



**Lower El Mirage Wash
Phase 2 – Analysis and Recommendations
Design Concept Report**

FCD Contract No: 2008C014

Work Assignment No. 4

August 25, 2011

Prepared for:

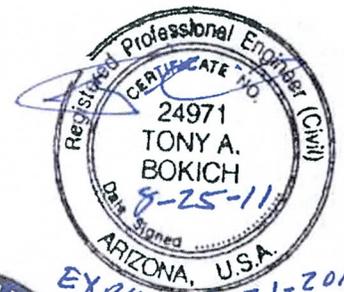
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EXECUTIVE SUMMARY

This report documents the study results and design recommendations for a reach of Lower El Mirage Wash from its confluence with the Agua Fria River to upstream of Cactus Road. This Design Concept Report was a joint effort by the Flood Control District of Maricopa County (District) and the City of El Mirage (City). This project was undertaken to develop solutions for local issues such as overtopping of Cactus Road during significant runoff events, the undersized and non-engineered West Cactus Basin and floodplain issues at Pueblo El Mirage downstream of El Mirage Road. The West Cactus Basin is not landscaped, lacks adequate maintenance access, has steeper than desirable slopes in some locations, does not provide an adequate level of flood protection during the 100-yr event and does not drain within 36-hours.

The Context Sensitive Flood Hazard Mitigation (CSFHM) Planning and Design Approach was used to select the preferred design concept documented in this report. The preferred concept was presented in a public meeting and was received positively. Major elements consist of a large box culvert under an improved Cactus Road, a multi-use landscaped detention basin with a reconfigured drainage outfall, a new culvert crossing under an improved El Mirage Road and re-grading of the existing earthen channel west of El Mirage Road. These major elements are presented in Figure 3, along with the other minor elements.

A summary of the important facts about the preferred concept is presented in the table below:

Preferred Concept Summary Table

Design Element	Value / Size	Cost
100-year peak inflow	660 cfs	
100-year peak outflow	180 cfs	
100-year storage volume,	64 acre-feet	
100-year water surface elevation (WSEL)	1113.6 ft.	
Maximum storage volume	70 acre-feet	
WSEL at maximum volume	1114.0 ft.	
Estimated total construction cost		\$2,300,000
Inflow structure	10' x 10' concrete box culvert	
Downstream channel grading	875 linear feet	
Outfall structure	sixty (60) inch diameter pipe	
Commercial land acquisition	1.3 acres	\$127,413
Temporary construction easement	0.57 acres	\$2,793

During the CSFHM process, the alternative and concept development efforts are focused on the Flooding, Land and Resource and Community contexts. As a result, the preferred concept meets all of the process requirements. It should be noted, however, that there is room within the concept design to optimize the hydraulic design, minimize costs, and maximize benefit to the community. The preferred



concept presented herein is a conceptual level design and therefore the engineering design proves the feasibility of the concept but has not been refined to a final design level.

Goals for optimization during final design should include maintaining a nearly balanced earthwork model, maximizing multi-use quality and opportunities and minimizing or eliminating land acquisition. Other parameters that may be desirable to optimize during final design are the basin ponding depth, peak outflow rate and depth of inundation of multi-use features during storm events.

The concept design presented within this report allows the final designer flexibility within the basin. Several of the features can be modified without sacrificing CSFHM constraints. A listing of final design recommendations is provided in Section 11.0 at the end of this report.



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1.0 INTRODUCTION

Lower El Mirage Wash and its contributing watershed are located in the West Valley of the Phoenix Metro area, within Maricopa County, Arizona. A Site Map showing the general location of the project is shown on Figure 1. The Lower El Mirage Wash drainage passes through the Cities of Surprise and El Mirage. This study addresses the lower reach of Lower El Mirage Wash. For simplicity, "this study" is referred to hereafter as LEMW DCR.

1.1 Project Area and Phasing

The overall project area is focused on the specific reach of Lower El Mirage Wash bounded by the Agua Fria River at the downstream end and the confluence of the Lower El Mirage Wash Tributary with Lower El Mirage Wash at the upstream end. The confluence is located approximately 800 feet upstream (north) of Cactus Road. The Vicinity Map is shown on Figure 2.

This is Phase 2 of a two-phased project. The *"Summary Report for Phase 1 – Analysis and Recommendations, Lower EL Mirage Wash Design Concept Report"* dated June 4, 2010 included the hydrologic analysis and hydraulics to determine the extent of flooding along Lower El Mirage Wash and to determine what, if any, analyses should be done in Phase 2. It was determined that Phase 2 should consist of development of a basin design concept at the southwest corner of Cactus Road and El Mirage Road.

1.2 Background

The lower reach of Lower El Mirage Wash passes through a private development known as Pueblo El Mirage, located within the City of El Mirage. The Pueblo El Mirage development was constructed circa 1985, prior to the original White Tanks/Agua Fria Area Drainage Master Study (ADMS) by WLB in 1991 (FCDMC, 1991). According to the West Cactus Basin CAR (FCDMC, 2004) the 1985 design flow utilized for the development was 250 cfs. Additionally the 2004 CAR indicates that the White Tanks ADMS documented a 100-yr flow of 1800 cfs, and subsequent ADMP updates document the design flow to be about 860 cfs. The various rates of flow are summarized in Table 3.1. The Lower El Mirage Wash Floodplain for the Pueblo El Mirage area was mapped as part of the original 1991 ADMS, and constitutes the effective floodplain mapping for Lower El Mirage Wash south of Cactus Road, using the 1800 cfs.

1.3 Purpose and Need

The original purpose of the project was to reduce the flooding hazards of the project area and to meet the needs of the City of El Mirage, the Private Community of Pueblo El Mirage and the landowners, Herbert and Elizabeth Bool who co-own with the City the private parcel that includes the western portion of the



West Cactus Basin. As the project developed other purposes and needs have been identified. The general purpose also includes identification of goals and objectives based on community input, adjacent land and resource compatibility, and providing for multi-use functions and landscape aesthetics that can be satisfied during final design.

The City's desires include removal of the West Cactus Basin dead storage that lies below the existing culvert outfall, re-grading the existing basin to provide safer local conditions, and a new culvert outfall under Cactus Road to eliminate the existing road overtopping situation. The basin's dead storage is considered a health and safety risk. The basin side slopes are steep and non uniform; it is a non-engineered basin and lacks aesthetic value. The existing culverts under Cactus Road are very undersized and the roadway experiences overtopping during significant runoff events creating unsafe conditions for drivers and pedestrians.

Other stakeholder interests include:

- The Pueblo El Mirage Community desires to reduce the 100-year peak flow rate in Lower El Mirage Wash below the threshold that floods existing homes and lots in the subdivision, i.e. 230 cfs.
- The Bool's would like to maintain ownership of 50% of their lot (parcel 501-44-004-N) that they co-own with the City so that they have a developable commercial parcel.
- The interests of Pueblo El Mirage and the Bool's are also considered to be interests of the City.

1.4 Overview

Phase 1 provided hydrologic updates to the ADMPU-AHA that documented the reduced peak flow rates in Lower El Mirage Wash. However, the study also determined that those reductions were not sufficient.

The alternatives developed for Phase 2 include initial improvements to the culvert crossings of Cactus and El Mirage Roads and grading and landscaping improvements to the basin. The proposed improvements eliminate the dead storage, provide aesthetic and landscaping improvements to the basin, reduce downstream flows to acceptable levels, eliminate the Cactus Road overtopping for events under the 100-year storm and allows for private development of one-half of the Bool parcel. The initial basin grading will also accommodate phased construction of recreational features by the City at a later date, when and if funding becomes available.

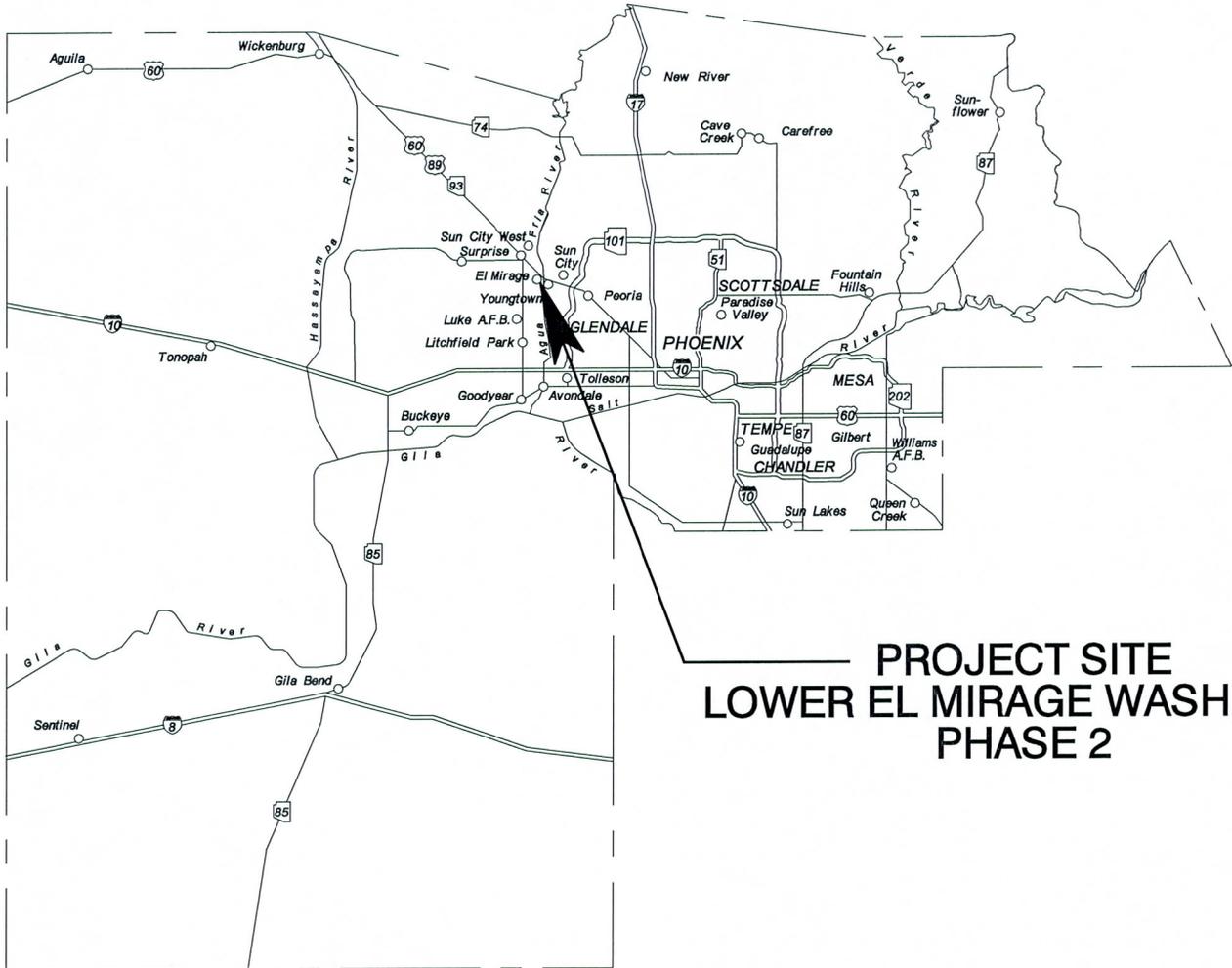
The Phase 1 study indicates the 100-yr existing flow crossing Cactus Road is 660 cfs. The existing basin contains about 20 acre-feet of dead storage. The existing box culvert under El Mirage Road will pass more than 300 cfs in its existing condition and over 350 cfs if the dead storage within the basin is removed. If the entire Bool parcel were to be filled for development the remaining basin volume would be insufficient to prevent overtopping of El Mirage Road in a 100-year event.



**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

LOWER EL MIRAGE WASH DCR

Phase 2
Analysis and Recommendations
FCD 2008C014 WA #4



**PROJECT SITE
LOWER EL MIRAGE WASH, DCR
PHASE 2**

**FIGURE 1
SITE MAP**

August 25, 2011

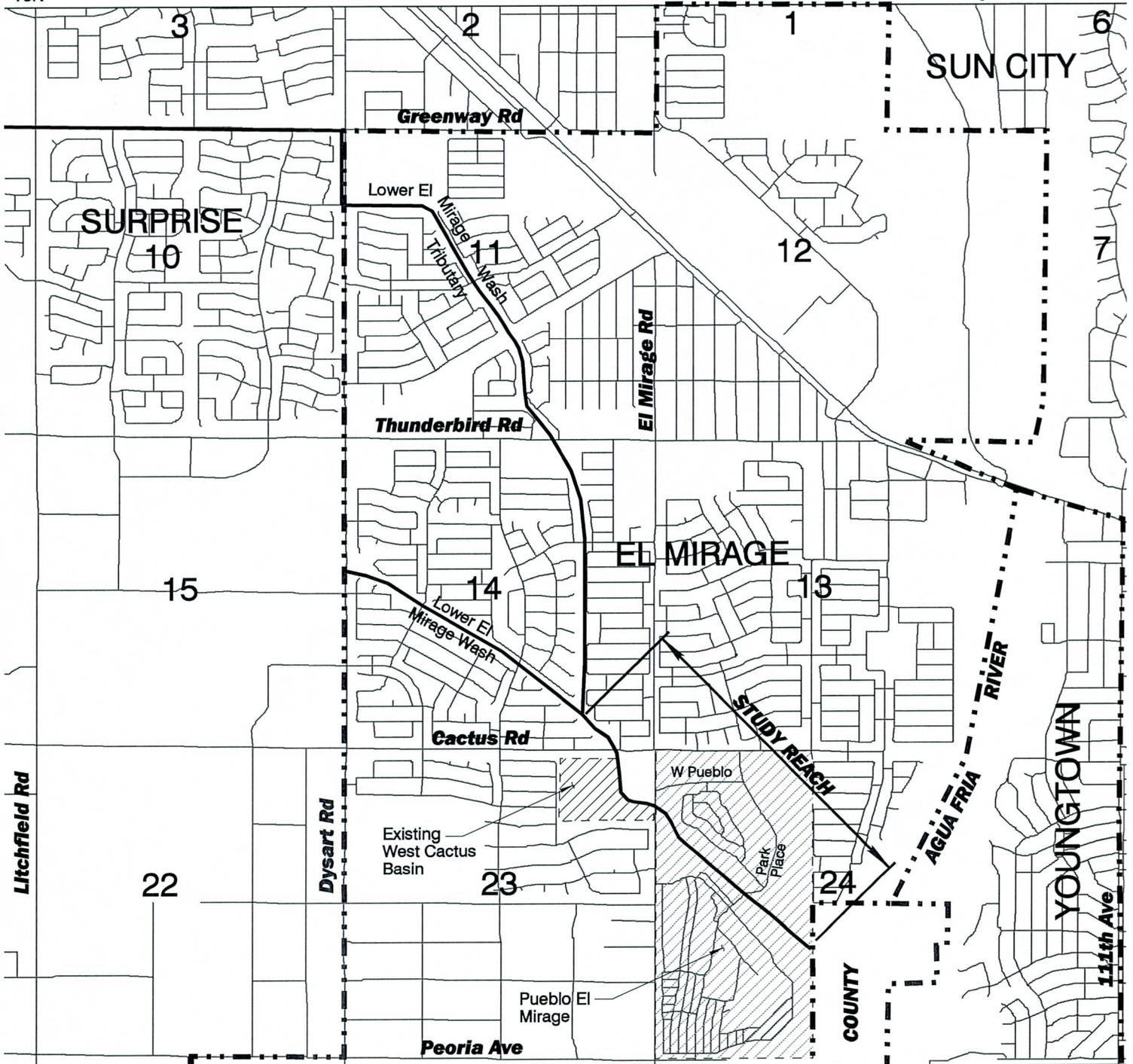


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R1W
RTE

T3N



Key to Symbols

-  Lower El Mirage Wash Existing Channel
-  City Limit
- 23** Section Number

**FIGURE 2
VICINITY MAP**

August 25, 2011



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1.5 Scope of Work

The scope of work requires the deliverance of a conceptual plan that can be moved forward into the Flood Control District of Maricopa County's Capital Improvement Project (CIP) Prioritization process for design and construction.

2.0 STAKEHOLDER INFORMATION

The stakeholders for this project are:

Flood Control District of Maricopa County

Valerie Swick, Project Manager

City of El Mirage

Lance Calvert, City Engineer

Joint property owners

Herbert and Elizabeth Bool

Pueblo El Mirage / Roberts Resorts

Scott Roberts, Developers and Property Managers

3.0 DATA COLLECTION

3.1 Previous Studies

Lower El Mirage Wash has been studied several times. Each study resulted in a different rate of flow for Lower El Mirage Wash. The previous studies and resulting 100-year peak discharge of Lower El Mirage Wash at El Mirage Road are summarized in Table 3.1.



**TABLE 3.1 – Comparison of 100-Year Peak Discharges
for Lower El Mirage Wash at El Mirage Road**

Date	Drainage Study	100-yr peak Discharge (cfs)
1985	Federal Emergency Management Agency, Original FIS	250 ¹
2001	Lower EL Mirage Wash Channelization LOMR	1,753 ^{1,2}
2004	Loop 303 Corridor / White Tanks ADMP update	857 ^{1,3}
2009	Loop 303 / White Tanks ADMP-AHA (2009)	214 ³
2010	This study - revisions to the ADMPU-AHA (2009)	230 ⁴

- Notes: (1) Per “West Cactus Detention Basin and Channels Project CAR” (FCDMC, 2004).
 (2) FEMA LOMR, by A-N West for the City of El Mirage for channelization upstream (northwest) of El Mirage Road.
 (3) Flow revision and resulting mapping revisions not submitted to FEMA.
 (4) Existing condition with CIP, conceptual design for West Cactus Basin.

The “Lower El Mirage Wash Design Concept Report, Phase 1 - Analysis and Recommendations Summary Report” dated June 4, 2010 documents hydrologic and hydraulic analysis for this study.

3.2 Mapping and Survey Data

Mapping for Phase 2 of this project consists of detailed mapping resulting from 2008 aerial photography. Detailed mapping for this study reach was ordered and delivered near the end of Phase 1. The Phase 1 study and hydrologic analysis utilized mapping produced for previous projects, which mainly consisted of two sets of mapping, and supplemental survey. Refer to the Phase 1 study for further Phase 1 mapping details and specifics.

Vertical mapping datum’s differ for the Phase 1 and Phase 2 reports. Computations and elevations presented throughout this report are on the North American Vertical Datum of 1988 (NAVD88), unless indicated otherwise. The Phase 1 datum is NGVD29.

To convert NAVD88 to National Geodetic Vertical Datum of 1929 (NGVD29), subtract 1.87 ft (**NAVD88-1.87-ft = NGVD29**).

3.3 FEMA and Floodplain Data

Lower El Mirage Wash is regulated by the Federal Emergency Management Agency (FEMA). The study reach contains both floodway and floodplain delineations. The current Flood Insurance Rate Map (FIRM) for this project is panel 04013C1605J (1605 of 4350) for Maricopa County and incorporated areas. The current FIRM panel is dated September 30, 2005, portions of which are reproduced in Appendix B.

The vertical datum used by FEMA for this area is NGVD29.



4.0 HYDROLOGY

Hydrologic analysis for the watershed contributing to this project is documented in the Phase 1 Summary Report, dated June 4, 2010. A copy of the HEC-1 routing diagram and output is provided in Appendix C.

Hydrologic modeling was performed for each alternative to satisfy the flooding context and aid in the evaluation of each concept. This consisted of stage-storage-discharge data for each concept layout. To estimate stage-discharge data, an inlet control rating curve was utilized. To estimate stage-storage data, contours for each concept were generated. The corresponding contour maps and stage-storage-discharge data are provided in Appendix C.

5.0 HYDRAULICS

As documented in the Phase 1 Study Report, there are several geometric features that restrict the channel capacity of Lower El Mirage wash through Pueblo El Mirage. The existing geometric features were modeled using HEC-RAS and supplemental survey data. Multiple discharges were evaluated. It was determined that the existing Park Place culvert in combination with existing finish floor elevations provide the limiting capacity for the study reach. The existing capacity of Lower El Mirage Wash through Pueblo El Mirage is 230 cfs, while providing one foot or more of freeboard beneath existing finish floor elevations.

6.0 OPPORTUNITIES AND CONSTRAINTS

A modified version of the District's Context Sensitive Flood Hazard Mitigation (CSFHM) Planning and Design Approach was used to establish preliminary concept alternatives. The Kickoff and Brainstorming meeting held on January 5, 2011 identified the context sensitive opportunities and constraints. Prior to the Community Meeting, the City of El Mirage indicated that recreational fields should be planned for as future possibilities but not identified as part of the community presentation. The Context Sensitive bullets below reflect the Community's input.

6.1 Flooding Context

- The El Mirage Road culvert will serve as the hydraulic control for the West Cactus Basin
- Provide sufficient West Cactus Basin storage to reduce the peak outflow below 230 cfs for the 100-yr storm
- The Cactus Road culvert will pass the anticipated 100-yr peak inflow of 660 cfs



- Terracing within the basin site for varying levels of inundation during varying frequencies of storm events
- Maintain storm drains on western and southern sides of project boundary

6.2 Land and Resources Context

- Meet minimum landscape buffer needs, as practicable, per District Aesthetic Treatment Policy
- Provide landscape design theme compatible with Suburban Context
- Design Landscape themes and Structural Methods that are compatible with the Suburban Context, as identified in the Project LIA
- Design Basin depth and side slopes to be "human-scaled" and compatible with pedestrian access
- Meander low flow, basin side slopes and overall configuration to create a more natural, aesthetic appearance for the basin. Use 6:1 or flatter for turf, and 4:1 or flatter for decomposed granite surface. 3:1 slopes for decomposed granite surface may be used in limited form as dictated by existing topography and where appropriate
- Provide opportunities for varied landscape treatments, including natural areas as well as future active and passive recreation areas
- Connect project site to existing neighborhood which is well kept with traditional suburban landscaping. Homes to the south of the site front the project, allowing the project site to have an opportunity to become a visual extension of the homes front yards
- Connect proposed project site trail system with existing trail system on the north side of Cactus Road
- Connecting the trail to the east side of Lower El Mirage Road is not feasible. The neighborhood on the east side of Lower El Mirage Road is a gated community and has requested that pedestrian access to the project site not be included as part of this design
- Views from the higher portions of the project site include views towards the west with the White Tank Mountains in the background

6.3 Community Context

- Provide adequate footprint for a future municipal facility, specific use not yet identified
- Provide a connection to the pedestrian areas located north and south of site
- Provide pedestrian access and circulation within proposed project area
- Provide a project conceptual design that meets the City of El Mirage maintenance needs
- Minimize the construction and life cycle costs
- Future active recreational areas are preferred to stay dry as long as possible, being the last area to be inundated

7.0 PRELIMINARY CONCEPTS

Three preliminary concepts were selected at the January 5, 2011 meeting. The concepts were formulated into drawings. The preliminary concept drawings were circulated to the stakeholders on January 27, 2011. The preliminary concept drawings are provided in Appendix D.



Feedback received from the Community was positive and each concept was developed further. Rough grading for each concept was determined. The grading efforts necessitated slight revisions to the concept layouts. These preliminary concept designs resulted in a meandering side sloped basin with terraced grading to provide for future recreation needs should community funding become available. Each concept provided the same general future recreational features, but slightly different layouts.

The final versions of the concept drawings and color renderings presented at the Community Meeting are provided in Appendix D. The Community Meeting was held at El Mirage Elementary School on March 30, 2011 at 5:30 PM. El Mirage Elementary School is located at 13500 N El Mirage Road, El Mirage, Arizona.

The feedback captured at the Community Meeting was favorable.

A line item cost estimate for each concept is provided in Appendix E.

8.0 CONCEPT ANALYSIS

This report does not make specific distinctions between the terms “Concept” or “Alternative”. The terms were used interchangeably during the Alternative Selection Meeting and the dual usage is carried forward within this report.

To evaluate the concepts, evaluation criteria was established during the Alternative Selection Meeting. The following is a list of the evaluation criteria:

- Effectiveness in Reducing Flooding
- Community Acceptance
- Multi-use Opportunities and Landscape Aesthetics
- Cost
- Stakeholder Acceptance
- Funding Opportunities

Using the aforementioned criteria, advantages and disadvantages for each concept are documented below.

8.1 Concept 1 – advantages and disadvantages

The advantages for Concept 1 are:

- + Balanced Earthwork
- + Better arrangement of open space
- + Provides about 20% more turf area



DESIGN CONCEPT REPORT

- + Provides buffer between private & municipal space
- + Panhandle (rectangular area south of Cactus Road) allows for multi use
- + Allows commercial space to increase without reducing multi use features

The disadvantages for Concept 1 are:

- Not the least cost (\$2,600,000)
- Higher earthwork cost than Concept 2 (\$559,000)

8.2 Concept 2 – advantages and disadvantages

The advantages for Concept 2 are:

- + Balanced Earthwork
- + Panhandle allows for multi use
- + Lowest cost (\$2,350,000)
- + Lowest Earthwork cost (\$433,000)
- + Provides largest remainder Bool parcel

The disadvantages for Concept 2 are:

- Longer outlet pipe increases capital cost
- Longer outlet increases maintenance, but not significantly
- No buffer between private & municipal space
- Multi-use area is closer to residences

8.3 Concept 3 – advantages and disadvantages

The advantages for Concept 3 are:

- + Bools do not need to import material
- + Commercial area connectivity
- + Provides most space for multi use
- + Buffer between private & municipal space

The disadvantages for Concept 3 are:

- Requires an import of earthwork for Phase I construction
- Highest earthwork cost (\$689,000)
- Panhandle does not allow for multi-use
- Least commercial space
- Highest cost (\$2,850,000)



8.4 Concept Evaluation

The evaluation criteria, advantages and disadvantages are ranked using the following scale:

- +1 point for a positive indicator
- No points for a neutral indicator
- 1 point for a negative indicator

The table below shows the results of applying the evaluation criteria to each concept.

TABLE 8.1 – Concept Ranking Results for Lower El Mirage Wash DCR

Evaluation Criteria	Concept 1	Concept 2	Concept 3
Effectiveness in Reducing Flooding	equal	equal	equal
Capital Cost (including right-of-way acquisition)	middle cost	least cost +1	most cost -1
Operations and Maintenance Cost	equal	equal	equal
Multi-Use/Aesthetics: <i>amount of open space</i>	equal	equal	most +1
Multi-Use/Aesthetics: <i>configuration of open space</i>	best +1	equal	equal
Multi-Use/Aesthetics: <i>amount of neighborhood buffer</i>	best +1	least -1	average
Multi-Use/Aesthetics: <i>connectivity with adjacent multi-use</i>	equal	equal	equal
Multi-Use/Aesthetics: <i>future multi-use opportunities</i>	equal	equal	equal
Community Acceptance	equal	equal	equal
Stakeholder Acceptance: <i>Flood Control District of Maricopa County</i>	preferred +1	equal	equal
Stakeholder Acceptance: <i>City of El Mirage</i>	equal	equal	least -1
Stakeholder Acceptance: <i>Pueblo El Mirage</i>	equal	equal	equal
Stakeholder Acceptance: <i>Herbert and Elizabeth Bool</i>	equal	preferred ¹ +1	equal
Funding Opportunities	equal	equal	equal
Ranking Totals:	+3 -0 = +3	+2 - 1 = +1	+1 - 2 = -1

¹Note: The Bools preferred Concept 2 because it provides maximum acreage for the commercial parcel; however Concept 1 can be modified to provide equal or more commercial acreage without sacrificing flood control function.

The evaluation criteria combined with the ranking scale indicates that Concept 1 is the preferred concept. The ranking results are:

- Concept 1 provides the highest ranking of +3**
- Concept 2 provides the middle ranking of +1
- Concept 3 provides the lowest ranking of -1

9.0 RECOMMENDED DESIGN CONCEPT

The selected concept / alternative is Concept 1. This concept received the highest ranking resulting from the evaluation criteria. One major advantage for Concept 1 is that the commercial space was increased to the south without reducing the multi-use features. The recommended concept is a slightly modified



revision of Concept 1, based on stakeholder input received after the public meeting. The preliminary concept plans included within this document indicate the current basin layout.

When holding the horizontal location of the future active recreational areas presented at the Public Meeting, the recommended design requires land acquisition from parcel 501-44-004-N. This parcel is jointly owned by Herbert J / Elizabeth L Bool and the City of El Mirage and consists of a total of 27.0 acres. It was assumed that the City and the Bools have a 50/50 split of the land. If the split is not 50/50 then the parties may negotiate fair compensation for the difference in acreage. The Recommended Design Concept needs an additional 1.3 acres above the 50/50 split. In the cost estimate for the concept, it was assumed that the Bools would be compensated for the additional 1.3 acres needed for the Recommended Design Concept.

The District provided a land acquisition value estimate of \$98,010 per acre. This could equate to a land acquisition compensation of \$127,413 for the 1.3 acre take. The value estimate is purely a cost-per-acre estimate and does not place added value on the remainder parcel for maintaining Cactus Road frontage.

The next sections highlight the features of the recommended design as distinguished by the context sensitive categories.

9.1 Flooding Context

The preliminary design layout and grading as presented within this document provide a 100-yr flooding solution. The peak rate of flow into the basin is 660 cfs. This is the design discharge for the Cactus crossing of El Mirage Road. The preliminary culvert size chosen for this analysis is a single barrel 10'x10' box culvert. The 10-ft height was selected based on the Community's desire for multi-use access. This culvert size has since been included in the Cactus Road Improvements Construction Documents by the City of El Mirage.

The storage volume resulting from the preliminary grading of the basin provides sufficient attenuation to the inflow hydrograph to reduce the peak basin discharge well below the maximum allowable 100-year peak discharge of 230 cfs. The design requirements and corresponding modeling results are summarized in Table 9.1.



TABLE 9.1 – Design Criteria

Criteria	Design Requirements	Concept Model Results
West Cactus Basin		
100-YR Peak inflow (discharge passing Cactus Road)	660 cfs	660 cfs
100-YR Peak outflow (discharge passing El Mirage Road)	≤230 cfs	180 cfs
Basin overtopping elevation	1115.0	1115.0
Basin maximum 100-YR WSEL	1114.0	1113.6
Basin freeboard	1.0-ft	1.4 ft
Basin storage volume at 100-YR WSEL	70 acre-feet, max	64 acre-feet
Outfall Channel (earthen with some native vegetation or grass lined)		
Outfall Channel design discharge	≤230 cfs	180 cfs
Outfall Channel minimum freeboard	1.0-ft	1.0- ft
Outfall Channel normal depth	2.8-ft	2.4-ft
Outfall Channel Manning's n-value	0.033	0.033
Roadway Culvert Crossings		
Cactus Road – 100-YR Design Q	660 cfs	660 cfs
Cactus Rd – culvert inlet HW	Maximum = 1119.0	1117.8
El Mirage Road – 100-YR Design Q	≤230 cfs	180 cfs
El Mirage Road – culvert inlet HW	Maximum = 1114.0	1113.6
Sediment Basin (located north of Cactus Road)		
Size	To be determined	Small
Depth	To be determined	Assumed 1.5-ft
Sediment Yield	To be determined	May not be required

When modeling the basin outlet as a 60-inch pipe, the resulting peak discharge is 180 cfs¹ and the basin peak storage volume is 64 ac-ft at an elevation of 1113.6. Using this configuration, the basin earthwork model indicates a balanced project. Shrink and swell factors for earthwork were not incorporated. It should be noted that considerable flexibility remains in the hydraulic model and basin grading to optimize the basin peak discharge and create additional volume for softer slopes or elevated multi-use features. Optimizing the basin grading for multi-use and maximizing the discharge will likely result in a borrow situation for earthwork.

¹ The resulting peak discharge of 180 cfs is taken from HEC-1 node SRD53 = 182 cfs.



The proposed basin includes level pool storage (about 3 ac-ft at elevation 1113.6) in the existing Lower El Mirage Wash by incorporating the proposed Cactus Road box culvert in the hydraulic model. This does not cause flooding as the peak flow of 660 cfs has already passed into the basin. The upstream limits of the level pool will be located at a point approximately 1,500 ft north of Cactus Road. At this location the level pool surface is about 6 feet below the bank elevation of Lower El Mirage Wash. At Cactus Road, the level pool elevation of 1113.6 is about 1.4 feet below the surrounding bank elevations of Lower El Mirage Wash.

The basin stage-storage-discharge relationship was developed using a combination of Culvert Master rating curves and HEC-1 to size the 60-inch outlet pipe and insure that the flood routing through the basin functions properly. See Appendix C.

The basin grading requires re-grading about 875 LF of the existing Lower El Mirage Wash downstream of El Mirage Road. This allows for both proper hydraulic function and gravity drainage of the basin. The channelization can match existing grade and cross section at that point.

9.2 Land and Resources Context

The Concept 1 layout provides elements that satisfy the land and resources context. The landscaping elements shown on Concept 1 were carried forward. Landscape Theme's have been defined for the project site to integrate the site plan with the adjacent neighborhood. This has included the placement of the future recreational features and less intense open space uses immediately adjacent to these residential areas and maintained the higher intensity uses further away and located below view of these same neighborhoods.

9.3 Community Context

The Concept 1 layout provides elements that satisfy the community context. The community elements shown on Concept 1 were carried forward. These elements are:

- Open space multi-uses through grading designs to provide safe year round accessibility
- Useable areas for outdoor recreation activities at elevations above nuisance flows
- Design of O&M access and other structural components as multi-use facilities
- Provide open space separation between residential neighborhood and municipal space
- Provide connectivity to trail system to the north of Cactus Road
- Provide pedestrian access to areas to north and south of site and circulation through the basin
- Provide about 2 acres for a Municipal Facility
- Minimal maintenance
- Minimal construction and life cycle costs



10.0 CONCEPT DESIGN

The preliminary construction plans provided in Appendix G of this report are conceptual. The Right-of-Way and line work provided will need to be verified with an American land Title Association (ALTA) boundary survey. Once the ALTA is complete, the utility base file will need to be verified and/or adjusted. The proposed design concept schematic is presented on Figure 3. The design concept rendering is shown on Figure 4.

10.1 Design Assumptions

- The drainage design hydrology is taken from the White Tanks ADMPU-AHA (2009) as modified for this project and documented in the Phase 1 Summary Report.
- Right-of-way locations are approximate and are based on the project mapping and aerial photography.
- Utilities shown are approximate horizontal locations.

10.2 Drainage Design Criteria

- West Cactus Basin will detain the 100-yr runoff volume at a WSEL 1-ft below the top of the basin
- West Cactus Basin storage volume will attenuate the 100-yr peak discharge leaving the basin and the maximum basin discharge shall not exceed 230 cfs
- West Cactus Basin Concept Design storage volume is 64 acre feet
- The detention basin side slopes shown are average side slopes
- Extend and maintain the storm drains on the western and southern sides of project boundary
- Future shared parking on Commercial parcel is to be elevated above the 100-yr WSEL
- Future parking on City / Basin parcel can be flooded up to 1.5-ft of inundation (100-yr)
- Future active recreation area along southern edge can be flooded up to 1-ft of inundation (100-yr)
- Pad for future restrooms and/ or public buildings will need to be elevated above 100-yr WSEL

10.3 Landscape Criteria

The goal of the landscape design was to meet the following requirements:

- Provide a variety of attractive landscaped open spaces that emphasize the desert park and / or desert oasis themed areas
- Provide opportunities for informal passive recreation areas
- Provide safe pedestrian connectivity between residential areas, commercial areas and adjacent trail system
- Integrate the design so that it fits within the surrounding context
- Design the overall site to accommodate future City desired active facilities

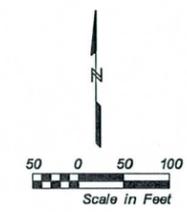
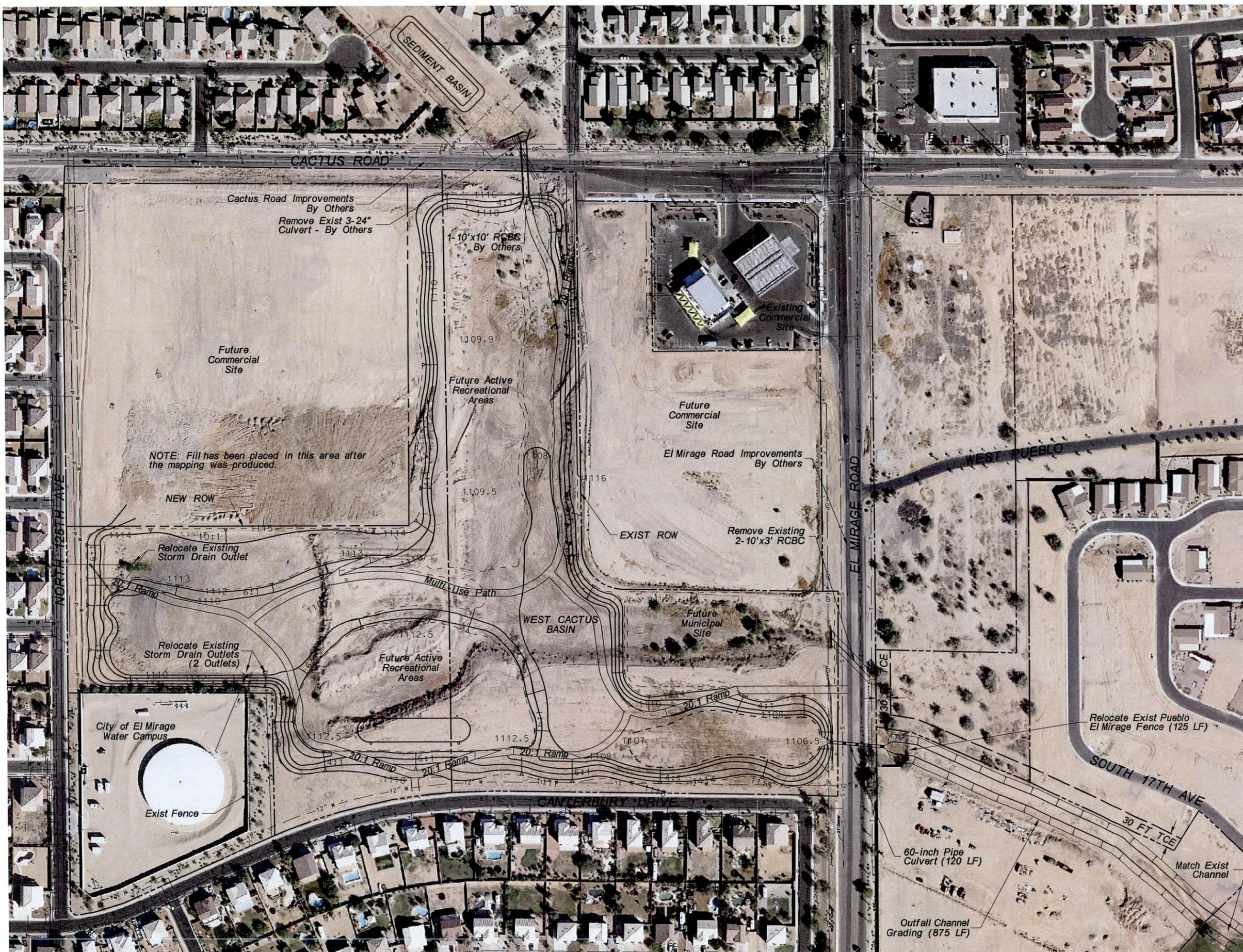




LOWER EL MIRAGE WASH DCR

Phase 2
Analysis and Recommendations
FCD 2008C014 WA #4

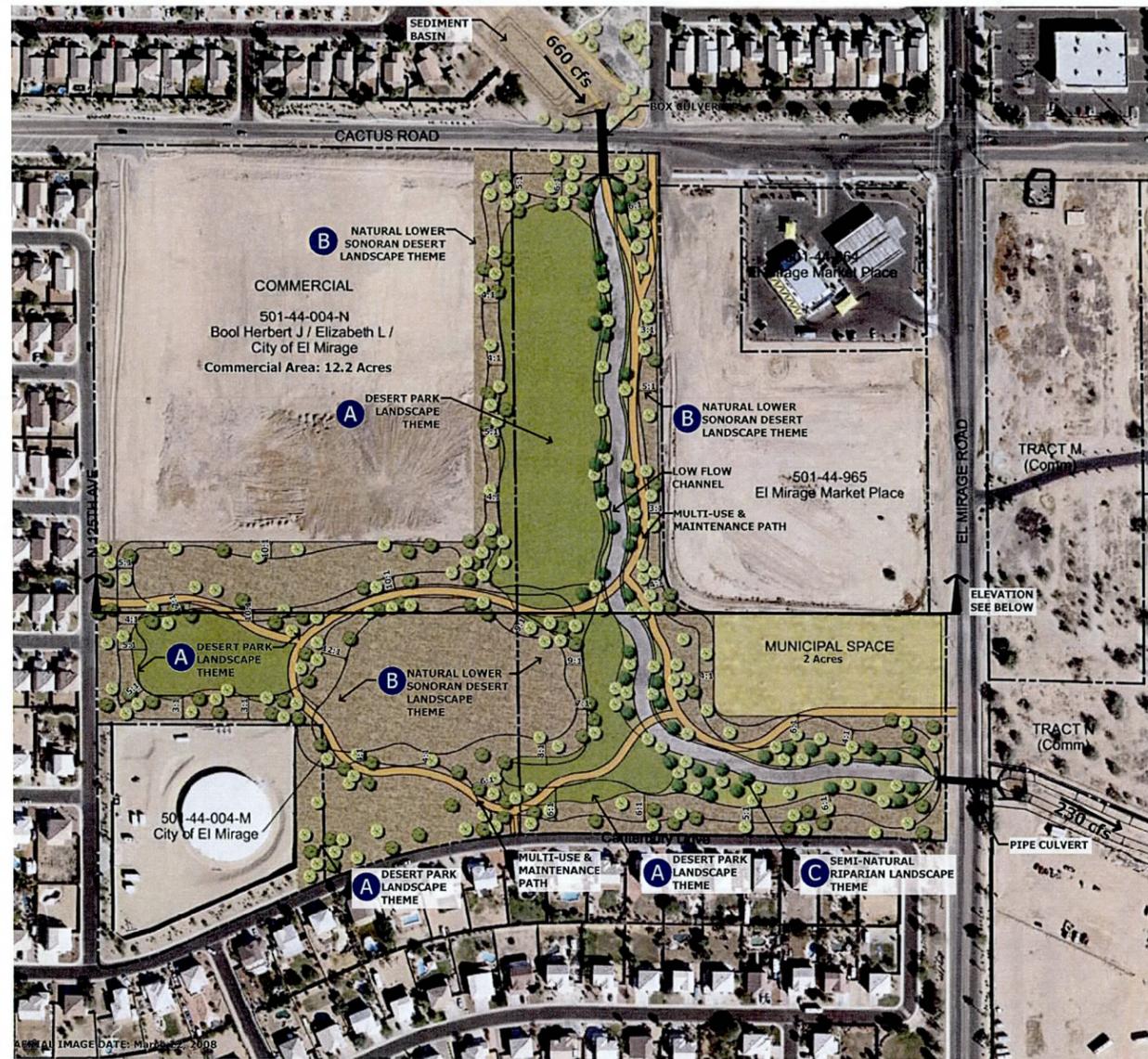
Estimated Construction Cost
\$2,300,000



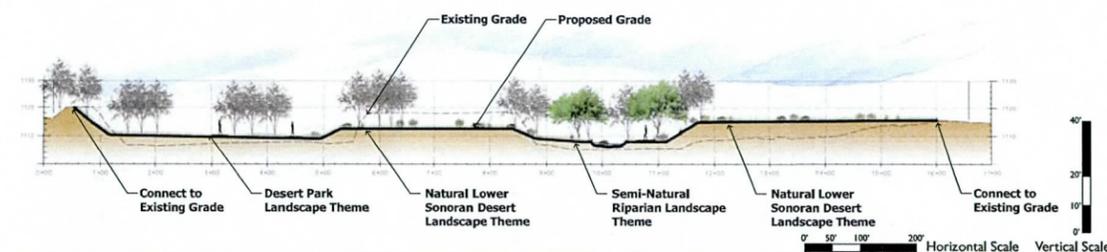
AZTEC
TYPASA Group www.aztec.us
4561 E. McDowell Road
Phoenix, AZ 85008-4505
Tel (602) 454-0402
Fax (602) 454-0403

FIGURE 3
DESIGN CONCEPT SCHEMATIC
August 25, 2011

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Scale Bar North Flood Control Improvements Preliminary Estimated Construction Costs **\$2,300,000**



Elevation of Flood Control Improvements

FLOOD CONTROL FEATURES

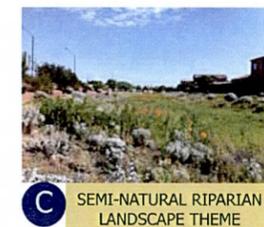
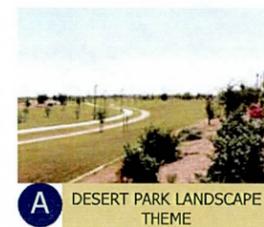
- Provide Adequate Culvert Size at Cactus Road
- Eliminate Flow Overtopping Cactus Road
- Minimize Erosion Potential at Cactus Road
- Eliminate Standing Water in Basin
- Reduce 100-yr Flooding Inundation Area Downstream
- Reduce Flow Constriction of Security Fence East of El Mirage Road
- Enhancement of Local Community Landscape Aesthetics

DISTINGUISHING FEATURES

- Potential to Use Gabion Basket Retaining Walls
- Minimizes El Mirage Road Culvert Length
- Provides Open Space Separation Between Residential Neighborhood and Municipal Space

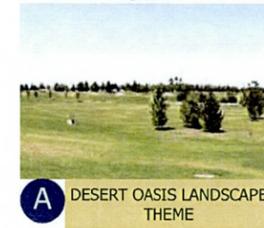
LANDSCAPE AESTHETICS & MULTI-USE FEATURES

- Provides a Variety of Attractive Landscape Open Spaces that Emphasizes the Desert Park and/or Desert Oasis Landscape Themed Areas



OR

OR



- Provides Opportunities for Informal Passive Recreation Activities
- Provides Pedestrian Connectivity Between Residential and Commercial Areas.



The preferred design is intended to integrate the basin and channel within the surrounding neighborhood and adjacent commercial context. The south and portions of the west sides of this project site are bordered by single family suburban neighborhoods. The east and north are either developed or targeted for future commercial sites. Two landscape themes were chosen for these areas which border existing development. Those landscape themes were the; Desert Park Landscape Theme and Desert Oasis Landscape Theme. Descriptions of landscaping themes are provided in Appendix F. These themes allow for a visual continuity to be developed between the adjacent developments (residential and commercial) and the project site. That transition includes desert adapted trees along the perimeter, the limited use of turf in the more active play zones, larger more pronounced shade trees, and of course the splash of color that shrubs and groundcovers can add to a landscape. The interior of the project site has been broken into two additional landscape themes. The areas outside of the low flow channel area have been identified to use the Natural Lower Sonoran Desert Landscape Theme or Enhanced Desert Landscape Theme. This allows for a natural Sonoran Desert landscape palette to be incorporated into this reach of the project. This theme plays off of and links to the landscape elements and features found in the surrounding residential areas with a heavier emphasis on the use of sonoran desert plantings. This makes the transition into the project site a blending of the surrounding residential landscape with the project site landscaping. The area along the low flow channel has been defined to use the Semi-Natural Riparian Landscape Theme. The landscape palette in this location is similar to the adjacent sonoran desert landscape; however the density of planting will be higher with a thicker understory that can take advantage of the nature of the soils and micro-environment associated and created by the low flow channel.

10.4 Path / Connectivity

A path system has been defined within the project site to allow for not only pedestrian access throughout the basin but also operations and maintenance vehicles. For the preliminary design, the path system has been defined as 16' wide, allowing for a 12' paved path and a 2' recovery area on each side of the path. (See Future Design Considerations)

At the time of this report a new trailhead was under design on the north side of Cactus Road. This existing trail network connects various neighborhoods in the area. A trail connection is shown on the preferred design between the project site and traversing under Cactus Road. This connection will allow pedestrians barrier free access to the entire inter-connected trail system. To the east the project site crosses underneath Lower El Mirage Road. The neighborhood on the east side of Lower El Mirage Road is a gated community that has requested there not be a trail connection to this neighborhood.



11.0 FINAL DESIGN RECOMMENDATIONS

11.1 Environmental Permits

During the final design phase the need for environmental permits, clearances, or documentation of compliance with regulations should be investigated. The list of potential permits may include:

- Clean Water Act Section 401 - Stormwater Pollution Prevention Plan
- Clean Water Act Section 402 - Arizona Pollutant Discharge Elimination System (AZPDES) permit
- US Army corps of Engineers Clean Water Act Section 404 permit
- Endangered Species Act
- National Historic Preservation Act / State Historic Preservation Act

The list of potential permits above may not be all inclusive as additional permitting requirements may be identified during final design.

11.2 Right of Way and Construction Easements

- The final design may require land acquisition for up to 1.3 acres from parcel APN 501-44-004-N at a cost of approximately \$127,413. The opportunity for this acquisition to be reduced or eliminated exists by taking advantage of the flexibility contained in the Concept Plan. It is possible that the final designer can extend the commercial area south to provide a 13.5 acre remnant commercial parcel with no land acquisition required, at a potential savings of up to \$127,400. Note that this change in plan would likely increase earthwork costs.
- A temporary construction easement will likely be required for the channel grading work west of El Mirage Road. It is anticipated that a 30-ft easement would allow this work to be completed.
- A temporary construction and/or slope easement may be required along the southern edge of the proposed commercial area, depending on the results of the supplemental survey.

11.3 Survey and Mapping

The proposed project will require an ALTA survey and a right of way determination. Updated supplemental topographic survey for the existing detention basin, right-of-way, upstream and downstream channel segments and adjacent roads will be required in order to complete construction documents.

11.4 As-Built Plans

As-built construction plans for the following will aid the final design effort:



- Storm drain pipe draining North 125th Avenue to the West Cactus Basin
- Storm drain pipe draining the City of El Mirage Water Campus to the West Cactus Basin
- Storm drain pipe draining Canterbury Drive to the West Cactus Basin

11.5 Utilities and Storm Drain

There are three storm drain outlets that drain to the existing West Cactus Basin. These systems outfall below the bottom of the existing basin, i.e. they are “bubble-up” outfalls and should be reconstructed with free outfalls if at all possible. Pot holing these pipes will aid the final designer in relocating the storm drain profiles.

There are no other known utilities located within the footprint of the proposed basin grading. The following utilities are shown on Figure 3 and should be located both horizontally and vertically during final design:

- Cactus Road Box Culvert Crossing
 - City of El Mirage 21” Sewer
 - Arizona Public Service, overhead and underground electric
 - Southwest Gas, verify the 4” line ends west of the proposed crossing.
- El Mirage Road Culvert Crossing
 - City of El Mirage 21” Sewer
 - City of El Mirage 12” Water
 - Cox Communications Cable TV, Fiber
 - Arizona Public Service, overhead electric

11.6 Drainage and Basin Design

- Hydrology - this concept design was developed using the HEC-1 model from the 2009 ADMPU Hydrologic Update as provided by the FCDMC. The 100-yr model provided and used was the 24-hour general storm model. A 100-yr 6-hour local storm HEC-1 model does not exist for the 10 square mile watershed contributing to this project.
- Hydraulics
 - update / verify stage-storage rating curve for basin grading design
 - select an appropriate outlet culvert configuration that discharges less than 230 cfs
 - verify the resulting 100-yr WSEL in the basin is below 1114.0
 - update / verify the stage-discharge rating curve
 - update the outfall channel design accordingly
- Sediment basin – this basin was added during the CSFHM kick off and brainstorming meeting. It was requested to minimize the turf maintenance. Grading of the low flow channel can accomplish the same goal. As such, the final designer should evaluate the necessity of this feature because sediment yield estimates were not a part of this project. The City has indicated that sediment has not been a significant issue in the Lower EL Mirage Wash upstream or downstream of Cactus Road.



- The earthwork estimate should be updated with the supplemental survey and final design grading.
- A geotechnical investigation will be required to estimate percolation rates for the sediment basin, establish earthwork compaction recommendations, shrink and swell estimates and suitability of soils for maintenance roads and landscaping. The basin grading earthwork model indicates nearly a balanced earthwork. This implies that all site soils are suitable for use within the project. This assumption will be tested and verified or modified by the results of the geotechnical investigation during final design.

11.7 Landscape Design

Additional site enhancements of the landscape design will be required to integrate the project site with both the programmed future commercial developments and City property development. The preliminary design is intended to provide the framework for any future designs or additions with minimal changes to the base design. Key elements of the future design include:

- Enable the connection of the project site under Cactus Road
- Investigate additional connection points with the adjacent neighborhoods to the south and west
- Ensure all pathways are in accordance with AASHTO guidelines. The AASHTO guidelines for multiple use pathways require a 2' minimum offset from the edge of path for vertical structures (lights, benches, trash cans, vegetation, etc). However, they recommend a 3' minimum when feasible. Additional dimensions of note are: 12' wide path for multi-use and an 8' min. vertical clearance (10' min. for underpasses). Furthermore, AASHTO requires additional pathway widths along curves that have less than a 100' radius.
- Ensure landscape design is in accordance with City of El Mirage code 154.103

Integrate the materials identified in Appendix F as part of the overall future project enhancements. The use of gabion baskets for retaining walls will allow for continuity with the trail system to the north, and may allow for additional meandering of the side slopes of the wash in the south.

11.8 Other Considerations

- Preparation of Final Construction Documents that allow the Contractor to perform mass grading controlled by on-board GPS should be a consideration. This could potentially reduce the construction costs as compared to conventional construction staking.
- Coordination with MCDOT and the City of El Mirage regarding roadway improvements to Cactus Road and El Mirage Road will be required.

12.0 REFERENCES

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- 2) Bentley Systems, Inc., Bentley CulvertMaster computer program, version 3.2, August 2008.



- 3) City of El Mirage, Cactus Road Improvements, 125th Drive to El Mirage Road, unsealed 100% submittal, June 2011.
- 4) Flood Control District of Maricopa County, White Tanks/Agua Fria Area Drainage Master Study (ADMS), WLB Group, Inc., 1991.
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- 6) Flood Control District of Maricopa County, Final Hydrology Report, Loop 303 / White Tanks ADMPU Area Hydrologic Analysis in Maricopa County, HDR, Arizona v1.2 / September 2009.
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- 21) Flood Control District of Maricopa County, Existing Facilities Landscape Aesthetics and Multi-Use Opportunities Assessment, North Valley Structures Analysis, February 5, 2001.
- 22) Flood Control District of Maricopa County, Existing Facilities Landscape Aesthetics and Multi-Use Opportunities Assessment, West Valley Structures Analysis, June 1, 2001.
- 23) Maricopa County Trail Commission, Maricopa County Regional Trail System Plan, August 16, 2004.
- 24) Maricopa Association of Governments, Desert Spaces, An Open Space Plan for the Maricopa County, undated.
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- 26) US Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, User's Manual, June 1998.
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- 28) US Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS, River Analysis System, User's Manual, March 2008.
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- 30) US Army Corps of Engineers, Hydrologic Engineering Center, Uneven Weir Flow Program, version 1.0, 1987.

APPENDIX A

Project Contacts, Meeting Minutes and Comment Resolution

Appendix A1 - Project Contacts

Appendix A2 - Meeting Minutes

Appendix A3 - Written Comments

Appendix A4 - Record of Comment Resolution

Appendix A1

Project Contacts



FCD 2008C014, Work Assignment No 4
Lower El Mirage Wash DCR, Phase 2 – Analysis and Recommendations

Flood Control District Contacts:

Valerie Swick, Project Manager

phone: 602-506-1501

email: vas@mail.maricopa.gov

John Holmes, Project Hydrologist

Harry Cooper, Project Landscape Architect/Planner

Gant Wegner, Public Information

Michael Duncan, Project Design after DCR

Other Flood Control District of Maricopa County Contacts:

Doug Williams

Dennis Holcomb

Greg Jones

Scott Vogel

City of El Mirage:

Lance Calvert, City Engineer

AZTEC Engineering:

Tony Bokich, Consultant Project Manager

phone: 602-454-0402

email: tbokich@aztec.us

David Phelps, Consultant Project Engineer

J2 Engineering and Environmental Design:

Jeff Engelmann, Landscape Architect

Pueblo El Mirage / Roberts Resorts:

Scott Roberts

Niel Roberts

Dennis Zwagerman (Consultant for Pueblo El Mirage)

Dennis Zwagerman Associates, Inc.

Appendix A2

Meeting Minutes



Meeting Date:	January 5, 2011	Meeting Time:	1:00 – 5:00 PM	
Location:	Flood Control District of Maricopa County (FCDMC)			
Subject:	FCD 2008C014, work assignment no. 4 Kickoff and Brainstorming Meeting	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations	
		Project No:	AZTEC No. AZE0913-04	
Attendees:	Valerie Swick (FCDMC meeting organizer) Doug Williams (FCDMC) John Holmes (FCDMC) Michael Duncan (FCDMC) Harry Cooper (FCDMC) Jennifer Pokorski (FCDMC, facilitator)	Lance Calvert (City of El Mirage) Tony Bokich (AZTEC) David Phelps (AZTEC) Jeff Engelmann (J2 Engineering and Environmental Design) Aaron Allan (J2 Engineering and Environmental Design) Ted Readyhough (J2 Engineering and Environmental Design)		
Prepared By:	David Phelps / Tony Bokich	Date Published:	February 15, 2011	

Introductions:

All were introduced. See attached sign in sheet.

Purpose of Meeting:

- Kick-off the Lower El Mirage DCR and discuss project logistics
- Review project goals and objectives
- Identify opportunities and constraints
- Develop preliminary concepts for the Lower El Mirage Wash basin
- Evaluate the preliminary concepts and agree on three concepts for further analysis

Desired Outcome:

Identify three preliminary concepts for further analysis.

Project Logistics:

The project logistics of communication lines, schedule and invoicing were discussed.

Project Overview:

Goals and objectives of the project were presented. The following was presented and documents the “overview of project goals and desired functions” for Flooding Context, Landscape Context and Community Context.

Lower El Mirage Design Concept Report - Overview of Project Goals and Desired Functions

Flooding Context - Hydrology and Hydraulic Considerations

At Cactus Road

- Culverts are too small
- Dip cross-section creates a driving hazard
- Occasional flow over road causes erosion downstream into basin

At El Mirage Road

- Invert of culverts is higher than those at Cactus Rd.
- Causing dead storage and vector control issues
- Two 90° bends after El Mirage Rd in downstream channel and before the security fence.
- Security fence creates a backwater condition

West Cactus Basin

- Dead storage
- The existing basin volume is not maximized due to existing culvert and dip crossing capacity.

- Need to identify the required volume needed to maintain the future discharge

Landscape Context

- Create a landscape design/ aesthetic treatment that is compatible with the Suburban Landscape Theme as defined in the project LIA.
- Provide a vegetated landscape buffer, as practicable.
- Create opportunities for native vegetation to establish in natural wash areas
- Vary side slopes, meander low flow and configure basin in a way to create a more natural, less geometric basin that is acceptable to the community, compatible with the landscape/environment and effective in reducing flood hazards.

Community Context

- Limit downstream flooding to eliminate flooding of homes and platted lots along the Lower El Mirage Wash
- Remove downstream obstruction to flow (existing fence) while providing security to downstream property owners.
- Minimize or eliminate overtopping of Cactus and El Mirage Roads (Note: City is currently working on roadway design improvements to both corridors). City plans to construct Cactus road improvements as soon as practical.
- Maximize use of existing Cactus Basin to minimize project excavation costs including City and City/private parcels.
- Mitigate ongoing erosion in existing channel and basin including areas upstream of Cactus Road.
- Provide for a multiuse recreational component to the corridor in accordance with City and Flood Control standards. Proposed recreational components include; a multiuse trail/bike path along the upper bank of the channel with future connection under Cactus Rd, two recreational/practice multiuse football/soccer fields in the West Cactus Basin (standard field size preferred), two Little League baseball fields (standard Little League size preferred), restoration of natural riparian/Sonoran desert landscape for passive areas to minimize maintenance and provide example of Sonoran desert habitat.
- Maintain development opportunities in developable areas including west and south of the existing basin.

Opportunities and Constraints:

Site specific considerations for this project were presented as follows:

Flooding Context

- The culvert under El Mirage Road will serve as the hydraulic control for the West Cactus Basin.
- West cactus basin shall provide storage to reduce the peak outflow below 270 cfs for the 100-yr storm.
- The culvert under Cactus Road should pass the anticipated 100-yr peak flow of 660 cfs.
- Multi-use fields are preferred dry, but can flood for any event if required for storage.
- The little league fields should only flood for events greater than a 25-yr storm, if possible.
- Parking lots should only flood for events greater than a 25-yr storm, if possible.

Landscape Context

- Meet minimum landscape buffer needs, as practicable, per District Aesthetic Treatment Policy.
- Landscape design theme compatible with Suburban Context.
- Design Landscape themes and Structural Methods that are compatible with the Suburban Context, as identified in the Project LIA.
- Design Basin depth and side slopes to be "human-scaled" and compatible with pedestrian access.
- Meander low flow, basin side slopes and overall configuration to create a more natural, aesthetic appearance for the basin. Use 6:1 or flatter for turf, and 4:1 or flatter for decomposed granite surface.
- Provide opportunities for varied landscape treatments, including natural areas as well as active and passive recreation areas.

Community Context

- Municipal Facility
- Pedestrian areas to north and south of site.
- Pedestrian access and circulation within proposed project area, especially between Little League field sites and multi-use field areas.
- Maintenance.
- Construction and life cycle costs.
- Parking concerns and space allocation.
- Maintain storm drains on western side of project boundary.
- Recreational field flooding: multi-use fields are preferred dry, but can flood more often; little league fields should only flood for larger storm events.

BREAK

Brainstorming Preliminary Concepts

The attendees broke into two groups. Each group was assigned the task of documenting three unique concepts that will accommodate as many of the flooding, landscape and community contexts as possible. Each concept should have a list of pros and cons. The preliminary concept sketches developed during the breakout session were scanned and are attached.

Evaluation and selection of Preliminary Concepts for further analysis

After the breakout session, both groups gathered together their three concepts. All six concepts were evaluated. Concept sketches with similar features were considered the same sketch. The group selected three concept sketches to carry forward.

ACTION ITEM: J2 to draw the three selected concepts and verify spatial dimensions (concept level effort).

ACTION ITEM: AZTEC to inspect layouts for volume functionality (concept level effort).

ACTION ITEM: Study Team to meet in two weeks to discuss further.



Meeting Subject: Kick Off and Alternatives Brainstorming Meeting

Date: January 5, 2011

Project Name: Lower El Mirage Wash DCR
 Phase 2 – Analysis and Recommendations

Project No: FCD 2008C014, WA #4
 AZTEC # AZE0913-04

Initial	Name	Agency	Phone	Email
	Dennis Holcomb	Flood Control District of Maricopa County	602-506-4074	dbh@ mail.maricopa.gov
DW	Doug Williams	Flood Control District of Maricopa County	602-506-8743	daw@ mail.maricopa.gov
	Greg Jones	Flood Control District of Maricopa County	602-506-5537	glj@ mail.maricopa.gov
GC	Harry Cooper	Flood Control District of Maricopa County	602-506-2956	HarryCooper@ mail.maricopa.gov
JP	Jennifer Pokorski	Flood Control District of Maricopa County	602-506-4695	jmp@ mail.maricopa.gov
JH	John Holmes	Flood Control District of Maricopa County	602-506-3320	jwh@ mail.maricopa.gov
MD	Michael Duncan	Flood Control District of Maricopa County	602-506-4732	mwd@ mail.maricopa.gov
VS	Valerie Swick	Flood Control District of Maricopa County	602-506-2929	vas@ mail.maricopa.gov
LC	Lance Calvert	City of El Mirage Public Works	623-876-2971	lcalvert@ cityofelmirage.org
DP	David Phelps	AZTEC Engineering	602-458-9284	dphelps@ aztec.us
TB	Tony Bokich	AZTEC Engineering	602-458-7487	tbokich@ aztec.us
AA	Aaron Allan	J2 Engineering and Environmental Design	602-438-2221	aallan@j2design.us
JE	Jeff Engelmann	J2 Engineering and Environmental Design	602-438-2221	jengelmann@j2design.us
TR	Ted Readyhough	J2 Engineering and Environmental Design	602-438-2221	treadyhough@j2design.us
PM	Pedro Mao-Rodriguez	FCD	602 506 0612	pedromelrodriguez@ na.l.maricopa.gov



Meeting Date:	January 20, 2011	Meeting Time:	3:00 – 4:00 PM
Location:	Flood Control District of Maricopa County (FCDMC)		
Subject:	FCD 2008C014, work assignment no. 4 Review of Brainstorming Concepts	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Harry Cooper (FCDMC) John Holmes (FCDMC) Michael Duncan (FCDMC) Lance Calvert (City of El Mirage)	Tony Bokich (AZTEC) David Phelps (AZTEC) Jeff Engelmann (J2 Engineering and Environmental Design) Aaron Allen (J2 Engineering and Environmental Design) Ted Readyhough (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	February 15, 2011

Purpose of Meeting:

- Review the concept drawings prepared during the kick-off and brainstorming meeting.
- Review preliminary layouts of brainstorming concepts.
- Evaluate the preliminary concept layouts and agree on what gets carried forward into concept development.

Desired Outcome:

- Three preliminary concept layouts for concept development

Discussion:

Copies of each concept were handed out (11x17).

Questions and discussion regarding commercial area requirements based on parcel ownership. Additional Community input is needed. List of questions:

- What is the required commercial area for the Bool property (based on acreage, assessed value, or something else)?
- What type of commercial development is anticipated for the Bool property?
- Can there be shared parking between the commercial and the park parking lot? What is the split?
- We are assuming the little League fields are elevated above the 25-yr flood event. Is this acceptable to the City?
- We are assuming the parking areas will be elevated above the 25-yr flood event. Is this acceptable to the City?
- Will the RCB under El Mirage Road be maintained by MCDOT or the City?

The concepts need slight revisions prior to seeking Community input from the City of El Mirage. The revised concepts are attached.

ACTION ITEM: J2 to revise the three selected concepts as indicated during the meeting (concept level effort).

ACTION ITEM: AZTEC to inspect revised layouts and determine commercial acreages (concept level effort).

ACTION ITEM: AZTEC to provide City with list of questions and revised concept layouts.



Flood Control District of Maricopa County

SIGN IN SHEET

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 www.tyrsa.es
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 Phoenix, AZ 85008-4505
 Phone: 602-454-0402
 Fax: 602-454-0403

Lower El Mirage Wash Design Concept Report Phase 2 – Analysis and Recommendations Meeting to Review Brainstorming Concepts

FCD2008C014, WA#4
 AZTEC #AZE0913-04

January 20, 2011

Initial	Name	Agency	Phone	Email
	Doug Williams	Flood Control District of Maricopa County	602-506-8743	daw@mail.maricopa.gov
	Greg Jones	Flood Control District of Maricopa County	602-506-5537	glj@mail.maricopa.gov
<i>HC</i>	Harry Cooper	Flood Control District of Maricopa County	602-506-2956	HarryCooper@mail.maricopa.gov
<i>JWH</i>	John Holmes	Flood Control District of Maricopa County	602-506-3320	jwh@mail.maricopa.gov
<i>MD</i>	Michael Duncan	Flood Control District of Maricopa County	602-506-4732	mwd@mail.maricopa.gov
<i>VAS</i>	Valerie Swick	Flood Control District of Maricopa County	602-506-2929	vas@mail.maricopa.gov
<i>LCL</i>	Lance Calvert	City of El Mirage Public Works	623-876-2971	lcalvert@cityofelmirage.org
<i>DTP</i>	David Phelps	AZTEC Engineering	602-458-9284	dphelps@aztec.us
<i>TB</i>	Tony Bokich	AZTEC Engineering	602-458-7487	tbokich@aztec.us
<i>A</i>	Aaron Allan	J2 Engineering and Environmental Design	602-438-2221	aallan@j2design.us
<i>JE</i>	Jeff Engelmann	J2 Engineering and Environmental Design	602-438-2221	jengelmann@j2design.us
<i>TR</i>	Ted Readyrough <i>T2</i>		<i>602 438 2221</i>	<i>tradyrough@j2design.us</i>



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Meeting Minutes

Lower El Mirage Wash DCR
 Phase 2 Page 1 of 2



Meeting Date:	February 15, 2011	Meeting Time:	1:00 – 2:00 PM
Location:	Flood Control District of Maricopa County (FCDMC)		
Subject:	FCD 2008C014, work assignment no. 4 Progress Meeting No. 1	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Greg Jones (FCDMC) John Holmes (FCDMC) Scott Vogel (FCDMC) Harry Cooper (FCDMC)	Lance Calvert (City of El Mirage) Tony Bokich (AZTEC) David Phelps (AZTEC) Aaron Allan (J2 Engineering and Environmental Design) Ted Readyhough (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	March 2, 2011

I. Introductions:

All were introduced.

II. Project Status:

- A. Concept Development:
 - Status: concept development is currently on hold, awaiting Community input.
 - Discussion regarding retrofitting existing El Mirage Road Reinforced Concrete Box Culvert: It was requested to develop a new concept of retrofitting the existing El Mirage Road box culvert as a cost savings measure. It was concluded that an entire new concept drawing is not necessary at this time. It was requested that AZTEC develop a component cost comparison for now. The cost comparison should be based on Concept 2. Existing Concept costs will be 2A and the retrofit costs will be 2B.
- B. Scott asked if the existing basin has sufficient volume to function as a detention basin for the proposed condition. Tony replied that it does. The existing side slopes are steeper than desirable and it is currently just a roughly graded pit.
- C. Feedback from El Mirage City Staff and Council:
 - Status: only verbal feedback at this point, but all feedback has been positive.
 - Our concepts will be presented by Lance to City Council on 3/10/2011, at 6:00 PM.
- D. Status of upcoming meeting with Bool parcel owners:
 - City manager is meeting with the Boos today.

III. Concept Development:

- A. H&H Modeling: Valerie directed AZTEC to progress with concept development using the current Concept Drawings. The project schedule does not provide enough time to allow us to wait on input from the City regarding the Bool parcel area split.
- B. Concept presentation: It was suggested that concept presentation (boards and costs) should illustrate construction phasing. Phase I would include FCDMC construction and costs (grading only). Phase I could include basic landscaping and irrigation improvements done by FCDMC if the City plans to turf the basin immediately following Phase I. Phase II would include City construction and costs (fine grading, landscaping, irrigation, park amenities etc). It was suggested that park features and amenities beyond Phase I be labeled as "Future Improvements" on the Public Meeting graphic displays.
- C. Cost estimating: Valerie and Scott asked if we could provide 'component costs' for some proposed improvements to allow for sub-alternative cost estimating. AZTEC agreed to do this.
- D. The City requested that the "Municipal Building" text on the Concept Drawings be revised to read "Municipal" at the next go around of revisions.

IV. Public Involvement:

- A. Public Meeting scheduled for March 2nd: this has been rescheduled to a tentative date of 3/16. As of 2/25/2010, the **tentative Public Meeting dates are 3/30 and 3/31**, pending booking the location. Once the date is set, a meeting notice will be sent.
- B. Graphics for Public Meeting – due to district February 23rd: this date needs to be **rescheduled**.
- C. Meeting mailer notices: FCDMC will coordinate with City. AZTEC is responsible for first draft of mailer notice. FCDMC is to provide sample notice to AZTEC.
- D. Tentative Meeting locations: El Mirage Elementary School or Dysart Community Center. FCDMC will contact and schedule.

V. Next Progress Meeting – scheduled for March 1st.

As of 2/25/2011, this meeting is in the process of being **rescheduled**. Once the date is set, a meeting notice will be sent out.

ACTION ITEM: AZTEC to begin concept development, including preliminary H&H modeling.

ACTION ITEM: AZTEC to document cost components for a new concept – Concept 2B.

ACTION ITEM: AZTEC to revise text on the Concept Drawings – change “Municipal Building” to “Municipal”.

ACTION ITEM: AZTEC – prepare draft public meeting mailer.

ACTION ITEM: FCDMC and City – determine the Public Meeting date, venue and schedule.

ACTION ITEM: FCDMC and City – coordinate Public Meeting mailer distribution.

ACTION ITEM: FCDMC to book the Public Meeting (place, date and time).

ACTION ITEM: City of El Mirage to supply AZTEC with improvement plans / expectations for El Mirage Road crossing of Lower El Mirage Wash.

ACTION ITEM: City of El Mirage to indicate timeline of basin turf planting. FCDMC may cost share basic irrigation and landscaping improvements as part of Phase I Construction.

ACTION ITEM: City of El Mirage to provide guidance regarding Bool property parcel split.



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Meeting Minutes

Lower El Mirage Wash DCR
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Meeting Date:	March 2, 2011	Meeting Time:	3:00 – 4:00 PM
Location:	Flood Control District of Maricopa County (FCDMC)		
Subject:	FCD 2008C014, work assignment no. 4 Progress Meeting No. 2	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Michael Duncan (FCDMC) Harry Cooper (FCDMC) Gant Wegner (FCDMC) Tony Bokich (AZTEC) David Phelps (AZTEC) Aaron Allan (J2 Engineering and Environmental Design)		
Prepared By:	David Phelps / Tony Bokich	Date Published:	April 8, 2011

I. Introductions:

All were introduced.

II. Project Status:

- A. Results of meeting with Bool parcel owners:
 Valerie reported on behalf of Lance, that the City did meet with the Bool's. The Bool's appear to be satisfied with the concept layouts (dated January 26, 2010). Regarding the subject of commercial area, the Bool's indicated that they would prefer to have as much area as possible. No specific acreage number was provided.
- B. Update from meetings with City Council, Mayor, City Manager, etc.:
 These meetings have not occurred yet. The HOA presidents meeting will be Monday the 14th at 5:30 PM.

III. Concept Development:

- A. H&H Modeling: There is plenty of storage volume. We need to keep an eye on the earthwork balance as we progress.

IV. Public Involvement:

- A. Critical Path Calendar – a revised calendar was provided and discussed.
- B. Community Meeting – Date has been booked for March 30th. Presenters to meet at 4:00 PM. Doors open at 5:30, presentation begins at 6:00. The advertised end time is 7:30 PM.
- C. Meeting Location – the location will be the cafeteria at El Mirage Elementary School, 13500 N El Mirage Road.
- D. Mailer Notices – Grant will provide the revisions to AZTEC. AZTEC will incorporate the FCDMC revisions and return. The District will handle the rest.
- E. Fact sheet preparation – this topic did not get discussed.
- F. Graphics for Community Meeting – this topic was discussed and took the majority of the meeting time. Many options and ideas were discussed. The consensus was to provide three boards. Each board would show two renderings of each Concept. One of the renderings would be the Phase 1 construction. The other rendering would be the Phase 2 rendering showing all of the recreational components. The idea is that even though we are showing two renderings per board, the Phase 1 rendering would be a repeat of the Phase 2 rendering with the recreational layers turned off. A fourth board showing cross sections would also be required. If a cross section for each Concept is added to boards 1, 2 and 3, then board number 4 could be eliminated.

Valerie will provide the team with an example format. A sample board for this project showing one Concept needs to be provided to the District no later than COB 3/11/2011. Final boards are due to FCD on a data CD by Noon of March 23rd.

- G. Power Point presentation for City Council Meeting (March 24th) – the District will do the power point and presentation.

V. Project Schedule

- A. Draft DCR due March 17th.

This agenda topic was not discussed. It does make sense that the date will slide because the Public Meeting date was pushed back about one month from the original scheduled date.

VI. Next Progress Meeting – scheduled for Tuesday April 5th, 1-2:00 PM at FCDMC.

ACTION ITEM: AZTEC to update the Community Meeting Flyer per FCDMC comments

ACTION ITEM: AZTEC / J2 to provide a sample Board showing one concept to FCDMC for review by COB 3/11

ACTION ITEM: AZTEC / J2 to provide Final Boards to FCDMC on CD by Noon 3/23

ACTION ITEM: FCDMC to provide comments to the Community Meeting Flyer

ACTION ITEM: FCDMC to publish and distribute the Flyer

ACTION ITEM: FCDMC to review and provide comments regarding the Sample Board



Flood Control District of Maricopa County

SIGN IN SHEET

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Lower El Mirage Wash Design Concept Report Phase 2 – Analysis and Recommendations Monthly Progress Meeting No. 2

FCD2008C014, WA#4
AZTEC #AZE0913-04

March 2, 2011

Initial	Name	Agency	Phone	Email
V/S	Valerie Swick	Flood Control District of Maricopa County	602-506-2929	vas@ mail.maricopa.gov
	Lance Calvert	City of El Mirage Public Works	623-876-2971	lcalvert@ cityofelmirage.org
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	Greg Jones	Flood Control District of Maricopa County	602-506-5537	glj@ mail.maricopa.gov
	Scott Vogel	Flood Control District of Maricopa County	602-506-4771	csv@ mail.maricopa.gov
M/D	Michael Duncan	Flood Control District of Maricopa County	602-506-4732	mwd@ mail.maricopa.gov
	Dennis Holcomb	Flood Control District of Maricopa County	602-506-110	dbh@ mail.maricopa.gov
H/C	Harry Cooper	Flood Control District of Maricopa County	602-506-2956	HarryCooper@ mail.maricopa.gov
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Meeting Minutes

Lower El Mirage Wash DCR
 Phase 2 Page 1 of 2



Meeting Date:	March 10, 2011	Meeting Time:	8:30 – 10:30 AM
Location:	AZTEC Engineering		
Subject:	FCD 2008C014, work assignment no. 4 Additional Meeting No. 2 Council Power Point submittal and Community Meeting submittal	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Harry Cooper (FCDMC)	Tony Bokich (AZTEC) David Phelps (AZTEC) Aaron Allan (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	May 6, 2011

Background:

This meeting was held at the request of FCDMC to coordinate two things. First, the team needs to provide graphics to Valerie for the Power Point presentation. We need to establish what she needs and when. Second, we need to show our progress regarding the Sample Board exhibit that will be due by COB tomorrow. This meeting was our second and last scoped additional meeting.

Discussion items were:

I. Requirements for the City of El Mirage Power Point:

- A. Estimated construction costs - only need to provide costs for the FCDMC construction items. No cost estimating of future construction will be presented to City Council. The cost detail should be itemized and totaled. The total number will be reported in the Power Point.
- B. Graphics – It was requested that JPEG raster images be provided. Two images for each concept. One showing Phase 1 work (FCDMC and City efforts) and one showing the Phase 2 future City facilities.
 - a. Concept 1 should be complete with meandering side slopes.
 - b. Concept 2 and 3 are desired to be complete with meandering side slopes. Due to the timeline, it may be acceptable to drop the engineered grading contour lines into each figure.
- C. The drop dead time for these items to be delivered to the FCDMC was set for Noon on 3/14/2011. It is noted that the presentation date to the City Council has not changed – it is still 3/24/2011. The City requested a copy of the Power Point by COB on 3/14.

II. Requirements for Community Meeting:

- A. Estimated construction costs – the total cost for the FCDMC construction items will be provided on each Board. No cost estimates for the future elements will be provided. A detailed line item breakdown is expected to support the total cost reported on the graphic.
- B. Graphics – no change to the agreements made during progress meeting No. 2 held 3/2/2011.
- C. Deadlines:
 - a. Provide a sample board with rendering for Concept 1 by COB Friday the 11th.
 - b. Other internal submittals per the Critical Path Calendar provided at Progress Meeting No 2.
 - c. Final Boards are due by COB 3/23/2011

III. Flood control features to include in the Phase I graphic and cost estimate:

- A. Multi Use Path.
- B. Sediment basin
- C. Natural area
- D. Configurations (landscaping annotation items)

IV. Unit Costs for Concepts

- A. Land costs – use these values for now, more specific costs will come from FCDMC
 - a. Storm Drain Easement = 40% value
 - b. Channel Easement = 100% value
- B. Grass turf, including irrigation = \$1.25 / square foot
- C. Gravel Mulch = \$0.45 / square foot
- D. Hydro seed = \$4500 / acre

ACTION ITEM: AZTEC to provide the in progress cost estimates for City Council Power Point to Valerie by Noon on 3/14

ACTION ITEM: AZTEC / J2 to provide the Power Point Graphics for City Council Power Point to Valerie by Noon on 3/14

ACTION ITEM: AZTEC / J2 to provide Final Boards to FCD on CD by Noon 3/23

ACTION ITEM: FCDMC to provide a land acquisition cost for this project

ACTION ITEM: FCDMC to provide more specific Storm Drain easement and Channel Easement costs for this project, if different than stated above.



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Meeting Minutes

Lower El Mirage Wash DCR
 Phase 2 Page 1 of 1



Meeting Date:	March 21, 2011	Meeting Time:	10:30 – 11:30 AM
Location:	AZTEC Engineering		
Subject:	FCD 2008C014, work assignment no. 4 Additional Meeting No. 3 Concept Board Revisions	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Harry Cooper (FCDMC)	Tony Bokich (AZTEC) David Phelps (AZTEC) Aaron Allan (J2 Engineering and Environmental Design) Ted Readyhough (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	May 6, 2011

Background:

This meeting was held at the request of FCDMC to coordinate revisions to the Concept Boards for the Community Meeting.

Discussion items were:

I. New direction

- A. Remove all references and line work showing future recreational items. This is new direction from City Council.
- B. Time for this new direction can be billed to the second additional public meeting within the current contract.
- C. It is likely that a time extension will be granted. This will be discussed at a later date.

II. Requirements for Boards / What do we show:

- A. Landscaping themes.
 - a. Eliminate future recreational renderings
 - b. Change the photos and add some new ones.
- B. Photos to use:
 - a. For Theme "A", use the photos currently shown for Theme "D"
 - b. For Theme "B", FCDMC will provide the photo
 - c. For Theme "C", FCDMC will provide the photo
- C. Path needs to connect to future recreational and parking areas. It is recognized that the graphic cannot identify these areas as such. Just add the path connections.
- D. Picture Theme Names (use the following):
 - a. For Theme "A", use Desert Park Theme
 - b. For Theme "B", use Natural Lower Sonoran Desert Theme
 - c. For Theme "C", use Semi-Natural Sonoran Desert Riparian Theme
- E. Move the cross section to be below the plan view
- F. Remember that this is a Flood Control Project. Move the Flooding Context bullets to the top right.

III. Timeline

- A. Revised draft boards due ASAP.
- B. Provide each draft concept board to FCDMC as it is finished.
- C. Final revisions are due to FCDMC no later than Friday (3/25)

IV. Example redlines

- A. Harry provided example redlines. AZTEC scanned them and will email. The example redline scans are not the direction for revisions, they are to be used as examples. Direction for the draft board was provided at the meeting and documented above.

ACTION ITEM: AZTEC to email copies of the example redlines.

ACTION ITEM: AZTEC / J2 to provide revised concept boards per the above timeline

ACTION ITEM: FCDMC to provide pictures



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Meeting Minutes

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Meeting Date:	March 24, 2011	Meeting Time:	3:00 – 4:00 PM
Location:	J2 Engineering and Environmental Design		
Subject:	FCD 2008C014, work assignment no. 4	Project:	Lower El Mirage Wash DCR
	Additional Meeting No. 4 Direction for Concept Boards	Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Dennis Holcomb (FCDMC)	David Phelps (AZTEC) Jeff Engelmann (J2 Engineering and Environmental Design) Ted Readyhough (J2 Engineering and Environmental Design) Taylor Hawkins (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	DRAFT on April 26, 2011

Background:

This meeting was held at the request of FCDMC to finalize the Concept Boards for the Community Meeting.

Discussion items were:

I. Direction

- A. Move the Flood Control Features to the upper right. This should be given the most space. This is the first bullet list and the heading shall read "FLOOD CONTROL FEATURES"
 - a. Insert the Flood Control Bullets per Valerie's handout.
- B. Second bullet list heading shall read "CONCEPT 1 DISTINGUISHING FEATURES"
 - a. Insert the bullets provided per handout from Dennis.
- C. Third bullet list heading shall read "LANDSCAPE AESTHETICS & MULTI-USE FEATURES"
 - a. Insert the bullets provided per handout from Dennis.
 - b. Insert the miniature icons (pictures) after the first bullet, but before the second bullet.

II. Redlines:

- A. A full size color copy of each Concept was redlined by Dennis and Valerie with the above information. Additional redlines were provided regarding annotations to the plan view graphic.
- B. It was indicated that the color and layout look great.
- C. The culverts were redlined to show as symbols, not actual sizes.
- D. Add the text "Preliminary Construction Cost" and the total estimated cost figure for each concept. Total cost will be supplied by AZTEC.

III. Timeline

- A. Revised draft boards due ASAP. The FCDMC still has to mount them prior to the Community Meeting.

IV. Unit Costs

- A. Tall pot trees: Density and cost were discussed. Consensus was to use \$5,000 per acre.

ACTION ITEM: AZTEC to provide updated cost estimates

ACTION ITEM: J2 to provide revised concept boards per the above timeline

ACTION ITEM: FCDMC to mount boards prior to Community Meeting



Meeting Date:	April 25, 2011	Meeting Time:	2:00 – 3:30 PM
Location:	Flood Control District of Maricopa County (FCDMC)		
Subject:	FCD 2008C014, work assignment no. 4 Alternative Selection Meeting	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Greg Jones (FCDMC meeting moderator) Doug Williams (FCDMC) John Holmes (FCDMC) Michael Duncan (FCDMC) Dennis Holcomb (FCDMC)	Harry Cooper (FCDMC) Tony Bokich (AZTEC) David Phelps (AZTEC) Jeff Engelmann (J2 Engineering and Environmental Design) Ted Readyhough (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps	Date Published:	May 12, 2011

I. Introductions:

All were introduced.

II. History:

This area has been studied multiple times:

- White Tanks ADMP 1st identified it as a flooding problem area
- White Tanks ADMPU confirmed the flooding problem area
- Two previous DCR documents attempted to provide a concept solution

III. Alternative Selection – Goals

Goals

- Complete the process and document the discussion and the selection process.
- Select the optimal concept to carry forward to preliminary design.

IV. Alternative Descriptions

An overview of each alternative was provided.

IV. Alternative Selection - Criteria:

The following criteria were discussed:

- A. Flood Control Function
- B. Cost
- C. Multi-use and aesthetics
- D. Public acceptance
- E. Stakeholder acceptance
- F. Funding sources

V. Concept Ranking Discussion:

Concept 1:

Advantages:

- + Balanced Earthwork
- + Better arrangement of open space
- + Provides about 20% more turf area
- + Provides buffer between private & municipal space
- + Panhandle (rectangular area south of Cactus Road) allows for multi use
- + Allows commercial space to increase without reducing multi use features

Disadvantages:

- Not the least cost
- Higher earthwork cost than Concept 2

Concept 2:

Advantages:

- + Balanced Earthwork

Disadvantages:

- Longer outlet pipe increases capital cost

- + Panhandle allows for multi use
- + Lowest cost
- + Provides largest remainder Bool parcel
- Longer outlet increases maintenance
- No buffer between private & municipal space
- Multi-use area is closer to residences

Concept 3:

Advantages:

- + Bools do not need to import material
- + Commercial area connectivity
- + Provides most space for multi use
- + Buffer between private & municipal space

Disadvantages:

- Requires an import of earthwork for Phase I construction
- Highest earthwork cost
- Panhandle does not allow for multi-use
- Least commercial space
- Highest cost

At the end of the Concept Ranking, the group voted and selected Concept 1 as the preferred concept.

VI. Results of Concept Ranking

Lower El Mirage Wash Concept Ranking

Criteria	Concept 1	Concept 2	Concept 3
Flood Control Function	equal	equal	equal
Capital Cost (including right-of-way acquisition)	middle cost	least cost	most cost
Operations and Maintenance Cost	equal	equal	equal
Multi-Use/Aesthetics: <i>amount of open space</i>	equal	equal	most
Multi-Use/Aesthetics: <i>configuration of open space</i>	best	equal	equal
Multi-Use/Aesthetics: <i>amount of neighborhood buffer</i>	best	least	average
Multi-Use/Aesthetics: <i>connectivity with adjacent multi-use</i>	equal	equal	equal
Multi-Use/Aesthetics: <i>future multi-use opportunities</i>	equal	equal	equal
Public Acceptance	equal	equal	equal
Stakeholder Acceptance: <i>Flood Control District of Maricopa County</i>	preferred	equal	equal
Stakeholder Acceptance: <i>City of El Mirage</i>	equal	equal	least
Stakeholder Acceptance: <i>Pueblo El Mirage</i>	equal	equal	equal
Stakeholder Acceptance: <i>Bools</i>	equal	* preferred	equal
Funding Sources	equal	equal	equal
Ranking Totals:	+3 -0 = +3	+2 -1 = +1	+1 -2 = -1

The ranking totals shown above are arrived at by assigning a positive point (+1) for better, best preferred, etc. No points are assigned for same or average. A negative point (-1) is assigned for each worst, least or unfavorable ranking.

*Bools preferred Concept 2 because it provides maximum acreage for commercial parcel, however Concept 1 can be modified to provide equal or more commercial acreage without sacrificing flood control function.

Lower El Mirage Wash Alternative Selection

Ranking item	Concept 1	Concept 2	Concept 3
Ranking criteria total points	+3	+1	-1

The above criteria and scoring support the selection of Concept 1.

VII. Project Schedule and Draft DCR

A. Draft DCR is now due on May 17, 2011.

Public Meeting date was pushed back about one month. AZTEC is to submit a request for a time extension. In addition, AZTEC was asked to estimate FCDMC budget funds that will be pushed into the next fiscal year as a result of the time extension.

- B. Direction for the Draft DCR content was to submit a pdf copy only (no hard copy required). DCR to include; reference and brief documentation of the three concepts, documentation of the selection process from today's meeting, and additional information about the preferred concept.
- C. Alternative 2B (retrofit the existing 2-10' wide x 3' tall reinforced box culvert) – discussion indicated that the retrofit would likely cost more than the 60-inch pipe shown for Concept 2. The retrofit alternative requires 225 LF of new 24" pipe in addition to plugging and filling one barrel of the 2-10'x3' box and extending both ends of the other barrel with a reduced barrel size to meter down the rate of flow. Additional right-of-way (drainage easement) is also required. This additional easement cost is not required by Concept 2. For these reasons, documentation of Alternative 2B will not be pursued any further or included in the Draft DCR.
- D. The City indicated the total Bool parcel area used in the DCR should reflect 13.5 acres. The acreages shown on the Concept drawings reflect 13.4 acres. All DCR concept cost estimates will increase by 0.1 acre.

VIII. Next Progress Meeting – skip the next progress meeting and schedule for first week of June.

ACTION ITEM: AZTEC to set up a meeting with Lance Calvert (City of El Mirage)

ACTION ITEM: AZTEC to revise schedule

ACTION ITEM: AZTEC to request time and budget extension

ACTION ITEM: AZTEC to provide the DRAFT DCR (pdf copy only) on May 17, 2011

ACTION ITEM: AZTEC to schedule next progress meeting, first week of June

ACTION ITEM: FCDMC to provide land values for this project



Meeting Date:	June 14, 2011	Meeting Time:	9:00 – 10:30 AM
Location:	Flood Control District of Maricopa County (FCDMC)		
Subject:	FCD 2008C014, work assignment no. 4 Monthly Progress Meeting No. 4	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Valerie Swick (FCDMC meeting organizer) Michael Duncan (FCDMC) John Holmes (FCDMC) Harry Cooper (FCDMC)	Lance Calvert (City of El Mirage) Tony Bokich (AZTEC) David Phelps (AZTEC) Ted Readyhough (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	July 12, 2011

I. Introductions:

All were introduced.

II. Preferred Concept Development:

Preliminary Design Criteria:

- A. Flood Control
 - Detain the 100-yr flood
 - The minimum freeboard around the entire basin will be 1-foot
- B. Commercial Area
 - The 50/50 split between the Bools and the City provides a remainder parcel for the Bool's of 13.5 acres
 - Concept 1 provided originally 9.8 acres of commercial area, which is 3.7 acres less than the 50/50 split
 - Purchasing land or reaching an agreement for land acquisition from the Bools is an option
 - The value of the land is required to evaluate cost benefits of hard structural elements
 - What is the minimum commercial area? It was discussed and suggested that a minimum of 11.5 acres should be provided for the future Commercial area. This minimizes the potential land purchase from the Bools to less than 2 acres
- C. Shared Parking
 - Shared parking is to be considered
 - The shared parking on the commercial property must be elevated above the 100-yr flood
- D. Multi-use features
 - Consensus was to maintain the same multi-use features shown/provided for Concept 1
 - Parking on City property can be flooded up to 1-ft of inundation for the 100-yr
 - The future Little League fields can be flooded up to 1.5-ft of inundation for the 100-yr
 - The future playground can be flooded up to 1.5-ft of inundation for the 100-yr
 - A pad for future restrooms, concession and other buildings will be provided at an elevation above the 100-yr
- E. Basin side slopes – to meet the flood control function, maintain the Concept 1 multi-use features and increase the commercial area to at least 11.5 acres, the basin's average side slopes must be steepened up.
 - Consensus to provide areas of 4:1 (horz:vert) average slopes.
 - It is preferred that all side slopes meander, but it is allowable to provide constant side slopes. In certain designated areas 3:1 slopes are permissible
 - Vertical components may be considered, if necessary, after maximizing volume with steeper side slopes
 - Acceptable areas for steeper side slopes were identified and will be documented in the DCR
- F. Earthwork:
 - Goal is to balance earthwork, but it may not be achievable
 - Need to break out a separate volume required to fill the remaining depression in the Bool remainder parcel.

III. Project Schedule:

- A. The project schedule has been extended into the next fiscal year
- B. An updated project schedule was distributed

IV. **Next Progress Meeting** – scheduled for Tuesday, July 12th from 1:00 - 2:00 PM at the District.

ACTION ITEM: AZTEC to develop the preferred alternative using the above constraints. The goal is to maximize the commercial area while still meeting the flood control requirements and provide the same multi-use features.

ACTION ITEM: J2 – provide minimum pad area for ball field buildings to AZTEC

ACTION ITEM: FCDMC to provide land acquisition costs



Flood Control District of Maricopa County

SIGN IN SHEET



4561 East McDowell Road
Phoenix, AZ 85008-4505
Phone: 602-454-0402
Fax: 602-454-0403

Lower El Mirage Wash Design Concept Report Phase 2 – Analysis and Recommendations Monthly Progress Meeting No. ~~84~~

FCD2008C014, WA#4
AZTEC #AZE0913-04

June 14, 2011

Initial	Name	Agency	Phone	Email
VS	Valerie Swick	Flood Control District of Maricopa County	602-506-2929	vas@ mail.maricopa.gov
LC	Lance Calvert	City of El Mirage Public Works	623-876-2971	lcalvert@ cityofelmirage.org
	Doug Williams	Flood Control District of Maricopa County	602-506-8743	daw@ mail.maricopa.gov
	Greg Jones	Flood Control District of Maricopa County	602-506-5537	glj@ mail.maricopa.gov
	Scott Vogel	Flood Control District of Maricopa County	602-506-4771	csv@ mail.maricopa.gov
MD	Michael Duncan	Flood Control District of Maricopa County	602-506-4732	mwd@ mail.maricopa.gov
	Dennis Holcomb	Flood Control District of Maricopa County	602-506-110	dbh@ mail.maricopa.gov
HC	Harry Cooper	Flood Control District of Maricopa County	602-506-2956	HarryCooper@ mail.maricopa.gov
JH	John Holmes	Flood Control District of Maricopa County	602-506-3320	jwh@ mail.maricopa.gov
TAB	Tony Bokich	AZTEC Engineering	602-458-7487	tbokich@ aztec.us
DP	David Phelps	AZTEC Engineering	602-458-9284	dphelps@ aztec.us
	Jeff Engelmann	J2 Engineering and Environmental Design	602-438-2221	jengelmann@j2design.us
	Aaron Allan	J2 Engineering and Environmental Design	602-438-2221	aallan@j2design.us
TR	Ted Readyhough	J2 Engineering and Environmental Design	602-438-2221	TReadyhough@j2design.us



Meeting Date:	July 12, 2011	Meeting Time:	1:00 – 2:30 PM
Location:	Flood Control District of Maricopa County (FCDMC)		
Subject:	FCD 2008C014, work assignment no. 4 Monthly Progress Meeting No. 5	Project:	Lower El Mirage Wash DCR Phase 2– Analysis and recommendations
		Project No:	AZTEC No. AZE0913-04
Attendees:	Greg Jones (FCDMC meeting organizer) Michael Duncan (FCDMC) Harry Cooper (FCDMC) Gant Wegner (FCDMC)	Lance Calvert (City of El Mirage) Tony Bokich (AZTEC) David Phelps (AZTEC) Jeff Engelmann (J2 Engineering and Environmental Design)	
Prepared By:	David Phelps / Tony Bokich	Date Published:	DRAFT July 27, 2011

I. Introductions:

All were introduced.

II. Development of Concept Plans:

- A. Sheets have been cut – production work still needs to be done
- B. Basin layout has been revised based on the design criteria and basin constraints discussed last month
- C. Basin side slopes need to be softened and shown on the DCR rendering graphic.
- D. Utility base file has been completed (concept horizontal locations only)
- E. Earthwork:
 - Earthwork needs to be revised to account for the fill that was placed after the project mapping. Consensus is to use 2010 aerial photography.
- F. Landscape Architecture:
 - Trees planted adjacent to paths shall be selected based on high canopy (elevated 10-ft above ground) and set back at least 2-ft from the path
 - Multi-use trails to provide a 2-ft setback from vertical features
 - The Consultant LA will manipulate the channel/basin side slopes and low flow to produce a more naturalistic and aesthetically-pleasing flood control project. The Consultant Engineer and Landscape Architect will coordinate design constraints/limitations (basin volume, invert elevations, additional restrictions) during the development/integration of the modified grading concept in order to ensure that the hydraulic function is maintained. Include a mention of the two restrictive grading areas identified in the meeting; 1) slope directly adjacent to southwest corner of municipal space near El Mirage Road, and 2) area adjacent to north side of existing water campus.
 - AASHTO guidelines for multiple use pathways require a 2' minimum offset from the edge of path for vertical structures (lights, benches, trash cans, vegetation, etc). However, they recommend a 3' minimum when feasible. Additional dimensions of note are: 12' wide path for multi-use and a 8' min. vertical clearance (10' min. for underpasses). Furthermore, AASHTO requires additional pathway widths along curves that have less than a 100' radius.
 - Include language regarding design elements such as gabions, retaining walls and other vertical structures as options to assist in slope/grading and maximizing the useable channel/basin bottom space as a future design consideration.
 - The Consultant Team will provide in-progress work products to the District for review prior to the draft document being produced. This includes the grading concept and proposed materials and planting palette exhibits.

III. Deliverables for Recommended Design Concept:

- A. Concept plans will consist of four sheets:
 - Cover Sheet
 - Basin Grading Sheet (100 scale)
 - Plan Profile Sheet for channel grading east of El Mirage Road (50 scale)

- Profile Sheet showing low flow profile through the basin from culvert to culvert
- B. Cost estimate
- C. Draft DCR updated and revised for Recommended Design Concept
 - Add a design recommendations section and include a statement for the final design to consider allowing mass grading by GPS control. This could save time and construction costs when compared to the conventional survey slope staking and grading methods.

IV. Project Schedule

- A. Submit DRAFT Final DCR on July 27th
- B. Final Comments Due to AZTEC no later than COB August 17th
- C. Comment Resolution meeting August 18th
- D. Submit Final DCR on August 25th
- E. Contract end date is August 25th

V. Next Progress Meeting – Comment Resolution Meeting, August 18th, time TBD

ACTION ITEM: AZTEC to send Mike Duncan a copy of the concept plans to verify scale, format and intent

ACTION ITEM: AZTEC to obtain the Cactus Road Plans from Entellus (Keith Nath)

ACTION ITEM: AZTEC to schedule comment resolution meeting for August 18th

ACTION ITEM: AZTEC to investigate the survey/design requirements for performing mass grading by GPS control.

ACTION ITEM: AZTEC to make a recommendation for final design based on the investigation of mass grading by GPS control.

ACTION ITEM: J2 to verify ball field size accommodates bleacher separation between the two fields

ACTION ITEM: J2 to soften basin side slopes for the Concept Plan

ACTION ITEM: J2 to provide path alignments to AZTEC for the Concept Plan

ACTION ITEM: FCDMC to provide land acquisition costs

Appendix A3

Record of Written Comments



Flood Control District of Maricopa County

Board of Directors

Fulton Brock, District 1
Don Stapley, District 2
Andrew Kunasek, District 3
Max Wilson, District 4
Mary Rose Wilcox, District 5

www.fcd.maricopa.gov

801 West Durango Street
Phoenix, Arizona 85009
Phone: 602-506-1501
Fax: 602-506-4601
T: 602-505-5897

August 15, 2011

Tony Bokich, P.E.
AZTEC Engineering
4561 East McDowell Road
Phoenix, Arizona 85008

RE: Lower El Mirage Wash Design Concept Report Phase 2 – Analysis and Recommendations
DRAFT – Final Design Concept Report, July 27, 2011

Dear Tony,

The following are our comments for the subject report.

General Comments:

1. There should be an Executive Summary that includes a brief summary of the selected alternative and a graphic that shows the costs. This Executive Summary should be no more than 2 pages.
2. Tab the appendices. Somehow create some kind of a differentiation between each appendix. Currently it is too difficult to find information in the Appendices.
3. There needs to be more details of the project within the report. What is the size of the inlet pipe under Cactus Road? What's the volume of the basin? What was used to size the pipes? What is the size of outlet pipe? How far do we have to chase grade into Pueblo El Mirage? The report needs some tables or something identifying some of these details and then referencing back to which Appendix.
4. Description of turn area should be discussed in terms of passive or open space recreation opportunities and NOT active/organized recreation.
5. While recognizing that the grading revisions from the Consultant LA were not incorporated into the line work completed by AZTEC for this submittal, I think that we should combine Appendices D and E into one. Place each concept in a paired format. The grading linework, followed by the rendered conceptual plan.
6. Add Gabions to the Materials Exhibit.

1.0 INTRODUCTION

Second line – change to word vicinity to ‘general location’

1.1 Project Area and Phasing

Second paragraph, first line – Include the specific reference for the report for Phase 1 including date.

1.2 Background

Line 4 – the term “is reported” to be significantly less is too vague, be specific in the numbers and where they came from.

1.3 Purpose and Need

Have the general purpose including adding some language that identifies additional goals/objectives for the project that consider producing a final project outcome that is acceptable to the community, compatible with the adjacent land and resources and provides opportunities for future multi-use functions and landscape aesthetics.

Create bullets points that specify the specific ‘needs’ of the various stakeholders. Use another word for ‘needs’ for example for the City’s needs – use “The City desires to include...

3rd paragraph – change ‘The Pueblo El Mirage need’ to ‘The Pueblo El Mirage interest’. Create a new bullet point for the Bool’s and change ‘need’ to ‘would like’.

1.4 Overview

Paragraph 1, last line – delete the last part of the sentence starting from ‘in themselves...’. Have the sentence stop with ‘not sufficient’.

Paragraph 3 – 2nd sentence – change the end of the sentence to say – 350 cfs if the dead storage within the basin is removed.

Paragraph 3 – last sentence – Not quite sure what the intent of this sentence is. Are you talking about filling in all the area, including the part owned by the city or just the Bool’s half?

Figure 1 – Site Map

Add something to clearly show the area. It is not real clear on the map.

Add a date to the figure.

Figure 2 – Vicinity Map

Add a date to the figure.

2.0 STAKEHOLDERS AND CONTACT INFORMATION

- Delete the words ‘and contact information’ from the title.
- Delete the addresses and phone numbers from the list.
- Have a list of the stakeholders and their interest rather than their personal information.
- Lance’s title should read City Engineer, not the Public Works Director.

3.0 DATA COLLECTION

3.1 Previous Studies

List all the previous studies and their flow rates. This can be done in a table format.

6.0 OPPORTUNITIES AND CONSTRAINTS

Change paragraph to read:

A modified version of the District's Context Sensitive Flood Hazard Mitigation (CSFHM) Planning and Design Approach was used to establish preliminary concept alternatives. The Kickoff and Brainstorming meeting held on January 5, 2011 identified the context sensitive opportunities and constraints. Prior to the Community meeting, the City of El Mirage indicated that recreational fields should be planned for as future possibilities but not identified as part of the community presentation. The Context Sensitive bullets below reflect the Community input.

6.1 Flooding Context

4th Bullet – revise to read “Terracing within the basin site for varying levels of inundation during varying flood levels.”

6.2 Landscape Context

Revise this title to read “**Land and Resources Context**”

Make sure all bullets start with an action verb for consistence.

5th Bullet – on the slope portion include ‘3:1 slopes for decomposed granite surface may be used in limited form as dictated by existing topography and where appropriate.’

6th Bullet – add future in front of ‘active and passive recreation areas’.

6.3 Community Context

4th Bullet – revise sentence to read “Provide a project conceptual design that meets the City of El Mirage maintenance needs.”

Add another bullet that reads “Future multi-use fields are preferred to stay dry as long a possible being the last area to be inundated.

7.0 PRELIMINARY CONCEPTS

2nd paragraph – Remove references to City asking for recreational components to be removed. Replace or reword to suggest that a ‘design was developed with meandering side slopes and a terraced grading concept to provide opportunities for future recreation needs should funding become available.’ or something similar.

8.0 CONCEPT ANALYSIS

Revise bullets to read:

- Effectiveness in Reducing Flooding
- Community Acceptance
- Multi-use Opportunities and Landscape Aesthetics
- Cost
- Stakeholder Acceptance
- Funding Opportunities

8.1, 8.2, and 8.3

Add the estimated cost to each line where cost is mentioned.

9.0 RECOMMENDED DESIGN CONCEPTS

2nd paragraph – Expand on ownership of the Bool property and how you arrived at the compensation for 1.3 acres.

9.2 Landscape Context - should read 'Land and Resources Context'
3rd line – replace the word 'playground' with 'future recreational'

9.3 Community Context
1st bullet – activations should read 'activities'

10.2 Drainage Design Criteria

Add a bullet that includes the required volume needed in the basin.

7th Bullet – replace 'Future little league terrace area' with 'Future active recreation area'

8th Bullet – change sentence to read 'Pad for future restrooms and/or public buildings will need to be elevated above the 100-yr WSEL.'

Figure 3:

Rename this figure to be Flood Control Improvements – Design Concepts. Remove the implication that it is just for landscape.

A general 3:1 slope is preferred along the north side of the water tank.

Indicate downstream fence removal/modification at Tract N/Pueblo property

11.0 FINAL DESIGN RECOMMENDATIONS

11.1 IGAs and Permits

The IGA is not really something needed for Design Recommendations.

1st paragraph, last sentence. This sentence is out of place, it could be in its own paragraph expanding on the temporary easement.

Don't know if we need to dictate that a 404 is necessary at this stage, rather that it should be investigated to determine if one is needed. We don't want to trap ourselves into a corner when we haven't completed that determination yet.

11.2 Next Steps

Survey and Mapping – last sentence. 'generated to a level acceptable for final design' is too general.

Utilities -- specify pot holing. Can you give any specific on where pot holing may be needed?

Drainage and Basin Design

There needs to be some specifics, somewhere in the document. What is the volume needed for the basin?

2nd paragraph, 1st line – change the word ‘can’ to must.

2nd paragraph, last sentence – This sentence talks about design criteria provided about, but no specifics were given.

4th paragraph – The statement says “A geotechnical investigation will be required”, but no reason is given.

Appendix A1 – Project Contacts

Greg questions having contacts in the document. He wants his name and phone number not listed.

Appendix C, 15% plans – Proposed Contours used for Stage-Storage Rating Curve

At the top of the page in the Hydraulic Function for Concept Design box, the 100-yr Outflow says 185 cfs, everywhere else it says 230 cfs.

Please let me know if you have any questions on our comments.

Sincerely,



Valerie A. Swick, E.I.T., CFM, PH
Project Manager

David T. Phelps

From: Valerie Swick - FCDX [vas@mail.maricopa.gov]
Sent: Wednesday, June 15, 2011 9:25 AM
To: Tony Bokich; David T. Phelps
Cc: Michael Duncan - FCDX; John Holmes - FCDX
Subject: Lower El Mirage Wash DCR - Phase 2 draft report comments

We have reviewed the draft report and have the following comments:

1. **Report /Appendices:** Label the area and contour map exhibits.
2. **Report /Appendices:** Include a HEC-1 schematic map in the report.
3. **Report /Appendices:** Table 8.1, pg. 11, "Operations and Maintenance Cost" reads "equal" for each concept. However, on pg. 2, a "disadvantage" of Concept 2 is increased maintenance. Do we want to add that to the results in Table 8.1?
4. **Report /Appendices:** On the spreadsheet entitled "Stage - Discharge Data for West Cactus Basin" for Concept No.1, indicate the source of the rating table data, reference to Phase 1 report or include the output data sheets from the analysis.
5. The previous project cost estimates assumed using half of the jointly owned parcel as baseline. For the (at least) selected alternative we would have a true-zero baseline for the estimate. If this is not in the report, it should be added. This will facilitate the development of the related IGA, where all contributions by the city are important.

Please let me know if you have any questions.

Valerie A Swick
Project Manager
Flood Control District of Maricopa County
2801 W. Durango St.
Phoenix, AZ 85009
vas@mail.maricopa.gov
Direct: (602) 506-2929
Fax: (602) 506-8561

Appendix A4

Record of Comment Resolution

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011 Date Returned: August 25th, 2011		

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
1	Flood Control District of Maricopa	VAS	General	There should be an Executive Summary that includes a brief summary of the selected alternative and a graphic that shows the costs. This Executive Summary should be no more than 2 pages.	TAB	A	Will add Executive Summary	A	TAB
2	Flood Control District of Maricopa	VAS	General	Tab the appendices. Somehow create some kind of a differentiation between each appendix. Currently it is too difficult to find information in the Appendices.	DTP	A	Separation between the appendices will be provided by using colored paper dividers.	A	DTP
3	Flood Control District of Maricopa	VAS	General	There needs to be more details of the project within the report. What is the size of the inlet pipe under Cactus Road? What's the volume of the basin? What was used to size the pipes? What is the size of outlet pipe? How far do we have to chase grade into Pueblo El Mirage? The report needs some tables or something identifying some of these details and then referencing back to which Appendix.	TAB	A	Section 9.1 already has much of this detail, but will expand the text to clarify and emphasize. The Executive Summary also contains new information in this regard.	A	TAB
4	Flood Control District of Maricopa	VAS	General	Description of turf area should be discussed in terms of passive or open space recreation opportunities and NOT active/organized recreation.	J2	A	Will revise text	A	TAB
5	Flood Control District of Maricopa	VAS	General	While recognizing that the grading revisions from the Consultant LA were not incorporated into the line work completed by AZTEC for this submittal, I think that we should combine Appendices D and E into one. Place each concept in a paired format. The grading linework, followed by the rendered conceptual plan.	DTP	A	We combined D and E as suggested. Note that we created a new Figure 3 named "Design Concept Schematic" that shows the Consultant LA contouring on a dimensioned schematic. In addition, it shows the new location of the future active recreation areas. See comments 39 & 41.	A	TAB
6	Flood Control District of Maricopa	VAS	General	Add Gabions to the Materials Exhibit.	J2	A	Will do.	A	TR
7	Flood Control District of Maricopa	VAS	1.0	INTRODUCTION Second line - change to word vicinity to 'general location'	TAB	A	Will do.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011 Date Returned: August 25th, 2011		

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
8	Flood Control District of Maricopa	VAS	1.1	Project Area and Phasing Second paragraph, first line - Include the specific reference for the report for Phase 1 including date.	TAB	A	Will do.	A	TAB
9	Flood Control District of Maricopa	VAS	1.2	Background Line 4 - the term "is reported" to be significantly less is too vague, be specific in the numbers and where they came from.	TAB	A	Will do.	A	TAB
10	Flood Control District of Maricopa	VAS	1.3	Purpose and Need Have the general purpose including adding some language that identifies additional goals objectives for the project that consider producing a final project outcome that is acceptable to the community, compatible with the adjacent land and resources and provides opportunities for future multi-use functions and landscape aesthetics.	TAB	A	Will do.	A	TAB
11	Flood Control District of Maricopa	VAS	1.3	Create bullets points that specify the specific 'needs' of the various stakeholders. Use another word for 'needs' for example for the City's needs - use "The City desires to include ...	TAB	A	Will do.	A	TAB
12	Flood Control District of Maricopa	VAS	1.3	3rd paragraph - change 'The Pueblo El Mirage need' to 'The Pueblo El Mirage interest'. Create a new bullet point for the Bool's and change 'need' to 'would like'.	TAB	A	Will do.	A	TAB
13	Flood Control District of Maricopa	VAS	1.4	Overview Paragraph 1, last line - delete the last part of the sentence starting from 'in themselves ... '. Have the sentence stop with 'not sufficient'.	TAB	A	Will do.	A	TAB
14	Flood Control District of Maricopa	VAS	1.4	Paragraph 3 - 2rd sentence - change the end of the sentence to say - 350 cfs if the dead storage <u>within the basin</u> is removed.	TAB	A	Will do.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011 Date Returned: August 25th, 2011		

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
15	Flood Control District of Maricopa	VAS	1.4	Paragraph 3 -last sentence - Not quite sure what the intent of this sentence is. Are you talking about filling in all the area, including the part owned by the city or just the Bool's half?	TAB	A	The sentence has been modified to be clearer.	A	TAB
16	Flood Control District of Maricopa	VAS	Figure 1	Site Map Add something to clearly show the area. It is not real clear on the map. Add a date to the figure.	TAB	A	Will do.	A	TAB
17	Flood Control District of Maricopa	VAS	Figure 2	Vicinity Map Add a date to the figure.	TAB	A	Will do.	A	TAB
18	Flood Control District of Maricopa	VAS	2.0	STAKEHOLDERS AND CONTACT INFORMATION Delete the words 'and contact information' from the title.	TAB	A	Will do.	A	TAB
19	Flood Control District of Maricopa	VAS	2.0	Delete the addresses and phone numbers from the list.	TAB	A	Will do.	A	TAB
20	Flood Control District of Maricopa	VAS	2.0	Have a list of the stakeholders and their interest rather than their personal information.	TAB	A	Will do.	A	TAB
21	Flood Control District of Maricopa	VAS	2.0	Lance's title should read City Engineer, not the Public Works Director.	TAB	A	Will do.	A	TAB
22	Flood Control District of Maricopa	VAS	3.1	Previous Studies List all the previous studies and their flow rates. This can be done in a table format.	TAB	A	Will add a table to the report.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011	Date Returned: August 25th, 2011	

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
23	Flood Control District of Maricopa	VAS	6.0	OPPORTUNITIES AND CONSTRAINTS Change paragraph to read: A modified version of the District's Context Sensitive Flood Hazard Mitigation (CSFHM) Planning and Design Approach was used to establish preliminary concept alternatives. The Kickoff and Brainstorming meeting held on January 5, 2011 identified the context sensitive opportunities and constraints. Prior to the Community meeting, the City of El Mirage indicated that recreational fields should be planned for as future possibilities but not identified as part of the community presentation. The context Sensitive bullets below reflect the Community input.	TAB	A	Will do.	A	TAB
24	Flood Control District of Maricopa	VAS	6.1	Flooding Context 4th Bullet - revise to read "Terracing within the basin site for varying levels of inundation during varying flood levels."	TAB	A	Will do.	A	TAB
25	Flood Control District of Maricopa	VAS	6.2	Landscape Context Revise this title to read " Land and Resources Context " Make sure all bullets start with an action verb for consistence.	J2	A	Will do.	A	TAB
26	Flood Control District of Maricopa	VAS	6.2	5th Bullet - on the slope portion include '3:1 slopes for decomposed granite surface may be used in limited form as dictated by existing topography and where appropriate.'	TAB	A	Will do.	A	TAB
27	Flood Control District of Maricopa	VAS	6.2	6th Bullet - add future in front of 'active and passive recreation areas'.	J2	A	Will do.	A	TAB
28	Flood Control District of Maricopa	VAS	6.3	Community Context 4th Bullet - revise sentence to read "Provide a project conceptual design that meets the City of El Mirage maintenance needs."	J2	A	Will do.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011	Date Returned: August 25th, 2011	

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
29	Flood Control District of Maricopa	VAS	6.3	Add another bullet that reads "Future multi-use fields are preferred to stay dry as long a possible being the last area to be inundated."	J2	B	We have had several comments regarding the naming of the recreational fields. Suggest using "future active recreational areas", see comment #37.	A	TR
30	Flood Control District of Maricopa	VAS	7.0	PRELIMINARY CONCEPTS 2nd paragraph - Remove references to City asking for recreational components to be removed. Replace or reword to suggest that a 'design was developed with meandering side slopes and a terraced grading concept to provide opportunities for future recreation needs should funding become available.' or something similar.	TAB	A	Will do.	A	TAB
31	Flood Control District of Maricopa	VAS	8.0	CONCEPT ANALYSIS Revise bullets to read: <ul style="list-style-type: none"> • Effectiveness in Reducing Flooding • Community Acceptance • Multi-use Opportunities and Landscape Aesthetics • Cost • Stakeholder Acceptance • Funding Opportunities 	TAB	A	Will do.	A	TAB
32	Flood Control District of Maricopa	VAS	8.1 8.2 8.3	Add the estimated cost to each line where cost is mentioned.	TAB	A	Will do.	A	TAB
33	Flood Control District of Maricopa	VAS	9.0	RECOMMENDED DESIGN CONCEPTS 2nd paragraph - Expand on ownership of the Bool property and how you arrived at the compensation for 1.3 acres.	TAB	A	Will provide a more detailed explanation.	A	TAB
34	Flood Control District of Maricopa	VAS	9.2	Landscape Context - should read 'Land and Resources Context' 3rd line - replace the word 'playground' with 'future recreational'	J2	A	Will do.	A	TAB
35	Flood Control District of Maricopa	VAS	9.3	Community Context 2nd bullet - activations should read 'activities'	TAB	A	Will do.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011		Date Returned: August 25th, 2011

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
36	Flood Control District of Maricopa	VAS	10.0	Drainage Design Criteria Add a bullet that includes the required volume needed in the basin.	TAB	A	Will do.	A	TAB
37	Flood Control District of Maricopa	VAS	10.0	7th Bullet - replace 'Future little league terrace area' with 'Future active recreation area'	DTP	A	We revised the bullet as requested, but added something to differentiate between the western and southern future active recreation areas.	A	TAB
38	Flood Control District of Maricopa	VAS	10.0	8th Bullet - change sentence to read 'Pad for future restrooms and/ or public buildings will need to be elevated above the 100-yr WSEL.'	TAB	A	Will do.	A	TAB
39	Flood Control District of Maricopa	VAS	Figure 3	Rename this figure to be Flood Control Improvements - Design Concepts. Remove the implication that it is just for landscape.	TAB	C	Suggest renaming this figure Flood Control Improvements - Design Concept Rendering. See also comment 41	A	TAB
40	Flood Control District of Maricopa	VAS	Figure 3	A general 3:1 slope is preferred along the north side of the water tank.	J2	B	General 3:1 slopes are provided.	A	TAB
41	Flood Control District of Maricopa	VAS	Figure 3	Indicate downstream fence removal/modification at Tract N/ Pueblo property	J2	B	Per discussions with Valerie, AZTEC will be adding a new Figure 3 and the current Figure 3 will become Figure 4. The new Figure 3, Design Concept Schematic, will depict the downstream fence removal/modification. This figure is a graphic version of the Concept Plan.	A	TAB
42	Flood Control District of Maricopa	VAS	11.1	IGAs and Permits The IGA is not really something needed for Design Recommendations.	TAB	A	Will delete reference to IGAs.	A	TAB
43	Flood Control District of Maricopa	VAS	11.1	1st paragraph, last sentence. This sentence is out of place, it could be in its own paragraph expanding on the temporary easement.	TAB	A	Agree. This has been rewritten and included as a bullet item in Section 11.2.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011	Date Returned: August 25th, 2011	

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
44	Flood Control District of Maricopa	VAS	11.1	Don't know if we need to dictate that a 404 is necessary at this stage, rather that it should be investigated to determine if one is needed. We don't want to trap ourselves into a corner when we haven't completed that determination yet.	TAB	A	The language has been softened to indicate the need for investigating the need for a permit.	A	TAB
45	Flood Control District of Maricopa	VAS	11.2	Next Steps Survey and Mapping -last sentence. 'generated to a level acceptable for final design' is too general.	TAB	A	Agree. Text will be revised accordingly.	A	TAB
46	Flood Control District of Maricopa	VAS	11.2	Utilities - specify pot holing. Can you give any specific on where pot holing may be needed?	TAB	C	Will investigate and add specifics to this section.	A	TAB
47	Flood Control District of Maricopa	VAS	11.2	Drainage and Basin Design There needs to be some specifics, somewhere in the document. What is the volume needed for the basin?	TAB	A	Section 9.1 already has much of this detail, but will expand the text to clarify and emphasize and also add this information to the Executive Summary.	A	TAB
48	Flood Control District of Maricopa	VAS	11.2	Drainage and Basin Design 2nd paragraph, 1st line - change the word 'can' to must.	TAB	A	Will do.	A	TAB
49	Flood Control District of Maricopa	VAS	11.2	Drainage and Basin Design 2nd paragraph, last sentence - This sentence talks about design criteria provided about, but no specifics were given.	TAB	A	Will add additional information.	A	TAB
50	Flood Control District of Maricopa	VAS	11.2	Drainage and Basin Design 4th paragraph - The statement says "A geotechnical investigation will be required", but no reason is given.	TAB	A	Will add additional information.	A	TAB
51	Flood Control District of Maricopa	VAS	Appendix A1	Project Contacts Greg questions having contacts in the document. He wants his name and phone number not listed.	TAB	A	Will do.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011	Date Returned: August 25th, 2011	

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
52	Flood Control District of Maricopa	VAS	Appendix C	15% plans - Proposed Contours used for Stage-Storage Rating Curve At the top of the page in the Hydraulic Function for Concept Design box, the 100-yr Outflow says 185 cfs, everywhere else it says 230 cfs.	TAB	A	Will revise and clarify.	A	TAB
53	Flood Control District of Maricopa	Michael Duncan	Appendix H, Sheet 2	At the top of Sheet 2 of the 15% plans, the 100-yr Outflow Q is shown as 185 cfs;	DTP	A	We removed the HYDRAULIC FUNCTION FOR CONCEPT DESIGN box	A	TAB
54	Flood Control District of Maricopa	Michael Duncan	Appendix H, Sheet 3	At the bottom of Sheet 3 of the 15% plans the Design Q is 230 cfs	DTP	A	We changed the text to read MAXIMUM DISCHARGE = 230 cfs on sheet 3 of the 15% plans.	A	TAB
55	Flood Control District of Maricopa	Michael Duncan	Appendix C	In the HEC-1 output of App. C, there is no 185 cfs. (If this is not the design model, the design model should also be included in report);	DTP	A	Rounding up was an error and has been rectified to 180 per the requirements in the Scope of Work. Basin Outflow node SRD53 is 182 cfs.	A	DTP
56	Flood Control District of Maricopa	Michael Duncan	6.1	At section 6.1 (page 7) and section 10.2 (page 13) of the report, the outflow is 230 cfs.	TAB	A	Will clarify. 230 cfs is maximum allowable discharge.	A	TAB
57	Flood Control District of Maricopa	Michael Duncan		The 185 cfs should be explained and documented in the text of the report	TAB	A	Will do.	A	TAB
58	Flood Control District of Maricopa	Greg Jones		Under Drainage Design Criteria. – This section needs to detail the design parameters used to develop the recommended plan. i.e. Volumes, Q's (100 year 6 hour at upstream, downstream, and a key project areas) , N-values, freeboard, scour depth, sediment yield, etc. If the 15% plans have this data, then just reference the 15% plan and cut down the written text.	TAB	B, D	Section 9.1 contains much of this information. Freeboard and channel N-values will be added. Sediment yield and scour were not a part of the project scope but verbiage has been added to Section 11.6 to clarify the need for a sediment yield analysis during final design.	A	TAB
59	Flood Control District of Maricopa	Greg Jones		Under Design Considerations. This section should be and include any Items that the Engineer feels that additional investigation / attention is needed and why.	TAB	A	Will do. This section has been expanded accordingly.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: Lower El Mirage Wash Design Concept Report Phase 2 - Analysis and Recommendations	Submittal Stage: DRAFT - Final Design Concept Report, July 27, 2011	Disposition Codes: A. Will Comply B. Consultant to Evaluate C. Client to Evaluate D. No Further Action
Aztec Project No: AZE0913-04	Consultant: AZTEC Engineering	
Date Received: August 15th, 2011	Date Returned: August 25th, 2011	

No.	Agency	Reviewer	Location Sheet #	Review Comments	Response By	Initial Disposition	Response	Final Disposition	Verified By
60	Flood Control District of Maricopa	Greg Jones		Under Environmental in the Design Considerations. The Consultant makes recommendations for 404 delineation, 402 clean water permit, Arch investigation, T&E investigations, and extra. I have problems with these statements when in fact the work/investigation may not be necessary. <ul style="list-style-type: none"> • The project is up-stream of a golf course and thus no nexus to require a 404. • The 402 permit should fall under the cities current permit. The water is not being diverted any differently, no new pollutants are being added, etc., so why does this project necessitate the need for testing and etc. beyond what is currently being done? • A quick statement that to the effect that T&E should be considered but it unlikely that any T&E will be observed. • The Arch should reference the ADMP and indicated whether or not there was not sites identified for this area. 	TAB / JH	D, A, A, A	Text will be revised to suggest that: the need for an AZPDES permit, a jurisdictional delineation for a 404 Permit, and cultural surveys will be investigated and determined during final design.	A	TAB

DESIGN REVIEW COMMENTS & RESOLUTION FORM

Project Name: FCD 2008C014 WA#2
 Lower El Mirage Wash DCR, Phase 2 - Analysis and Recommendations
Aztec No. AZE0913-02

Submittal:
 DRAFT DCR for Phase 2, dated May 17, 2011
Consultant:
 Aztec Engineering

Disposition Codes:
 A. Will Comply
 B. Consultant to Evaluate
 C. Client to Evaluate
 D. No Further Action

Item No.	Agency	Reviewer	Comment #	Location (sheet/DWG #)	Review Comments	Code	Response	Responder
1	FCDMC		1	Report / Appendices	Label the area and contour map exhibits	A		ntp
2	FCDMC		2	Report / Appendices	Include a HEC-1 schematic map in the report.	A		ntp
3	FCDMC		3	Report / Appendices	Table 8.1, pg. 11, "Operations and Maintenance Cost" reads "equal" for each concept. However, on pg. 2, a "disadvantage" of Concept 2 is increased maintenance. Do we want to add that to the results in Table 8.1?	A	Revised the disadvantage description for Concept 2 on page 10 to read " - Longer outlet increases maintenance, but not significantly"	ntp
4	FCDMC		4	Report / Appendices	On the spreadsheet entitled "Stage - Discharge Data for West Cactus Basin" for Concept No.1, indicate the source of the rating table data, reference to Phase 1 report or include the output data sheets from the analysis.	A		ntp
5	FCDMC		5	General	The previous project cost estimates assumed using half of the jointly owned parcel as baseline. For the (at least) selected alternative we would have a true-zero baseline for the estimate. If this is not in the report, it should be added. This will facilitate the development of the related IGA, where all contributions by the city are important.	A	The baseline comparison for this project includes land acquisition. The acreage of acquisition has been minimized.	ntp
6								
7								
8								
9								
10								

APPENDIX B

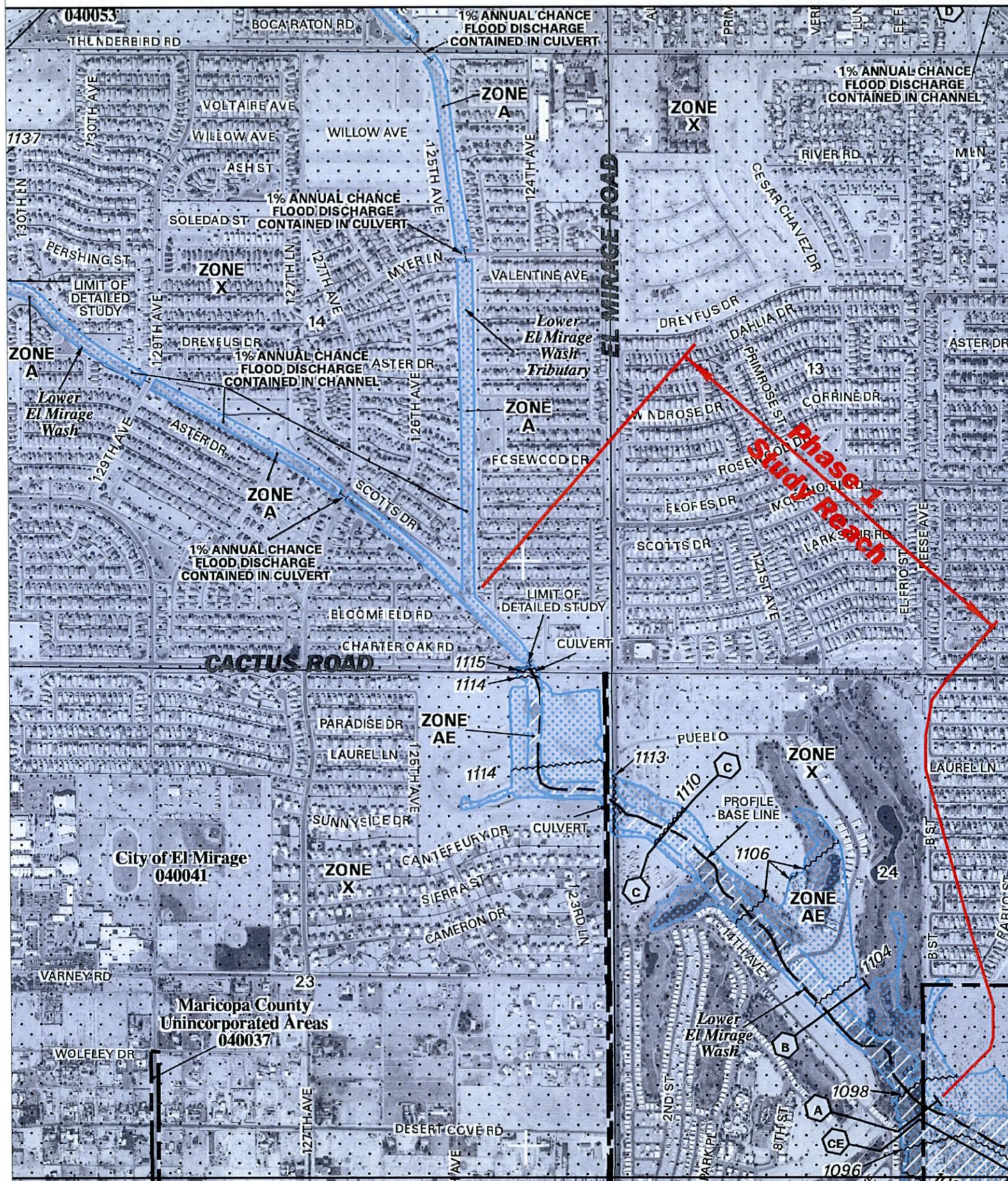
FEMA Map



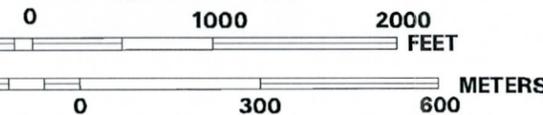
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LOWER EL MIRAGE WASH DCR

Phase 1
Analysis and Recommendations
FCD 2008C014 WA #2



MAP SCALE 1" = 1000'



NFP

PANEL 1605J

FIRM FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1605 OF 4350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL MIRAGE, CITY OF	040041	1605	J
GLENDALE, CITY OF	040045	1605	J
MARICOPA COUNTY	040037	1606	J
SURPRISE, CITY OF	040053	1605	J

Notice to User: The Map Numbers shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 04013C1605J
MAP REVISED SEPTEMBER 30, 2005
Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

JOINS PANEL 1610

VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29)

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

AZTEC
TYPESA Group
www.aztec.us
www.typos.es

4561 E. McDowell Road
Phoenix, AZ 85008-4505
Tel (602) 454-0402
Fax (602) 454-0403

FEMA MAP
PORTION OF FEMA FIRM PANEL
04013C1605J

	BY	DATE
DESIGNED	D.Phelps	5/20/10
DRAWN	K.Leahy	5/25/10
CHECKED	T.Bokich	5/25/10

APPENDIX C

Stage-Storage-Discharge Data for Concept Design

Copies of the following data are provided:

- HEC-1 routing diagram developed during Phase 1
- Pertinent portions of the HEC-1 output file used to model West Cactus Basin Improvements for the Concept Design
- Stage-storage-discharge backup data

A digital copies of HEC-1 are provided in Appendix I. Refer to the Phase 1 Study Report for details regarding the contributing watershed HEC-1 from the ADMPU-AHA (2009).



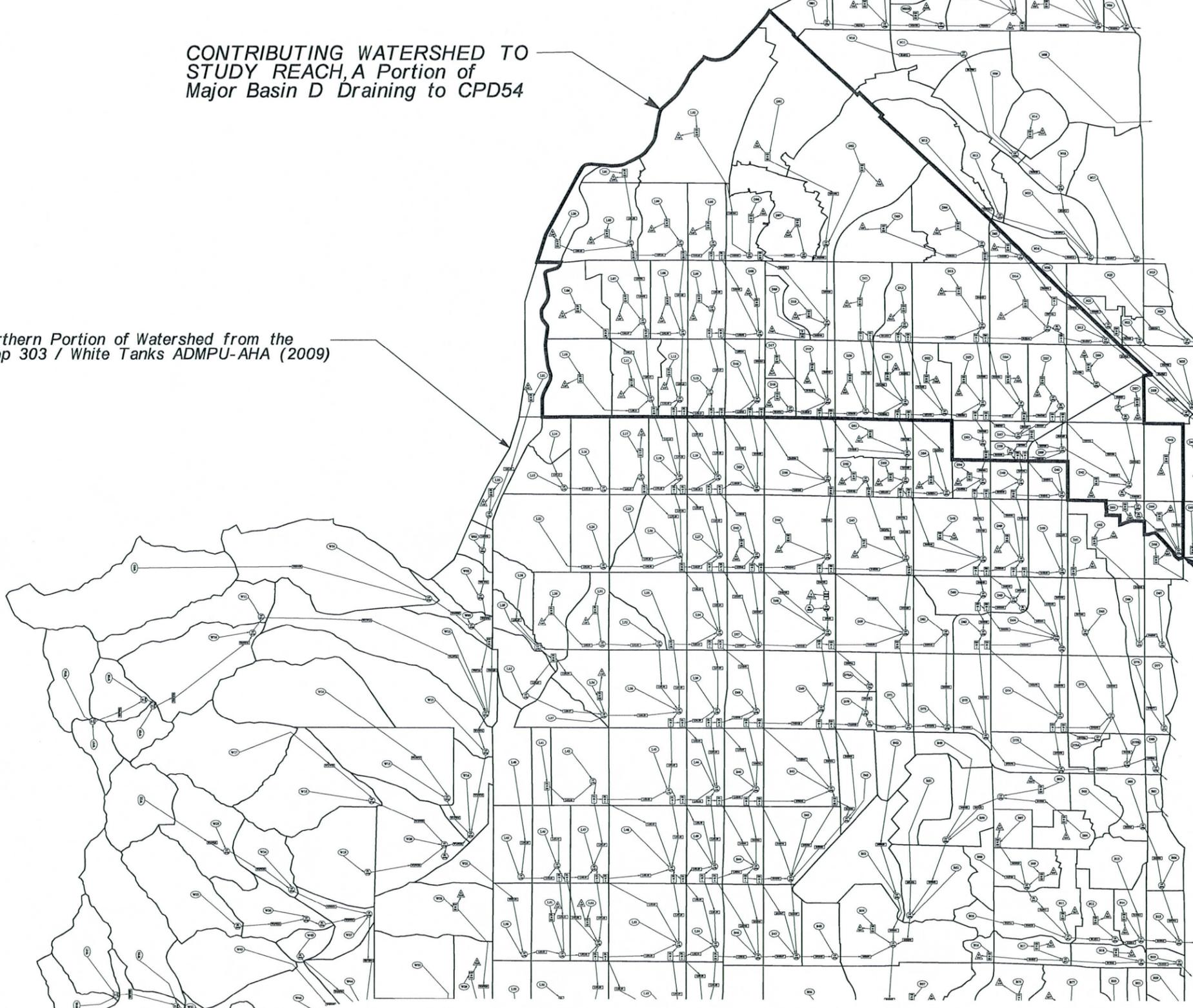
LOWER EL MIRAGE WASH DCR Phase 1 Analysis and Recommendations FCD 2008C014 WA #2

Tuthill Road Perryville Road Citrus Road Cotton Lane Sarival Avenue Reems Road Bullard Avenue Litchfield Road Dysart Road El Mirage Road

Pinnacle Peak Road Deer Valley Road Beardsley Road Union Hills Drive Bell Road Greenway Road Thunderbird / Waddell Road Cactus Road Peoria Avenue Olive Avenue Northern Avenue Glendale Avenue Bethany Home Road Camelback Road Indian School Road

CONTRIBUTING WATERSHED TO STUDY REACH, A Portion of Major Basin D Draining to CPD54

Northern Portion of Watershed from the Loop 303 / White Tanks ADMPU-AHA (2009)



Concentration Point CPD54



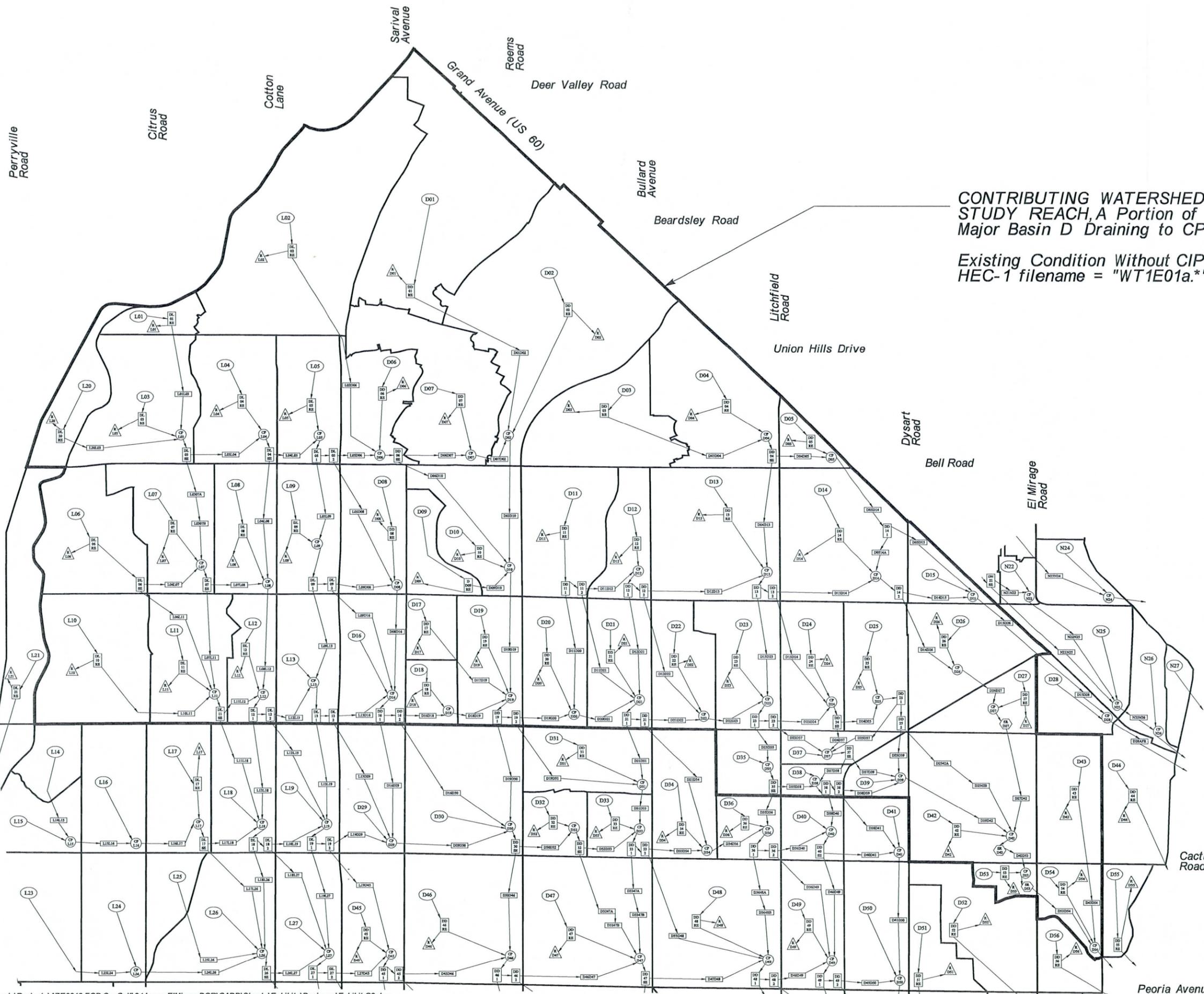
EXHIBIT C1 NORTHERN PORTION OF HEC-1 ROUTING DIAGRAM FROM THE LOOP 303 / WHITE TANKS ADMPU-AHA (2009)

	BY	DATE
DESIGNED	D.Phelps	5/20/10
DRAWN	K.Leahy	5/25/10
CHECKED	T.Bokich	5/25/10



LOWER EL MIRAGE WASH DCR

Phase 1
Analysis and Recommendations
FCD 2008C014 WA #2



CONTRIBUTING WATERSHED TO STUDY REACH, A Portion of Major Basin D Draining to CPD54

Existing Condition Without CIP
HEC-1 filename = "WT1E01a.*"

LEGEND

- Sub Basin Label
- Hydrograph Route Label
- Hydrograph Route Direction
- Diversion Label
- Retention Label
- Storage Route Label
- Concentration Point Label
- Sub Basin Boundary



EXHIBIT C2
NORTHERN PORTION OF HEC-1 ROUTING DIAGRAM
LOOP 303 / WHITE TANKS ADMPU-AHA (2009)
EXISTING CONDITION WITHOUT CIP

	BY	DATE
DESIGNED	D.Phelps	5/20/10
DRAWN	K.Leahy	5/25/10
CHECKED	T.Bokich	5/25/10

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 21JUL11 TIME 16:41:10
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*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

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X X XXXXXXX XXXXX X
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XXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
 1      ID      Flood Control District of Maricopa County
 2      ID      L303_EX_CIP_MB01 - Loop 303/ White Tanks ADMFU AHA
 3      ID      100 YEAR
 4      ID      24 Hour Storm
 5      ID      Unit Hydrograph: S-Graph
 6      ID      08/18/2009
 7      ID
 8      ID      FCDMC CONTRACT 2007C031
 9      ID      BY HDR ENGINEERING (#79902)
10      ID      EXISTING CONDITIONS WITH CIP-AUGUST 2009
11      ID      MAJOR BASIN 01
12      ID      HDR FILE NAME: ECIP-MB1.DAT
13      ID
14      ID      *****
15      ID
16      ID      FOLLOWING ARE THE CHANGES BY FCDMC:
17      ID      1. Removed SRD14. - by JWH 10-16-09
18      ID      FILE NAME: WT1EC01.DAT
19      ID
20      ID      For details concerning changes to this HEC-1 model, please contact
21      ID      FCDMC, H&H Branch.
22      ID
23      ID      *****
24      ID
25      ID      AZTEC revisions for FCD2008C014, Work Assignment No. 2 are listed below:
26      ID      1. Extracted portion of Major Basin D draining to CPD54 (Lower El Mirage)
27      ID      2. Removed operation SRD42 (model large capacity culvert @ Cactus Rd.)
28      ID      3. Revised operation SRD53 (model future west cactus basin - Concept 1)
29      ID      Note: SRD53 (west cactus basin) contains the current preliminary design
30      ID      Preliminary Design Assumptions:
31      ID      - Basin rough grading, dated 6/28/2011
32      ID      - Outlet is a single new 60" pipe, inlet control (invert = 1106.6)
33      ID
34      ID      Filename: LEMW-03.ih1      Date: 07/21/2011 - dtp
35      ID
36      IT      5      0      0      2000
37      IN      15
38      IO      3
39      *DIAGRAM
40      *
41      JD      3.480 0.0001
42      PC      0.000 0.002 0.005 0.008 0.011 0.014 0.017 0.020 0.023 0.026
43      PC      0.029 0.032 0.035 0.038 0.041 0.044 0.048 0.052 0.056 0.060
44      PC      0.064 0.068 0.072 0.076 0.080 0.085 0.090 0.095 0.100 0.105
45      PC      0.110 0.115 0.120 0.126 0.133 0.140 0.147 0.155 0.163 0.172
46      PC      0.181 0.191 0.203 0.218 0.236 0.257 0.283 0.387 0.663 0.707
47      PC      0.735 0.758 0.776 0.791 0.804 0.815 0.825 0.834 0.842 0.849
48      PC      0.856 0.863 0.869 0.875 0.881 0.887 0.893 0.898 0.903 0.908
49      PC      0.913 0.918 0.922 0.926 0.930 0.934 0.938 0.942 0.946 0.950
50      PC      0.953 0.956 0.959 0.962 0.965 0.968 0.971 0.974 0.977 0.980
51      PC      0.983 0.986 0.989 0.992 0.995 0.998 1.000
52      JD      3.393 5.0
53      JD      3.306 10.0
54      JD      3.219 20.0
55      JD      3.132 30.0

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1

HEC-1 INPUT

PAGE 2

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55	JD	2.965	90.0								
56	JD	2.927	120.0								
	*										
	*										
57	KK	D03BASIN									
58	KM	BASIN BOUNDARY FROM KINGSWOOD PARKE									
59	BA	0.723									

DATA REMOVED FROM HARD COPY - Refer to digital copy of output

652	KK	CPD39COMBINE									
653	HC	2	6.813								
	*										
654	KK	D39D42ROUTE									
655	KM	Cross-section: Cross-section determined from Waddell									
656	KM	Road Drainage Improvement CAR Final									
657	KM	by HDR dated April 10, 2009, RLE1									
658	RS	3	FLOW								
659	RC	0.030	0.030	0.030	5691	0.0039	0.00				
660	RX	0.00	30.00	38.00	54.00	76.50	104.00	139.00	154.00		
661	RY	10.00	4.00	4.00	0.00	0.00	0.00	7.00	10.00		
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662	KK	D42BASIN									
663	KM	BASIN BOUNDARY FROM PARQUE VERDE MULTI PHASE									
664	KM	DYSART SCHOOL DISTRICT, AND BUENA VISTA									
665	BA	0.994									
666	LG	0.24	0.24	5.20	0.29	32					
667	UI	0	150	594	890	1330	1722	1186	816	463	246
668	UI	148	46	46	45	0	0	0	0	0	0
669	UI	0	0	0	0	0	0	0	0	0	0
670	UI	0	0	0	0	0	0	0	0	0	0
671	UI	0	0	0	0	0	0	0	0	0	0
	*										
672	KK	DD42REDIVERT									
673	KM	Retention volume estimated based on aerial, Cactus and Dysart									
674	KM	Subdivision and Parque Verde - No Reports available									
675	DT	RD42	71.8	0.0							
676	DI	0.0	500.0	5000.0	50000.0	0.0	0.0	0.0	0.0	0.0	0.0
677	DQ	0.0	500.0	5000.0	50000.0	0.0	0.0	0.0	0.0	0.0	0.0
	*										
678	KK	CPD42COMBINE									
679	HC	3	9.87								
	*										
	*	Storage behind Cactus Road - 2009 ADMPU data REMOVED by AZTEC									
	*	To account for future Cactus Culvert (large capacity - no attenuation)									
	*	KK SRD42STORAGE									
	*	KM Storage behind Cactus Road									
	*	KO									
	*	RS	1	STOR							
	*	SV	0.64	4.60	17.30	27.60	56.30				
	*	SQ		139.00	426.00	827.00	1295.00				
	*	SE1105.3	1108.00	1110.00	1112.00	1114.00	1116.00				
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HEC-1 INPUT

PAGE 18

LINE	ID	1	2	3	4	5	6	7	8	9	10
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681	KM	Cross-section: Cross-section determined from									
682	KM	Waddell Road Drainage Improvement CAR Final									
683	KM	by HDR dated April 10, 2009, RLE3									
684	RS	1	FLOW								
685	RC	0.030	0.030	0.030	1558	0.0020	0.00				
686	RX	0.00	10.00	22.00	97.00	171.00	172.00	184.00	194.00		
687	RY	3.50	3.00	0.00	0.00	0.00	0.00	3.00	3.50		
	*										
688	KK	D53BASIN									
689	KM	BASIN BOUNDARY FROM EL MIRAGE MARKET PLACE, RANCHO MIRAGE UNIT 3									
690	BA	0.118									
691	LG	0.31	0.32	4.60	0.36	11					
692	UI	0	55	169	306	215	107	39	12	9	0
693	UI	0	0	0	0	0	0	0	0	0	0
694	UI	0	0	0	0	0	0	0	0	0	0
695	UI	0	0	0	0	0	0	0	0	0	0
696	UI	0	0	0	0	0	0	0	0	0	0
	*										
697	KK	DD53REDIVERT									
698	KM	Retention volume estimated based on aerial									
699	DT	RD53	12.1	0.0							
700	DI	0.0	500.0	5000.0	50000.0	0.0	0.0	0.0	0.0	0.0	0.0

701	DQ	0.0	500.0	5000.0	50000.0	0.0	0.0	0.0	0.0	0.0	0.0	
702	KK	CPD53COMBINE										
703	KO	1	2									
704	HC	2	9.988									
705	KK	SRD53STORAGE										
706	KM	West Cactus Basin - 2009 ADMPU data revised by AZTEC										
707	KM	Preliminary Basin design No 2. Rough grading plan of 6/28/2011										
708	KM	Outlet = 1-60" pipe rating curve (Invert = 1106.6)										
709	KO	1	2									
710	RS	1	STOR									
711	SV	0	0.17	2.3	6.5	14.1	25.1	37.3	52.3	70.7	77.0	
712	SV	82.5	91.4	113.6								
713	SQ	0	5	10	30	60	92	127	165	195	207	
714	SQ	213	222	242								
715	SE	1106.6	1107	1108	1109	1110	1111	1112	1113	1114	1114.3	
716	SE	1114.6	1115	1116								

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HEC-1 INPUT

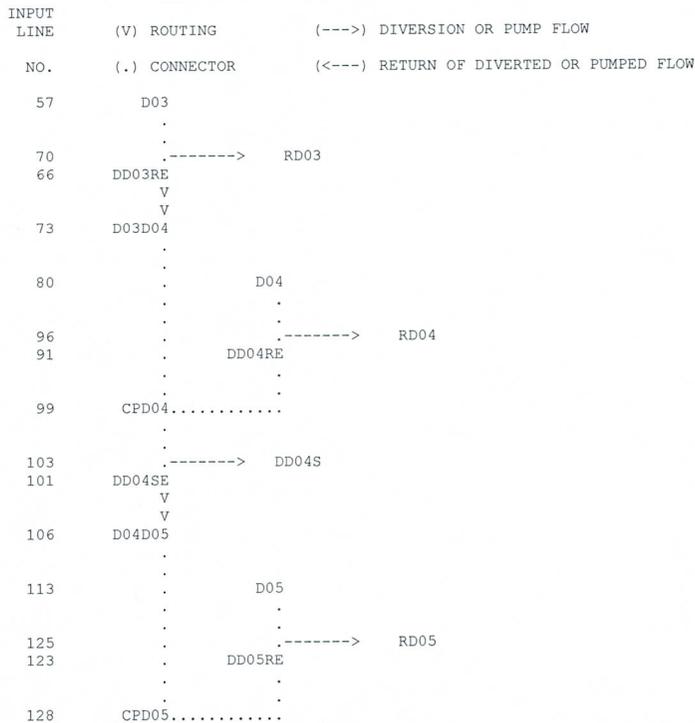
PAGE 19

LINE	ID12345678910	
717	KK	D53D54ROUTE										
718	KM	Cross-section: Cross-section determined from										
719	KM	Waddell Road Drainage Improvement CAR Final										
720	KM	by HDR dated April 10, 2009, RLE4										
721	RS	4	FLOW									
722	RC	0.030	0.030	0.030	3999	0.0038	0.00					
723	RX	0.00	36.00	39.00	42.00	45.00	48.00	51.00	87.00			
724	RY	1102.8	1096.80	1096.80	1096.80	1096.80	1096.80	1096.80	1102.80			
725	KK	D43BASIN										
726	KM	BASIN BOUNDARY FROM MONTA BLANCA ESTATES, SUNNYVALE AND SUNDIAL										
727	BA	0.500										
728	LG	0.25	0.25	4.70	0.37	33						
729	UI	0	75	299	448	669	867	596	410	233	124	
730	UI	75	23	23	23	0	0	0	0	0	0	
731	UI	0	0	0	0	0	0	0	0	0	0	
732	UI	0	0	0	0	0	0	0	0	0	0	
733	UI	0	0	0	0	0	0	0	0	0	0	

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SCHEMATIC DIAGRAM OF STREAM NETWORK



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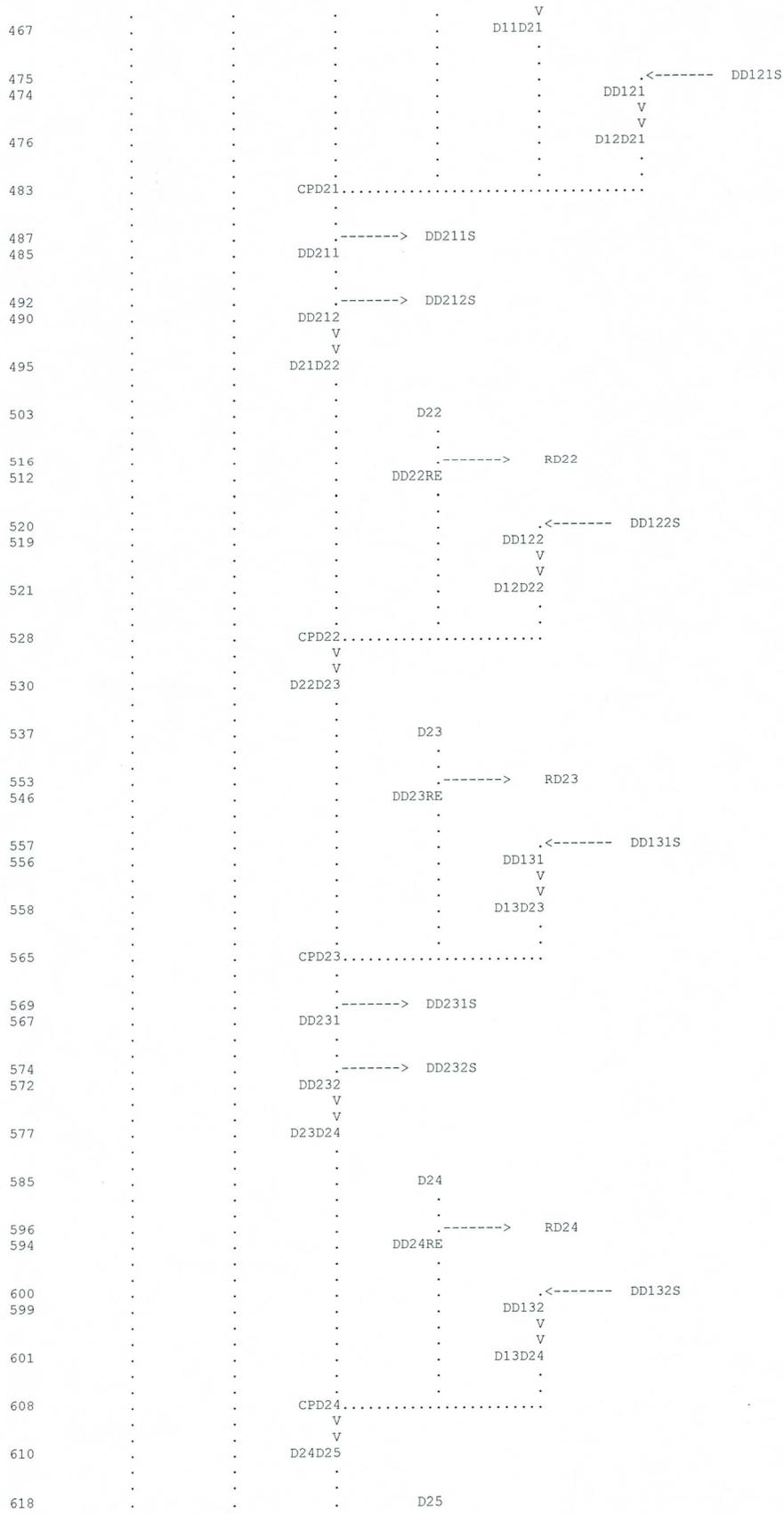
V
V
130 D05D14
.
139 -----> DD141S
137 DD141
V
V
142 D05D15
.
149 D11
.
164 -----> RD11
159 DD11RE
.
169 -----> DD111S
167 DD111
.
174 -----> DD112S
172 DD112
V
V
177 D11D12
.
184 D12
.
200 -----> RD12
194 DD12RE
.
203 CPD12.....
.
207 -----> DD121S
205 DD121
.
212 -----> DD122S
210 DD122
V
V
215 D12D13
.
223 D13
.
237 -----> RD13
232 DD13RE
.
241 -----> DD04S
240 DD04SE
V
V
242 D04D13
.
249 CPD13.....
.
253 -----> DD131S
251 DD131
.
258 -----> DD132S
256 DD132
V
V
261 D13D14
.
268 D14
.
279 -----> RD14
277 DD14RE
.
283 -----> DD141S
282 DD141
V
V
284 D0514A
.
292 CPD14.....

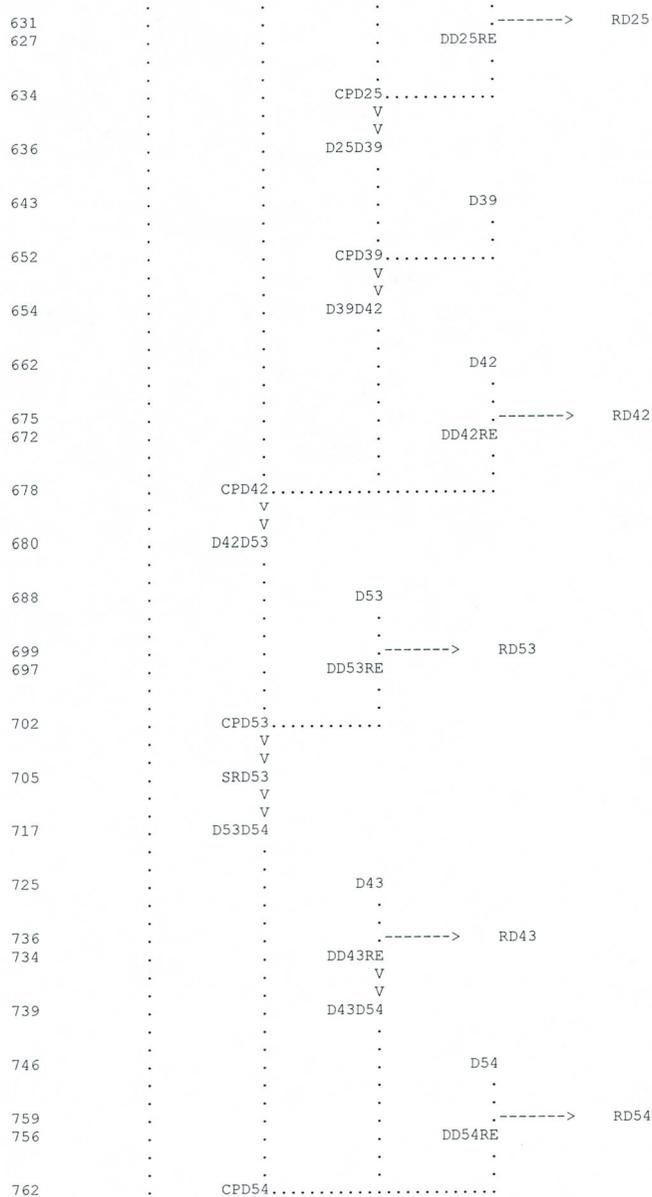
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296 . . . . . DD142S
294 . . . . . DD142
      . . . . . V
299 . . . . . V
      . . . . . D14D15
306 . . . . . D15
      . . . . .
315 . . . . . CPD15
      . . . . . V
317 . . . . . D15D26
      . . . . . V
324 . . . . . D15D28
      . . . . .
331 . . . . . D28
      . . . . .
340 . . . . . CPD28
      . . . . . V
342 . . . . . D28AFR
      . . . . .
348 . . . . . D26
      . . . . .
360 . . . . . RD26
358 . . . . . DD26RE
      . . . . .
364 . . . . . DD142S
363 . . . . . DD142
      . . . . . V
365 . . . . . D14D26
      . . . . .
372 . . . . . CPD26
      . . . . . V
374 . . . . . D26D27
      . . . . .
381 . . . . . D27
      . . . . .
393 . . . . . RD27
391 . . . . . DD27RE
      . . . . .
396 . . . . . CPD27
      . . . . . V
398 . . . . . SRD27
      . . . . . V
406 . . . . . D27D42
      . . . . .
414 . . . . . D20
      . . . . .
428 . . . . . RD20
423 . . . . . DD20RE
      . . . . .
432 . . . . . DD111S
431 . . . . . DD111
      . . . . . V
433 . . . . . D11D20
      . . . . .
440 . . . . . CPD20
      . . . . . V
442 . . . . . D20D21
      . . . . .
449 . . . . . D21
      . . . . .
462 . . . . . RD21
458 . . . . . DD21RE
      . . . . .
466 . . . . . DD112S
465 . . . . . DD112
      . . . . . V

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RUNOFF SUMMARY										
FLOW IN CUBIC FEET PER SECOND										
TIME IN HOURS, AREA IN SQUARE MILES										
	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	D03	960.	12.25	110.	34.	11.	.72		
+	DIVERSION TO	RD03	960.	12.25	96.	26.	9.	.72		
+	HYDROGRAPH AT	DD03RE	177.	12.67	25.	8.	3.	.72		
+	ROUTED TO	D03D04	110.	12.92	24.	8.	3.	.72		

+	HYDROGRAPH AT	D04	1149.	12.33	142.	44.	15.	.89
+	DIVERSION TO	RD04	1118.	12.33	85.	24.	8.	.89
+	HYDROGRAPH AT	DD04RE	1065.	12.42	72.	20.	7.	.89
+	2 COMBINED AT	CPD04	1062.	12.42	95.	28.	9.	1.61
+	DIVERSION TO	DD04S	647.	12.42	30.	7.	2.	1.61
+	HYDROGRAPH AT	DD04SE	414.	12.42	65.	21.	7.	1.61
+	ROUTED TO	D04D05	308.	12.67	64.	21.	7.	1.61
+	HYDROGRAPH AT	D05	325.	12.17	35.	12.	4.	.16
+	DIVERSION TO	RD05	137.	11.92	13.	4.	1.	.16
+	HYDROGRAPH AT	DD05RE	325.	12.17	27.	8.	3.	.16
+	2 COMBINED AT	CPD05	337.	12.67	89.	28.	9.	1.78
+	ROUTED TO	D05D14	272.	12.83	88.	28.	9.	1.78
+	DIVERSION TO	DD141S	150.	12.83	17.	4.	1.	1.78
+	HYDROGRAPH AT	DD141	122.	12.17	71.	24.	8.	1.78
+	ROUTED TO	D05D15	128.	12.50	70.	24.	8.	1.78
+	HYDROGRAPH AT	D11	780.	12.42	107.	33.	11.	.66
+	DIVERSION TO	RD11	750.	12.33	58.	16.	5.	.66
+	HYDROGRAPH AT	DD11RE	719.	12.50	60.	17.	6.	.66
+	DIVERSION TO	DD111S	591.	12.50	49.	14.	5.	.66
+	HYDROGRAPH AT	DD111	128.	12.50	12.	3.	1.	.66
+	DIVERSION TO	DD112S	46.	12.50	6.	2.	1.	.66
+	HYDROGRAPH AT	DD112	82.	12.50	6.	2.	1.	.66
+	ROUTED TO	D11D12	52.	12.67	6.	2.	1.	.66
+	HYDROGRAPH AT	D12	241.	12.58	53.	16.	5.	.35
+	DIVERSION TO	RD12	241.	12.58	28.	8.	3.	.35
+	HYDROGRAPH AT	DD12RE	225.	12.75	31.	9.	3.	.35
+	2 COMBINED AT	CPD12	272.	12.75	36.	10.	3.	1.01
+	DIVERSION TO	DD121S	118.	12.75	13.	4.	1.	1.01
+	HYDROGRAPH AT	DD121	154.	12.75	23.	7.	2.	1.01
+	DIVERSION TO	DD122S	63.	12.75	11.	3.	1.	1.01
+	HYDROGRAPH AT	DD122	91.	12.75	13.	4.	1.	1.01
+	ROUTED TO	D12D13	52.	13.67	12.	4.	1.	1.01

+	HYDROGRAPH AT	D13	1138.	12.25	124.	36.	12.	1.03
+	DIVERSION TO	RD13	431.	12.00	30.	9.	3.	1.03
+	HYDROGRAPH AT	DD13RE	1138.	12.25	103.	27.	9.	1.03
+	HYDROGRAPH AT	DD04SE	647.	12.42	30.	7.	2.	1.61
+	ROUTED TO	D04D13	189.	13.50	30.	7.	2.	1.61
+	3 COMBINED AT	CPD13	1138.	12.25	144.	38.	13.	3.65
+	DIVERSION TO	DD131S	210.	12.25	13.	3.	1.	3.65
+	HYDROGRAPH AT	DD131	923.	12.25	130.	34.	11.	3.65
+	DIVERSION TO	DD132S	396.	12.25	39.	10.	3.	3.65
+	HYDROGRAPH AT	DD132	527.	12.25	91.	24.	8.	3.65
+	ROUTED TO	D13D14	449.	12.67	89.	24.	8.	3.65
+	HYDROGRAPH AT	D14	1097.	12.42	148.	46.	15.	.94
+	DIVERSION TO	RD14	1097.	12.42	117.	32.	11.	.94
+	HYDROGRAPH AT	DD14RE	490.	12.67	47.	14.	5.	.94
+	HYDROGRAPH AT	DD141	150.	12.83	17.	4.	1.	1.78
+	ROUTED TO	D0514A	122.	13.08	17.	4.	1.	1.78
+	3 COMBINED AT	CPD14	980.	12.67	151.	42.	14.	4.76
+	DIVERSION TO	DD142S	599.	12.67	122.	35.	12.	4.76
+	HYDROGRAPH AT	DD142	381.	12.67	30.	8.	3.	4.76
+	ROUTED TO	D14D15	331.	12.83	29.	8.	3.	4.76
+	HYDROGRAPH AT	D15	420.	12.17	44.	14.	5.	.22
+	3 COMBINED AT	CPD15	481.	12.83	137.	45.	15.	4.98
+	ROUTED TO	D15D26	393.	13.00	136.	45.	15.	4.98
+	ROUTED TO	D15D28	371.	13.17	135.	45.	15.	4.98
+	HYDROGRAPH AT	D28	425.	12.17	38.	12.	4.	.25
+	2 COMBINED AT	CPD28	475.	12.25	168.	57.	19.	5.23
+	ROUTED TO	D28AFR	462.	12.25	168.	57.	19.	5.23
+	HYDROGRAPH AT	D26	982.	12.25	101.	31.	10.	.64
+	DIVERSION TO	RD26	982.	12.25	98.	26.	9.	.64
+	HYDROGRAPH AT	DD26RE	31.	13.42	13.	5.	2.	.64
+	HYDROGRAPH AT	DD142	599.	12.67	122.	35.	12.	4.76
	ROUTED TO							

+		D14D26	498.	12.92	120.	35.	12.	4.76
+	2 COMBINED AT	CPD26	492.	12.92	131.	39.	13.	5.40
+	ROUTED TO	D26D27	462.	13.00	130.	39.	13.	5.40
+	HYDROGRAPH AT	D27	498.	12.17	52.	17.	6.	.32
+	DIVERSION TO	RD27	100.	11.92	13.	4.	1.	.32
+	HYDROGRAPH AT	DD27RE	498.	12.17	45.	12.	4.	.32
+	2 COMBINED AT	CPD27	491.	12.17	169.	51.	17.	5.72
+	ROUTED TO	SRD27	491.	12.17	169.	51.	17.	5.72
+	ROUTED TO	D27D42	423.	13.42	165.	51.	17.	5.72
+	HYDROGRAPH AT	D20	587.	12.33	70.	22.	7.	.50
+	DIVERSION TO	RD20	587.	12.33	70.	19.	6.	.50
+	HYDROGRAPH AT	DD20RE	10.	15.00	6.	2.	1.	.50
+	HYDROGRAPH AT	DD111	591.	12.50	49.	14.	5.	.66
+	ROUTED TO	D11D20	335.	12.92	46.	14.	5.	.66
+	2 COMBINED AT	CPD20	334.	12.92	51.	16.	5.	1.16
+	ROUTED TO	D20D21	250.	13.33	49.	16.	5.	1.16
+	HYDROGRAPH AT	D21	565.	12.33	72.	22.	7.	.50
+	DIVERSION TO	RD21	565.	12.33	72.	20.	7.	.50
+	HYDROGRAPH AT	DD21RE	9.	15.92	6.	2.	1.	.50
+	HYDROGRAPH AT	DD112	46.	12.50	6.	2.	1.	.66
+	ROUTED TO	D11D21	22.	13.33	5.	2.	1.	.66
+	HYDROGRAPH AT	DD121	118.	12.75	13.	4.	1.	1.01
+	ROUTED TO	D12D21	90.	13.00	13.	4.	1.	1.01
+	4 COMBINED AT	CPD21	327.	13.33	70.	23.	8.	2.00
+	DIVERSION TO	DD211S	218.	13.33	51.	17.	6.	2.00
+	HYDROGRAPH AT	DD211	109.	13.33	19.	6.	2.	2.00
+	DIVERSION TO	DD212S	54.	13.33	13.	4.	1.	2.00
+	HYDROGRAPH AT	DD212	55.	13.33	5.	2.	1.	2.00
+	ROUTED TO	D21D22	39.	13.67	5.	2.	1.	2.00
+	HYDROGRAPH AT	D22	562.	12.33	67.	21.	7.	.45
+	DIVERSION TO	RD22	562.	12.33	67.	19.	6.	.45
+	HYDROGRAPH AT	DD22RE	8.	16.75	5.	2.	1.	.45

+	HYDROGRAPH AT	DD122	63.	12.75	11.	3.	1.	1.01
	ROUTED TO							
+		D12D22	45.	13.42	10.	3.	1.	1.01
+	3 COMBINED AT	CPD22	79.	13.58	18.	6.	2.	2.46
	ROUTED TO							
+		D22D23	71.	13.75	18.	6.	2.	2.46
+	HYDROGRAPH AT	D23	556.	12.42	75.	22.	7.	.54
+	DIVERSION TO	RD23	556.	12.42	69.	18.	6.	.54
+	HYDROGRAPH AT	DD23RE	75.	13.08	13.	4.	1.	.54
+	HYDROGRAPH AT	DD131	210.	12.25	13.	3.	1.	3.65
	ROUTED TO							
+		D13D23	133.	12.50	13.	3.	1.	3.65
+	3 COMBINED AT	CPD23	130.	12.50	39.	13.	4.	5.64
	DIVERSION TO							
+		DD231S	13.	12.50	4.	1.	0.	5.64
+	HYDROGRAPH AT	DD231	117.	12.50	35.	12.	4.	5.64
+	DIVERSION TO	DD232S	14.	12.50	4.	1.	0.	5.64
+	HYDROGRAPH AT	DD232	103.	12.50	31.	10.	3.	5.64
	ROUTED TO							
+		D23D24	86.	12.75	31.	10.	3.	5.64
+	HYDROGRAPH AT	D24	538.	12.42	71.	21.	7.	.49
+	DIVERSION TO	RD24	538.	12.42	71.	21.	7.	.49
+	HYDROGRAPH AT	DD24RE	4.	21.08	2.	1.	0.	.49
+	HYDROGRAPH AT	DD132	396.	12.25	39.	10.	3.	3.65
	ROUTED TO							
+		D13D24	300.	12.50	39.	10.	3.	3.65
+	3 COMBINED AT	CPD24	343.	12.58	67.	21.	7.	6.13
	ROUTED TO							
+		D24D25	309.	12.75	67.	21.	7.	6.13
+	HYDROGRAPH AT	D25	574.	12.33	72.	22.	7.	.50
+	DIVERSION TO	RD25	574.	12.33	69.	19.	6.	.50
+	HYDROGRAPH AT	DD25RE	21.	13.58	9.	3.	1.	.50
+	2 COMBINED AT	CPD25	309.	12.75	74.	23.	8.	6.63
	ROUTED TO							
+		D25D39	287.	12.83	72.	23.	8.	6.63
+	HYDROGRAPH AT	D39	113.	12.50	16.	4.	1.	.18
+	2 COMBINED AT	CPD39	356.	12.83	85.	27.	9.	6.81
	ROUTED TO							
+		D39D42	291.	13.08	84.	27.	9.	6.81
+	HYDROGRAPH AT	D42	1317.	12.33	151.	46.	15.	.99
+	DIVERSION TO	RD42	1317.	12.33	135.	36.	12.	.99

+	HYDROGRAPH AT	DD42RE	215.	12.75	31.	10.	3.	.99
+	3 COMBINED AT	CPD42	661.	13.33	254.	80.	27.	9.87
+	ROUTED TO	D42D53	642.	13.42	251.	80.	27.	9.87
+	HYDROGRAPH AT	D53	180.	12.17	13.	4.	1.	.12
+	DIVERSION TO	RD53	180.	12.17	13.	4.	1.	.12
+	HYDROGRAPH AT	DD53RE	0.	.00	0.	0.	0.	.12
+	2 COMBINED AT	CPD53	642.	13.42	251.	80.	27.	9.99
+	ROUTED TO	SRD53	182.	15.83	167.	80.	27.	9.99
+	ROUTED TO	D53D54	182.	16.08	167.	80.	27.	9.99
+	HYDROGRAPH AT	D43	643.	12.33	74.	23.	8.	.50
+	DIVERSION TO	RD43	643.	12.33	66.	18.	6.	.50
+	HYDROGRAPH AT	DD43RE	105.	12.75	16.	5.	2.	.50
+	ROUTED TO	D43D54	44.	13.75	15.	5.	2.	.50
+	HYDROGRAPH AT	D54	338.	12.25	29.	8.	3.	.27
+	DIVERSION TO	RD54	67.	12.00	5.	2.	1.	.27
+	HYDROGRAPH AT	DD54RE	338.	12.25	26.	7.	2.	.27
+	3 COMBINED AT	CPD54	319.	12.25	178.	89.	30.	10.76

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION SRD27
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM				
PLAN 1	ELEVATION	1142.00	.00	.00				
	STORAGE	0.	0.	0.				
	OUTFLOW	52.	0.	0.				
	RATIO OF PMF	1.00	1147.38	1147.38	0.	582.	166.58	13.00
	MAXIMUM RESERVOIR W.S.ELEV							
	MAXIMUM DEPTH OVER DAM							
	MAXIMUM STORAGE AC-FT							
	MAXIMUM OUTFLOW CFS							
	DURATION OVER TOP HOURS							
	TIME OF MAX OUTFLOW HOURS							
	TIME OF FAILURE HOURS							
PLAN 2	ELEVATION	1142.00	.00	.00				
	STORAGE	0.	0.	0.				
	OUTFLOW	52.	0.	0.				
	RATIO OF PMF	1.00	1146.68	1146.68	0.	498.	166.58	13.00
	MAXIMUM RESERVOIR W.S.ELEV							
	MAXIMUM DEPTH OVER DAM							
	MAXIMUM STORAGE AC-FT							
	MAXIMUM OUTFLOW CFS							
	DURATION OVER TOP HOURS							
	TIME OF MAX OUTFLOW HOURS							
	TIME OF FAILURE HOURS							
PLAN 3	ELEVATION	1142.00	.00	.00				
	STORAGE	0.	0.	0.				
	OUTFLOW	52.	0.	0.				
	RATIO OF PMF	1.00	1146.52	1146.52	0.	478.	166.58	12.17
	MAXIMUM RESERVOIR W.S.ELEV							
	MAXIMUM DEPTH OVER DAM							
	MAXIMUM STORAGE AC-FT							
	MAXIMUM OUTFLOW CFS							
	DURATION OVER TOP HOURS							
	TIME OF MAX OUTFLOW HOURS							
	TIME OF FAILURE HOURS							
PLAN 4	INITIAL VALUE							
	SPILLWAY CREST							
	TOP OF DAM							

		ELEVATION	1142.00		.00		.00	
		STORAGE	0.		0.		0.	
		OUTFLOW	52.		0.		0.	
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	1.00	1146.39	1146.39	0.	463.	166.58	12.25	.00
PLAN 5			INITIAL VALUE	SPILLWAY CREST	TOP OF DAM			
		ELEVATION	1142.00	.00	.00			
		STORAGE	0.	0.	0.			
		OUTFLOW	52.	0.	0.			
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	1.00	1146.27	1146.27	0.	448.	166.58	12.25	.00
PLAN 6			INITIAL VALUE	SPILLWAY CREST	TOP OF DAM			
		ELEVATION	1142.00	.00	.00			
		STORAGE	0.	0.	0.			
		OUTFLOW	52.	0.	0.			
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	1.00	1146.11	1146.11	0.	429.	166.58	12.17	.00
PLAN 7			INITIAL VALUE	SPILLWAY CREST	TOP OF DAM			
		ELEVATION	1142.00	.00	.00			
		STORAGE	0.	0.	0.			
		OUTFLOW	52.	0.	0.			
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	1.00	1146.02	1146.02	0.	417.	166.58	12.25	.00
PLAN 8			INITIAL VALUE	SPILLWAY CREST	TOP OF DAM			
		ELEVATION	1142.00	.00	.00			
		STORAGE	0.	0.	0.			
		OUTFLOW	52.	0.	0.			
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	1.00	1145.96	1145.96	0.	411.	166.58	12.25	.00

*** NORMAL END OF HEC-1 ***

Client: Flood Control District of Maricopa County
 Project: FCD2008C014, WA#4 - Lower El Mirage Wash DCR, Phase 2
 Description: **Stage Storage Discharge Data - Preliminary Design of 6/30/11**
 AZTEC Project No.: AZE0913-04

Date: 6/28/11 By: D. Phelps
 Date: 6/30/11 Checked: M. Martinez

Stage - Discharge Data for West Cactus Basin

Stage (feet)	Water Surface Elevation	Discharge, in cfs			Storage Volume ac-ft
		Total	Culvert	Weir	
0	1106.6	0	0	0	0
0.4	1107	5	5	0	0.14
1.4	1108	10	10	0	2.2
2.4	1109	30	30	0	6.4
3.4	1110	60	60	0	14
4.4	1111	92	92	0	25
5.4	1112	127	127	0	37.3
6.4	1113	165	165	0	52.3
7.4	1114	195	195	0	70.7
7.7	1114.3	207	207	0	77
8	1114.6	213	213	0	82.5
8.4	1115	222	222	0	91.4
9.4	1116	242	242	0	113.6

Elevation datum = NAVD88

CONCEPT No 1

**Stage - Storage - Discharge Data for West Cactus Basin
 CODE into HEC-1**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SV	0	0.14	2.2	6.4	14	25	37.3	52.3	70.7	77
SV	82.5	91.4	113.6							
SQ	0	5	10	30	60	92	127	165	195	207
SQ	213	222	242							
SE	1106.6	1107	1108	1109	1110	1111	1112	1113	1114	1114.3
SE	1114.6	1115	1116							

Note: Storage data from preliminary grading dated 06/30/2011
 Outlet data for **1-60"** pipe (rating curve from culvert master).
 The storage volume includes level pool ponding for the channel
 area upstream of Cactus Road.

This is the preliminary design for the preferred concept.

OPERATION POINT: 100-yr Peak Qout = 182 cfs; Stage = 1113.6; Peak V = 64 ac-ft

Client: Flood Control District of Maricopa County
 Project: FCD2008C014, WA#4 - Lower El Mirage Wash DCR, Phase 2
 Description: **Concept Design -- Basin Volume (preliminary design of 6/30/11)**
 AZTEC Project No.: AZE0913-04

Date: 6/30/2011 By: D. Phelps Rough grading to set to minimize Commercial area acquisition
 Date: 7/12/2011 Chkd by: M. Martinez

Record of measured stage-storage data for West Cactus Basin
 Including level pool storage north of Cactus

Stage (feet)	Water Surface Elevation	Surface Area (acres)	Storage Volume	
			Incremental (ac-ft)	Cumulative (ac-ft)
0	1106.6	0.00	0.00	0.00
0.4	1107	1.03	0.14	0.14
1.4	1108	3.38	2.09	2.2
2.4	1109	5.12	4.22	6.4
3.4	1110	10.38	7.59	14.0
4.4	1111	11.64	11.00	25.0
5.4	1112	12.90	12.26	37.3
6.4	1113	17.11	14.95	52.3
7.4	1114	19.77	18.43	70.7
8.4	1115	21.60	20.68	91.4
9.4	1116	22.88	22.24	113.6

Including storage N of Cactus
 Including storage N of Cactus

Data source:
 Preliminary Design rough grading plan No 3 dated 6/30/2011
 NAVD 88

Record of measured stage-storage data for Level Pool North of Cactus Road

Stage (feet)	Water Surface Elevation	Surface Area (acres)	Storage Volume	
			Incremental (ac-ft)	Cumulative (ac-ft)
0	1109	0.00	0.00	0.00
1	1110	0.51	0.17	0.17
2	1111	1.14	0.81	0.98
3	1112	1.77	1.44	2.42
4	1113	2.58	2.16	4.58
5	1114	3.40	2.98	7.56
6	1115	4.53	3.95	11.52
7	1116	5.67	5.09	16.60

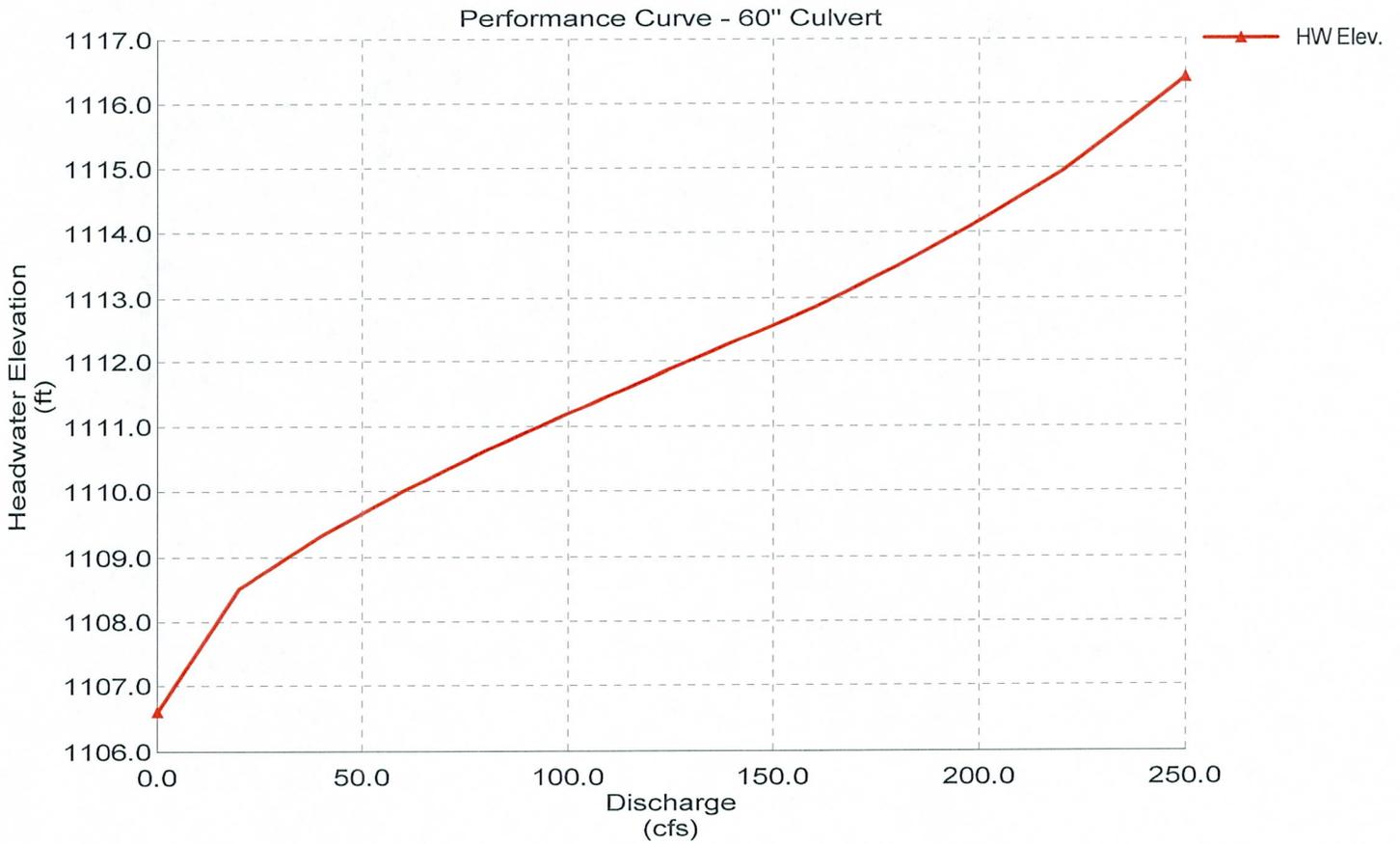
Data source:
 Detailed Mapping provided by AeroTech Mapping (3/22/10).
 Vertical Datum = NAVD 88 Aerial Date = 3/22/2008.

Performance Curves Report

El Mirage Rd

Range Data:

Discharge	Minimum	Maximum	Increment
	0.00	250.00	20.00 cfs



Culvert Analysis Report

Culvert-1

60 inch culvert

Culvert Summary

Computed Headwater Elev.	1,114.18 ft	Discharge	200.00 cfs
Inlet Control HW Elev.	1,114.08 ft	Tailwater Elevation	1,108.50 ft
Outlet Control HW Elev.	1,114.18 ft	Control Type	Outlet Control
Headwater Depth/Height	1.52		

Grades

Upstream Invert	1,106.60 ft	Downstream Invert	1,106.50 ft
Length	125.00 ft	Constructed Slope	0.000800 ft/ft

Hydraulic Profile

Profile	CompositeM2PressureProfile	Depth, Downstream	4.04 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	4.04 ft
Velocity Downstream	11.77 ft/s	Critical Slope	0.006063 ft/ft

Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	60 inch	Rise	5.00 ft
Number Sections	1		

Outlet Control Properties

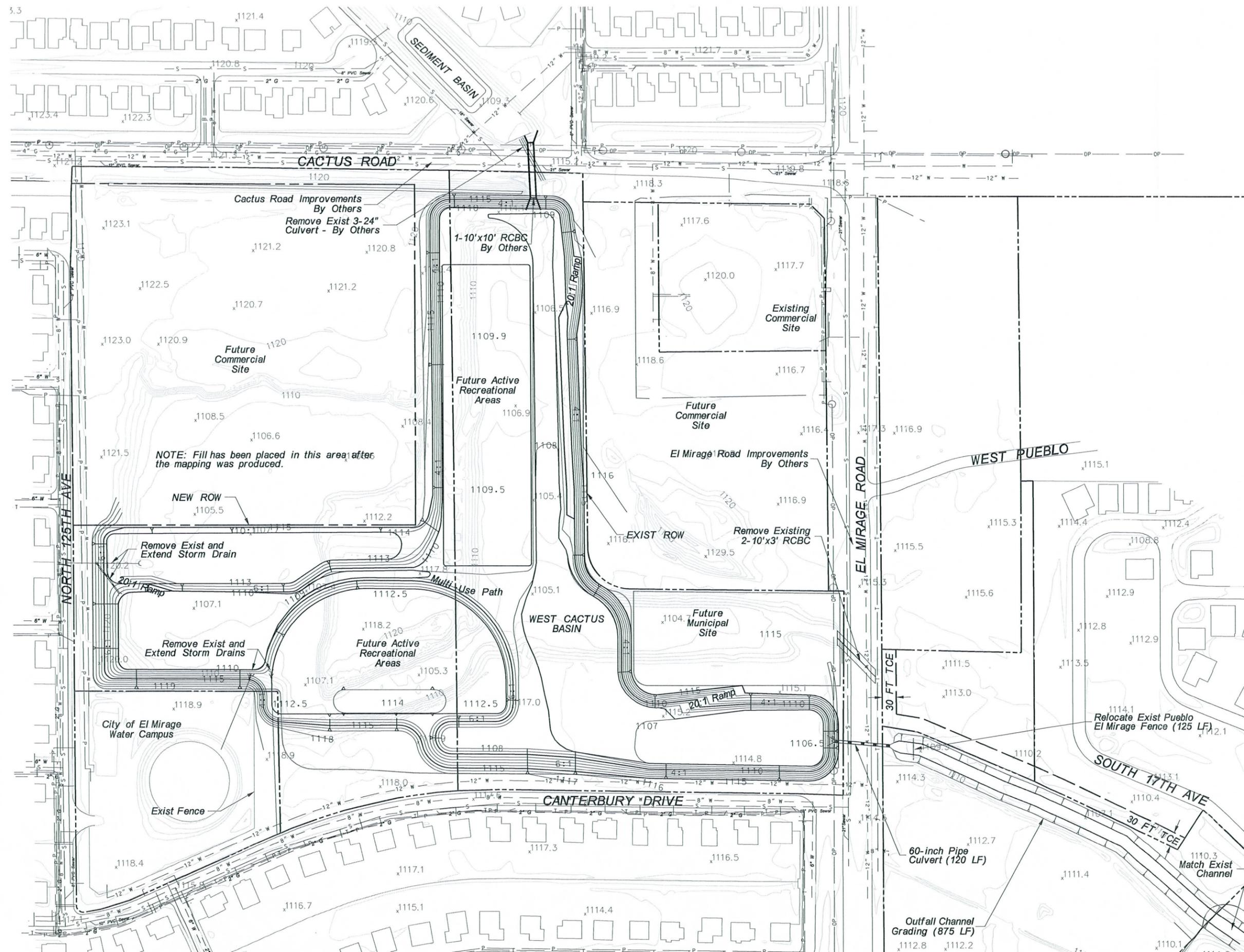
Outlet Control HW Elev.	1,114.18 ft	Upstream Velocity Head	1.61 ft
Ke	0.50	Entrance Loss	0.81 ft

Inlet Control Properties

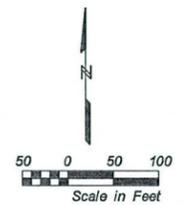
Inlet Control HW Elev.	1,114.08 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	19.6 ft ²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		



LOWER EL MIRAGE WASH DCR
Phase 2
Analysis and Recommendations
FCD 2008C014 WA #4



NOTE: Fill has been placed in this area after the mapping was produced.



August 25, 2011

AZTEC
 TYPSA Group www.aztec.us
 4561 E. McDowell Road
 Phoenix, AZ 85008-4505
 Tel (602) 454-0402
 Fax (602) 454-0403

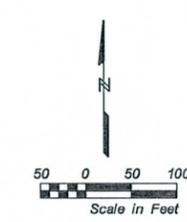
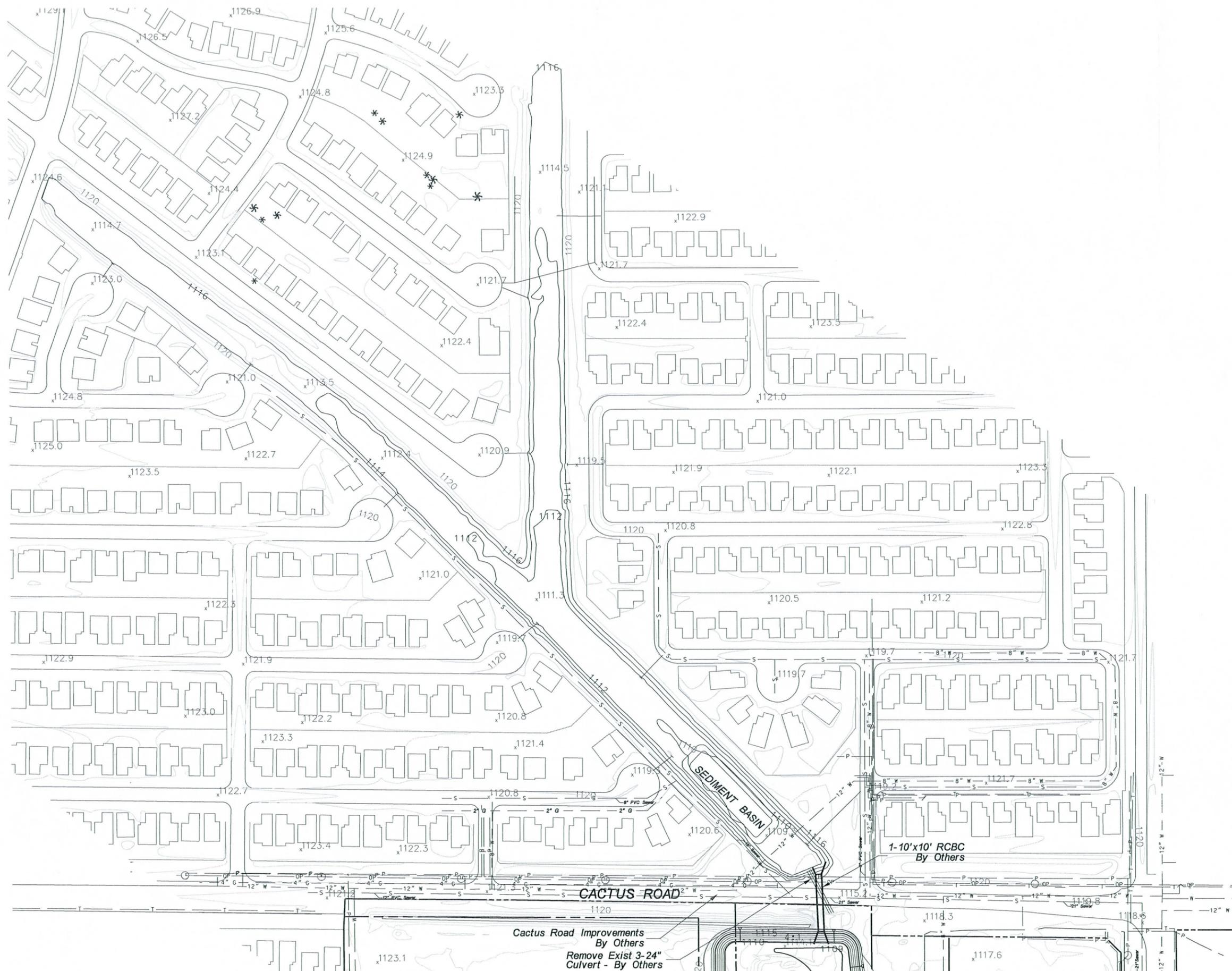
EXHIBIT C3
DESIGN CONCEPT GRADING CONTOURS
Used for HEC-1 Stage-Storage

8/22/2011 2:02:56 PM



LOWER EL MIRAGE WASH DCR

Phase 2
Analysis and Recommendations
FCD 2008C014 WA #4



August 25, 2011

AZTEC
 TYPSA Group www.aztec.us
 www.tyrsa.es

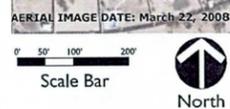
4561 E. McDowell Road
 Phoenix, AZ 85008-4505
 Tel (602) 454-0402
 Fax (602) 454-0403

EXHIBIT C4
Existing Contours Showing Storage Volume
North of Cactus Road

8/19/2011 4:28:30 PM

APPENDIX D

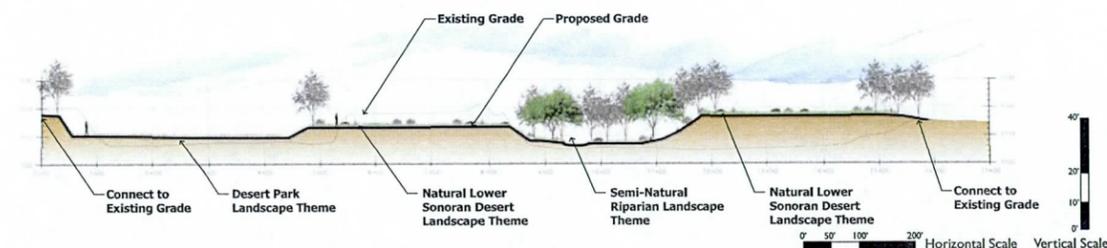
Preliminary Concept Drawings and Color Renderings



Flood Control Improvements

Preliminary Estimated Construction Costs

\$2,600,000



Elevation of Flood Control Improvements

FLOOD CONTROL FEATURES

- Provide Adequate Culvert Size at Cactus Road
- Eliminate Flow Overtopping Cactus Road
- Minimize Erosion Potential at Cactus Road
- Eliminate Standing Water in Basin
- Reduce 100-yr Flooding Inundation Area Downstream
- Reduce Flow Constriction of Security Fence East of El Mirage Road
- Enhancement of Local Community Landscape Aesthetics

CONCEPT 1 DISTINGUISHING FEATURES

- Sediment Basin
- Minimizes El Mirage Road Culvert Length
- Provides Open Space Separation Between Residential Neighborhood and Municipal Space

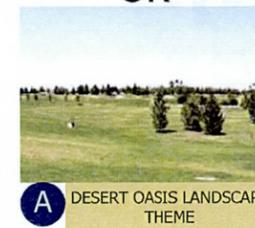
LANDSCAPE AESTHETICS & MULTI-USE FEATURES

- Provides a Variety of Attractive Landscape Open Spaces that Emphasizes the Desert Park and/or Desert Oasis Landscape Themed Areas



OR

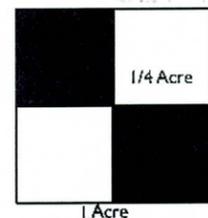
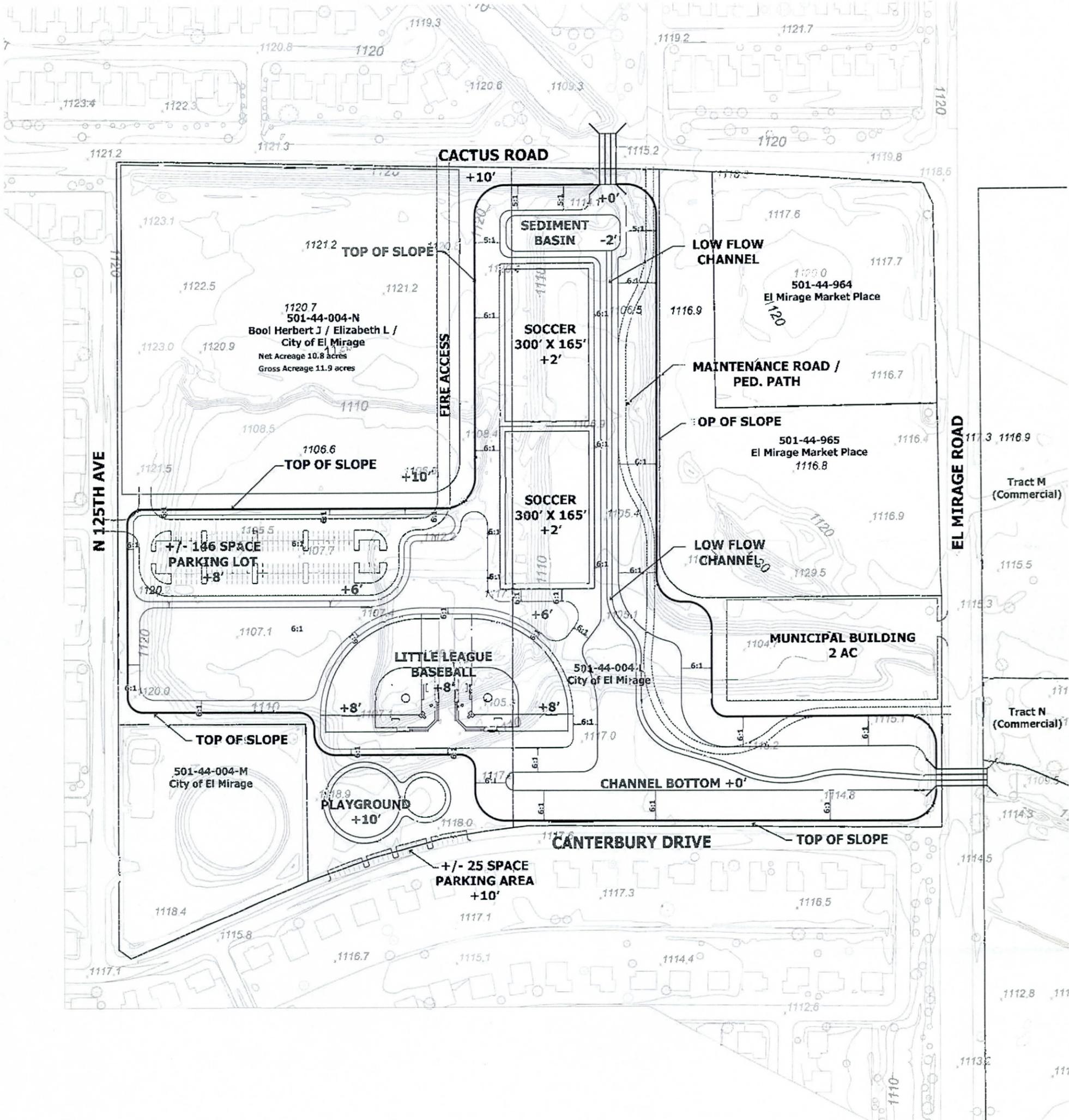
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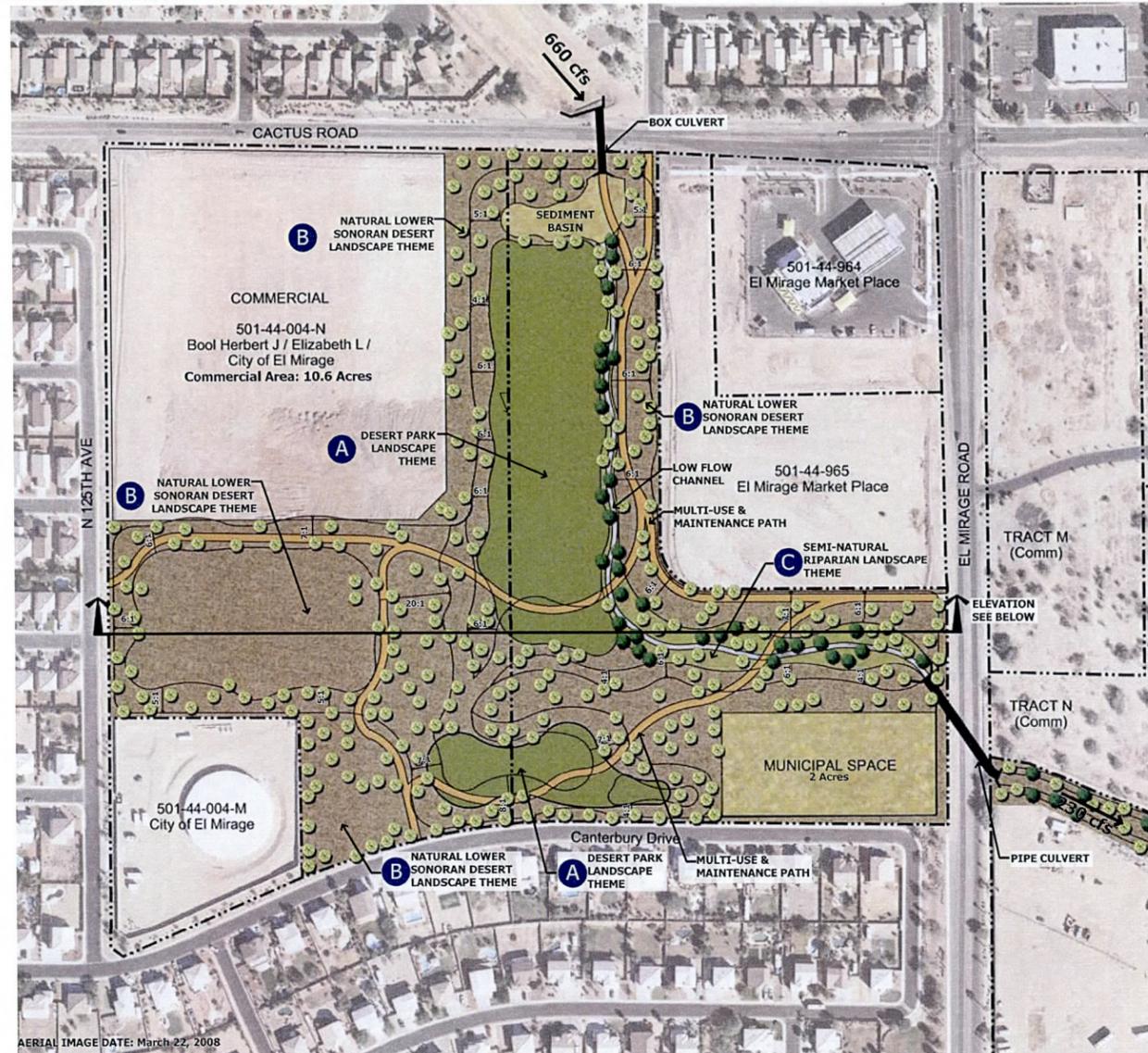


- Provides Opportunities for Informal Passive Recreation Activities
- Provides Pedestrian Connectivity Between Residential and Commercial Areas.

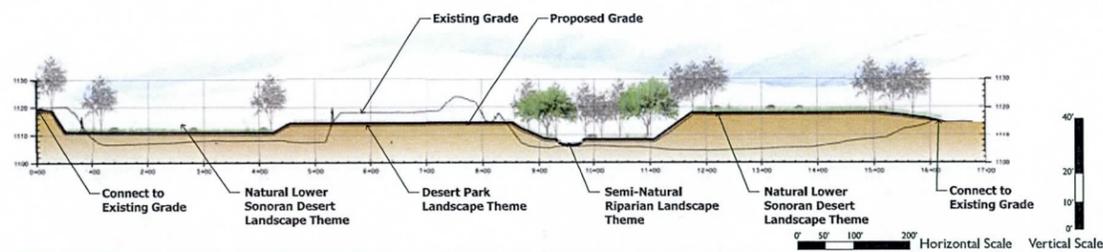
Lower El Mirage Wash

Concept 1





Flood Control Improvements Preliminary Estimated Construction Costs **\$2,350,000**



Elevation of Flood Control Improvements

FLOOD CONTROL FEATURES

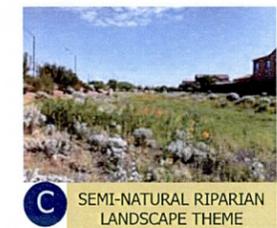
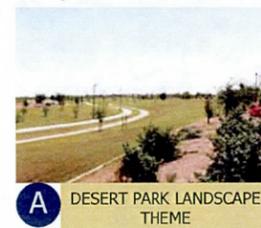
- Provide Adequate Culvert Size at Cactus Road
- Eliminate Flow Overtopping Cactus Road
- Minimize Erosion Potential at Cactus Road
- Eliminate Standing Water in Basin
- Reduce 100-yr Flooding Inundation Area Downstream
- Reduce Flow Constriction of Security Fence East of El Mirage Road
- Enhancement of Local Community Landscape Aesthetics

CONCEPT 2 DISTINGUISHING FEATURES

- Sediment Basin
- New El Mirage Road Culvert (Longer than other Concepts)
- Does Not Provide Open Space Separation Between Residential Neighborhood and Municipal Space

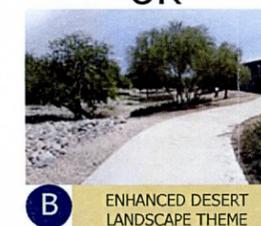
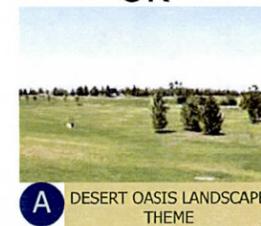
LANDSCAPE AESTHETICS & MULTI-USE FEATURES

- Provides a Variety of Attractive Landscape Open Spaces that Emphasizes the Three Distinct Areas of Desert Park and/or Desert Oasis, Enhanced Natural Riparian and Semi-Natural and or/Enhanced Desert Landscape Themed Areas



OR

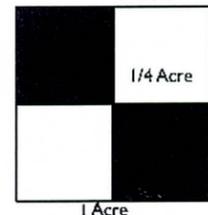
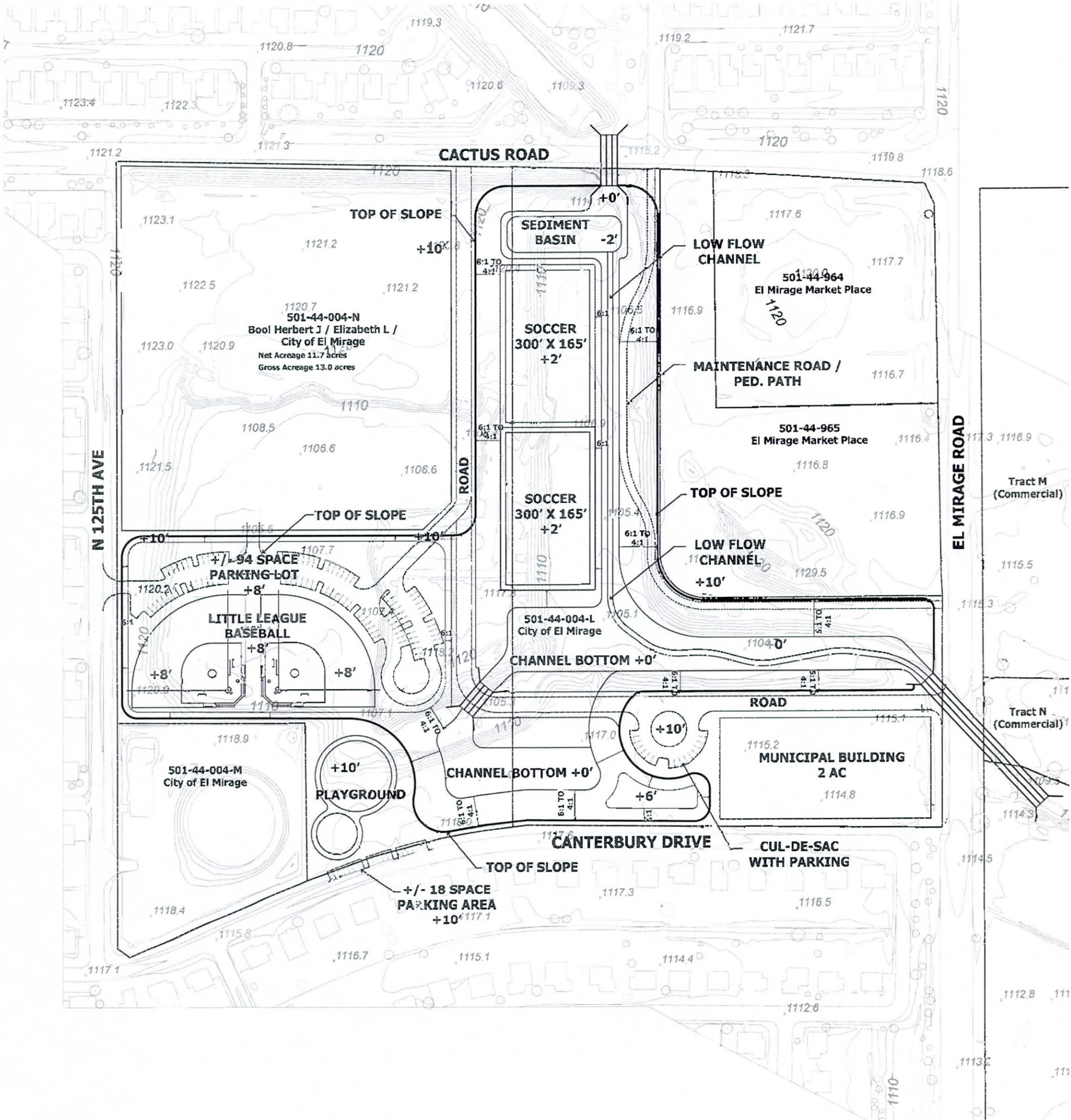
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- Provides Opportunities for Informal Passive Recreation Activities
- Provides Pedestrian Connectivity Between Residential and Commercial Areas.

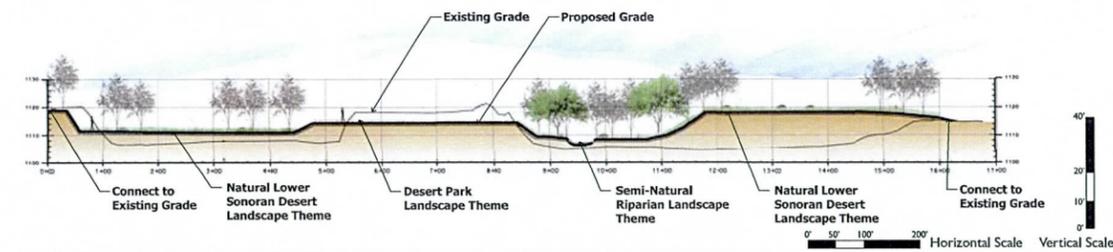
Lower El Mirage Wash

Concept 2





Flood Control Improvements Preliminary Estimated Construction Costs **\$2,850,000**



Elevation of Flood Control Improvements

FLOOD CONTROL FEATURES

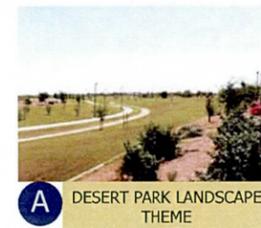
- Provide Adequate Culvert Size at Cactus Road
- Eliminate Flow Overtopping Cactus Road
- Minimize Erosion Potential at Cactus Road
- Eliminate Standing Water in Basin
- Reduce 100-yr Flooding Inundation Area Downstream
- Reduce Flow Constriction of Security Fence East of El Mirage Road
- Enhancement of Local Community Landscape Aesthetics

CONCEPT 3 DISTINGUISHING FEATURES

- No Sediment Basin
- Minimizes El Mirage Road Culvert Length
- Provides Open Space Separation Between Residential Neighborhood and Municipal Space

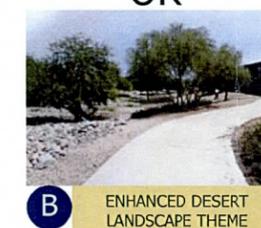
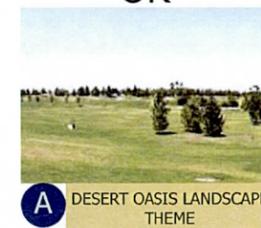
LANDSCAPE AESTHETICS & MULTI-USE FEATURES

- Provides a Variety of Attractive Landscape Open Spaces that Emphasizes a Larger Linear Enhanced Natural Riparian Corridor and Provides Connectivity to Adjacent Desert Park and/or Oasis and Semi-Natural and/or Enhanced Desert Landscape Themed Areas



OR

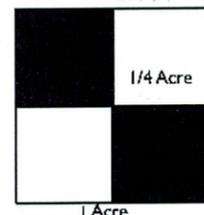
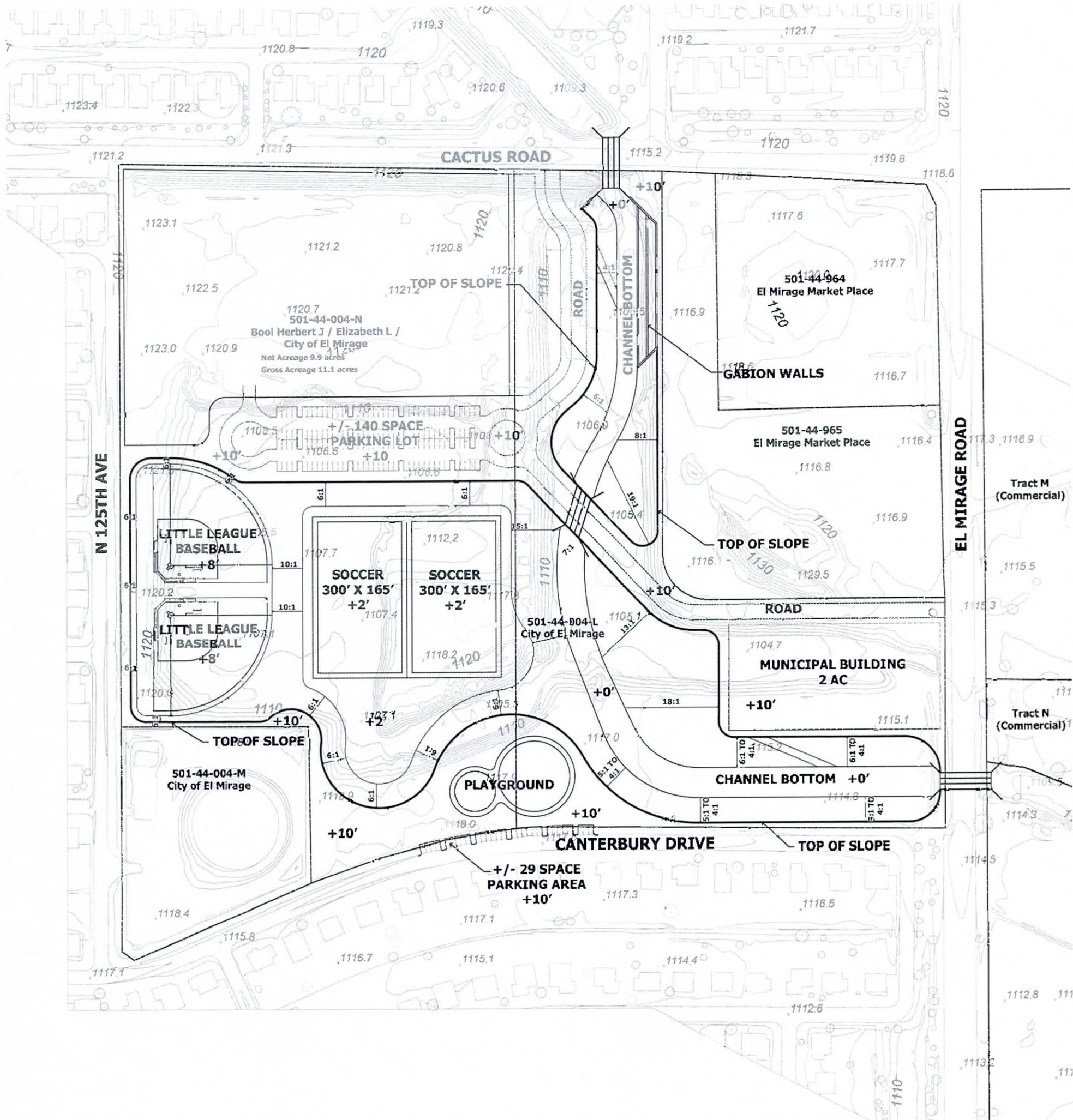
OR



- Provides Opportunities for Informal Passive Recreation Activities
- Provides Pedestrian Connectivity Between Residential and Commercial Areas.

Lower El Mirage Wash

Concept 3



APPENDIX E

Cost Estimates

DESIGN CONCEPT - COST ANALYSIS

Lower El Mirage Wash - Design Concept Report, Phase 2
 Flood Control District of Maricopa County
Recommended Concept: West Cactus Basin Improvements

August 17, 2011
 Contract FCD 2008C014
 Work Assignment No. 4

Major Construction Items:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Cactus Road Box Culvert (1-10'wide x 10' tall x 115 LF)	\$93,550	LS	1	\$93,550
2	El Mirage Road Culvert (1-60" pipe), including HDWLs	\$180.00	LF	120	\$21,600
3	Earthwork - basin excavation	\$3.00	CY	91,000	\$273,000
4	Earthwork - basin compacted fill (basin area)	\$2.75	CY	72,000	\$198,000
5	Earthwork - basin compacted fill (commercial area)	\$2.75	CY	21,000	\$57,750
6	Earthwork - Import Material	\$10.00	CY	0	\$0
7	Earthwork - channel excavation	\$3.25	CY	2,000	\$6,500
8	Multi Use Path - concrete surface	\$4.00	SF	59,400	\$237,600
9	Basin treatment - grass turf & irrigation	\$1.25	SF	249,086	\$311,358
10	Basin treatment - gravel mulch	\$0.45	SF	216,089	\$97,240
11	Basin treatment - hydro seed	\$4,500	acre	10.6	\$47,700
12	Basin Landscaping treatment - tall pot trees	\$5,000	acre	25.0	\$125,000
13	Pueblo El Mirage Channel treatment - hydro seed	\$4,500	acre	1.3	\$5,850
14	Relocate Pueblo El Mirage Fence	\$10,000	LS	1	\$10,000
15	Remove and dispose of 2-10'x3' El Mirage RCBC	\$52,200	LS	1	\$52,200
15	Remove and dispose of 3-24" Cactus Road culvert	\$10.00	LF	270	\$2,700
16	Remove and dispose of concrete irrigation ditch	\$7.00	LF	230	\$1,610
SUBTOTAL					\$1,541,658

CONTINGENCIES:

Administration:	8%	\$123,333
Construction and Engineering:	25%	\$385,414

Sub Total for Major Construction Items: \$2,050,405

Land Acquisition:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT	
1	TCE*, 30 ft wide within private Tract N	0.33 Acres	\$0.11	SF	14,375	\$1,617
2	TCE*, 30 ft wide within private Tract M	0.24 Acres	\$0.11	SF	10,454	\$1,176
3	Parcel 501-44-004-N (50/50 split)	1.30 Acres	\$2.25	SF	56,628	\$127,413
SUBTOTAL					\$130,206	

* TCE, Temporary Construction Easement

CONTINGENCIES:

Engineering, Legal & Administration:	30%	\$39,062
--------------------------------------	-----	----------

Sub Total for Land Acquisition: \$169,268

TOTAL Estimate: \$2,219,673
(rounded up) \$ 2,300,000

TABLE E1

PRELIMINARY CONCEPT COST ANALYSIS

Lower El Mirage Wash - Design Concept Report, Phase 2

Flood Control District of Maricopa County

Concept 1: West Cactus Basin Improvements

The TOTAL cost documented below was reported to City Council on 3/23/2011

March 24, 2011

Contract FCD 2008C014

Work Assignment No. 4

Major Construction Items:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Cactus Road Box Culvert (1-10'wide x 10' tall x 130 LF)	\$104,965	LS	1	\$104,965
2	El Mirage Road Culvert (1-60" pipe), including HDWLs	\$180.00	LF	110	\$19,800
3	Earthwork - basin excavation	\$3.00	CY	95,765	\$287,295
4	Earthwork - basin compacted fill	\$2.75	CY	94,594	\$260,134
5	Earthwork - Import Material	\$10.00	CY	0	\$0
6	Earthwork - channel excavation	\$3.25	CY	3,500	\$11,375
7	Multi Use Path - concrete surface	\$4.00	SF	61,950	\$247,800
8	Basin treatment - grass turf & irrigation	\$1.25	SF	261,378	\$326,723
9	Basin treatment - gravel mulch	\$0.45	SF	398,936	\$179,521
10	Basin treatment - hydro seed	\$4,500	acre	16.8	\$75,600
11	Channel treatment - hydro seed	\$4,500	acre	1.8	\$8,100
12	Landscaping treatment - tall pot trees	\$5,000	acre	25.0	\$125,000
13	Relocate Pueblo El Mirage Fence	\$10,000	LS	1	\$10,000
14	Remove and dispose of 2-10'x3' El Mirage RCBC	\$52,200	LS	1	\$52,200
15	Remove and dispose of 3-24" Cactus Road culvert	\$10.00	LF	270	\$2,700
SUBTOTAL					\$1,711,212
<u>CONTINGENCIES:</u>					
				Administration:	8% \$136,897
				Construction and Engineering:	25% \$427,803
Sub Total for Major Construction Items:					\$2,275,912

Land Acquisition:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Land acquisition (50/50 split) 3.6 Acres	\$1.50	SF	156,816	\$235,224
SUBTOTAL					\$235,224
<u>CONTINGENCIES:</u>					
				Engineering, Legal & Administration:	30% \$70,567
Sub Total for Land Acquisition:					\$305,791
TOTAL Estimate:					\$2,581,703

TABLE E2

PRELIMINARY CONCEPT COST ANALYSIS

Lower El Mirage Wash - Design Concept Report, Phase 2

Flood Control District of Maricopa County

Concept 2: West Cactus Basin Improvements

The TOTAL cost documented below was reported to City Council on 3/23/2011

March 24, 2011

Contract FCD 2008C014

Work Assignment No. 4

Major Construction Items:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Cactus Road Box Culvert (1-10'wide x 10' tall x 130 LF)	\$104,965	LS	1	\$104,965
2	El Mirage Road Culvert (1-60" pipe), including HDWLs	\$180.00	LF	225	\$40,500
3	Earthwork - basin excavation	\$3.00	CY	75,463	\$226,389
4	Earthwork - basin compacted fill	\$2.75	CY	71,062	\$195,421
5	Earthwork - Import Material	\$10.00	CY	0	\$0
6	Earthwork - channel excavation	\$3.25	CY	3,500	\$11,375
7	Multi Use Path - concrete surface	\$4.00	SF	61,880	\$247,520
8	Basin treatment - grass turf & irrigation	\$1.25	SF	218,068	\$272,585
9	Basin treatment - gravel mulch	\$0.45	SF	414,774	\$186,648
10	Basin treatment - hydro seed	\$4,500	acre	18.9	\$85,050
11	Channel treatment - hydro seed	\$4,500	acre	1.8	\$8,100
12	Landscaping treatment - tall pot trees	\$5,000	acre	26.1	\$130,500
13	Relocate Pueblo El Mirage Fence	\$10,000	LS	1	\$10,000
14	Remove and dispose of 2-10'x3' El Mirage RCBC	\$52,200	LS	1	\$52,200
15	Remove and dispose of 3-24" Cactus Road culvert	\$10	LS	270	\$2,700
SUBTOTAL					\$1,573,953
<u>CONTINGENCIES:</u>					
				Administration:	8% \$125,916
				Construction and Engineering:	25% \$393,488
Sub Total for Major Construction Items:					\$2,093,357

Land Acquisition:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Land acquisition (50/50 split)	\$1.50	SF	121,968	\$182,952
SUBTOTAL					\$182,952
<u>CONTINGENCIES:</u>					
				Engineering, Legal & Administration:	30% \$54,886
Sub Total for Land Acquisition:					\$237,838
TOTAL Estimate:					\$2,331,195

TABLE E3

PRELIMINARY CONCEPT COST ANALYSIS

Lower El Mirage Wash - Design Concept Report, Phase 2

Flood Control District of Maricopa County

Concept 3: West Cactus Basin Improvements

The TOTAL cost documented below was reported to City Council on 3/23/2011

March 24, 2011

Contract FCD 2008C014

Work Assignment No. 4

Major Construction Items:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Cactus Road Box Culvert (1-10'wide x 10' tall x 130 LF)	\$104,965	LS	1	\$104,965
2	El Mirage Road Culvert (1-60" pipe), including HDWLs	\$180.00	LF	110	\$19,800
3	Earthwork - basin excavation	\$3.00	CY	91,440	\$274,320
4	Earthwork - basin compacted fill	\$2.75	CY	103,320	\$284,130
5	Earthwork - Import Material	\$10.00	CY	11,880	\$118,800
6	Earthwork - channel excavation	\$3.25	CY	3,500	\$11,375
7	Multi Use Path - concrete surface	\$4.00	SF	60,200	\$240,800
8	Basin treatment - grass turf & irrigation	\$1.25	SF	222,980	\$278,725
9	Basin treatment - gravel mulch	\$0.45	SF	397,775	\$178,999
10	Basin treatment - hydro seed	\$4,500	acre	17.5	\$78,750
11	Channel treatment - hydro seed	\$4,500	acre	1.8	\$8,100
12	Landscaping treatment - tall pot trees	\$5,000	acre	26.4	\$132,000
13	Relocate Pueblo El Mirage Fence	\$10,000	LS	1	\$10,000
14	Remove and dispose of 2-10'x3' El Mirage RCBC	\$52,200	LS	1	\$52,200
15	Remove and dispose of 3-24" Cactus Road culvert	\$10	LS	270	\$2,700
SUBTOTAL					\$1,795,664

CONTINGENCIES:

Administration:	8%	\$143,653
Construction and Engineering:	25%	\$448,916

Sub Total for Major Construction Items: \$2,388,233

Land Acquisition:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Land acquisition (50/50 split)	\$1.50	SF	230,868	\$346,302
SUBTOTAL					\$346,302

CONTINGENCIES:

Engineering, Legal & Administration:	30%	\$103,891
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Sub Total for Land Acquisition: \$450,193

TOTAL Estimate: \$2,838,425

APPENDIX F

**Landscape Design Themes, Landscape Planting Palette and
Landscape Materials Palette**



FLOOD PROTECTION STRUCTURE TYPES

Introduction

Preservation of the natural landscapes of Maricopa County and protection of local community character are primary objectives of the Flood Control District's Board approved Policy for the Landscaping and Aesthetic Treatment of Flood Control Structures. The development of context sensitive flood mitigation solutions that protect and enhance open spaces, recreation, biological, and cultural resource environments of Maricopa County are also important goals that are an integral part of carrying out the District's overall mission.

The identification and selection of flood protection structure types that have the potential to be context sensitive with the environments in which they are placed is an important early step in District planning studies. This handbook is intended to serve as a guide to assist in the identification and selection of

flood control structure types that have the potential to be context sensitive with the valued characteristics of the scenery, recreation and open space environments of Maricopa County. Future updates of this handbook will include guidelines for the identification and selection of flood protection structure types that are context sensitive with the biological and cultural resource environments of Maricopa County.

Six Flood Control Structure Types that are frequently considered, evaluated and recommended in District Area Drainage and Watercourse Master Planning studies, Project Pre-designs and Final Designs are listed in Table 1 below.

Table 1 Flood Protection Structure Types and their Potential to Achieve Context Sensitivity with the Landscape Settings of Maricopa County

Flood Protection Structure Types	Potential Magnitude of Landscape Alteration	Potential to Achieve Context Sensitivity
Non-Structural Underground Pipe Channel Levee Conveyance Channel Storage Basin Flood Retarding Structure or Dam	Lowest ↓ Highest	Highest ↓ Lowest

These structure types vary in their physical and visual characteristics and, hence, their ability to complement the variety of landscape settings, open spaces and recreation environments found within Maricopa County. The above structure types are arrayed as a spectrum according to their overall

potential to modify and achieve context sensitivity with the landscape settings commonly found within Maricopa County. Within this spectrum, the Non-structural and Underground Pipe structure types have the highest potential for achieving context sensitivity with a majority of the landscape settings in Maricopa County. The Levee and Conveyance Channel structure types generally have an intermediate potential, whereas the Storage Basin and Flood Retarding structure types tend to have the lowest potential for achieving context sensitivity with a majority of the landscape settings in Maricopa County.

The physical dimension or "scale" of the structure types relative to the size of the features in the surrounding landscape setting also influences the perceived ability of flood control structures to achieve context sensitivity

with the visual environments in which they are placed. The size and depth of large scale flood control structures can appear to be visually overwhelming and out of context with landscape settings comprised of small scale features. For this reason, the Levee, Conveyance Channel, Storage Basin and Flood Retarding structure types are further stratified into three structure type scale sub-classes. The three scale sub-classes include:

- Small Scale Structures
- Medium Scale Structures
- Large Scale Structures

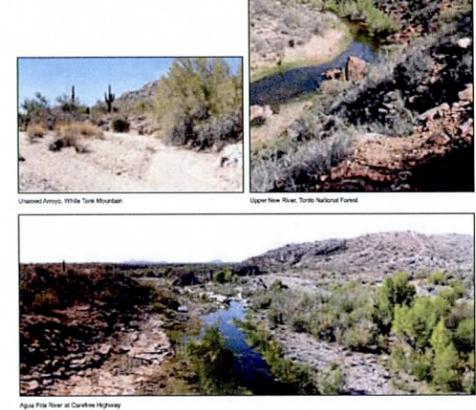
The physical dimensions of the structure types associated with each Scale Sub-Class are summarized in Table 2.

Table 2 Flood Protection Structure Types Scale Sub-Classes

Structure Type	Scale Sub-Class	Physical Dimension
Non-Structural	NA	NA
Underground Pipe	NA	NA
Channel Levee	Small	Up to 5 ft. height and up to 25 ft. width
	Medium	5-10 ft. height and 25-100 ft. width
	Large	10+ ft. height and 100 ft. + width
Conveyance Channel	Small	Up to 5 ft. depth and up to 25 ft. width
	Medium	5-8 ft. depth and 25-100 ft. width
	Large	8 ft. + depth and 100 ft. + width
Storage Basin	Small	Up to 8 ft. depth and 5 acres in size
	Medium	Up to 8 ft. depth (60%), up to 15 ft. depth (40%) and 5-20 acres in size
	Large	15+ ft. depth and 20+ acres in size
Dam	Small	Up to 10 ft. high and up to 1 mile in total length
	Medium	10-15 ft. high and 1-2 miles in total length
	Large	15+ feet height and 2+ miles in total length

Non-Structural Method

The Non-Structural Structure Type is representative of flood protection of flood plain elements and is characterized by an absence of structural elements or features for flood protection or other purposes. Exceptions may include low standard road facilities for flood plain monitoring and administrative purposes and low impact facilities to support passive recreation activities, public information/education, and natural resource restoration and management. Typically, this structure type is implemented through a variety of local ordinances, County floodplain regulations, State statutes and Federal regulations. Natural topographic features such as rivers, washes, arroyos, channels, valleys and ridges perform the functions of storm water conveyance, storage and retention. Since the visual character of the landscape is usually preserved under this structure type, it will usually complement and become context sensitive with the visual character of most landscape settings.

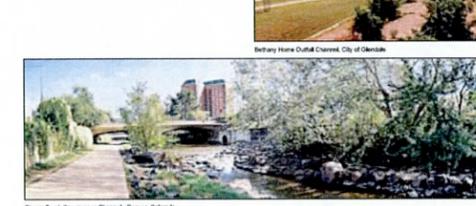


Conveyance Channel

The conveyance channel structure type includes all types of constructed earthen and hard lined open channel structures that serve the purpose of conveying storm waters. The major structural components of this structure type include the channel bottom, side slopes and overbank area, the latter of which typically includes a maintenance road and landscape setback (buffer) area. The overall form of the conveyance channel structure type typically appears in the landscape as a concave linear flat bottomed trough with either a geometric or organic shape. The interior side slopes of this structure type can vary from vertical to gently sloping. This structure type typically includes a variety of ancillary structural features which can include inlets, outlets, weirs, grade control structures, energy dissipaters and low flow channels. The length and width of these structures can vary significantly. The overall visual prominence of the conveyance channel structure type ranges from moderately low to moderate based upon their size and interior position in the landscape. The conveyance channel structure type is context sensitive with a moderate range of landscape settings, recreation and open space environments in Maricopa County.

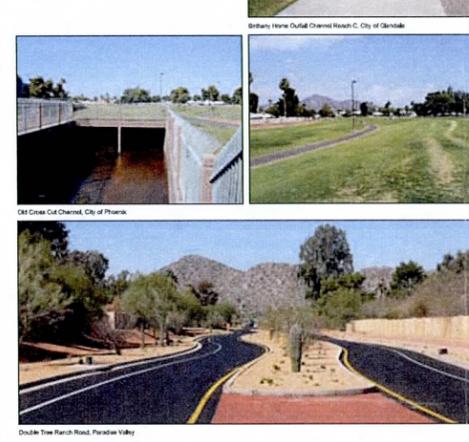
The conveyance channel structure type is further stratified into scale sub-classes to better define their context sensitivity with the visual, recreation and open space environments of Maricopa County. The scale sub-classes for this structure type include the following:

- Small Scale Conveyance Channels: Up to 5 ft. depth and up to 25 ft. width
- Medium Scale Conveyance Channels: 5-8 ft. depth and up to 25-100 ft. width
- Large Scale Conveyance Channels: 8 ft. + depth and up to 100 ft. + width



Underground Pipe

The underground pipe structure type includes construction of all types of buried conduit conveyance structures. The overall form of this structure type is linear. Visible landscape disturbances result from this structure type are usually limited to the introduction of linear lines and patterns into the landscape setting. With sufficient right of way, the visibility of these disturbances often can be minimized through vegetation restoration and application of landscape architectural design principles. Consequently, this structure type is typically low in visual prominence and is able to achieve context sensitivity with a wide range of landscape settings, recreation and open space environments in Maricopa County. This structure type also provides opportunities for linear parks, trails, open space connectivity and spatial separation of local communities.



Channel Levee

The channel levee structure type includes earthen and hard structural embankments, dikes and vertical flood walls for controlling flood waters adjacent to a watercourse. The channel levee structure type is seen as a linear protrusion with a geometric or organic convex form in the landscape. Since this structure type is usually limited to a height of six feet or less, its visual prominence in the landscape is most often moderately low. This structure type, therefore, is context sensitive with a moderate range of landscape settings, recreation and open space environments in Maricopa County.

Channel Levees may be constructed either as stand alone structures or in combination with a constructed conveyance channel. When constructed as stand alone structures, channel levees can provide opportunities for preservation of natural river and wash floodplains situated below the levee. When they are constructed as an integral part of a conveyance channel, the levee structure is likely to appear as a vertical extension of the channel side slopes above the natural grade of the landscape.

The Channel Levee structure type is further stratified into three scale sub-classes to better define their potential context sensitivity with the landscape settings, recreation and open space environments in Maricopa County. The three scale sub-classes include:

- Small Scale Channel Levees: Up to 6 ft. height and up to 25 ft. width
- Medium Scale Channel Levees: 6-10 ft. height and 25-100 ft. width
- Large Scale Channel Levees: 10+ ft. height and 100 ft. + width



Storage Basin

The storage basin structure type includes all types of earthen and hardened open flood water storage basins that are commonly found throughout metropolitan areas of Maricopa County.

The major structural components of this structure type include a large bottom area, side slopes and an overbank area that typically contains a maintenance road facility and landscape setback area. Storage basin structures typically appear as a large concave depression or hollow with either a geometric or organic form in the landscape. Ancillary features often include a low flow channel, inlets, weirs, energy dissipaters, outlets and riser structures. The overall size of these structure types can vary significantly. The visual prominence of these structures typically ranges from moderately high to high due to their apparent size and extent. The storage basin structure type is context sensitive with a limited range of landscape settings, recreation and open space environments in Maricopa County.

The storage basin structure type is further stratified into scale sub-classes to better define their context sensitivity with the visual, recreation and open space environments of Maricopa County. The scale sub-classes for this structure type include the following:

- Small Scale Storage Basins: Up to 8 ft. depth 5 acres in size
- Medium Scale Storage Basins: Up to 8 ft. depth (60%), up to 15 ft. depth (40%) 5-20 acres in size
- Large Scale Storage Basins: 15+ ft. depth 20+ acres in size



Dam

The dam structure type includes all types of earthen and hardened flood retarding structures that are designed to retard and temporarily store storm waters. The major structural components of this structure type include the dam embankment, pool reservoir, principle outlet, emergency spillway.

The dam structure type usually appears in the landscape as an extended linear protrusion with either a geometric or organic convex form. It is similar in overall form to the channel levee structure type but its physical dimension is usually much larger. Ancillary structures include principal and emergency spillways, outlets, and riser structures. Dam structures that are owned and operated by the District are typically situated in the landscape along the cusp between the lower bajada and the valley plain and are usually viewed against the backdrop of isolated mountain ranges that are found throughout the Sonoran Desert in Maricopa County. The visual prominence of these structures is typically high due to the scale and magnitude of their protrusion form. The dam structure type is context sensitive with a limited range of landscape settings, recreation and open space environments in Maricopa County.

The Dam structure type is further stratified into scale sub-classes to better define their context sensitivity with the visual, recreation and open space environments of Maricopa County. The scale sub-classes for this structure type include the following:

- Small Scale Dams: Up to 10 ft. high 1 mile or less in total length
- Medium Scale Dams: 10-15 ft. high 1-2 miles in total length
- Large Scale Dams: 15+ feet height and 2+ miles in total length





FLOOD PROTECTION STRUCTURAL METHODS

Introduction

Preservation of the natural landscapes of Maricopa County and protection of local community character are primary objectives of the Flood Control District's Board approved Policy for Landscaping and Aesthetic Treatment of Flood Control Facilities. These objectives are accomplished by planning and designing flood protection facilities to complement the positive visual characteristics of the landscape settings in which they are located.

The District routinely evaluates and implements a variety of non-structural and structural methods for providing flood protection in Area Drainage and Watercourse Master Planning, Project Pre-Design and Final Design. Listed below are six of the most commonly applied methods by the Flood Control District of Maricopa County.

- Non-Structural Method
- Soft Structural Method
- Semi-Soft Structural Method
- Hard Structural Method with Aesthetic Treatment
- Semi-Hard Structural Method
- Hard Structural Method

These flood protection structural methods vary in their physical and visual characteristics and their relative ability to complement or enhance the visual character of the landscape settings found in Maricopa County. The above flood protection structural methods are arrayed as a spectrum according to their visual character and potential for achieving context sensitivity with the landscapes of Maricopa County (refer to Tables 1 and 2).

The identification and selection of flood protection structural methods that have the potential to complement the visual character of the landscape settings in which they will be constructed, therefore, is a key first step towards developing flood protection solutions that will be context sensitive with the visual environment and meet the goals of the District's aesthetic treatment policy.

Following are brief descriptions and photo examples for each of the flood protection structural methods identified above. They are presented here to provide a better understanding of their visual characteristics, potential to achieve context sensitivity with the visual environments of Maricopa County, and their use in flood protection method landscape compatibility assessments.

Table 1

Flood Protection Methods	Super Structure				Structural Components				
	None	Earthen		Hard		None	Concealed or Buried	Aesthetic Treatment Applied	Standard Engineering Design
		With Aesthetic Treatment	Without Aesthetic Treatment	With Aesthetic Treatment	Without Aesthetic Treatment				
Non Structural	X					X			
Soft Structural		X				X			
Semi-Soft Structural		X					X		
Hard Structural Method with Aesthetic Treatment				X			X		
Semi-Hard Structural			X					X	
Hard Structural					X				X

Table 2

Flood Protection Methods	Level of Landscape Modification	Effect on Landscape Character	Potential for Context Sensitivity
Non Structural	Not Present (None)	Preserved	Highest
Soft Structural	Not Evident	Retained	
Semi-Soft Structural	Slightly Evident	Partially Retained	↓
Hard with Aesthetic Treatment	Evident*	Modified	
Semi-Hard Structural	Strongly Evident (Visually Dominant)	Strongly Modified	Lowest
Hard Structural	Very Strong Evident (Drastic Alteration)	Drastically Modified	

Non-Structural Method

- Characterized by an absence of flood control structures
- May include low standard roads for administration
- Natural landforms & drainage features convey or store storm waters
- Existing landscape character is preserved
- Complements the character of most landscape settings



Waterman Wash



Gila River



Gila River



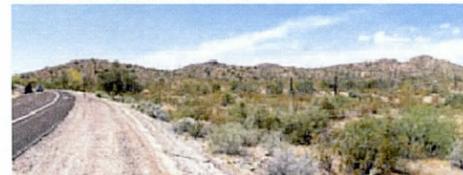
Gila River



Estrella Ranch Natural Upland Basin - Natural



Agua Fria River



Ridge Line along Estrella Parkway

Hard Structural Method with Aesthetic Treatment

- Superstructure is constructed of hard (concrete) materials
- Overall form is freeform or gracefully meandering
- Structural components (inlets, outlets, etc) may be hard or soft
- Aesthetic features include:
 - User of attractive colors and textures
 - Architectural detailing & rustication techniques
 - Urban art
 - Vegetation planting & Landscape buffers
- Character of structure is visually dominant as a feature attraction
- Complementary to select settings



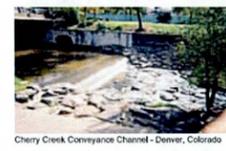
Double Tree Ranch Channel



Crismon Development Channel



Arizona Canal Diversion Channel



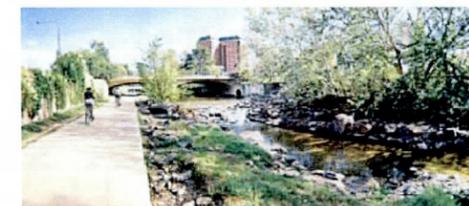
Cherry Creek Conveyance Channel - Denver, Colorado



Arizona Canal Diversion Channel



Santa Fe Dam



Cherry Creek Conveyance Channel - Denver, Colorado



Cave Creek Dam

Soft-Structural Method

- Superstructure is constructed of earthen (soft) materials
- Overall form emulates surrounding natural landforms
- Hard structural components are concealed or are not noticeable
- Utilizes materials with colors & textures found in surrounding landscape
- Aesthetic features include vegetation planting & landscape buffers
- Existing landscape character is retained
- Complements the character of most landscape settings



Falcon Dunes Golf Course Detention Basin



Wildfire Golf Course Conveyance Channel



Oak Basin



Arizona Billmore Basin



Freestone Park Basin



Old Cross Cut Channel



Stone Creek Golf Course, Indian Bend Wash Channel



Guadalupe Flood Retarding Structure



White Tanks Flood Retarding Structure #3 (Simulation)

Semi-Soft Structural Method

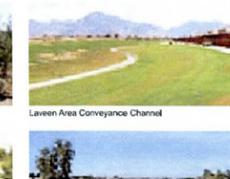
- Superstructure is constructed of earthen (soft) materials
- Structural components such as inlets & outlets may be hard (concrete)
- Forms, colors and textures of structural components complement the setting
- Aesthetic features include vegetation planting & landscape buffers
- Existing landscape character is slightly modified
- Complements the character of most landscape settings



Upper East Fork Cave Creek & Paradise Valley Detention Basin



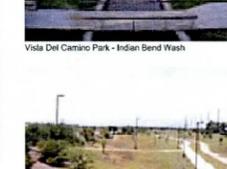
Wildfire Golf Course Conveyance Channel



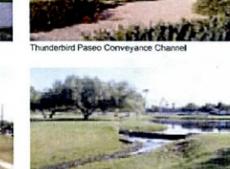
Laveen Area Conveyance Channel



El Dorado Park - Indian Bend Wash



Visa Del Camino Park - Indian Bend Wash



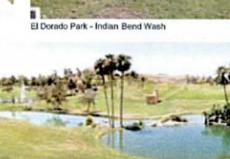
Thunderbird Paseo Conveyance Channel



10th Street Basin



Bethany Home Outfall Channel



El Dorado Park - Indian Bend Wash

Hard Structural Method

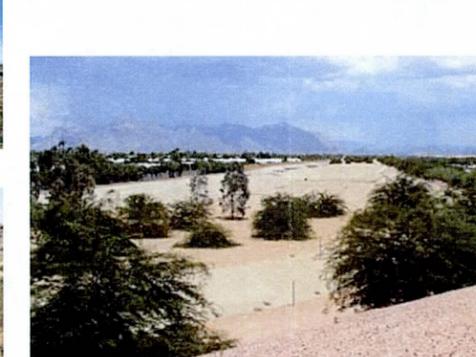
- Superstructure is constructed of hard (concrete) materials
- Overall form is geometric & contrasts with natural landforms
- Structural components are hard & geometric
- Aesthetic features are absent
- Structure strongly dominates the character of the setting
- Compatible with limited landscape settings



Spookhill Flood Retarding Structure Conveyance Channel



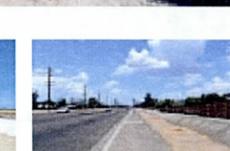
White Tanks 4 Inlet Conveyance Channel



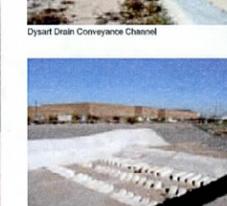
US 80 Arizona Department of Transportation Basin



Dysart Drain Conveyance Channel



City of Mesa Conveyance Channel



Skunk Creek 4 Drop Structure



City of Williams Dam

Semi-Hard Structural Method

- Superstructure is constructed of earthen (soft) materials
- Overall form is geometric & contrasts with natural landforms
- Structural components are hard & geometric
- Aesthetic features are absent
- Structure is visually dominant within the setting
- Compatible with limited landscape settings



Sunny Cove Riser Structure Dam



McMicken Outlet Channel



East Maricopa Floodway Channel



Tatum Wash Basin



Guadalupe Flood Retarding Structure (Downstream Slope)



McMicken Dam



Sossaman Basin



White Tanks Flood Retarding Structure #3



LANDSCAPE DESIGN THEMES

Introduction

The planning and design of flood control facilities to preserve the natural beauty of Sonoran Desert landscapes and protect local community character is a primary goal of the landscaping and aesthetic treatment policy of the Flood Control District of Maricopa County. The identification of landscape design themes based upon the character of the landscape is an important early step in the planning and design of flood control facilities to be context sensitive with the visual environments of Maricopa County.

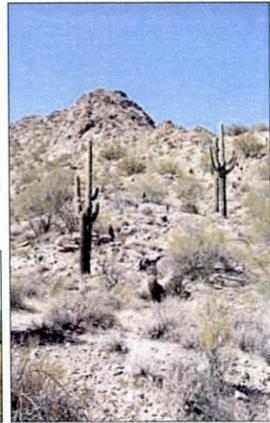
Landscape design themes identify the desired overall "look" for flood control projects for specific landscape settings. The landscape design theme, as intended herein, is a visual design concept that is established to unify the visual appearance of flood control projects with the visual character of their surrounding landscape settings. Landscape design themes serve as a basis for establishing a cohesive set of landscape design guidelines for project design that address appropriate scale, landform grading, plant materials selection and arrangement, and use of other materials, forms, colors and textures, to achieve the desired appearance.

The purpose is to provide guidance for the identification and application of landscape design themes that will enable District flood control projects to become context sensitive with the landscape settings found in Maricopa County. The information and approach presented herein may be useful to other jurisdictions and may have application to other land use activities within Maricopa County.

It is recognized that additional landscape design themes may be desired based upon historic or planned landscape character. It is further recognized that District flood control requirements and recreational, wildlife, cultural, and other multiple-use program requirements, may strongly influence or dictate the selection of landscape design themes for particular flood control projects. The landscape themes presented are intended to serve as a framework and starting point for development of more refined landscape design themes, as needed, during project planning and design studies for application to specific landscape settings.

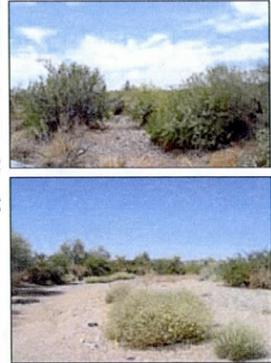
Natural Sonoran Desert Uplands Theme

- This theme emulates the visual character of natural bajada, foothills and mountain landscape settings found within the Sonoran Desert.
- Flood water storage basins and channels are sized and shaped to replicate the scale of natural landforms and drainage features within the Mountain Lands Landscape character subtype.
- The overall form of flood control structures is designed to conform to, and accentuate, natural topographic forms in the subtype.
- Plant palette consists of species found in the palo-verde-mixed cacti forest, of which Palo Verde and Saguaro are signature plant species.
- Plant materials are arranged to replicate the patterns and densities found within the subtype.
- This theme is context sensitive with the bajada, foothills and mountains physical settings within Maricopa County.



Natural Lower Sonoran Desert Riparian Theme

- This theme emulates the visual character of natural desert washes that traverse the valley floor of the Sonoran Desert.
- Flood control channels and storage basins are sized and configured to replicate the scale and accentuate the form of drainage features found in the Valley Lands landscape character subtype.
- Their overall form typically replicates the dendritic drainage patterns and may include small islands and gravel bars similar to those found within the subtype.
- Plant palette includes plant species that are prominent along natural washes and other drainage features within the subtype, of which Mesquite and Willow are signature species.
- Plant materials are combined and arranged to form bosques and other natural patterns that are typically associated with the drainage features found in the subtype.
- This theme is context sensitive with all of the physical settings of the valley lands and river lands landscape character subtypes in Maricopa County.



Natural Sonoran Desert Uplands Riparian Theme

- This theme emulates the visual character of natural arroyo landscape settings found within the Sonoran Desert.
- Flood control channels and storage basins are sized and configured to replicate the scale and accentuate the form of drainage features found in the Mountain Lands landscape character subtype.
- Their overall form may emulate both braided and dendritic drainage patterns and may include small islands and gravel bars similar to those found within the subtype.
- Plant palette includes plant species that are prominent along natural arroyos and other drainage features within the subtype, of which Palo Verde, Ironwood and Willow are signature species.
- Plant materials are combined and arranged to form bosques and other natural patterns that are typically associated with drainage features in the subtype.
- This theme is context sensitive with all physical settings of the Sonoran Mountain Lands landscape character subtype in Maricopa County.



Natural Sonoran Desert Hydro Riparian Theme

- This theme emulates the visual character of rivers, washes and arroyos found within the Sonoran Desert that are wet year round.
- Flood control channels and storage basins are sized and configured to replicate the scale and accentuate the form of drainage features found in the River Lands landscape character subtype.
- Bottom areas are designed to replicate the variety of physical conditions and flow characteristics found within the rivers of the subtype and typically will include a natural appearing low flow feature along with a variety of sand, gravel, cobble, boulders, bars and straits.
- Plant palette includes plant species that make up the Lower Sonoran Desert Hydro Riparian native plant community, of which Cottonwood and Willow galleries are a signature feature.
- Plant materials are arranged to replicate the densities and patterns that naturally occur within the subtype.
- This theme is context sensitive with all landscape settings within the Sonoran Desert Landscape Character Type in Maricopa County.



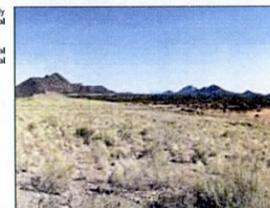
Natural Lower Sonoran Desert Theme

- This theme emulates the visual characteristics of natural settings found within the valley floor of the Sonoran Desert.
- Flood control channels and basins are sized and shaped to replicate the scale of landforms and secondary drainage features found within the Valley Lands landscape character subtype and may include landscape berms and other topographic features to control the apparent size of flood control structures.
- The overall form of flood control structures is designed to accentuate natural landforms and vegetation patterns found within the subtype.
- Plant palette includes plant species that are visually prominent within the Lower Sonoran Desert, of which the signature species include Mesquite, Bur sage and Creosote.
- Plant densities and arrangements replicate the densities and patterns that are characteristic within the subtype.
- This theme is context sensitive only within the valley plains physical setting in Maricopa County.



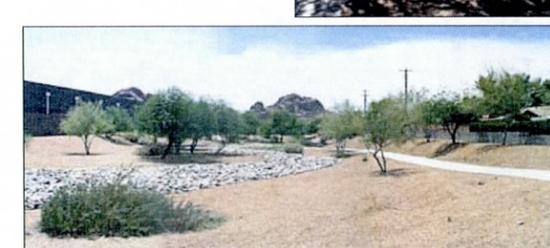
Semi-Natural Sonoran Desert Theme

- This theme is a variant of any of the preceding natural themes.
- Flood control channels and basins are sized and configured to replicate the scale of natural landforms, vegetation patterns and drainage features found within the Sonoran Desert landscape character type and/or the scale of open space features typically associated with suburban and rural residential settings within the character type.
- The overall form of flood control structures accentuates and exaggerates the forms of natural topographic and drainage features found in the character type to provide additional landscape variety and visual interest.
- Plant palettes typically consist of signature species and other plant materials associated with the landscape character subtype within which flood control facilities are located.
- The number and density of signature plant species is significantly increased to create an enhanced and more prominent natural appearance.
- This theme is context sensitive with all physical and cultural settings within the Sonoran Desert character type where a natural appearance with increased visual variety is desired.



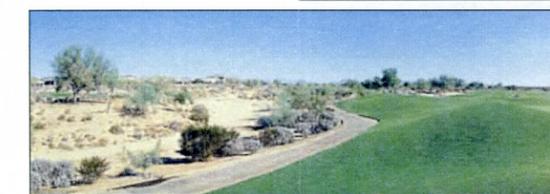
Enhanced Desert Theme

- This theme is also a variant of any of the preceding natural themes that emphasizes extensive use of inert gravel materials and an open arrangement of plant materials with a managed appearance.
- Flood control channels and basins are sized and configured to replicate the scale of natural landforms, vegetation patterns and drainage features found within the Sonoran Desert landscape character type and the scale of open space and predominant structural features found within the suburban and rural residential settings within the character type.
- The overall form of flood control structures accentuates and exaggerates the forms of natural topographic and drainage features found in the character type to create additional landscape variety and visual interest.
- Surface treatments typically involve extensive use of decomposed granite gravels and other natural inert materials in combination with a variety of native and desert adapted plant species.
- Plant materials and inert materials are arranged to create interesting variety in forms, patterns and spaces, accentuate the topographic forms of the structure, reinforce gateways, entrance views, provide shade and to screen discordant features from view.
- This theme is context sensitive with suburban, urban and industrial settings and transportation corridors in Maricopa County where an enhanced natural appearance is desired.



Desert Park Theme

- This theme is a combination of the Enhanced Desert and Desert Oasis Themes.
- Flood control channels and basins are sized and configured to be in scale with the size of open spaces and structural features that are typically found within the surrounding suburban and rural residential settings.
- The overall form of flood control structures accentuates and exaggerates the forms of natural topographic and drainage features found in the character type to create additional landscape variety and visual interest.
- Surface treatments typically include a combination of turf and gravel pavements with both native and desert adapted canopy trees and palms that has a more lush and green appearance than the previously described themes.
- Plant materials and inert materials are arranged to create interesting variety in forms, patterns and spaces, accentuate the topographic forms of the structure, reinforce gateways, entrance views, provide shade and to screen discordant features from view.
- This theme is context sensitive with suburban, urban and industrial cultural settings within the Sonoran Desert landscape character type.



Desert Oasis Theme

- This theme emphasizes a park-like appearance with an emphasis on turf and canopy trees.
- Flood control channels and basins are sized and configured to be in scale with the size of open spaces and structural features that are typically found within the surrounding suburban and rural residential settings.
- The overall form of flood control structures accentuates and exaggerates the forms of natural topographic and drainage features found in the character type to create additional landscape variety and visual interest.
- Surface treatments typically are turf with both native and desert adapted canopy trees and palms.
- Plant materials and inert materials are arranged to create interesting variety in forms, patterns and spaces, accentuate the topographic forms of the structure, reinforce gateways, entrance views, provide shade and to screen discordant features from view.
- This theme is context sensitive with suburban, urban and industrial cultural settings within the Sonoran Desert landscape character type.



Desert Plaza Theme

- This theme emphasizes extensive use of architecturally designed hardened materials with plant materials serving mainly as visual accents.
- Flood control facilities are sized and configured to be in scale with the structural features and spaces that are typically found within the surrounding urban setting.
- The overall form of flood control structures is inspired by the physical characteristics of drainage features found within the Sonoran Desert Character Type and often accentuates and exaggerates the scale and variety of those characteristics in abstract forms, colors and textures to create additional landscape variety and visual interest.
- Surface treatments predominantly consist of architecturally designed hardscape materials in a variety of colors, textures, patterns and special design motifs.
- Plant materials include a variety of native and introduced species that are employed for special effects, shade and spatial definition.
- This theme is context sensitive primarily with urban settings in Maricopa County.





Flood Control Improvements-Planting Palette



August 25, 2011

A DESERT PARK LANDSCAPE THEME/DESERT OASIS LANDSCAPE THEME



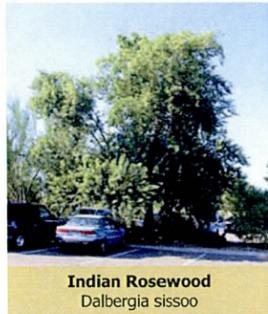
A DESERT PARK LANDSCAPE THEME

OR

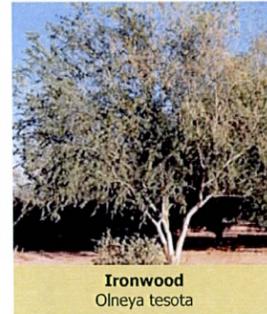


A DESERT OASIS LANDSCAPE THEME

Trees



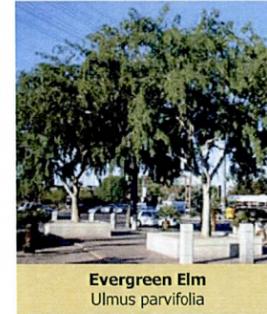
Indian Rosewood
Dalbergia sissoo



Ironwood
Olneya tesota

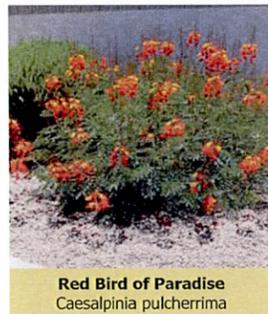


Native Mesquite
Prosopis species

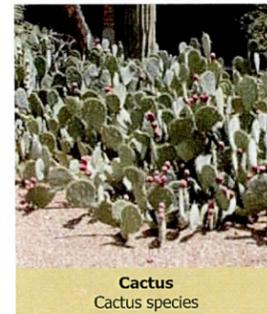


Evergreen Elm
Ulmus parvifolia

Accents/ Shrubs



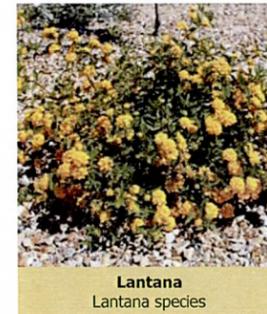
Red Bird of Paradise
Caesalpinia pulcherrima



Cactus
Cactus species



Baja Fairy Duster
Calliandra californica



Lantana
Lantana species



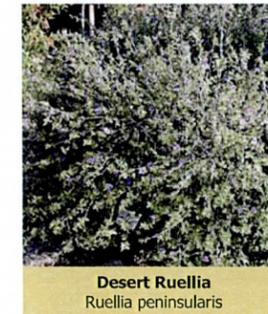
Sage species
Leucophyllum species



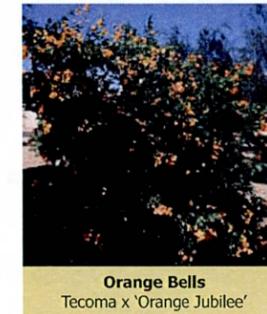
Deer Grass
Mulhenbergia rigens



Bear Grass
Nolina microcarpa



Desert Ruellia
Ruellia peninsularis



Orange Bells
Tecoma x 'Orange Jubilee'



Flood Control Improvements-Planting Palette



B NATURAL LOWER SONORAN DESERT LANDSCAPE THEME/ENHANCED DESERT LANDSCAPE THEME



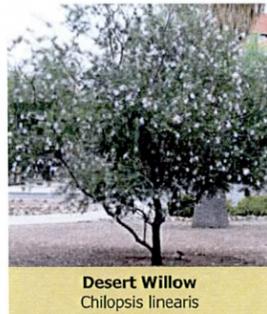
OR



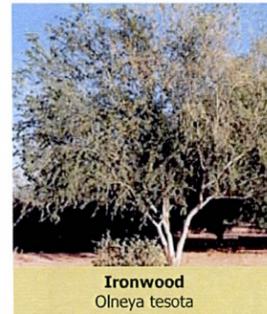
B NATURAL LOWER SONORAN DESERT LANDSCAPE THEME

B ENHANCED DESERT LANDSCAPE THEME

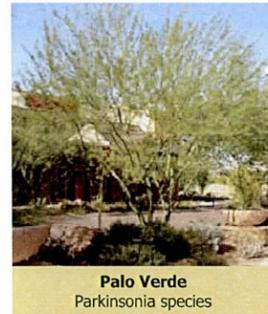
Trees



Desert Willow
Chilopsis linearis



Ironwood
Olneya tesota

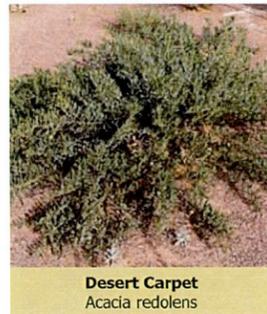


Palo Verde
Parkinsonia species



Native Mesquite
Prosopis species

Accents/ Shrubs



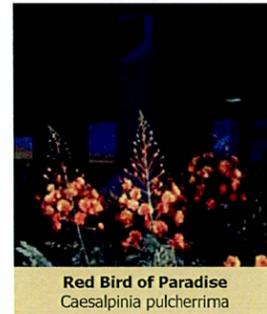
Desert Carpet
Acacia redolens



Triangle Leaf Bursage
Ambrosia deltoidea



Desert Marigold
Baileya multiradiata



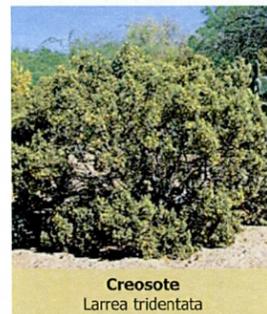
Red Bird of Paradise
Caesalpinia pulcherrima



Green Brittlebush
Encelia frutescens



Mormon Tea
Ephedra viridis



Creosote
Larrea tridentata



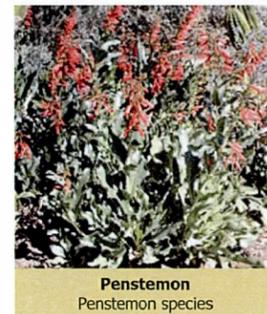
Sage species
Leucophyllum species



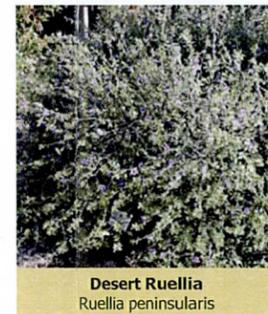
Deer Grass
Mulhenbergia rigens



Bear Grass
Nolina microcarpa



Penstemon
Penstemon species



Desert Ruellia
Ruellia peninsularis



C SEMI-NATURAL RIPARIAN LANDSCAPE THEME

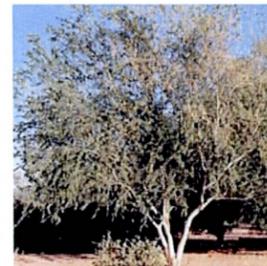


C SEMI-NATURAL RIPARIAN LANDSCAPE THEME

Trees



Desert Willow
Chilopsis linearis



Ironwood
Olneya tesota



Palo Verde
Parkinsonia species



Native Mesquite
Prosopis species

Accents/ Shrubs



Triangle Leaf Bursage
Ambrosia deltoidea



Four Wing Saltbush
Atriplex canescens



Desert Marigold
Baileya multiradiata



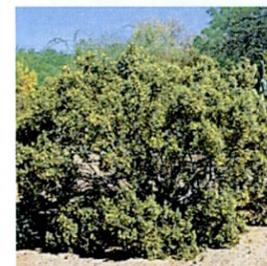
Wooly Butterfly Bush
Buddleja marrubifolia



Green Brittlebush
Encelia frutescens



Chuparosa
Justicia californica



Creosote
Larrea tridentata



Deer Grass
Mulhenbergia rigens



Penstemon
Penstemon species



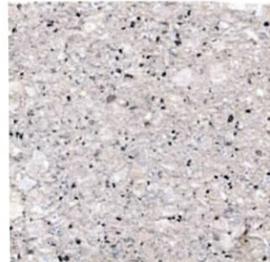
Desert Ruellia
Ruellia peninsularis



Flood Control Improvements-Materials



Concrete Finish Options



Sandblasted Finish



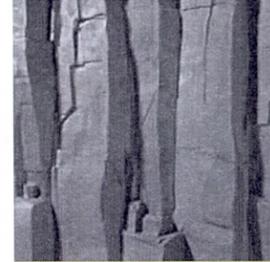
Exposed Aggregate Finish



Raked Finish



Board Formed



Oregon Basalt Formliner



Rugged Flagstone Formliner

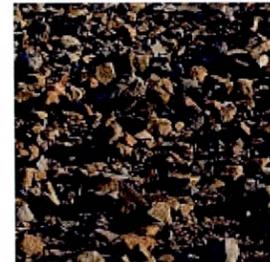


Stained Concrete

Surface Materials



Decomposed Granite

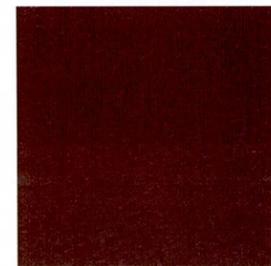
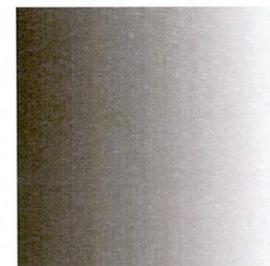


Desert Pavement

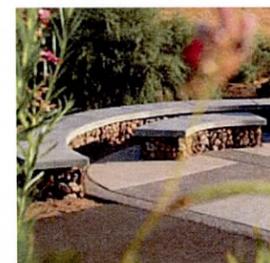


Native Seed

Desert Color Palette



Accents



Gabion Basket Seatwall



Gabion Basket Retaining Wall

APPENDIX G

Concept Plans



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

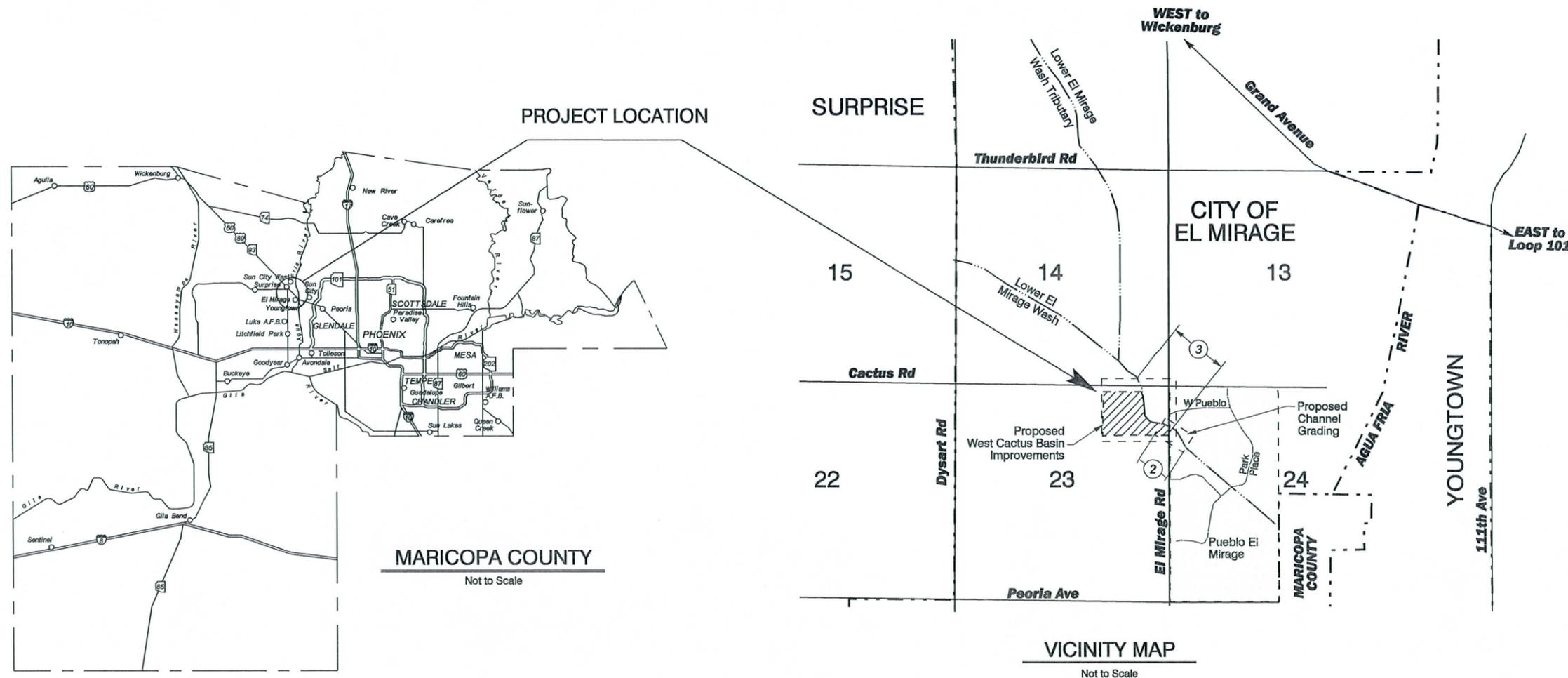
IN COOPERATION WITH THE CITY OF EL MIRAGE
 CONCEPT PLANS FOR WEST CACTUS BASIN
 PCN 470.30.20
 FCD CONTRACT NO. 2008-C014 - ASSIGNMENT NO. 4

CONCEPT PLANS

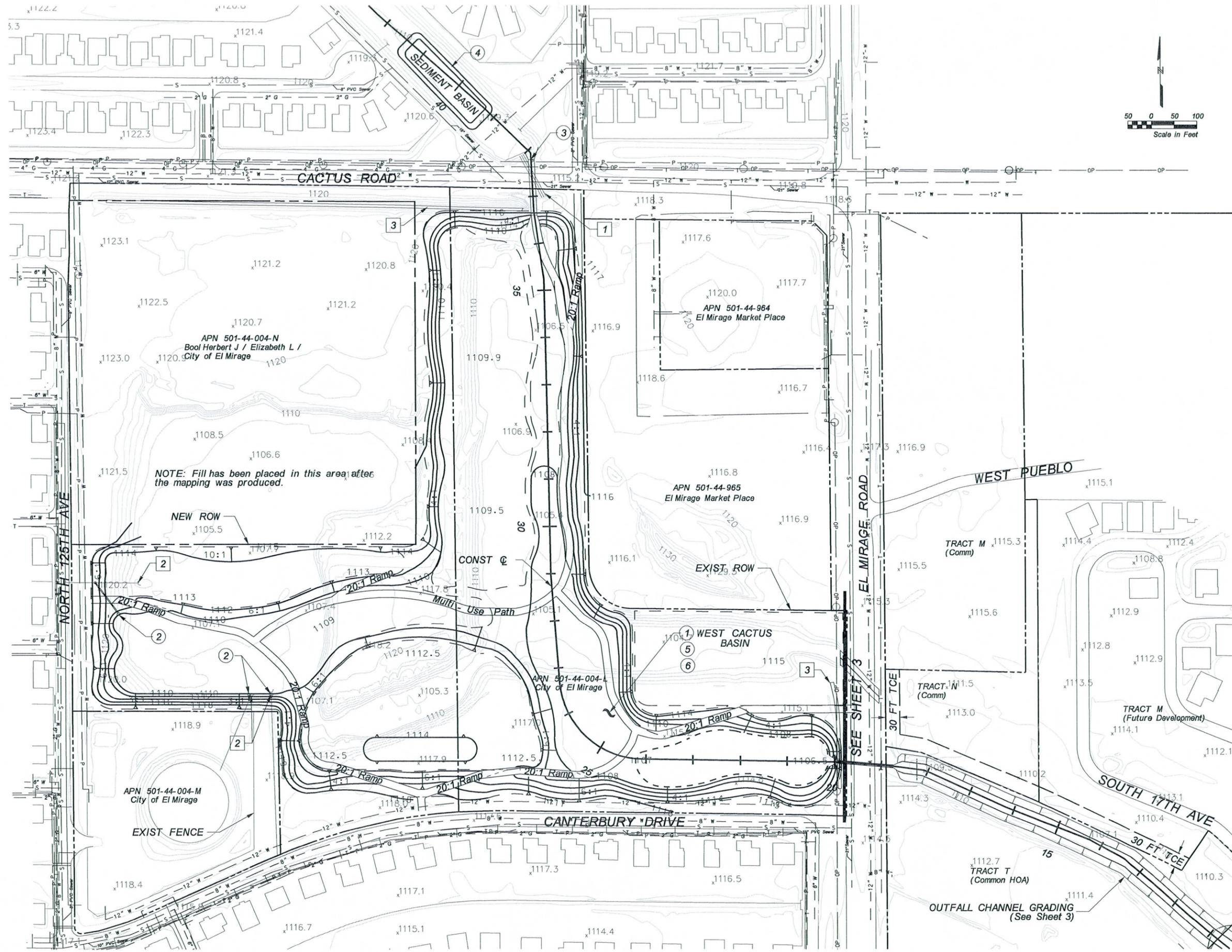
THESE PLANS WERE DEVELOPED TO DETERMINE GENERAL GRADE, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE WEST CACTUS BASIN AND LOWER EL MIRAGE WASH FROM CACTUS ROAD TO WEST OF EL MIRAGE ROAD

DATUM

VERTICAL DATUM: NAVD88
 HORIZONTAL DATUM: NAD83 (1992.0 EPOCH)
 COORDINATE SYSTEM: ARIZONA COORDINATE SYSTEM, 1983 CENTRAL ZONE
 UNIT OF MEASUREMENT: INTERNATIONAL FEET



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
ISSUE RECOMMENDED BY: _____	
PROJECT MANAGER _____	DATE _____
ISSUED FOR PUBLIC BIDDING BY: _____	
CHIEF ENGINEER & GENERAL MANAGER _____	DATE _____
BOARD OF DIRECTORS OF THE FLOOD CONTROL DISTRICT	
DON STAPLEY - CHAIRMAN	
DISTRICT 1	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDY KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX



- REMOVE
- 1 EXIST 3 BARREL 24" DIA. RCP CULVERT - TO BE REMOVED BY OTHERS
- 2 REMOVE EXIST STORM DRAIN AND OUTLETS 3 TOTAL
- 3 REMOVE EXIST CONCRETE IRRIGATION DITCH

- CONSTRUCT
- 1 STA 19+95 TO STA 36+30 CONSTRUCT STORM WATER DETENTION BASIN TO GRADES AND LIMITS SHOWN.
- 2 CONSTRUCT 125 LIN. FT. NEW STORM DRAIN
- 3 SINGLE BARREL 10'x10' RCBC - BY OTHERS
- 4 STA 39+25 TO STA 41+45 CONSTRUCT STORM WATER SEDIMENT BASIN
- 5 CONSTRUCT 4950 LIN. FT MULTI-USE PATH (12-ft wide concrete with 2' shoulders)
- 6 PROVIDE LANDSCAPING FEATURES PER LANDSCAPE CONCEPT DESIGN SHOWN IN THE DESIGN CONCEPT REPORT

GENERAL NOTES

- 1) UTILITY LOCATIONS ARE SCHEMATIC
- 2) STRUCTURE SIZES ARE APPROXIMATE
- 3) LANDSCAPE AESTHETIC TREATMENTS AND MULTI-USE DESIGN GUIDELINES ARE PROVIDED IN THE LOWER EL MIRAGE WASH DESIGN CONCEPT REPORT - PHASE 2
- 4) PRELIMINARY NOT FOR CONSTRUCTION: CONCEPT PLANS DEVELOPED TO DETERMINE GENERAL GRADE, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE WEST CACTUS BASIN AND LOWER EL MIRAGE WASH FROM CACTUS ROAD TO EAST OF EL MIRAGE ROAD.

NO.	REVISION	BY	DATE
3			
2			
1			



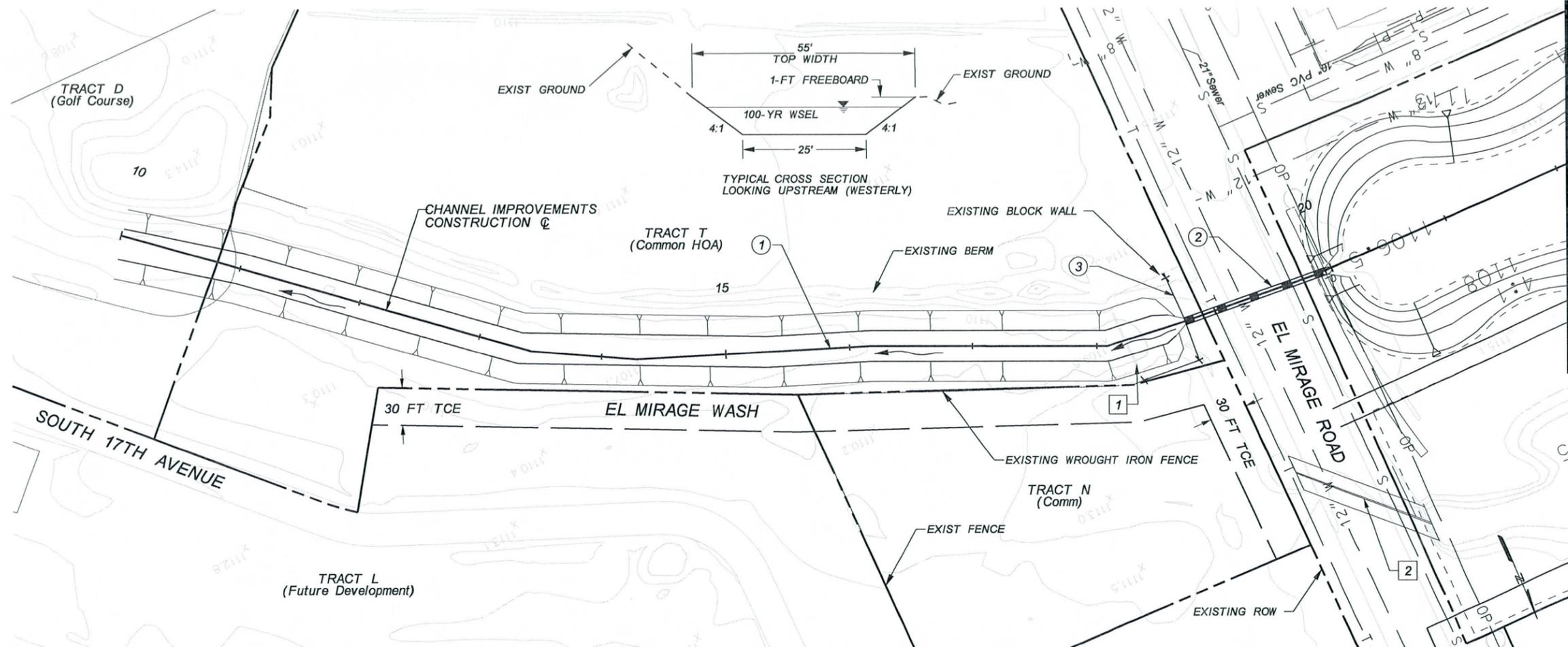
**LOWER EL MIRAGE WASH DCR
FCD NO. 2008C014, WA No 4**

	BY	DATE
DESIGNED	D. Phelps	08/25/2011
DRAWN	D. Phelps	08/25/2011
CHECKED	T. Bokich	08/25/2011

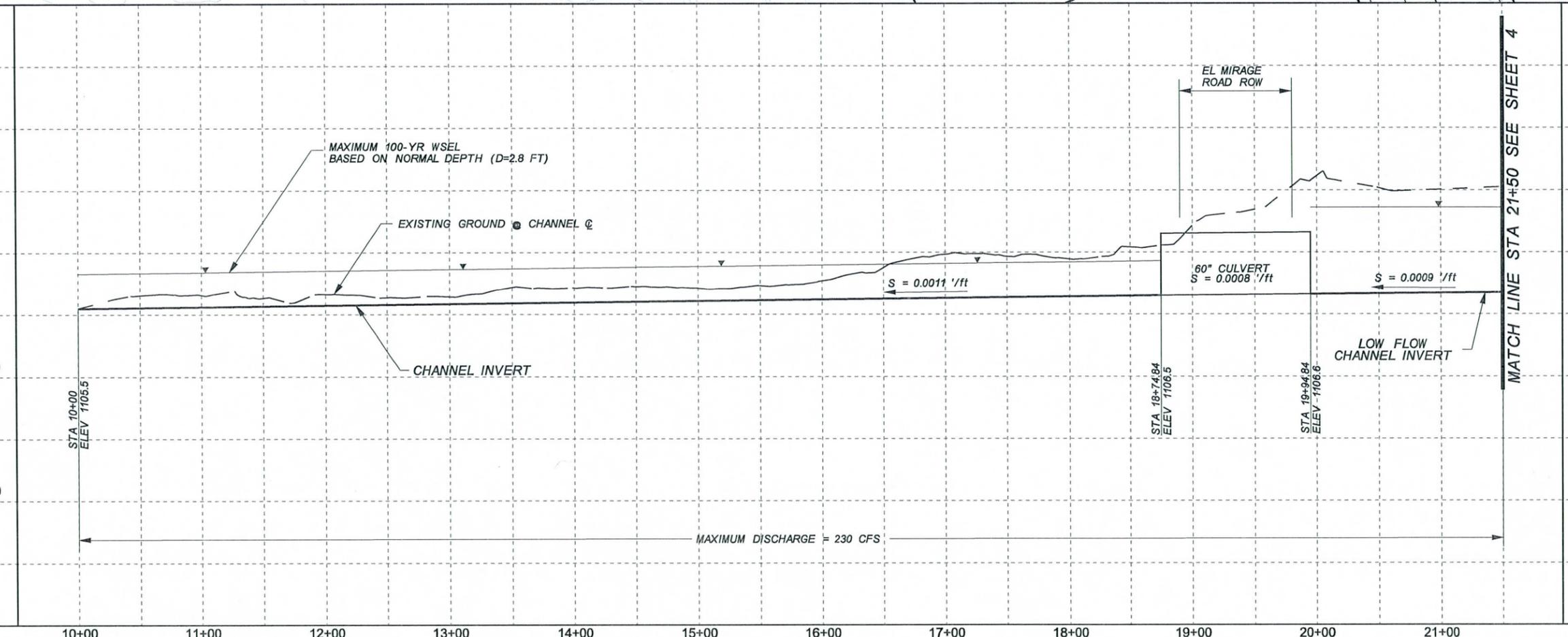
15%
PRELIMINARY NOT FOR CONSTRUCTION

WEST CACTUS BASIN PLAN

DRAWING NO.	WEST CACTUS BASIN PLAN	SHEET OF	2 4
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- REMOVE
- 1 REMOVE EXISTING FENCE (122 LF)
 - 2 REMOVE EXISTING 2 BARREL 10'x3' RCBC (118 LF)
- CONSTRUCT
- 1 STA 10+00 TO STA 18+75 CONSTRUCT 875 LIN. FT. CHANNEL
 - 2 CONSTRUCT 120 LIN. FT. 60" CULVERT
 - 3 CONSTRUCT 125 LIN. FT. NEW FENCE



- GENERAL NOTES**
- 1) UTILITY LOCATIONS ARE SCHEMATIC
 - 2) STRUCTURE SIZES ARE APPROXIMATE
 - 3) LANDSCAPE AESTHETIC TREATMENTS AND MULTI-USE DESIGN GUIDELINES ARE PROVIDED IN THE LOWER EL MIRAGE WASH DESIGN CONCEPT REPORT - PHASE 2
 - 4) PRELIMINARY NOT FOR CONSTRUCTION: CONCEPT PLANS DEVELOPED TO DETERMINE GENERAL GRADE, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE WEST CACTUS BASIN AND LOWER EL MIRAGE WASH FROM CACTUS ROAD TO EAST OF EL MIRAGE ROAD.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

LOWER EL MIRAGE WASH DCR FCD NO. 2008C014, WA No 4

	BY	DATE
DESIGNED	D. Phelps	08/25/2011
DRAWN	D. Phelps	08/25/2011
CHECKED	T. Bokich	08/25/2011

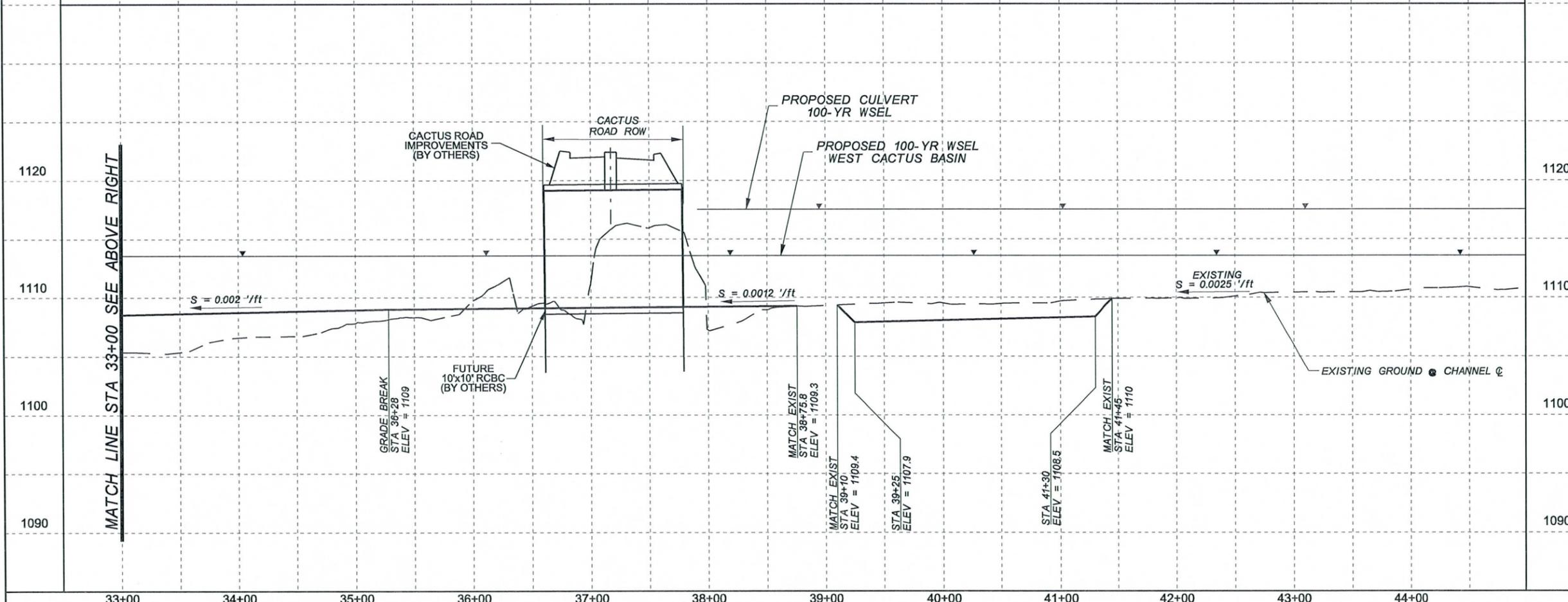
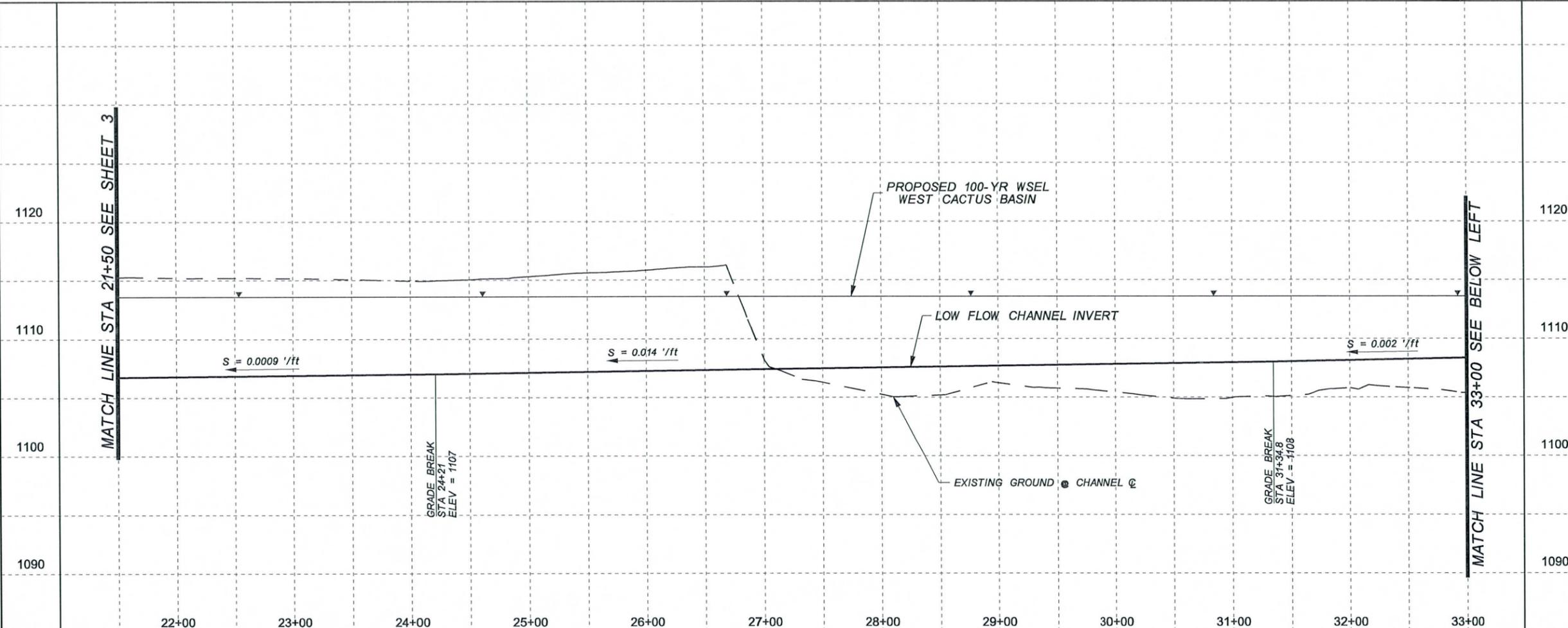
15% PRELIMINARY NOT FOR CONSTRUCTION

AZTEC 4851 N. McDowell Road Phoenix, AZ 85008-4000 Tel: (602) 484-0400 Fax: (602) 484-0402 www.aztec.com

DRAWING NO.	PLAN AND PROFILE STA 10+00 TO STA 18+60.00	SHEET OF 3 4
-------------	--	--------------

REMOVE

CONSTRUCT



GENERAL NOTES

- 1) UTILITY LOCATIONS ARE SCHEMATIC
- 2) STRUCTURE SIZES ARE APPROXIMATE
- 3) LANDSCAPE AESTHETIC TREATMENTS AND MULTI-USE DESIGN GUIDELINES ARE PROVIDED IN THE LOWER EL MIRAGE WASH DESIGN CONCEPT REPORT - PHASE 2
- 4) PRELIMINARY NOT FOR CONSTRUCTION: CONCEPT PLANS DEVELOPED TO DETERMINE GENERAL GRADE, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE WEST CACTUS BASIN AND LOWER EL MIRAGE WASH FROM CACTUS ROAD TO EAST OF EL MIRAGE ROAD.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

LOWER EL MIRAGE WASH DCR
FCD NO. 2008C014, WA No 4

	BY	DATE
DESIGNED	D. Phelps	08/25/2011
DRAWN	D. Phelps	08/25/2011
CHECKED	T. Bokich	08/25/2011

15%
PRELIMINARY
NOT FOR
CONSTRUCTION



DRAWING NO.	WEST CACTUS BASIN PROFILE STA 21+50 TO STA 43+00	SHEET OF 4 4
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APPENDIX H

Digital Data