crossing structure at the north boundary of Falcon Dunes Golf Course.

The total acreage of the channel south of the basin weir with a 225' ROW is approximately 26.9 acres. Additional land will need to be acquired to increase the width of the ROW from 150' to 225'. The maximum allowable additional cost for land acquisition for meeting the goals of visual and environmental mitigation is 30% of the ROW needed to perform the primary goal of conveyance and storage. The total acreage needed, as determined by the FCD to convey and store, is approximately 77.1 acres with 46.7 acres for the basin, 12.4 acres for the channel north of the weir, and 18 acres for the channel south of the weir. The allowable additional land that can be acquired for visual and environmental mitigation is approximately 23 acres. The actual amount of land that will need to be acquired to increase the width of the ROW to 225' is approximately 6.5 acres. The FCD's anticipated cost per acre for this land is approximately \$40,000, which will increase the cost of land acquisition for the project by \$260,000.

The landscape cost ceiling for suburban land for the channel south of the weir, based upon a 225' ROW is approximately \$1,077,000. Based upon a native seed mix, use of decomposed granite in the bottom of the basin, and 10 trees per acre, the approximate cost for landscape and irrigation is approximately \$690,000 with a 15% contingency. Please see the Preliminary Opinion of Probable Cost in the appendix for further detail on the anticipated line item costs.

A figure showing a cut/fill analysis of a 150' wide ROW and a 225' ROW is shown on Figure (2).

### **Basin– Passive Concept**

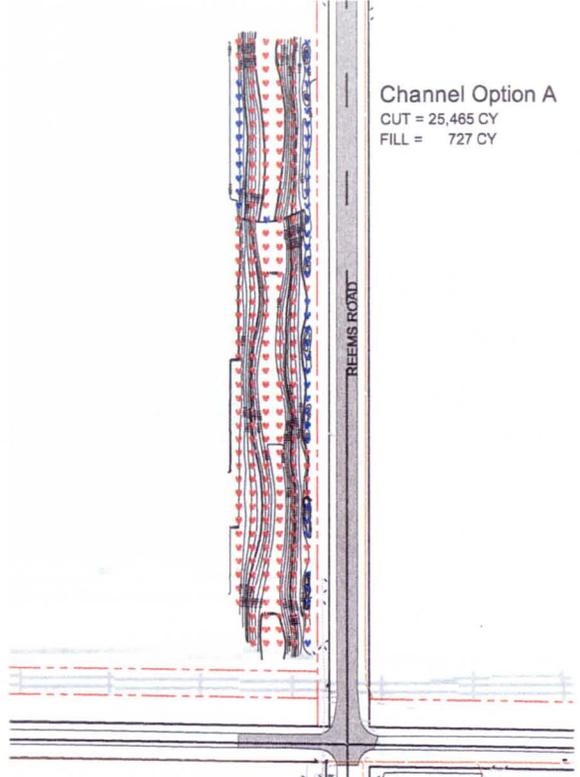
The given minimum performance standards for the basin are as follows:

1. Retain a minimum of 165 acre-feet of water.
2. Side-slopes shall not exceed 4:1.
3. Weir width to be a minimum of 200' long.
4. Basin depth to be a minimum of 8'.
5. Provide for a minimum channel bottom width of 70' north of the weir and 20' bottom width south of the weir. It is beneficial to keep the channel alignment constant where the weir occurs.

The primary goals listed above are accomplished with the passive concept as shown in Figure (4). The channel has the width necessary to accommodate the channel design requirements. Further, the storage capacity of the basin is approximately 208 acre-feet, providing over 25% additional capacity then the minimum 165 acre-feet needed. FCD drop structures and weirs can be accommodated within this plan.

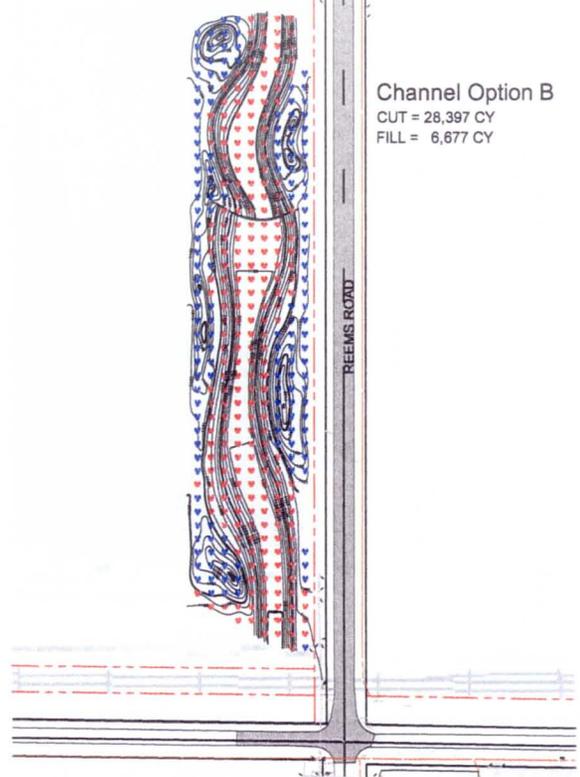
The goal of providing a design that provides an aesthetic response is also accomplished in this design. The preliminary site plan provides opportunities throughout for interpretive areas and/or outdoor classrooms. These areas can be used for a number of different educational themes that could include outdoor botanical communities, the need for flood control and how those needs are accomplished, and/or interpretive areas for aircraft found at Luke Air Force Base. A total of 6 interpretive areas are provided of which 2 are amphitheater style. As discussed in the existing conditions, the area in and around the site is predominantly flat farmland. Variations in topography will make a visual statement and differences in elevation of 4' and over will be noticeable. The site plan proposes the development of an interpretive overlook approximately 15' above existing grade for aircraft enthusiasts to use to identify and observe jets from Luke on approach to land. The southern boundary of the site is in close proximity to one of the main approach patterns for the base and this provides a safe location for people to observe the aircraft. Figures (5 & 6) show how the passive concept would fold into the site surroundings.

Another secondary goal of creating a balanced site through creative use of cut and fill is partially realized with the Passive preliminary site plan. The variation in landform including a lookout area provides a need for import soil to the basin area. The need to spoil dirt from the channel to the north and south of the basin is mitigated to some extent with the need for soil at the



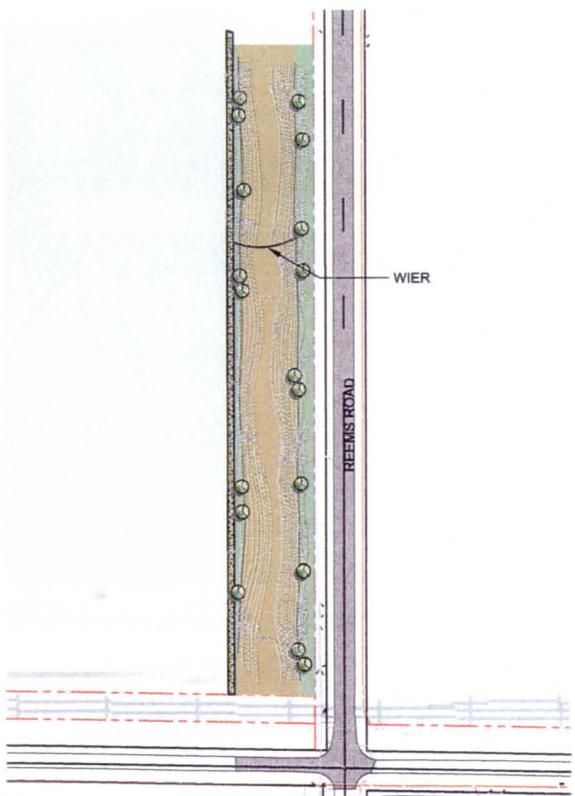
Channel Option A  
 CUT = 25,465 CY  
 FILL = 727 CY

150' Wide Channel Grading

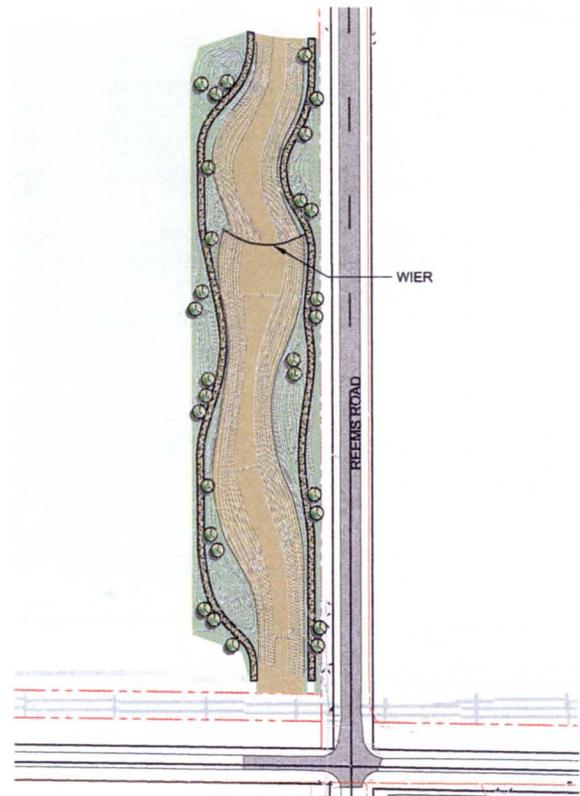


Channel Option B  
 CUT = 28,397 CY  
 FILL = 6,677 CY

225' Wide Channel Grading



150' Wide Rendered Channel

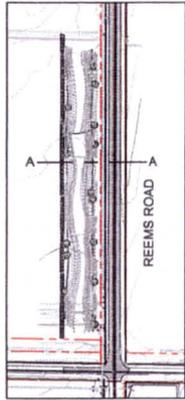


225' Wide Rendered Channel

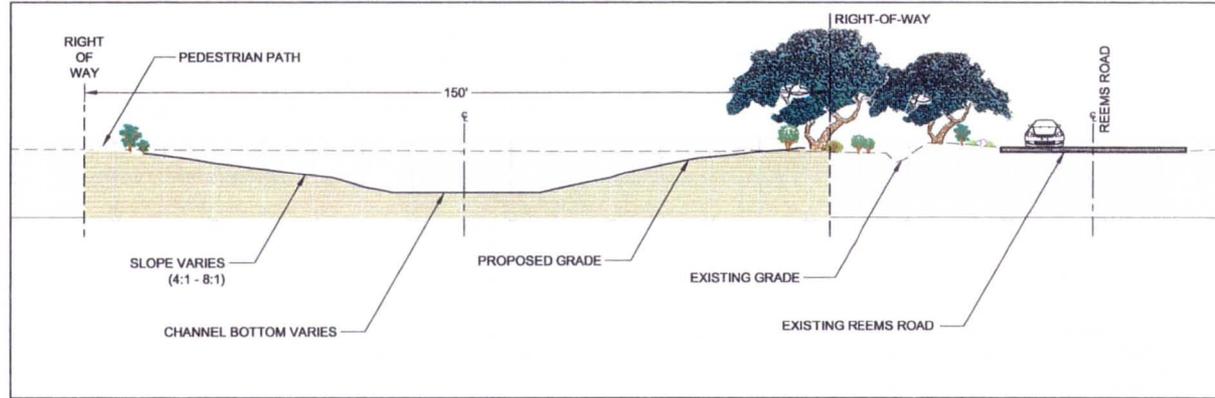
## Reems Road Basin and Channel Project

### Channel Configuration Options

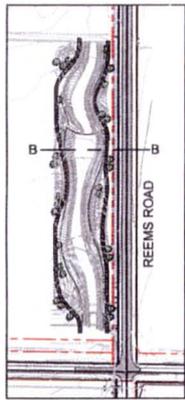
Figure 2



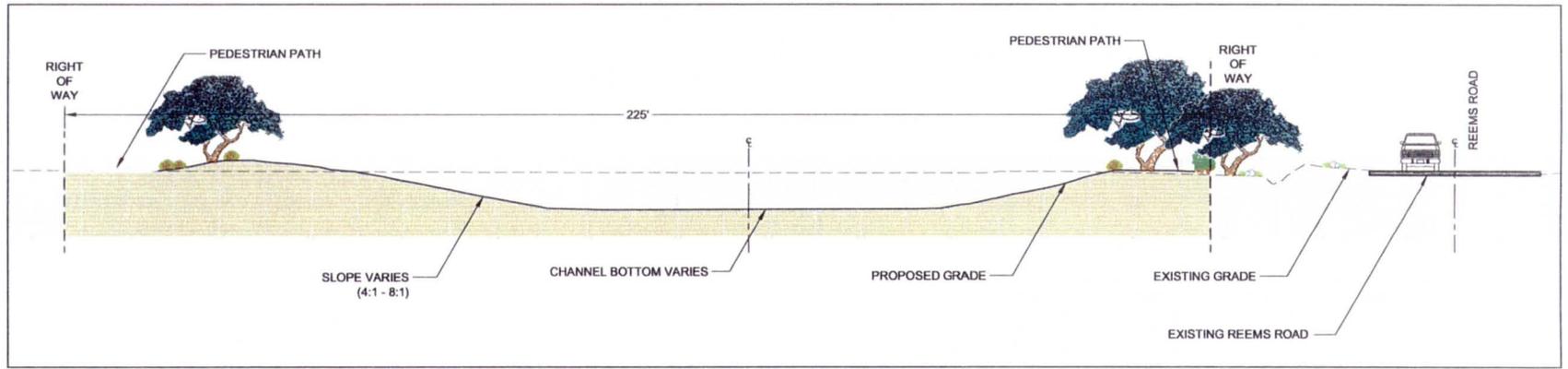
150' Wide Channel



150' Wide Channel Section (A)



225' Wide Channel



225' Wide Channel Section (B)



## Reems Road Basin and Channel Project

### Channel Configuration Options - Sections

Figure 3

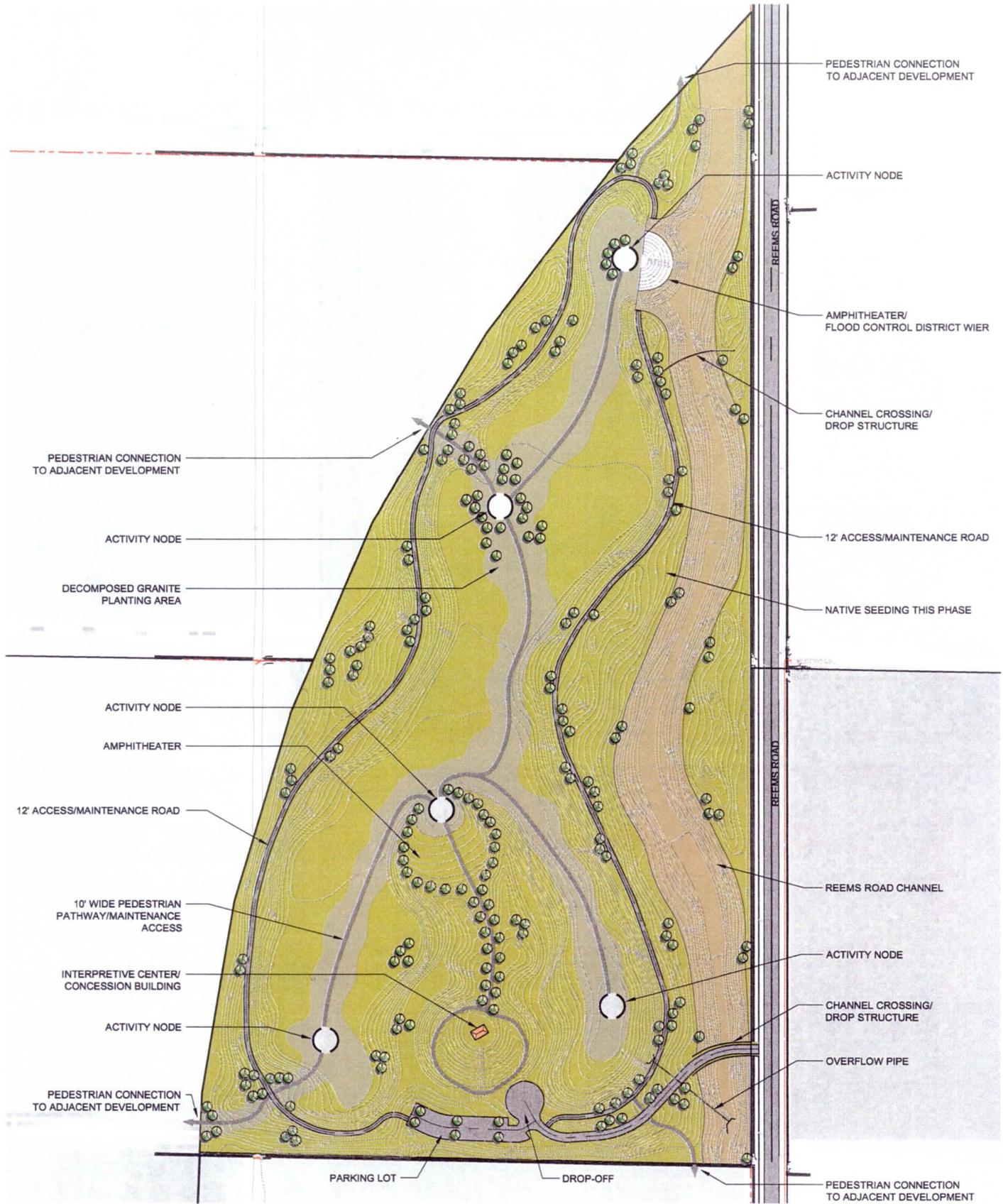
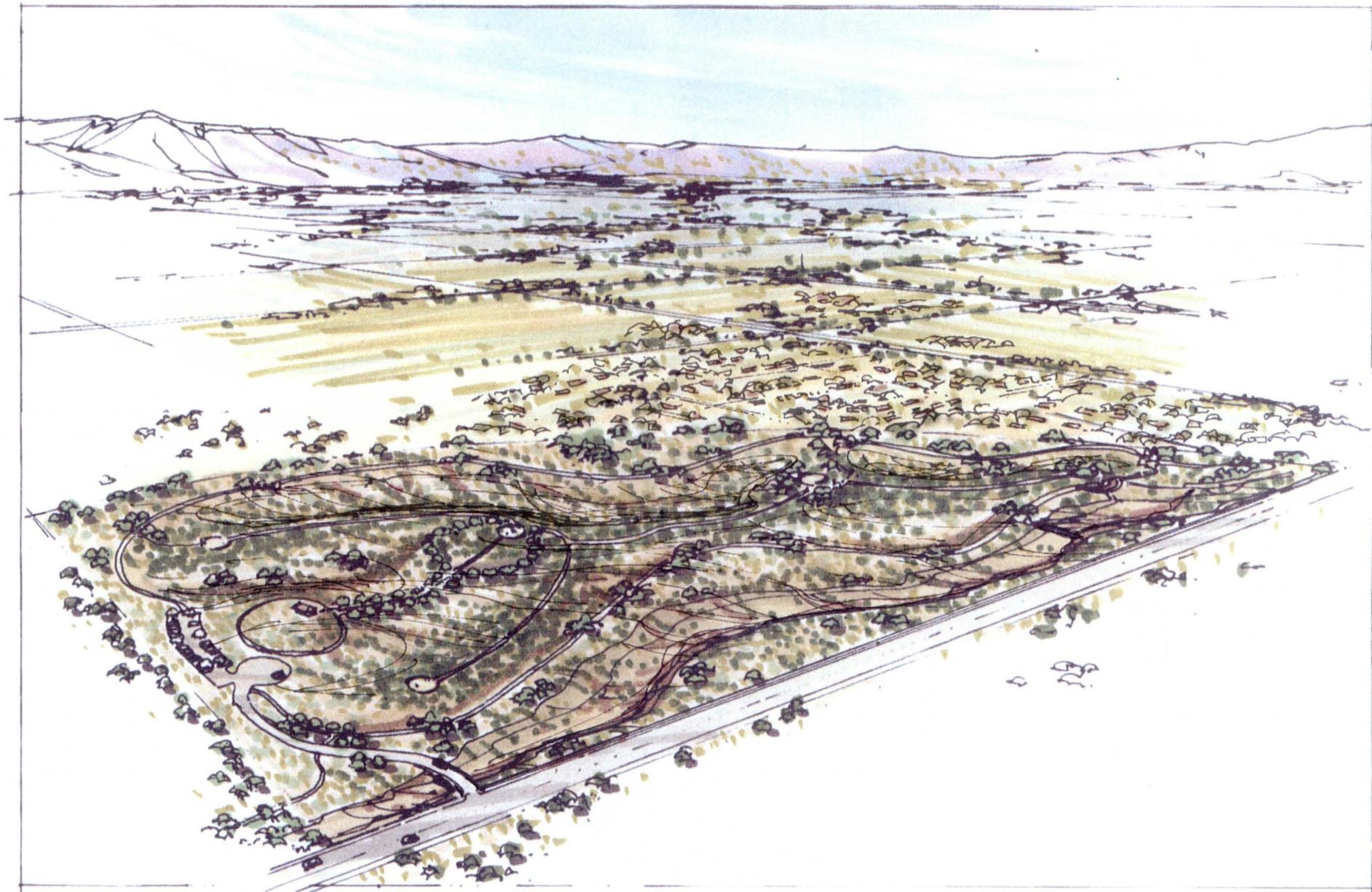


Figure 4

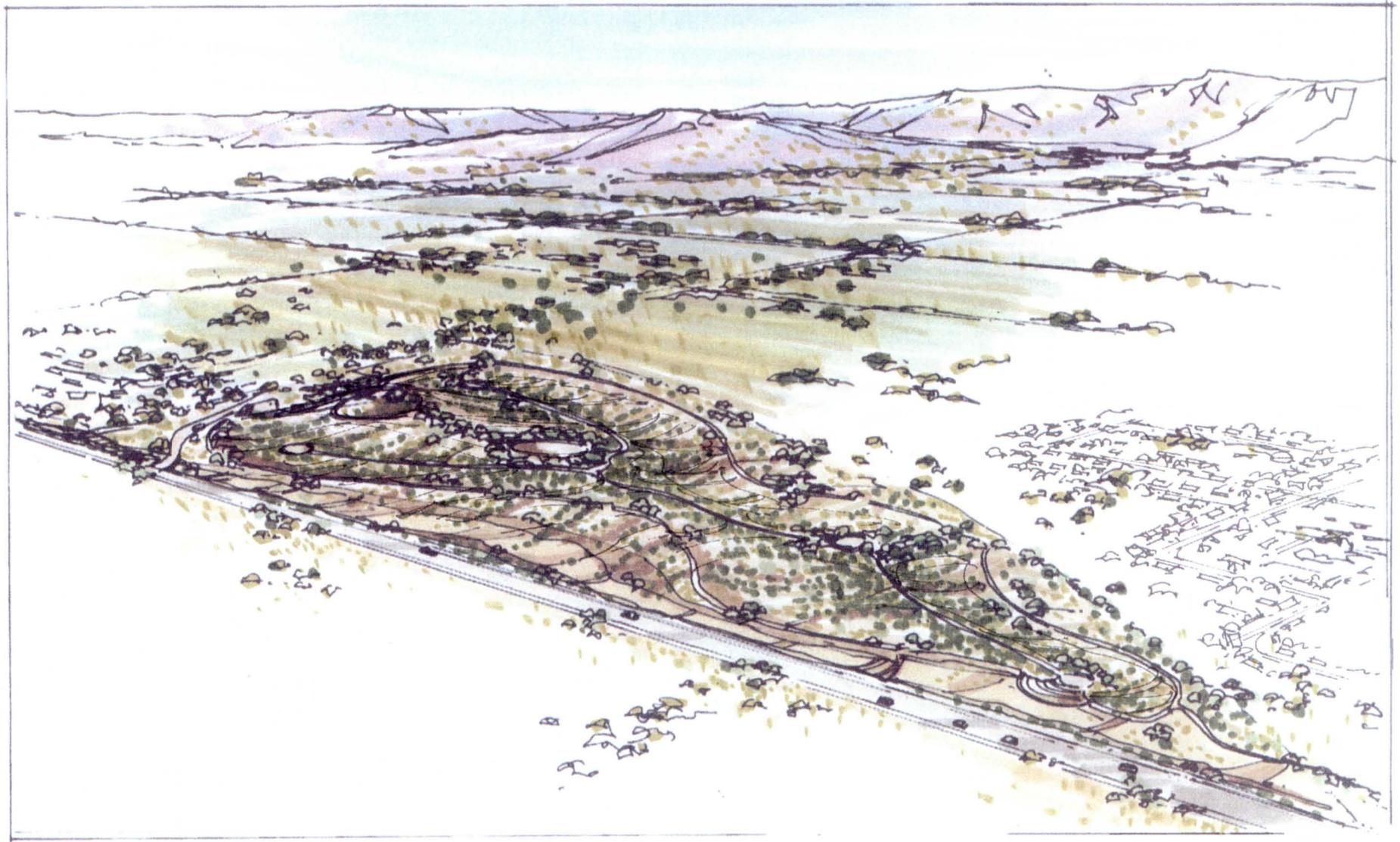
# Reems Road Basin and Channel Project

## Passive Recreational Use Plan - Rendered Draft



PASSIVE

Figure 5



Z- PASSINE

Figure 6

basin area. The location of the weir at the north side of the site reinforces the need for fill. This is due, in part, by the weir elevation and the resulting over bank elevation. The site slopes down hill at approximately 0.5% to the southeast. The channel elevation is at its highest point at the north part of the site. Therefore, by placing the weir at the north edge of the site, the resulting over bank elevation is maintained along the entire rim of the basin creating a need for fill at the south end of the site to accommodate. Placing the weir farther south will lessen the need for fill and will reduce the chance for balancing the site. A cut/fill analysis of the passive concept is shown in Figure (7).

The Passive Preliminary Site Plan does not provide an opportunity for active recreation. Therefore, a potential partner will encounter additional costs in earthmoving and potential FCD structural adjustments to accommodate their programming needs. However, due to the amount of land available for the basin and channel, the opportunity remains for a potential partner to accommodate many of their regional programming needs in the future while maintaining the facilities primary function of conveyance and water storage.

The Passive Preliminary Site plan provides many opportunities for visual mitigation using depressions and berming, variation in horizontal alignment of the channel and basin over-bank, and side slope variation. Landforms have been designed to minimize the visual impact of the basin and channel area and provide visual interest through widely varying elevation changes and shaped depressions.

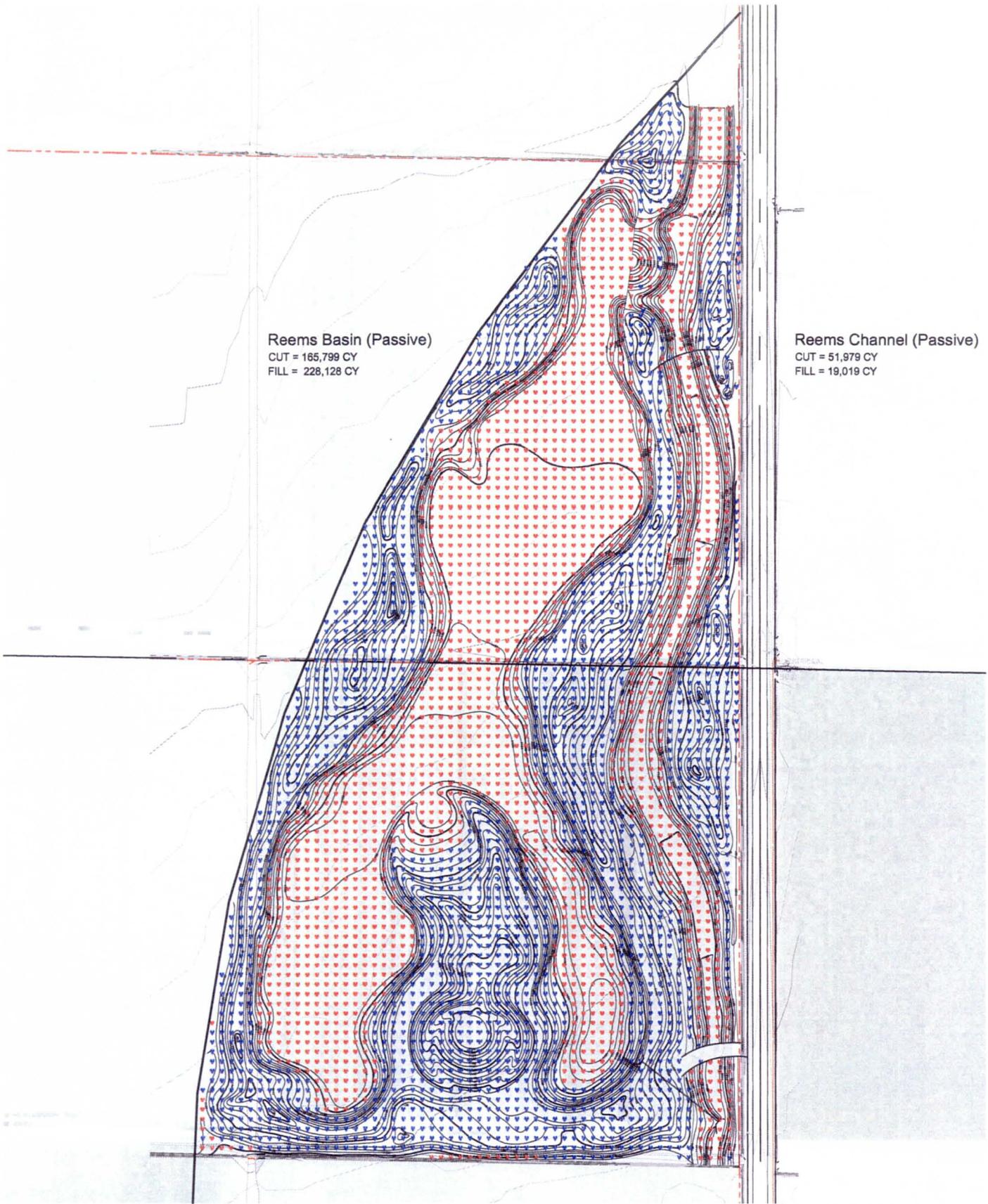
The total acreage of the basin area, excluding the channel area, is approximately 46.7 acres. The landscape cost ceiling for suburban land for the basin area cannot exceed approximately \$1,869,000. Based upon a native seed mix, select use of decomposed granite, and 10 trees per acre, the approximate cost for landscape and irrigation is approximately \$1,117,000 with a 15% contingency. Please see the Preliminary Opinion of Probable Cost in the appendix for further detail on the anticipated line item costs.

The Passive Preliminary Site Plan provides the FCD with a solution that accommodates all of its primary and secondary requirements except for providing for grading to accommodate a partnership with a municipality. However, if a municipality becomes interested in the property, adjustments can be made as necessary for their programming needs.

### **Basin– Active Concept**

The given minimum performance standards for the basin are as follows:

1. Retain a minimum of 165 acre-feet of water.
2. Side-slopes shall not exceed 4:1.
3. Weir width to be a minimum of 200' long.



**Reems Road Basin and Channel Project**  
 Passive Recreational Use Plan - Mass Grading

Figure 7

4. Basin depth to be a minimum of 8'.
5. Provide for a minimum channel bottom width of 70' north of the weir and 20' bottom width south of the weir. It is beneficial to keep the channel alignment constant where the weir occurs.

The primary goals listed above are accomplished with the active concept as shown in Figure (8). The channel has the width necessary to accommodate the channel design requirements. Further, the storage capacity of the basin is approximately 214 acre-feet, providing almost 30% additional capacity then the minimum 165 acre-feet needed. FCD drop structures and weirs can be accommodated within this plan.

The active concept provides opportunities for an aesthetic response in the design. However, the opportunities for variations in channel alignment and strong variation in landform are limited compared to the passive concept. The reason for this limitation is due to the space required for the incorporation of active sports activities within the basin. The shape of the basin is driven in large part by the placement of (4) regulation softball fields with 300' outfields, (6) soccer fields, an aircraft observation overlook similar in location to the passive concept, a basketball and tennis court, restroom/ concession buildings, and supporting roadways, parking, and pedestrian circulation. The basin is tiered in a way that limits inundation of facilities that are more maintenance intensive (i.e. softball fields) to the larger storm events. The southern 3 soccer fields will be inundated before the northern 3 soccer fields, which will be inundated before the softball fields. The variation in elevation of these areas provides visual interest while increasing the capacity of the basin. Figures (9 & 10) show how the active concept would fold into the site surroundings.

Municipalities are often looking for opportunities to acquire large parcels of land to develop as a regional park. However, parcels exceeding 30 acres within the boundaries of their city are difficult to locate at a reasonable price. This parcel of land being utilized for the basin is similar in size to a regional park and, as development moves into this area, the municipalities that may annex this area will likely have an interest in an opportunity to utilize a parcel like this to meet their growing recreational programming needs. The active concept provides the FCD with a picture of how this basin can be developed to fulfill its primary purpose of conveyance and storage and providing appropriate visual mitigation, while providing a municipality the opportunity to fulfill its recreational needs. The municipality will benefit in that the land would not need to be purchased. The FCD will benefit in that the long-term cost of maintenance for the facility will be reduced, and possibly eliminated.

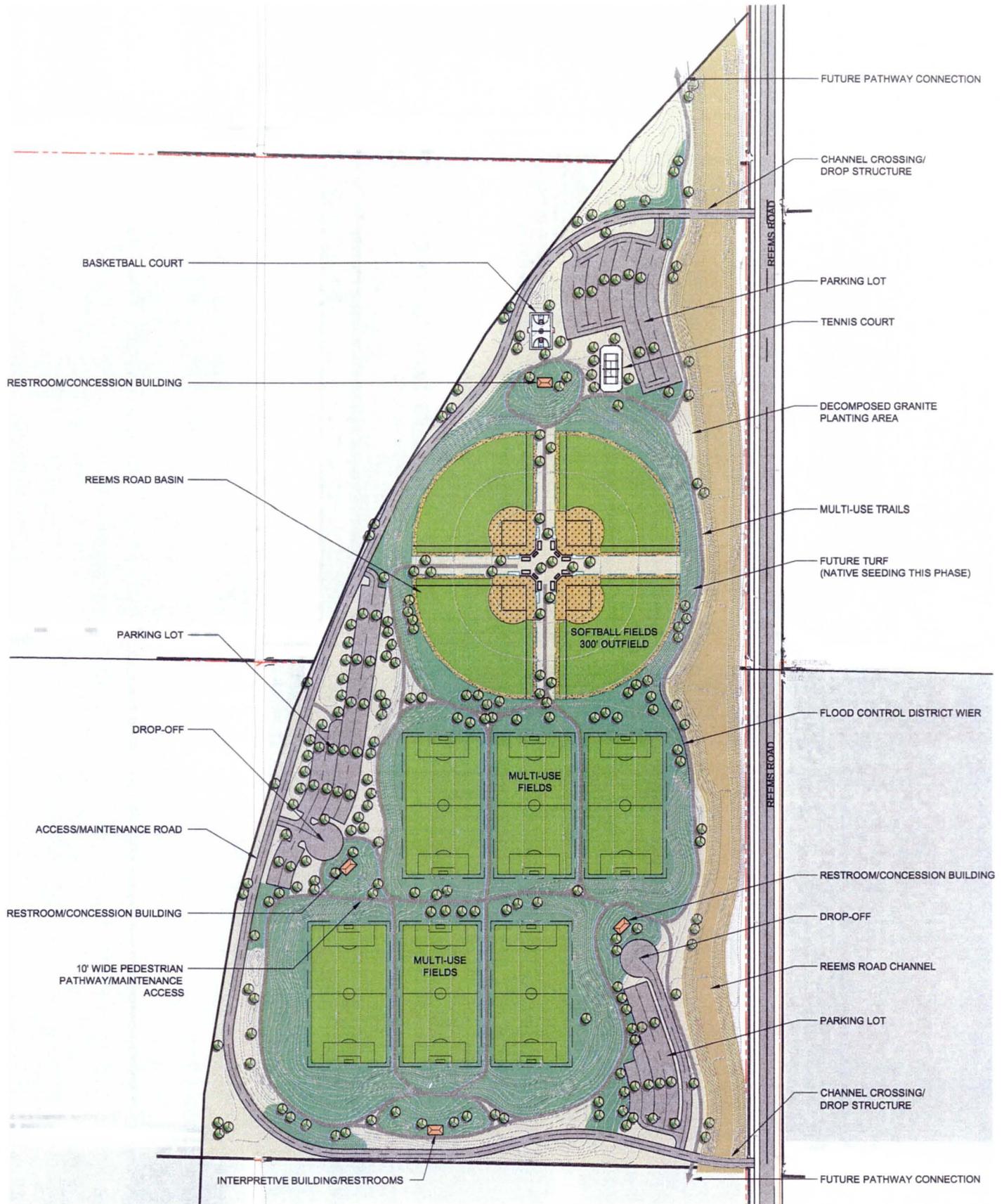
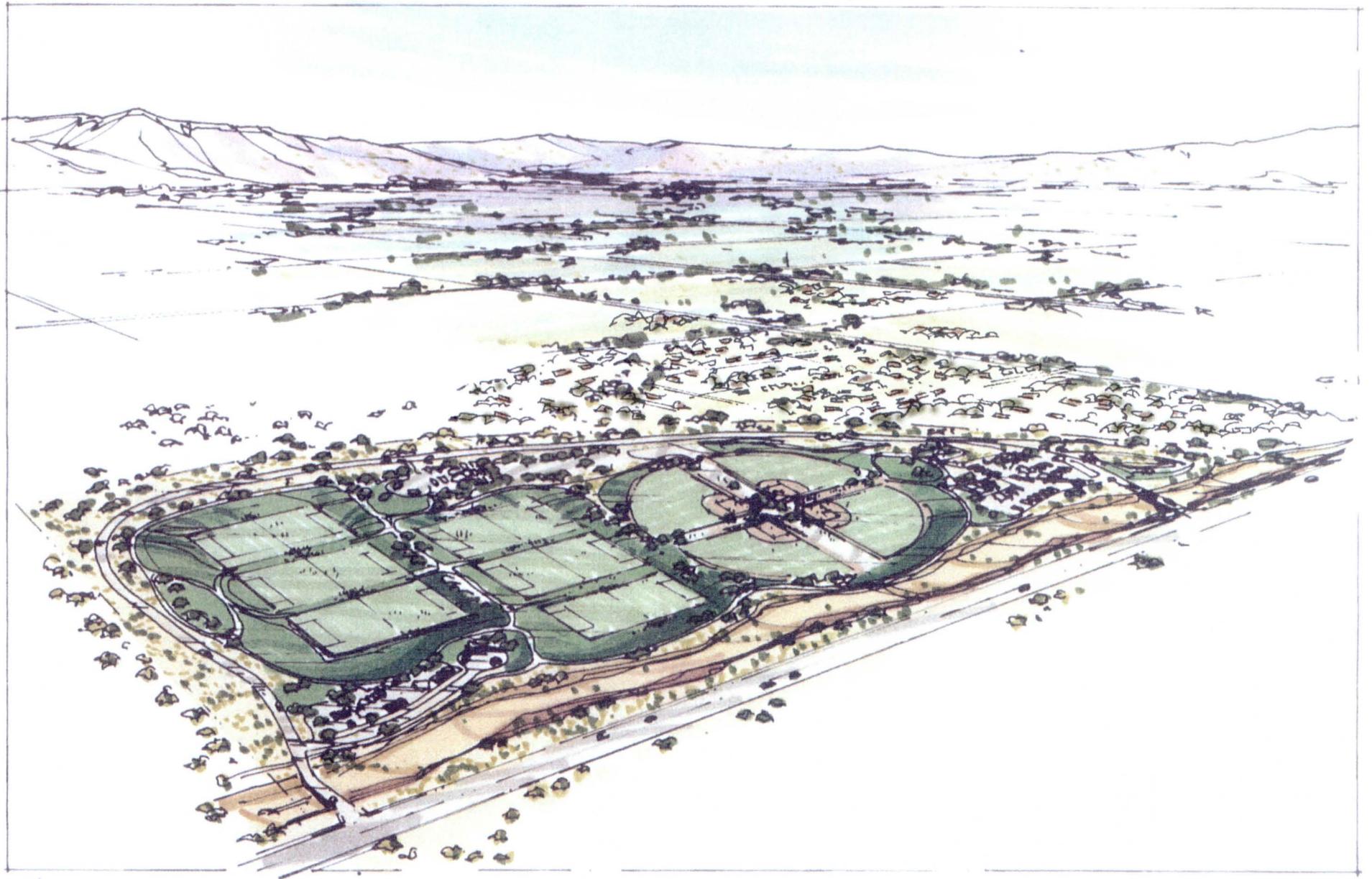


Figure 8

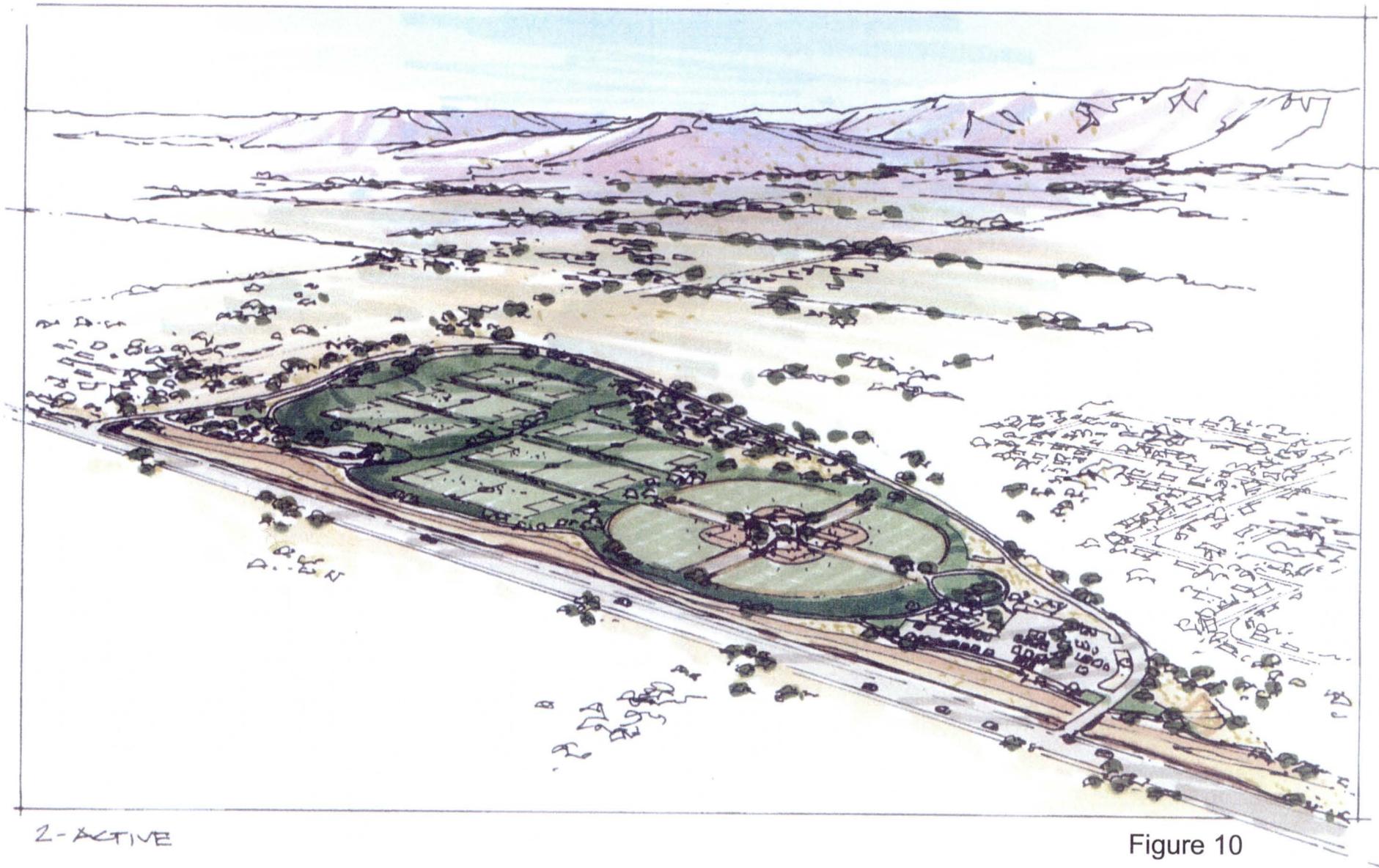
# Reems Road Basin and Channel Project

Active Recreational Use Plan - Rendered Draft



ACTIVE

Figure 9



2-ACTIVE

Figure 10

The area needed to provide playable surfaces for the active sports fields limits the potential to balance the cut/fill of the site. The location of the weir in relation to the basin also affects the ability of the site to be balanced. The weir is strategically placed to spill south of the softball field 4-plex to reduce the chance for inundation. The result of this placement in comparison to the passive concept is that the over bank elevation is reduced from 43.0 for the passive concept to 37.5 for this concept. The impact is that less fill is required to maintain the over-bank elevation, and the bottom of the basin needs to be lower than the passive concept creating more cut. The result is that the basin and the channel will not be balanced and there will be significant soil export. See Figure (11) for further cut/fill information and Figures (12 & 13).

The total acreage of the basin area, excluding the channel area, is approximately 46.7 acres. The landscape cost ceiling for suburban land for the basin area cannot exceed approximately \$1,869,000. Based upon a native seed mix, select use of decomposed granite, and 10 trees per acre, the approximate cost for landscape and irrigation is approximately \$1,052,000 with a 15% contingency. Please see the Preliminary Opinion of Probable Cost in the appendix for further detail on the anticipated line item costs.

The Active Preliminary Site Plan provides the FCD with a solution that accommodates all of its primary and secondary requirements except for providing a balanced site. The FCD will need to coordinate with other construction projects within a reasonable vicinity to the project for the potential of spoiling the excess soil at one of these locations. Providing an opportunity for a municipality to enter into an agreement and develop the site with minimal grading will be a further incentive for mixed use.

### **Preferred Alternative**

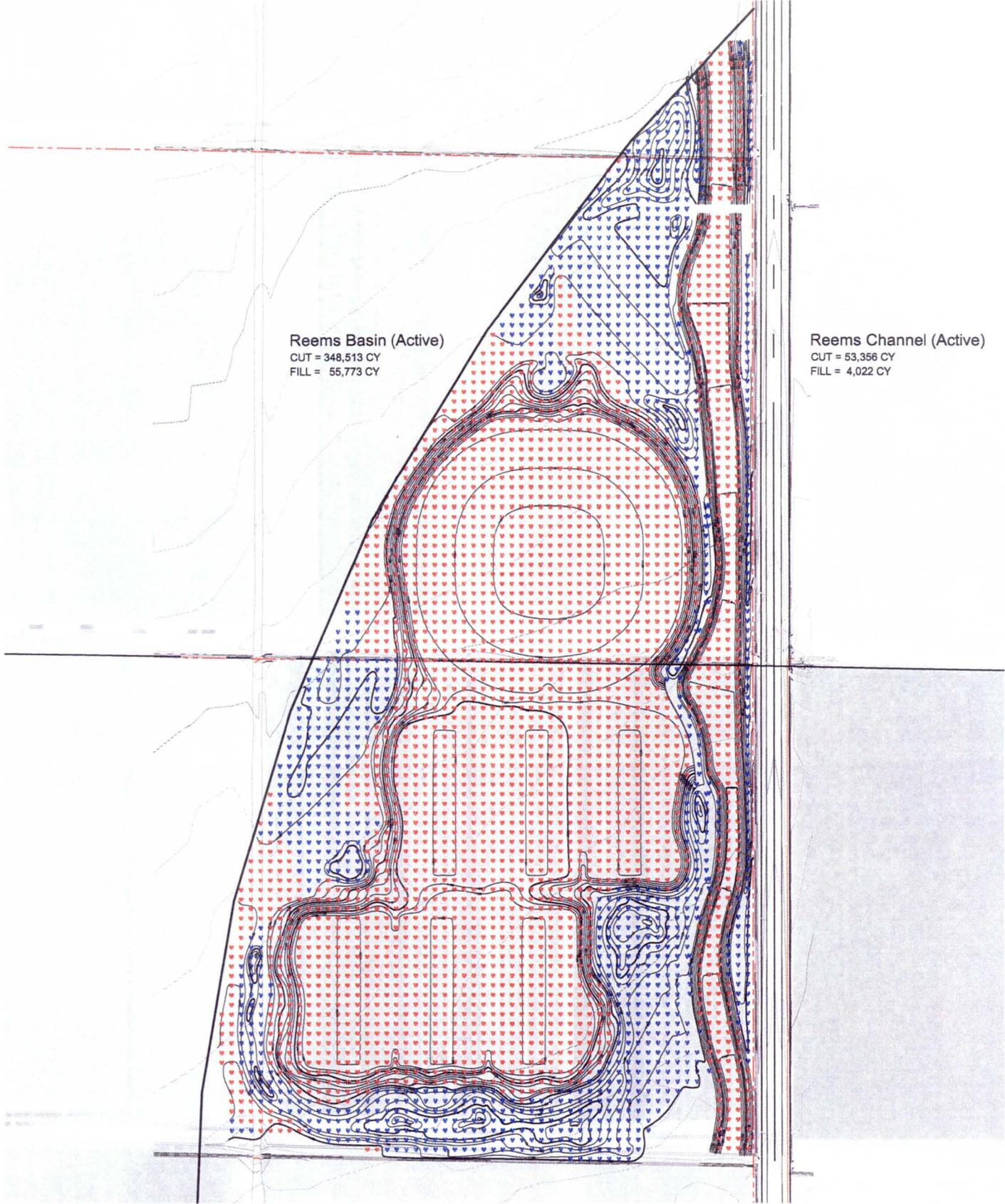
Based upon the Brainstorming meeting facilitated by SiteTek for the Reems Road Basin and Channel, a preferred alternative was defined. The meeting notes for the meeting can be found in the appendix.

### **Channel South of the Basin Weir**

Based upon the Brainstorming meeting facilitated by SiteTek for the Reems Road Channel and Basin, the FCD is pursuing the acquisition of additional land for a 225' ROW. The preferred alternative shall provide a design that shows this preference.

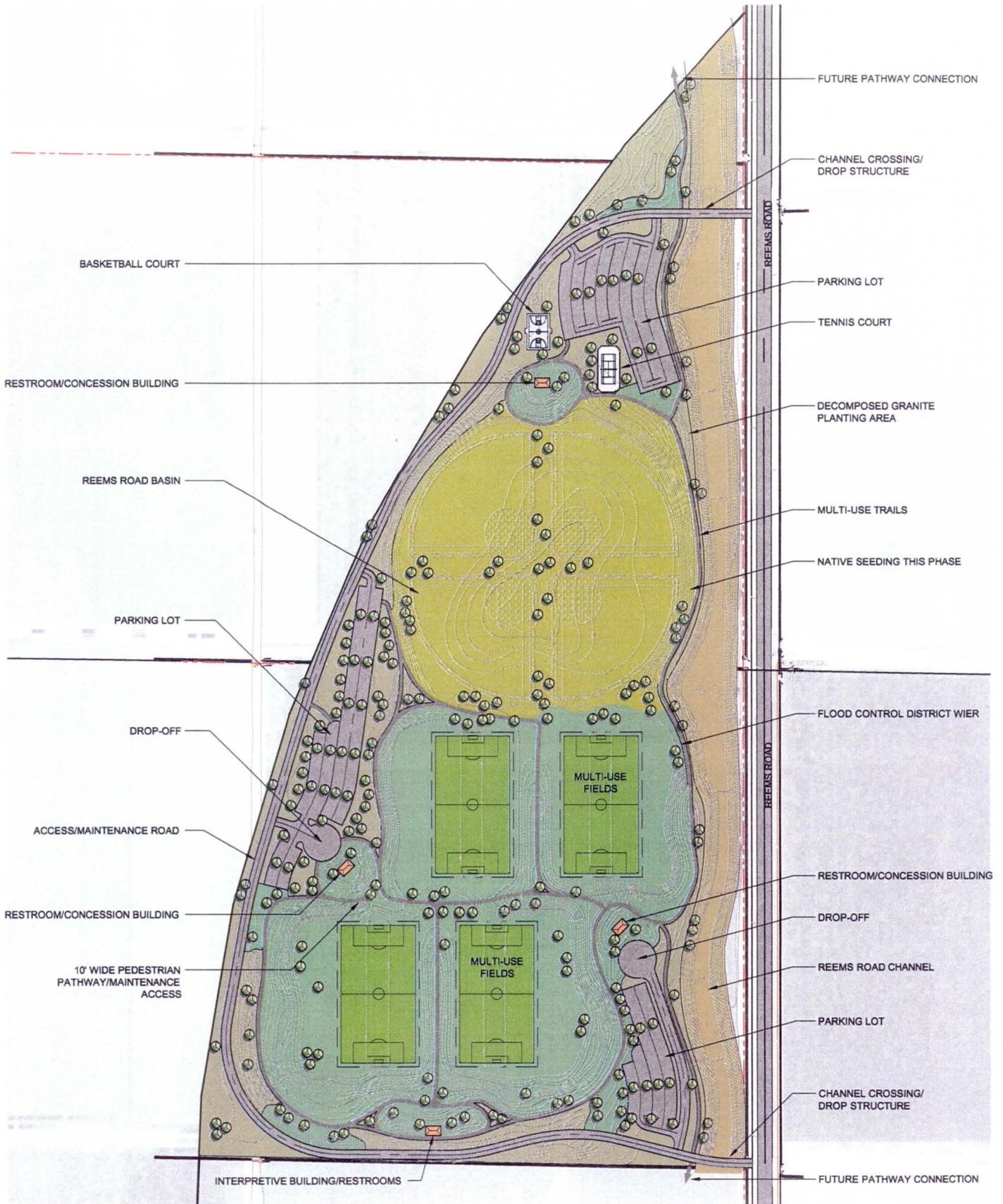
### **Basin**

The consensus and direction given at the Brainstorming meeting was that the basin was to be further refined utilizing the passive concept as the basis for a preferred alternative. In the interest of building a project that is close to a



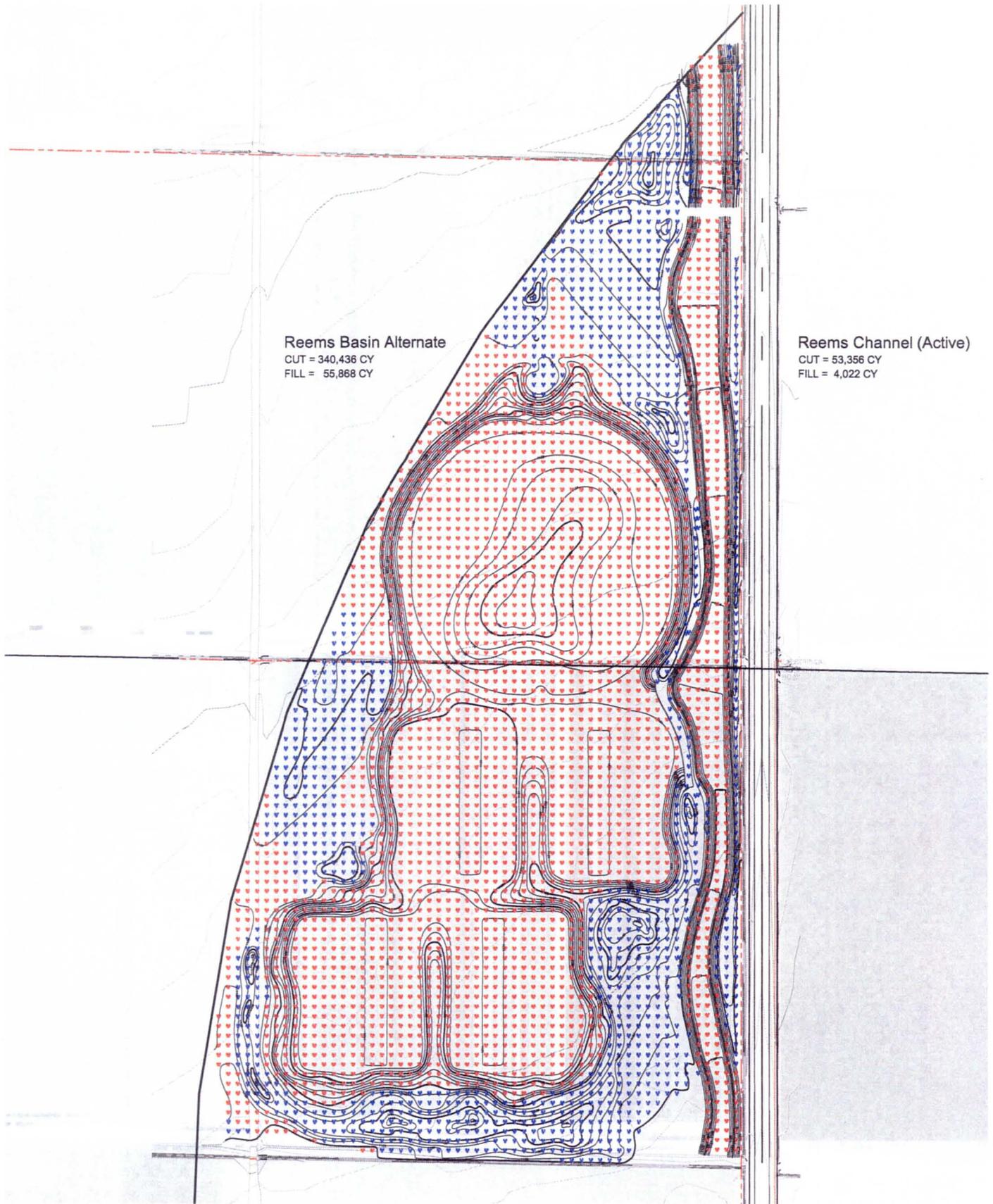
**Reems Road Basin and Channel Project**  
 Active Recreational Use Plan - Mass Grading

Figure 11



Reems Road Basin and Channel Project  
 Active Recreational Use Plan Alternate - Rendered Draft

Figure 12



Reems Road Basin and Channel Project  
 Active Recreational Use Alternate Plan - Mass Grading

Figure 13

balance in earthwork is cost effective to the FCD. Further, the FCD has not identified a municipality that would have an immediate interest in developing the basin as a park and take over the maintenance of the site. The design and construction of this project does not preclude that a municipality could not develop the site in the future. On the contrary, the FCD would welcome the opportunity for a municipality to come in and develop the site as they need in the future and take over the maintenance costs. This solution also pushes the cost of soil export off until the municipality incorporates their improvements.

The FCD requested that the weir be placed near the middle of the site similar in location to the active concept. This will reduce the likelihood that, upon development of the site by a municipality, that the weir would need to be redesigned and rebuilt to accommodate their maintenance needs. See Figures (14 &15).

If the FCD determined that they would, at some point in the future, develop the site as an interpretive center dedicated to educating the community about the benefits that the FCD provides, a site plan was developed to illustrate what the development may look like. Open turf areas, dedicated parking, a lookout area, outdoor classrooms, and multiple educational interpretive areas connected by a pedestrian pathway system are a few of the amenities that could be provided. See Figure (16).

### **Design Alternatives for Structural Components**

Theming is an exercise that can tie a project together in terms of layout, visual connectivity, and use. In the past, many projects that have a primary purpose that is highly functional, but mechanical in nature, are designed without regard to how it folds visually into its surroundings. However, it has become apparent that value is added with the thoughtful visual integration and mitigation of these projects by tying it into the adjacent area. Through theme development, a functional solution to a project is accomplished while creating value by integrating the project visually with the surrounding neighborhood.

Structural components within a project, including weirs, drop structures, and culverts, are a visually dominant feature in a Flood Control District Project. These components are instrumental in accomplishing the primary goals of conveyance and storage. Likewise, they can also be instrumental in accomplishing the secondary goals of visually folding the project into its surroundings by conveying a design theme. Techniques can be used to reinforce themes through applications of form, color, texture, and height variations onto and within these structural components. The OA design team utilized these techniques to establish alternative design themes that may be used for the Reems Road Basin.

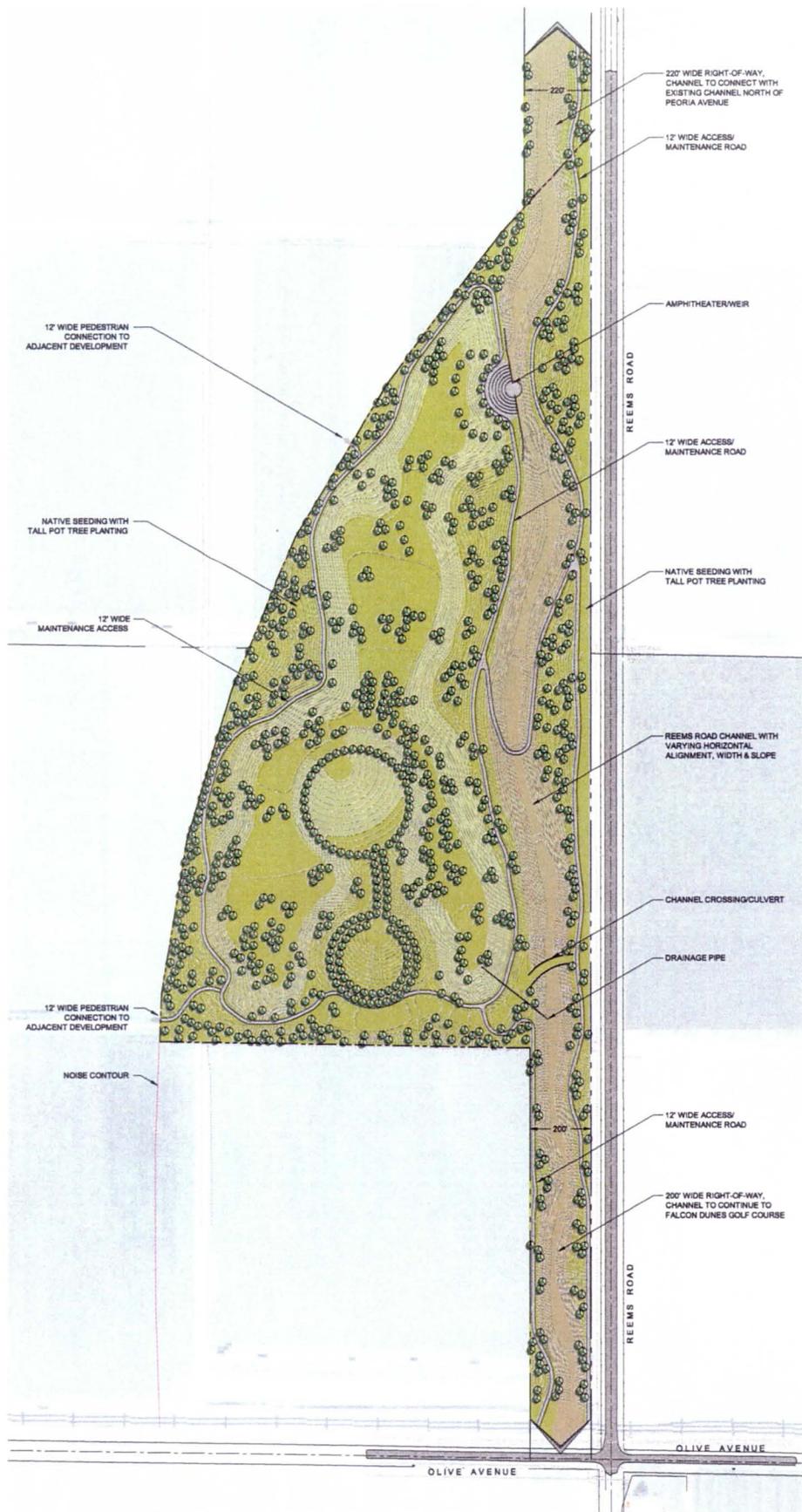


Figure 14

Reems Road Basin and Channel Project  
 Preferred Alternative Use Plan - Draft



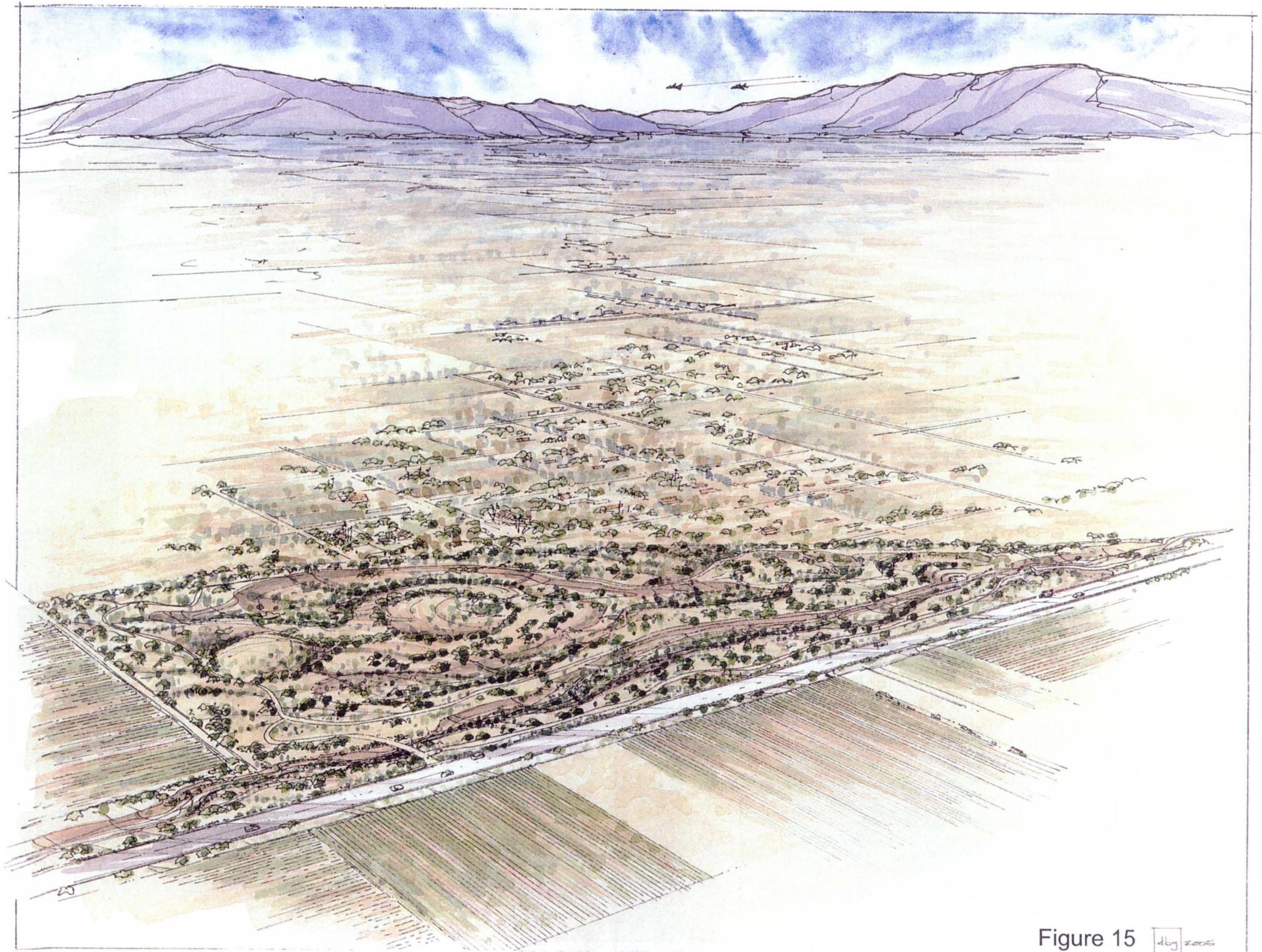


Figure 15 dby 2005

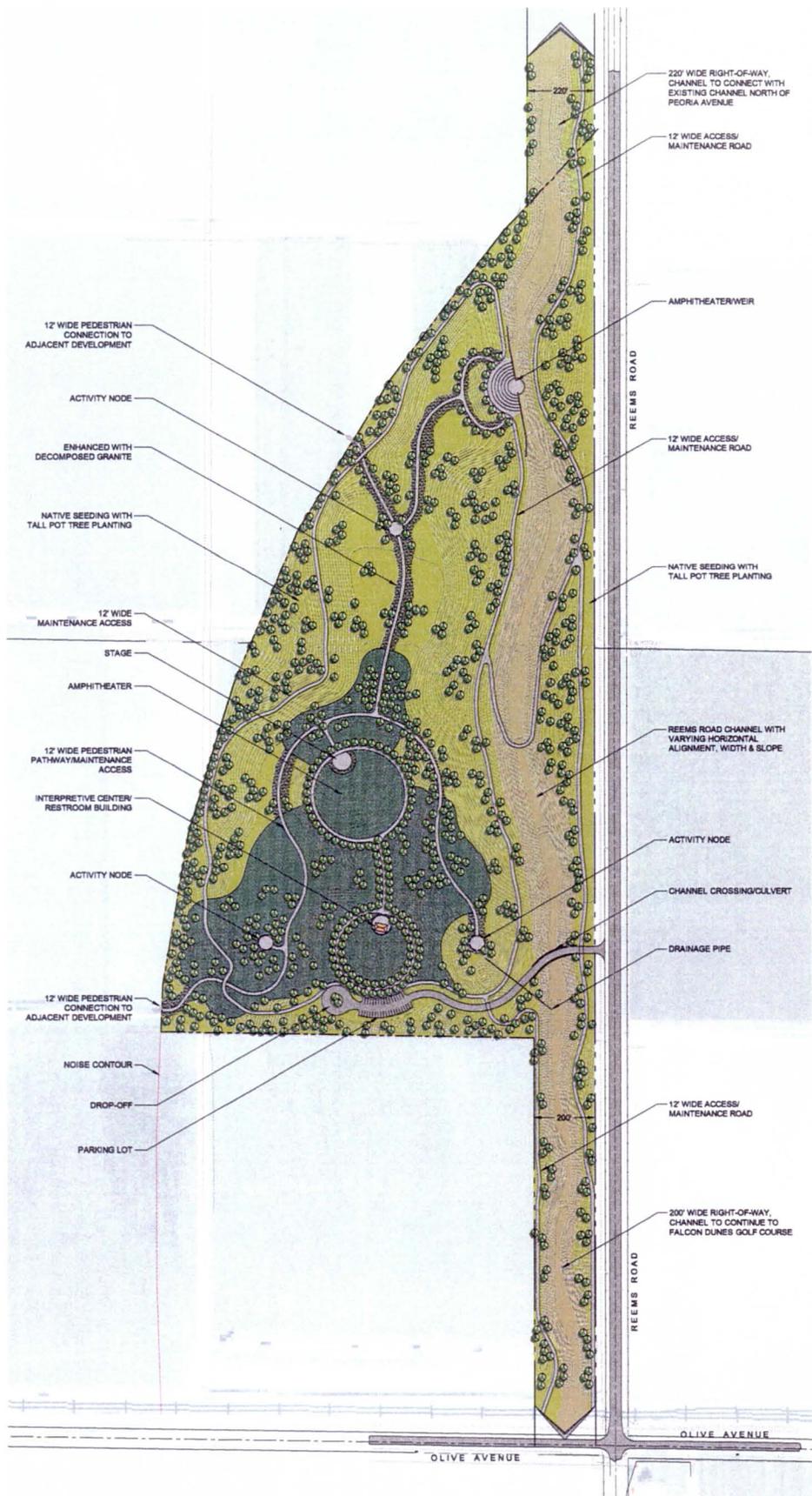


Figure 16

Reems Road Basin and Channel Project

Preferred Alternative Use Plan - Draft

Full Build Out



## Theming

During the Reems Road Channel and Basin Brainstorming Meeting stakeholders and the OA design team discussed potential themes that should be evaluated for use on the project. The three themes suggested are as follows:

1. **Aircraft and Luke Air Force Base**
2. **Roses and Agriculture**
3. **Flood Control District**

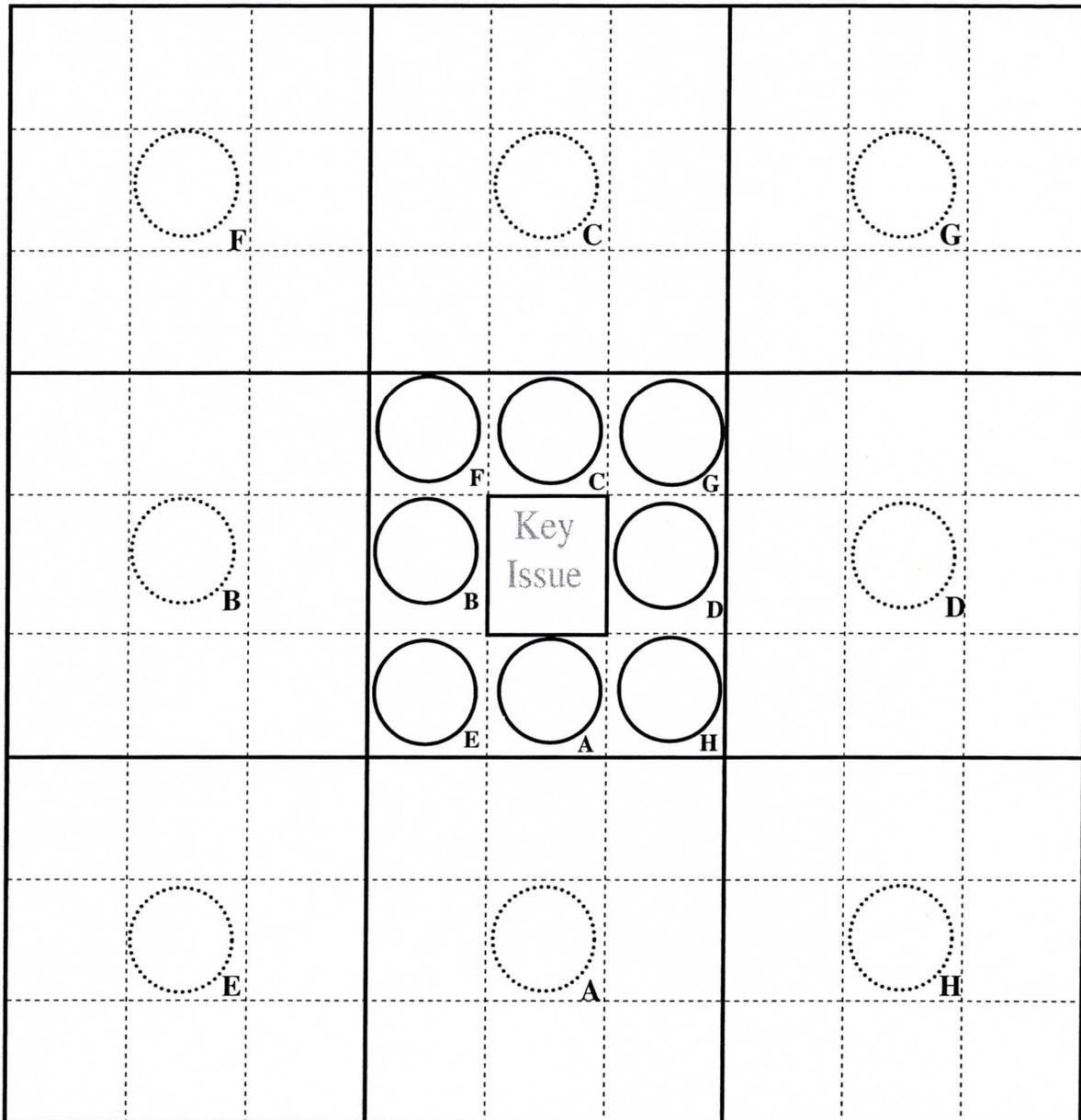
### Process

Although literal interpretations of a theme can be derived from their titles, defined creativity exercises can be employed to drill down into the subtleties of how a theme is physically conveyed into the built environment. For example, for "Aircraft and Luke Air Force Base" a literal interpretation of this theme may be implemented by laying out an aircraft outline in the concrete. However, a metaphorical and subtle response to the theme may include the use of windsocks. Another may be utilizing a jets's contrail as a subcomponent of the aircraft theme and using that idea to develop a "crossing contrails" pattern in the paving. These are responses that are a layer of thinking more subtle, but convey the theme in a much more powerful way.

The inherent difficulty with employing this type of application of a theme is generating the subtle ideas that convey that theme. The OA design team utilized a creativity exercise that promotes this type of thinking. The exercise is called the Lotus Blossom (Jasmine Blossom) and was developed by Luis and Aileen Aranda, Professors at Arizona State University's W.P. Carey School of Business. A diagram of how the Lotus Blossom Exercise works is shown in Figure (17). Utilizing the frame work of the Lotus Blossom Exercise, OA developed variations to the exercise and expanded it as follows:

1. A Jasmine blossom with a 9-petal layout was used in lieu of the 8-petal lotus blossom.
2. After filling out the interior blossom of each theme, each OA design team member voted on what they considered the four strongest words or phrases to be. The four that received the most votes were placed in the center of a new blossom for developing related ideas.
3. At the conclusion of the exercise, OA design team members voted on the most powerful words or phrases in terms of theme development for each theme.
4. Those receiving the most votes for each theme were posted as strong metaphorical connections to the central theme.

## Lotus Blossom



**Process:**

- Write your central theme or problem in the diagram's center.
- Think of related ideas and write them in the surrounding circles.
- Transfer each idea in the central circle to the corresponding outside circle.
- Try to think of eight new ideas involving the new central theme. Fill in as many boxes as you can.
- Continue the process until you've completed as much of the diagram as you can.
- Evaluate your ideas. Select the best to develop. Keep the rest for future possibilities.

5. A list of built components that will be constructed was developed. These items represent the opportunity to convey the metaphorical connections of each theme.
6. The OA design team then generated words, diagrams, and sketches to show how the metaphors to the theme would be physically conveyed in a built environment.
7. The sketches were cataloged and used to generate preliminary ideas on how to convey the themes as part of the design of the Structural Components in the project.

This process was used for each potential theme concept. The following sections outline, in further detail, the specifics of each theme and its preliminary development.

The components listed in which a theme can be physically communicated in a built environment for this project are listed as follows:

1. Walls
2. Land Form
3. FCD Structures
  - a. Drop Structures
  - b. Weirs
  - c. Culverts
  - d. Pedestrian Underpasses
4. Walkways and paved areas
5. Ramadas
6. Interpretive Areas
7. Landscape Layout
8. Amphitheater

### **Theme Alternative 1-Aircraft and Luke Air Force Base**

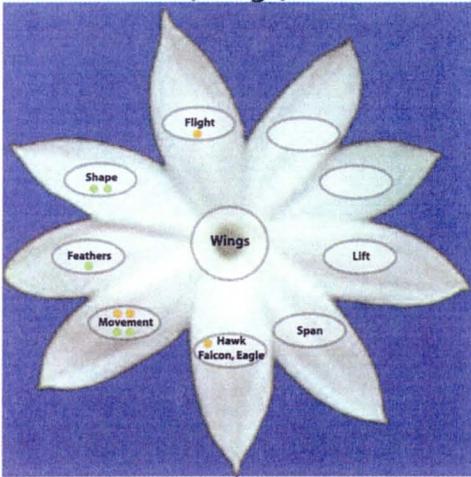
Due to the proximity of the site to Luke Air Force Base and the fact that the site is close to a well-used landing pattern for the Base, there is an opportunity to take advantage of these attributes as a theme. Given the FCD and Luke interest in providing an alternative lookout area for approaching aircraft, an opportunity exists to reinforce the theme with a dedicated aircraft interpretive look out area.

Figure (18) shows the Jasmine Blossom Exercise results for the Aircraft and Luke Air Force Base theme alternative from the OA design charette. Below is a summary:

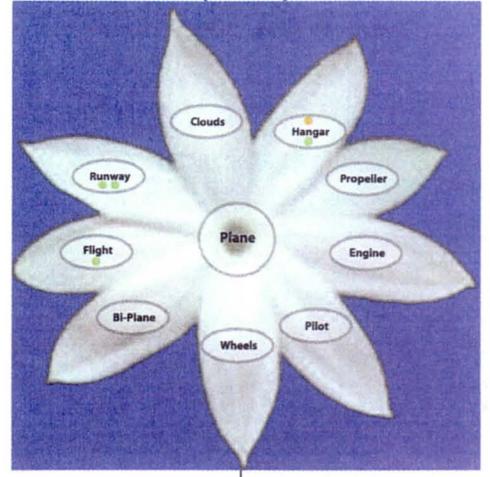
#### **Central Theme: Aircraft and Luke Air Force Base**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Wings	1	0
Noise	1	0
Plane	3	1

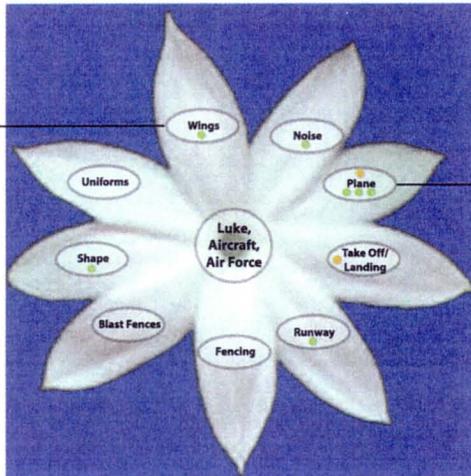
Flood Control District  
**(Wings)**



Flood Control District  
**(Plane)**

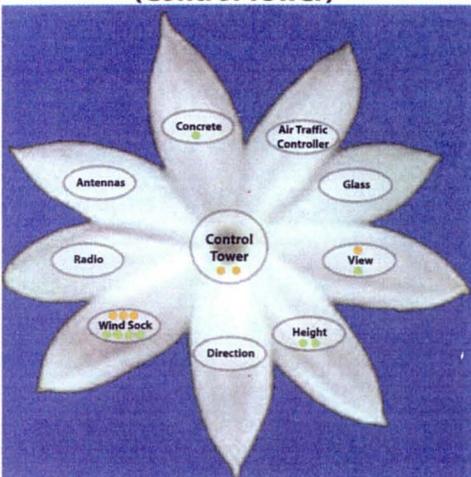


**JASMINE BLOSSOM**  
Luke, Aircraft, Air Force

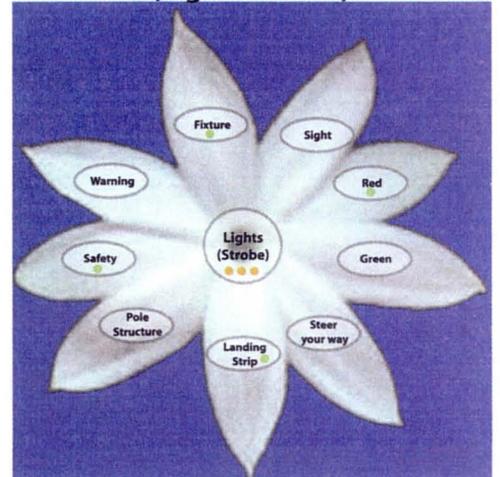


- Hangar
- Control Tower
- Flight Patterns
- Lights (Strobe)

Flood Control District  
**(Control Tower)**



Flood Control District  
**(Lights-Strobe)**



- Form
- Lights

Figure 18

Take Off/Landing	0	1
Runway	1	0
Fencing	0	0
Blast Fences	0	0
Shape	1	0
Uniforms	0	0
Hanger	0	1
Control Tower	2	3
Flight Patterns	0	0
Landing (Strobe) Lights	3	4

Secondary Theme: **Plane**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Clouds	0	0
Hanger	1	1
Propeller	0	0
Engine	0	0
Pilot	0	0
Wheels	0	0
Bi-Plane	0	0
Flight	1	0
Runway	2	0

Secondary Theme: **Landing (Strobe) Lights**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Fixture	1	0
Sight	0	0
Red	1	0
Green	0	0
Steer your way	0	0
Landing Strip	1	0
Pole Structure	0	0
Safety	1	0

Secondary Theme: **Control Tower**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Concrete	1	0
Air Traffic Controller	0	0
Glass	0	0
View	1	1
Height	2	0
Direction	0	0
Wind Sock	4	3
Radio	0	0
Antennas	0	0
Form	0	0

Lights 0 0

Secondary Theme: **Wings**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Flight	0	1
Shape	2	0
Feathers	1	0
Movement	2	2
Hawk, Falcon, Eagle	0	1
Span	0	0
Lift	0	0

Theme metaphors derived: **Aircraft and Luke Air Force Base**

1. Landing (Strobe) lights as it relates to Luke.
2. Wind Sock as it relates to Control Tower.
3. Movement as it relates to Wings.
4. Control Tower as it relates to Luke.

The next step in the process is to relate the components that a theme can be physically communicated in a built environment for this project to the theme metaphors derived. For example, the design team was asked, "What does Movement as it relates to wings look like for a ramada?" The answer to that is preliminary theme development related to Aircraft and Luke Air Force Base. The team was given 10 minutes of freethinking and idea generation to come up with as many ideas as possible. Figures (19 & 20) show the ideas that were generated.

**Theme Alternative 2-Roses and Agriculture**

The surrounding land use is currently agriculture and has been for many years. Roses appear to be the dominant crop for the land directly adjacent to this project. This area and its farmers are one of the most proliferate rose producers of any area in the nation. Due to proposed development of homes and businesses in the area, rose production will likely be discontinued in favor of new development. A way of tying the historic use of this land to its agricultural roots, namely rose production, is by evaluating the possibility of utilizing a theme of roses and agriculture.

Figure (21) shows the Jasmine Blossom Exercise results for the Roses and Agriculture theme alternative from the OA design charette. Below is a summary:

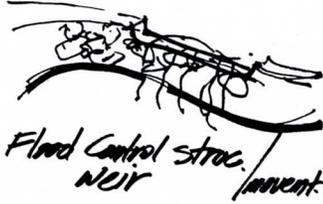
Central Theme: **Roses and Agriculture**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Rows	2	1
Color Variations	3	0

# Aircraft and Luke AFB

## WALKWAYS

- WIND SOCK / CONTROL TOWER
- AS DIRECTIONAL SIGNAGE POSTS
- PAVING PATTERNS



MOVEMENT  
MASSIVE SWEEPING  
LANDFORMS.

STROBE LIGHTS  
LEADING TO  
PED. UNDERPASS

Ped UNDERPASS  
Strobe lights

## RAMADAS

- CONTROL TOWER/LAKE
- ROOF SHAPE
- COLUMN REGION



Land form  
wings / noxomart

## FCD STRUCTURES

- CONTROL TOWER/LAKE
- VARIOUS TYPES OF MATERIALS

## LANDSCAPE

- STROBE LIGHTS / LAKE
- VARIATION OF PLANT MATERIAL

Wells  
Strobe light

LARGE AREAS OF  
FABRIC BLOWING  
LIKE WINDSOCKS  
FOR RAMADAS

RAMADA - WINDSOCK

STROBE LIGHTS  
MIMICK FLOW  
OF WATER INTO  
BASIN  
FCD - STROBE  
STROBES

DROP STRUCTURES  
SHAPED LIKE  
WINGS. (WING FLAPS)

INTERPRETIVE  
AREA OF WING  
PARTS  
A WING GARDEN

MINI CONTROL  
TOWERS AS  
RAMADAS

## Walkways

Strobe lights  
along walkway

## INTERPRETIVE AREAS

- MOVEMENT / WINGS
- HISTORY OF FLIGHT

## Weirs

Strobe lights  
along top

## Interpretive Areas



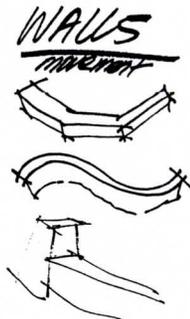
## LANDFORM

ELEVATION  
W/ LIGHTING  
FOR DIRECTION

RAMADAS  
CANVAS

WALL  
sculptures

WALKWAYS  
VARY PLANT  
TYPES



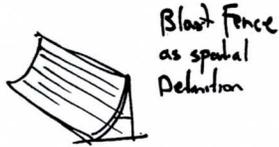
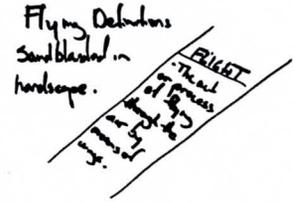
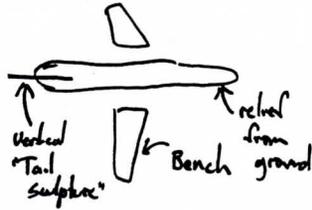
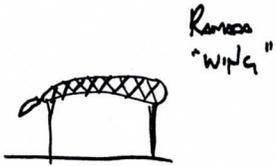
Interpretive  
Air Dept  
in wells &  
wells the various  
plans that have  
been @ Luke



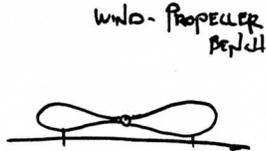
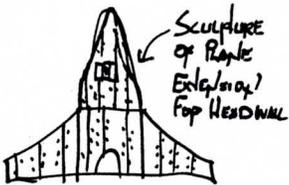
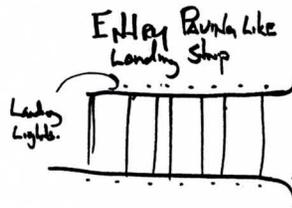
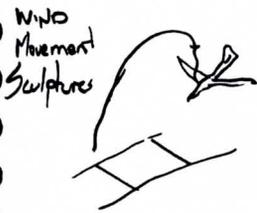
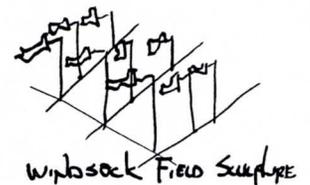
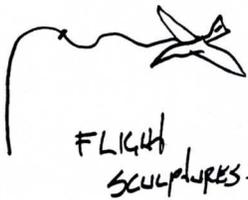
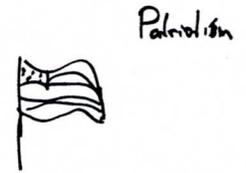
WALLS  
ACCENT  
LIGHTING

Figure 19

# Aircraft and Luke AFB



Trash Receptacles,  
Storage areas in  
shape of a Hanger



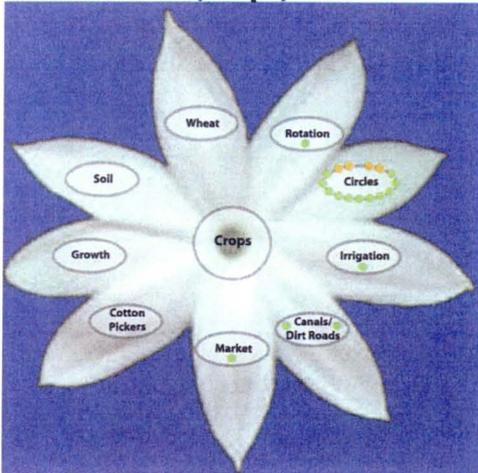
Air Force Memorial  
for Fallen in recent  
Wars.

Famous Flight Quotes  
Sandblasted into hardscape.

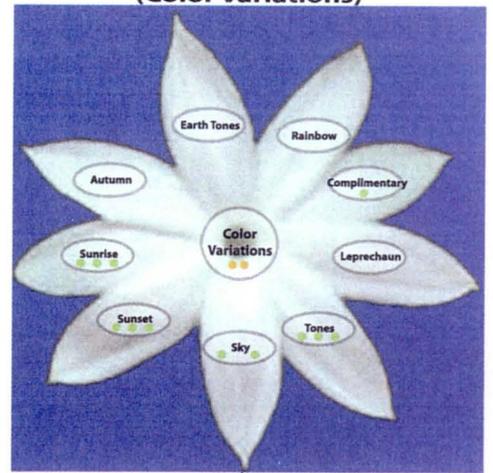
"Feathers shall raise man  
even as they do birds, toward  
heaven; that is by letter written  
with their quills." -Leonardo da Vinci.

Figure 20

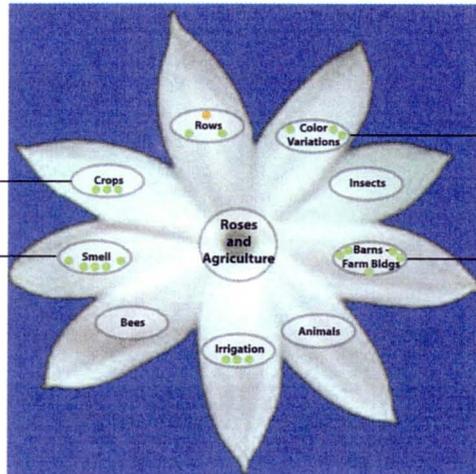
Flood Control District  
(Crops)



Flood Control District  
(Color Variations)



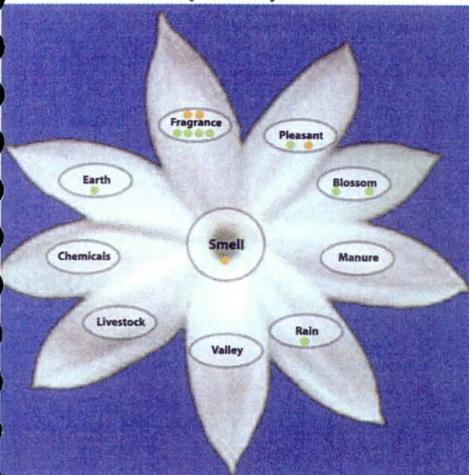
**JASMINE BLOSSOM**  
Roses and Agriculture



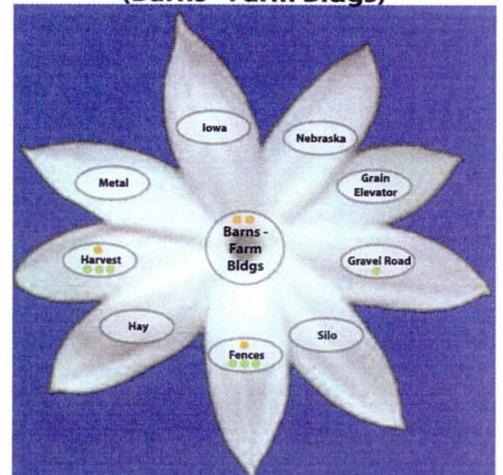
- Mosaic
- Diversity
- Seasons

- Valentines Day
- Equipment
- Harvest
- Government Subsidies

Flood Control District  
(Smell)



Flood Control District  
(Barns - Farm Bldgs)



- Wood
- Barbed Wire
- Animals
- Pens
- Trough
- Windmill

Figure 21

Insects	0	0
Barns-Farm Buildings	5	2
Animals	0	0
Irrigation	3	0
Bees	0	0
Smell	5	1
Crops	3	0
Valentines Day	0	0
Equipment	2	0
Harvest	1	0
Government Subsidies	0	0

Secondary Theme: **Color Variations**

Related Ideas	Votes Received	Final Votes
Earth Tones	0	0
Rainbow	0	0
Complimentary	1	0
Leprechaun	0	0
Tones	3	0
Sky	2	0
Sunset	3	0
Sunrise	3	0
Autumn	0	0
Mosaic	0	0
Diversity	0	0
Seasons	0	0

Secondary Theme: **Smell**

Related Ideas	Votes Received	Final Votes
Fragrance	4	2
Pleasant	1	1
Blossom	2	0
Manure	0	0
Rain	0	0
Valley	0	0
Livestock	0	0
Chemicals	0	0
Earth	1	0

Secondary Theme: **Barns/ Farm Buildings**

Related Ideas	Votes Received	Final Votes
Iowa	0	0
Nebraska	0	0
Grain Elevator	0	0
Gravel Road	1	0
Silo	0	0

Fences	3	1
Hay	0	0
Harvest	3	1
Metal	0	0
Wood	0	0
Barbed Wire	0	0
Animals	0	0
Pens	0	0
Trough	1	0
Windmill	3	0

Secondary Theme: **Crops**

Related Ideas	Votes Received	Final Votes
Wheat	0	0
Rotation	1	0
Circles	11	4
Irrigation	1	0
Canals/ Dirt Roads	2	0
Market	0	0
Cotton Pickers	0	0
Growth	0	0
Soil	0	0

Theme metaphors derived: **Roses and Agriculture**

1. Fragrance as it relates to Smell.
2. Barns and Buildings as it relates to Roses and Agriculture.
3. Color Variations as it relates to Rose and Agriculture.
4. Circle as it relates to Crop.

The next step in the process is to relate the components that a theme can be physically communicated in a built environment for this project to the theme metaphors derived. For example, the design team was asked, "How can circles as it relates to roses and agriculture be physically communicated with hardscape layout?" The answer to that is preliminary theme development related to Roses and Agriculture. The team was given 10 minutes of freethinking and idea generation to come up with as many ideas as possible. Figures (22 & 23) show the ideas that were generated.

**Theme Alternative 3-Flood Control District**

This facility, by its function, has opportunities to provide educational and theming opportunities regarding why the flood control district exists, the goals that the FCD has, and how it accomplishes those goals. Through theming and interpretation, the FCD has an opportunity to educate the public on one of its own projects.

Figure (24) shows the Jasmine Blossom Exercise results for the Flood Control District theme alternative from the OA design charette. Below is a summary:

**Central Theme: Flood Control District**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Levee	0	0
Channel	2	0
Dam	2	1
Storm	1	5
Frequency	0	0
Massive	0	1
Conveyance	2	0
Gabion	2	0
Engineer	0	0
Mapping	0	0
Regional	1	0
Watershed	2	0
Erosion	0	0
Basin	1	0
Duration	0	0
Landform	1	0
Outfall	0	0
Rainfall	0	0

**Secondary Theme: Conveyance**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Water	1	0
Flow	1	0
Erosion	0	0
Channel	0	1
Movement	3	4
Current	0	0
Braiding	1	0
Downstream	0	0
System	0	0
Direction	0	0

**Secondary Theme: Dam**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Storage	0	0
Earth	1	0
Structure	1	0
Berming	0	0

# Roses and Agriculture



CIRCULAR  
DROP STRUCTURES

## RAMADAS

COLOR VARIATIONS

- BASED UPON DIFFERENT STORM EVENTS AT DIFF. TIMES OF DAY/YEAR.

## INTERPRETIVE AREAS

- FRAGRANCE / SMELL
- BASED UPON NATIVE PLANTS

## Color

wells  
wells  
landscape  
ramadas

## Land forms

Crop circles

## LANDSCAPE

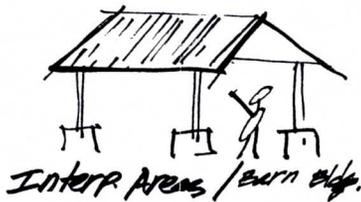
- COLOR VARIATIONS
- ABSTRACT PLANTING DESIGN w/ COLOR, TEXTURE, FORM

USE ROSES FOR  
LANDSCAPE  
INTERPRETIVE AREA/  
LANDSCAPE.

CIRCULAR  
WALLS  
CIRCULAR  
WALKS.

## FOO STRUCTURES

- BARN/S/BUILDINGS/FARM
- BROAD VARIATIONS OF THE SHAPES



Interp Areas / Barn etc.

WALKWAYS

SMELL

LANDFORM

PLAN VIEW

SECONDARY  
DESIGN

## Ramadas

Bain slopes

RAMADA  
BARNS.

COLOR VARIATIONS  
WITH LANDSCAPE  
MATERIAL  
ROWS OF COLOR

MASSIVE LANDFORM  
(CONTOURED)  
AS CIRCLES

## landscape Smell

Large bosques of heavily scented waterlilies

LANDSCAPE

RURAL

RAILROAD  
TIES

RAMADAS

VINES

IVY



Landscape Crops

## WALLS

CIRCLE/CROPS

- PATTERN BASED UPON FLOODING HISTORY (i.e. inundate, cracked patterns)

## Crop circles

- landscape materials
- interpretation
- drop structures

ROWS OF TREES  
ROWS OF SHRUBS  
ROWS OF GROUNDCOVER

# Roses and Agriculture



Plaza like  
Rose Petals



Feature Rose  
Honest techniques  
including harvest, storage,  
distribution.



Rose Varieties

Show via Mosaics and  
Sandblasted images  
in Hardscape.



Windmill as  
entry feature.

Bench w/ Roses  
as sculpture



Plot of Rose farm  
maintained



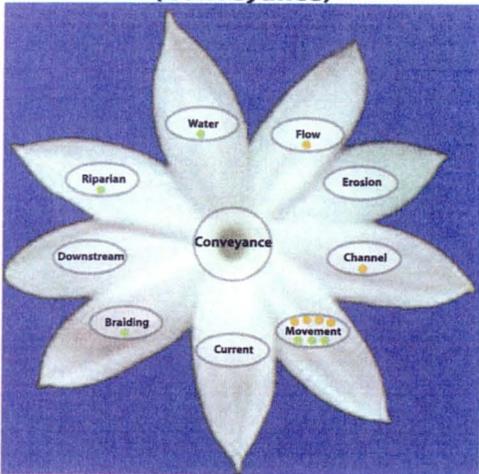
Maintenance Enclosures  
Trash Receptacles in  
form of "Rose Stamp"  
Barr.



Various color  
roses as form  
bar on headwall  
w/ integral  
color

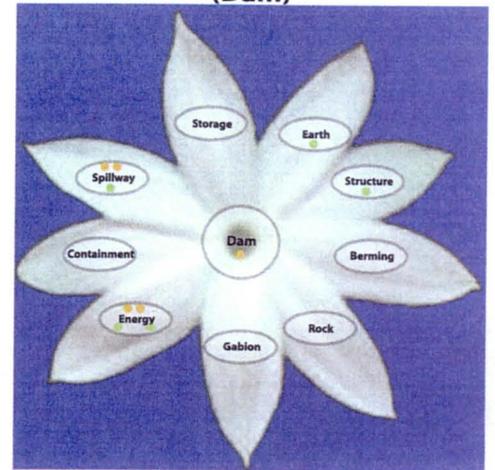
Figure 23

Flood Control District  
(Conveyance)



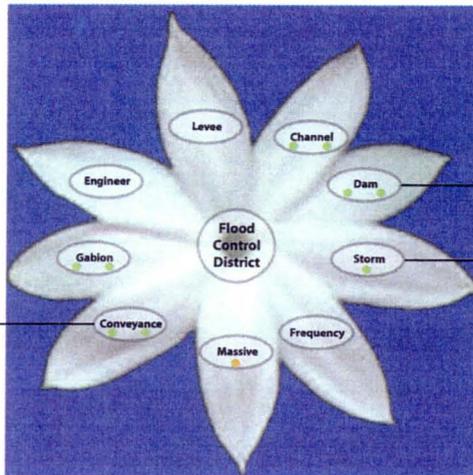
- System
- Direction

Flood Control District  
(Dam)



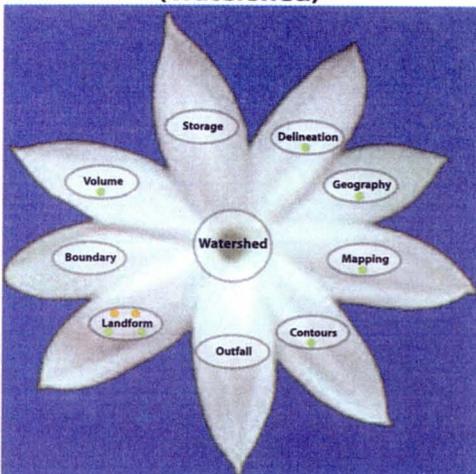
- Disipation

**JASMINE BLOSSOM**  
Flood Control District



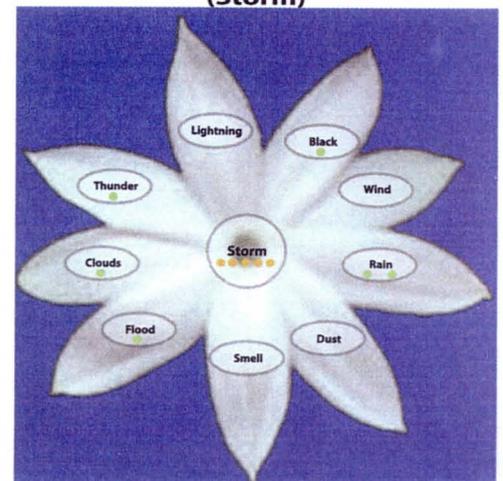
- Mapping
- Regional
- Watershed
- Erosion
- Basin
- Duration
- Landform
- Outfall
- Rainfall

Flood Control District  
(Watershed)



- Regional
- Wetlands
- Soils

Flood Control District  
(Storm)



- Rainbow
- Maintenance

Figure 24

Rock	0	0
Gabion	0	0
Energy	2	2
Containment	0	0
Spillway	1	2
Dissipation	0	0

Secondary Theme: **Storm**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Lightning	0	0
Black	0	0
Wind	0	0
Rain	2	0
Dust	0	0
Smell	0	0
Flood	1	0
Clouds	1	0
Thunder	1	0
Rainbow	0	0
Maintenance	0	0

Secondary Theme: **Watershed**

<u>Related Ideas</u>	<u>Votes Received</u>	<u>Final Votes</u>
Storage	0	0
Delineation	0	0
Geography	1	0
Mapping	1	0
Contours	1	1
Outfall	0	0
Landform	2	2
Boundary	0	0
Volume	1	0
Regional	0	0
Wetlands	0	0
Soils	0	0

Theme metaphors derived: **Flood Control District**

1. Spillway as it relates to Dam.
2. Energy as it relates to Dam.
3. Landform as it relates to Watershed.
4. Movement as it relates to conveyance.
5. Storm as it relates to the Flood Control District.

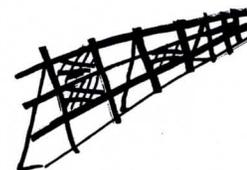
The next step in the process is to relate the components that a theme can be physically communicated in a built environment for this project to the theme metaphors derived. For example, the design team was asked, "What does storm look like as it relates to a wing wall?" The answer to that is preliminary theme development related to the Flood Control District Concept. The team was given 10 minutes of freethinking and idea generation to come up with as many ideas as possible. Figures (25 & 26) show the ideas that were generated.

# Flood Control District

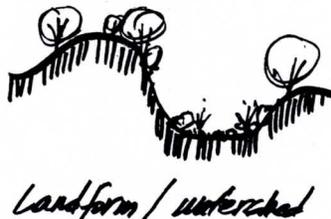
SERPENTINE WALLS.



MODEL OF REGIONAL LANDFORM TO EXPLAIN WATERSHED.



FCD  
 - LANDSCAPE MOVEMENT / CONJOYANCE  
 - CREATE AREAS DEPICTING THE DIFFERENT EVENTS & HOW PLANTS "GROW" ALONG THE CONJOYANCE



THUNDERHEAD RAMADAS

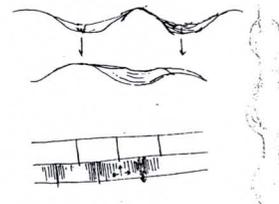


FCD RAMADAS



WATERFALL DROP STRUCTURE

FCD  
 - INTERPRETIVE AREAS  
 - ~~WALLS~~ CREATE A SERIES OF "ROOMS" WITH DESIGN ELEMENTS INTEGRATED



ENERGY.

FCD  
 WALKWAYS

- HAVE QUOTES OF FAMOUS PHYSICISTS SANDBLASTED IN CONCRETE

MOVEMENT IN:  
 LANDFORM  
 WALLS  
 WALKS  
 LANDSCAPE



INTERPRATIVE AREAS TO PROVIDE ENERGY TO INSPIRE EDUCATION

FCD  
 along the walkways could be audio sounds of streams

DAM STRUCTURES  
 SECONDARY PURPOSE  
 ENERGY SOURCE  
 IRRIGATION

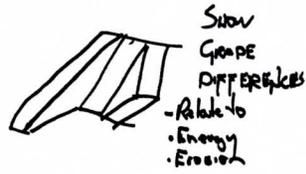
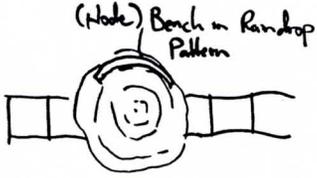
SPILLWAY MOVEMENT SNAKE

FCD  
 Interpretive floodlights w/ adjustments in the valley

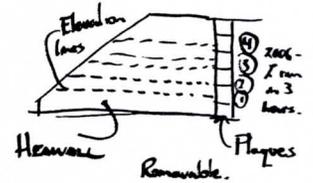
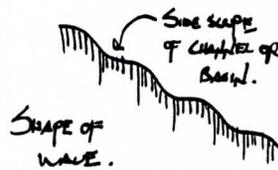
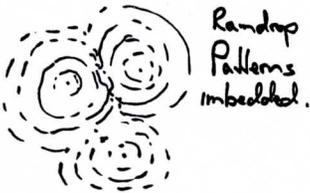
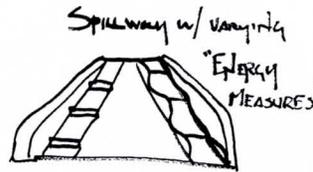
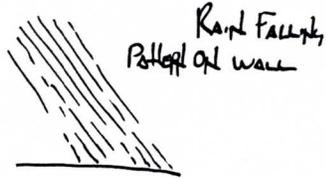
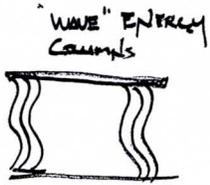
WALLS MOVEMENT SNAKE

Figure 25

# Flood Control District



Rampadas and/or built structures named after Flood Control Processes. i.e. erosion, conveyance, detention - with definitions and bleed.



Percolation areas  
- sandy area  
- clay area  
Educate about effects of Perc

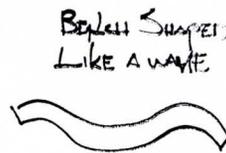
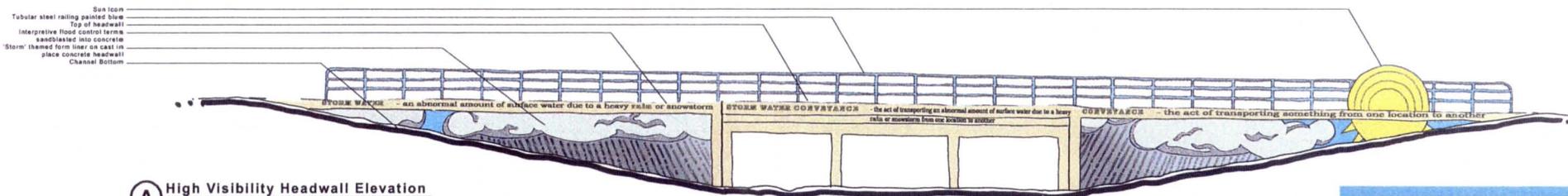


Figure 26

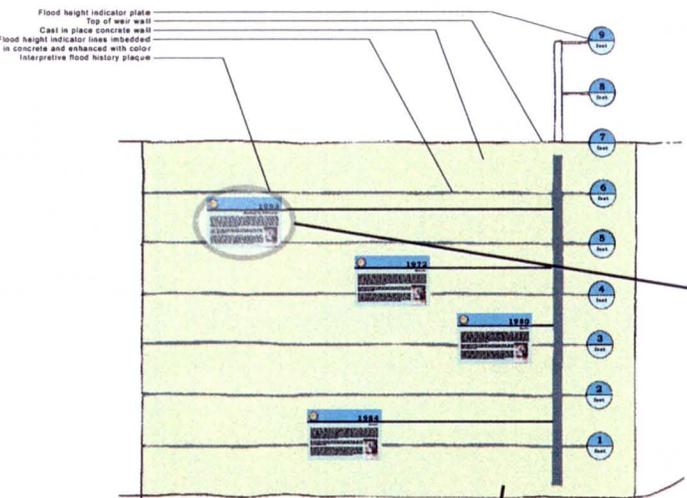
## **Final Alternative for Structural Components**

The Flood Control District, Roses and Agriculture, and Aircraft and Luke Air Force Base Concepts were presented to the stakeholders at the Flood Control District. The FCD chose to pursue the Flood Control District Concept for further development.

Figure (27) shows suggested aesthetic treatments for headwalls, railings, and the weir. Each structural component draws upon the interpretation of what the Flood Control District is and how they add value to the community.



**A High Visibility Headwall Elevation**



**Flood History Wall Enlargement**

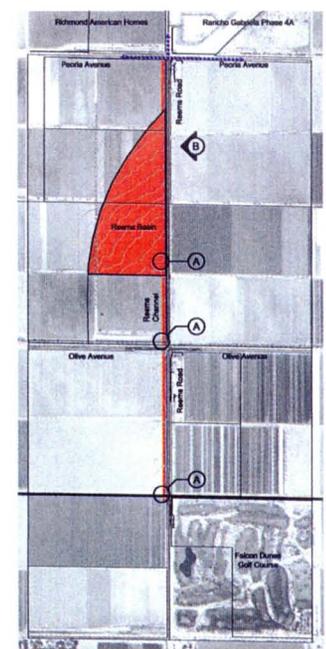
**1993**  
**January to February**

An unusual series of storms from the Pacific Ocean starting on January 6, 1993, and continuing through February 28, 1993, caused excessive and prolonged precipitation across Arizona. These excessive rains resulted in the most widespread and severe flooding in Arizona since the turn of the century (Mar. 19th and others, 1925). Winter storms normally originate in the Gulf of Alaska and dissipate most of their moisture before reaching Arizona. Because the position of the jetstream during January was farther south than was normal, subtropical moisture from the Pacific Ocean west of the coast of Baja California was directed toward Arizona, creating excessive rains that resulted in widespread flooding and loss of property. Eight deaths and 112 injuries were attributed to the floods. Estimated damage to public and private property exceeded \$400 million (U.S. Army Corps of Engineers, 1994).

The most intense rains fell in central Arizona north and east of Phoenix. This area includes most of the Verde and Salt River Basins. Precipitation was 520 percent of normal for January and 450 percent of normal for February in these areas (U.S. Army Corps of Engineers, 1994).

The prolonged rainfall during January and February caused record or near-record flood peaks and flood volumes on nearly every major river basin in the state. Figure 57 shows the network of selected streamflow-gaging stations operated by the U.S. Geological Survey in Arizona. Record maximum discharges occurred at 28 of the streamflow-gaging stations during the floods of 1993 (table 24). The following sections describe flooding in the unregulated portions of the Little Colorado River, upper Gila River, Santa Cruz River, Salt River, and Verde River Basins.

**Interpretive Flood History Plaque**

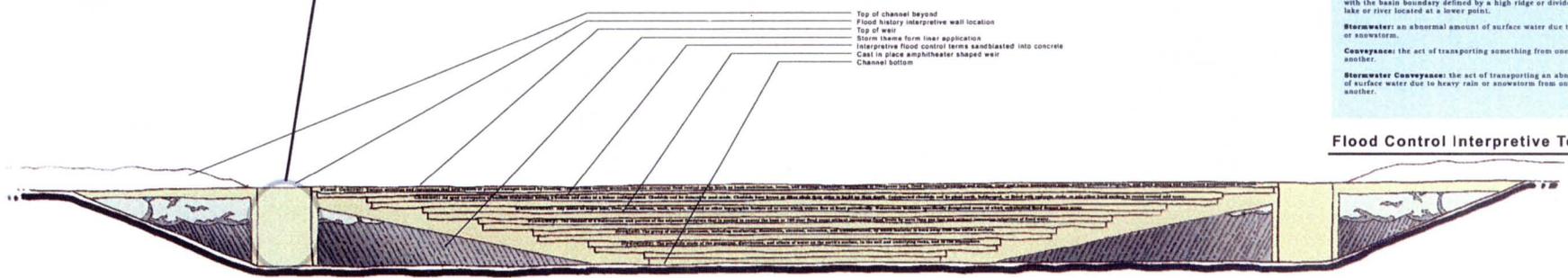


**Key**

**Flood control terms to utilize for interpretation**

- Erosion:** The group of natural processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is worn away from the earth's surface.
- Hydrology:** The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.
- Floodplain:** A low plain adjacent to a river that is formed chiefly of river sediment and is subject to flooding.
- CFS:** The measuring unit of cubic feet per second (cfs), which is used to quantify the amount of flow in a wash. A cubic foot is equivalent to 7.5 gallons of water. Thus, 1 cfs is 7.5 gallons of water passing by you every second.
- Channel:** An open conveyance of surface stormwater having a bottom and sides in a linear configuration. Channels can be natural or man-made. Channels have levees or dikes along their sides to build up their depth. Constructed channels can be plain earth, landscaped, or lined with concrete, stone, or any other hard surface to resist erosion and scour.
- Detention Basin:** A basin or reservoir where water is stored for regulating a flood. It has outlets for releasing the flows during the floods.
- Flood Control:** Various activities and regulations that help reduce or prevent damages caused by flooding. Typical flood control activities include: structural flood control works (such as bank stabilization, levees, and drainage channels); acquisition of flood-prone land; flood insurance programs and studies; river and basin management plans; public education programs; and flood warning and emergency preparedness activities.
- Floodway:** The channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than one foot and without increasing velocities of flood water.
- Percolation:** The movement of water through the subsurface soil layers, usually continuing downward to the groundwater or water table reservoir.
- Retention Basin:** A basin or reservoir where water is stored for regulating a flood. Unlike a detention basin, it does not have outlets for releasing the flows; the water must be disposed by draining into the soil, evaporation, or pumping systems.
- Sedimentation:** A large scale water treatment process where heavy solids settle out.
- Storm Drainage System:** A drainage system for collecting runoff of stormwater on highways and removing it to appropriate outlets. The system includes inlets, catch basins, storm sewers, drains, reservoirs, pump stations, and detention basins.
- Thalweg:** The line of maximum depth in a stream. The thalweg is the part that has the maximum velocity and causes cutbanks and channel migration.
- Watercourse:** Any minor or major lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.
- Watershed:** An area from which water drains into a lake, stream or other body of water. A watershed is also often referred to as a basin, with the basin boundary defined by a high ridge or divide, and with a lake or river located at a lower point.
- Stormwater:** an abnormal amount of surface water due to heavy rain or snowstorm.
- Conveyance:** the act of transporting something from one location to another.
- Stormwater Conveyance:** the act of transporting an abnormal amount of surface water due to heavy rain or snowstorm from one location to another.

**Flood Control Interpretive Terms**



**B Reems Channal Weir / Amphitheater Elevation**

**Reems Road Basin and Channel Project**  
 Preferred Aesthetic Concept Design for Structural Components  
 March 2005



**Figure 27**

## APPENDICES

### APPENDIX A - REPORTS, DESIGN GUIDELINES AND AREA PLANS

The extensive research effort by the Design Team during the Inventory and Analysis process referenced the following plans. The documents are available at several Municipalities web sites and City complexes.

- City of Surprise Planning and Design Guidelines Manual, July 27, 2002.
- Maricopa Association of Governments, Desert Spaces – Environmentally Sensitive Development Areas (ESDA) – Policies and Design Guidelines, June 2000
- Maricopa County White Tank/Grand Avenue Area Plan
- Loop 303 Corridor/White Tanks Area Drainage Master Plan Update Draft Data Collection Report, May 2003

## **APPENDIX B - MUNICIPAL GENERAL, COMPREHENSIVE AND MASTER PLANS**

The General plans of the cities and towns surrounding the Reems Basin and Channel Site are utilized as a guideline for the development of the Design Alternative. The following general plans are for reference only.

- City of Buckeye, General Development Plan, Adopted September 18, 2001.
- City of El Mirage General Plan, December 18, 2003.
- City of Glendale, Glendale 2025 The Next Step General Plan, Adopted May 28, 2002 and Voter Ratified November 5, 2002, Effective Date December 1, 2002.
- City of Surprise, Surprise General Plan 2020, Revised February 2004, Adopted November 30, 2002, Ratified by Public Vote on March 31, 2001.
- City of Glendale Parks and Recreation Master Plan, February 2001
- Maricopa County 2020 Eye to the Future Comprehensive Plan
- Maricopa County Growing Smarter/Growing Smarter Plus, Eye to the Future 2020 Plan, 1998 and 2000.

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost	
<b>Reems Road Basin</b>						
<b>Passive Site Plan Alternative</b>						
<b>Initial Phase of Construction for FCD</b>						
1	<b>Grading</b>					
2	*Site Excavation and Backfill	393,900	CY	3.75	\$ 1,477,125	
3	*Import/Export Material	62,300	CY	4.00	\$ 249,200	
4						
5	<b>Paving and Hardscape</b>					
6	8" Aggregate Base Course Pathway	16,500	SY	8.00	\$ 132,000	
7					\$ -	
8	<b>Landscaping</b>					
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	1,665,000	SF	0.15	\$ 249,750	
10	Decomposed Granite 3/8" Minus	370,000	SF	0.30	\$ 111,000	
11						
12	<b>Irrigation</b>					
13	Temporary Irrigation System	2,035,000	SF	0.30	\$ 610,500	
14	<b>Aesthetics</b>					
15	Allowance for Hardscape Character on FCD Drop Structures, Walls, Etc.	1	lump sum	100,000.00	\$ 100,000	
					Subtotal	\$ 2,929,575
					15% Contingency	\$ 439,436
					<b>Total</b>	\$ 3,369,011

\*May vary with volume and need for spoil elsewhere

16	<b>Policy for the Aesthetic Treatment and Landscaping</b>					
17	Landscape Cost Ceiling Per Acre Suburban	46.7	Acre	40,000.00	\$ 1,868,687	
18	Landscape Cost Ceiling Per Acre Rural	46.7	Acre	12,000.00	\$ 560,606	
19	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with 15% contingency	1	LS	\$ 1,116,938	\$ 1,116,938	
20						
21	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>					
22	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503	
23	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802	
24						
<b>Flood Control Themed Structural Components</b>						
25	Steel Handrail with 'Sun Icon'	675	LF	75.00	\$ 50,625	
26	Custom 'Storm' Form Liner-One for each side (approx. 700 SF)	1	Ea	40,000.00	\$ 40,000	
27	Form Liner Application and Paint	3,375	SF	5.00	\$ 16,875	
28	Custom Letter SandBlasting and Paint	26	Ea	800.00	\$ 20,800	
					<b>Total</b>	\$ 128,300

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Passive Site Plan Alternative</b>					
<b>Full Build-out of facilities after FCD construction</b>					
1	<b>Water and Sewer</b>				
2	6" PVC Schedule 80 Water Line	950	LF	10.00	\$ 9,500
3	8" PVC Sewer Pipe SDR 35	950	EA	30.00	\$ 28,500
4					
5	<b>Drainage</b>				
6	Misc. Drainage infrastructure for development of passive appurtenances only including 8" PVC Schedule 80 drainage pipe, outfall structures and catch basins (drywells are not included)	1	LS	12,000.00	\$ 12,000
7					
8	<b>Grading</b>				
9	**Fine Grading (Mass grading completed as FCD base, limited to areas defined as DG in the base FCD plan, parking lot, roadway and amphitheater)	10	AC	2,000.00	\$ 20,000
10					
11	<b>Architecture</b>				
12	Interpretive Center with Restroom	2,000	SF	160.00	\$ 320,000
13	Outdoor Classrooms with shade structure, seat walls, etc.	3	Ea	40,000.00	\$ 120,000
14					
15	<b>Site Lighting</b>				
16	Parking Lot and Pathway lighting ( Not CPTED compliant, 70 fixtures @ 75' OC for pathway lighting, 1 fixture per 15 parking spaces for parking lot)	74	EA	3,000.00	\$ 222,000
	Transformer, Service, SES, and other electrical infrastructure	1	LS	50,000.00	\$ 50,000
17					
18	<b>Paving and Hardscape</b>				
19	Asphalt Roadway and Parking Lot	4,900	SY	10.00	\$ 49,000
20	Curb and Gutter	3,000	LF	10.00	\$ 30,000
21	Amphitheater with Stage Shade Structure	1	LS	100,000.00	\$ 100,000
22	**Amphitheater/FCD Weir (Finish only. Base structure completed by FCD base)	1	LS	20,000.00	\$ 20,000
23	6" thick 12' Concrete Pathway/Maintenance access	74,800	SF	3.50	\$ 261,800
24					
25	<b>Landscaping</b>				
26	Enhancement of Decomposed Granite Areas defined in Base FCD plan ( (20) 24" box trees, (150) 5 gallon shrubs, (250) 1 gallon shrubs per acre)	370,000	AC	0.25	\$ 92,500
27					
28	<b>Irrigation</b>				
29	Drip irrigation for enhanced planting areas	370,000	SF	0.45	\$ 166,500
				<b>Subtotal</b>	\$ 1,501,800
				<b>15% Contingency</b>	\$ 225,270
				<b>Total</b>	\$ 1,727,070

\*\*No known references to this cost. Educated Guess

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Active Site Plan Alternative 1</b>					
<b>Initial Phase of Construction for FCD</b>					
1	<b>Grading</b>				
2	*Site Excavation and Backfill	405,000	CY	3.75	\$ 1,518,750
3	*Import/Export Material	292,740	CY	4.00	\$ 1,170,960
4					
5	<b>Paving and Hardscape</b>				
6	8" Aggregate Base Course Pathway	13,000	SY	8.00	\$ 104,000
7					
8	<b>Landscaping</b>				
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	2,035,000	SF	0.15	\$ 305,250
10					
11	<b>Irrigation</b>				
12	Temporary Irrigation System	2,035,000	SF	0.30	\$ 610,500
13					
14	<b>Aesthetics</b>				
15	Allowance for Hardscape Character FCD on Drop Structures, Walls, Etc.	1	lump sum	100,000.00	\$ 100,000
				Subtotal	\$ 3,809,460
				15% Contingency	\$ 571,419
				<b>Total</b>	<b>\$ 4,380,879</b>

\*May vary with volume and need for spoil elsewhere

16	<b>Policy for the Aesthetic Treatment and Landscaping</b>				
17	Landscape Cost Ceiling Per Acre Suburban	46.7	Acre	40,000.00	\$ 1,868,687
18	Landscape Cost Ceiling Per Acre Rural	46.7	Acre	12,000.00	\$ 560,606
19	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with 15% contingency	1	LS	\$ 1,053,113	\$ 1,053,113
20					
21	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>				
22	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503
23	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802
24					

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Active Site Plan Alternative 1</b>					
<b>Initial Phase of Construction for FCD</b>					
<b>Full Build-out of facilities after FCD construction</b>					
1	<b>Water and Sewer</b>				
2	6" PVC Schedule 80 Water Line	3,000	LF	10.00	\$ 30,000
3	8" PVC Sewer Pipe SDR 35	3,600	EA	30.00	\$ 108,000
4	Manholes	24	EA	5,000.00	\$ 120,000
5					
6	<b>Drainage</b>				
7	Misc. Drainage infrastructure for development of passive appurtenances only including 8" PVC Schedule 80 drainage pipe, outfall structures and catch basins (drywells are not included)	1	LS	50,000.00	\$ 50,000
8					
9	<b>Grading</b>				
10	**Fine Grading (Mass grading completed as FCD base, limited to sports fields, parking lots, roadway, and open turf areas)	43	AC	2,000.00	\$ 86,000
11					
12	<b>Architecture</b>				
13	Interpretive Center with Restroom	2,000	SF	160.00	\$ 320,000
14	Restroom /Concession Building (1500 SF @ \$160/SF)	3	EA	160,000.00	\$ 480,000
15					
16	<b>Site Lighting</b>				
17	Parking Lot and Pathway lighting ( Not CPTED compliant, 70 fixtures @ 75' OC for pathway lighting, 1 fixture per 15 parking spaces for parking lot)	200	EA	3,000.00	\$ 600,000
18	Softball Field Lighting	4	EA	125,000.00	\$ 500,000
19	Soccer Field Lighting	6	EA	100,000.00	\$ 600,000
20	Tennis Court Lighting	1	EA	24,000.00	\$ 24,000
21	Basketball Court Lighting	1	EA	24,000.00	\$ 24,000
22	Transformer, Service, SES, and other electrical infrastructure	1	LS	250,000.00	\$ 250,000
23					
24	<b>Sports Fields and Hardscape</b>				
25	Asphalt Roadway and Parking Lot	35,200	SY	10.00	\$ 352,000
26	Curb and Gutter	14,000	LF	10.00	\$ 140,000
27	Softball Field including fence, backstop, turf	4	LS	100,000.00	\$ 400,000
28	Soccer Field including Turf and goals	6	LS	20,000.00	\$ 120,000
29	Basketball Court	1	EA	30,000.00	\$ 30,000
30	Tennis Court	1	EA	55,000.00	\$ 55,000
31	Playground	1	LS	100,000.00	\$ 100,000
32	6" thick 12' Concrete Pathway/Maintenance access	74,800	SF	3.50	\$ 261,800
33	Misc. Site Furnishings	1	LS	100,000.00	\$ 100,000
34	<b>Landscaping</b>				
35	Enhancement of Decomposed Granite Areas defined in Base FCD plan ( (20) 24" box trees, (150) 5 gallon shrubs, (250) 1 gallon shrubs and DG throughout per acre)	450,000	SF	0.55	\$ 247,500
36	Open Turf Area	800,000	SF	0.13	\$ 104,000
37					
38	<b>Irrigation</b>				
39	Drip irrigation for enhanced planting areas	450,000	SF	0.45	\$ 202,500
40	Turf Irrigation for Fields and Open Turf Area	1,478,000	SF	0.65	\$ 960,700
				Subtotal	\$ 6,265,500
				15% Contingency	\$ 939,825
				<b>Total</b>	\$ 7,205,325

\*\*No known references to this cost. Educated Guess

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Active Site Plan Alternative 2</b>					
<b>Initial Phase of Construction for FCD</b>					
1	<b>Grading</b>				
2	*Site Excavation and Backfill	396,000	CY	3.75	\$ 1,485,000
3	*Import/Export Material	284,500	CY	4.00	\$ 1,138,000
4					
5	<b>Paving and Hardscape</b>				
6	8" Aggregate Base Course Pathway	13,000	SY	8.00	\$ 104,000
7					\$ -
8	<b>Landscaping</b>				
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	2,035,000	SF	0.15	\$ 305,250
10					
11	<b>Irrigation</b>				
12	Temporary Irrigation System	2,035,000	SF	0.30	\$ 610,500
13					
14	<b>Aesthetics</b>				
15	Allowance for Hardscape Character on Drop Structures, Walls, Etc.	1	lump sum	100,000.00	\$ 100,000
				Subtotal	\$ 3,742,750
				15% Contingency	\$ 561,413
				<b>Total</b>	\$ 4,304,163

\*May vary with volume and need for spoil elsewhere

16	<b>Policy for the Aesthetic Treatment and Landscaping</b>				
17	Landscape Cost Ceiling Per Acre Suburban	46.7	Acre	40,000.00	\$ 1,868,687
18	Landscape Cost Ceiling Per Acre Rural	46.7	Acre	12,000.00	\$ 560,606
19	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with a 15% contingency	1	LS	\$ 1,053,113	\$ 1,053,113
20					
21	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>				
22	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503
23	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802
24					

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Active Site Plan Alternative 2</b>					
<b>Initial Phase of Construction for FCD</b>					
<b>Full Build-out of facilities after FCD construction</b>					
1	<b>Water and Sewer</b>				
2	6" PVC Schedule 80 Water Line	3,000	LF	10.00	\$ 30,000
3	8" PVC Sewer Pipe SDR 35	3,600	EA	30.00	\$ 108,000
4	Manholes	24	EA	5,000.00	\$ 120,000
5					
6	<b>Drainage</b>				
7	Misc. Drainage infrastructure for development of passive appurtenances only including 8" PVC Schedule 80 drainage pipe, outfall structures and catch basins (drywells are not included)	1	LS	50,000.00	\$ 50,000
8					
9	<b>Grading</b>				
10	**Fine Grading (Mass grading completed as FCD base, limited to sports fields, parking lots, roadway, and open turf areas)	43	AC	2,000.00	\$ 86,000
11					
12	<b>Architecture</b>				
13	Interpretive Center with Restroom	2,000	SF	160.00	\$ 320,000
14	Restroom /Concession Building (1500 SF @ \$160/SF)	3	EA	160,000.00	\$ 480,000
15					
16	<b>Site Lighting</b>				
17	Parking Lot and Pathway lighting ( Not CPTED compliant, 70 fixtures @ 75' OC for pathway lighting, 1 fixture per 15 parking spaces for parking lot)	200	EA	3,000.00	\$ 600,000
18	Softball Field Lighting	4	EA	125,000.00	\$ 500,000
19	Soccer Field Lighting	4	EA	100,000.00	\$ 400,000
20	Tennis Court Lighting	1	EA	24,000.00	\$ 24,000
21	Basketball Court Lighting	1	EA	24,000.00	\$ 24,000
22	Transformer, Service, SES, and other electrical infrastructure	1	LS	250,000.00	\$ 250,000
23					
24	<b>Sports Fields and Hardscape</b>				
25	Asphalt Roadway and Parking Lot	35,200	SY	10.00	\$ 352,000
26	Curb and Gutter	14,000	LF	10.00	\$ 140,000
27	Softball Field including fence, backstop, turf	4	LS	100,000.00	\$ 400,000
28	Soccer Field including Turf and goals	4	LS	20,000.00	\$ 80,000
29	Basketball Court	1	EA	30,000.00	\$ 30,000
30	Tennis Court	1	EA	55,000.00	\$ 55,000
31	Playground	1	LS	100,000.00	\$ 100,000
32	6" thick 12' Concrete Pathway/Maintenance access	74,800	SF	3.50	\$ 261,800
33	Misc. Site Furnishings	1	LS	100,000.00	\$ 100,000
34	<b>Landscaping</b>				
35	Enhancement of Decomposed Granite Areas defined in Base FCD plan ( (20) 24" box trees, (150) 5 gallon shrubs, (250) 1 gallon shrubs and DG throughout per acre)	450,000	SF	0.55	\$ 247,500
36	Open Turf Area	963,000	SF	0.13	\$ 125,190
37					
38	<b>Irrigation</b>				
39	Drip irrigation for enhanced planting areas	450,000	SF	0.45	\$ 202,500
40	Turf Irrigation for Fields and Open Turf Area	1,478,000	SF	0.65	\$ 960,700
				Subtotal	\$ 6,046,690
				15% Contingency	\$ 907,004
				<b>Total</b>	\$ 6,953,694

\*\*No known references to this cost. Educated Guess

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
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Item No.	Description	Quantity	Unit	Unit Cost	Total Cost	
<b>Reems Road Basin</b>						
<b>150' ROW Channel Alternative</b>						
<b>Initial Phase of Construction for FCD</b>						
1	<b>Grading</b>					
2	*Site Excavation and Backfill	26,200	CY	3.75	\$ 98,250	
3	*Import/Export Material	24,700	CY	4.00	\$ 98,800	
4						
5	<b>Paving and Hardscape</b>					
6	8" Aggregate Base Course Pathway	1,600	SY	8.00	\$ 12,800	
7						
8	<b>Landscaping</b>					
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	158,000	SF	0.15	\$ 23,700	
10						
11	<b>Irrigation</b>					
12	Temporary Irrigation System	158,000	SF	0.30	\$ 47,400	
13						
14	<b>Aesthetics</b>					
15	Allowance for Hardscape Character on FCD Drop Structures, Walls, Etc.	1	lump sum	50,000.00	\$ 50,000	
					Subtotal	\$ 330,950
					15% Contingency	\$ 49,643
					<b>Total for one 1150' Length of Channel</b>	\$ 380,593
					Number of 1150' lengths of channel in this reach	6.75
					Total Cost for Channel Landscape	\$ 2,568,999

\*May vary with volume and need for spoil elsewhere

16	<b>Policy for the Aesthetic Treatment and Landscaping</b>				
17	Landscape Cost Ceiling Per Acre Suburban	24.5	Acre	40,000.00	\$ 979,339
18	Landscape Cost Ceiling Per Acre Rural	24.5	Acre	12,000.00	\$ 293,802
19	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with a 15% contingency	1	LS	\$ 551,914	\$ 551,914
20					
21	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>				
22	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503
23	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802
24					

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
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Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>250' ROW Channel Alternative</b>					
<b>Initial Phase of Construction for FCD</b>					
1	<b>Grading</b>				
2	*Site Excavation and Backfill	35,000	CY	3.75	\$ 131,250
3	*Import/Export Material	21,720	CY	4.00	\$ 86,880
4					
5	<b>Paving and Hardscape</b>				
6	8" Aggregate Base Course Pathway	3,300	SY	8.00	\$ 26,400
7					\$ -
8	<b>Landscaping</b>				
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	229,000	SF	0.15	\$ 34,350
10					
11	<b>Irrigation</b>				
12	Temporary Irrigation System	229,000	SF	0.30	\$ 68,700
13					
14	<b>Aesthetics</b>				
15	Allowance for Hardscape Character on FCD Drop Structures, Walls, Etc.	1	lump sum	50,000.00	\$ 50,000
				Subtotal	\$ 397,580
				15% Contingency	\$ 59,637
<b>Total for one 1150' Length of Channel</b>					<b>\$ 457,217</b>
Number of 1150' lengths of channel in this reach					6.75
<b>Total Cost for Channel Landscape</b>					<b>\$ 3,086,215</b>

\*May vary with volume and need for spoil elsewhere

\*\*\*Does not include the cost of land acquisition Estimated Additional acreage needed: 8.5

16	<b>Policy for the Aesthetic Treatment and Landscaping</b>				
17	Landscape Cost Ceiling Per Acre Suburban	35.5	Acre	40,000.00	\$ 1,419,421
18	Landscape Cost Ceiling Per Acre Rural	35.5	Acre	12,000.00	\$ 425,826
19	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with a 15% contingency	1	LS	\$ 799,926	\$ 799,926
20					
21	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>				
22	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503
23	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802
24					

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Channel North of Weir at a 220' ROW</b>					
<b>Initial Phase of Construction for FCD</b>					
1	<b>Grading</b>				
2	*Site Excavation and Backfill	0	CY	3.75	\$ -
3	*Import/Export Material	0	CY	4.00	\$ -
4					
5	<b>Paving and Hardscape</b>				
6	8" Aggregate Base Course Pathway	0	SY	8.00	\$ -
7					
8	<b>Landscaping</b>				
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	539,950	SF	0.15	\$ 80,993
10	Inert Groundcover at bottom of Basin	171,850	SF	0.35	\$ 60,148
11					
12	<b>Irrigation</b>				
13	Temporary Irrigation System	539,950	SF	0.30	\$ 161,985
14					
15	<b>Aesthetics</b>				
16	Allowance for Hardscape Character on FCD Drop Structures, Walls, Etc.	1	lump sum	50,000.00	\$ 50,000
				Subtotal	\$ 353,125
				15% Contingency	\$ 52,969
				<b>Total Cost</b>	\$ 406,094

\*May vary with volume and need for spoil elsewhere

17	<b>Policy for the Aesthetic Treatment and Landscaping</b>				
18	Landscape Cost Ceiling Per Acre Suburban	12.4	Acre	40,000.00	\$ 495,822
19	Landscape Cost Ceiling Per Acre Rural	12.4	Acre	12,000.00	\$ 148,747
20	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with a 15% contingency	1	LS	\$ 348,594	\$ 348,594
21					
22	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>				
23	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503
24	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802
25					

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD

**Flood Control District**  
**Reems Road Basin and Channel**  
**Falcon Dunes Golf Course North to Northern**  
Preliminary Opinion of Probable Cost

Olsson Associates  
4/21/2005

Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
<b>Reems Road Basin</b>					
<b>Channel South of Weir at a 225' ROW</b>					
<b>Initial Phase of Construction for FCD</b>					
1	<b>Grading</b>				
2	*Site Excavation and Backfill	0	CY	3.75	\$ -
3	*Import/Export Material	0	CY	4.00	\$ -
4					
5	<b>Paving and Hardscape</b>				
6	8" Aggregate Base Course Pathway	0	SY	8.00	\$ -
7					
8	<b>Landscaping</b>				
9	HydroSeeded Native mix w/ (10) 15 gallon trees per acre	1,173,286	SF	0.15	\$ 175,993
10	Inert Groundcover at bottom of Basin	208,560	SF	0.35	\$ 72,996
11					
12	<b>Irrigation</b>				
13	Temporary Irrigation System	1,173,286	SF	0.30	\$ 351,986
14					
15	<b>Aesthetics</b>				
16	Allowance for Hardscape Character on FCD Drop Structures, Walls, Etc.	1	lump sum	50,000.00	\$ 50,000
	Additional Land required to increase ROW from 150' to 225'	7	Acre	40,000.00	\$ 260,000
				Subtotal	\$ 910,975
				15% Contingency	\$ 136,646
				<b>Total Cost</b>	\$ 1,047,621

\*May vary with volume and need for spoil elsewhere

17	<b>Policy for the Aesthetic Treatment and Landscaping</b>				
18	Landscape Cost Ceiling Per Acre Suburban	26.9	Acre	40,000.00	\$ 1,077,398
19	Landscape Cost Ceiling Per Acre Rural	26.9	Acre	12,000.00	\$ 323,219
20	Proposed Landscape Aesthetics for Alternate 1 (Items 9 and 12) with a 15% contingency	1	LS	\$ 691,121	\$ 691,121
21					
22	<b>Project Aesthetic Feature Costs: Maximum Cost Guideline***</b>				
23	Project Aesthetic Feature Costs for a <b>Suburban</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	5.00%	\$ 153,503
24	Project Aesthetic Feature Costs for a <b>Rural</b> Project with a construction budget between \$2,500,000 and \$10,000,000	\$ 3,070,058	percentage	4.00%	\$ 122,802
25					

\*\*\*Based upon a percentage of the total construction cost of structural components provided by the FCD