

GLENDALE / PEORIA ADMPU 107TH AVENUE AND UNION HILLS DRIVE DESIGN CONCEPT REPORT - PHASE 2 ALTERNATIVES ANALYSIS VOLUME I

CONTRACT FCD 2009C036
ASSIGNMENT NO. 2



Prepared for:
Flood Control District of Maricopa County
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Phoenix, Arizona 85009



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Exp. 9-30-2012

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JULY 2011 - FINAL

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**GLENDALE / PEORIA ADMPU
107TH AVENUE AND UNION HILLS DRIVE
DESIGN CONCEPT REPORT - PHASE 2
ALTERNATIVE ANALYSIS**

1. EXECUTIVE SUMMARY

The Glendale/Peoria Area Drainage Master Plan Update (ADMPU), 107th Avenue and Union Hills Drive Design Concept Report (DCR) is an update of the original Glendale / Peoria ADMPU and the Northwest Update. The DCR hydrology study is comprised of a watershed of approximately 16.5 square miles with the DCR area of interest being generally bound on the north by Beardsley Road, to the east by 107th Avenue, to the west by Agua Fria River and to the south by the Sun City Drain Channel confluence with the Agua Fria River.

The DCR has been commissioned by the Flood Control District of Maricopa County (FCD) in response to flooding complaints in area subdivisions and roadways near the 107th Ave. and Union Hills Drive intersection. The study area is located within three jurisdictions, the City of Peoria, the City of Surprise and Unincorporated Maricopa County. The DCR was initiated with the concept consistent with the Phase 1 Analysis and Recommendations Report with the specific areas of concern being the Lake Pleasant Mobile Home Estates, the Paradise Resort Travel Trailer Park, the Coyote Lakes development, 107th Avenue, Union Hills Drive, and 115th Avenue roadways and associated intersections.

Through the public input process and after additional review by the District it was determined that flows from the Beardsley Road Channel would be incorporated into 107th and Union Hills Drive Design Concept Report. Due to the introduction of the Beardsley Road flows being post the alternative analysis for the 107th Avenue and Union Hills Drive study area, the alternatives analysis contained within this DCR are presented in two parts; Pre-Beardsley Road Flows and Post-Beardsley Road Flows.

The Flood Control District's Context Sensitive Flood Hazard Mitigation Planning and Design Approach was utilized in this study. This approach entails the inventory and analysis of information pertaining to the flooding, land and resource and community contexts in an effort to produce a Recommended Plan that will be effective in reducing the risks of flooding in ways that will be compatible with the environment and acceptable to local communities to the maximum degree possible. Flood protection structure types that were determined to be acceptable to the local communities and compatible with the landscape settings in which they are placed were utilized in the development of the alternatives and the recommended alternative. These structures include use of underground pipes in areas where rights of ways constraints posed limitations on the use of other solutions, use of existing and proposed open channel systems, along with use of detention basins to attenuate peak flows where needed. Additionally, flood protection methods for building the structure types that were determined to be compatible with the landscape settings of the study area, such as the Semi-soft Structural Method, have been incorporated into the Recommended Plan along with other aesthetic and multi-use features to achieve compatibility with the land and resource context and acceptability with the community context to the greatest degree possible.

2. INTRODUCTION

2.1. Project Location

The overall study area for the Glendale/ Peoria Area Drainage Master Plan (ADMP) is approximately 80 square miles and includes portions of the Cities of Peoria, Glendale, Sun City, Youngtown, Phoenix, and unincorporated portions of Maricopa County. The original ADMP was completed in May 1987 by CDM Inc. and JM Montgomery Inc. and was updated in May 2002 by Entellus (ADMPU) and again in May 2007 by Wood Patel (NWU) for the Flood Control District of Maricopa County (FCD).

The 107th Avenue and Union Hills Drive Phase 2 Design Concept Report (DCR) is comprised of a watershed of approximately 16.5 square miles with the DCR area of interest being generally bound on the north by Beardsley Road, to the east by 107th Avenue, to the west by the Agua Fria River and to the south by the confluence with the Agua Fria River (Greenway Road alignment). See Figure 1 for a Project Area map.

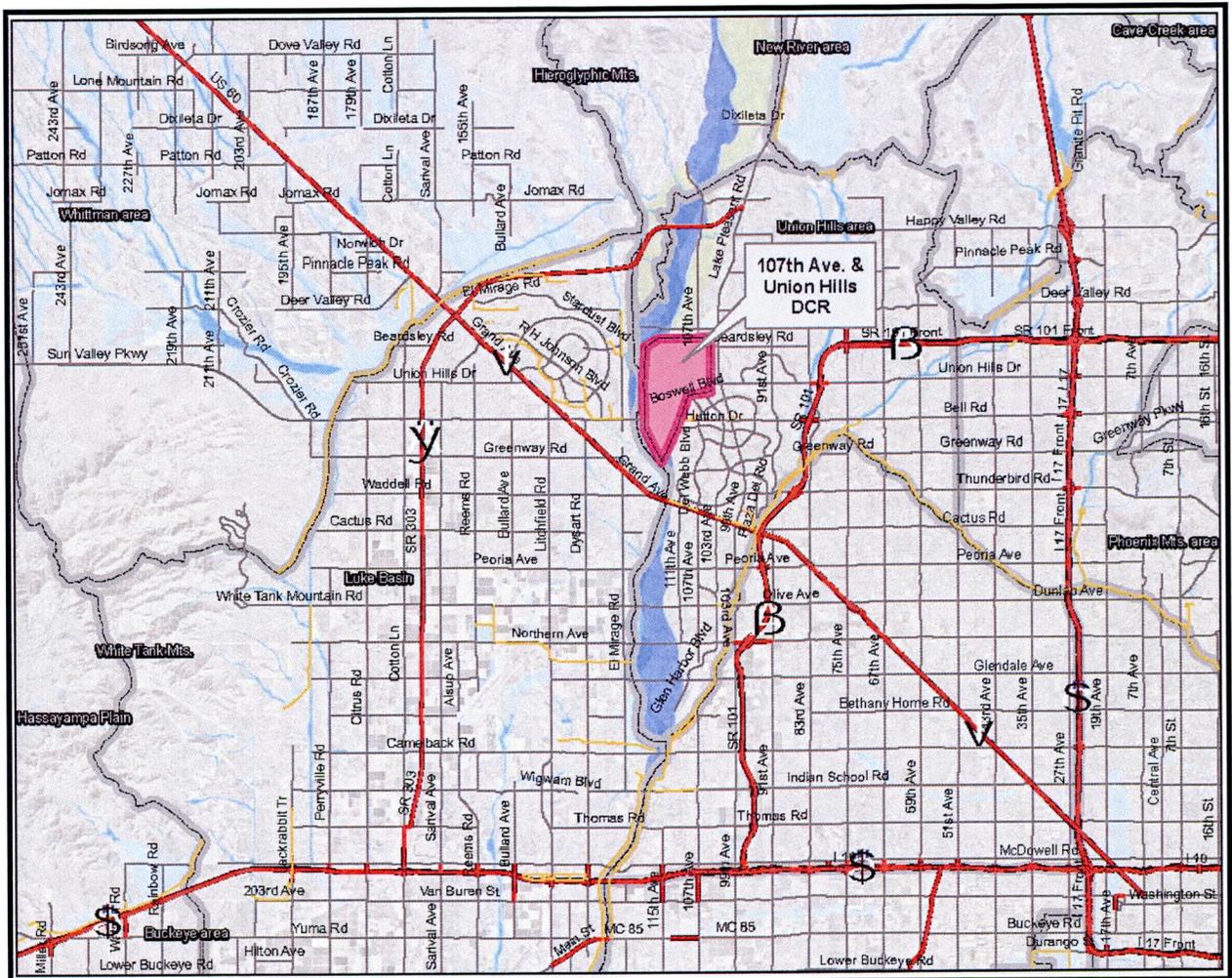


Figure 1 – Project Area Map (Courtesy FCDMC)

2.2. Need and Purpose

The DCR has been commissioned by the Flood Control District of Maricopa County (FCD) in response to flooding complaints in the area subdivisions and roadways near the 107th Ave. and Union Hills Drive intersection. The study area

is located within three jurisdictions; the City of Peoria, the City of Surprise and Unincorporated Maricopa County (see Figure 3 for the Annexation Map).

The purpose of the study is to develop a recommended alternative that will mitigate flooding along Union Hills Drive between 107th and 115th Avenue, 115th Avenue between Beardsley Road and Bell Road, and lastly along the Sun City Drain Channel south of Bell Road to the confluence with the Agua Fria River.

This report documents the development of the context sensitive alternatives and selection and design of the recommended alternative as shown in the 15% design plans.

The stated project goals for the 107th and Union Hills Drive DCR are as follows.

- Develop Context Sensitive Solutions for the flooding occurring on 107th Avenue, Union Hills Drive, and 115th Avenue. The 100 year design event is preferable; however solutions utilizing a lesser event will be analyzed should the 100 year event become infeasible.
- Develop solutions that are context sensitive with the landscape setting of the project study area.
- Provide solutions that preserve existing recreation & open space resources and take into consideration the ultimate Parks/Trails/Multi-use requirements of the City of Peoria, the City of Surprise, Maricopa County and neighborhood/public input.
- Provide solutions that take into consideration the ultimate transportation and utility needs of 107th Avenue, Union Hills Drive, and 115th Avenue and Bell Road.
- Provide solutions that may be phased and accomplish the goals above.

2.3. Scope

The information and analysis presented in this report is a part of the scope of work performed by Goodwin and Marshall, Inc. for the FCD under Contract No. 2009C036 Work Order No. 2 and Change Order No. 1. The scope includes preparation of baseline hydrologic and hydraulic analysis, data collection, development of alternatives, and selection of the recommended alternative and preparation of cost estimates and 15% plans.

3. DATA COLLECTION AND PROJECT DATA

Various data was collected, reviewed and documented through the course of preparing the Design Concept Report. The information was obtained from the stakeholders, or through research of public records. A list of agencies contacted can be viewed below. For additional information, please see Appendix "A" for the Data Collection Memo.

- Arizona Public Service
- Arizona American Water
- COX Communications
- El Paso Natural Gas
- Qwest Communications
- Southwest Gas
- Maricopa County Department of Transportation
- Flood Control District of Maricopa County
- City of Surprise
- City of Peoria

3.1. Aerial Topographic Survey / Datum

3.1.1. Project Datum

The GIS information provided by the FCD is on NGVD datum however the project datum is NAVD 88 in order that the Aerial Topographic information may be utilized for the alternatives analysis and future design topography.

The project benchmark is:

Benchmark Held is a NGS control point

Designation= 1HB1 PID= AJ3858

State/County= Az/Maricopa

USGS Quad= Calderwood Butte (1981)

Location= 445 feet+/- Southwest of a parking lot at Deer Village Park on Deanna Drive east of 91st Avenue

Elevation= 1262.17 NAVD 88 Datum (Project Datum)

Elevation=1260.30 NGVD 29 Datum

3.1.2. Aerial Topographic Survey

An aerial topographic survey was performed in conjunction with the Phase 1 analysis for the project area generally located at 115th Avenue to $\frac{3}{4}$ mile east and Union Hills Drive to $\frac{3}{4}$ mile north. The aerial topographic survey was flown at an altitude sufficient to provide 1' contours and incorporates a minimum amount of planimetric features to complete Phase 1 of the work assignment. For the purposes of Phase 1 & 2 analysis, the aerial topography includes all planimetric features that are necessary to create the digital terrain model (DTM) required for producing the 1' contours. These features include curbs, gutters, creeks and break lines. Should the District wish, the remaining planimetric features may be completed and utilized with the final design.

3.1.3. Field Survey

A field survey was performed by District personnel on November 19, 2010 to supplement the FCD Aerial topographic information (NAVD 88 Datum). The topographic survey was conducted along the full reach of the project;

Sun City Drain Channel, Bell Road Culvert, Canyon Ridge Channel and culverts, and Union Hills Drive. The cross-sections were surveyed at locations that corresponded to the cross-sections within the Existing Conditions HEC-RAS model and also included existing culvert flow lines and top of curb elevations for incorporation into the HEC-RAS model.

4. OWNERSHIP / MAINTENANCE RESPONSIBILITY OF EXISTING ROADWAY AND DRAINAGE FACILITIES

Through detailed discussions with the project stakeholders and review area final plats, annexation ordinances, and improvement plans, the ownership of the existing roadways and drainage facilities were determined to the best extent possible (See Figures 3 and 4 respectively). A discussion detailing the area roadways and drainage systems are included below. Please see Appendix "C" for additional information regarding existing and ultimate roadway cross-sections for the study area.

4.1. Roadways

See Figure 3.

4.1.1. 107th Avenue (Beardsley Road to Union Hills Drive)

107th Avenue is comprised of a total ROW width of 95 feet (40 ft. east of the section line and 55 ft. west of the section line). The roadway was annexed into The City of Peoria in 1977 and 1989 under Peoria Ordinance number 77-48 and 89-40. Based on the information above and discussions with the project stakeholders this roadway is owned and maintained by the City of Peoria.

4.1.2. Union Hills Drive (107th Avenue to 111th Avenue)

Union Hills Drive is comprised of a total ROW width of 95 feet (40 ft. south of the section line and 55 ft. north of the section line). The north 55 ft. was annexed into the City of Peoria in 1977 under Peoria Ordinance number 77-48. The south 40 ft. of the Union Hills Drive roadway corridor lies

within county jurisdiction. Based on the information above and discussions with the project stakeholders the ownership of the maintenance responsibilities for this section of roadway is unknown. The existing 30 ft. of pavement lies within the City of Peoria, however the south 40 ft. containing a roadside swale appears to lie within the county. However, according to Intergovernmental Agreement C-64-08-219-2-00 between the City of Surprise and Maricopa County, this south 40' from 115th Ave. to approximately 1,100 feet east of 111th Ave. will be annexed to the City of Surprise upon completion of the Union Hills Drive improvements. A resolution between the City of Peoria, City of Surprise and Maricopa County should be made to clarify responsibilities for this segment of Union Hills Drive.

4.1.3. Union Hills Drive (111th Avenue to 113th Avenue)

Union Hills Drive is comprised of a varying ROW width through this quarter mile section. A 40 ft. ROW dedication was made south of the section line as part of the Canyon Ridge development and was annexed into the City of Surprise in 1997 under Ordinance No. 97-5. The north ROW tapers from 55 ft. at 111th Avenue to a width of 33 ft. at 113th Avenue and was annexed into the City of Peoria in 2003 under Ordinance No. 03-175. Based on the information above and discussions with the project stakeholders this roadway is owned by the two jurisdictions discussed above and maintenance responsibility is unknown. A resolution between the City of Peoria and the City of Surprise should be made to clarify this issue.

4.1.4. Union Hills Drive (113th Avenue to 115th Avenue)

Union Hills Drive is comprised of a total ROW width of 73 ft. through this quarter mile section. A 40 ft. ROW dedication was made south of the section line as part of the Canyon Ridge development and was annexed into the City of Surprise in 1995 under Ordinance No. 95-14. The north 33

ft. of ROW appears to still lie within county jurisdiction. Based on the information above and discussions with the project stakeholders this roadway is owned by the two jurisdictions discussed above, and maintenance responsibility is unknown. A resolution between the City of Surprise and Maricopa County should be made to clarify this issue.

4.1.5. 115th Avenue (Beardsley Road to Union Hills Drive)

115th Avenue is comprised of a total ROW width of 73 ft. through this one mile section. A 33 ft. ROW dedication was made west of the section line as part of the Coyote Lakes development and was annexed into the City of Surprise in 1980 and 1983 under Ordinance Nos. 80-2 and 83-8. The east 40 ft. of ROW appears to still lie within county jurisdiction. Based on the information above and discussions with the project stakeholders this roadway is owned by the two jurisdictions discussed above, however, is currently being maintained by the City of Surprise.

4.1.6. 115th Avenue (Union Hills Drive to Bell Road)

115th Avenue is comprised of a total ROW width of 73 ft. through this one mile section. A 33 ft. ROW dedication was made west of the section line as part of the Coyote Lakes development and was annexed into the City of Surprise in 1980 and 1983 under Ordinance Nos. 80-2 and 83-8. The east 40 ft. of ROW was dedicated with Canyon Ridge development and was annexed into the City of Surprise in 1995 under Ordinance No. 95-14. Based on the information above and discussions with the project stakeholders this roadway is owned and maintained by the City of Surprise.

4.2. Drainage Systems

See Figure 4.

4.2.1. Beardsley Road Channel

The Beardsley Road Channel is comprised of an improved earthen channel east of 111th Avenue, an improved concrete channel between 111th Avenue and the 113th Avenue alignment, and an unimproved channel cross-section from 113th Avenue to 115th Avenue. The City of Peoria currently maintains the Beardsley Road Channel east of 113th Avenue while maintenance responsibilities west of 113th Avenue are undetermined.

4.2.2. Canyon Ridge Channel / Detention Basins

The Canyon Ridge Channel and detention basin system was constructed in 1998 to convey on-site and off-site storm water through the Canyon Ridge Development to the outfall generally located at 115th Avenue and Bell Road. The City of Surprise and the Canyon Ridge HOA currently maintain the channel system from approximately 720' west of 113th Avenue to Bell Road as described in Doc. 1999-0579675, while the portion of channel from 111th Avenue to 720' west of 113th Avenue is maintained by the Canyon Ridge HOA as described in the Canyon Ridge, Unit 6 Final Plat.

4.2.3. Sun City Drain Channel

The Sun City Drain Channel is located north of Bell Road from Del Webb Blvd. west to 115th Avenue then south generally along the 115th Avenue Alignment to the confluence with the Agua Fria. Ownership and maintenance responsibility for the Drain from 112th Avenue east was transferred to FCD from MCDOT in 2005. From 112th Avenue west to the Agua Fria outfall, the Drain is located in a dedicated public drainage easement on private parcels within unincorporated Maricopa County. At this time, Maricopa County (including FCD and MCDOT) has no responsibility to maintain this facility from 112th Avenue west to the outfall. The proposed project will not change the location of storm flows entering

the Drain at the northeast corner of 115th Avenue and Bell Road, but will in fact control and reduce those flows thereby protecting the Drain and the associated Bell Road culvert. It is anticipated that the District will need to work with the property owners or HOA's responsible for the relevant drainage easements to ensure adequate long term maintenance of the Sun City Drain channel.

5. BASELINE EXISTING CONDITIONS HYDROLOGY

5.1. Existing Data Reviewed

- *Glendale/Peoria ADMPU* (ADMPU) hydrologic models and reports (Entellus, 2001)
- *Glendale/Peoria ADMPU Northwest Region Update* (ADMPU NWU) hydrologic models and reports (Wood Patel, 2007)
- Site visit by G&M and stakeholders on September 23, 2010
- Aerial topography collected as part of Phase 1 DCR
- Aerial photography provided by FCD
- Field survey information provided by the District on November 19, 2010.
- *Master Drainage Report for Canyon Ridge* (CVL, 1997)
- Canyon Ridge West Infrastructure – Mass Grading Plans (CVL, 1998)
- Canyon Ridge West Infrastructure – Paving and Storm Drain Plans (CVL, 1998)
- Canyon Ridge West – Parcel 5 – Grading and Drainage Plans (CVL, 2004)
- Canyon Ridge West – Parcel 5 – Paving and Storm Drain Plans (CVL, 2004)
- The Village at Canyon Ridge West – Grading and Drainage Plan (M2 group, 2006)
- *Glendale/Peoria ADMPU 107th and Union Hills Drive Design Concept Report – Analysis and Recommendations* (Goodwin and Marshall, Inc. 2010)

5.2. Summary of Hydrology Revisions

The Existing Conditions Hydrologic Model prepared with Phase 1 of the work assignment involved two distinct revisions. The first revision to the model was to extend the Phase 1 DCR model to the confluence of the watershed and the Agua Fria River. The details of this revision can be found in the Technical Memorandum Dated October 4, 2010 in Volume II, Appendix A.1. The second revision was completed in order to reflect the drainage basins and routing as found in the Canyon Ridge Master Drainage Report & associated as-built construction plans. The details of this hydrology revision may be viewed in the Technical Memorandum dated April 26, 2011 found in Volume II, Appendix A.2.

5.3. Summary of Hydrologic Modeling Results

A flow comparison of the Baseline Existing Conditions model to the previous accepted baseline models is shown in Tables 1 and 2 below. The concentration point locations maybe viewed in graphic format on Figure 2.

Model	Concentration Point 100 year, 6 hour Discharge (cfs)			
	CA07F	CA07E	CA07D	CA07B(6)
ADMPU Exist. Conditions (Entellus, Inc.)	230	1140	1100	1830
ADMPU 107 th & UHD DCR Exist. Conditions (G&M, 2010)	160	760	1050	1920
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2010)	160	760	1050	1920
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2011)	160	760	1050	1950

Table 1: 100-YR, 6HR Discharge Comparison

Model	Concentration Point 100 year, 6 hour Discharge (cfs)			
	CA06A	CA06	A99P	CA99Q
ADMPU Exist. Conditions (Entellus, Inc.)	1980	2110	960	2090
ADMPU 107 th & UHD DCR Exist. Conditions (G&M, 2010)	N/A	N/A	N/A	N/A
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2010)	2070	850	960	2690
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2011)	2130	850	960	2760

Table 2: 100-YR, 6HR Discharge Comparison, Continued

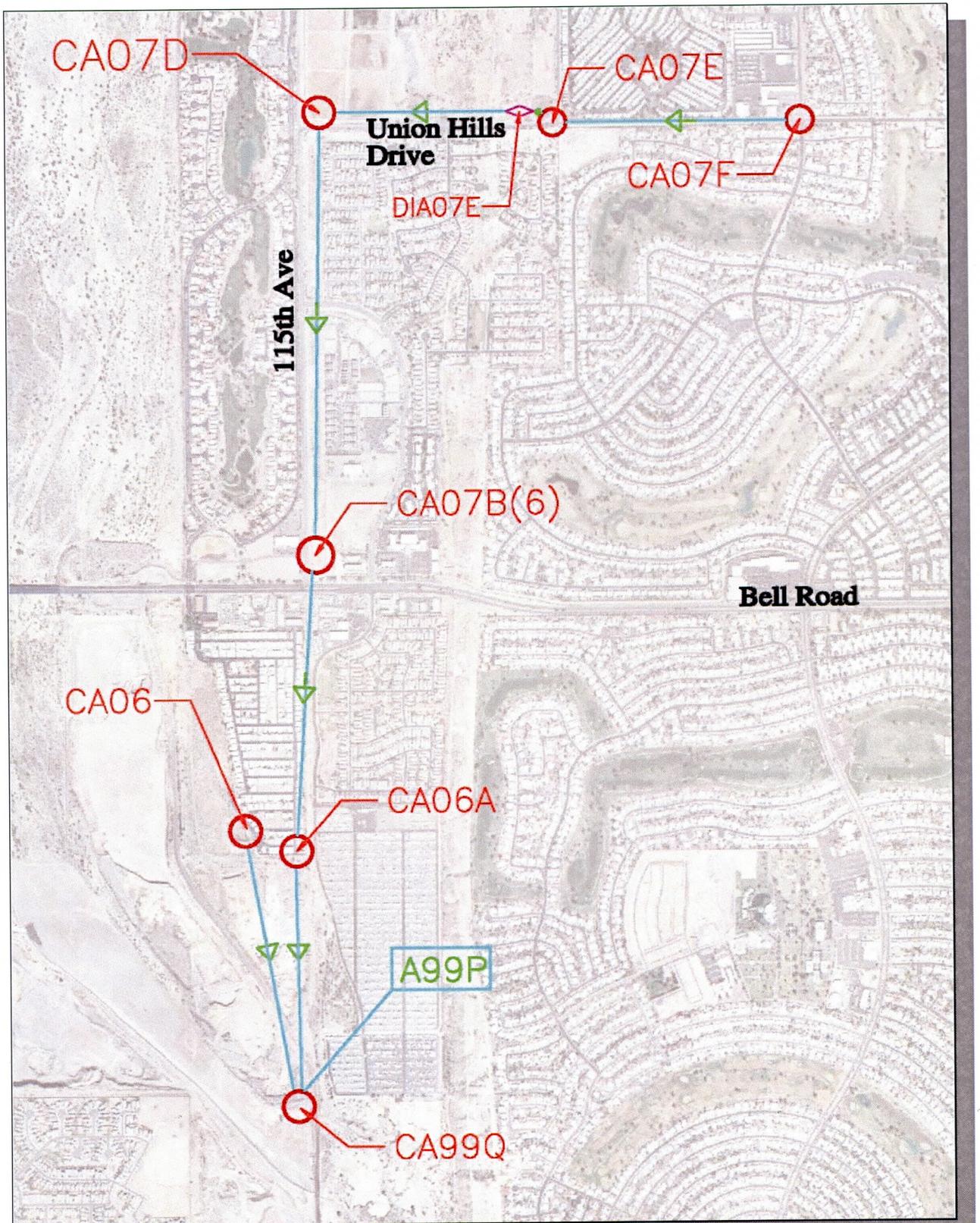


Figure 2 – 107TH Ave. & Union Hills Dr. DCR HEC-1 Schematic

6. EXISTING CONDITIONS HYDRAULIC ANALYSIS

6.1. Existing Drainage Facilities

A detailed existing conditions HEC-RAS model was performed for the study reach, the details of which may be viewed in Volume II. Below is a brief summary of the existing drainage facilities along the applicable corridors. Please see Figure 4 for a graphic representation of these areas.

6.1.1. 107th Avenue

107th Avenue currently does not have an organized storm drain system to convey storm water flows. The roadway currently conveys off-site and on-site run-off west to the existing commercial development and Lake Pleasant Mobile Home Park. Flows are then conveyed southwest through Paradise Resort Travel Trailer Park to 111th Avenue and Union Hills Drive.

6.1.2. Union Hills Drive

Union Hills Drive from 107th Avenue to 111th Avenue utilizes an existing earthen channel located along the south side of the existing pavement to convey storm water flows west to the Canyon Ridge Channel. The channel currently has a maximum capacity of 362 cfs near the 107th Ave. intersection and ending with a capacity of 10 cfs near the 111th Ave. intersection. The existing conditions hydrology model indicates that approximately 160cfs is conveyed along Union Hills Drive in the controlling 100year 6 hour event. In events that exceed the capacity of the existing channel storm water flows enter the Canyon Ridge Channel, the existing retention basin at the northwest corner of Union Hills Drive and 111th Ave. or continue west along Union Hills Drive.

Union Hills Drive from 111th Avenue to 115th Avenue conveys storm water west via curb and gutter. Scuppers are located at intervals along the southern curb where storm water is captured and conveyed south into the Canyon Ridge Channel system.

6.1.3. 111th Avenue

111th Avenue conveys storm water south from Beardsley Road via curb and gutter to the Union Hills Drive intersection where scuppers then transfer storm water to a retention basin located at the northwest corner of 111th Avenue and Union Hills Drive.

6.1.4. 115th Avenue

115th Avenue conveys storm water south from Beardsley Road via curb and gutter to the Union Hills Drive Intersection then continues south to Bell Road intersection. Scuppers are located along the eastern curb that transfers storm water from 115th Avenue to the existing Canyon Ridge channel / detention basin located east of 115th Avenue.

6.1.5. Beardsley Road Channel

The Beardsley Road Channel project was identified in the Glendale/Peoria ADMPU and is located in the southwest portion of the study area. The purpose of the Beardsley Channel Improvements is to mitigate flooding issues by conveying the contributing runoff to the Agua Fria River. As discussed above the Beardsley Road Channel is comprised of various cross-sections to convey storm water east to west, generally along the Beardsley Road alignment. The existing conditions hydraulic analysis performed in conjunction with this report verified that the Beardsley Road flows are channel confined within the improved sections of the channel. The ADMPU study notes (and was confirmed in Phase 1 of the 107th and Union Hills DCR) that the entrance into the Coyote Lakes Golf Course (115th Avenue) constricts the channel capacity and storm water runoff overtops the banks of the channel and flows south to merge with area flows generally at the 115th Avenue and Union Hills Drive Intersection.

6.1.6. Canyon Ridge Channel / Detention Facilities

The Canyon Ridge Channel / Detention Facilities were constructed as part of the Canyon Ridge Development and utilizes earthen channel sections, roadway crossing culverts of various sizes, linear detention facilities and associated weir structures to convey the 100year storm event. A review of the Master Drainage Study performed in support of the Canyon Ridge development indicates that the drainage system was designed for a minimum of 810 cfs, however, the results of the detailed HEC-RAS analysis performed in conjunction with the DCR indicate that constrictions located at the 114th Avenue, Avenue of the Arts, and West Valley Art Museum Entrance culvert crossings reduce the carrying capacity such that 115th and adjoining lots within the Canyon Ridge development are inundated. Details of the HEC-RAS analysis may be found in Volume II of this report.

6.1.7. Bell Road / Sun City Drain Culvert

Bell Road is a Maricopa Department of Transportation facility and was constructed as a full Major Arterial cross section in 1992. The drainage system utilizes three – 9 ft. x 5 ft. RCB culvert to convey storm water flows under Bell Road to the southern reach of the Sun City Drain Channel. Based on historic research it appears the Bell Road culvert was originally constructed to convey the Sun City Drain flows while the DCR subject drainage area north of Bell Road was conveyed west along the north ROW of Bell Road via earthen channel to the Agua Fria River. With the construction of the Coyote Lakes and Canyon Ridge developments the channel west to the Agua Fria was abandoned and flows were directed to overtop the Sun City Drain Channel north of Bell Road and be conveyed south via the Bell Road culvert. The results of the DCR Existing Conditions HEC-RAS model show that the culvert system has inadequate capacity for the 100 year storm event and flows overtop Bell Road at a depth of approximately 0.74 ft over an approximate distance of 1,100 feet.

6.1.8. Sun City Drain Channel

Based on the field ties performed by the district, the Sun City Drain Channel south of Bell Road is generally an incised trapezoidal channel with a bottom width of 10-15 feet, side slopes of +/-4:1 and an average depth of 6-8 feet. The majority of the channel section is comprised of a deteriorated shotcrete lining transitioning to an earthen lined channel near its confluence with the Agua Fria River. The results of the DCR Existing Conditions HEC-RAS model show that the channel system has inadequate capacity for the 100 year storm event (+/-1,950 cfs). The channel has varying capacity throughout the reach with a limiting capacity of 850 cfs approximately 2,000 feet south of Bell Road.

7. CONTEXT SENSITIVE FLOOD HAZARD MITIGATION APPROACH

It is important to note that the CSFHM discussion contained within this section is currently under development and the methodologies contained within this report are subject to change. The interested reader should coordinate with the District's Landscape Branch prior to implementation of the described approach.

As defined by the District *"The Context Sensitive Flood Hazard Mitigation Planning and Design Approach serves as a framework for floodplain managers, water resource professionals, planners, engineers, landscape architects, environmental professionals and others, to guide the development of FHM solutions that integrate the three required basic functions of being **Acceptable** to local communities, **Compatible** with landscape resources and **Effective** in reducing flooding hazards (ACE). The CSFHM Approach provides water resource professionals with an innovative tool for consistently delivering multi-objective results.*

A context sensitive solution, as defined by the District, is one that integrates and delivers all three basic functional outputs of being acceptable, compatible and effective. It should be recognized that achievement of only one or two of these

functional outputs, does not constitute a context sensitive solution. It requires all three. Conversely, it should also be recognized that in real world application of the CSFHM Approach, the degree to which context sensitive solutions will be produced will depend upon the complexities, opportunities and constraints that are presented by the project. Nevertheless, performance of the required basic functions contained in the ACE challenge is a critically important initial intent.

*The CSFHM model focuses on the interrelationship between three contexts: Flooding, Land and Resource, and the Community. The Flooding Context is defined through an analysis of risk and exposure to flooding. The Land and Resource Context is defined through the analysis of valued characteristics of landscape resources. The Community Context is defined through the analysis of direction and vision provided in local community plans and public sensing. The CSFHM Approach then identifies context sensitive solutions that lie within the interface between these three contexts. The range of FHM solutions that are identified through application of the CSFHM Approach are then used as the “**building-blocks**” for designing alternatives in FHM planning studies and project designs.”*

7.1. Data Collection and Inventory

The following procedure was utilized to develop the Context Sensitive Flood Hazard Mitigation solutions. The details of the CSFHM analysis may be viewed in Appendix D.

7.1.1. Flood Context Inventory

- Review Historical Flooding Data
- Identification of Flooding Risk and Exposure
- Analyze to identify the presence of different flooding types

7.1.2. Land and Resource Context Inventory

- Landscape Character
- Open Space
- Parks and Recreation

7.1.3. Community Context Inventory

- Identifies desired community character and needed multi-purpose functions that could potentially be integrated into Flood Hazard Mitigation (FHM) solutions.
- Examination of local community goals, objectives and requirements for project area.
- Review general plans, elements, ordinances and guidelines for:
 - City of Surprise
 - City of Peoria
 - Maricopa County

7.2. Data Analysis Process

7.2.1. Flood Inventory and Analysis

- Analyze the range of FHM solutions that reduce flooding. The FHM solutions are rated as either EFFECTIVE or INEFFECTIVE.
- The flooding types existing within the study were determined to be shallow sheet flooding due to the lack of an organized drainage system and overbank flooding from channelized sections with lack of capacity for the design event.
- Based discussions with the district, the effective flood measures for sheet flooding and overbank flooding are underground pipe, channel conveyance, and storage basins.

GENERAL ANALYSIS		Structural Types					
		Non-Structural (Natural)	Underground Pipe	Channel Levee	Conveyance Channel	Storage Basin	Dam
Flooding Types	Riverine / Channel Flooding						
	Overbank Flooding	E	E	E	E	E	IE
	Flash Flood	E	E	E	E	E	IE
	Dam or Levee Failure	IE	IE	E	E	IE	IE
	Alluvial Fans	IE	IE	E	E	E	E
	Sheet Flooding	IE	IE	E	E	IE	E
	Impoundment Flooding	IE	E	E	E	E	E
	Urban Drainage	IE	E	IE	E	E	IE
Ground Failures							

E = Effective RED - TEXT REPRESENTS EXISTING FLOODING TYPES WITHIN STUDY AREA
IE = Ineffective

Table 3 – Flood Mitigation Effectiveness

7.2.2. Landscape Inventory and Analysis

The 107th Avenue and Union Hills Drive Landscape and Inventory Analysis was prepared by the District in June 2010 and has been utilized for the purpose of this analysis.

- Range of compatible FHM solutions determined by assessing the relative ability of the FHM strategies, structure types, structural methods and landscape design themes to complement the valued characteristics and beneficial functions of the landscape settings, open spaces and recreation

environments found within the study area. Each FHM solution is rated as either COMPATIBLE or INCOMPATIBLE. This analysis was taken directly from the Districts LIA report and verified through interviews with the project stakeholders as well as numerous site visits to review and document existing site landscape character, density, palette and overall appearance. Please refer Appendix D where the recommendations of the project LIA Section 4.0 are addressed.

7.2.3. Community Inventory and Analysis

- Range of acceptable FHM solutions typically established by assessing the potential ability of the FHM strategies, structure types, structural methods and landscape design themes to meet the desired local community character and goals. Each FHM solution is rated as either ACCEPTABLE or UNACCEPTABLE.

Based on field inspections the structural methods and landscape design themes were identified and determined to be within the range contained within the LIA. Please refer to Appendix D for graphic representation of the consultant's findings.

7.2.4. Comparative Analysis to Determine FHM solutions that are both Compatible and Effective.

- Compare the COMPATIBLE/EFFECTIVE set of solutions to the ACCEPTABLE solutions to identify the set of solutions that meet all three of the required basic functions – ACCEPTABLE, COMPATIBLE AND EFFECTIVE (ACE).

7.3. CSFHM Findings

7.3.1. Final Range of Acceptable, Compatible and Effective Flood Hazard Mitigation Solutions

Range of Acceptable, Compatible and Effective Flood Hazard Mitigation Solutions

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Underground Pipe	A/C/E	A/C/E	A/C/E	A/C/E
	Conveyance Channel	A/C/E	A/C/E	A/C/E	A/C/E
	Storage Basin	A/C/E	A/C/E	A/C/E	A/C/E

A/C/E = ACCEPTABLE, COMPATIBLE AND EFFECTIVE

Range of Context Sensitive Flood Hazard Mitigation Methods and Landscape Design Themes		
Structure Types (Small* or Medium) Refer to Table to in the LIA report	Structural Methods	Landscape Design Themes
Underground Pipe	Soft Structural	Semi-Natural Sonoran Desert
Conveyance Channel	Semi-Soft	Enhanced Desert
Storage Basin		Desert Park
		Desert Oasis
		Desert Plaza Theme

Table 4 – A/C/E Solutions

For the purpose of this analysis the study area was divided into 4 areas based on land use and available drainage systems.

- Area A = Arizona American Water and City of Peoria WWTP Facilities
No organized drainage system
- Area B = Paradise Resort Travel Trailer Park
No organized drainage system
- Area C = Sun City Development (Single Family Residential – Age restricted)
No organized drainage system
- Area D = Canyon Ridge Development (Single Family Residential)
Established Drainage System

The array of structure types shown were determined based on their effectiveness in mitigating flooding and does not include the “Natural Structures” contained in the LIA as

the study area is a suburban environment. The “Natural Structural Method” and “Natural” design themes were also omitted from the available Structural Methods and Landscape Design Themes respectively do to the same reasoning stated above. Examples of the structural types, structural methods, and Landscape Design themes may be viewed in the District’s LIA manual contained in Appendix D of this report.

8. BASIS FOR DESIGN

The Flood Control District of Maricopa County, Drainage Design Manual Volume 1 (Hydrology) and Volume 2 (Hydraulics) have been utilized as the general basis for design. Specific deviation from design criteria will be discussed in the applicable alternative analysis. As noted in the project goals above it was the intent of the analysis to convey the 100 year event through the study area; this concept applied to underground storm drain pipe, open channel sections, culvert sections, and detention basins. Local drainage basins have not been analyzed for the purpose of this report; however their concentration points have been identified to the greatest extent possible for use the final design.

INTRODUCTION OF BEARDSLEY ROAD FLOWS

As previously discussed, through the public input process and after additional review by the District it was determined that flows from the Beardsley Road Channel would be incorporated into 107th and Union Hills Drive Design Concept Report. Due to the introduction of the Beardsley Road flows being post the alternative analysis for the 107th Avenue and Union Hills Drive study area, the alternatives analysis contained within this DCR are presented in two parts; Pre-Beardsley Road Flows and Post-Beardsley Road Flows.

9. DEVELOPMENT OF ALTERNATIVES – PRE-BEARDSLEY ROAD FLOWS

For the purposes of this evaluation, the study area was broken into smaller study segments that may have various available alternatives. The conveyance alternatives within any given segment are generally independent of the alternatives that may be selected elsewhere within the study area. This methodology allows for each segment to be evaluated on its own merit and then to be combined with the other preferred segment alternatives in order to obtain the project recommended alternative. The alternatives discussed below will utilize the segment number followed by the alternative number; for example Alternative 4.2 is Segment 4 Alternative 2.

Please see Figure 4 for a graphic representation of the “Pre-Beardsley Road Flows” segment locations and the December 16, 2010 – Meeting 4, Meeting Notes in Appendix G, Volume I for schematics of the Alternatives.

9.1. Hydrologic & Hydraulic Boundary Conditions – Pre-Beardsley Road Flows

Through discussions with project stakeholders the principal hydrologic and hydraulic boundary condition was determined to be the Bell Road Culvert and associated downstream reach of channel known as the Sun City Drain Channel. Bell Road was identified by MCDOT as an area of high importance and the removal and replacement of the culvert was determined to be infeasible due to the impact on the extremely high volume of motorist and associated high construction and management cost to perform construction activities within the Bell Road ROW. MCDOT’s drainage design criteria allows for 6 inches of overtopping in a 100 year event, however, it was agreed by the stake holders that Bell Road should be protected from the 100 year event due to the importance of Bell Road to maintain emergency vehicular traffic circulation in the region.

- As previously discussed, the Sun City Drain Channel downstream of Bell Road has varying capacity with a segment of approximately 1,200 ft. in length having a limiting capacity of approximately 850 cfs.

- Based on the existing conditions hydraulic model, the Bell Road Culvert system is shown to have a capacity of +/-1,100 cfs at a headwater elevation of 1163.40. The existing low top of curb of elevation for Bell Road is 1164.40 resulting in approximately 1.00 ft. of freeboard.
- Through discussions with the stakeholders, it was agreed that the 1,200 ft. of channel with limited capacity should be reconstructed to convey a higher flow.
- The remainder of the channel system (approximately 1 mile in length) was shown to have a capacity exceeding the 1,100 cfs capacity of the Bell Road culverts.
- Based on the findings above, the maximum allowable flow rate from the project area (at Bell Road) has been established to be 1,100 cfs.

Per the existing conditions hydrologic analysis (Appendix A.2, Volume II) the 100 year 6 hour existing conditions discharge for the channel system crossing under Bell Road was found to be 1,950 cfs. In order to match the *allowable* peak discharge of 1,100 cfs, two alternatives of attenuation were explored a) detention and b) detention with diversion. The detention alternative modeled 2 basins, the first located generally at the northwest corner of 111th Ave and Union Hills Drive (Basin B) and the second located generally at the northeast corner of 115th Ave and Bell Road (Basin C). The detention with diversion utilizes the Basin B detention and removes Basin C while replacing the attenuation affect with a diversion west along Bell Road to the Agua Fria.

Due to the required Detention / Diversion required upstream of Bell Road, it was determined that a secondary goal would be to utilize any necessary detention facilities to regulate flows entering into the 1.5 mile reach of existing channel, culverts, and detention ponds located within Canyon Ridge Development. The flows would be regulated such that the existing capacity of the Canyon Ridge Channel system is not exceeded thus reducing potential costly upgrades to the existing infrastructure.

PRE-BEARDSLEY ROAD FLOWS ALTERNATIVE DISCUSSION

9.2. Segment 1 – 107th Avenue

9.2.1. Alternative 1

Per discussions with the City of Peoria, this segment was required to be piped based on the limited ROW available for a fully improved roadway section. It was also determined that 107th Avenue drainage conditions are not regional in nature therefore the drainage improvements for Segment 1 will be performed as a City of Peoria CIP project.

- The drainage area for 107th was delineated to be approximately 18 acres from Beardsley Road to West Palm Tree Drive with an additional 8.4 acres accumulating from W. Palm to Union Hills Drive (UHD).
- The associated discharges at UHD were approximated to be 30 cfs for the 10-year event and 64 cfs for the 100-year event.
- The design event to be utilized for 107th system is to be revisited at the time of final design and further input by the City of Peoria.

9.3. Segment 2 – Union Hills Drive (107th to 111th Avenue)

9.3.1. Alternative 1

Alternative 2.1 proposes to pipe the storm water flows from 107th Avenue to the Canyon Ridge Channel located at the southeast corner of 111th Avenue and Union Hills Drive. The storm drain is proposed to be sized for the 100 year event and be constructed within the roadway cross-section to minimize current and future linear utility conflicts.

9.3.2. Alternative 2

Alternative 2.2 proposes to convey Alt. 2.1 storm water via open channel. This solution is temporary in nature and would be replaced with underground storm drain when Union Hills Drive is expanded to its ultimate cross-section.

9.3.3. Segment 2 - Alternative Comparison

Alternative 2.1 was found to be the preferable alternative due to the fact that the piped alternative is a permanent solution and may be used to convey the Union Hills Drive street flows if it is deemed appropriate during final design. Additionally, Alternative 2.2 requires the potential relocation of a 20" El Paso Natural Gas (EPNG) gas line, the use of substantial guard railing and retaining wall along significant reaches of the Segment.

9.4. Segment 3 – 111th Avenue to Basin B

9.4.1. Alternative 1

Segment 3.1 proposes to convey storm water exiting the Paradise Resort Travel Trailer Park via low water crossing west across 111th Avenue to an earthen channelized section that then flows west for approximately ¼ mile to Basin B.

9.4.2. Alternative 2

Segment 3.2 proposes to convey storm water exiting the Paradise Resort Travel Trailer Park via box culvert under 111th Avenue to an earthen channelized section that then flows west for approximately ¼ mile to Basin B.

9.4.3. Segment 3 - Alternative Comparison

For the purposes of this report Alternative 3.2 was found to be preferable due to the lower maintenance cost, as well as, the fact that it delivers a 100 year event solution. It is recommended that a combined culvert/low water crossing alternative be evaluated at the time of final design.

9.5. Segment 4 – Canyon Ridge Channel / Detention System

9.5.1. Alternative 1

Segment 4.1 proposes to convey storm water from the Basin B outfall to west and south through the Canyon Ridge Channel / Detention System. As discussed in Section 9.1 above, this alternative proposes to utilize the

existing Canyon Ridge Channel infrastructure with the goal of minimizing the required upgrades/modifications to the existing infrastructure.

9.6. Segment 5 – Bell Road Culvert

Under existing conditions, 1050 cfs from the combination at Union Hills Drive and 115th Ave. is conveyed south through the existing channel/detention facilities to the existing east-west running Sun City Drain Channel located along the north right-of-way of Bell Road. The flows from the 115th Channel\Detention system overtop the Bell Road channel bank and combine north of the Bell Road culverts for a total of 1,950 cfs.

9.6.1. Alternative 1

Alternative 5.1 proposes to expand the existing Canyon Ridge Detention Basin located east of 115th Avenue and north of Bell Road (Basin C). It was determined that a total of approximately 67 acre-feet of storage is required to attenuate the flows to match the allowable 1,100 cfs at the Bell Road Culvert. The expansion of Basin C requires the acquisition of approximately +/-11 acres of vacant land to the east of Basin C (currently owned by Stearns Bank – Zoned Commercial).

9.6.2. Alternative 2

Alternative 5.2 utilizes Basin C in its current configuration and diverts the necessary amount of storm water west to the Agua Fria in order to match the allowable 1,100 cfs at the Bell Road culvert. This alternative would require the diversion of approximately 370 cfs utilizing a double barrel 10'x3' box culvert from Basin C, under 115th Avenue, through the existing Pavilion at Coyote Lakes commercial development. Alternative 5.2 would also require the construction of a permanent grade to drain swale within the Agua Fria River to achieve a positive outfall.

9.6.3. Segment 5 - Alternative Comparison

Alternative 5.2 was determined to be infeasible due to the high construction cost, impacts on adjoining parcels due to ROW acquisition,

the required Agua Fria River grading and the high maintenance cost. Alternative 5.1 was preferred with qualifications that additional work be performed in the area of Basin B to maximize the storage thus minimizing the Basin C footprint and associated land acquisition cost. The City of Peoria stated that to accomplish this objective, a portion of their land north of Union Hills Drive (+/- 300 ft.) could be used to supplement the required detention volume (*Basin A*).

9.7. Segment 6 – Sun City Drain Channel

9.7.1. Alternative 1

Alternative 6.1 proposes to attenuate the 115th Avenue and the Sun City Drain flows north of Bell Road via expanding the Basin C detention pond. The flows are proposed to be attenuated to the downstream controlling capacity of 850 cfs. It was determined that a total of approximately 110 acre-feet of storage is required to attenuate the flows to match the minimum capacity of 850 cfs for the Sun City Drain Channel.

9.7.2. Alternative 2

Alternative 6.12 proposes to improve the deficient section of the Sun City Drain Channel to maintain a minimum capacity of 1,150 cfs (*matching similar capacities upstream*). This alternative requires approximately 1,200 linear feet of channel improvement. It is anticipated that the channel improvements may be performed without the acquisition of additional ROW.

9.7.3. Segment 6 - Alternative Comparison

The revised hydrology model performed for Alternative 6.1 indicated that by combining the Sun City Drain drainage area with the 115th Channel drainage area created an excess volume of water that could not be attenuated to comply with the downstream constraints.

The Flood Control District is currently researching ownership and maintenance responsibilities for Sun City Drain Channel south of Bell Road. Subject to the findings of this research exercise Alternative 6.2 was

selected as the preferred alternative and is intended to create a 100 year storm system would be in place for the entire system to its confluence with the Agua Fria River.

Based on the condition of the Sun City Drain Channel and the lack of protected outfall into the Agua Fria, additional evaluation is expected to occur by the District to further refine the limits of work for Segment 6.

10. DEVELOPMENT OF ALTERNATIVES – POST- BEARDSLEY ROAD FLOWS

Upon conclusion of the Alternatives Analysis for 107th Avenue & Union Hills Drive and corresponding public input, the District revised the scope of the DCR to include an alternative analysis to include the storm water flows in the Beardsley Road Channel. It was agreed that the inclusion of the Beardsley Road Channel flows would not alter the hydrology and hydraulic boundary conditions previously established. The alternative analysis of the Beardsley Road Channel flows were also to honor the selected preferred alternatives for Segment 1, 2, 4, 5, and 6 and were to focus on routing the Beardsley flows to the Agua Fria River or expanding detention Basin's A & B to appropriately attenuate the additional volume of storm water for inclusion into the 107th Avenue and Union Hills Drive drainage outfall. Please see Figure 6 for a graphic representation of the "Post-Beardsley Road Flows" segment locations.

POST-BEARDSLEY ROAD FLOWS ALTERNATIVE DISCUSSION

10.1. Segment 7 – Beardsley Road Channel

10.1.1. Alternative 1

Alternative 7.1 proposes to improve the Beardsley Road Channel (via open channel or closed conduit) generally along the Beardsley Road alignment to 115th Avenue and continue the channel through the Coyote Lakes Golf Course west to the Agua Fria.

10.1.2. Alternative 2

Alternative 7.2 proposes to improve the Beardsley Road Channel (via open channel or closed conduit) generally along the Beardsley Road alignment to an existing gravel mining pit located at the southeast corner of 115th Avenue and Beardsley Road. The mining pit would be remediated to comply with District standards regarding depth, access, and side slopes. The flows would then outfall along the alignment discussed in Alternative 1 or south along 115th Avenue where it would combine with the 107th and Union Hills Drive flows at the Canyon Ridge Channel system at the southeast corner of 115th Avenue and Union Hills Drive.

10.1.3. Alternative 3

Alternative 7.3 proposes to capture the Beardsley Road Channel (via open channel or closed conduit) generally at 113th avenue (entrance to the City of Peoria waste water treatment facility) then divert south along the east property line of Arizona American Water recharge property. The flows would be conveyed approximately ½ mile to the northern limits of Basin B where they would be attenuated to conform to the allowable outfall conditions established in the 107th and Union Hills Drive alternative analysis.

10.1.4. Segment 7 - Alternative Comparison

Research for Alternative 7.1 & 7.2 found that the active mining area surrounding the north and west limits of the Coyote Lakes Golf Course extends south of Beardsley Road approximately ½ mile thus preventing an acceptable outfall for the Beardsley Channel flows to be constructed. The component of Segment 7.2 that would utilize the existing mining pit as detention facility was deemed unfeasible due to the depth of excavation (+/-40 ft) and the associated cost to remediate the pit to meet District standards.

Through additional coordination with the City of Peoria and the District, Alternative 7.3 was found to be the preferred alternative if the following conditions could be met.

- No Impacts to existing operations of Arizona American Water and City of Peoria WWTP operations.
- Maximum slopes of 4:1
- Maximum depth of 12 feet as measured from the deepest portion of the Basin to the top of bank.
- Available land for Detention Basin A to be provided by the City of Peoria a maximum of 300 feet north of Union Hills Drive as measured from the future north ROW line of Union Hills Drive.
- Channels and detention facilities should be incised and should not have a bermed condition that could be construed as being a non-certified levee in the future.

11. RECOMMENDED ALTERNATIVE SUMMARY

Below is a discussion of the Recommended Alternative, as developed based on input and approval from the project stakeholders. Details regarding the selection process may be viewed in the Alternative Analysis in Sections 9 and 10 of this report. Based on the District's request, all culverts referenced having a 3' height in Alternative Analysis section have been revised to have a minimum 4' in height in Recommended Alternative. Please see Figure 8 for a graphic representation of the various segments and the associated recommended alternatives. Additionally, please note that the required ROW acquisition shown as part of the alternatives is based on best available data and is subject to change as part of the final design.

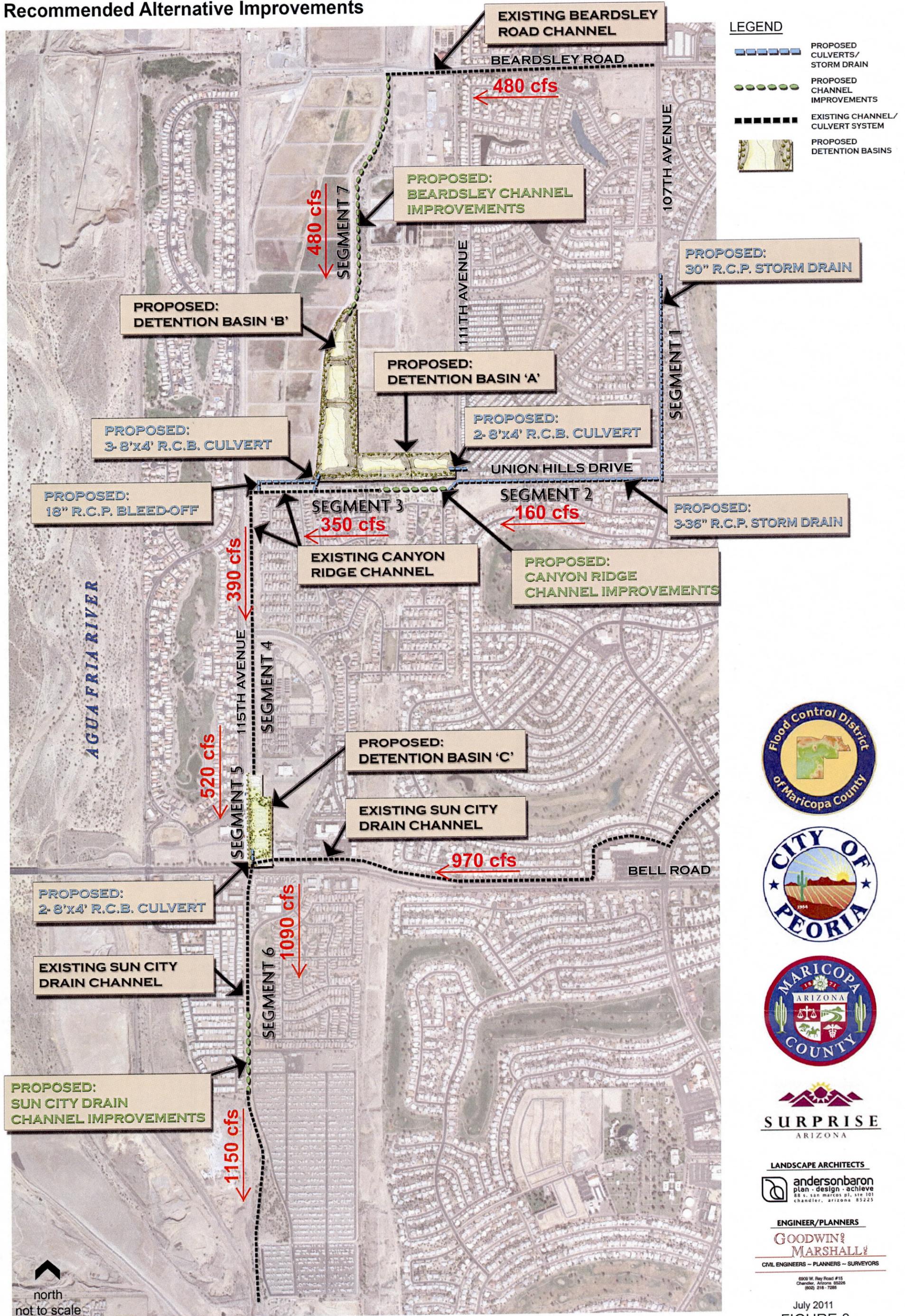
11.1. Segment 1 – 107th Avenue

Alternative 1.1 - Underground Pipe

Two drainage areas were identified for Segment 1. The first being approximately 18 acres and extends from Beardsley Road to West Palm Tree Drive and the second being approximately 8.4 acres from W. Palm to Union Hills Drive (UHD). The associated discharges at UHD and 107th Ave. were estimated to be 30 cfs for the 10-year event and 64 cfs for the 100-year event. The 15% plans for the UHD storm drain system are

107TH AVE. AND UNION HILLS DRIVE DRAINAGE ALTERNATIVE ANALYSIS

Recommended Alternative Improvements



intended to be sized to accommodate the 107th flows, however, the 107th storm drain design and construction is currently anticipated to be included as part of the City of Peoria's 107th CIP program.

11.2. Segment 2 - Union Hills Drive (107th Avenue to 111th Avenue)

Alternative 2.1 - Underground Pipe

The 100 year discharge for Segment 2 is approximated to be 160 cfs. Segment 2 is generally located along the UHD alignment from 107th Avenue to 111th Avenue (+/- 1,320 L.F.). The use of 3 ft. diameter parallel pipe systems is proposed to convey the flows from 107th to the existing Canyon Ridge Channel located at the southwest corner of 111th Ave. and UHD. The use of the RCP was preferred over a 3 ft. tall box system due to maintenance issues and high construction cost. The preliminary design of the pipe system under the EPNG pipe line has been coordinated with EPNG engineering staff however the final design must be submitted to EPNG for approval. Note that, the storm drain shall be required to cross under the EPNG line and shall maintain the minimum 2 ft. clearance throughout the entire easement. In order to maintain the clearance, downstream grading within the Canyon Ridge Channel is needed to provide positive outfall for the pipe system.

11.3. Segment 3 - 111th Avenue to Basin A

Alternative 3.2 – Culvert Crossing

Approximately 350 cfs is being conveyed through the existing retention pond located south of W. Cimarron Blvd. in the Ventana Lakes development. The Ventana Lakes flows are currently routed south along 111th Ave. to the UHD intersection where they are combined with the flows from the Paradise RV Resort. The 111th Ave. storm water is currently modeled flowing full street width and contained by the existing walls located at the east and west ROW lines. As the flows approach UHD they are proposed to be captured by scuppers and taken east to the

existing Paradise RV Resort basin and west to the proposed basins located north of UHD. These flows are approximated to be split with half exiting 111th Ave to the east and half exiting 111th Ave to the west.

The flows exiting the Paradise Resort Retention basin have been estimated to be 500 cfs and are proposed to be conveyed west to Basin A via 2-8'x4' box culverts.

11.4. Segment 7 - Beardsley Road Diversion Channel

Alternative 7.3 – Channel Diversion to Basin B

The Beardsley Road Diversion Channel is proposed to convey approximately 480 cfs from Beardsley Road to Basin B via open channel. The recommended alternative proposes the use of a 15' bottom width, 2:1 side slope, concrete channel with 4:1 earthen tie-in slopes. The channel is generally located in the slope area along the eastern property line of the Arizona American Property. The horizontal alignment and cross-section of the channel was selected in order to minimize the channel's footprint thus reducing the potential for conflicts with the existing Arizona American and City of Peoria Wastewater treatment facilities.

- Requires +/- 3.9 acres of land to be acquired from Arizona American Water. See Figure 9 for graphic representation of estimated ROW requirements.
- Requires +/- 4.2 acres of land to be acquired from the City of Peoria. See Figure 9 for graphic representation of estimated ROW requirements.
- The alignment for the diversion channel was generally viewed acceptable by all stakeholders however; the City of Peoria will have additional input regarding the final conveyance structure (open channel or piped) and the location/need for service roads at the time of final design. Additional consideration is required to evaluate the potential seepage issues discussed in Basin A and B attenuation below.

11.5. Basin A and B Attenuation

Please see Figure 7 (Plate 7 from the Volume II report) for a graphic schematic of the Basin A & B configuration.

As discussed above, the criteria for basins were amended to a max depth of 12 feet (as measured from bottom to positive overflow elevation). Based on input from the City of Peoria, channels and detention facilities should be incised and should not have a bermed condition that could be construed as being a non-certified levee in the future. Basin bottoms shall be sloped to insure positive runoff while side slopes shall not exceed 4:1 slope however should meander and incorporate grading for trails and service roads.

- Basin A.1 and A.2 are proposed to be generally located along the south property line of the City of Peoria Waste Water Treatment facility (encroaching no more than +/- 300 ft. north of the north ROW line). The 500 cfs from the 111th culvert shall be conveyed through a series of stair stepped ponds (A.1 & A.2). The Recommended Alternative hydrology model utilizes approximately +/-44 acre-feet of storage (*max available*) for these basins and will be connected with 2-24" RCP pipes to convey the nuisance flows while the larger events will be conveyed via a rectangle weir (or similar) to the downstream pond (B.3).
- Basin B.1, B.2 & B.3 are proposed to be located in Arizona American slope area located north of UHD approximately at the 113th Avenue intersection. The current model utilizes approximately +/-80.8 acre-feet of storage (*max available*) for these basins. The ponds will be stair stepped and connected as discussed in Basins A.1 and A.2.
- Finally Basin 3 will utilize 3-8'x4' culverts to discharge peak flows +/- 330 cfs) to the existing Canyon Ridge Channel. Due to the depth of the basin discussed above, a bleed off pipe will be constructed

approximately 900 ft. downstream in the existing Canyon Ridge development in order to allow for complete drainage of the pond.

- The time required to completely drain Basins A & B in the 100 Year event is estimated to be 19 hours.
- The construction of Basins A&B requires +/- 22.1 acres of land to be acquired from Arizona American Water and +/- 8.7 acres of land to be acquired from the City of Peoria. See Figure 9 for graphic representation of estimated ROW requirements.
- Additional discussion with Peoria will be required during final design to address potential seepage issues along the storm drain system. The seepage issues are twofold:
 - 1) Shallow seepage from the Peoria basins that could show up as continual flow in the channel and basin system or in the Arizona American recharge ponds.
 - 2) Deep seepage from the channel and basin system that could show up as contaminants in the AZ American monitoring wells.

11.6. Segment 4 – Canyon Ridge Channel / Detention System

Alternative 4.1

The improved conditions hydrologic model has been revised to account for the flow reduction caused by Basin A & B storage and indicate that the existing channel system and existing culverts have capacity to convey the +/- 350 cfs generated by the 100 year event.

11.7. Segment 5 – Basin C

Alternative 5.1 – Basin C Detention

The existing Canyon Ridge Channel system utilizes a series of online detention facilities to mitigate peak flows. The southern most of these online detention basins (Basin C) is proposed to be expanded +/-100ft to the east in order to detain the necessary 29 acre-feet of storage.

Additionally a berm along 115 Ave shall be constructed in order to prevent detained flows from inundating 115 Ave.

- Requires +/- 3.2 acres of land to be acquired from Stearns Bank (or current owner) for Expansion of Basin C. See Figure 10 for graphic representation of estimated ROW requirements.
- Requires +/- 2.1 acres of temporary grading easement to be obtained from Stearns Bank (or current owner) to ensure the property has 1 ft. of freeboard above the Basin C high water elevation. See Figure 10 for graphic representation of estimated grading limits.
- City of Surprise request that the existing trail located along 115th East ROW line be kept in place as part of the recommended alternative.

11.8. Segment 6 – Sun City Drain Channel

Alternative 6.2 – Sun City Drain Channel Improvements

- This alternative proposes the improvement of a +/- 1,550 ft, section of the existing Sun City Drain Channel. The reach of the channel being improved currently has limited capacity and is proposed to be reconstructed to convey the design event.
- Based on the condition of the Sun City Drain Channel and the lack of protected outfall into the Agua Fria, additional evaluation is expected to occur by the District to further refine the limits of work for Segment 6.

12. RECOMMENDED ALTERNATIVE – HYDROLOGY

The flows from the Recommended Alternative hydrology model are significantly lower than the existing conditions hydrology model as expected. The addition of the Detention Basins A and B have reduced the flow being released into the 115th Avenue Channel due to the large amount of storage provided. The flows within the channel south of Union Hills Drive and 115th Channel in the Recommended Alternative do not exceed the capacity of the channel or culverts along this channel section. With the addition of Detention Basin C, the peak flows from the study area have been delayed sufficiently such that peak flows

from the Canyon Ridge development and the Sun City Drainage Channel along Bell Road have passed prior the Basin C peak outflow. This results in a peak discharge being routed south beneath Bell Road to the Agua Fria River that is lower than the capacity of the Bell Road culverts and can be contained within the channel downstream of Bell Road post the recommended improvements. Tables 3 & 4 show a comparison of previous flows to the 100 year, 6 hour flows for the Recommended Alternative. The concentration point locations maybe viewed in graphic format on Figure 2.

Model	Concentration Point 100 year, 6 hour Discharge (cfs)			
	CA07F	CA07E	CA07D	CA07B(6)
ADMPU Exist. Conditions (Entellus, Inc.)	230	1140	1100	1830
ADMPU 107 th & UHD DCR Exist. Conditions (G&M, 2010)	160	760	1050	1920
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2010)	160	760	1050	1920
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2011)	160	760	1050	1950
ADMPU 107 th & UHD Improved Conditions (G&M, 2011)	160	665	390	1080

Table 5 - Post DCR - 100-YR, 6-Hr Discharge Comparison

Model	Concentration Point 100 year, 6 hour Discharge (cfs)			
	CA06A	CA06	A99P	CA99Q
ADMPU Exist. Conditions (Entellus, Inc.)	1980	2110	960	2090
ADMPU 107 th & UHD DCR Exist. Conditions (G&M, 2010)	N/A	N/A	N/A	N/A
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2010)	2070	850	960	2690
ADMPU 107 th & UHD DCR-2 Exist. Conditions (G&M, 2011)	2090	850	960	2700
ADMPU 107 th & UHD Improved Conditions (G&M, 2011)	1150	850	960	1790

Table 6 - Post DCR - 100 YR, 6-HR Discharge Comparison, Continued **13. RECOMMENDED**

ALTERNATIVE - HYDRAULICS

The results of the recommended alternative hydraulic model were as expected. The discharges shown in Tables, 3 & 4 are completely contained within the channel in the recommended alternative proposed conditions. The existing culverts have capacity to convey the flows without overtopping their respective street or the 115th Avenue or Union Hills Drive top of curb. A table of the HEC-RAS results summary and cross sections as well as the HEC-RAS base map may be found in Volume II.

14. RECOMMENDED ALTERNATIVE – LANDSCAPE APPROACH

The Context Sensitive Flood Hazard Mitigation Planning and Design Approach (CSFHM) findings within the 107th Avenue and Union Hills drainage concept report identified the surrounding natural vegetation and local community land and resource, predominantly analyzing the visual impact of flood control structures and general aesthetics of the adjacent properties. The process includes analysis of existing landscape conditions as well as defining landscape structure, methods and themes which are compatible within the range of possible project solutions. General compatible structure types as identified within the Landscape Inventory Analysis (LIA) range from Class 5 and 6; specifically Subclasses 5.1, 5.2 and 6.3. This range of different types of structures has been determined to be compatible with the landscape settings of the study area as well as with the size and depth of channels and basin structures. The compatible structural method as identified in the LIA is Class 3 indicating that non-structural, soft structural, and semi-soft structural methods are compatible with the landscape settings of the study area. The following is a discussion on the landscape approach to the recommended alternative.

14.1. Segment 1 – 107th Avenue:

Alternative 1.1 – Underground Pipe (Structure Compatibility Class 6 Sub-Class 6.3)

- The prescribed structural method is Semi-Soft Structural (Class 3)
- The prescribed landscape design theme is Enhanced Desert Landscape which is in keeping with the desired character for the project area and the existing landscape vegetation
- The prescribed landscape aesthetic features shall be developed as part of the final design. The physical disturbance and extent of landscape required will be defined as the project is further designed. The consultant recommends that existing pedestrian connections be maintained or replaced as part of the project improvements. Landscape setback, ground plane shaping, or other municipal requests shall be developed through the final design

process. At a minimum, the consultant recommends that all planting areas receive 2" deep ½" screened decomposed granite for dust control. All Trees to be planted in an organic manner a minimum of 10'-0" from the edge of pavement or curb and a maximum of 15'-0" from edge of pavement or curb. The recommended plant materials palette is as follows: Mesquite, Palo Verde, Desert Willow, Bursage, Leucopyhllum species, Tecoma species, Dalea species, and Lantana species.

- The following items should be considered in developing a final solution for the above described project:
 - Plant material shall match existing species and shall respond to the specific landscape design themes identified;
 - Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be provided for all landscape surfaces;
 - Salvage and re-establish indigenous vegetation where possible;
 - Avoid disturbance to saguaros, Ironwoods, Mesquites, Palo Verdes and to the existing xero-riparian vegetation as much as possible;
 - Use materials, shapes, and colors that blend in with the existing surroundings.
- The acceptability map located in Appendix D indicates that the proposed solution to this segment of the overall project delivers a solution that is Acceptable to the local community. The recommended alternative delivers a solution that is Compatible with landscape resources through a landscape theme and structural method that is in context with the surrounding area. The recommended alternative delivers a solution that is Effective in reducing flood hazard through the use of an underground pipe to divert and transmit storm flows.

14.2. Segment 2 – Union Hills Drive (107th Avenue to 111th Avenue)

Alternative 2.1 – Underground Pipe (Structure Compatibility Class 5 which is the lower of the two identified in the project LIA Sub-Class 5.1)

- The prescribed structural method is Semi-Soft Structural (Class 3)
- The prescribed landscape design theme is Enhanced Desert Landscape which is in keeping with the desired character for the project area and the existing landscape vegetation
- The prescribed landscape aesthetic features shall include in the interim condition (as shown in Appendix I) a low flow swale along the south side of the road approximately 8" deep lined with an angular cobble. The swale should provide for positive drainage at or greater than .25 percent. All planting areas to receive 2" deep ½" screened decomposed granite for dust control. All Trees to be planted in an organic manner a minimum of 10'-0" from the edge of pavement or curb and a maximum of 15'-0" from edge of pavement or curb. The interim condition creates a need for landscape only temporarily since the ultimate condition includes widening the road by where the need for the landscaping is eliminated where the installation of the pipe occurs in the recommended alternative. In the ultimate condition the median shall include an 8" high mounded grade combined with 8" deep swales on each side of the berm within the berm to contain nuisance water. The trees should be planted to a meandering offset from center of median a maximum of 5'-0" with a minimum of two varieties of trees. The recommended plant materials palette is as follows: Mesquite, Palo Verde, Desert Willow, Bursage, Leucopyhllum species, Tecoma species, Dalea species, and Lantana species.
- The following items should be considered in developing a final solution for the above described project:
 - Plant material shall match existing species and shall respond to the specific landscape design themes identified;

- Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be provided for all landscape surfaces;
 - Salvage and re-establish indigenous vegetation where possible;
 - Avoid disturbance to saguaros, Ironwoods, Mesquites, Palo Verdes and to the existing xero-riparian vegetation as much as possible.
- The acceptability map located in Appendix D indicates that the proposed solution to this segment of the overall project delivers a solution that is Acceptable to the local community. The recommended alternative delivers a solution that is Compatible with landscape resources through a landscape theme and structural method that is in context with the surrounding area. The recommended alternative delivers a solution that is Effective in reducing flood hazard through the use of an underground pipe to divert and transmit storm flows.

14.3. Segment 3 – 111th Avenue to Basin A

Alternative 3.2 – Culvert Crossing (Structure Compatibility Class 5 Sub-Class 5.1)

- The prescribed structural method is Semi-Soft Structural (Class 3)
- The prescribed landscape design theme is Enhanced Desert Landscape which is in keeping with the desired character for the project area and the existing landscape vegetation
- The prescribed landscape aesthetic features shall be developed as part of the final design. The physical disturbance and extent of landscape required will be defined as the project is further designed. The consultant recommends that existing pedestrian connections be maintained or replaced as part of the project improvements. Landscape setback, ground plane shaping, or other

municipal requests shall be developed through the final design process. At a minimum, the consultant recommends that all planting areas receive 2" deep ½" screened decomposed granite for dust control. All Trees to be planted in an organic manner a minimum of 10'-0" from the edge of pavement or curb and a maximum of 15'-0" from edge of pavement or curb. The recommended plant materials palette is as follows: Mesquite, Palo Verde, Desert Willow, Bursage, Leucopyhllum species, Tecoma species, Dalea species, and Lantana species.

- The following items should be considered in developing a final solution for the above described project:
 - Plant material shall match existing species and shall respond to the specific landscape design themes identified;
 - Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be provided for all landscape surfaces;
 - Salvage and re-establish indigenous vegetation where possible;
 - Avoid disturbance to saguaros, Ironwoods, Mesquites, Palo Verdes and to the existing xero-riparian vegetation as much as possible;
 - Use materials, shapes, and colors that blend in with the existing surroundings.
- The acceptability map located in Appendix D indicates that the proposed solution to this segment of the overall project delivers a solution that is Acceptable to the local community. The recommended alternative delivers a solution that is Compatible with landscape resources through a landscape theme and structural method that is in context with the surrounding area. The recommended alternative delivers a solution that is Effective in reducing flood hazard through the use of a culvert crossing to divert and transmit storm flows.

14.4. Segment 7 – Beardsley Road Diversion Channel

Alternative 7.3 – Channel Diversion to Basin B

- The project LIA describes the Structure Compatibility Class within the land area for the designated Segment as class 5 Sub-Class 5.1 within the Suburban River Terrace Future Landscape Character Units map (Figure 7). The consultant team has reviewed the project site, character and physical attributes of the land and has, in its professional judgment, re-evaluated the landscape character within the prescribed lands as Suburban Valley Plains. The existing land use is predominantly developed residential including two major Public Facilities the Arizona American Recharge Facility and the City of Peoria Waste Water Treatment Facility. It is perceived that these uses are permanent and therefore substantiate the following recommended revision:
 - The landscape character within the above defined area is in context with the land area immediately to its adjacent east boundary currently represented in the project LIA as Suburban Valley Plains; a more appropriate designation. Based on this recommendation to modify the Landscape Character Unit to Suburban Valley Plain the Future Combined Landscape Structure Types Compatibility Class designation within the project LIA shown on Figure 17 within the described area should be redefined as Compatibility Class 6.3.
- The project LIA describes the structural method within the project as Semi-Soft Structural (Class 3). The recommended revision listed above does not affect the recommended structural method as defined by the project LIA. The proposed solution of a Hard Structural Method does not meet the criteria for a fully context

sensitive solution per the Districts CSFHM process. The project limitations which derived this solution are described below.

- The prescribed landscape design theme is Enhanced Desert Landscape which is in keeping with the desired character for the project area and the existing landscape vegetation.
- Due to the proximity of the existing Arizona American recharge facilities and the existing City of Peoria wastewater treatment facilities the project stakeholders determined that a 2:1 concrete channel with 4:1 tie slopes are recommended in order to minimize the Beardsley Road Diversion Channel footprint. The aesthetic and multiple-use design guidelines for channel conveyance facilities requires a setback and buffer zone ranging in size variably by a minimum of 30' to 50'. Due to Project Stakeholder and City requests to minimize the land acquisition for financial reasons, the minimum area required for conveyance and O&M facilities were recommended as part of the 15% design plans leaving no additional land area for the setback and buffer zone or any additional landscape aesthetic treatments. The consultant recommends that as the final design plans develop that the aesthetic treatment options be reconsidered as part of the project. In the event it is determined that planting areas are to be included in the final design solution the consultant recommends at a minimum that all planting areas receive 2" deep ½" screened decomposed granite for dust control. All Trees to be planted in an organic manner a minimum of 10'-0" from the edge of the drainage channel and a maximum of 15'-0" from edge of the drainage channel or outside the edge of the O&M road to allow for clear access. The recommended plant materials palette is as follows: Mesquite, Palo Verde, Desert Willow, Bursage, Leucophyllum species, Tecoma species, Dalea species, and Lantana species.
- The following items should be considered in developing a final solution for the above described project:

- Plant material shall match existing species and shall respond to the specific landscape design themes identified;
 - Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be provided for all landscape surfaces;
 - Salvage and re-establish indigenous vegetation where possible;
 - Avoid disturbance to saguaros, Ironwoods, Mesquites, Palo Verdes and to the existing xero-riparian vegetation as much as possible;
 - Use materials, shapes, and colors that blend in with the existing surroundings.
- The acceptability map located in Appendix D indicates that the proposed solution to this segment of the overall project does not deliver a solution that is Acceptable to the local community. In this specific segment of the project the Flood Mitigation solution has taken precedence over creating a fully context sensitive solution per the Districts' CSFHM process. The recommended alternative delivers a solution that is not Compatible with landscape resources as recommended in the project LIA. As described above the limited available land has left no available property for landscape or aesthetic treatment. The recommended alternative delivers a solution that is Effective in reducing flood hazard through the use of a concrete lined conveyance channel to divert and transmit storm flows.

14.5. Basin A and B Attenuation

- The project LIA describes the Structure Compatibility Class within the land area for the designated Segment as class 5 Sub-Class 5.1 within the Suburban River Terrace Future Landscape Character Units map (Figure 7). The consultant team has reviewed the project

site, character and physical attributes of the land and has, in its professional judgment, re-evaluated the landscape character within the prescribed lands as Suburban Valley Plains. The existing land use is predominantly developed residential including two major Public Facilities the Arizona American Recharge Facility and the City of Peoria Waste Water Treatment Facility. It is perceived that these uses are permanent and therefore substantiate the following recommended revision:

- The landscape character within the above defined area is in context with the land area immediately to its adjacent east boundary currently represented in the project LIA as Suburban Valley Plains; a more appropriate designation. Based on this recommendation to modify the Landscape Character Unit to Suburban Valley Plain the Future Combined Landscape Structure Types Compatibility Class designation within the project LIA shown on Figure 17 within the described area should be redefined as Compatibility Class 6.3.
- The project LIA describes the structural method within the project as Semi-Soft Structural (Class 3). The recommended revision listed above does not affect the recommended structural method as defined by the project LIA. The recommended alternative of a Storage Basin combined with an underground pipe with a Sub-Class of Medium does not fully meet the criteria for a context sensitive solution per the Districts CSFHM process. The project limitations which derived this solution are described below.
- The prescribed landscape design theme is Semi Natural Sonoran Desert Landscape which is in keeping with the desired character for the project area and the existing landscape vegetation. This also allows for the basins to take on a more naturalized appearance as the materials become established and mature.

- Due to the proximity of the existing Arizona American recharge facilities and the existing City of Peoria wastewater treatment facilities the project stakeholders determined that the available land to mitigate the flooding was limited that the function of the basins would take precedence over the aesthetic or landscape features of the basins. The acceptable design depth of 12' was established by the City of Peoria for the segment which exceeds the allowable percentage of depth stated within the acceptable structure subclass of medium. The aesthetic and multiple-use design guidelines for Basins requires a setback and buffer zone ranging in size variably by a minimum of 30' to 50'. Due to Project Stakeholder and City requests to minimize the land acquisition for financial reasons, the minimum area required for conveyance and O&M facilities were recommended as part of the 15% design plans leaving no additional land area for the setback and buffer zone. The following are recommendations based on the 15% plans included within Appendix I of this DCR:
 - The basin and channel shall have warping side slopes with meandering slope from 4:1 to 6:1 creating a more natural undulating character and matching the existing character of the current landforms;
 - Due to the depth of the basins it has been recommended that a perimeter fence be installed to protect the public from potential dangers;
 - The multi-use and operations and maintenance road (O&M) shall meander slightly with high and low points aligning with the side contours while maintaining ADA accessibility in the event public access is granted in the future;
 - Maintenance access to the concrete weirs shall be maintained;
 - The weirs have also been shown with optional aesthetic treatment through the placement of boulders. The weirs shall

be designed to emulate a natural wash or stream with the boulders to anchor and protect from erosion while providing an aesthetically pleasing visual element both in a flood event and while the basins are dry;

- A minimum of one access point for operation and maintenance access into the invert of the basin shall be provided from the top of the slope to the bottom of the basin at a minimum width of 10 feet and a maximum slope of 10:1;
- The surface for the multi-use and operations and maintenance road (O&M) shall be gravel mulch over crushed ABC matching existing O&M road surfaces within the surrounding parcels;
- The gravel mulch for the O&M road shall have an approved stabilizer mix to reduce dust and erosion;
- The basin shall appear more organic, free flowing and less geometric, side slopes shall meander and undulate vertically with a maximum of 4:1 and where possible 6:1 within the basin;
- The channel low flow shall meander from east to west through the outlet/inlet pipes that interconnect the basins to provide positive drainage and emulate a natural stream. Minimum desired slope gradient for the low flow channel to be .25 percent;
- All planting areas to receive 1" deep ½" screened decomposed granite for dust control;
- All Trees to be planted in an organic manner a minimum of 10'-0" from the edge of the O&M road and a maximum of 15'-0" from edge of the O&M road to allow for clear access. The slopes of the basin shall be planted in a non-linear organic manner to allow for a variable visual scene along the length of the slope and to aid in creating a visual buffer of the slopes themselves;

- The recommended plant materials palette for the basins described is: Mesquite, Palo Verde, Ironwood, Cottonwood (to be utilized in bottom of basin and within 10 year event thresholds), Brittlebush, Bursage, Creosote, Jojoba and Fairy Duster (species).
- The following items should be considered in developing a final solution for the above described project:
 - Review the opportunity for public access into the fenced areas for trails, overlook ramada structure, benches, tables and other recreational opportunities as shown in Appendix I;
 - Plant material shall match existing species and shall respond to the specific landscape design themes identified;
 - Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be provided for all landscape surfaces;
 - Salvage and re-establish indigenous vegetation where possible;
 - Avoid disturbance to saguaros, Ironwoods, Mesquites, Palo Verdes and to the existing xero-riparian vegetation as much as possible.
- The acceptability map located in Appendix D indicates that the proposed solution to this segment of the overall project does not deliver a solution that is Acceptable to the local community. In this specific segment of the project the Flood Mitigation solution has taken precedence over creating a fully context sensitive solution per the Districts' CSFHM process. The recommended alternative delivers a solution that is Compatible with landscape resources through a landscape theme and structural method that is in context with the surrounding area. The recommended alternative delivers a solution that is Effective in reducing flood hazard through the use of storage basins to attenuate flows and prevent downstream flooding.

14.6. **Segment 4 – Canyon Ridge Channel / Detention System**

Alternative 4.1

- This segment is an existing channel / detention system and has no proposed improvements.

14.7. **Segment 5 – Basin C**

Alternative 5.1 – Basin C Detention

- The project LIA describes the Structure Compatibility Class within the land area for the designated Segment as class 1 within the Suburban River Channel Future Landscape Character Units map (Figure 7). The consultant team has reviewed the project site, character and physical attributes of the land and has, in its professional judgment, re-evaluated the landscape character within the residential and commercial areas known as Coyote Lakes east of the Agua Fria River alignment, south to Bell Road, North to Beardsley Road and all those areas defined as Suburban River Terrace as described in sections 14.4 & 14.5 and has recommended that it be redefined as Suburban Valley Plains. The existing land use is predominantly developed residential including two major Public Facilities the Arizona American Recharge Facility and the City of Peoria Waste Water Treatment Facility. It is perceived that these uses are permanent and therefore substantiate the following recommended revision:
 - The landscape character within the above defined area is in context with the land area immediately to its adjacent east boundary currently represented in the project LIA as Suburban Valley Plains; a more appropriate designation. Based on this recommendation to modify the Landscape Character Unit to Suburban Valley Plain the Future Combined Landscape Structure Types Compatibility Class designation within the project LIA shown on Figure 17 within

the described area should be redefined as Compatibility Class 6.3.

- The project LIA describes the structural method within the project as Semi-Soft Structural (Class 3). The recommended revision listed above does not affect the recommended structural method as defined by the project LIA. The recommended alternative of a Storage Basin combined with an underground pipe with a Sub-Class of Medium does meet the criteria for a context sensitive solution per the Districts CSFHM process. The recommended alternative has an overall form that is geometric and contrasts with natural land forms. This is not consistent with the definition of a Semi-Soft Structural solution. However, the majority of the proposed basin is an existing condition (approximately 80% existing) where additional land is required to meet the flooding mitigation requirements. The consultant, using its professional judgment, has noted that the existing basins that are on the east side of 115th Avenue have the same appearance. The additional land required for flood mitigation is proposed to be in a similar context to the existing basins. The proposed landscape and potential recreation elements are in context with the definition of Semi-Soft Structural. Therefore the consultant feels the criteria for a Semi-Soft Structural solution are being largely satisfied by the recommended solution.
- The prescribed landscape design theme is Semi Natural Sonoran Desert Landscape which is in keeping with the desired character for the project area and the existing landscape vegetation. The landscape area from the back of curb to the proposed granular trail along the length of the proposed improvements shall be Enhanced Desert which is in character with the existing adjacent roadway landscape.
- The aesthetic and multiple-use design guidelines for Basins requires a setback and buffer zone ranging in size variably by a

minimum of 30' to 50'. Due to Project Stakeholder and City requests to minimize the land acquisition for financial reasons, the minimum area required for conveyance and O&M facilities were recommended as part of the 15% design plans leaving no additional land area for the setback and buffer zone. The following are recommendations based on the 15% plans included within Appendix I of this DCR:

- The basin and channel shall have warping side slopes with meandering slope from 4:1 to 6:1 creating a more natural undulating character and matching the existing character of the current landforms;
- The existing stabilized granular trail along the east side of 115th Avenue shall be modified from the current 5'-0" wide to 8'-0" wide with 3" deep ¼" minus stabilized granite (color to match existing). The trail is to be modified from Bell Road to the south side of Avenue of the Arts;
- The channel low flow shall meander from north to south along the west side to the outlet/inlet pipes at Bell Road. Provide positive drainage and emulate a natural stream. Minimum desired slope gradient for the low flow channel to be .25 percent;
- At a minimum the basin is to be designed to a level that is consistent with the surrounding conditions and basins to the north;
- A minimum of one access point for operation and maintenance access into the invert of the basin shall be provided from the top of the slope to the bottom of the basin at a minimum width of 10 feet and a maximum slope of 10:1;
- The surface for the multi-use and operations and maintenance road (O&M) shall be gravel mulch over crushed ABC matching existing O&M road surfaces within the surrounding parcels;

- The gravel mulch for the O&M road shall have an approved stabilizer mix to reduce dust and erosion;
- All Trees to be planted in an organic manner a minimum of 10'-0" from the edge of the O&M road and a maximum of 15'-0" from edge of the O&M road to allow for clear access. The slopes of the basin shall be planted in a non-linear organic manner to allow for a variable visual scene along the length of the slope and to aid in creating a visual buffer of the slopes themselves;
- All planting areas to receive 2" deep ½" screened decomposed granite for dust control;
- The recommended plant materials palette for the basins described is: Mesquite, Palo Verde, Ironwood, Cottonwood (to be utilized in bottom of basin and within 10 year event thresholds), Brittlebush, Bursage, Creosote, Jojoba and Fairy Duster (species).
- The following items should be considered in developing a final solution for the above described project:
 - Review the opportunity for recreational design features as part of the final design and as recommended in the 15% design plans. This includes a potential multi-use turf field, trails, benches, tables and access to the adjacent public parking lot to the north of the proposed basin as shown in Appendix I;
 - Plant material shall match existing species and shall respond to the specific landscape design themes identified;
 - Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be provided for all landscape surfaces;
 - Salvage and re-establish indigenous vegetation where possible;

- Avoid disturbance to saguaros, Ironwoods, Mesquites, Palo Verdes and to the existing xero-riparian vegetation as much as possible.
- The acceptability map located in Appendix D indicates that the proposed solution to this segment of the overall project does deliver a solution that is Acceptable to the local community. The recommended alternative delivers a solution that is Compatible with landscape resources through a landscape theme and structural method that is in context with the surrounding area. The recommended alternative delivers a solution that is Effective in reducing flood hazard through the use of a storage basin to attenuate flows to prevent downstream flooding.

14.8. Segment 6 – Sun City Drain

Alternative 6.2 – Sun City Drain Channel Improvements

- Due to the immediate adjacency of existing Sun City Drainage Channel improvements with this segment the Stakeholder and City direction is to match the existing site conditions. No landscape or aesthetic treatments are proposed for this segment.

15. SUMMARY AND PHASE 2 RECOMMENDATION

The Glendale/Peoria Area Drainage Master Plan Update (ADMPU), 107th Avenue and Union Hills Drive Design Concept Report (DCR) is an update of the original Glendale / Peoria ADMPU and the Northwest Update. The DCR hydrology study is comprised of a watershed of approximately 16.5 square miles with the DCR area of interest being generally bound on the north by Beardsley Road, to the east by 107th Avenue, to the west by Agua Fria River and to the south by the Sun City Drain Channel confluence with the Agua Fria River.

The DCR has been commissioned by the Flood Control District of Maricopa County (FCD) in response to flooding complaints in area subdivisions and roadways near the 107th Ave. and Union Hills Drive intersection. The study area is located within three jurisdictions, the City of Peoria, the City of Surprise and Unincorporated Maricopa County. The DCR was initiated with the concept consistent with the Phase 1 Analysis and Recommendations Report with the specific areas of concern being the Lake Pleasant Mobile Home Estates, the Paradise Resort Travel Trailer Park, the Coyote Lakes development, 107th Avenue, Union Hills Drive, and 115th Avenue roadways and associated intersections.

Through the public input process and after additional review by the District it was determined that flows from the Beardsley Road Channel would be incorporated into 107th and Union Hills Drive Design Concept Report. Due to the introduction of the Beardsley Road flows being post the alternative analysis for the 107th Avenue and Union Hills Drive study area, the alternatives analysis contained within this DCR are presented in two parts; Pre-Beardsley Road Flows and Post-Beardsley Road Flows.

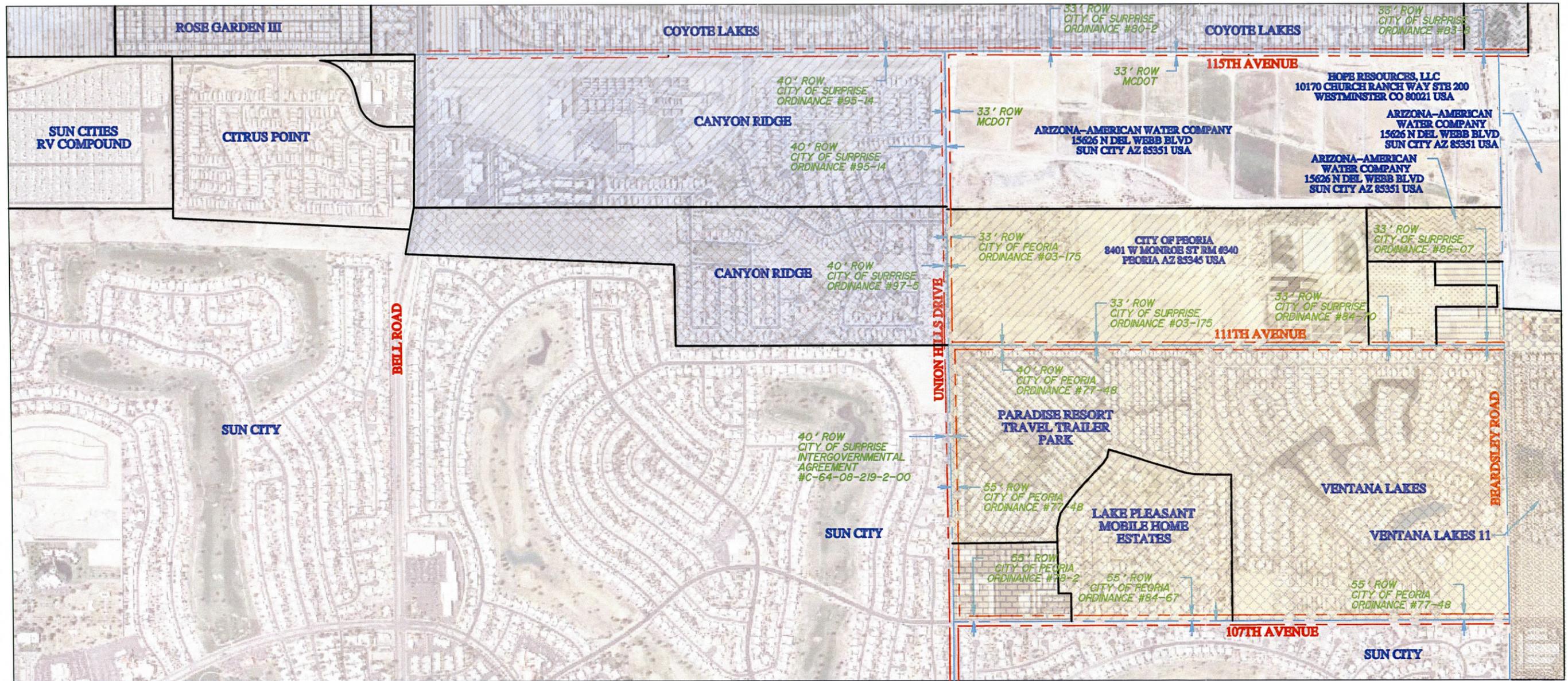
The Flood Control District's Context Sensitive Flood Hazard Mitigation Planning and Design Approach was utilized in this study. This approach entails the inventory and analysis of information pertaining to the flooding, land and resource and community contexts in an effort to produce a Recommended Plan that will be effective in reducing the risks of flooding in ways that will be compatible with the environment and acceptable to local communities to the maximum degree possible. Flood

protection structure types that were determined to be acceptable to the local communities and compatible with the landscape settings in which they are placed were utilized in the development of the alternatives and the recommended alternative. These structures include use of underground pipes in areas where rights of ways constraints posed limitations on the use of other solutions, use of existing and proposed open channel systems, along with use of detention basins to attenuate peak flows where needed. Additionally, flood protection methods for building the structure types that were determined to be compatible with the landscape settings of the study area, such as the Semi-soft Structural Method, have been incorporated into the Recommended Plan along with other aesthetic and multi-use features to achieve compatibility with the land and resource context and acceptability with the community context to the greatest degree possible.

16. REFERENCES

1. Anderson-Nelson, Inc., Paving, Grading and Drainage Plans for Coyote Lakes, April 1992
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3. Coe and Van Loo, Canyon Ridge West, Infrastructure Improvement Plans, November 2003.
4. Coe and Van Loo, Canyon Ridge West, Mass Grading Plans, November 2003.
5. Coe and Van Loo, Canyon Ridge, Master Drainage Report, January 1997.
6. Entellus, Glendale/Peoria ADMPU, May 2002
7. Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona Volume I, Hydrology – 2009
8. Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona Volume II, Hydraulics – 1996
9. Kaminski Hubbard Engineering, Inc., Bell Road Improvement Program, Grand Avenue to 115th Avenue, April 1991.
10. M2 Group, The Village at Canyon Ridge West, Grading and Drainage, February 2006.
11. Norman Engineering Group, Inc., Civil Improvement Plans for QuickTrip #494, August 2002.
12. Ritoch-Powell & Associates, Inc., Grading and Drainage Plan for the Pavilions at Coyote Lakes, September 2006
13. Ritoch-Powell and Associates, Inc, Drainage Memo for Union Hills Drive, 115th Avenue to +/- 1,080 ft. West of 107th Avenue, September 2009.
14. United Engineering Group, Bell Road and 115th Improvement Plans, August 2008.
15. Wood, Patel & Associates, Glendale/ Peoria ADMPU Northwest Region Update Hydrologic Study, May 2007





NOTES:

1. ALL PLANS AND PLATS REFERENCED ON THIS EXHIBIT CAN BE FOUND IN THE 107TH AVE. & UNION HILLS DRIVE PHASE I DESIGN CONCEPT REPORT.
2. ANY AREA NOT SHOWN TO BE UNDER THE JURISDICTION OF THE CITY OF PEORIA OR THE CITY OF SURPRISE FALLS UNDER THE JURISDICTION OF MARICOPA COUNTY.

<i>LEGEND</i>	
	RIGHT OF WAY
	SECTION LINE
	CITY OF PEORIA JURISDICTION
	CITY OF SURPRISE JURISDICTION



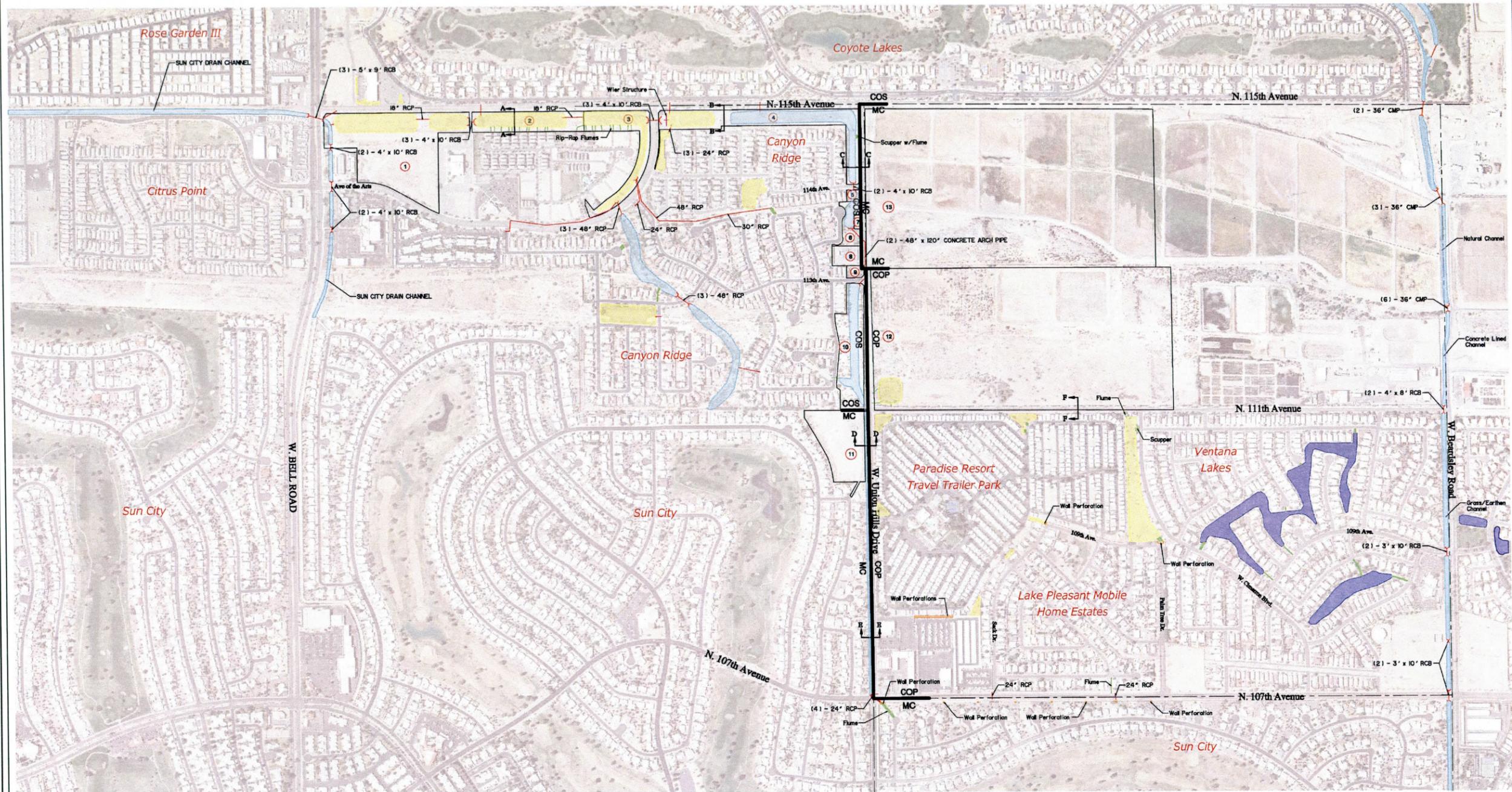
ENGINEER/PLANNER:

GOODWIN & MARSHALL

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6909 W. Ray Rd. #15, Chandler, AZ 85226
Metro (602) 218-7285

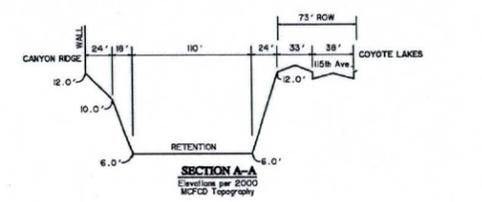
FIGURE 3
ANNEXATION MAP
for
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FCD2009C136.2
CITIES OF PEORIA AND SURPRISE
AND UNINCORPORATED
MARICOPA COUNTY, ARIZONA
JUNE, 2011



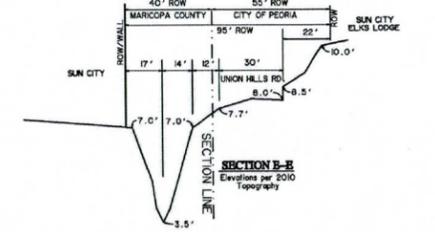
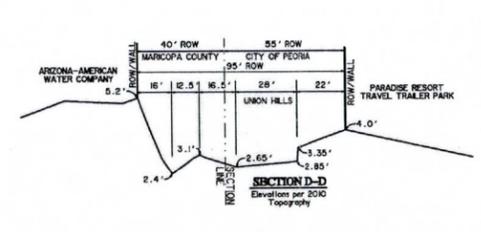
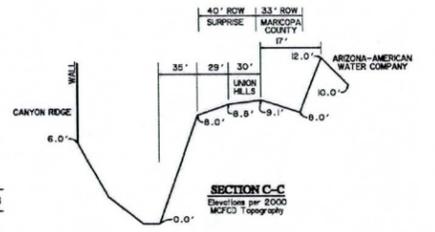
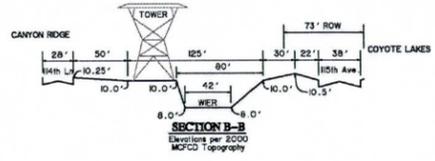
OWNERSHIP



- | | |
|---|--|
| 1 Parcel: 200-13-016-X
Owner: Slemons Bank National Association | 8 Parcel: 200-13-385
Owner: Arizona Public Service Co |
| 2 Parcel: 200-13-373
Owner: Canyon Ridge West Master Association | 9 Parcel: 200-36-385
Owner: Canyon Ridge West Master Association |
| 3 Parcel: 200-13-371
Owner: Canyon Ridge West Master Association | 10 Parcel: 200-36-391
Owner: Canyon Ridge West Master Association |
| 4 Parcel: 200-13-171-B
Owner: Canyon Ridge West Master Association | 11 Parcel: 230-05-943
Owner: Arizona-American Water Company |
| 5 Parcel: 200-13-172
Owner: Canyon Ridge West Master Association | 12 Parcel: 200-35-825
Owner: City of Peoria |
| 6 Parcel: 200-36-390
Owner: Canyon Ridge West Master Association | 13 Parcel: 200-13-008-B
Owner: Arizona-American Water Company |
| 7 Parcel: 200-13-010-A
Owner: Arizona-American Water Company | |

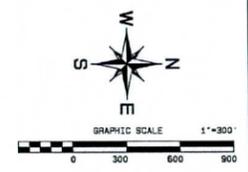


NOTE: ELEVATIONS SHOWN ON CROSS SECTIONS HAVE BEEN REDACTED TO FINAL DWT. (i.e. 1496.0 = 6.0)



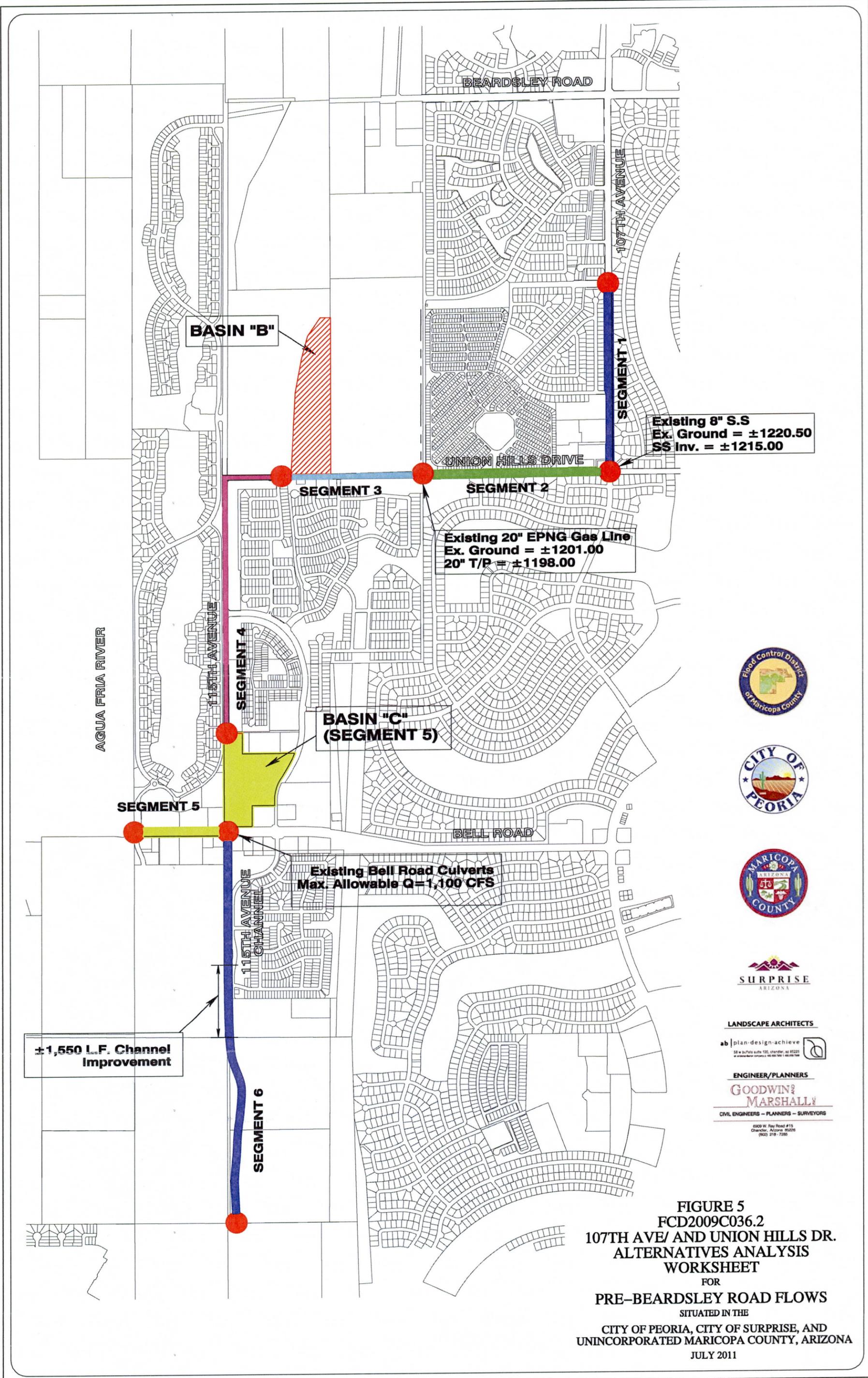
LEGEND

- LAKE/POND
- CHANNEL
- DETENTION/RETENTION
- SCUPPER/FLUME
- WALL PERFORATION
- STORM DRAIN PPE/CULVERTS
- CROSS SECTION



**FIGURE 4
EXISTING DRAINAGE
FACILITIES MAP
FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FCD 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND UNINCORPORATED
MARICOPA COUNTY, ARIZONA
JULY 2011**

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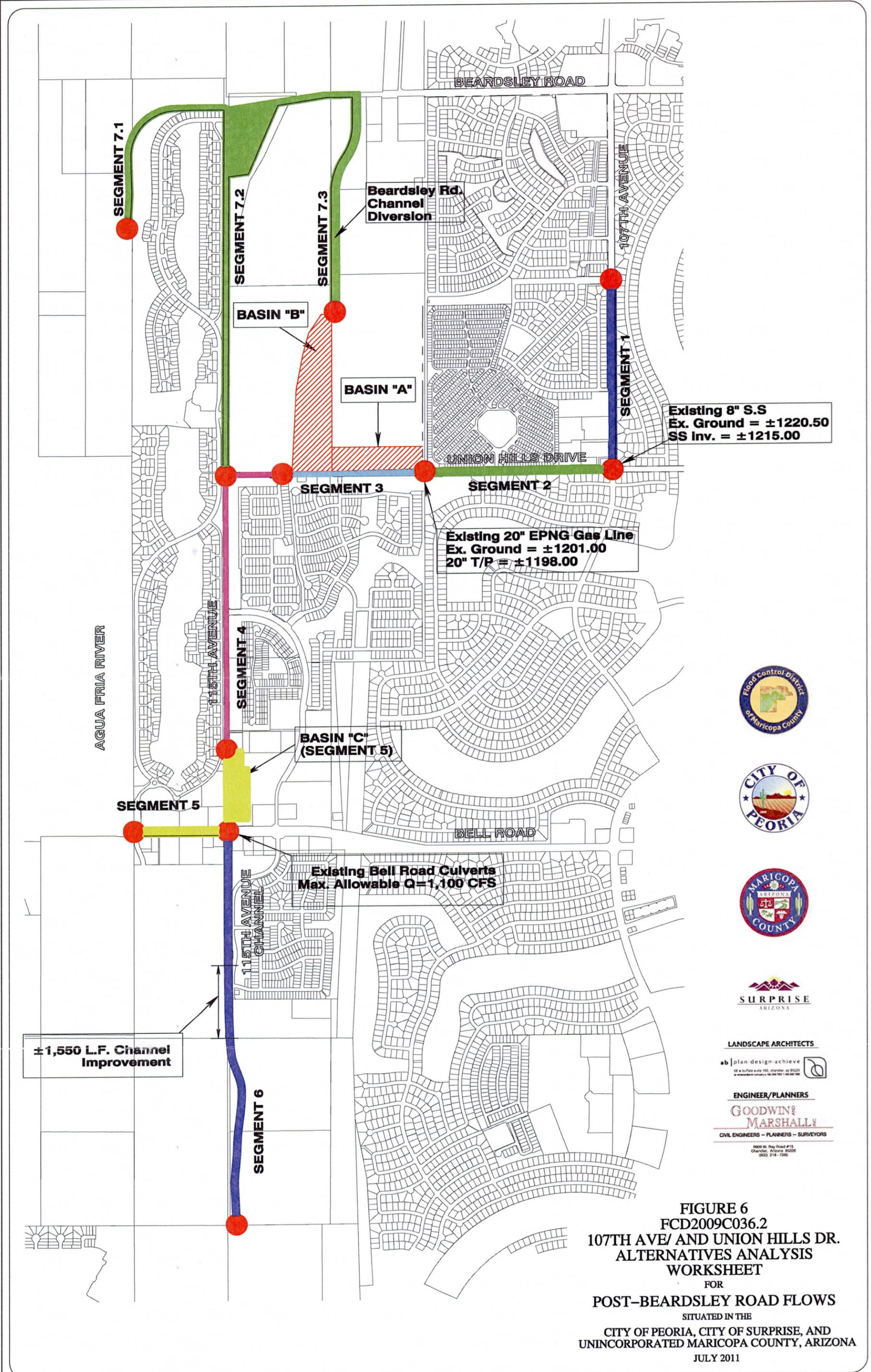
Existing 8" S.S
 Ex. Ground = ±1220.50
 SS Inv. = ±1215.00

Existing 20" EPNG Gas Line
 Ex. Ground = ±1201.00
 20" T/P = ±1198.00

Existing Bell Road Culverts
 Max. Allowable Q = 1,100 CFS

±1,550 L.F. Channel
 Improvement

FIGURE 5
FCD2009C036.2
107TH AVE/ AND UNION HILLS DR.
ALTERNATIVES ANALYSIS
WORKSHEET
 FOR
PRE-BEARDSLEY ROAD FLOWS
 SITUATED IN THE
 CITY OF PEORIA, CITY OF SURPRISE, AND
 UNINCORPORATED MARICOPA COUNTY, ARIZONA
 JULY 2011



Existing 8" S.S.
 Ex. Ground = ±1220.50
 SS Inv. = ±1215.00

Existing 20" EPNG Gas Line
 Ex. Ground = ±1201.00
 20" T/P = ±1198.00

Existing Bell Road Culverts
 Max. Allowable Q = 1,100 CFS

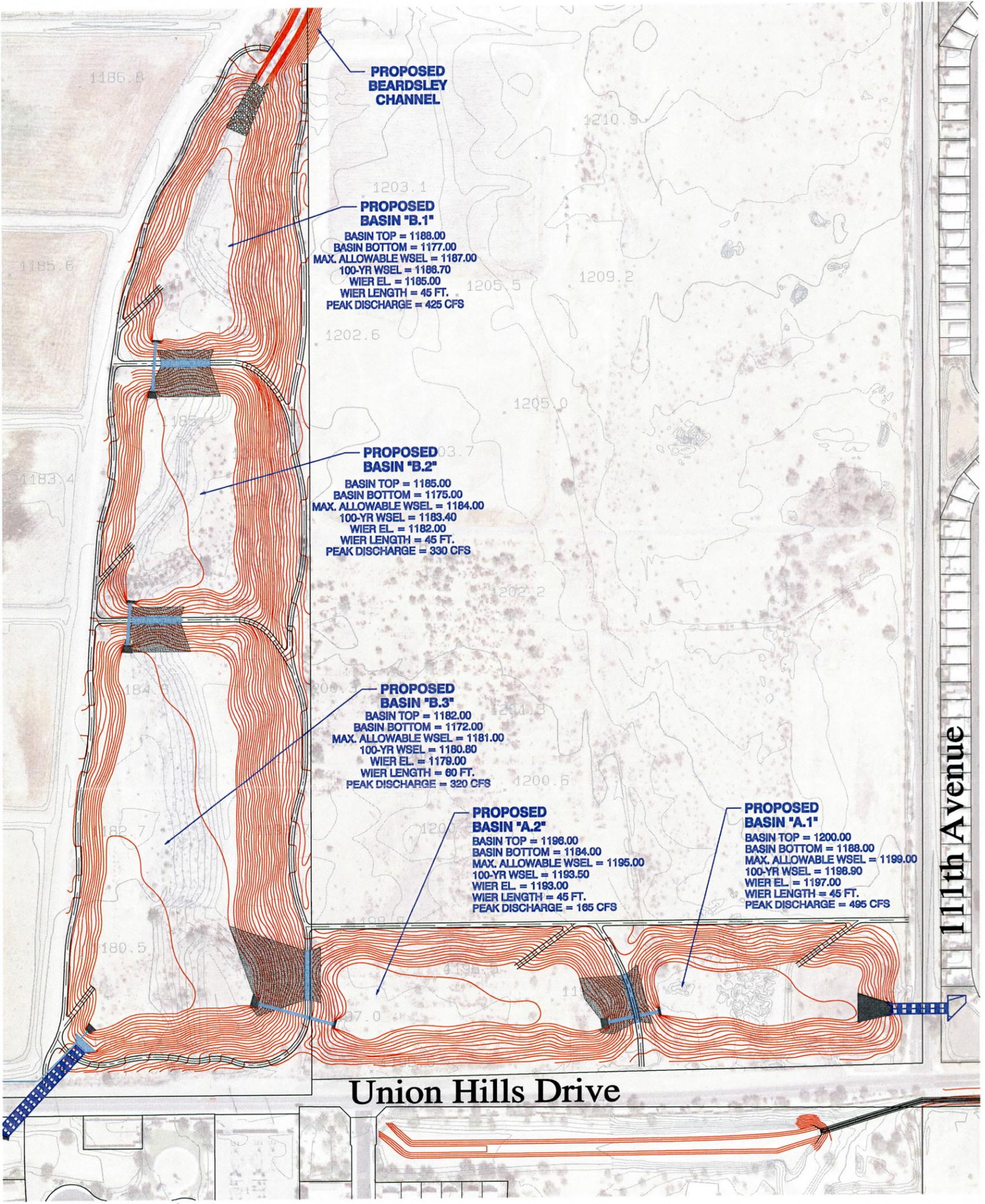
±1,550 L.F. Channel Improvement



LANDSCAPE ARCHITECTS
 ab | plan design achieve
 28 W. DuPont Suite 100, Chandler, AZ 85226
 www.abplan.com 480.948.7800

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GOODWIN & MARSHALL
 CIVIL ENGINEERS - PLANNERS - SURVEYORS
 1900 W. Ray Road #15
 Chandler, Arizona 85226
 (602) 219-7285

FIGURE 6
FCD2009C036.2
107TH AVE/ AND UNION HILLS DR.
ALTERNATIVES ANALYSIS
WORKSHEET
 FOR
POST-BEARDSLEY ROAD FLOWS
 SITUATED IN THE
 CITY OF PEORIA, CITY OF SURPRISE, AND
 UNINCORPORATED MARICOPA COUNTY, ARIZONA
 JULY 2011



ENGINEER/PLANNER:

GOODWIN & MARSHALL

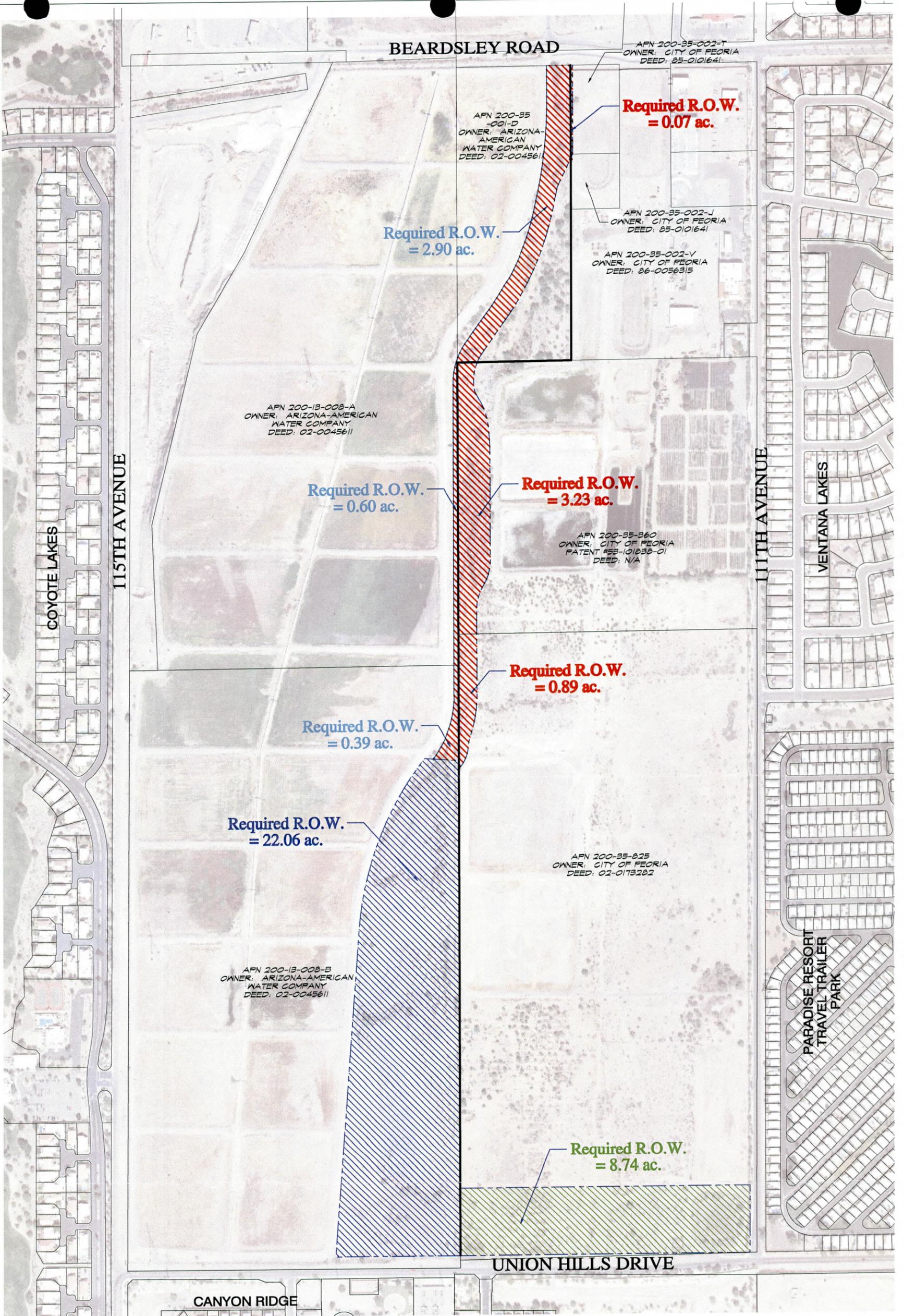
CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS

8909 W. Ray Rd. #15, Chandler, AZ 85228
 Metro (602) 218-7285

FIGURE 7
PLATE 7

RECOMMENDED ALTERNATIVE
 BASINS A & B IMPROVEMENTS

FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FCD 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND UNINCORPORATED
 MARICOPA COUNTY, ARIZONA
 JUNE, 2011



SURPRISE
ARIZONA



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Metro (602) 218-7285

FIGURE 9

RECOMMENDED ALTERNATIVE
BASINS A & B AND BEARDSLEY
CHANNEL R.O.W. ACQUISITION

FOR

**107TH AVENUE AND
UNION HILLS DRIVE**

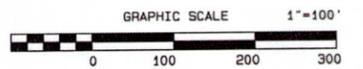
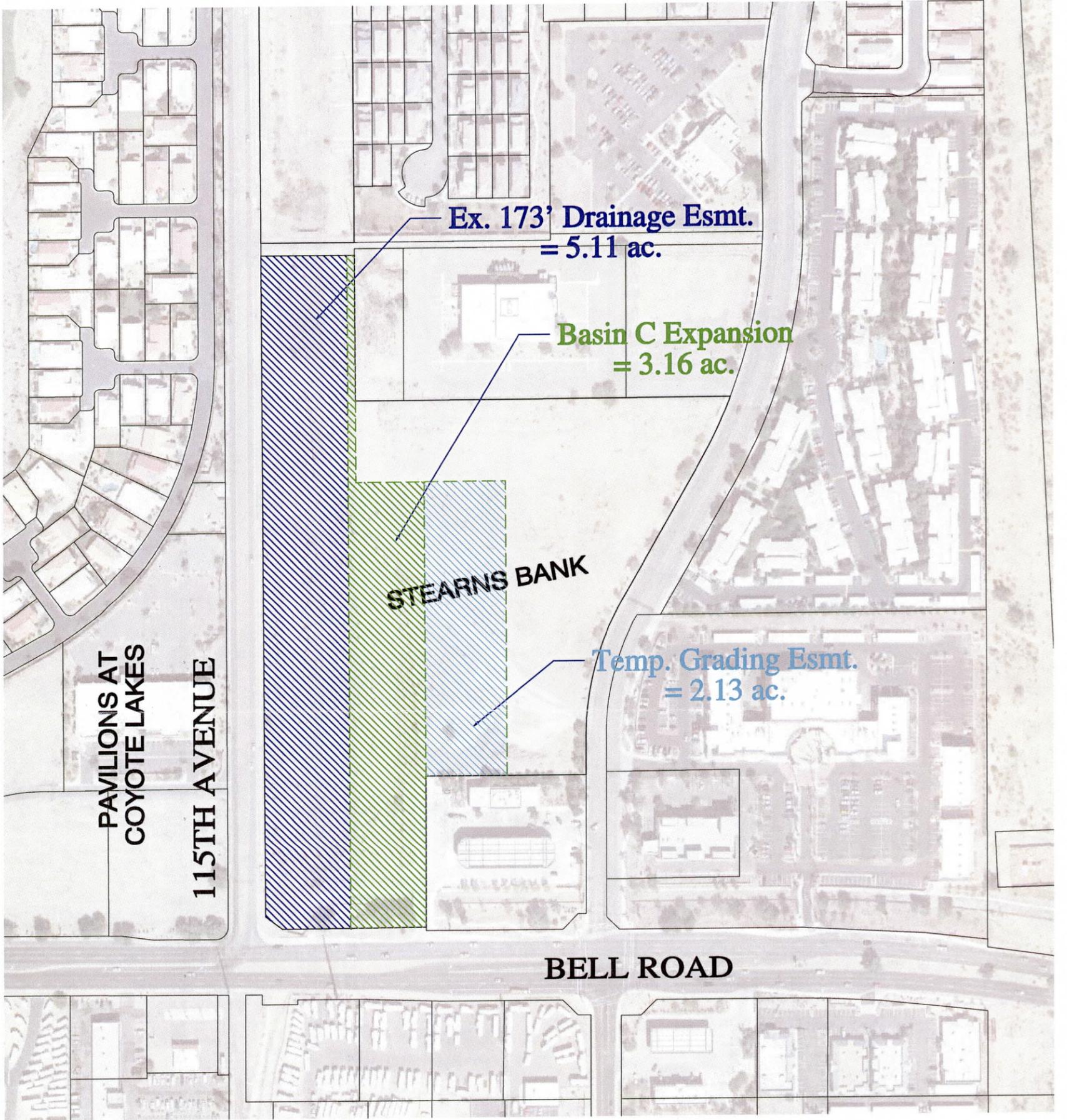
CONTRACT: FCD 2009C036.2

CITIES OF PEORIA AND SURPRISE

AND UNINCORPORATED

MARICOPA COUNTY, ARIZONA

JULY 2011



SURPRISE
ARIZONA



ENGINEER/PLANNER:

GOODWIN & MARSHALL

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FIGURE 10
RECOMMENDED ALTERNATIVE
BASIN C R.O.W. ACQUISITION
FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FCD 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND UNINCORPORATED
MARICOPA COUNTY, ARIZONA
JULY 2011



City of Peoria -
Documented Flooding
Complaints

DRAINAGE COMPLAINTS FOR THE AREA

Paradise RV Park: The community has on several occasions been concern with local flooding. They have maintenance facilities and recreational facilities inundated by certain flow events. This Community has small storm water retention facilities, per an outdated standard. Off-site flows enter thru turned block wall openings along the east side of the development, and thru wall openings along the northeast boundary. No particular damage claims have been made. They do not have an "Action or Response Plan" that might help in averting much of the concerns.

WWTP Basin: Basin is designed to contain the impact of the roadway and pavement along 111th Av. adjacent to the WWTP. The Basin fills prematurely since flow also enters from UHD. Basin does not discharge within prescribed timeframe.

107th Av.: Reports of flow crossing the roadway causing a nuisance and safety concern for motorists. Silt and debris hazard and related maintenance associated with the flow crossing the roadway. Flooded intersection at UHD.

Union Hills Drive (UHD): Reports of flow crossing into the roadway causing a nuisance and safety concern for motorists. Silt and debris hazard and related maintenance associated with the flow crossing the roadway.

DRAINAGE CONCERNS IN THE AREA

Lake Pleasant Mobile Home Estates: This community has no storm water retention at all. The Community is responsible to maintain wall openings on the discharge end of the drainage system, which maintenance is not consistent. Off-site flows enter at Sack Drive and thru a drainage way at Dinero Road and Carnation Drive.

Sun City Storage: This development has no storm water retention at all.

Sun City Lodge: The development has no retention at all. Debris from Sun City and 107th Av. roadway litters parking lot.

107 Union Hills LLC: The development has no storm water retention at all.

Circle K: The Development has no storm water retention at all

Salvation Army: The development has no storm water retention at all.

Sun City Elks Lodge: The development has no storm water retention at all.

Un-metered outlet and surface flows over the roadway along east side of 107th Av. from UHD to Palm Tree Dr. Including the UHD, 107th intersection.

Maintenance of wall openings throughout Section 30; T3N, R1E, SE $\frac{1}{4}$ section.

Loss of conveyance cross section along the south side of UHD from 107th Av. westerly to 111th Av.

Lack of off-site flows reaching the Canyon Ridge West Development.

Lack of retention volume for developments throughout The SE $\frac{1}{4}$ section, Section 30; T3N, R1E.

Unintended inundation of the WWTP Basin.

Lack of outlet or discharge for the WWTP Basin.

Missing roadway improvements for UHD from 107th to 111th Av. and 107th Av. from UHD to Palm Tree Dr. (i.e. curb, gutter, storm drains, catch basin.)

City of Surprise -
Documented Flooding
Complaints,
January 2010 Storm





MEMORANDUM

DATA COLLECTION 107th Avenue and Union Hills Drive Design Concept Report Phase 1 – Analysis and Recommendations

The purpose of this memorandum is to summarize the data collection efforts relative to the above referenced project.

a. Flood Control District of Maricopa County

- i. Glendale/Peoria ADMP Update
- ii. Glendale/Peoria ADMPU Northwest Region Update
- iii. Pinnacle Peak Road Hydrology (Wood Patel, 2010)
- iv. GIS Data

b. City of Peoria

- Beardsley Road, 111th Avenue to Lake Pleasant Heights Road Pavement Rehabilitation and Utility Improvements Plans
- 112th Avenue and Beardsley Road Street Improvements Plans
- 111th Avenue Roadway Improvement plans
- Bay Pointe at Ventana Lakes G&D plans
- Bay Pointe Unit 2 at Ventana Lakes G&D plans
- Greystone Heritage at Ventana Lakes G&D plans
- Greystone Heritage Unit 2 at Ventana Lakes G&D plans
- Moonlight Bay at Ventana Lakes Phase 1&2 G&D plans
- South Bay at Ventana Lakes G&D plans
- South Bay Unit 2 at Ventana Lakes G&D plans
- The Landings at Ventana Lakes G&D plans
- Beardsley Road Improvement plans – 91st Ave. to 83rd Ave.
- Beardsley Road West Paving plans
- Beardsley Road East Paving plans
- Sun City Masonic Fellowship Center - Lodge #72 site plan
- Sun City Masonic Fellowship Center - Lodge #72 addition site plan
- Sun City Service Center for the Salvation Army
- Sun City RV and Mini Storage site plan
- Flood Complaint Summary

Goodwin and Marshall, Inc.

6909 West Ray Road #15 ~ Chandler, Arizona 85226 ~ 602-218-7285

Page 1 of 2



c. City of Surprise

- Bell Road Improvement Plans – Grand Avenue to 115th Avenue
- Improvement Plans for 114th Avenue – 115th Avenue to Bell Road
- Improvement Plans for Bell Road and 115th Avenue
- Canyon Ridge West Infrastructure Mass Grading plans
- The Village at Canyon Ridge West G&D plans
- The Village at Canyon Ridge West Paving Plans
- Coyote Lakes Paving Plans
- Canyon Ridge West Infrastructure Paving and Storm Drain plans
- Canyon Ridge West Parcel 5 G&D plans
- Canyon Ridge Master Drainage Report

d. Miscellaneous Data

- Canyon Ridge Parcel 5 Final Plat
- Canyon Ridge Parcel 6 Final Plat
- Lake Pleasant Mobile Home Estates Two Final Plat
- Paradise Resort Travel Trailer Park Final Plat
- Sun City Unit Forty-Five Final Plat
- Sun City Unit Forty-Seven Final Plat
- MCDOT City of Peoria and City Surprise ROW maps
- City of Peoria Study Area Annexation Ordinances
- City of Surprise Study Area Annexation Ordinances

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Beardsley Road Pavement Rehabilitation.pdf	16,060 KB	Adobe Acrobat Document	10/7/2010 11:32 AM
Greystone Heritage Unit Two at Ventana Lakes Sewer Plan.pdf	4,926 KB	Adobe Acrobat Document	10/7/2010 12:17 PM
Greystone Heritage Unit Two at Ventana Lakes Water Plan.pdf	3,520 KB	Adobe Acrobat Document	10/7/2010 11:52 AM
ID 8403.pdf	40,145 KB	Adobe Acrobat Document	10/7/2010 12:09 PM
Lake Pleasant Mobile Estates.pdf	535 KB	Adobe Acrobat Document	10/7/2010 11:47 AM
Moonlight Bay at Ventana Lakes Phase I Sewer Plan.pdf	2,078 KB	Adobe Acrobat Document	10/7/2010 12:25 PM
Moonlight Bay at Ventana Lakes Phase II Sewer Plan.pdf	1,570 KB	Adobe Acrobat Document	10/7/2010 11:59 AM

Name	Size Type	Modified
Moonlight Bay Phase I Water Plan.pdf	957 KB Adobe Acrobat Document	10/7/2010 11:34 AM
Moonlight Bay Phase II Water Plan.pdf	1,256 KB Adobe Acrobat Document	10/7/2010 11:33 AM
Peoria Relief Sewer.pdf	12,984 KB Adobe Acrobat Document	10/7/2010 12:19 PM
South Bay at Ventana Lakes Sewer Plan.pdf	2,629 KB Adobe Acrobat Document	10/7/2010 12:11 PM
South Bay at Ventana Lakes Water Plan.pdf	2,315 KB Adobe Acrobat Document	10/7/2010 11:48 AM
South Bay Unit Two at Ventana Lakes Sewer Plan.pdf	4,743 KB Adobe Acrobat Document	10/7/2010 12:14 PM
South Bay Unit Two at Ventana Lakes Water Plan.pdf	3,508 KB Adobe Acrobat Document	10/7/2010 11:50 AM
The Landings at Ventana Lakes Sewer Plan.pdf	2,660 KB Adobe Acrobat Document	10/7/2010 12:04 PM
The Landings at Ventana Lakes Water Plan.pdf	1,459 KB Adobe Acrobat Document	10/7/2010 11:40 AM
Tract C the Landings at Ventana Lakes.pdf	2,753 KB Adobe Acrobat Document	10/7/2010 12:01 PM
Ventana Lakes Lift Station.pdf	2,561 KB Adobe Acrobat Document	10/7/2010 12:22 PM
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39-2.pdf	196 KB Adobe Acrobat Document	10/12/2010 11:26 AM
39-3.pdf	280 KB Adobe Acrobat Document	10/12/2010 11:26 AM
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002.aux	5 KB AUX File	12/4/2009 4:52 PM
003.TIF	994 KB TIF Image	8/7/2001 1:41 PM

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005.aux	5 KB AUX File	12/4/2009 4:52 PM
006.TIF	760 KB TIF Image	8/7/2001 1:42 PM
006.aux	5 KB AUX File	12/4/2009 4:52 PM
007.TIF	875 KB TIF Image	8/7/2001 1:42 PM
007.aux	5 KB AUX File	12/4/2009 4:52 PM
008.TIF	903 KB TIF Image	8/7/2001 1:43 PM
008.aux	5 KB AUX File	12/4/2009 4:52 PM
009.TIF	802 KB TIF Image	8/7/2001 1:43 PM
009.aux	5 KB AUX File	12/4/2009 4:52 PM
SC-146.pdf	5,019 KB Adobe Acrobat Document	11/10/2010 12:06 PM
W:\10388A.2\Conflict Research\Arizona American\sc-148		
001.TIF	741 KB TIF Image	8/7/2001 1:46 PM
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002.TIF	287 KB TIF Image	8/7/2001 1:46 PM
002.aux	5 KB AUX File	12/4/2009 4:53 PM
003.TIF	437 KB TIF Image	8/7/2001 1:46 PM
003.aux	5 KB AUX File	12/4/2009 4:54 PM
004.TIF	705 KB TIF Image	8/7/2001 1:47 PM
004.aux	5 KB AUX File	12/4/2009 4:54 PM
005.TIF	1,143 KB TIF Image	8/7/2001 1:47 PM
005.aux	5 KB AUX File	12/4/2009 4:54 PM
006.TIF	718 KB TIF Image	8/7/2001 1:47 PM
006.aux	5 KB AUX File	12/4/2009 4:54 PM
007.TIF	1,368 KB TIF Image	8/7/2001 1:48 PM
007.aux	5 KB AUX File	12/4/2009 4:54 PM
sc-148.pdf	2,971 KB Adobe Acrobat Document	11/10/2010 12:10 PM
W:\10388A.2\Conflict Research\Arizona American\sc-150		
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001.aux	5 KB AUX File	12/4/2009 4:56 PM
002.TIF	406 KB TIF Image	8/7/2001 1:56 PM
002.aux	5 KB AUX File	12/4/2009 4:56 PM
003.TIF	399 KB TIF Image	8/7/2001 1:56 PM
003.aux	5 KB AUX File	12/4/2009 4:56 PM
004.TIF	408 KB TIF Image	8/7/2001 1:57 PM
004.aux	5 KB AUX File	12/4/2009 4:56 PM
005.TIF	313 KB TIF Image	8/7/2001 1:57 PM
005.aux	5 KB AUX File	12/4/2009 4:57 PM
006.TIF	465 KB TIF Image	8/7/2001 1:57 PM
006.aux	5 KB AUX File	12/4/2009 4:57 PM
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007.aux	5 KB AUX File	12/4/2009 4:57 PM
008.TIF	621 KB TIF Image	8/7/2001 1:58 PM
008.aux	5 KB AUX File	12/4/2009 4:57 PM
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009.aux	5 KB AUX File	12/4/2009 4:57 PM
010.TIF	410 KB TIF Image	8/7/2001 1:59 PM
010.aux	5 KB AUX File	12/4/2009 4:57 PM

Name	Size Type	Modified
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012.aux	5 KB AUX File	12/4/2009 4:57 PM
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002.TIF	421 KB TIF Image	8/7/2001 2:11 PM
W:\10388A.2\Conflict Research\Arizona American\sc-209		
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002.aux	5 KB AUX File	12/4/2009 5:23 PM
003.TIF	707 KB TIF Image	8/28/2001 7:06 PM
003.aux	5 KB AUX File	12/4/2009 5:23 PM
004.TIF	883 KB TIF Image	8/28/2001 7:07 PM
004.aux	5 KB AUX File	12/4/2009 5:23 PM
005.TIF	951 KB TIF Image	8/28/2001 7:07 PM
005.aux	5 KB AUX File	12/4/2009 5:23 PM
006.TIF	666 KB TIF Image	8/28/2001 7:08 PM
006.aux	5 KB AUX File	12/4/2009 5:23 PM
007.TIF	4,712 KB TIF Image	8/28/2001 7:10 PM
007.aux	5 KB AUX File	12/4/2009 5:23 PM
008.TIF	967 KB TIF Image	8/28/2001 7:11 PM
008.aux	5 KB AUX File	12/4/2009 5:24 PM
W:\10388A.2\Conflict Research\Arizona American\sc-210		
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002.aux	5 KB AUX File	12/4/2009 5:23 PM
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004.aux	5 KB AUX File	12/4/2009 5:23 PM
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006.TIF	1,314 KB TIF Image	8/28/2001 7:14 PM
006.aux	5 KB AUX File	12/4/2009 5:23 PM
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007.aux	5 KB AUX File	12/4/2009 5:23 PM
008.TIF	682 KB TIF Image	8/28/2001 7:15 PM
008.aux	5 KB AUX File	12/4/2009 5:23 PM
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009.aux	5 KB AUX File	12/4/2009 5:23 PM
W:\10388A.2\Conflict Research\Arizona American\sc-212		
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002.TIF	583 KB TIF Image	8/28/2001 7:21 PM
002.aux	5 KB AUX File	12/4/2009 5:22 PM
003.TIF	719 KB TIF Image	8/28/2001 7:21 PM
003.aux	5 KB AUX File	12/4/2009 5:22 PM
004.TIF	739 KB TIF Image	8/28/2001 7:22 PM

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005.aux	5 KB AUX File	12/4/2009 5:22 PM
006.TIF	661 KB TIF Image	8/28/2001 7:23 PM
006.aux	5 KB AUX File	12/4/2009 5:22 PM
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002.aux	5 KB AUX File	12/4/2009 4:51 PM
003.TIF	836 KB TIF Image	9/7/2001 3:49 PM
003.aux	5 KB AUX File	12/4/2009 4:51 PM
004.TIF	961 KB TIF Image	9/7/2001 3:50 PM
004.aux	5 KB AUX File	12/4/2009 4:51 PM
005.TIF	950 KB TIF Image	9/7/2001 3:50 PM
005.aux	5 KB AUX File	12/4/2009 4:51 PM
006.TIF	1,308 KB TIF Image	9/7/2001 3:51 PM
006.aux	5 KB AUX File	12/4/2009 4:51 PM
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007.aux	5 KB AUX File	12/4/2009 4:51 PM
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002.aux	5 KB AUX File	12/4/2009 4:50 PM
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003.aux	5 KB AUX File	12/4/2009 4:50 PM
004.TIF	1,114 KB TIF Image	9/7/2001 3:54 PM
004.aux	5 KB AUX File	12/4/2009 4:50 PM
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005.aux	5 KB AUX File	12/4/2009 4:50 PM
006.TIF	680 KB TIF Image	9/7/2001 3:55 PM
006.aux	5 KB AUX File	12/4/2009 4:51 PM
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003.TIF	452 KB TIF Image	9/7/2001 3:56 PM
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004.TIF	886 KB TIF Image	9/7/2001 3:57 PM
004.aux	5 KB AUX File	12/4/2009 4:50 PM
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005.aux	5 KB AUX File	12/4/2009 4:50 PM
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006.aux	5 KB AUX File	12/4/2009 4:50 PM
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004.aux	5 KB AUX File	12/4/2009 4:50 PM
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002.aux	5 KB AUX File	12/4/2009 4:49 PM
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003.aux	5 KB AUX File	12/4/2009 4:49 PM
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004.aux	5 KB AUX File	12/4/2009 4:49 PM
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005.aux	5 KB AUX File	12/4/2009 4:49 PM
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006.aux	5 KB AUX File	12/4/2009 4:50 PM
007.TIF	693 KB TIF Image	9/7/2001 4:03 PM
007.aux	5 KB AUX File	12/4/2009 4:50 PM
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001.aux	5 KB AUX File	12/4/2009 4:49 PM
002.TIF	550 KB TIF Image	9/7/2001 4:03 PM
002.aux	5 KB AUX File	12/4/2009 4:49 PM
003.TIF	1,024 KB TIF Image	9/7/2001 4:04 PM
003.aux	5 KB AUX File	12/4/2009 4:49 PM
004.TIF	919 KB TIF Image	9/7/2001 4:04 PM
004.aux	5 KB AUX File	12/4/2009 4:49 PM
005.TIF	986 KB TIF Image	9/7/2001 4:05 PM
005.aux	5 KB AUX File	12/4/2009 4:49 PM
006.TIF	1,025 KB TIF Image	9/7/2001 4:06 PM
006.aux	5 KB AUX File	12/4/2009 4:49 PM
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002.aux	5 KB AUX File	12/4/2009 4:49 PM
003.TIF	1,067 KB TIF Image	9/7/2001 4:07 PM
003.aux	5 KB AUX File	12/4/2009 4:49 PM
004.TIF	841 KB TIF Image	9/7/2001 4:08 PM
004.aux	5 KB AUX File	12/4/2009 4:49 PM
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005.aux	5 KB AUX File	12/4/2009 4:49 PM
006.TIF	876 KB TIF Image	9/7/2001 4:09 PM
006.aux	5 KB AUX File	12/4/2009 4:49 PM
007.TIF	1,919 KB TIF Image	9/7/2001 4:10 PM
007.aux	5 KB AUX File	12/4/2009 4:49 PM
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004.TIF	773 KB TIF Image	9/7/2001 8:43 PM
004.aux	5 KB AUX File	12/4/2009 4:37 PM
005.TIF	856 KB TIF Image	9/7/2001 8:44 PM
005.aux	5 KB AUX File	12/4/2009 4:37 PM
006.TIF	843 KB TIF Image	9/7/2001 8:44 PM
006.aux	5 KB AUX File	12/4/2009 4:37 PM
007.TIF	1,025 KB TIF Image	9/7/2001 8:45 PM
007.aux	5 KB AUX File	12/4/2009 4:37 PM
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004.TIF	276 KB TIF Image	10/22/2001 1:49 PM
005.TIF	412 KB TIF Image	10/22/2001 1:49 PM
006.TIF	422 KB TIF Image	10/22/2001 1:49 PM
007.TIF	720 KB TIF Image	10/22/2001 1:49 PM
008.TIF	995 KB TIF Image	10/22/2001 1:50 PM
009.TIF	902 KB TIF Image	10/22/2001 1:50 PM
010.TIF	436 KB TIF Image	10/22/2001 1:50 PM
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001.TIF	1,588 KB TIF Image	10/22/2001 1:53 PM
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003.TIF	874 KB TIF Image	10/22/2001 12:54 PM
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003.TIF	1,027 KB TIF Image	10/22/2001 2:20 PM
004.TIF	992 KB TIF Image	10/22/2001 2:20 PM
sc-443.pdf	1,944 KB Adobe Acrobat Document	11/10/2010 12:12 PM
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Name	Size Type	Modified
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72-118	File Folder	12/6/2010 3:22 PM
79-108	File Folder	12/6/2010 3:22 PM
96-104	File Folder	12/6/2010 3:22 PM
2009-193	File Folder	12/6/2010 3:22 PM
2009-224	File Folder	12/6/2010 3:22 PM
sc-123	File Folder	12/6/2010 3:22 PM
sc-124	File Folder	12/6/2010 3:22 PM
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TEMP018.TIF	595 KB TIF Image	10/26/2010 10:28 AM
TEMP019.TIF	587 KB TIF Image	10/26/2010 10:28 AM
TEMP020.TIF	758 KB TIF Image	10/26/2010 10:29 AM
TEMP021.TIF	516 KB TIF Image	10/26/2010 10:29 AM
TEMP022.TIF	779 KB TIF Image	10/26/2010 10:29 AM
TEMP023.TIF	843 KB TIF Image	10/26/2010 10:29 AM
TEMP024.TIF	830 KB TIF Image	10/26/2010 10:30 AM
TEMP025.TIF	747 KB TIF Image	10/26/2010 10:30 AM
TEMP026.TIF	857 KB TIF Image	10/26/2010 10:30 AM
TEMP027.TIF	708 KB TIF Image	10/26/2010 10:30 AM
TEMP028.TIF	727 KB TIF Image	10/26/2010 10:31 AM
TEMP029.TIF	901 KB TIF Image	10/26/2010 10:31 AM
TEMP030.TIF	582 KB TIF Image	10/26/2010 10:31 AM
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004.TIF	564 KB TIF Image	8/23/2007 1:37 PM
005.TIF	516 KB TIF Image	8/23/2007 1:37 PM
006.TIF	423 KB TIF Image	8/23/2007 1:37 PM
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003.TIF	493 KB TIF Image	8/23/2007 1:39 PM
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007.TIF	453 KB TIF Image	8/23/2007 1:40 PM
008.TIF	524 KB TIF Image	8/23/2007 1:40 PM
009.TIF	475 KB TIF Image	8/23/2007 1:40 PM
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005.TIF	505 KB TIF Image	8/23/2007 1:49 PM
006.TIF	459 KB TIF Image	8/23/2007 1:50 PM
007.TIF	408 KB TIF Image	8/23/2007 1:50 PM
008.TIF	478 KB TIF Image	8/23/2007 1:50 PM
009.TIF	481 KB TIF Image	8/23/2007 1:50 PM
010.TIF	464 KB TIF Image	8/23/2007 1:50 PM
011.TIF	434 KB TIF Image	8/23/2007 1:50 PM
012.TIF	518 KB TIF Image	8/23/2007 1:50 PM
013.TIF	404 KB TIF Image	8/23/2007 1:50 PM
014.TIF	543 KB TIF Image	8/23/2007 1:51 PM
015.TIF	534 KB TIF Image	8/23/2007 1:51 PM
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017.TIF	497 KB TIF Image	8/23/2007 1:51 PM
018.TIF	439 KB TIF Image	8/23/2007 1:51 PM
019.TIF	450 KB TIF Image	8/23/2007 1:51 PM
W:\10388A.2\Conflict Research\Arizona American\Sewer\51-107		
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032.TIF	531 KB TIF Image	8/23/2007 2:05 PM
033.TIF	563 KB TIF Image	8/23/2007 2:05 PM
034.TIF	683 KB TIF Image	8/23/2007 2:05 PM
035.TIF	692 KB TIF Image	8/23/2007 2:05 PM
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006.TIF	456 KB TIF Image	8/28/2001 5:07 PM
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008.TIF	2,827 KB TIF Image	9/7/2001 2:59 PM
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009.TIF	1,854 KB TIF Image	9/7/2001 3:00 PM
009.aux	5 KB AUX File	12/4/2009 4:57 PM
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010.aux	5 KB AUX File	12/4/2009 4:57 PM
011.TIF	1,999 KB TIF Image	9/7/2001 3:02 PM
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003.TIF	2,082 KB TIF Image	9/7/2001 3:03 PM
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004.aux	5 KB AUX File	12/4/2009 4:55 PM

Name	Size Type	Modified
005.TIF	797 KB TIF Image	9/7/2001 3:05 PM
005.aux	5 KB AUX File	12/4/2009 4:55 PM
006.TIF	1,717 KB TIF Image	9/7/2001 3:05 PM
006.aux	5 KB AUX File	12/4/2009 4:55 PM
007.TIF	2,241 KB TIF Image	9/7/2001 3:06 PM
007.aux	5 KB AUX File	12/4/2009 4:55 PM
008.TIF	1,636 KB TIF Image	9/7/2001 3:07 PM
008.aux	5 KB AUX File	12/4/2009 4:56 PM
009.TIF	1,871 KB TIF Image	9/7/2001 3:08 PM
009.aux	5 KB AUX File	12/4/2009 4:56 PM
010.TIF	1,839 KB TIF Image	9/7/2001 3:09 PM
010.aux	5 KB AUX File	12/4/2009 4:56 PM
011.TIF	1,753 KB TIF Image	9/7/2001 3:09 PM
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W:\10388A.2\Conflict Research\Arizona American\Sewer\sc-319		
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002.aux	5 KB AUX File	12/4/2009 4:55 PM
003.TIF	1,715 KB TIF Image	9/7/2001 3:11 PM
003.aux	5 KB AUX File	12/4/2009 4:55 PM
004.TIF	2,030 KB TIF Image	9/7/2001 3:12 PM
004.aux	5 KB AUX File	12/4/2009 4:55 PM
005.TIF	1,620 KB TIF Image	9/7/2001 3:12 PM
005.aux	5 KB AUX File	12/4/2009 4:55 PM
006.TIF	2,383 KB TIF Image	9/7/2001 3:13 PM
006.aux	5 KB AUX File	12/4/2009 4:55 PM
W:\10388A.2\Conflict Research\Arizona American\Sewer\sc-320		
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002.TIF	280 KB TIF Image	9/7/2001 3:14 PM
002.aux	5 KB AUX File	12/4/2009 4:54 PM
003.TIF	1,687 KB TIF Image	9/7/2001 3:15 PM
003.aux	5 KB AUX File	12/4/2009 4:54 PM
004.TIF	1,641 KB TIF Image	9/7/2001 3:15 PM
004.aux	5 KB AUX File	12/4/2009 4:54 PM
005.TIF	1,569 KB TIF Image	9/7/2001 3:16 PM
005.aux	5 KB AUX File	12/4/2009 4:54 PM
006.TIF	1,640 KB TIF Image	9/7/2001 3:17 PM
006.aux	5 KB AUX File	12/4/2009 4:54 PM
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007.aux	5 KB AUX File	12/4/2009 4:55 PM
008.TIF	1,636 KB TIF Image	9/7/2001 3:19 PM
008.aux	5 KB AUX File	12/4/2009 4:55 PM
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009.aux	5 KB AUX File	12/4/2009 4:55 PM
010.TIF	1,586 KB TIF Image	9/7/2001 3:20 PM
010.aux	5 KB AUX File	12/4/2009 4:55 PM
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W:\10388A.2\Conflict Research\Arizona American\Sewer\sc-321		

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002.aux	5 KB AUX File	12/4/2009 4:53 PM
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003.aux	5 KB AUX File	12/4/2009 4:54 PM
004.TIF	1,924 KB TIF Image	9/7/2001 3:24 PM
004.aux	5 KB AUX File	12/4/2009 4:54 PM
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005.aux	5 KB AUX File	12/4/2009 4:54 PM
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006.aux	5 KB AUX File	12/4/2009 4:54 PM
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007.aux	5 KB AUX File	12/4/2009 4:54 PM
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008.aux	5 KB AUX File	12/4/2009 4:54 PM
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010.aux	5 KB AUX File	12/4/2009 4:54 PM
011.TIF	1,829 KB TIF Image	9/7/2001 3:32 PM
011.aux	5 KB AUX File	12/4/2009 4:54 PM
012.TIF	1,976 KB TIF Image	9/7/2001 3:33 PM
012.aux	5 KB AUX File	12/4/2009 4:54 PM
013.TIF	2,414 KB TIF Image	9/7/2001 3:35 PM
013.aux	5 KB AUX File	12/4/2009 4:54 PM

W:\10388A.2\Conflict Research\Arizona American\Sewer\sc-396

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006.TIF	4,032 KB TIF Image	10/22/2001 2:16 PM
007.TIF	810 KB TIF Image	10/22/2001 2:16 PM
008.TIF	1,161 KB TIF Image	10/22/2001 2:17 PM
009.TIF	1,366 KB TIF Image	10/22/2001 2:17 PM
010.TIF	1,695 KB TIF Image	10/22/2001 2:17 PM
011.TIF	1,502 KB TIF Image	10/22/2001 2:17 PM
012.TIF	1,102 KB TIF Image	10/22/2001 2:17 PM
013.TIF	1,441 KB TIF Image	10/22/2001 2:18 PM
014.TIF	1,624 KB TIF Image	10/22/2001 2:18 PM
015.TIF	1,315 KB TIF Image	10/22/2001 2:18 PM
016.TIF	1,541 KB TIF Image	10/22/2001 2:18 PM
017.TIF	1,321 KB TIF Image	10/22/2001 2:18 PM
018.TIF	1,325 KB TIF Image	10/22/2001 2:19 PM
019.TIF	1,143 KB TIF Image	10/22/2001 2:19 PM
020.TIF	1,290 KB TIF Image	10/22/2001 2:19 PM
021.TIF	1,250 KB TIF Image	10/22/2001 2:19 PM
022.TIF	1,347 KB TIF Image	10/22/2001 2:19 PM
023.TIF	2,212 KB TIF Image	10/22/2001 2:20 PM
024.TIF	3,657 KB TIF Image	10/22/2001 2:20 PM

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003.TIF	1,591 KB TIF Image	10/22/2001 1:42 PM
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005.TIF	1,644 KB TIF Image	10/22/2001 1:43 PM
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004.TIF	1,057 KB TIF Image	10/22/2001 12:48 PM
005.TIF	401 KB TIF Image	10/22/2001 12:48 PM
W:\10388A.2\Conflict Research\Arizona American\Sewer\sc-404		
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003.TIF	472 KB TIF Image	10/22/2001 1:31 PM
004.TIF	414 KB TIF Image	10/22/2001 1:31 PM
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003.TIF	2,555 KB TIF Image	10/22/2001 2:28 PM
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003.TIF	1,540 KB TIF Image	10/22/2001 1:31 PM
004.TIF	1,282 KB TIF Image	10/22/2001 1:31 PM
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003.TIF	958 KB TIF Image	10/22/2001 2:08 PM
004.TIF	1,010 KB TIF Image	10/22/2001 2:08 PM
005.TIF	1,040 KB TIF Image	10/22/2001 2:08 PM
006.TIF	1,014 KB TIF Image	10/22/2001 2:09 PM
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008.TIF	1,095 KB TIF Image	10/22/2001 2:09 PM
009.TIF	947 KB TIF Image	10/22/2001 2:09 PM
010.TIF	920 KB TIF Image	10/22/2001 2:09 PM
011.TIF	964 KB TIF Image	10/22/2001 2:10 PM
012.TIF	859 KB TIF Image	10/22/2001 2:10 PM
013.TIF	785 KB TIF Image	10/22/2001 2:10 PM
014.TIF	917 KB TIF Image	10/22/2001 2:10 PM
015.TIF	924 KB TIF Image	10/22/2001 2:10 PM
016.TIF	963 KB TIF Image	10/22/2001 2:10 PM
017.TIF	881 KB TIF Image	10/22/2001 2:11 PM
018.TIF	866 KB TIF Image	10/22/2001 2:11 PM
019.TIF	914 KB TIF Image	10/22/2001 2:11 PM
020.TIF	882 KB TIF Image	10/22/2001 2:11 PM
021.TIF	891 KB TIF Image	10/22/2001 2:11 PM
022.TIF	868 KB TIF Image	10/22/2001 2:12 PM
023.TIF	863 KB TIF Image	10/22/2001 2:12 PM
024.TIF	903 KB TIF Image	10/22/2001 2:12 PM

Name	Size Type	Modified
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003.TIF	874 KB TIF Image	10/22/2001 12:54 PM
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004.TIF	3,716 KB TIF Image	10/22/2001 1:38 PM
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006.TIF	1,761 KB TIF Image	10/22/2001 1:38 PM
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010.TIF	1,487 KB TIF Image	10/22/2001 1:38 PM
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013.TIF	2,390 KB TIF Image	10/22/2001 1:39 PM
014.TIF	2,130 KB TIF Image	10/22/2001 1:39 PM
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004.TIF	1,307 KB TIF Image	10/22/2001 2:04 PM
005.TIF	1,327 KB TIF Image	10/22/2001 2:04 PM
006.TIF	1,371 KB TIF Image	10/22/2001 2:04 PM
007.TIF	1,348 KB TIF Image	10/22/2001 2:05 PM
008.TIF	1,400 KB TIF Image	10/22/2001 2:05 PM
009.TIF	1,257 KB TIF Image	10/22/2001 2:05 PM
010.TIF	1,396 KB TIF Image	10/22/2001 2:05 PM
011.TIF	1,873 KB TIF Image	10/22/2001 2:06 PM
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002.TIF	1,329 KB TIF Image	11/1/2001 9:29 PM
003.TIF	957 KB TIF Image	11/1/2001 9:30 PM
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003.TIF	3,516 KB TIF Image	11/1/2001 9:54 PM
004.TIF	2,651 KB TIF Image	11/1/2001 9:54 PM
005.TIF	2,635 KB TIF Image	11/1/2001 9:55 PM
006.TIF	2,559 KB TIF Image	11/1/2001 9:55 PM
007.TIF	2,660 KB TIF Image	11/1/2001 9:55 PM
008.TIF	3,392 KB TIF Image	11/1/2001 9:55 PM
009.TIF	2,640 KB TIF Image	11/1/2001 9:55 PM
010.TIF	1,162 KB TIF Image	11/1/2001 9:55 PM
011.TIF	676 KB TIF Image	11/1/2001 9:56 PM

Name	Size Type	Modified
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W:\10388A.2\Conflict Research\Arizona American\Sewer\sc-504		
001.TIF	1,256 KB TIF Image	11/1/2001 11:04 PM
Summary: 1.307 Object(s) / 353.527 KB		



107th Ave & Union Hills 11-18-10

Meta Data:

Vertical Datum: NAVD 88
Coordinate System: US State Plane 1983
Zone: Arizona Central 0202
Datum: NAD 1983 (NSRS 2007)
Geoid Model: Geoid09AZ

LEGEND

BC Back of Curb
BOT Bottom
CL Centerline
CMP Corrigated Metal Pipe
EOA Edge of Asphalt
EOR Edge of Road
GB Grade Break
INV Invert
NG Natural Ground
RCP Reinforced Concrete Pipe
RD Road
RPP Reinforced Plastic Pipe
TB Top of Bank
TC Top of Curb

CULVERTS & MISC. TOPO DATA

CULVERTS @ BELL RD

Point #	Northing	Easting	Elevation	Description
100	960070.3	581087.4	1156.27	INV CL
101	960073.1	581077.4	1156.18	INV CL
102	960076.2	581066.1	1156.21	INV CL
103	960090.2	581072.2	1164.64	TC
104	960125.8	581082.6	1165.46	TC
105	960145.2	581090.6	1165.57	TC
106	960193.3	581107.4	1164.34	TC
107	960198.1	581121.6	1157.23	INV CL
108	960200.8	581111.2	1157.18	INV CL
109	960203.8	581100.8	1157.18	INV CL
110	960272	581156.9	1160.02	INV 18" RPP
111	960296.1	581143.7	1160.11	INV 18" RPP

WEIRS & TOWER PROTECTION DETAIL

Point #	Northing	Easting	Elevation	Description
112	961084.1	581198.4	1161.81	SHOTCRETE
113	961146.6	581198.4	1161.61	SHOTCRETE
114	961146.3	581137.1	1161.56	SHOTCRETE
115	961084.9	581136.4	1161.61	SHOTCRETE
116	961034.4	581168.6	1157.76	BOT CL
117	961052.1	581170	1161.37	TOP CL
118	961177.3	581161.6	1161.67	TOP CL
119	961190.7	581159.7	1158.64	BOT CL
120	961225.9	581158.5	1158.99	GB
121	961233.8	581158.3	1160.45	GB
122	961306.3	581154.2	1161.16	BOT CL
123	961320.7	581153.6	1163.14	TOP CL
124	961356	581158.2	1158.67	BOT CL

CULVERTS @ ACCESS RD (STA: 1.330 - 1.346)

Point #	Northing	Easting	Elevation	Description
125	961535.8	581150.8	1158.6	INV CL
126	961535.8	581139.8	1158.77	INV CL
127	961535.7	581128.9	1158.69	INV CL
128	961550.2	581139.5	1165.58	EOA
129	961573.8	581139.6	1165.94	EOA
130	961585.5	581150.8	1158.69	INV CL
131	961585.4	581140	1158.9	INV CL
132	961585.4	581129	1158.85	INV CL

CULVERTS & WEIR @ AVENUE OF THE ARTS (STA: 1.640 - 1.675)

Point #	Northing	Easting	Elevation	Description
133	963171.8	581141.6	1163.1	INV CL
134	963171.6	581130.9	1163.09	INV CL
135	963171.5	581120	1163.03	INV CL
136	963193.8	581131	1169.63	TC
137	963260.8	581130.9	1169.76	TC
138	963282.8	581141.3	1163.41	INV CL
139	963282.8	581130.4	1163.76	INV CL
140	963282.8	581120.5	1163.59	INV CL
141	963320.5	581126	1164.18	INV 24" RCP
142	963344.7	581128	1164.36	INV 24" RCP
143	963335.7	581128.1	1167.42	CL WEIR TOP

EXISTING GROUND @ PERIMETER WALL

Point #	Northing	Easting	Elevation	Description
144	961915.5	581229	1165.25	NG@WALL
145	964777.8	581214.1	1179.03	NG@WALL

CULVERTS @ 114TH AVE (STA: 2.102 - 2.122)

Point #	Northing	Easting	Elevation	Description
146	965044.3	581712.3	1174.08	INV CL
147	965033.7	581712.4	1174.08	INV CL
148	965039.6	581727	1182.17	TC
149	965039.6	581758.8	1182.19	TC
150	965034.1	581773.4	1175.62	INV CL
151	965044.4	581773.2	1175.47	INV CL

ARCH CULVERT AROUND SUBSTATION @ +/- 113TH AVE

Point #	Northing	Easting	Elevation	Description
152	965033.6	582129	1183.56	INV CL
153	965017.2	582128.2	1183.68	INV CL
154	965079.2	582635.7	1187.76	INV CL
155	965086.3	582642.7	1188	INV CL

CULVERTS @ 107TH & UNION HILLS DR

Point #	Northing	Easting	Elevation	Description
156	965159.9	586352.2	1217.02	24"RCP INV
157	965157.4	586354.1	1217.09	24"RCP INV
158	965155.4	586355.5	1217.11	24"CMP INV
159	965153.5	586356.8	1217.24	24"CMP INV
160	965244	586459.2	1217.51	24"RCP INV
161	965241.1	586461	1218.12	24"RCP INV
162	965174.5	586469.8	1219.66	24"CMP INV
163	965176.7	586469.9	1219.6	24"CMP INV

CROSS SECTION TOPO

CROSS SECTION @ STA 0.000

Point #	Northing	Easting	Elevation	Description
1000	954530.4	581067.2	1130.06	NG
1001	954538.4	581110.2	1130.38	EOR
1002	954539.2	581115.5	1133.58	TB
1003	954544.1	581141	1128.69	GB
1004	954545.6	581148.3	1124.51	TOE
1005	954557.8	581214.4	1126.5	TOE
1006	954561	581233.3	1137.62	TB
1007	954562.9	581242.3	1135.24	GB
1008	954568	581270.3	1136.45	NG

CROSS SECTION @ STA 0.095

Point #	Northing	Easting	Elevation	Description
1009	955050.2	581193.9	1140.79	NG @ FENCE
1010	955049.8	581179	1139.78	TB

1011	955045.4	581157.6	1129.05	TOE
1012	955047.4	581102.7	1130.34	TOE
1013	955049.3	581096.4	1138.54	TB
1014	955045.8	581073.2	1136.69	GB
1015	955046	581061.1	1131.68	GB
1016	955045.3	581040	1131.28	NG

CROSS SECTION @ STA 0.189

Point #	Northing	Easting	Elevation	Description
1017	955548.3	581060.7	1139.8	NG
1018	955550.5	581100.2	1140.35	TB
1019	955548.2	581115	1134.41	TOE
1020	955548.1	581138.3	1133.57	TOE
1021	955548.4	581155.2	1139.24	TB
1022	955548.4	581183.9	1140.12	NG

CROSS SECTION @ STA 0.284

Point #	Northing	Easting	Elevation	Description
1023	956031.6	581254.8	1144.33	NG
1024	956039	581215.5	1142.43	TB
1025	956041.7	581196.2	1137.02	TOE
1026	956045.1	581180	1135.74	TOE
1027	956047.1	581166.9	1142.34	TB
1028	956053.4	581136.1	1141.61	NG

CROSS SECTION @ STA 0.379

Point #	Northing	Easting	Elevation	Description
1029	956522.3	581163.1	1146.42	NG
1030	956532.9	581193.6	1145.97	TB
1031	956538	581210.1	1141.06	TOE
1032	956541.9	581222	1141.24	TOE
1033	956547.6	581237.7	1145.58	TB
1034	956556.3	581263.9	1147.14	NG @ FENCE

CROSS SECTION @ STA 0.473

Point #	Northing	Easting	Elevation	Description
1035	957024.7	581110.8	1149.53	NG @ FENCE
1036	957018.7	581084.2	1148.97	TB
1037	957013.8	581061.4	1143.41	TOE

1038	957011.2	581050.4	1143.35	TOE
1039	957004.5	581019.4	1151.62	TB
1040	957001.8	581008.4	1147.23	GB
1041	956995.7	580980.5	1146.89	NG

CROSS SECTION @ STA 0.568

Point #	Northing	Easting	Elevation	Description
1042	957508.4	580981.9	1149.48	NG @ WALL
1043	957509	581014.8	1148.81	TB
1044	957509.9	581029.8	1145.32	TOE
1045	957509.8	581039.5	1145.51	TOE
1046	957510.4	581064.5	1150.18	TB @ FENCE

CROSS SECTION @ STA 0.663

Point #	Northing	Easting	Elevation	Description
1047	958010	581084.8	1152.38	CL RD
1048	958009.4	581065.4	1151.77	GUTTER
1049	958009.5	581064.8	1152.22	BC/TB
1050	958009.5	581040.4	1146.9	TOE
1051	958009.4	581028.7	1147.04	TOE
1052	958009.6	581014.8	1150.6	TB
1053	958009.1	580981	1151.11	NG @ WALL

CROSS SECTION @ STA 0.758

Point #	Northing	Easting	Elevation	Description
1054	958509.6	580980.9	1153.48	NG @ WALL
1055	958509.6	581013.9	1152.78	TB
1056	958509.6	581031	1148.78	TOE
1057	958509.2	581040.3	1148.49	TOE
1058	958509.4	581057.8	1152.81	TB
1059	958508.9	581093.9	1154.3	BC

CROSS SECTION @ STA 0.852

Point #	Northing	Easting	Elevation	Description
1060	959009.2	581084.4	1156.86	CL RD
1061	959009.4	581064.8	1156.4	GUTTER
1062	959009.4	581064.1	1156.83	BC/TB
1063	959009.4	581043.2	1150.81	TOE
1064	959008.7	581032.2	1150.64	TOE

1065	959009.2	581011.9	1155.34	TB
1066	959009	580980.4	1156.61	NG @ WALL

CROSS SECTION @ STA 0.947

Point #	Northing	Easting	Elevation	Description
1067	959506.2	580980	1159.14	NG @ WALL
1068	959507.8	581005.2	1158.75	TB
1069	959509.1	581031.5	1152.72	TOE
1070	959515.6	581044.7	1152.97	TOE
1071	959510.5	581058.7	1156.45	GB
1072	959510.6	581065.4	1161.08	TB @ FENCE

CROSS SECTION @ STA 1.050

Point #	Northing	Easting	Elevation	Description
1073	960058.2	581028.4	1162.69	NG
1074	960052.9	581057.6	1161.7	TB
1075	960053.1	581059.7	1155.94	TOE
1076	960048.8	581086.4	1155.87	TOE
1077	960048.1	581090.5	1160.65	GB
1078	960046.9	581096.5	1163.36	TB @ FENCE

CROSS SECTION @ STA 1.231

Point #	Northing	Easting	Elevation	Description
1079	960991.9	581257.6	1163.67	NG
1080	960992.3	581215.4	1164.79	TB
1081	960992.1	581189.2	1157.82	TOE
1082	960992.3	581089.2	1157.83	TOE
1083	960992.4	581062	1164.23	TB
1084	960992.5	581035.6	1164.21	BC

CROSS SECTION @ STA 1.894

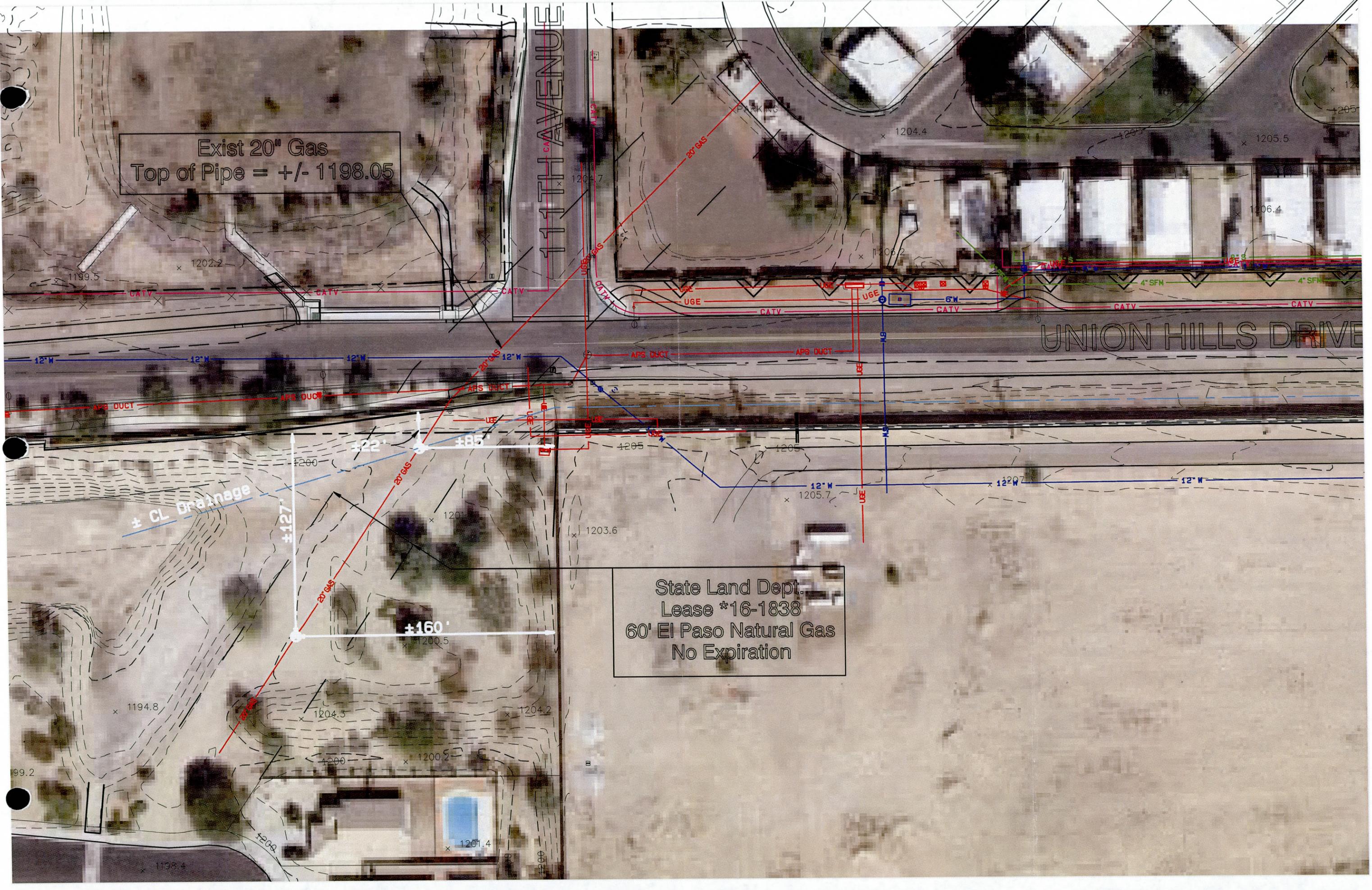
Point #	Northing	Easting	Elevation	Description
1085	964491.6	581006.4	1174.42	BC
1086	964491.3	581048.2	1173.48	TB
1087	964492.1	581076	1167.46	TOE
1088	964491.4	581141.1	1167.47	TOE
1089	964491.5	581167.3	1173.53	TB
1090	964491	581191.2	1173.67	TOE
1091	964491	581215.8	1178.41	TB @ WALL

Exist 20" Gas
Top of Pipe = +/- 1198.05

111TH AVENUE

UNION HILLS DRIVE

State Land Dept.
Lease *16-1838
60' El Paso Natural Gas
No Expiration



NGS Control

- NGS Horiz. Control**
- Good
- Poor
- Mark Not Found

NGS Designation

- NGS OPUS DB**

GDACS Monuments

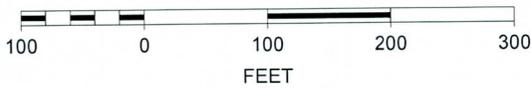
- UPLSS Corners**
- Other Monuments**

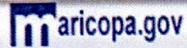
PLSS Lines

- Section Line Determination Status**
- ACCEPTED
- CONFLICTED
- ESTIMATED
- Township-Range**
- T-R Text**
- Section Text**



SCALE 1 : 1,791



**Land Survey Section: Report****UPLSS Corners**

The information here on was gathered by the Maricopa County Department of Transportation (MCDOT) and is deemed reliable but is not guaranteed and should always be verified by the user. MCDOT is currently in the process of quality control checks. The elevations contained here are derived by GPS static procedures with a rigorous vertical adjustment. It is entirely the responsibility of any other user to determine its suitability and errors and/or omissions before using it for themselves and/or for another purpose.

Unofficial Document

Unique ID: 13168
Point Name: 47503-1
Alias: 4750301
Import Date: 10/17/2005
Modified Date:
Classification: USPLSS Monument
Township: T04N
Range: R01E
Section: 31
UPLSS Corner Name: North 1/4
USPLSS Corner Type:
Determination Status: Resolved
Latitude NAD83(1992): 33.390900508N (DD.MMSSsssss)
Longitude NAD83(1992): 112.175485845W (DDD.MMSSsssss)
Ellipsoid Height (Int. Feet): 1105.332
SPC AZ C Northing (Int Feet): 965153.675
SPC AZ C Easting (Int Feet): 583786.738
NAVD88 Elev. (Int feet): 1203.597
Combination Grid Factor: 1.000137319
Convergence: - 0.12420
Last Date Visited: 11/29/2004
FIRM/Agency: ENTRANCO
MCR Number: [2005-1312320](#)
MCR Book: 775
MCR Page: 37
Project Number: 69012
Project Name: GDACS
Monument Status: Good
Description: FD 3" PEORIA BC FL NOTE-CENTER PUNCHED
Comments:

Photos of Survey Point

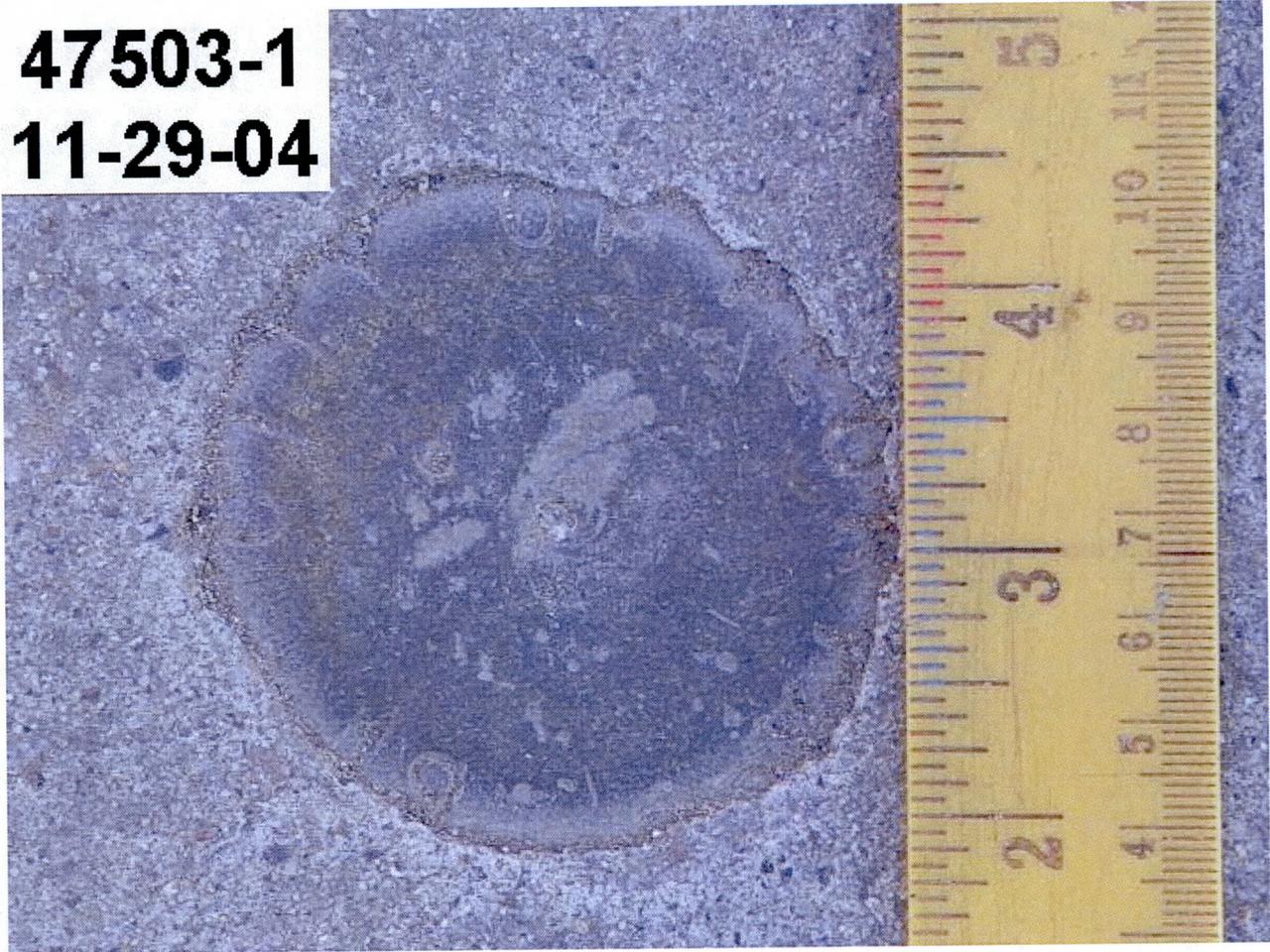
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47503-1
11-29-04



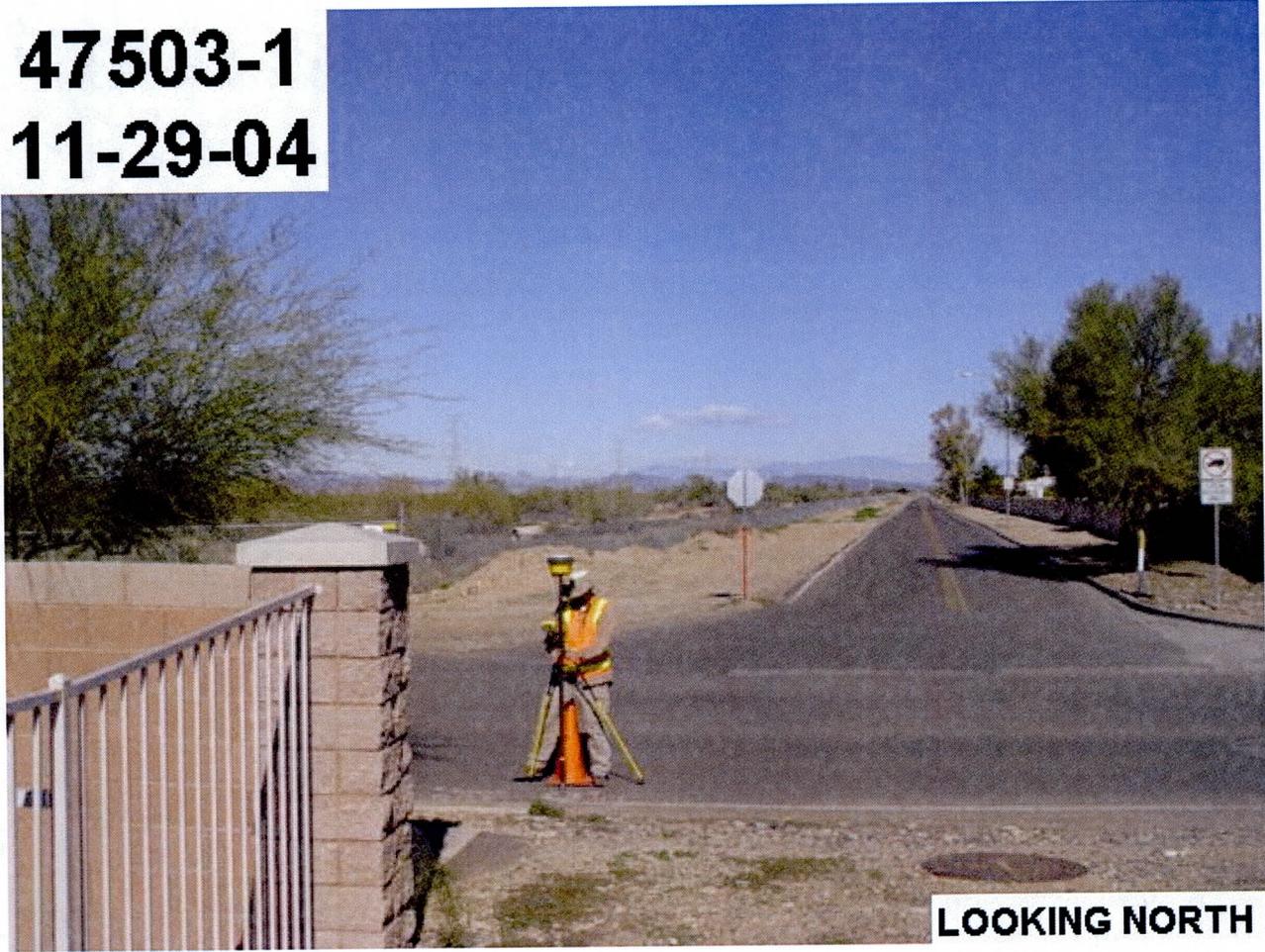
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47503-1
11-29-04



DSC02924.JPG

47503-1
11-29-04



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Close



BASEPLANS U.S.A.

2750 S. Hardy Dr. Suite 2
Tempe, AZ 85282

LOCATION BOOKLET

PREPARED FOR:

FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY

Project Name	: 107th Ave. and Union Hills Dr. DCR-Phase II
Contract No.	: 2009-025
Project No.	:
Work Assignment	: 2
BasePlans Job No.	: 317-02
Date	: January 27, 2011

VACUUM EXCAVATION DATA SHEET
 BASEPLANS U.S.A.
 2750 S. Hardy Dr. Suite 2, Tempe, AZ 85282 - Ph: (480)784-4452

Date: 27-Jan-11

FCDMC Proj. Name: 107th Ave and Union Hills Dr.
 DCR-Phase II

BasePlans Job No.: 317-02

FCDMC Contract No: 2010C006

Pothole No.: 1

Type of Utility: EPNG

Approx. Outside Diameter of Pipe: 20"

Structure/Pipe Material Composition: Steel

Approx. Width of Conduit/Slurry Bank: n/a

Config. of Non-encased Multi Conduit System: n/a

Station		Offset		Surface Elev.	Top Elev.	Bottom Elev.
Given	Actual	Given	Actual			
n/a	n/a	n/a	n/a	1200.82	1198.07	n/a

Pothole Coordinates: N= 965236.791, E= 583785.402

Surface to Top: 2.75
 Surface to Bottom: n/a

Benchmark Provided #1: 47503-1 BCHH at int. Union Hills Dr. and 111th Ave
 Elev.= 1203.597
 NAVD88 datum

Benchmark Provided #2: 47504-1 BCHH at the int. union Hills Dr. and 107th Ave.
 Elev.= 1219.957
 NAVD88 datum

Swing Ties: Distance	Description	Approx. Location
No. 1 126.42	Set 60d nail	N= 965117.250, E= 583744.273
No. 2 66.62	Set 60d nail	N= 965170.832, E= 583776.051
No. 3 30.45	Set 60d nail	N= 965215.946, E= 583807.594

Remarks: All data is in English and based on information received from FCDMC.
 Coordinates are based on values supplied by FCDMC at the Section Corner 47503-1.

VACUUM EXCAVATION DATA SHEET
 BASEPLANS U.S.A.
 2750 S. Hardy Dr. Suite 2, Tempe, AZ 85282 - Ph: (480)784-4452

Date: 27-Jan-11

FCDMC Proj. Name: 107th Ave and Union Hills Dr.
 DCR-Phase II

BasePlans Job No.: 317-02

FCDMC Contract No: 2010C006

Pothole No.: 2

Type of Utility: EPNG

Approx. Outside Diameter of Pipe: 20"

Structure/Pipe Material Composition: Steel

Approx. Width of Conduit/Slurry Bank: n/a

Config. of Non-encased Multi Conduit System: n/a

Station		Offset		Surface Elev.	Top Elev.	Bottom Elev.
Given	Actual	Given	Actual			
n/a	n/a	n/a	n/a	1200.35	1196.35	n/a

Pothole Coordinates: N= 965118.588, E= 583704.779

Surface to Top: 4.00

Surface to Bottom: n/a

Benchmark Provided #1: 47503-1 BCHH at int. Union Hills Dr. and 111th Ave
 Elev.= 1203.597
 NAVD88 datum

Benchmark Provided #2: 47504-1 BCHH at the int. union Hills Dr. and 107th Ave.
 Elev.= 1219.957
 NAVD88 datum

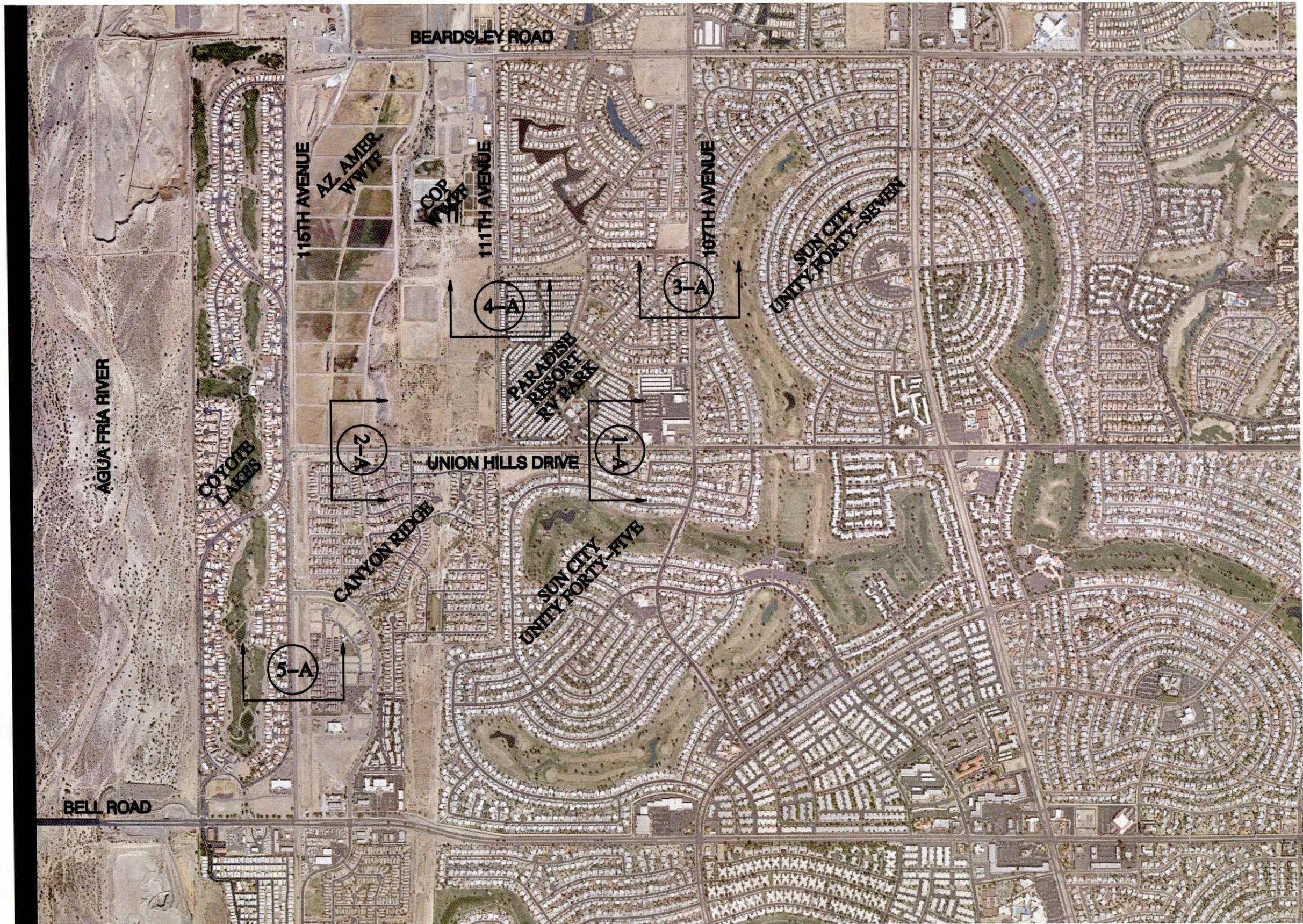
Swing Ties: Distance	Description	Approx. Location
No. 1 39.52	Set 60d nail	N= 965117.250, E= 583744.273
No. 2 88.37	Set 60d nail	N= 965170.832, E= 583776.051
No. 3 141.60	Set 60d nail	N= 965215.946, E= 583807.594

Remarks: All data is in English and based on information received from FCDMC.
 Coordinates are based on values supplied by FCDMC at the Section Corner 47503-1.

Testhole Summary Report

Pothole #	Street	Northing	Easting	Anticipated Utility	Ground Elev.	Surface to top of Pipe	Top of Pipe Elev.	Bottom Elev.	Width of Bank	Actual Material Type, Outside Diameter	Utility Owner
1	Union Hills Dr.	965236.791	583785.402	EPNG	1200.82	2.75	1198.07	na	na	20" Steel	El Paso Natural Gas
2	Union Hills Dr.	965118.588	583704.779	EPNG	1200.35	4.00	1196.35	na	na	20" Steel	El Paso Natural Gas





SCALE = NTS

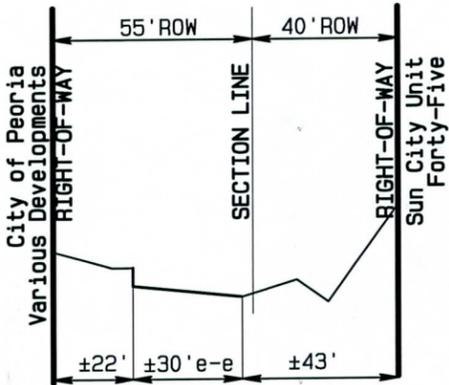
NOTE:
 CROSS-SECTION LOCATIONS
 ARE SHOWN FOR SCHEMATIC
 PURPOSES ONLY.

ENGINEER/PLANNER:
**GOODWIN
 MARSHALL &**
 CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS
 8909 W. Ray Rd. #15, Chandler, AZ 85226
 Metro (602) 218-7285

**DRAFT
 ROADWAY CROSS-SECTIONS
 AERIAL MAP
 FOR
 107TH AVENUE AND
 UNION HILL DRIVE
 CONTRACT: FCD 2009C036.2
 OCTOBER, 2010**

Union Hills Drive
Typ. Existing Conditions
111th-107th
Facing East

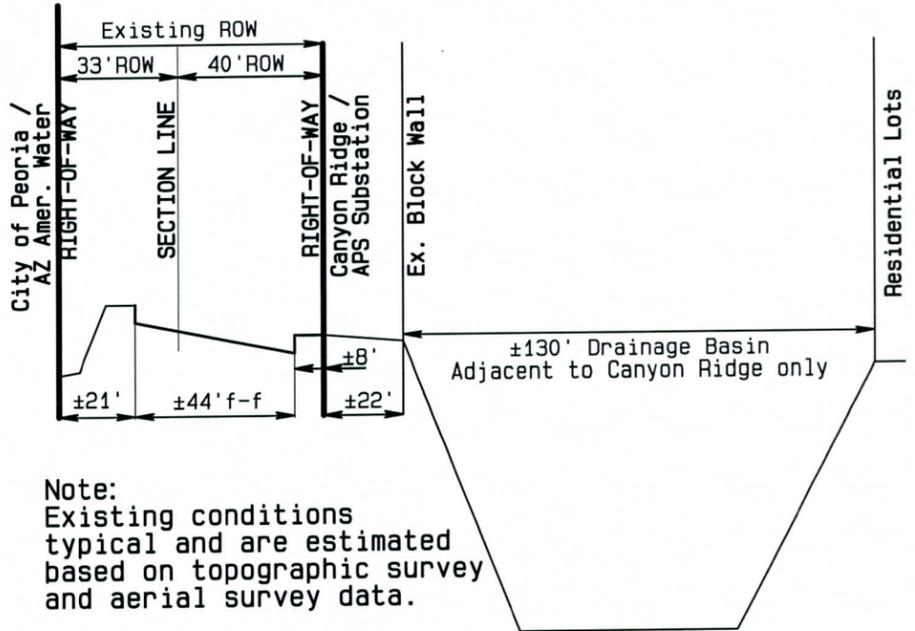
1-A



Note:
Existing conditions typical and are estimated based on topographic survey and aerial survey data.

Union Hills Drive
Typ. Existing Conditions
115th-111th
Facing East

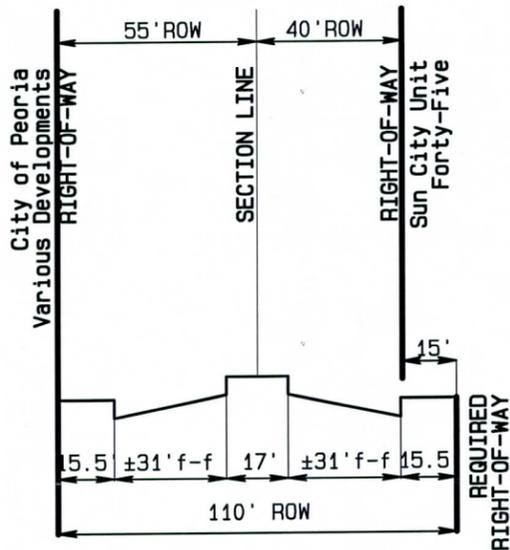
2-A



Note:
Existing conditions typical and are estimated based on topographic survey and aerial survey data.

Union Hills Drive
Surprise Minor Arterial with Bike Lanes
111th-107th
Facing East

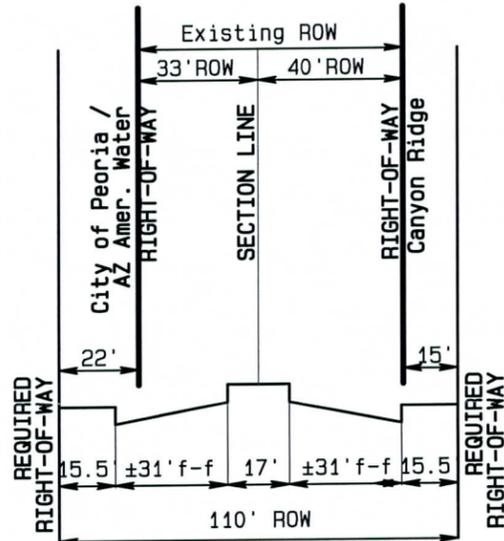
1-B



Note:
Minor Arterial Cross Section shown centered on section line and is intended for illustrative purposes only.

Union Hills Drive
Surprise Minor Arterial with Bike Lanes
115th-111th
Facing East

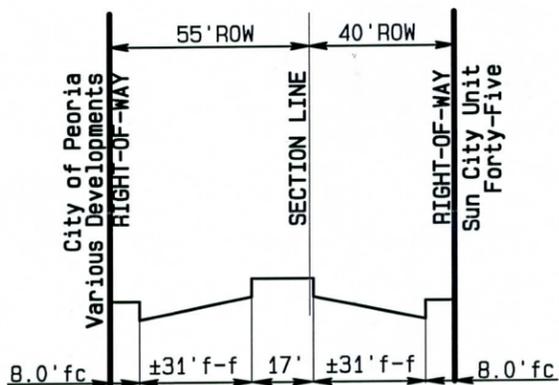
2-B



Note:
Minor Arterial Cross Section shown centered on section line and is intended for illustrative purposes only.

Union Hills Drive
Surprise
Modified Minor Arterial with Bike Lanes
111th-107th
Facing East

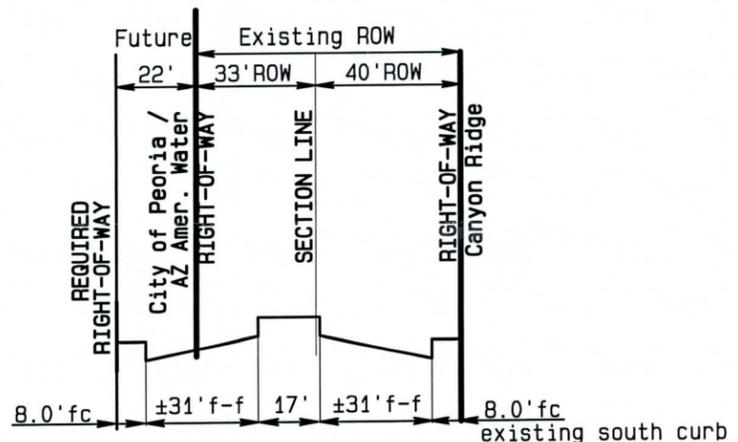
1-C



Note:
Modified Arterial Cross Section shown is intended to best fit within the existing right-of-way.

Union Hills Drive
Surprise
Modified Minor Arterial with Bike Lanes
115th-111th
Facing East

2-C



Note:
Modified Arterial Cross Section shown is intended to best fit within the existing right-of-way and be consistent with Union Hill section to the east.

ENGINEER/PLANNER:

**GOODWIN
MARSHALL**

CIVIL ENGINEERS - PLANNERS - SURVEYORS

8909 W. Ray Rd. #15, Chandler, AZ 85228
Metro (602) 218-7285

SCALE

H - 1" = 50'

V - 1" = 5'

**DRAFT
ROADWAY CROSS-SECTIONS**

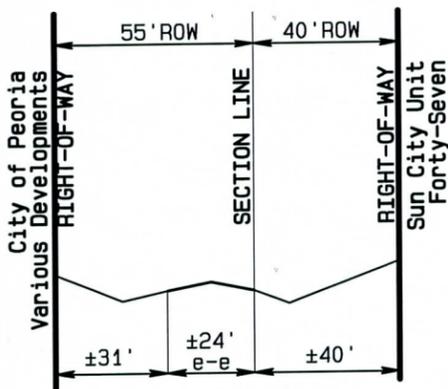
**FOR
107TH AVENUE AND
UNION HILL DRIVE**

CONTRACT: FCD 2009C036.2

OCTOBER, 2010

3-A

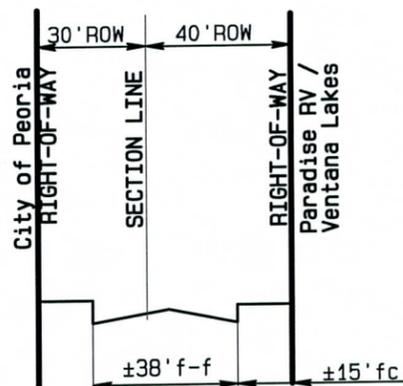
107th Avenue
Typ. Existing Condions
Facing North



Note:
Existing conditions typical and are estimated based on topographic survey and aerial survey data.

4-A

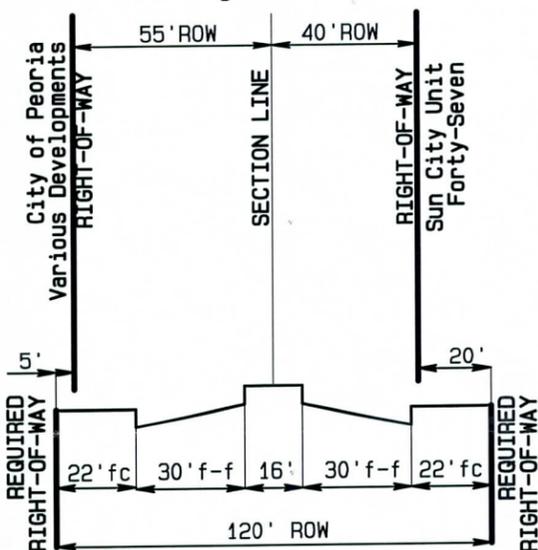
111th Avenue
Modified Major Collector
Typ. Existing Condions
Facing North



Note:
Existing conditions typical and are estimated based on topographic survey and aerial survey data.

3-B

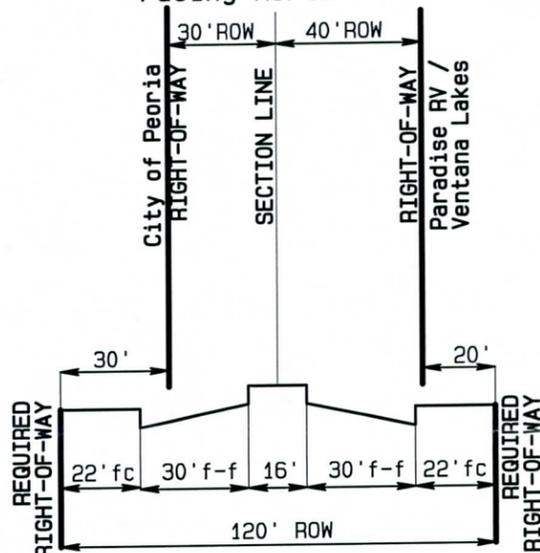
107th Avenue
Peoria Minor Arterial with Bike Lanes
Union Hills to Beardsley
Facing North



Note:
Minor Arterial Cross Section shown centered on section line and is intended for illustative purposes only.

4-B

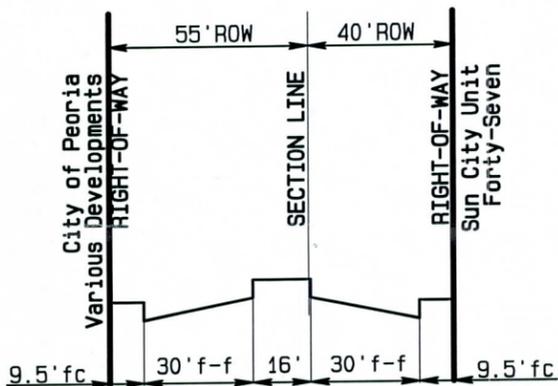
111th Avenue
Peoria Minor Arterial with Bike Lanes
Union Hills to Beardsley
Facing North



Note:
Minor Arterial Cross Section shown centered on section line and is intended for illustative purposes only.

3-C

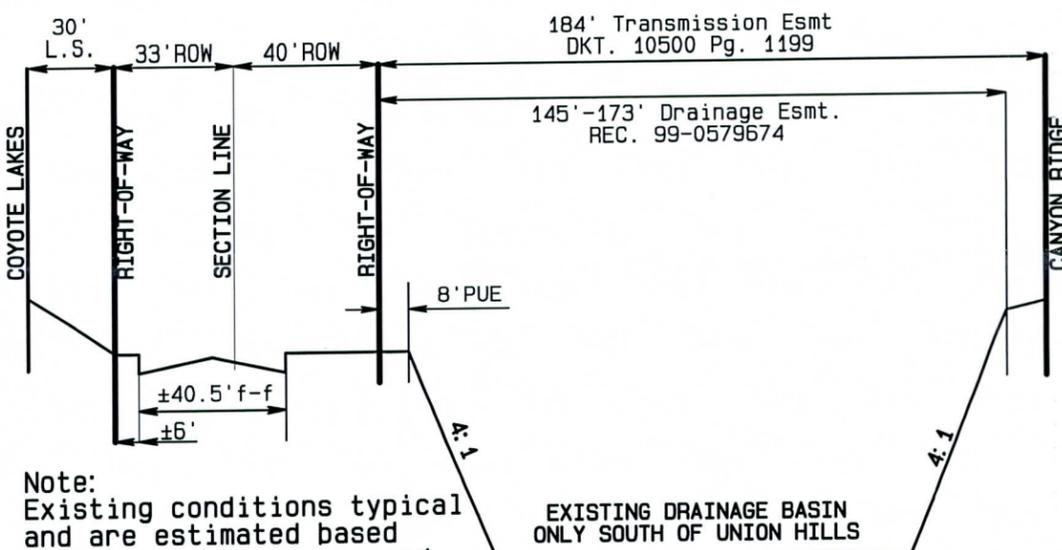
107th Avenue
Peoria Modified Minor Arterial
Union Hills to Beardsley
Facing North



Note:
Modified Arterial Cross Section shown is intended to best fit within the existing right-of-way.

5-A

115th Avenue
Typ. Existing Condions
Facing North



Note:
Existing conditions typical and are estimated based on topographic survey and aerial survey data.

ENGINEER/PLANNER:

**GOODWIN
MARSHALL &**

CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS

6909 W. Ray Rd. #15, Chandler, AZ 85226
Metro (602) 218-7285

SCALE
H - 1"=50
V - 1"=5'

**DRAFT
ROADWAY CROSS-SECTIONS
FOR
107TH AVENUE AND
UNION HILL DRIVE
CONTRACT: FCD 2009C036.2
OCTOBER, 2010**

Roadway	Current Jurisdiction	Ultimate Jurisdiction	Existing ROW	Existing Lanes	Existing Pavement Width	Maricopa County Designation	MCDOT ROW	MCDOT Lanes	MCDOT Pavement Widths	Surprise Designation	Surprise ROW	Surprise Lanes	Surprise Pavement Widths	Peoria Designation	Peoria ROW	Peoria Lanes	Peoria Pavement Widths	RESTRICTED ROW WIDTH	Proposed Designation	Proposed ROW	Proposed Lanes	Proposed Pavement Widths	Comments
107th Avenue (Union Hills Dr - 1/2 mile north)	Peoria	Peoria	95 ft.	1 x 1	+/-24' e-e	Principal Arterial with Bike Lanes	130 ft.	3x3 with 14' Median	2 x 43.5' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 35' f-f	95 ft.	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 35' f-f	ROW is locked by existing development east and west.
107th Avenue (Beardsley Rd - 1/2 mile south)	Peoria	Peoria	95 ft.	2x2 with Center Turn	+/-60' e-e	Principal Arterial with Bike Lanes	130 ft.	3x3 with 14' Median	2 x 43.5' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 35' f-f	95 ft.	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 35' f-f	ROW is locked by existing development east and west.
111th Avenue (Beardsley to Union Hills Dr.)	Peoria	Peoria	70 ft.	1x1 with Bike Lanes	+/-38' f-f	Not Designated	-	-	-	Not Designated	-	-	-	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 35' f-f	*70 ft.	*Major Collector with Bike Lanes	*70 ft.	1x1 with Bike Lanes	38' f-f	Roadway appears to be constructed per ultimate section however it does not match Peoria's Transportation Plan. Additional ROW to the West subject COP dedication.
115th Avenue (Beardsley to Union Hill Dr.)	Surprise	Surprise	73 ft.	1 x 1	+/-31' f-f	Minor Arterial	130 ft.	2x2 with Center Turn	73' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Not Designated	-	-	-		Minor Arterial with Bike Lanes				West ROW locked - Additional ROW could be expanded by obtaining ROW from Arizona American and contingent to APS approval.
115th Avenue (Union Hills Dr. to Bell Rd.)	Surprise	Surprise	73 ft.	1 x 1 with Center Turn	+/-40.5' f-f	Minor Arterial	130 ft.	2x2 with Center Turn	73' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Not Designated	-	-	-		Minor Arterial with Bike Lanes				West ROW locked - Additional ROW could be expanded by obtaining ROW from Arizona American and contingent to APS approval.
Union Hills Drive																							
107th - 111th	Peoria / Surprise / MCDOT	Unknown	95 ft.	1 x 1	+/- 30' f-e	Minor Arterial	130 ft.	2x2 with Center Turn	73' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Major Collector with Bike Lanes	70 ft.	1x1 with Center Turn	48' f-f	95 ft.	Minor Arterial with Bike Lanes	95	2x2 with 16' Median	2 x 31' f-f	ROW is locked by existing development north and south.
111th - 113th	Peoria / Surprise	Unknown	73 ft.	1 x 1 with Center Turn	+/- 44' f-f	Minor Arterial	130 ft.	2x2 with Center Turn	73' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Not Designated	-	-	-	**95 ft.	Minor Arterial with Bike Lanes	95	2x2 with 16' Median	2 x 31' f-f	South ROW locked - North ROW could be expanded by obtaining ROW from COP
113th - 115th	Surprise / MCDOT	Unknown	73 ft.	1 x 1 with Center Turn	+/- 44' f-f	Minor Arterial	130 ft.	2x2 with Center Turn	73' f-f	Minor Arterial with Bike Lanes	110 ft.	2x2 with 16' Median	2 x 31' f-f	Not Designated	-	-	-	**95 ft.	Minor Arterial with Bike Lanes	95	2x2 with 16' Median	2 x 31' f-f	South ROW locked - North ROW could be expanded by obtaining ROW from Arizona American

* Modified Peoria Major Collector Cross-Section for Existing Conditions

** Minimum ROW for Minor Arterial Section

Reference Documentation for Roadway Cross Sections
 Maricopa County Major Streets and Routes Plan - September 2004
 Surprise Transportation Plan - December 2005
 City of Peoria Traffic Engineering Report - 2010



Responses to 107th Avenue and Union Hills Drive LIA Recommendations

4.0 Recommendations

1. Identify local community parks and their recreation functional requirements that are planned in the future within the study area and seek opportunity to integrate these requirements with the resource protection/enhancement and flood hazard mitigation functional requirements of the project.

The information was reviewed in the project LIA and utilized as a baseline for documentation. Through an iterative process the consultant performed Stakeholder interviews including parks and planning staff with the City of Peoria, City of Surprise, Maricopa County as well as review of Parks and Recreation master plans, general plans, land use plans, zoning plans and multiple site reviews to verify the LIA's findings. The result of the research and documentation is represented on the 15% plans. Further clarification can be found in Section 14 of the DCR.

2. Identify and incorporate opportunities for implementing the local community trail system as an integral part of the project.

Where possible the recommended alternative provides for trails access in and along all roadways as well as allowing for potential recreational opportunities within the basin areas including trails connections. The recommended trails and recreation opportunities shall be reviewed and potentially implemented as part of the final design process. See section 14.0 of the project DCR and appendix D for more information.

3. Utilize the range and scales of structure types, structural methods and landscape design themes that are identified in section 3.0 as compatible with the landscape resources of the project study area for development of context sensitive flood hazard mitigation project alternatives (see table 4.1 below)

The recommended alternatives utilize the range of structure types, structural methods and landscape design themes that are identified in section 3.0 of the project LIA.

4. Conduct a more detailed site analysis of the project study area to identify opportunities for preserving any remaining natural resources, enhance/improve the existing condition of landscape resources of the project study area and to identify opportunities to incorporate local community recreation multi-use functions into project alternatives.

The information was reviewed in the project LIA and utilized as a baseline for documentation. Through an iterative process the consultant performed Stakeholder interviews including parks and planning staff with the City of Peoria,

City of Surprise, Maricopa County as well as review of Parks and Recreation master plans, general plans, land use plans, zoning plans and multiple site reviews to verify the LIA's findings. The result of the research and documentation is represented on the 15% plans. Further clarification can be found in Section 14 of the DCR.

5. Integrate the aesthetic and multiple use guidelines referenced in section 5.0 in all phases of project planning and design.
The aesthetic and multiple use guidelines were utilized in creating the recommended alternatives. Please refer to section 14 of the DCR for an explanation of the integration and/or restriction of certain applications.
6. Develop a minimum of one alternative that is designed to be context sensitive to the maximum degree possible (i.e. one that is acceptable to the local community, compatible with the environment and effective in reducing the risks of flooding).
Section 14 of the DCR and Appendix D detail the recommended alternative and an explanation of the recommended solution.
7. Assess the effectiveness of floodplain preservation & restoration as a strategy for reducing the risks of flooding within the project study area.
Section 11 of the DCR detail the effectiveness of the recommended flooding solutions.

4.1 Range of Context Sensitive Flood Hazard Mitigation Solutions

Structure Types (Small* or Medium*) *Refer to Table 2	Structural Methods	Landscape Design Themes
Natural Structure	Natural Method	Natural Lower Sonoran Desert
Underground Pipe	Soft-Structural	Natural Lower Sonoran Desert Riparian
Channel Levee	Semi-Soft	Semi-Natural Sonoran Desert
Conveyance Channel		Enhanced Desert
Storage Basin		Desert Park
		Desert Oasis
		Desert Plaza Theme

FLOODING CONTEXT INVENTORY

		Flood Area			
		A	B	C	D
Flood Types	Riverine / Channel Flooding				
	Overbank Flooding	Yes	Yes	Yes	Yes
	Flash Flood	No	No	No	No
	Dam or Levee Failure	No	No	No	No
	Alluvial Fans	No	No	No	No
	Sheet Flooding	Yes	Yes	Yes	Yes
	Impoundment Flooding	No	No	No	No
	Urban Drainage	Yes	Yes	Yes	Yes
	Ground Failures				
	MudFlood and Mudflows	No	No	No	No
	Subsidence	No	No	No	No
	Liquefaction	No	No	No	No
	Fluctuating Lake Levels	No	No	No	No
	Coastal Flooding and Erosion	No	No	No	No

Area A= Arizona American Water and City of Peoria WWTP Facilities - No Organized Storm Drain System

Area B= Paradise Resort Travel Trailer Park - No Organized Storm Drain

Area C= Sun City Development (Single Family Residential - Age restricted) - No Organized Storm Drain

Area D= Canyon Ridge Development (Single Family Residential) - Established Storm Drain

FLOOD INVENTORY AND ANALYSIS (FIA)

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Natural Structures	IE	IE	IE	IE
	Underground Pipe	E	E	E	E
	Channel Levee	IE	IE	IE	IE
	Conveyance Channel	E	E	E	E
	Storage Basin	E	E	E	E
	Flood Retarding Structure or Dam	IE	IE	IE	IE

E = EFFECTIVE
IE = INEFFECTIVE

Land Resource Inventory and Analysis (LIA)

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Natural Structures	C	C	C	C
	Underground Pipe	C	C	C	C
	Channel Levee	C	C	C	C
	Conveyance Channel	C	C	C	C
	Storage Basin	C	C	C	C
	Flood Retarding Structure or Dam	IC	IC	IC	IC

C = COMPATIBLE
IC = INCOMPATIBLE

COMMUNITY CONTEXT INVENTORY AND ANALYSIS

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Natural Structures	A	A	A	A
	Underground Pipe	A	A	A	A
	Channel Levee	A	A	A	A
	Conveyance Channel	A	A	A	A
	Storage Basin	A	A	A	A
	Flood Retarding Structure or Dam	UA	UA	UA	UA

A = ACCEPTABLE
UA = UNACCEPTABLE

FLOOD HAZARD MITIGATION SOLUTION - LIA / FIA COMPARISON = COMPATIBLE/EFFECTIVE

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Natural Structures				
	Underground Pipe	C/E	C/E	C/E	C/E
	Channel Levee				
	Conveyance Channel	C/E	C/E	C/E	C/E
	Storage Basin	C/E	C/E	C/E	C/E
	Flood Retarding Structure or Dam				

C/E = COMPATIBLE AND EFFECTIVE

FLOOD HAZARD MITIGATION SOLUTION - CIA/LIA/FIA COMPARISON = ACCEPTABLE/COMPATIBLE/EFFECTIVE

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Natural Structures				
	Underground Pipe	A/C/E	A/C/E	A/C/E	A/C/E
	Channel Levee				
	Conveyance Channel	A/C/E	A/C/E	A/C/E	A/C/E
	Storage Basin	A/C/E	A/C/E	A/C/E	A/C/E
	Flood Retarding Structure or Dam				

A/C/E = ACCEPTABLE, COMPATIBLE AND EFFECTIVE

ACE Comparison for the Range of Context Sensitive Flood Hazard Mitigation Solutions as prepared by the FCDMC

Structure Types (Small* or Medium)	Structural Methods	Landscape Design Themes
Refer to Table to in the LIA report		
Natural Structures	Natural Method	Natural Lower Sonoran Desert
Underground Pipe	Soft Structural	Natural Lower Sonoran Desert Riparian
Channel Levee	Semi-Soft	Semi-Natural Sonoran Desert
Conveyance Channel		Enhanced Desert
Storage Basin		Desert Park
		Desert Oasis
		Desert Plaza Theme

FCD2009C036 CONTEXT SENSITIVE FLOOD HAZARD MITIGATION FINDINGS

Range of Acceptable, Compatible and Effective Flood Hazard Mitigation Solutions

		Flood Area			
		A	B	C	D
Flood Mitigation Measures Structure Types	Underground Pipe	A/C/E	A/C/E	A/C/E	A/C/E
	Conveyance Channel	A/C/E	A/C/E	A/C/E	A/C/E
	Storage Basin	A/C/E	A/C/E	A/C/E	A/C/E

A/C/E = ACCEPTABLE,
COMPATIBLE AND
EFFECTIVE

Range of Context Sensitive Flood Hazard Mitigation Methods and Landscape Design Themes			
Structure Types (Small* or Medium) Refer to Table to in the LIA report	Structural Methods	Landscape Design Themes	
Underground Pipe	Soft Structural	Semi-Natural Sonoran Desert	
Conveyance Channel	Semi-Soft	Enhanced Desert	
Storage Basin		Desert Park	
		Desert Oasis	
		Desert Plaza Theme	

The array of structure types shown were determined based on their effectiveness in mitigating flooding and does not include the "Natural Structures" contained in the LIA as the study area is a suburban environment. The "Natural Structural Method" and "Natural" design themes were also omitted from the available Structural Methods and Landscape Design Themes respectively do to the same reasoning stated above.

LEGEND

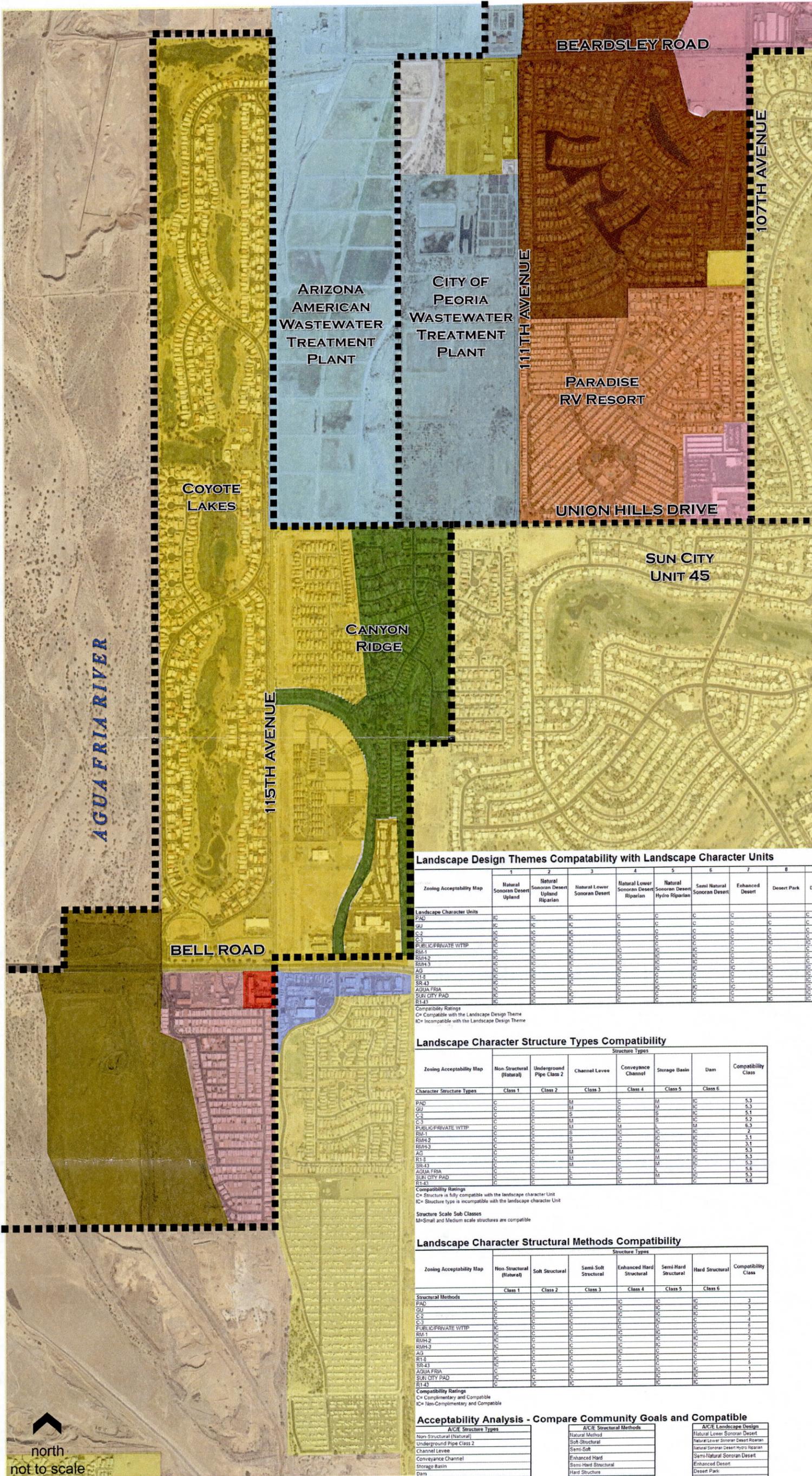
■■■■■■■■■■ BOUNDARY

Zoning

- PAD
- GU
- C-2
- C-3
- PUBLIC/PRIVATE WTTP
- RM-1
- RMH-2
- RMH-3
- AG
- R1-8
- SR-43
- AGUA FRIA RIVER
- SUN CITY PAD
- R1-43

SOURCES

CITY OF SURPRISE - GENERAL PLAN 2030 ZONING MAP
 CITY OF PEORIA - 2010 GENERAL PLAN ZONING MAP



Landscape Design Themes Compatibility with Landscape Character Units

Zoning Acceptability Map	1	2	3	4	5	6	7	8	9	10
	Natural Sonoran Desert Upland	Natural Sonoran Desert Upland Riparian	Natural Lower Sonoran Desert	Natural Lower Sonoran Desert Riparian	Natural Sonoran Desert Hydro Riparian	Semi Natural Sonoran Desert	Enhanced Desert	Desert Park	Desert Oasis	Urban Plaza
Landscape Character Units	IC	IC	IC	C	C	C	C	C	C	IC
PAD	IC	IC	IC	C	C	C	C	C	C	IC
GU	IC	IC	IC	C	C	C	C	C	C	IC
C-2	IC	IC	IC	C	C	C	C	C	C	IC
C-3	IC	IC	IC	C	C	C	C	C	C	IC
PUBLIC/PRIVATE WTTP	IC	IC	IC	C	C	C	C	C	C	IC
RM-1	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC
RMH-2	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC
RMH-3	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC
AG	IC	IC	IC	IC	IC	IC	IC	IC	IC	IC
R1-8	IC	IC	IC	C	C	C	C	C	C	IC
SR-43	IC	IC	IC	C	C	C	C	C	C	IC
AGUA FRIA	IC	IC	IC	C	C	C	C	C	C	IC
SUN CITY PAD	IC	IC	IC	C	C	C	C	C	C	IC
R1-43	IC	IC	IC	C	C	C	C	C	C	IC

Compatibility Ratings
 C= Compatible with the Landscape Design Theme
 IC= Incompatible with the Landscape Design Theme

Landscape Character Structure Types Compatibility

Zoning Acceptability Map	Structure Types						Compatibility Class
	Non-Structural (Natural)	Underground Pipe Class 2	Channel Levee	Conveyance Channel	Storage Basin	Dam	
Character Structure Types	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	
PAD	C	C	M	C	M	IC	5.3
GU	C	C	M	C	M	IC	5.3
C-2	C	C	S	C	S	IC	5.1
C-3	C	C	M	C	S	IC	5.2
PUBLIC/PRIVATE WTTP	C	C	M	C	M	IC	6.3
RM-1	C	C	S	IC	IC	IC	2
RMH-2	C	C	S	IC	IC	IC	3.1
RMH-3	C	C	S	IC	IC	IC	3.1
AG	C	C	M	C	M	IC	5.3
R1-8	C	C	M	C	M	IC	5.3
SR-43	C	C	M	C	M	IC	5.3
AGUA FRIA	C	C	IC	IC	L	IC	2.6
SUN CITY PAD	C	C	C	C	M	IC	5.3
R1-43	C	C	IC	IC	L	IC	5.6

Compatibility Ratings
 C= Structure is fully compatible with the landscape character Unit
 IC= Structure type is incompatible with the landscape character Unit

Structure Scale Sub Classes
 M=Small and Medium scale structures are compatible

Landscape Character Structural Methods Compatibility

Zoning Acceptability Map	Structure Types						Compatibility Class
	Non-Structural (Natural)	Soft Structural	Semi-Soft Structural	Enhanced Hard Structural	Semi-Hard Structural	Hard Structural	
Structural Methods	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	
PAD	C	IC	C	IC	IC	IC	3
GU	C	IC	C	IC	IC	IC	3
C-2	C	IC	C	IC	IC	IC	3
C-3	C	IC	C	IC	IC	IC	4
PUBLIC/PRIVATE WTTP	C	IC	C	IC	IC	IC	2
RM-1	IC	IC	C	IC	IC	IC	2
RMH-2	IC	IC	C	IC	IC	IC	2
RMH-3	IC	IC	C	IC	IC	IC	2
AG	IC	IC	C	IC	IC	IC	6
R1-8	IC	IC	C	IC	IC	IC	5
SR-43	IC	IC	C	IC	IC	IC	5
AGUA FRIA	IC	IC	C	IC	IC	IC	1
SUN CITY PAD	IC	IC	C	IC	IC	IC	3
R1-43	IC	IC	IC	IC	IC	IC	1

Compatibility Ratings
 C= Complimentary and Compatible
 IC= Non-Complimentary and Compatible

Acceptability Analysis - Compare Community Goals and Compatible

A/C/E Structure Types	A/C/E Structural Methods	A/C/E Landscape Design
Non-Structural (Natural)	Natural Method	Natural Lower Sonoran Desert
Underground Pipe Class 2	Soft Structural	Natural Lower Sonoran Desert Riparian
Channel Levee	Semi-Soft	Natural Sonoran Desert Hydro Riparian
Conveyance Channel	Enhanced Hard	Semi-Natural Sonoran Desert
Storage Basin	Semi-Hard Structural	Enhanced Desert
Dam	Hard Structure	Desert Park
		Desert Oasis
		Desert Plaza

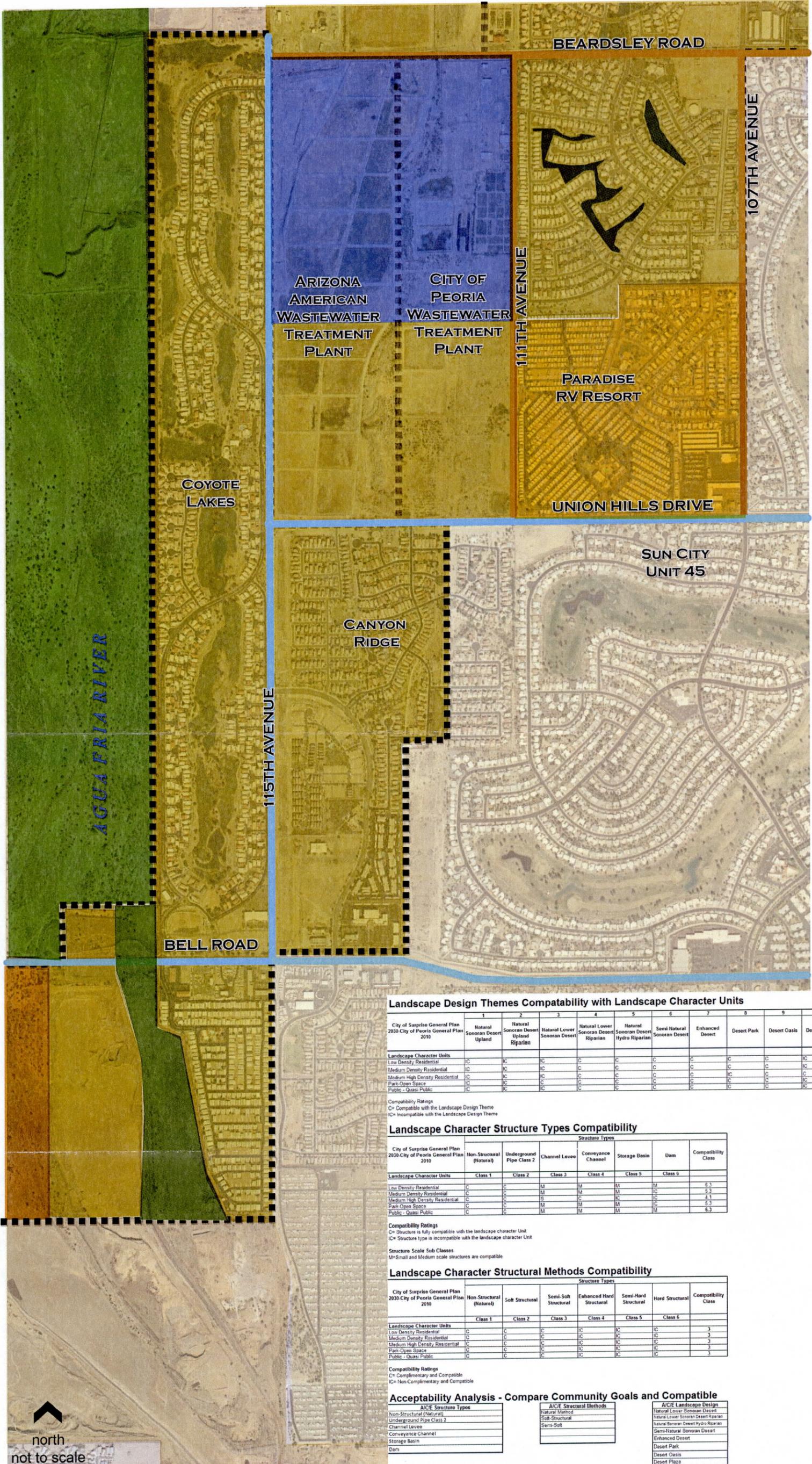


LANDSCAPE ARCHITECTS
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 GOODWIN & MARSHALL
 CIVIL ENGINEERS - PLANNERS - SURVEYORS
 8908 W. Ray Road #115
 Chandler, Arizona 85226
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Acceptability Map
 Community Context Zoning
 FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FDC 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND INCORPORATED MARICOPA
 COUNTY, ARIZONA
 MAY, 2011

↑
 north
 not to scale



LEGEND

- BOUNDARY
- LAND-USE**
- LOW RESIDENTIAL
- PARK- OPENSOURCE
- MEDIUM RESIDENTIAL
- PUBLIC - QUASI-PUBLIC
- MEDIUM HIGH DENSITY

CIRCULATION

-
-

SOURCES

- CITY OF SURPRISE - GENERAL PLAN 2030 LAND USE MAP
- CITY OF PEORIA - 2010 GENERAL PLAN LAND USE PLAN



Landscape Design Themes Compatibility with Landscape Character Units

	1	2	3	4	5	6	7	8	9	10
City of Surprise General Plan 2030-City of Peoria General Plan 2010	Natural Sonoran Desert Upland	Natural Sonoran Desert Upland Riparian	Natural Lower Sonoran Desert	Natural Lower Sonoran Desert Riparian	Natural Sonoran Desert Hydro Riparian	Semi-Natural Sonoran Desert	Enhanced Desert	Desert Park	Desert Oasis	Desert Plaza
Landscape Character Units										
Low Density Residential	IC	IC	IC	C	C	C	C	C	C	IC
Medium Density Residential	IC	IC	IC	C	C	C	C	C	C	IC
Medium High Density Residential	IC	IC	IC	C	C	C	C	C	C	IC
Park-Open Space	IC	IC	IC	C	C	C	C	C	C	IC
Public - Quasi Public	IC	IC	IC	C	C	C	C	C	C	IC

Compatibility Ratings
 C= Compatible with the Landscape Design Theme
 IC= Incompatible with the Landscape Design Theme

Landscape Character Structure Types Compatibility

City of Surprise General Plan 2030-City of Peoria General Plan 2010	Structure Types						Compatibility Class
	Non-Structural (Natural)	Underground Pipe Class 2	Channel Levee	Conveyance Channel	Storage Basin	Dam	
Landscape Character Units	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	
Low Density Residential	C	C	M	M	M	M	6.3
Medium Density Residential	C	C	M	M	M	M	5.3
Medium High Density Residential	C	C	S	C	IC	IC	4.1
Park-Open Space	C	C	M	M	M	M	5.3
Public - Quasi Public	C	C	M	M	M	M	6.3

Compatibility Ratings
 C= Structure is fully compatible with the landscape character Unit
 IC= Structure type is incompatible with the landscape character Unit
 M=Small and Medium scale structures are compatible

Landscape Character Structural Methods Compatibility

City of Surprise General Plan 2030-City of Peoria General Plan 2010	Structure Types						Compatibility Class
	Non-Structural (Natural)	Soft Structural	Semi-Soft Structural	Enhanced Hard Structural	Semi-Hard Structural	Hard Structural	
Landscape Character Units	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	
Low Density Residential	C	C	C	IC	IC	IC	3
Medium Density Residential	C	C	C	IC	IC	IC	3
Medium High Density Residential	C	C	C	IC	IC	IC	3
Park-Open Space	C	C	C	IC	IC	IC	3
Public - Quasi Public	C	C	C	IC	IC	IC	3

Compatibility Ratings
 C= Complementary and Compatible
 IC= Non-Complementary and Compatible

Acceptability Analysis - Compare Community Goals and Compatible

A/C/E Structure Types	A/C/E Structural Methods	A/C/E Landscape Design
Non-Structural (Natural)	Natural Method	Natural Lower Sonoran Desert
Underground Pipe Class 2	Soft-Structural	Natural Lower Sonoran Desert Riparian
Channel Levee	Semi-Soft	Semi-Natural Sonoran Desert
Conveyance Channel		Enhanced Desert
Storage Basin		Desert Park
Dam		Desert Oasis
		Desert Plaza

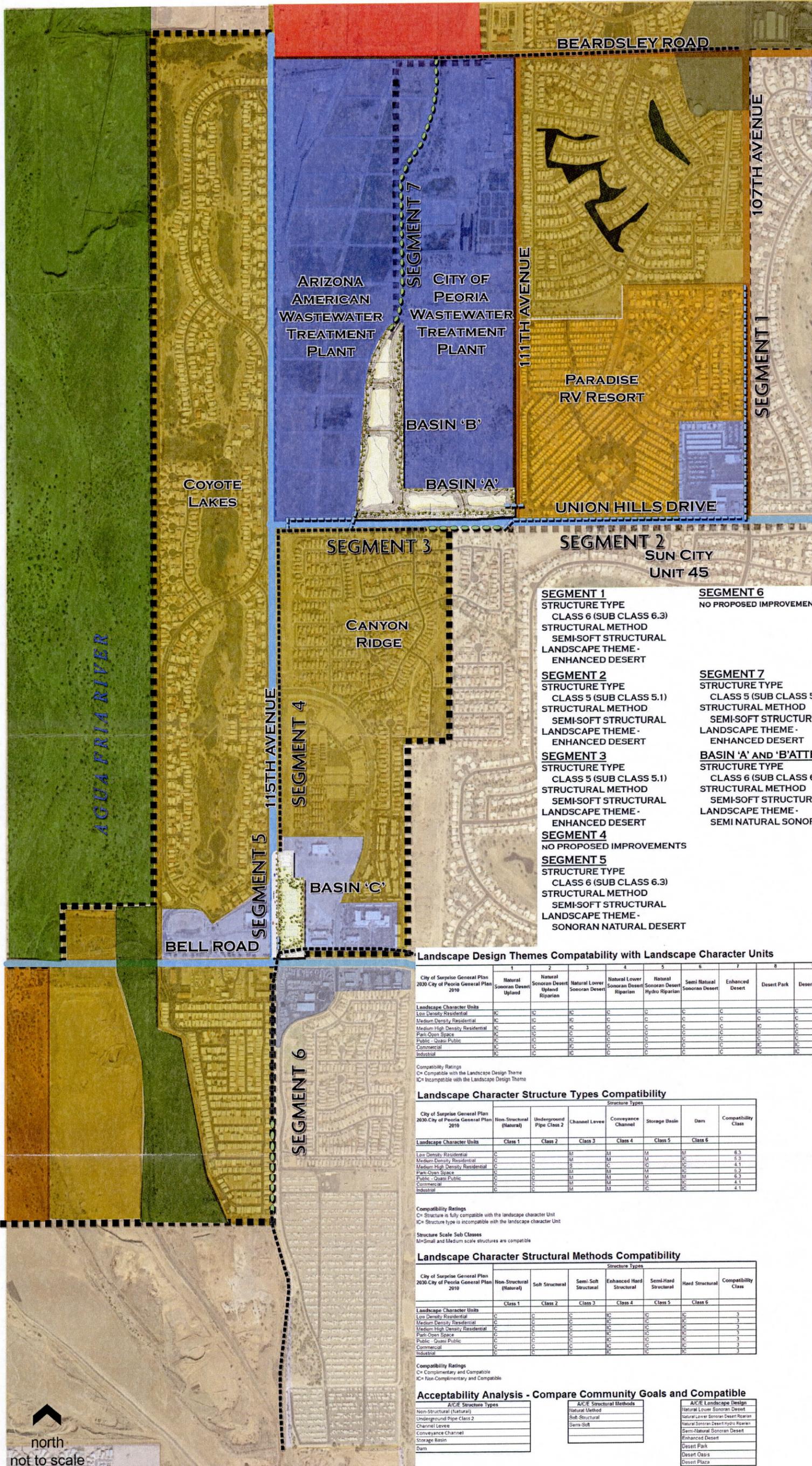
LANDSCAPE ARCHITECTS



ENGINEER/PLANNERS



Acceptability Map
 Community Context Land Use
 FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FDC 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND INCORPORATED MARICOPA
 COUNTY, ARIZONA
 MAY, 2011



- LEGEND**
- PROPOSED CULVERTS/STORM DRAIN
 - BOUNDARY
 - PROPOSED CHANNEL IMPROVEMENTS
 - EXISTING CHANNEL/CULVERT SYSTEM
 - PROPOSED DETENTION BASINS
- LAND-USE**
- LOW RESIDENTIAL
 - PARK-OPENSOURCE
 - MEDIUM RESIDENTIAL
 - PUBLIC - QUASI-PUBLIC
 - MEDIUM HIGH DENSITY
 - COMMERCIAL
 - INDUSTRIAL
- CIRCULATION**
- ARTERIAL
 - COLLECTOR
- SOURCES**
- CITY OF SURPRISE - GENERAL PLAN 2030 LAND USE MAP
 - CITY OF PEORIA - 2010 GENERAL PLAN LAND USE PLAN

- SEGMENT 1**
STRUCTURE TYPE
CLASS 6 (SUB CLASS 6.3)
STRUCTURAL METHOD
SEMI-SOFT STRUCTURAL
LANDSCAPE THEME -
ENHANCED DESERT
- SEGMENT 2**
STRUCTURE TYPE
CLASS 5 (SUB CLASS 5.1)
STRUCTURAL METHOD
SEMI-SOFT STRUCTURAL
LANDSCAPE THEME -
ENHANCED DESERT
- SEGMENT 3**
STRUCTURE TYPE
CLASS 5 (SUB CLASS 5.1)
STRUCTURAL METHOD
SEMI-SOFT STRUCTURAL
LANDSCAPE THEME -
ENHANCED DESERT
- SEGMENT 4**
NO PROPOSED IMPROVEMENTS
- SEGMENT 5**
STRUCTURE TYPE
CLASS 6 (SUB CLASS 6.3)
STRUCTURAL METHOD
SEMI-SOFT STRUCTURAL
LANDSCAPE THEME -
SONORAN NATURAL DESERT
- SEGMENT 6**
NO PROPOSED IMPROVEMENTS
- SEGMENT 7**
STRUCTURE TYPE
CLASS 5 (SUB CLASS 5.1)
STRUCTURAL METHOD
SEMI-SOFT STRUCTURAL
LANDSCAPE THEME -
ENHANCED DESERT
- BASIN 'A' AND 'B' ATTENUATION**
STRUCTURE TYPE
CLASS 6 (SUB CLASS 6.3)
STRUCTURAL METHOD
SEMI-SOFT STRUCTURAL
LANDSCAPE THEME -
SEMI NATURAL SONORAN DESERT

Landscape Design Themes Compatibility with Landscape Character Units

City of Surprise General Plan 2030 City of Peoria General Plan 2010	1 Natural Sonoran Desert Upland	2 Natural Sonoran Desert Upland Riparian	3 Natural Lower Sonoran Desert	4 Natural Lower Sonoran Desert Riparian	5 Natural Sonoran Desert Hydro Riparian	6 Semi Natural Sonoran Desert	7 Enhanced Desert	8 Desert Park	9 Desert Oasis	10 Desert Plaza
Landscape Character Units										
Low Density Residential	IC	IC	IC	IC	C	C	C	C	C	IC
Medium Density Residential	IC	IC	IC	IC	C	C	C	C	C	IC
Medium High Density Residential	IC	IC	IC	IC	C	C	C	C	C	IC
Park-Open Space	IC	IC	IC	IC	C	C	C	C	C	IC
Public - Quasi Public	IC	IC	IC	IC	C	C	C	C	C	IC
Commercial	IC	IC	IC	IC	C	C	C	C	C	IC
Industrial	IC	IC	IC	IC	C	C	C	C	C	IC

Compatibility Ratings
C= Compatible with the Landscape Design Theme
IC= Incompatible with the Landscape Design Theme

Landscape Character Structure Types Compatibility

City of Surprise General Plan 2030 City of Peoria General Plan 2010	Structure Types						Compatibility Class
	Non-Structural (Natural)	Underground Pipe Class 2	Channel Levee	Conveyance Channel	Storage Basin	Dam	
Landscape Character Units							
Low Density Residential	C	C	M	M	M	M	6.3
Medium Density Residential	C	C	M	M	M	M	5.3
Medium High Density Residential	C	C	S	C	IC	IC	4.1
Park-Open Space	C	C	M	M	M	M	6.3
Public - Quasi Public	C	C	M	M	M	M	6.3
Commercial	C	C	M	M	IC	IC	4.1
Industrial	C	C	M	M	IC	IC	4.1

Compatibility Ratings
C= Structure is fully compatible with the landscape character Unit
IC= Structure type is incompatible with the landscape character Unit

Structure Scale Sub Classes
M=Small and medium scale structures are compatible

Landscape Character Structural Methods Compatibility

City of Surprise General Plan 2030 City of Peoria General Plan 2010	Structure Types						Compatibility Class
	Non-Structural (Natural)	Soft Structural	Semi-Soft Structural	Enhanced Hard Structural	Semi-Hard Structural	Hard Structural	
Landscape Character Units							
Low Density Residential	C	C	C	IC	IC	IC	3
Medium Density Residential	C	C	C	IC	IC	IC	3
Medium High Density Residential	C	C	C	IC	IC	IC	3
Park-Open Space	C	C	C	IC	IC	IC	3
Public - Quasi Public	C	C	C	IC	IC	IC	3
Commercial	C	C	C	IC	IC	IC	3
Industrial	C	C	C	IC	IC	IC	3

Compatibility Ratings
C= Complementary and Compatible
IC= Non-Complementary and Compatible

Acceptability Analysis - Compare Community Goals and Compatible

AC/E Structure Types	AC/E Structural Methods	AC/E Landscape Design
Non-Structural (Natural)	Natural Method	Natural Lower Sonoran Desert
Underground Pipe Class 2	Soft-Structural	Natural Lower Sonoran Desert Riparian
Channel Levee	Semi-Soft	Natural Sonoran Desert Hydro Riparian
Conveyance Channel		Semi-Natural Sonoran Desert
Storage Basin		Enhanced Desert
Dam		Desert Park
		Desert Oasis
		Desert Plaza

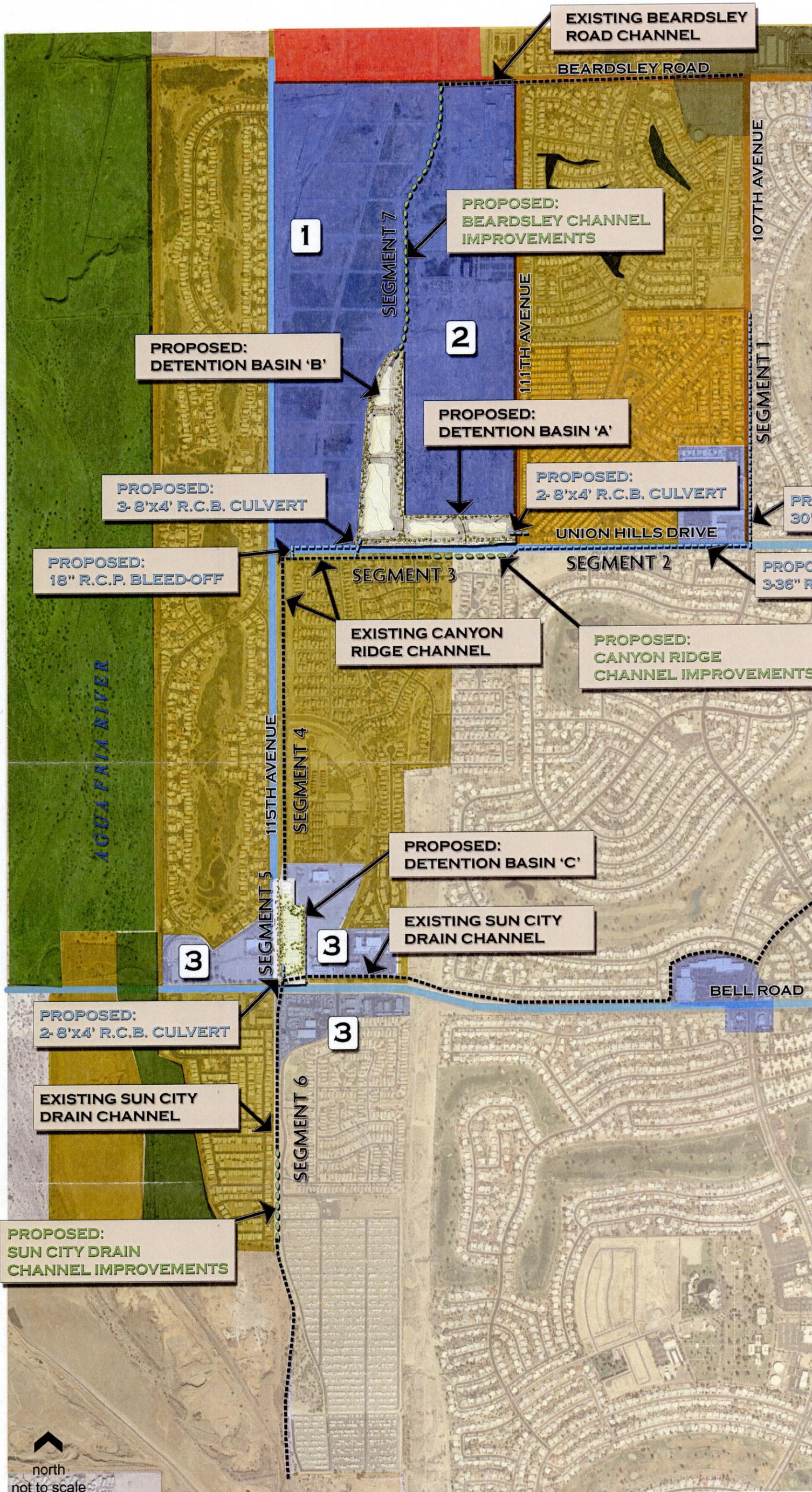


LANDSCAPE ARCHITECTS
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Chandler, Arizona 85226
(480) 918-7200

Acceptability Map
Community Context
Zoning and Land Use Combined
FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FDC 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND INCORPORATED MARICOPA
COUNTY, ARIZONA
MAY, 2011

↑
north
not to scale



LEGEND

- PROPOSED CULVERTS/ STORM DRAIN
- BOUNDARY
- PROPOSED CHANNEL IMPROVEMENTS
- EXISTING CHANNEL/ CULVERT SYSTEM
- PROPOSED DETENTION BASINS

LAND-USE

- LOW RESIDENTIAL
- PARK- OPENSOURCE
- MEDIUM RESIDENTIAL
- PUBLIC - QUASI-PUBLIC
- MEDIUM HIGH DENSITY
- COMMERCIAL
- INDUSTRIAL

CIRCULATION

- ARTERIAL
- COLLECTOR

SOURCES

- CITY OF SURPRISE - GENERAL PLAN 2030 LAND USE MAP-STAFF
- CITY OF PEORIA - 2010 GENERAL PLAN LAND USE PLAN-STAFF
- GOODWIN MARSHALL-ENGINEERS

- 1** Arizona Waste Water Treatment Plant
 - 2** Peoria Waste Water Treatment Plant
- LAND USE DESIGNATED IN THE LANDSCAPE INVENTORY AND ANALYSIS IS SUBURBAN. ACTUAL CURRENT LAND USE WITHIN AREAS 1 AND 2 IS BEING USED AS (WTP) OR PUBLIC FACILITIES AND WILL BE INDEFINITELY. COMPATIBILITY CLASS 5 SPECIFICALLY SUBCLASS 5.4 IS COMPATIBLE FOR THIS AREA BASED ON LOCATION AND SURROUNDING LAND USE.
- 3** Commercial



LANDSCAPE ARCHITECTS



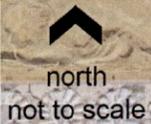
ENGINEER/PLANNERS



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Acceptability Map
Community Context
Combined Recommended Alternative

FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FDC 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND INCORPORATED MARICOPA
COUNTY, ARIZONA
MAY, 2011



107th Avenue & Union Hills Design Concept Report (DCR) Project Landscape Inventory & Analysis Report

Prepared by
Dennis Holcomb & Pedro Melo-Rodriguez
June 30, 2010

Landscape Architecture Branch
Project Planning and Management Division
Flood Control District of Maricopa County

1.0 Introduction

This report provides a brief summary of the information contained in the 107th avenue and Union Hills DCR project landscape inventory and analysis (LIA) prepared by the Flood Control District of Maricopa County (District). The terminology and approach utilized in this report are defined in the documents referenced in section 5.0 of this report which can be found on the District's web site at:

<http://www.fcd.maricopa.gov/Projects/PPM/landArch.aspx>

1.1 Purpose of the Project LIA

The purpose of the project LIA is to provide: 1) a basic understanding of the land and resource context of the project study area; 2) an analysis of the compatibility of the range of possible flood hazard mitigation solutions with the inventoried landscape resources; and 3) guidelines and recommendations for development of context sensitive flood hazard mitigation alternatives. The District provided project LIA is intended to serve as a framework and starting point for any additional inventories and analyses of the land and resource context that may be required as a part of the DCR study.

1.2 Scope of the Project LIA

The District provided project LIA contains inventory and analysis maps for the project study area that have been clipped from the District's Landscape Inventory and Analysis for Maricopa County. Mapped information is provided at two scales: the regional scale and the local project scale. The regional scale inventory maps typically encompass an area extending approximately 10 miles beyond the project study area boundary. The local project scale inventory and analysis maps typically encompass an area extending one mile beyond the project study area boundary. The acreage summaries provided in this report are limited to the area contained within the project study area boundary. Additionally, the project LIA contains process diagrams and other information to assist the reader in understanding the source and relationship of the data components that are discussed or referenced in this project LIA report. The information provided in this report has not been field verified.

1.3 Project Study Area

The 107th Avenue and Union Hills project study area comprises an approximately 2550 acre site located east of the Agua Fria River on 107th Avenue and Union Hills road in the cities of Surprise and Peoria.

1.4 Project Goals and Objectives for the Land & Resource Context

District goals and objectives for development of context sensitive flood hazard mitigation solutions for District planning studies and project designs are outlined in the document titled: *Flood Control District Land & Resource Goals & Objectives for Planning Studies and Project Design*, FCDMC, November 13, 2008, which is available on the District's web site.

2.0 Landscape Inventory

The landscape inventory contained in this report includes assessments of existing and planned future landscape character, existing parks and recreation resources and existing open space resources that are found within the regional and local context of the project study area.

2.1 Regional Context

The purpose of the regional scale landscape inventory is to identify landscape resources of regional significance that are situated within or in proximity to the project study area.

2.1.1 Scenery Resources

The project study area is situated within the River Lands and Valley Lands Landscape Character Sub-type of the Sonoran Desert Landscape Character Type (Fig 1 &2). Regionally significant scenery resources situated within the regional context of the project study area include the Agua Fria River located west of the project area. The project area is centrally located between several major topographic features of the Phoenix Metropolitan area that define the spatial context of the study area and its surrounds. These include the White Tank Mountains located approximately ten miles to the west, the Phoenix South Mountains ten miles to the east and the lesser Union Hills ten miles to the northeast. These landforms serve as the major landscape focal points within the regional context of the project study area. The Agua Fria River is a regionally significant scenery resource found within the project study area.

2.1.2 Open Space & Recreation Resources

Regionally significant recreation resources found within the regional context of the project study area include White Tank Mountain Regional Park situated 10 miles to the west, Adobe Dam Regional Recreation Area 7 miles to the northeast, Dreamy Draw Recreation Area 11 miles to the east and Lake Pleasant located 12 miles to the north (Fig 8). Segments of the Maricopa County Regional Trail are located along the Agua Fria River next to the project study area and along New River approximately 2.5 miles east of the study area. Regionally significant open space resources situated within the regional context of the project study area include the Phoenix Mountain Preserve to the east, the White Tank Mountains to the west, the Hieroglyphic Mountains and Lake Pleasant located to the north of the project study area (Fig 10). Regionally significant recreation and open space resources do not occur within the project study area.

2.2 Local Project Area Context

The purpose of the local project scale inventory is to provide a general understanding of land and resource conditions within and immediately adjacent to the project site area.

2.2.1 Scenery Resources - Landscape Character Physical Settings:

Physical Settings represent subdivisions of the Landscape Character Sub-Types that display similar visual and physical characteristics. The Valley Lands Landscape Character Subtype is comprised of two Physical Settings: the Valley Plains and the Valley Washes. The Valley Plains Setting comprises approximately 32% of the project site area and the Valley Wash Setting comprises less than 1%. The River Lands Character Subtype is comprised of the River Channel and River Terrace. The River Channel Setting comprises 45%, while the River Terrace Setting of the Agua Fria River comprises the remainder 24% of the project site area (Fig 3).

2.2.2 Scenery Resources - Existing Landscape Character Cultural Settings:

Cultural landscape settings represent landscape areas that display similar visual characteristics based upon human developed landscape features. Suburban cultural settings comprise approximately 62% and the natural settings comprise 26% of the project site area. Urban and Industrial settings comprise 7% and 5% of the project site area. Less than 1% of the project site area is comprised the rural settings (Figure 4).

2.2.3 Scenery Resources – Future Landscape Character Cultural Settings:

Suburban settings are expected to increase in the future to 81% and replace most of the existing natural setting and reduce it to 10% within the project site area. The urban and industrial settings are also expected to decrease in the future to 5% and 4%. There will not be a rural setting within the project site area in the future conditions (Fig 5). The limited existing rural settings are expected to be completely replaced by suburban setting.

The future landscape character cultural settings data came from the 2008 future update of the 2007 Maricopa Association of Governments (MAG) future land-use data. In an effort to obtain the latest future land-use data for the Rainbow Valley Area Drainage Master Plan in August 2008, the GIS department of Maricopa County collected data from cities of Avondale, Buckeye, Goodyear, El Mirage, and Surprise. City land-use codes were translated into MAG land-use codes. The 2007 MAG future land-use data was used in areas not covered by the aforementioned cities. Bureau of Land Management property was merged with the data, taking precedence over the city future land-use plans. The combining of the city, MAG and BLM datasets resulted in the creation of the 2008 future land-use dataset that is currently being used, as base data for development of the future mapping in the Maricopa County Landscape Inventory & Analysis (LIA).

2.2.4 Scenery Resources - Existing Landscape Character Units:

Landscape Character Units are the product of combining the physical and cultural landscape character settings. Thirteen landscape character units are found within the project site area (Fig 6). The suburban valley plains unit comprises 28% of the project site area. The suburban river channel unit comprises 21% of the project site area. The natural river channel and suburban river terrace units comprise 16% and 13% of the project site area. The rest of the project site area (18%) is comprised of the natural river terrace (9%), urban river channel (5%), industrial river channel (4%), natural valley plains (2%), urban valley plains (2%), and industrial river terrace units (1%).

2.2.5 Scenery Resources - Future Landscape Character Units:

The suburban valley plains will increase to 30% in future conditions. The suburban river channel will increase to 29% by reducing the natural river channel to 9% (Fig 7). The suburban river terrace will increase to 22% by reducing the natural river terrace to less than 1% of the project site area. The rest of the project site area (16%) is comprised of the natural river channel (9%), urban river channel (4%), industrial river channel (2%), industrial river terrace (1%) and urban valley plains units (1%).

2.2.6 Parks and Recreation Resources:

According to the Maricopa County LIA local parks do not presently exist within the project site area (Fig 9). However, there are three golf courses that comprise 10% of the project site area: Coyote Lakes Parkway, Riverview, and Willocreek & Willowbrook golf course. The regional trail system is a significant regional component that is within the project site area that is located along the Agua Fria River.

2.2.7 Open Space Resources:

Areas designated as floodway and flood fringe (Fig 11) that are associated with the Agua Fria River drainage feature that passes along the project study area are the most significant open space areas within the project site area. These floodplain lands are located on the west of the project site area. Open Space Conservation areas comprise 2% of the project site area. According to the MAG Desert Spaces Plan, these areas should be conserved to protect open space resource quality and minimize the impacts of development or land use activities. Areas that are not developed should remain nearly in its natural condition, while areas that have been altered should be rehabilitated to conserve open spaces.

3.0 Landscape Analysis

The following is a summary of the compatibility of the preliminary range of possible structure types, structural methods and landscape design themes with the combined landscape resources (scenery, recreation and open space) of the 107th Avenue & Union Hills project site area. The compatibility class maps for the individual resource inventories are included in the report (Figs 12-15). For additional information about the approach used in the analysis of landscape resources, please refer to the Flood Protection Structure Types, Structural Methods and Landscape Design Themes Handbooks which are available on the District's web site.

3.1 Structure Types Compatibility – Existing Combined Resources:

The Existing Combined Resources Structure Types Compatibility Class Map for the project site area (Fig 16) indicates that natural structures (i.e. those associated with floodplain preservation and restoration) are the only structure types (Compatibility Class 1) that will be compatible with the floodplain lands contained within the project study area. The Structure Types Compatibility Class Map indicates that a portion of the project site area has the following range of possible structure types: natural structures, underground structures, levees, conveyance channels, storage basins (compatibility class 5.1) at small scales. The rest of the project site area has the entire range of possible structure types including natural structures, underground structures, levees, conveyance channels, storage basins and flood retarding structures (Compatibility Class 6) at medium scales will be compatible with landscape resources in the remainder of the project site area. Scale and compatibility descriptions are contained in table 2 & 3.

3.2 Structure Types Compatibility – Future Combined Resources:

Structure types compatibility based upon future conditions remains essentially the same as for existing conditions (Figure 17).

3.3 Structural Methods Compatibility - Existing Combined Resources:

The Combined Existing Resources Structural Methods Compatibility Class Map (Fig 22) indicates the natural method (Compatibility Class 1) is the only compatible structural method within the floodway and flood fringe areas of the project site area. Compatibility class 3, which includes the Semi-Soft, Soft and Natural Methods are compatible with landscape resources in the remainder of the project study area.

3.4 Structural Methods Compatibility – Future Combined Resources:

Structural methods compatibility based upon future conditions combined resources within the project site area remain unchanged from those indicated above in section 3.3 (Fig 23).

3.5 Landscape Design Theme Compatibility:

The Natural Lower Sonoran Desert Riparian and Hydro-riparian landscape design themes will be compatible within the bottom areas of any flood hazard mitigation structures proposed within the project study area. The Natural and Semi-natural Sonoran Desert landscape design themes will be compatible in all other areas of the project site area where a natural appearance is desired. Application of the more culturally influenced landscape design themes such as the Enhanced Desert, Desert Park or Desert Oasis themes may be appropriate to apply if the local community indicates that a suburban landscape design theme is more in keeping with the desired character for the project site area.

4.0 Recommendations

1. Identify local community parks and their recreation functional requirements that are planned in the future within the study area and seek opportunity to integrate these requirements with the resource protection/enhancement and flood hazard mitigation functional requirements of the project.
2. Identify and incorporate opportunities for implementing the local community trail system as an integral part of the project
3. Utilize the range and scales of structure types, structural methods and landscape design themes that are identified in section 3.0 as compatible with the landscape resources of the project study area for development of context sensitive flood hazard mitigation project alternatives (see table 4.1 below).
4. Conduct a more detailed site analysis of the project study area to identify opportunities for preserving any remaining natural resources, enhance/improve the existing condition of landscape resources of the project study area and to identify opportunities to incorporate local community recreation multi-use functions into project alternatives.
5. Integrate the aesthetic and multiple use guidelines referenced in section 5.0 in all phases of project planning and design.
6. Develop a minimum of one alternative that is designed to be context sensitive to the maximum degree possible (i.e. one that is acceptable to the local community, compatible with the environment and effective in reducing the risks of flooding).
7. Assess the effectiveness of floodplain preservation & restoration as a strategy for reducing the risks of flooding within the project study area.

4.1 Range of Context Sensitive Flood Hazard Mitigation Solutions

Structure Types (Small* or Medium*) <small>*Refer to Table 2</small>	Structural Methods	Landscape Design Themes
Natural Structure	Natural Method	Natural Lower Sonoran Desert
Underground Pipe	Soft-Structural	Natural Lower Sonoran Desert Riparian
Channel Levee	Semi-Soft	Semi-Natural Sonoran Desert
Conveyance Channel		Enhanced Desert
Storage Basin		Desert Park
		Desert Oasis
		Desert Plaza Theme

5.0 References

1. *Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects*, FCDMC, December 16, 1996, with Cost Ceiling Tables 1 & 2, March 3, 2009
2. *The Context Sensitive Flood Hazard Mitigation Planning and Design Approach*, FCDMC, April 19, 2010
3. *Flood Control District Land & Resource Goals & Objectives for Planning Studies and Project Design*, FCDMC, November 13, 2008
4. *Flood Protection Structure Types Handbook - Descriptions, Photo Examples and Land & Resource Compatibility ratings for Scenery, Recreation and Open Space Resources in Maricopa County*, FCDMC, June, 2010
5. *Flood Protection Methods Handbook - Descriptions, Photo Examples and Land & Resource Compatibility ratings for Scenery, Recreation and Open Space Resources in Maricopa County*, FCDMC, June, 2010
6. *Landscape Design Themes Handbook - Descriptions, Photo Examples and Land & Resource Compatibility ratings for Scenery, Recreation and Open Space Resources in Maricopa County*, FCDMC, June, 2010
7. GIS Landscape Inventory and Analysis for Maricopa County (LIA), FCDMC, 2009
8. *Aesthetic and Multiple-Use Guidelines for Flood Control Basins, Channels and Flood Retarding Structures*, FCDMC, April 23, 2002
9. Existing Facilities Landscape Aesthetics and Multi-Use Opportunities Assessment, North Valley Structures Analysis, FCDMC, February 5, 2001
10. *Existing Facilities Landscape Aesthetics and Multi-Use Opportunities Assessment, West Valley Structures Analysis*, FCDMC, June 1, 2001
11. *Maricopa County Regional Trail System Plan*, Maricopa County Trail Commission, August 16, 2004
12. *Desert Spaces, An Open Space Plan for the Maricopa County*, Maricopa Association of Governments, undated

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- Figure 2 - Regional Landscape Character Physical Settings
- Figure 3 - Landscape Character Physical Settings
- Figure 4 - Existing Cultural Settings
- Figure 5 - Future Cultural Settings
- Figure 6 - Existing Landscape Character Units
- Figure 7 - Future Landscape Character Units

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- Figure 9 - Parks & Recreation Resources

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- Table 2 - Structure Types Scale Sub-Classes Table
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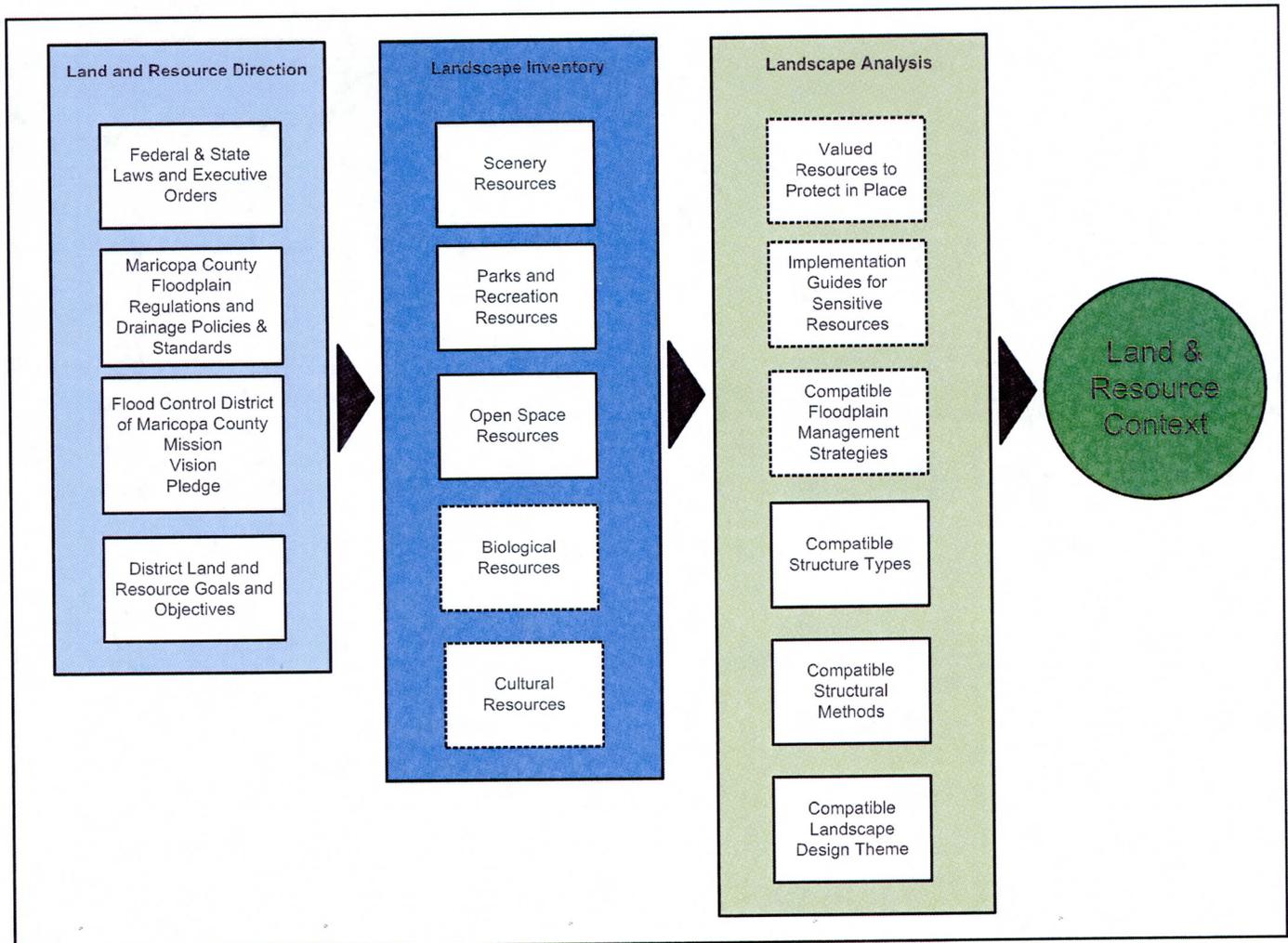
Structural Methods Compatibility Analysis

- Flood Protection Structural Methods Overview
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- Table 6 - Landscape Design Themes Compatible with Parks & Recreation Resources
- Table 7 - Landscape Design Themes Compatible with Open Space Resources

Landscape Inventory & Analysis Process



- Currently Available
- Under Development

Landscape Inventory

Scenery Resources

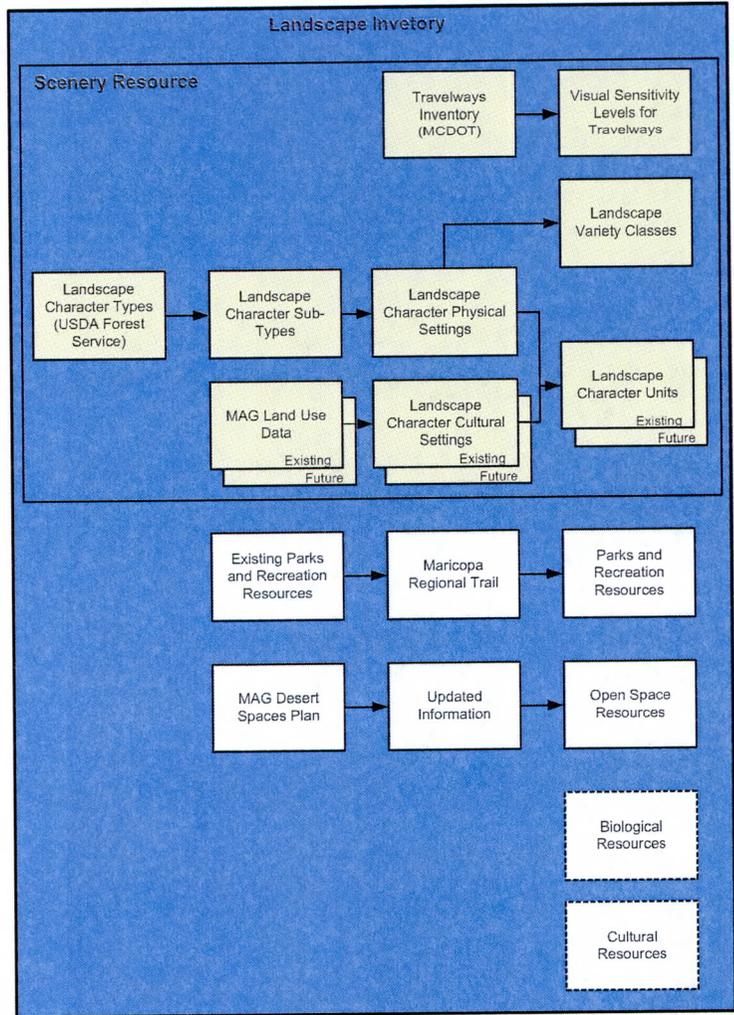
Parks & Recreation Resources

Open Space Resources

Biological Resources (Reserved)

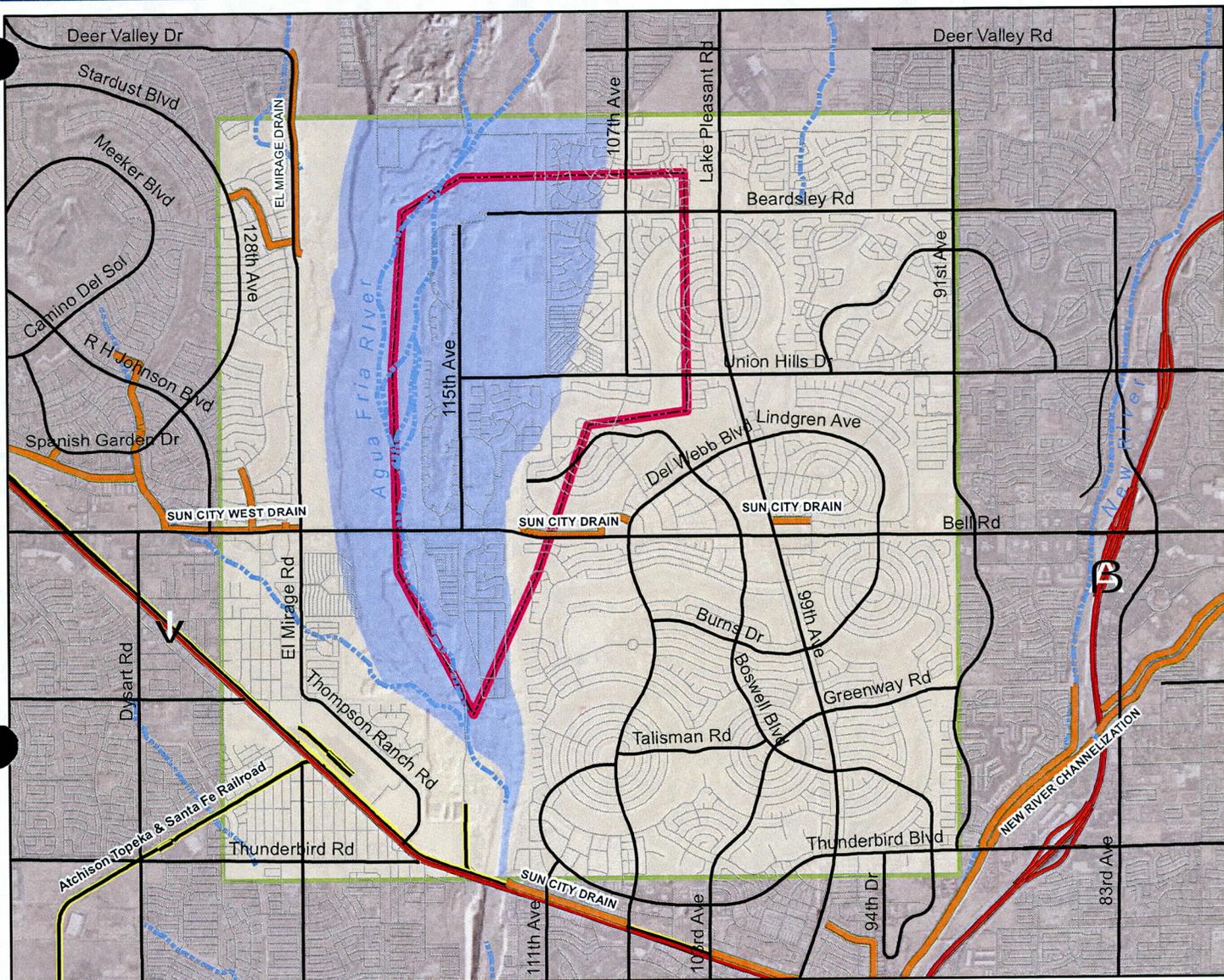
Cultural Resources (Reserved)

Scenery Resource Inventory





107th Avenue and Union Hills Drive DCR Landscape Character Sub-Types



Landscape Charater Sub-Types

- Sonoran River Lands
- Sonoran Valley Lands

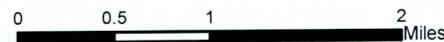
Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Landscape Character Types Map, 2008
- "Landscape Character Types of the National Forests in Arizona, and New Mexico," USDA Forest Service
- Aerial photography and topographic mapping, Flood Control District of Maricopa County

Prepared by
Flood Control District of Maricopa County
June 2010

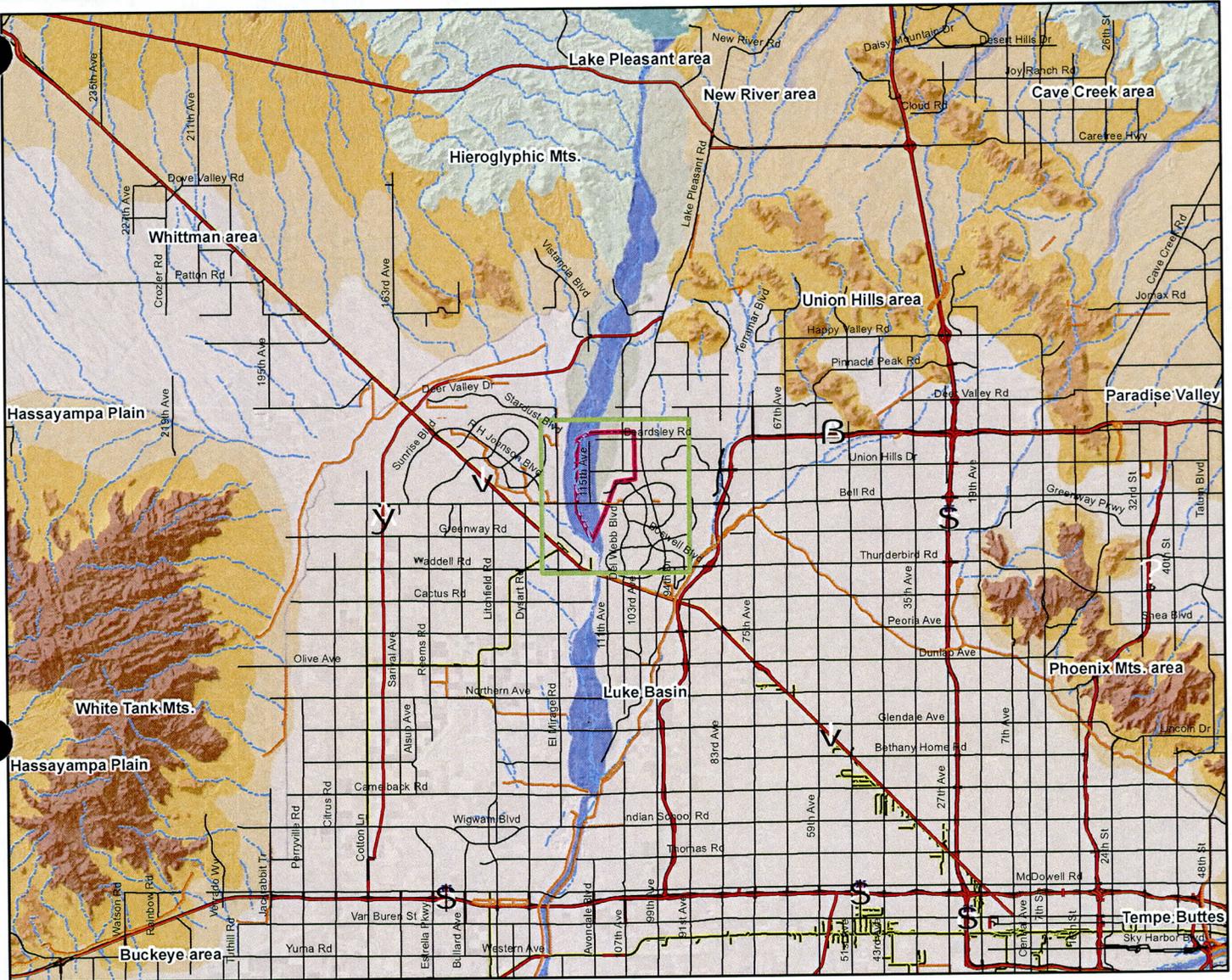


1 inch = 1 miles

Figure 1



Regional Landscape Character Physical Settings



Regional Landscape Character Physical Settings

Tonto Character Type

- Sonoran Arizona Uplands
- Upland Wash

Sonoran Desert Character Type

Sonoran River Lands Subtype

- River Channel
- River Terrace

Sonoran Valley Lands Subtype

- Valley Plains
- Valley Wash

Sonoran Mountain Lands Subtype

- Arroyo
- Foothills
- Upper Bajada
- Lower Bajada
- Mountains

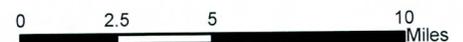
Reference Features

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- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

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- Landscape Character Types and Subtypes Map, 2008
- Aerial photography and topographic mapping, Flood Control District of Maricopa County
- Land Cover Types Map, Arizona Land and Resource Inventory System, State of Arizona

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May 2010

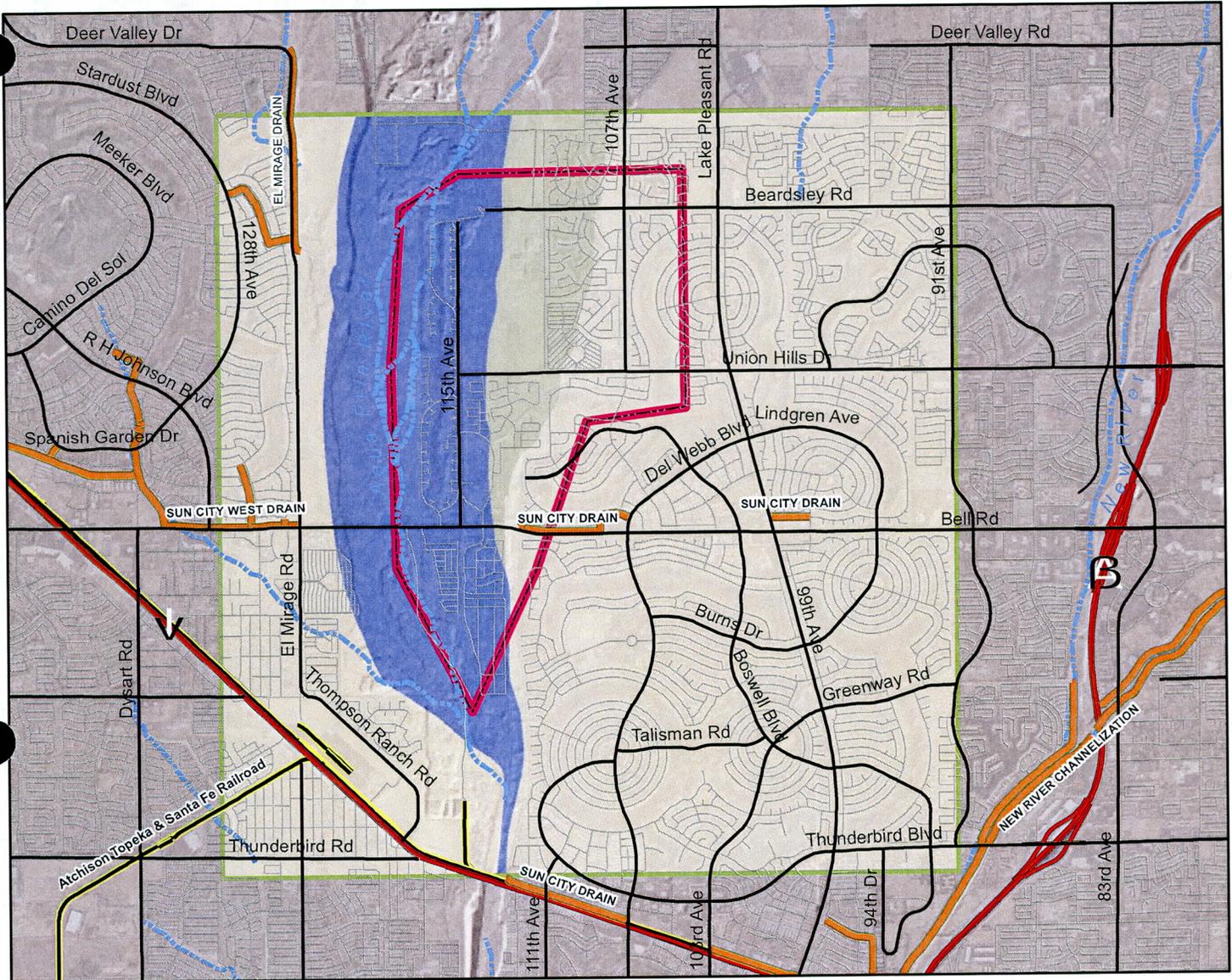


1 inch = 5 miles

Figure 2



Landscape Charater Physical Settings



Landscape Charater Physical Settings

- River Channel
- River Terrace
- Valley Plains
- Valley Wash

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Landscape Character Types and Subtypes Map, 2008
- Aerial photography and topographic mapping, Flood Control District of Maricopa County
- Land Cover Types Map, Arizona Land and Resource Inventory System, State of Arizona

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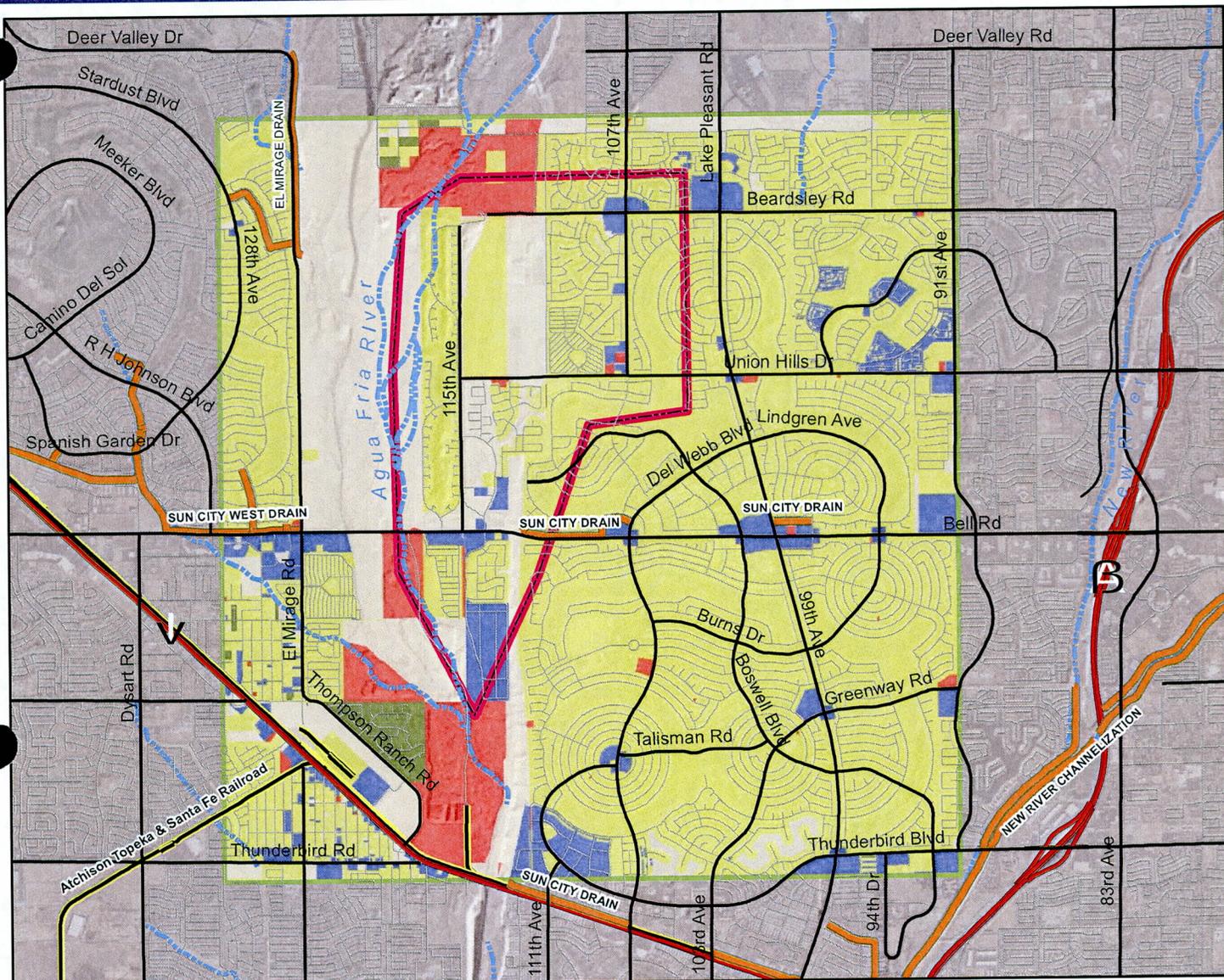


1 inch = 1 miles

Figure 3



107th Avenue and Union Hills Drive DCR Existing Cultural Settings



Existing Cultural Settings

- Natural
- Rural
- Suburban
- Urban
- Industrial

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- MAG 2004 Land Use data base
- Reclassification of 2005 MAG Land Use classifications into Cultural Settings by Flood Control District of Maricopa County

Prepared by
Flood Control District of Maricopa County
June 2010

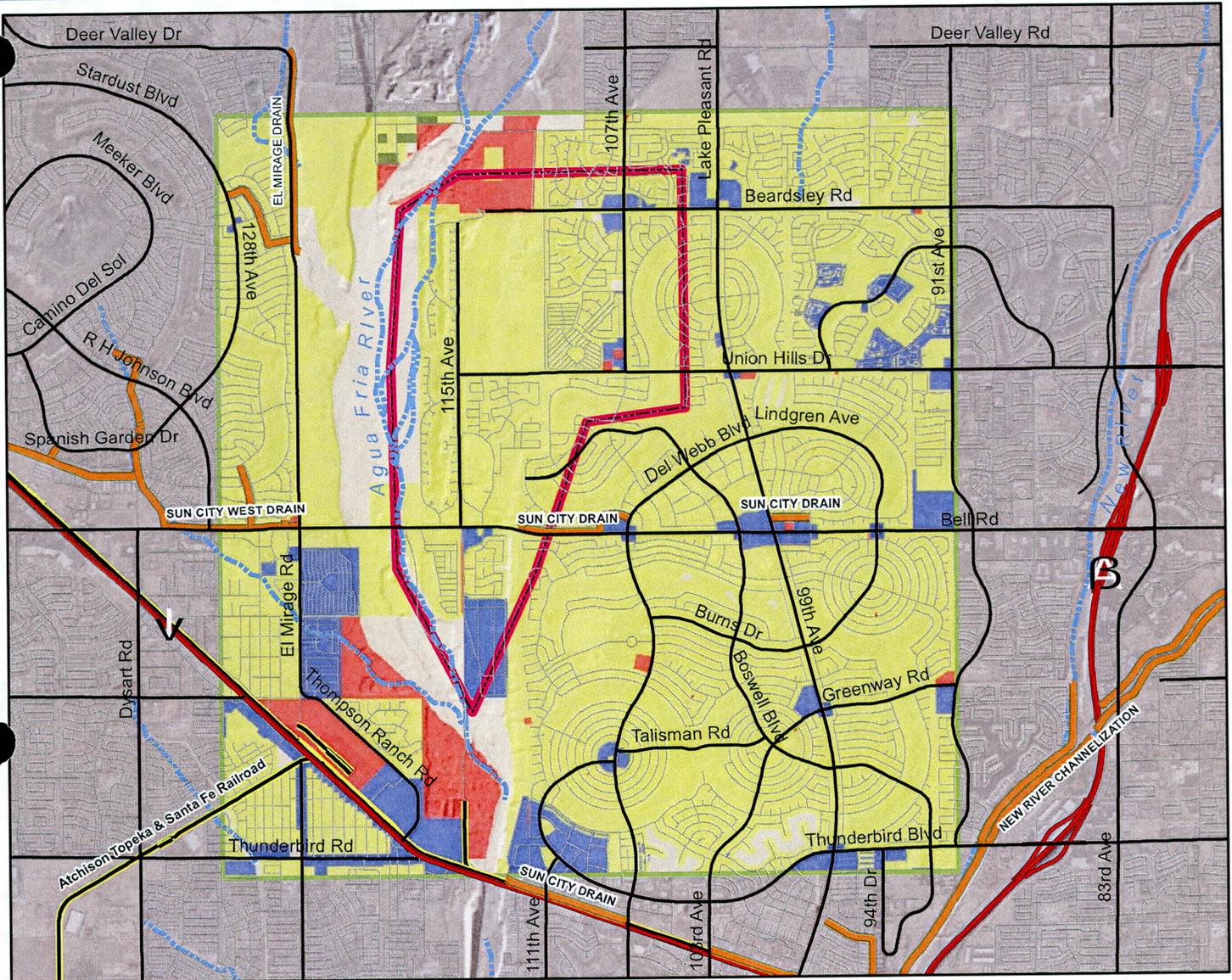


1 inch = 1 miles

Figure 4



107th Avenue and Union Hills Drive DCR Future Cultural Settings



Future Cultural Settings

- Natural
- Rural
- Suburban
- Urban
- Industrial

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- MAG Future Land Use data base
- Updated Land Use information from BLM, cities of Avondale, Buckeye, Goodyear, El Mirage, and Surprise 2008
- Reclassification of 2005 MAG Land Use classifications into Cultural Settings by Flood Control District of Maricopa County

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June 2010

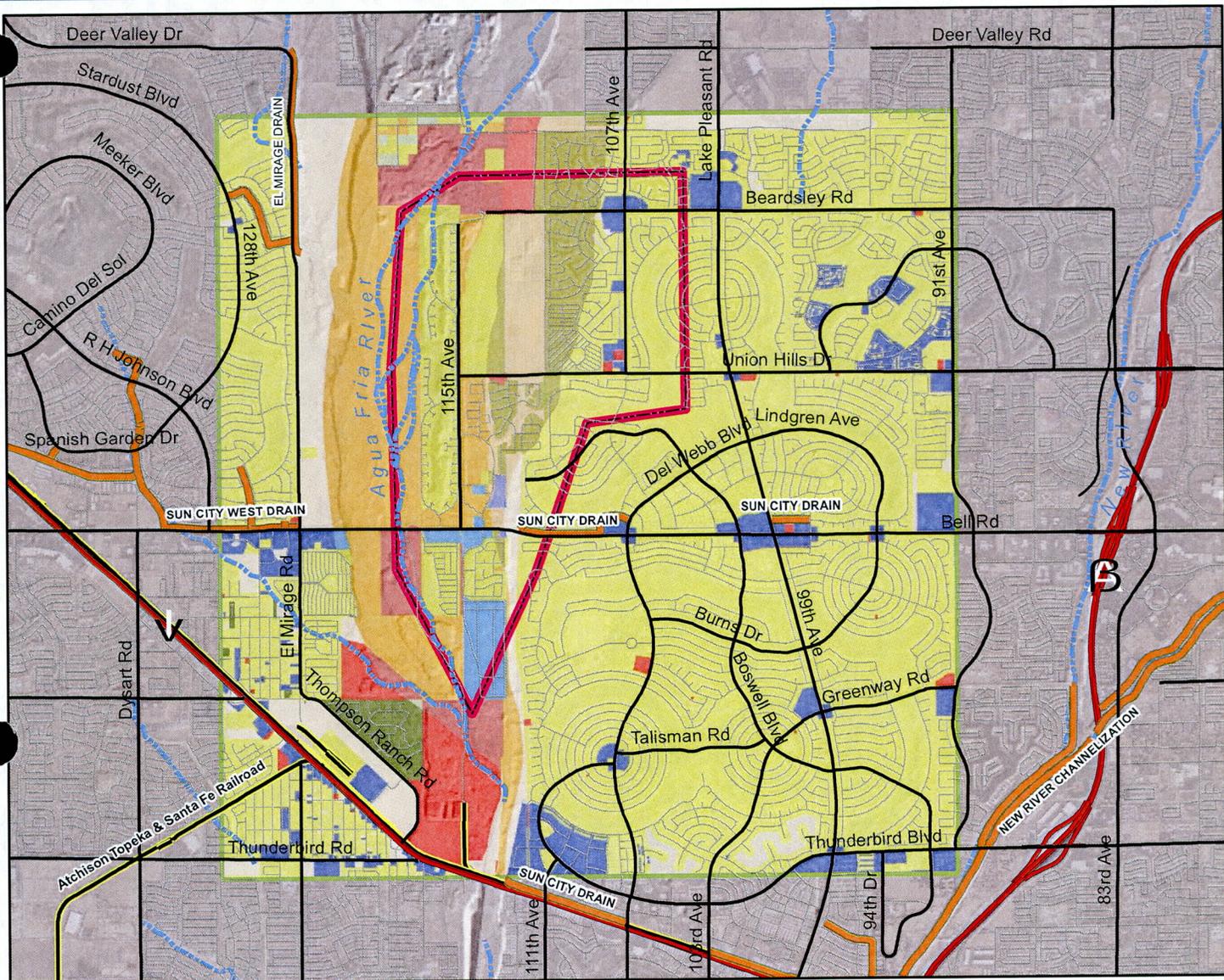


1 inch = 1 miles

Figure 5



Existing Landscape Character Units



Existing Landscape Character Units

- Natural River Channel
- Natural River Terrace
- Natural Valley Plains
- Natural Valley Wash
- Rural River Channel
- Urban River Terrace
- Urban Valley Plains
- Urban Valley Wash
- Suburban River Channel
- Suburban River Terrace
- Suburban Valley Plains
- Suburban Valley Wash
- Urban River Channel
- Urban River Terrace
- Urban Valley Plains
- Urban Valley Wash
- Industrial River Channel
- Industrial River Terrace
- Industrial Valley Plains
- Industrial Valley Wash

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
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- Collector Streets
- Streams
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Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Existing Landscape Character Cultural Settings Map, 2008
- Landscape Character Physical Settings Map, 2008

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June 2010

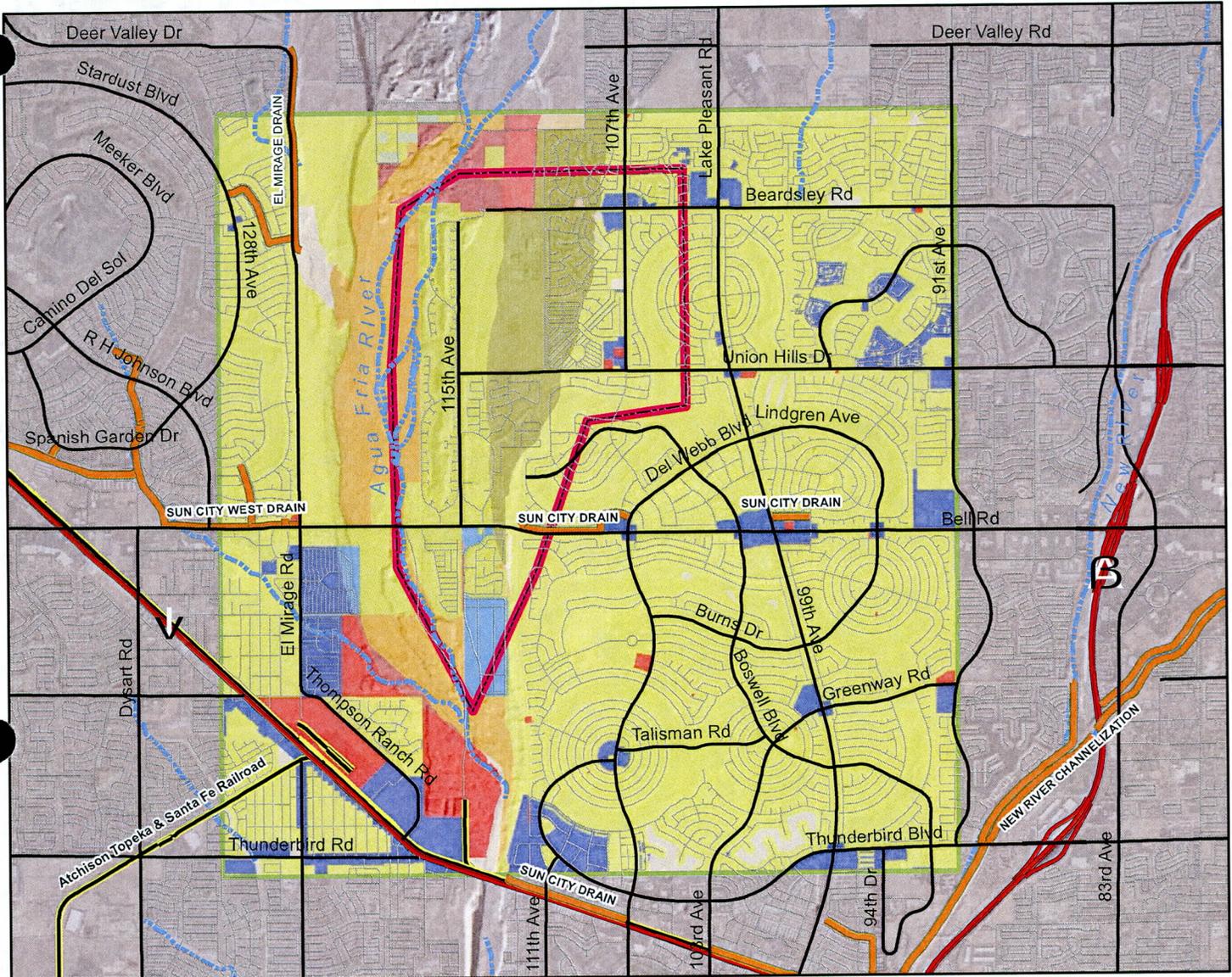


1 inch = 1 miles

Figure 6



Future Landscape Character Units



Future Landscape Character Units

- Natural River Channel
- Natural River Terrace
- Natural Valley Plains
- Natural Valley Wash
- Rural River Channel
- Suburban River Channel
- Suburban River Terrace
- Suburban Valley Plains
- Suburban Valley Wash
- Urban River Channel
- Urban River Terrace
- Urban Valley Plains
- Urban Valley Wash
- Industrial River Channel
- Industrial River Terrace
- Industrial Valley Plains
- Industrial Valley Wash

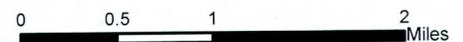
Reference Features

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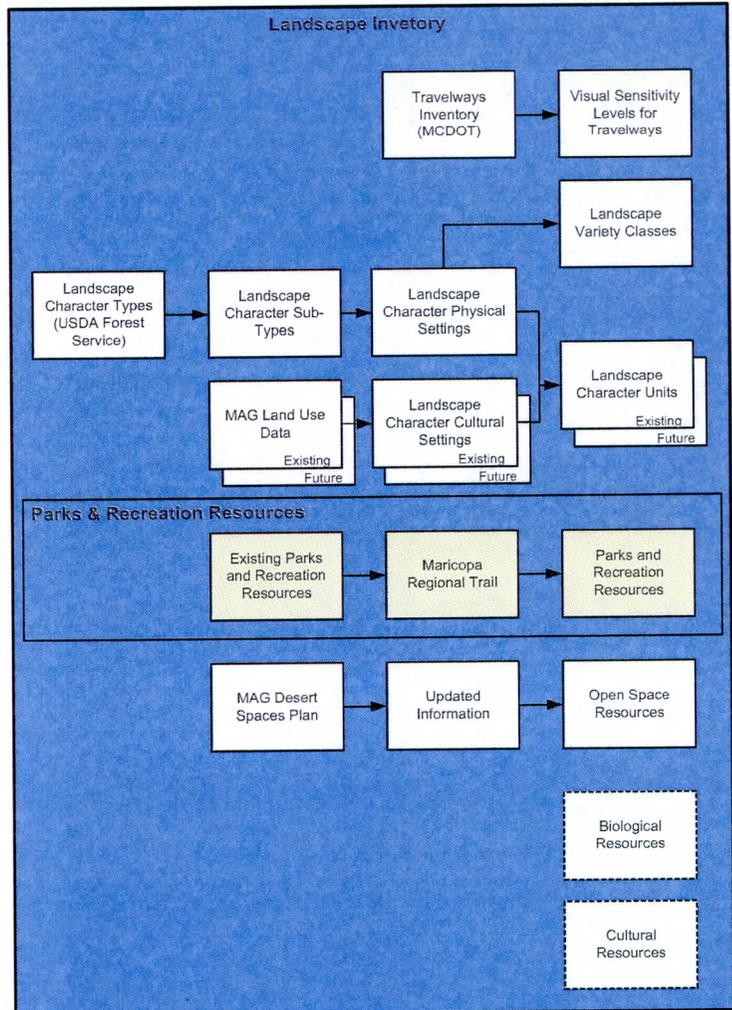
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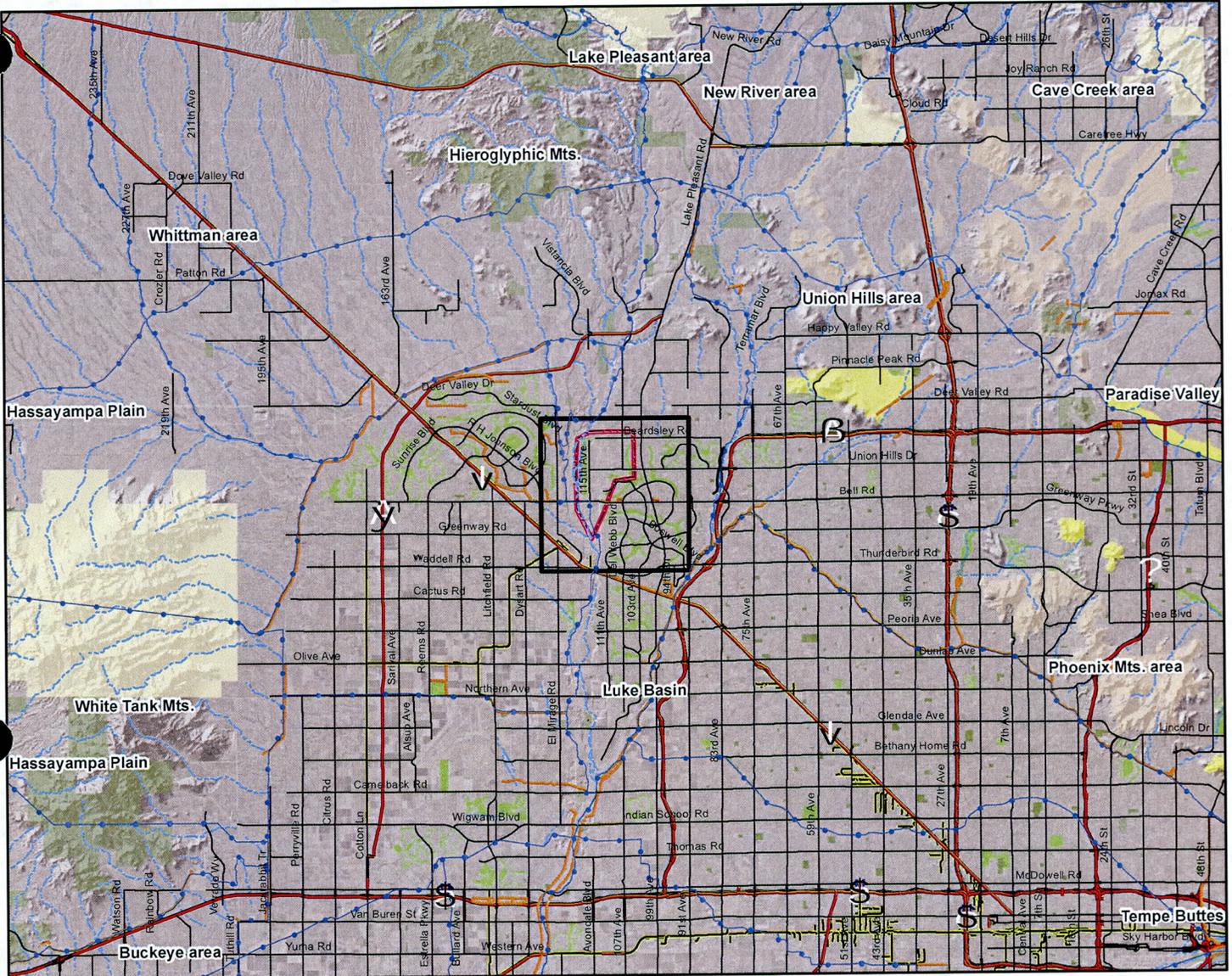
Figure 7

Parks & Recreation Resources Inventory





Regional Parks & Recreation Resources



Regional Parks & Recreation Resources

Federal

Bureau of Land Management

Regional

County Regional Parks & Recreation Areas

City Mountain Preserves

City Regional Parks

Maricopa Regional Trail System

Local

County and City Parks

Golf Courses

Reference Features

Study Area

Project Site

Highways

Rail-Road

Major Arterial

Collector Streets

Streams

FCD Structures

Sources

- Maricopa County District of Transportation
- USDI Bureau of Land Management (BLM)

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May 2010

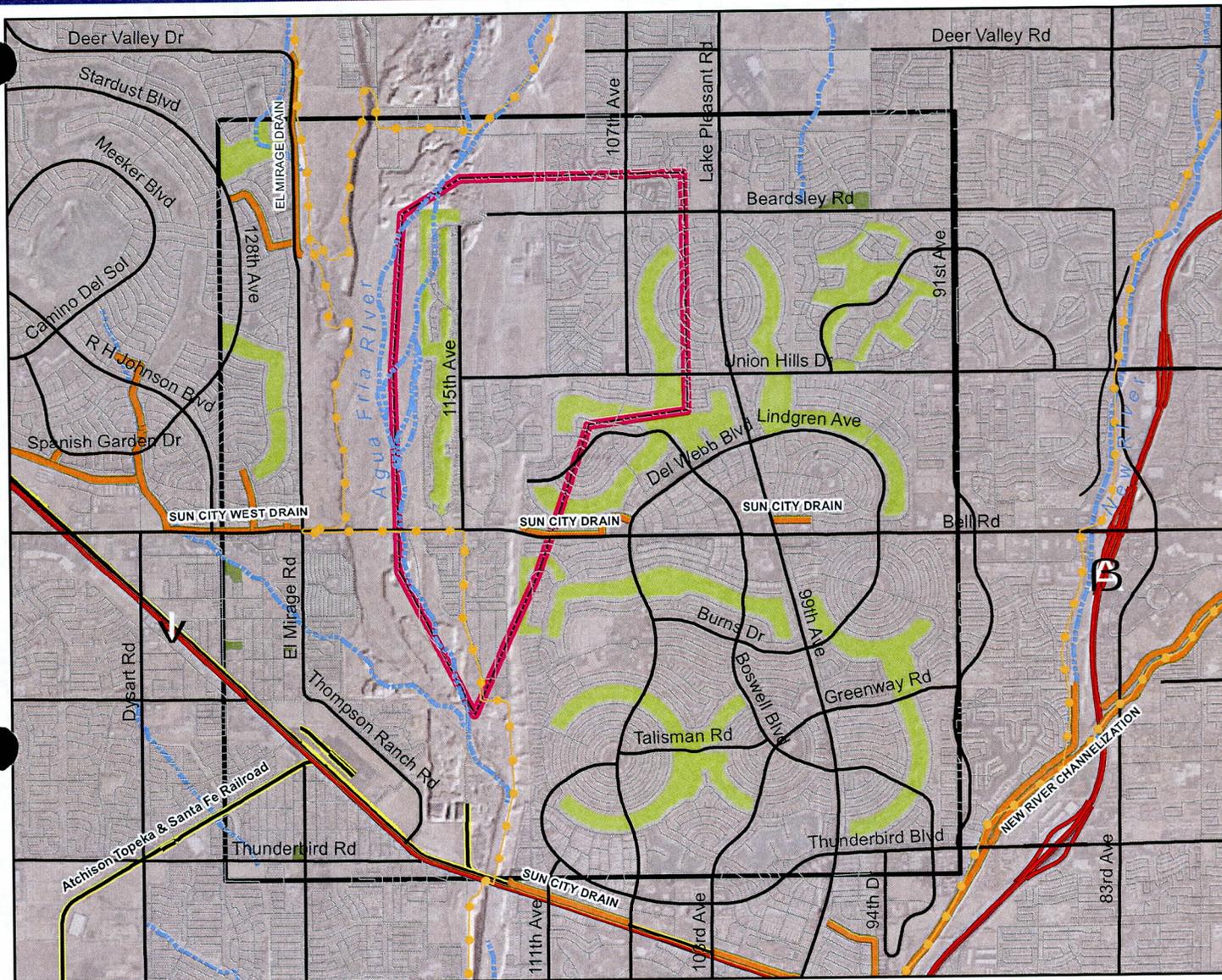


1 inch = 5 miles

Figure 8



107th Avenue and Union Hills Drive DCR Parks & Recreation Resources



Parks & Recreation Resources

- Local City Parks
- Local Golf Courses
- Maricopa Regional Trail System

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Maricopa County District of Transportation
- USDI Bureau of Land Management (BLM)

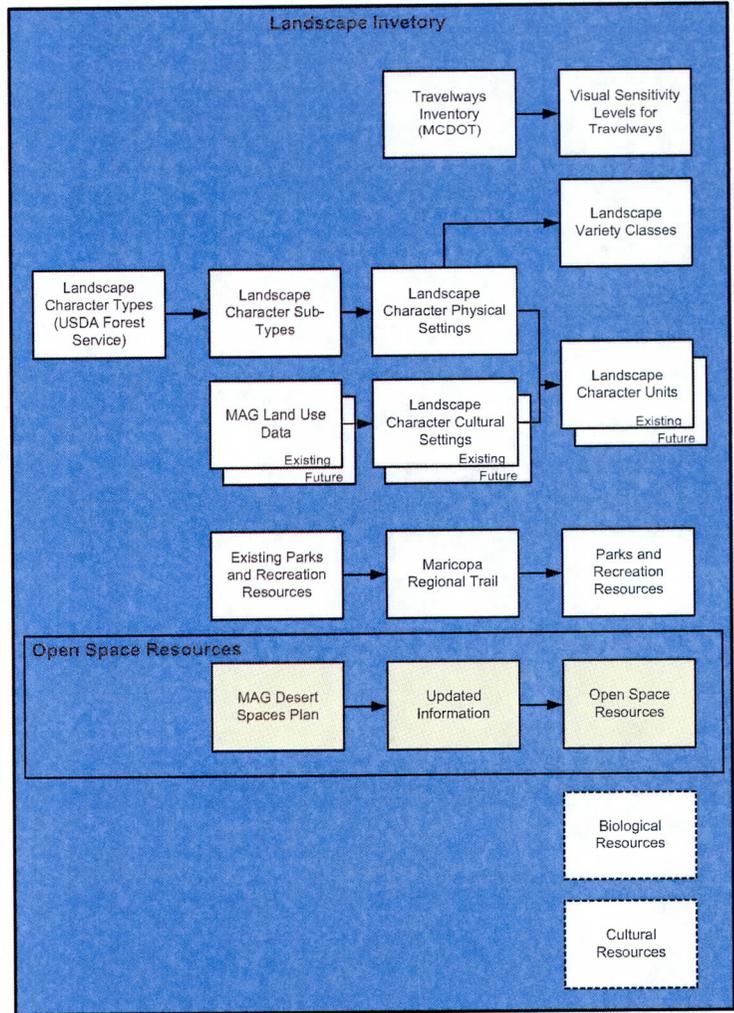
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June 2010



1 inch = 1 miles

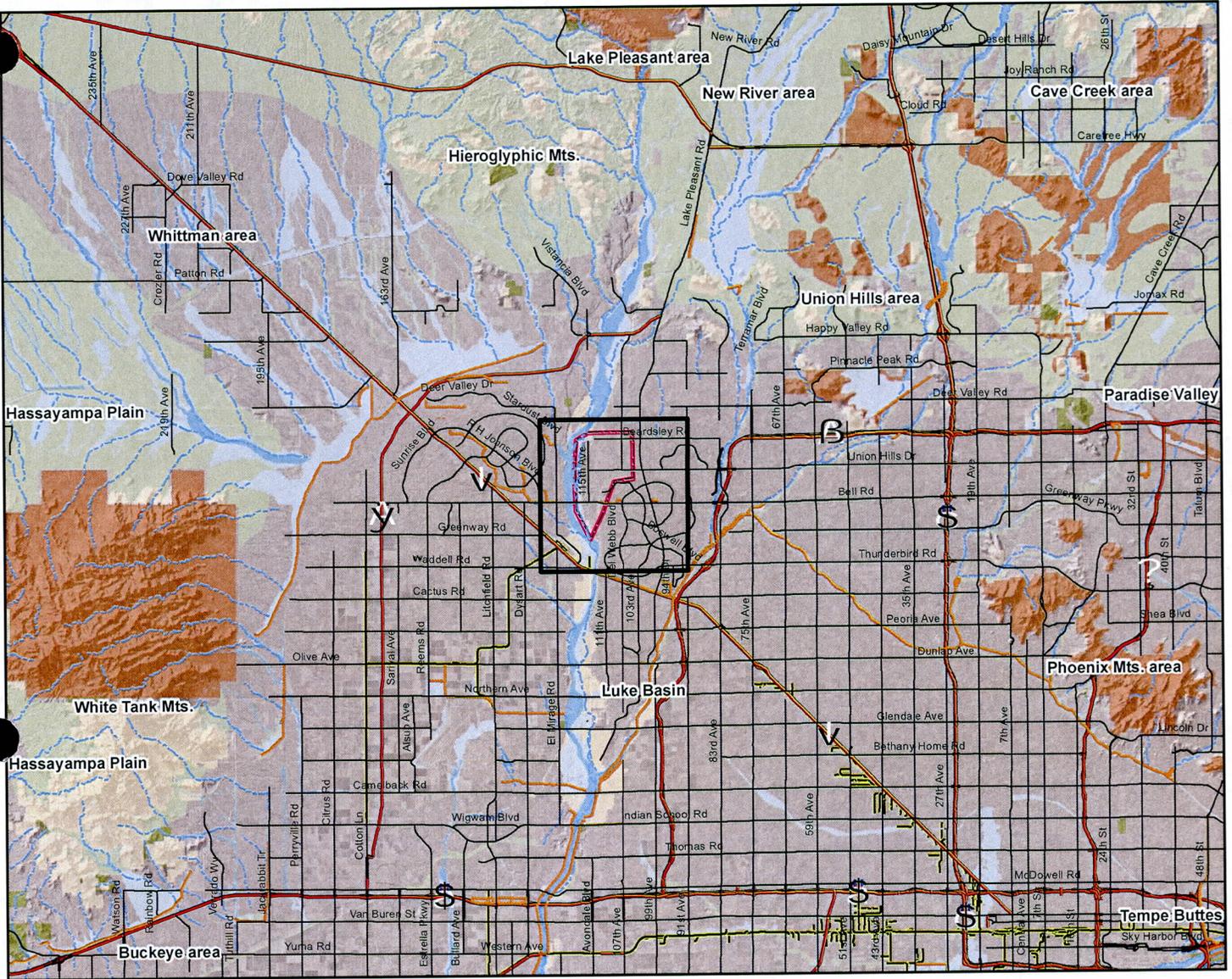
Figure 9

Open Space Resources Inventory





107th Avenue and Union Hills Drive DCR Regional Open Space Resources



Regional Open Space Resources

- Secured Open Space
 - County Regional Parks & Recreation Areas
 - City Mountain Preserves
 - City Regional Parks
- Open Space Conservation Areas
- Open Space Retention Areas
- BLM Lands
- Floodway
- Floodplain Fringe & Outer Floodplain Zones

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Maricopa Association of Governments
- USDI Bureau of Land Management
- Flood Control District of Maricopa County

Prepared by
Flood Control District of Maricopa County
May 2010

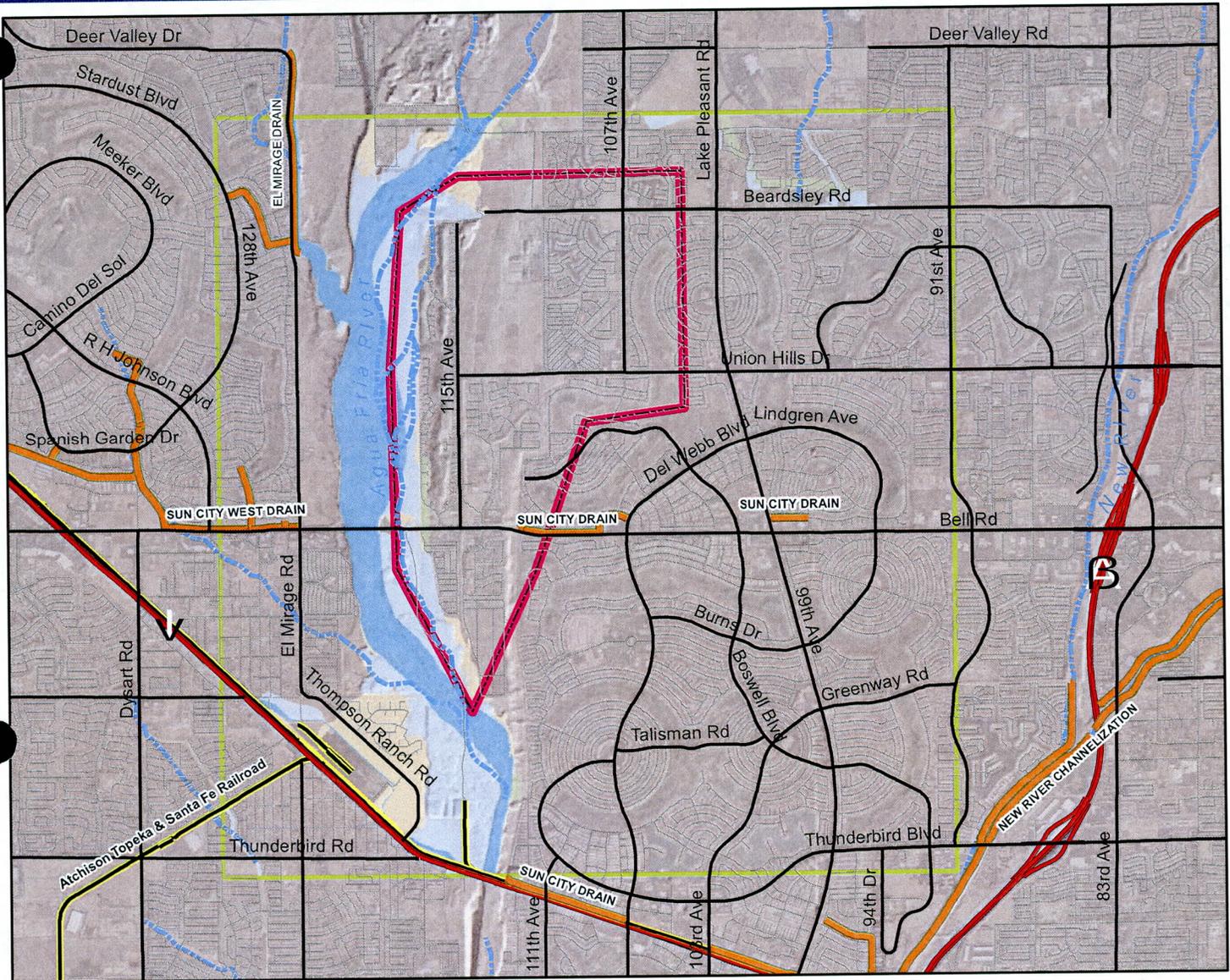


1 inch = 5 miles

Figure 10



107th Avenue and Union Hills Drive DCR Open Space Resources



Open Space Resources

- Open Space Conservation Areas
- Open Space Retention Areas
- Floodway
- Floodplain Fringe & Other Floodplain Zones

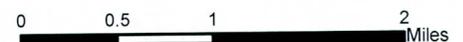
Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

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- USDI Bureau of Land Management
- Flood Control District of Maricopa County

Prepared by
Flood Control District of Maricopa County
June 2010



1 inch = 1 miles

Figure 11

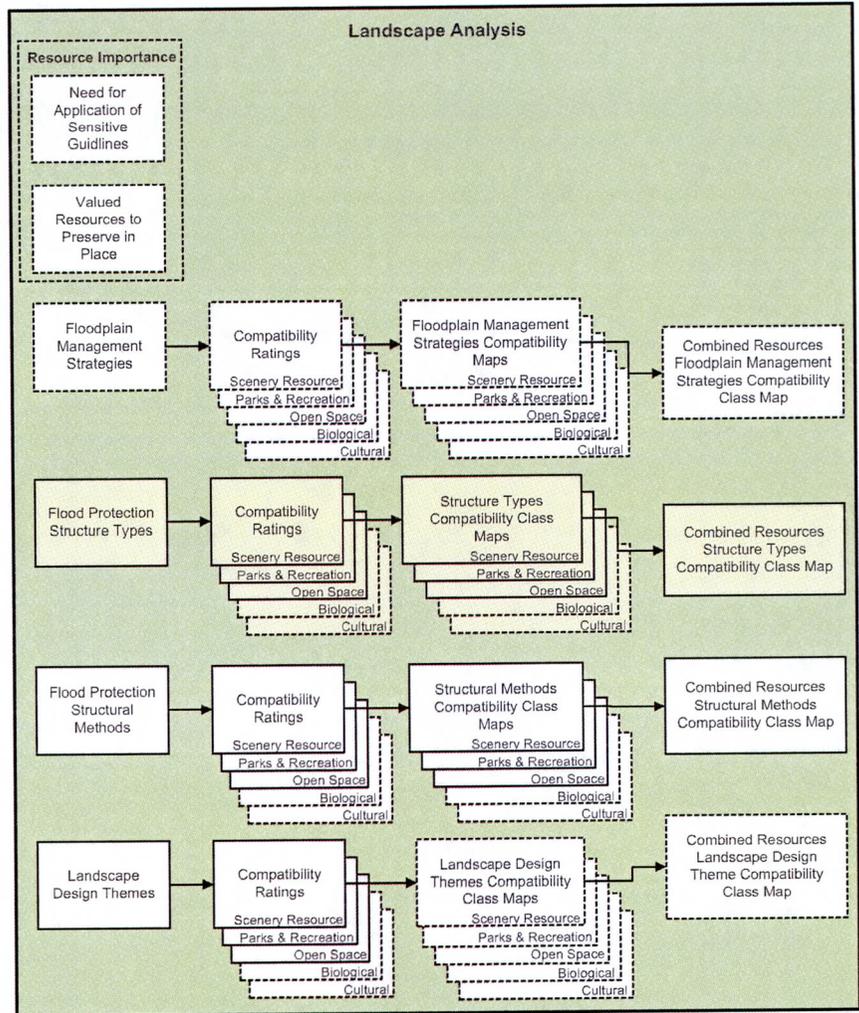
Landscape Analysis

Structure Types Compatibility

Structural Methods Compatibility

Landscape Design Themes Compatibility

Structure Types Compatibility Analysis





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 Type	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

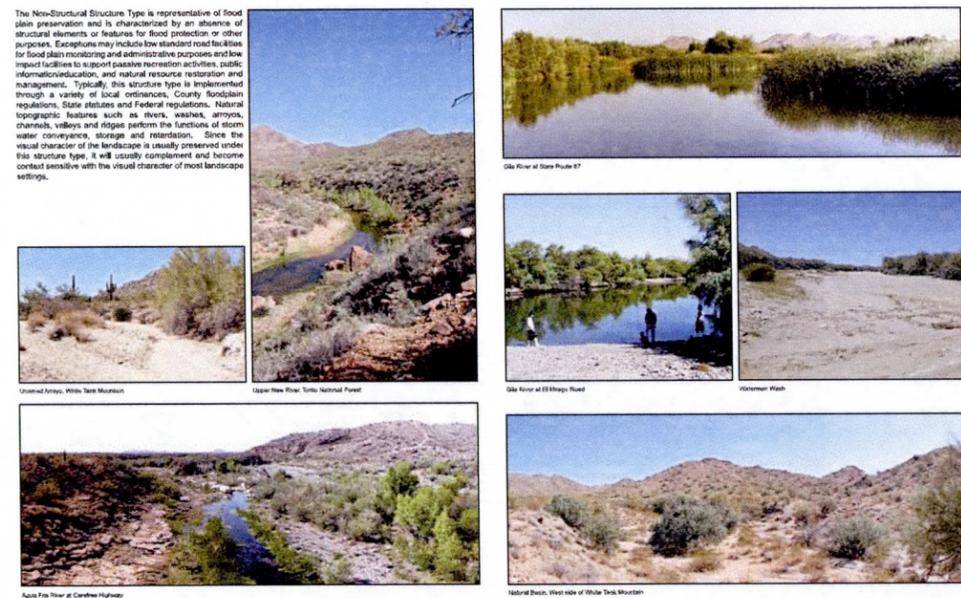
The physical dimensions of the structure types associated with each Scale Sub-Class are summarized in Table 2.

Table 2 Flood Protection Structure Types Scale Sub-Classes

Structure Type	Scale Sub-Class	Physical Dimension
Non-Structural	N/A	N/A
Underground Pipe	N/A	N/A
Channel Levee	Small	Up to 6 ft. height and up to 25 ft. width
	Medium	6-10 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 5 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 high and 2+ miles in total length

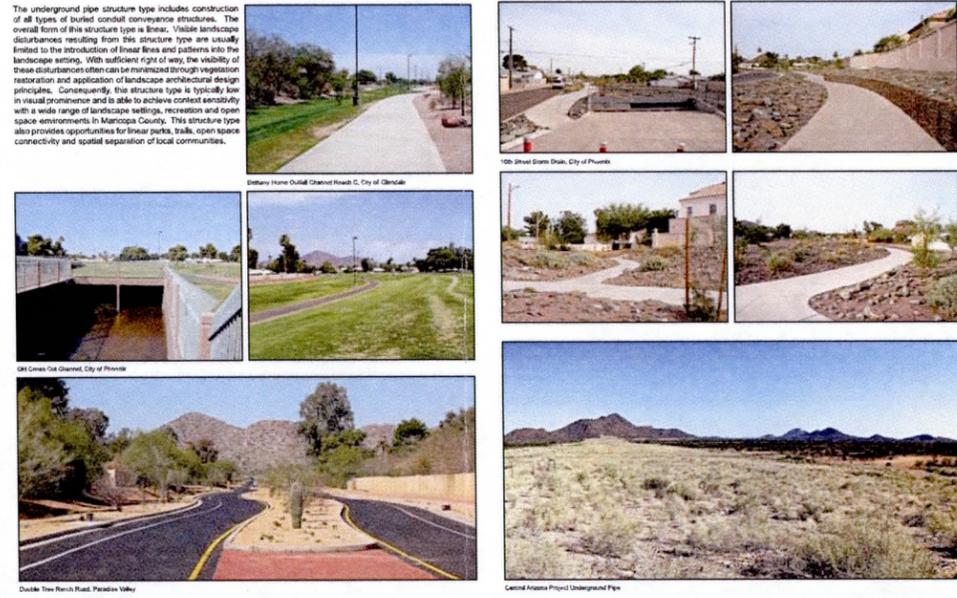
Non-Structural Method

The Non-Structural Structure Type is representative of flood plain preservation 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 retardation. Since the visual character of the landscape is usually preserved, this structure type, it will usually complement and become context sensitive with the visual character of most landscape settings.



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 resulting from this structure type are usually limited to the introduction of linear ditches and patterns into the landscape setting. With sufficient right of way, the visibility of these disturbances 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.



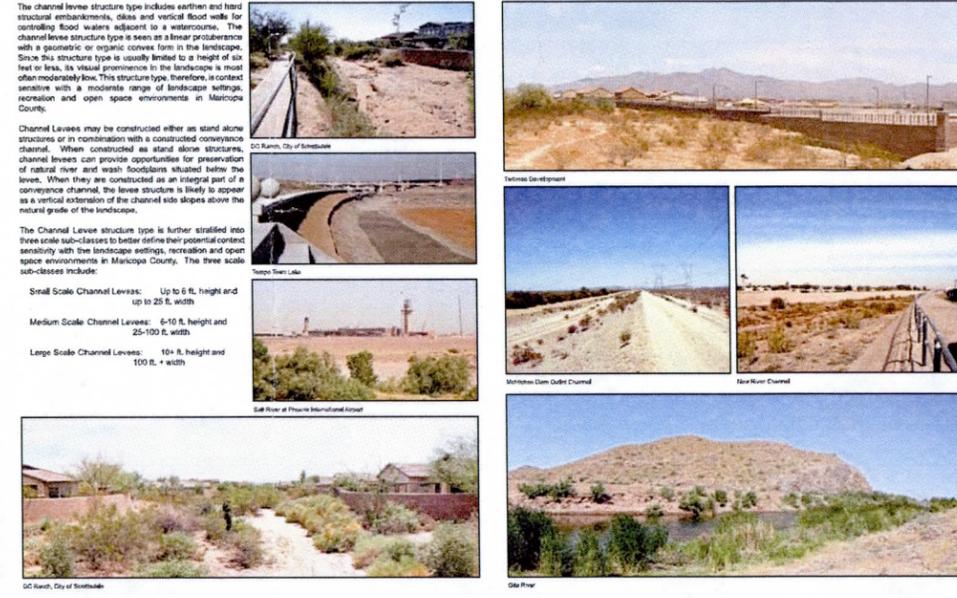
Channel Levee

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 they are 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

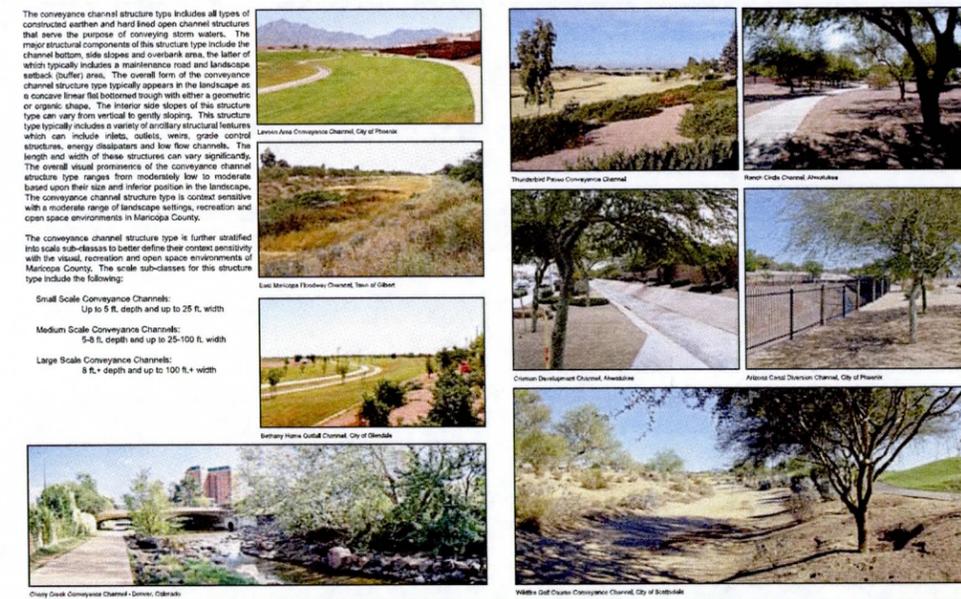


Conveyance Channel

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 concrete 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 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



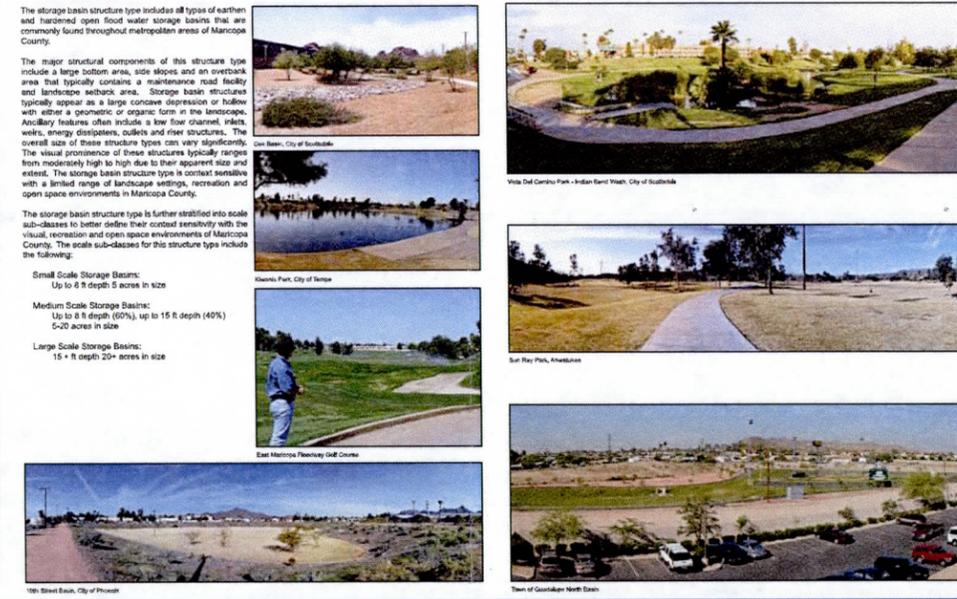
Storage Basin

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 river 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



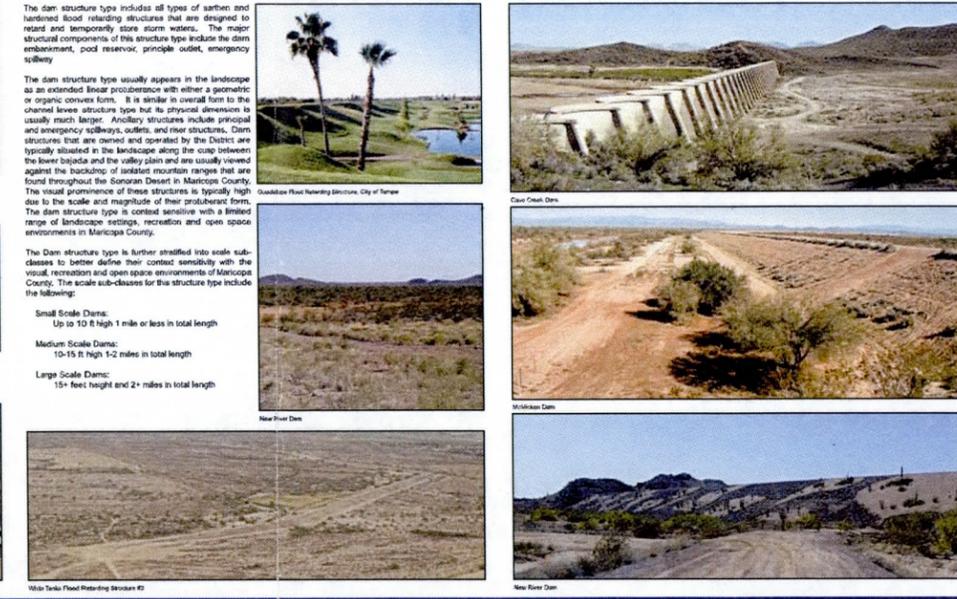
Dam

The dam structure type includes all types of earthen and hardened flood retaining 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 river structures. Dam structures that are owned and operated by the District are typically situated in the landscape along the edge between the lower basins 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 protruberant 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



Compatibility Classes & The Range of Compatible Structure Types

TABLE 1

Compatibility Class	Non Structural	Underground Pipe	Channel Levee	Conveyance Channel	Storage Basin	Dam
Class 1						
Class 2						
Class 3						
Class 4						
Class 5						
Class 6						

Structure Types Scale Sub-Classes Table

TABLE 2

Structure Type	Scale Sub-Class	Physical Dimension
Non-Structural	NA	NA
Underground Pipe	NA	NA
Channel Levee	Small Medium Large	Up to 6 ft height and up to 25 ft width 6-10 ft height and 25-100 ft width 10 ft+ height and 100 ft+ width
Conveyance Channel	Small Medium Large	Up to 5 ft depth and up to 25 ft width 5-8 ft depth and 25-100 ft width 8 ft+ depth and 100 ft+ width
Storage Basin	Small Medium Large	Up to 8 ft depth and 5 acres in size Up to 8 ft depth (60%), up to 15 ft depth (40%) and 5-20 acres in size 15 ft+ height and 20+ acres in size
Dam	Small Medium Large	Up to 10 ft high and up to 1 mile in total length 10-15 ft high and 1-2 miles in total length 15 ft+ height and 2+ miles in total length

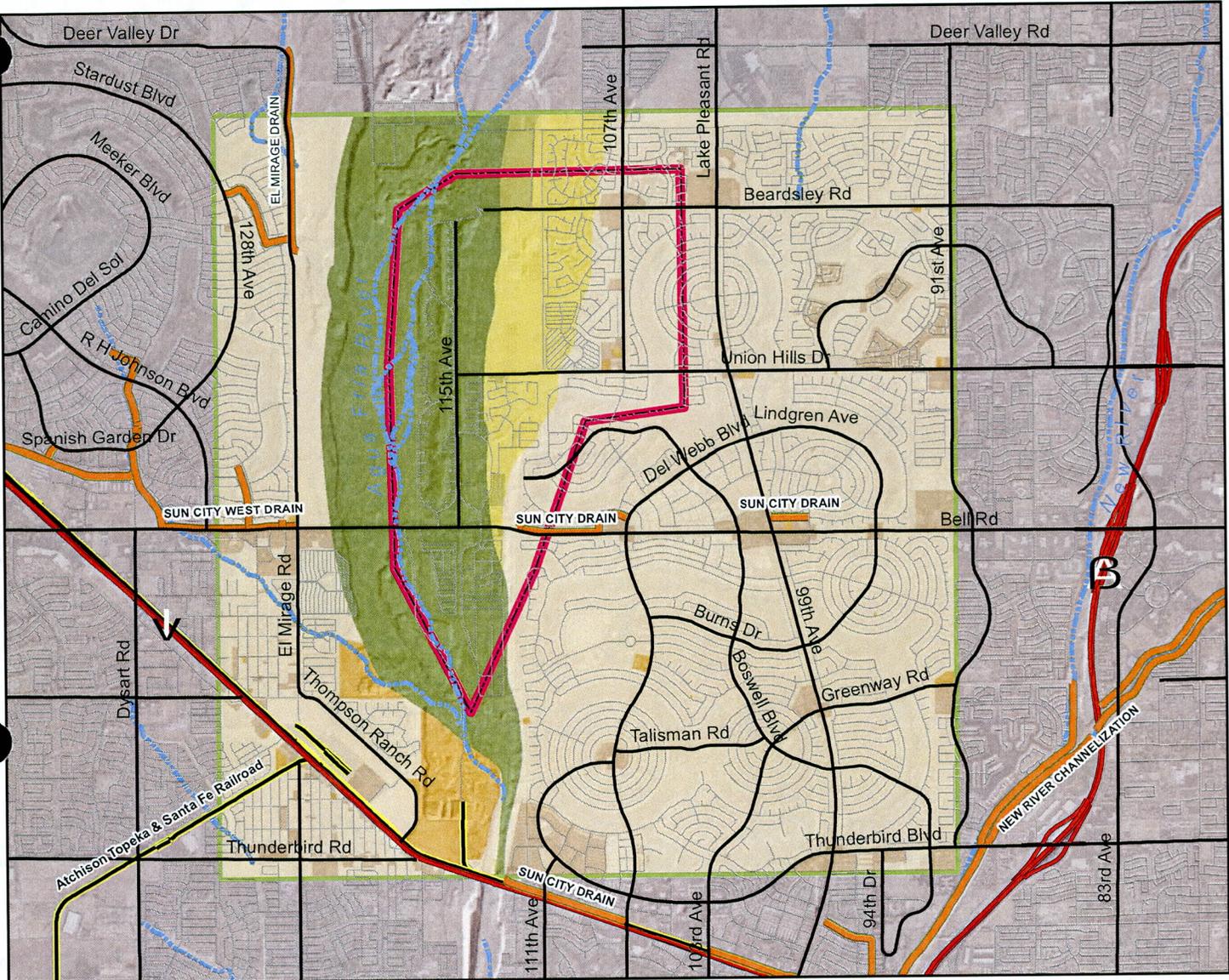
Compatibility Sub-Classes & The Range of Compatible Structure Types

TABLE 3

Compatibility Class	Compatibility Sub-Class	Description
Class 1	1	Compatible with Non-Structural
Class 2	2	Compatible with Non-Structural and Underground Pipe
Class 3	3.1	Compatible with Non-Structural, Underground Pipe and SMALL Channel Levee
Class 3	3.2	Compatible with Non-Structural, Underground Pipe and MEDIUM Channel Levee
Class 3	3.3	Compatible with Non-Structural, Underground Pipe and LARGE Channel Levee
Class 4	4.1	Compatible with Non-Structural, Underground Pipe, SMALL Channel Levee, and SMALL Conveyance Channel
Class 4	4.2	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, and SMALL Conveyance Channel
Class 4	4.3	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, and MEDIUM Conveyance Channel
Class 4	4.4	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, and LARGE Conveyance Channel
Class 4	4.5	Compatible with Non-Structural, Underground Pipe, LARGE Channel Levee, and LARGE Conveyance Channel
Class 5	5.1	Compatible with Non-Structural, Underground Pipe, SMALL Channel Levee, SMALL Conveyance Channel, and SMALL Storage Basin
Class 5	5.2	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, SMALL Conveyance Channel, and SMALL Storage Basin
Class 5	5.3	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, SMALL Conveyance Channel, and MEDIUM Storage Basin
Class 5	5.4	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, MEDIUM Conveyance Channel, and MEDIUM Storage Basin
Class 5	5.5	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, LARGE Conveyance Channel, and MEDIUM Storage Basin
Class 5	5.6	Compatible with Non-Structural, Underground Pipe, LARGE Channel Levee, LARGE Conveyance Channel, and LARGE Storage Basin
Class 6	6.1	Compatible with Non-Structural, Underground Pipe, SMALL Channel Levee, SMALL Conveyance Channel, SMALL Storage Basin and SMALL Dam
Class 6	6.2	Compatible with Non-Structural, Underground Pipe, SMALL Channel Levee, MEDIUM Conveyance Channel, SMALL Storage Basin and MEDIUM Dam
Class 6	6.3	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, MEDIUM Conveyance Channel, MEDIUM Storage Basin and MEDIUM Dam
Class 6	6.4	Compatible with Non-Structural, Underground Pipe, MEDIUM Channel Levee, LARGE Conveyance Channel, MEDIUM Storage Basin and LARGE Dam
Class 6	6.5	Compatible with Non-Structural, Underground Pipe, LARGE Channel Levee, LARGE Conveyance Channel, LARGE Storage Basin and LARGE Dam



107th Avenue and Union Hills Drive DCR Existing Landscape Character Units Structure Types Compatibility



Existing Landscape Character Units Structure Types Compatibility

- Compatibility Class 1
- Compatibility Class 5.1
- Compatibility Class 5.2
- Compatibility Class 6.3
- Compatibility Class 6.4
- Compatibility Class 6.5

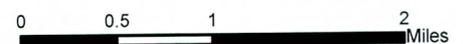
Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Existing Landscape Character Units Structure Types Compatibility Ratings Matrix, 2008
- Existing Landscape Character Units Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

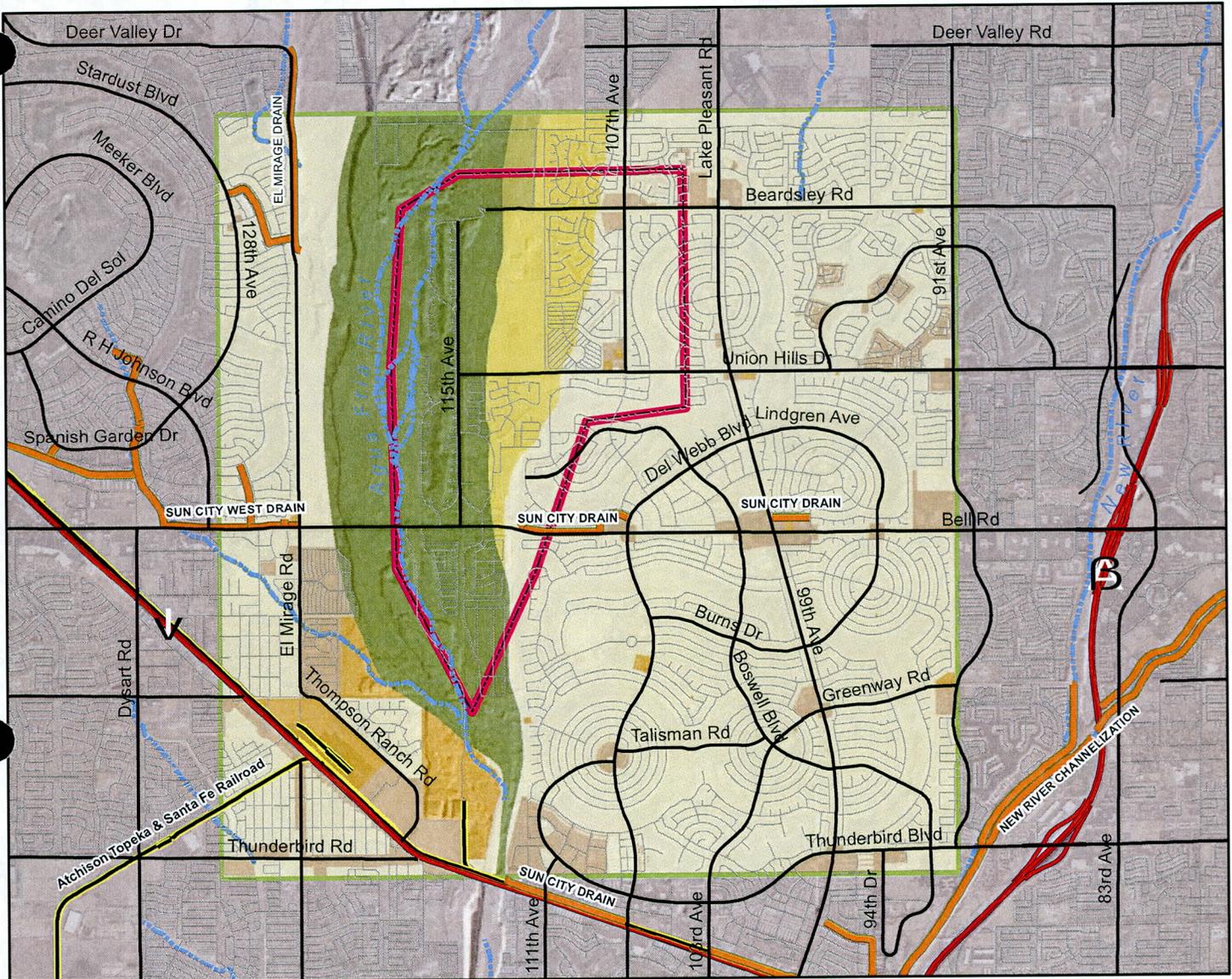


1 inch = 1 miles

Figure 12



107th Avenue and Union Hills Drive DCR Future Landscape Character Units Structure Types Compatibility



Future Landscape Character Units Structure Types Compatibility

- Compatibility Class 1
- Compatibility Class 5.1
- Compatibility Class 5.2
- Compatibility Class 6.3
- Compatibility Class 6.4
- Compatibility Class 6.5

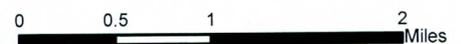
Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Future Landscape Character Units Structure Types Compatibility Ratings Matrix, 2008
- Future Landscape Character Units Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

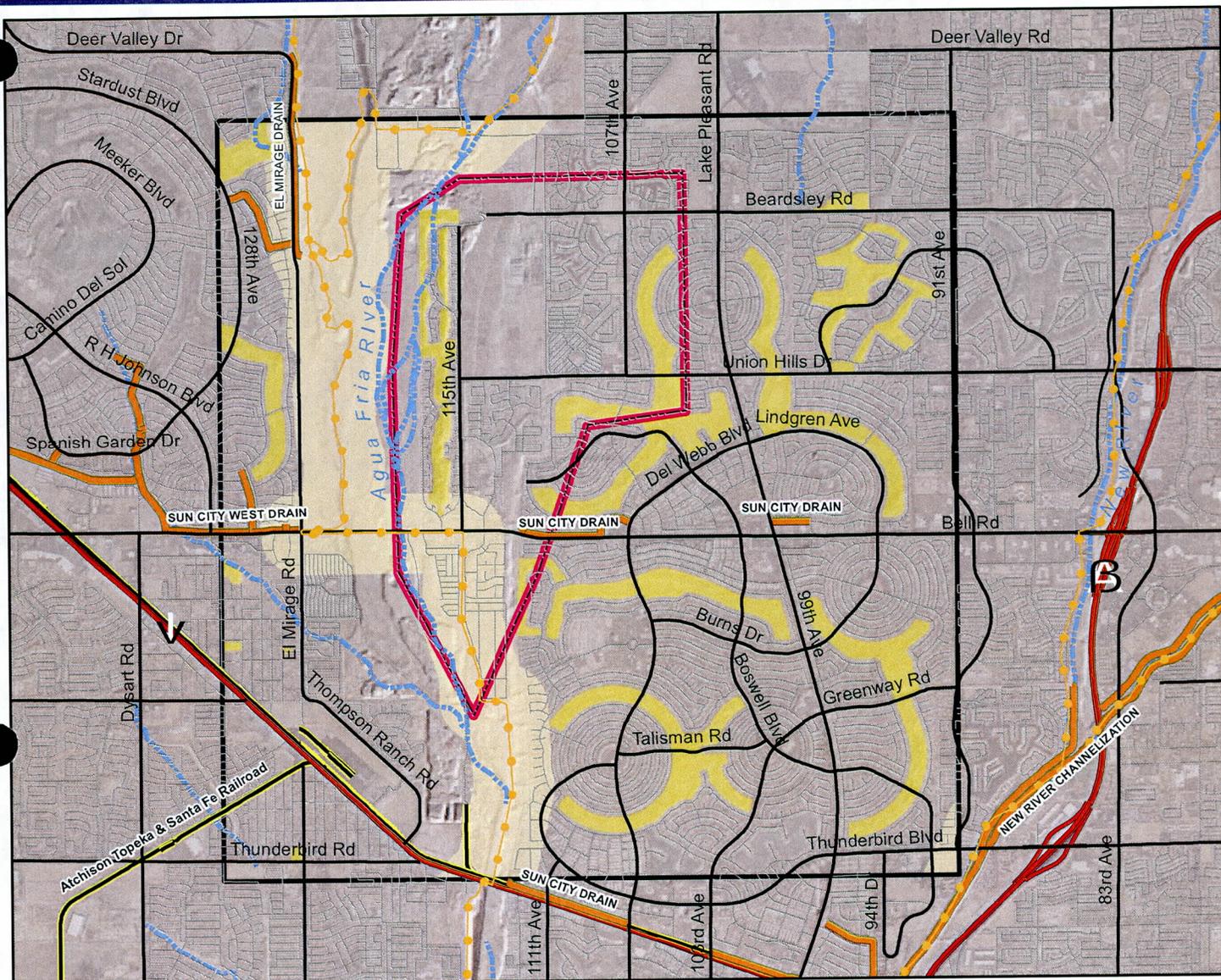


1 inch = 1 miles

Figure 13



107th Avenue and Union Hills Drive DCR Parks & Recreation Resources Structure Types Compatibility



Parks & Recreation Resources Structure Types Compatibility

- Compatibility Class 5
- Compatibility Class 6
- Maricopa Regional Trail System

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA)
- Parks & Recreation Resources Structure Type Compatibility Ratings Matrix, 2008
- Parks & Recreation Resources Map, 2008

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June 2010

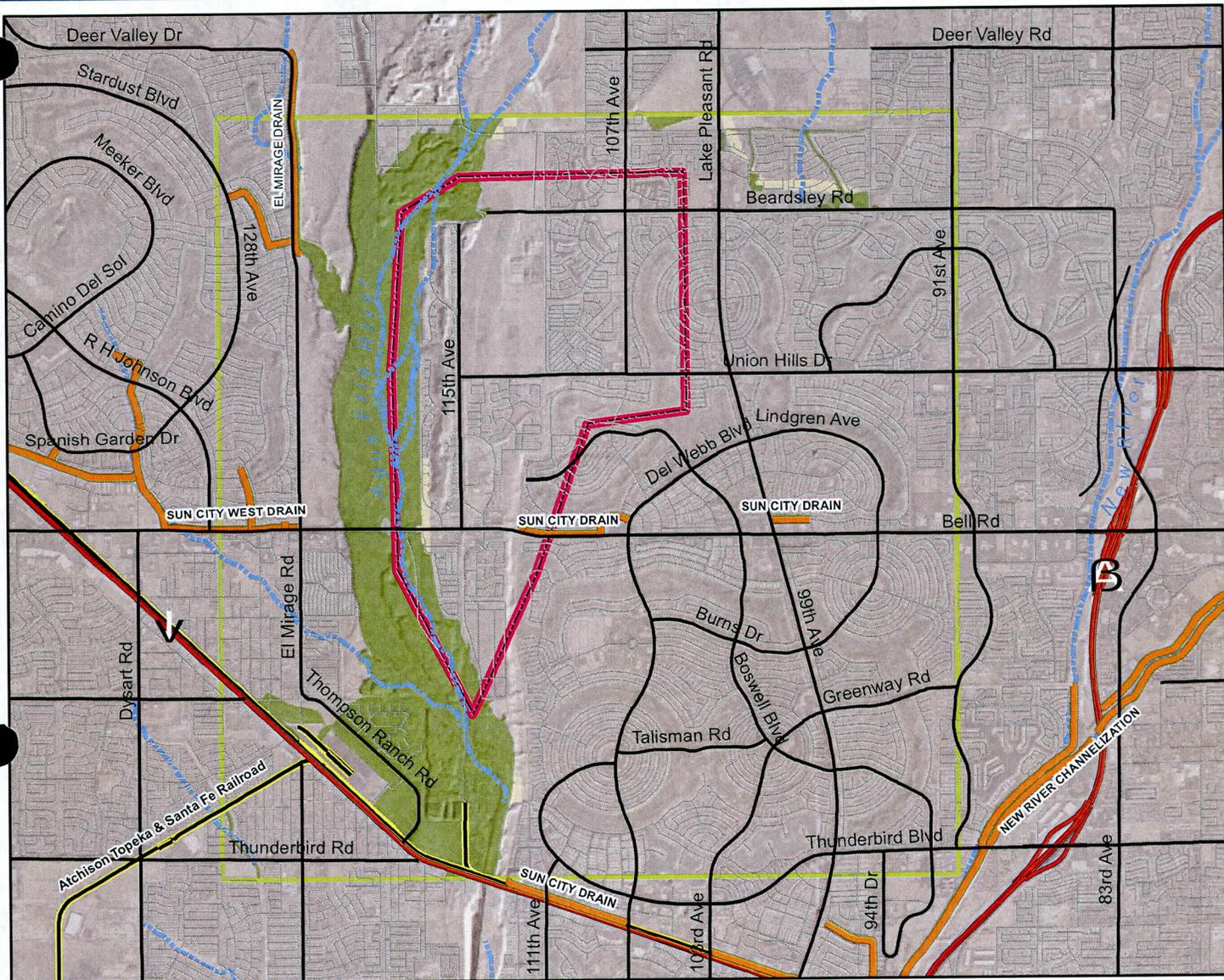


1 inch = 1 miles

Figure 14



107th Avenue and Union Hills Drive DCR Open Space Resources Structure Types Compatibility



Open Space Resources Structure Types Compatibility

- Compatibility Class 5
- Compatibility Class 6

Reference Features

- Study Area
- Project Site
- Highways
- Major Arterial
- Collector Streets
- Streams
- Rail-Road
- FCD Structures

Sources

- Maricopa Association of Governments
- USDI Bureau of Land Management
- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA)
 - Open Space Resources Structure Type Compatibility Ratings Matrix, 2008
 - Open Space Resources Map, 2008

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Flood Control District of Maricopa County
June 2010

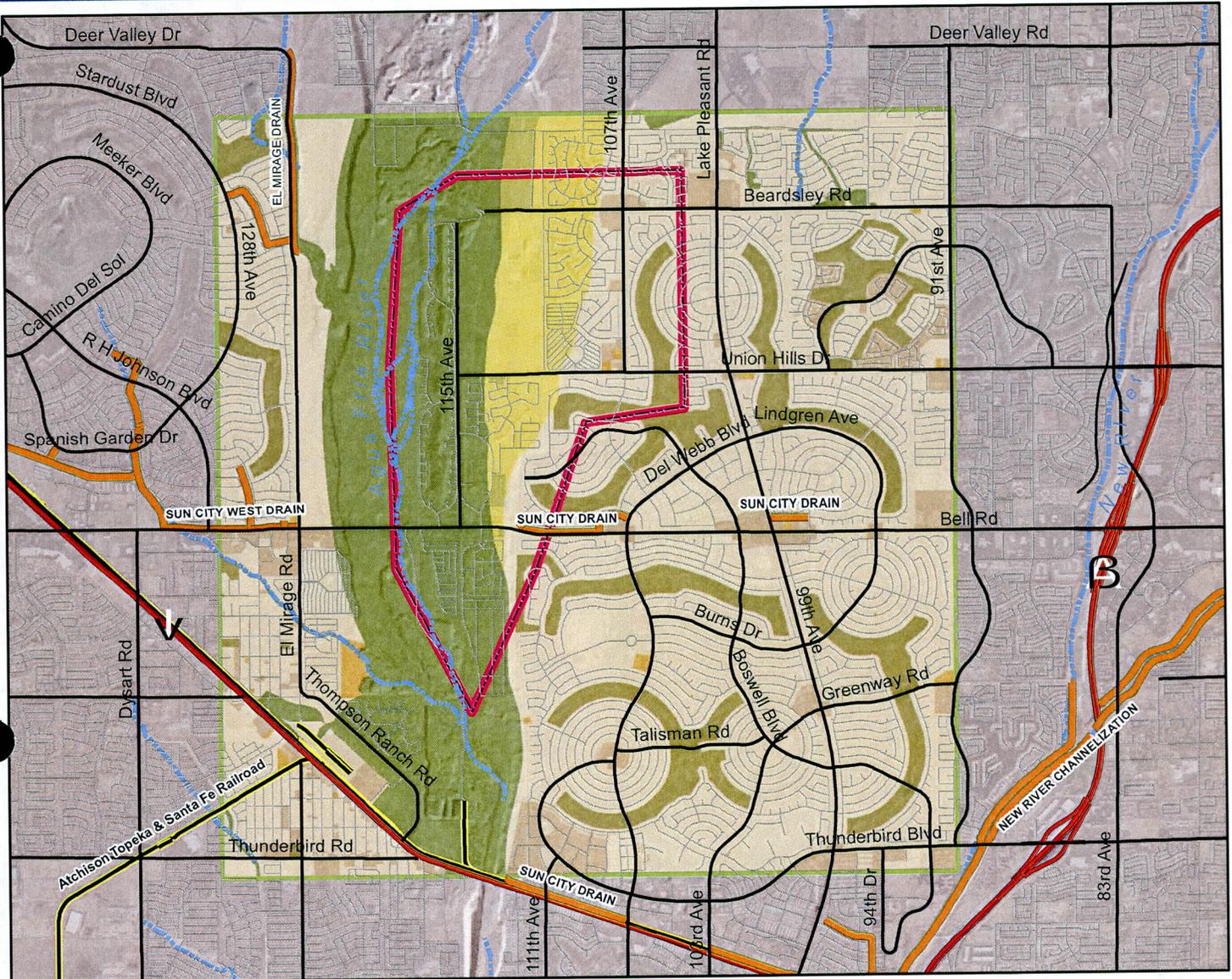


1 inch = 1 miles

Figure 15



107th Avenue and Union Hills Drive DCR Existing Combined Structure Types Compatibility



Existing Combined Structure Types Compatibility

- Compatibility Class 1
- Compatibility Class 5.1
- Compatibility Class 5.2
- Compatibility Class 5.4
- Compatibility Class 5.5
- Compatibility Class 6.3
- Compatibility Class 6.4
- Compatibility Class 6.5

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA)
- Existing Landscape Character Units Structure Types Compatibility Map, 2008
- Parks & Recreation Resources Structure Types Compatibility Map, 2008
- Open Space Resources Structure Types Compatibility Map, 2008

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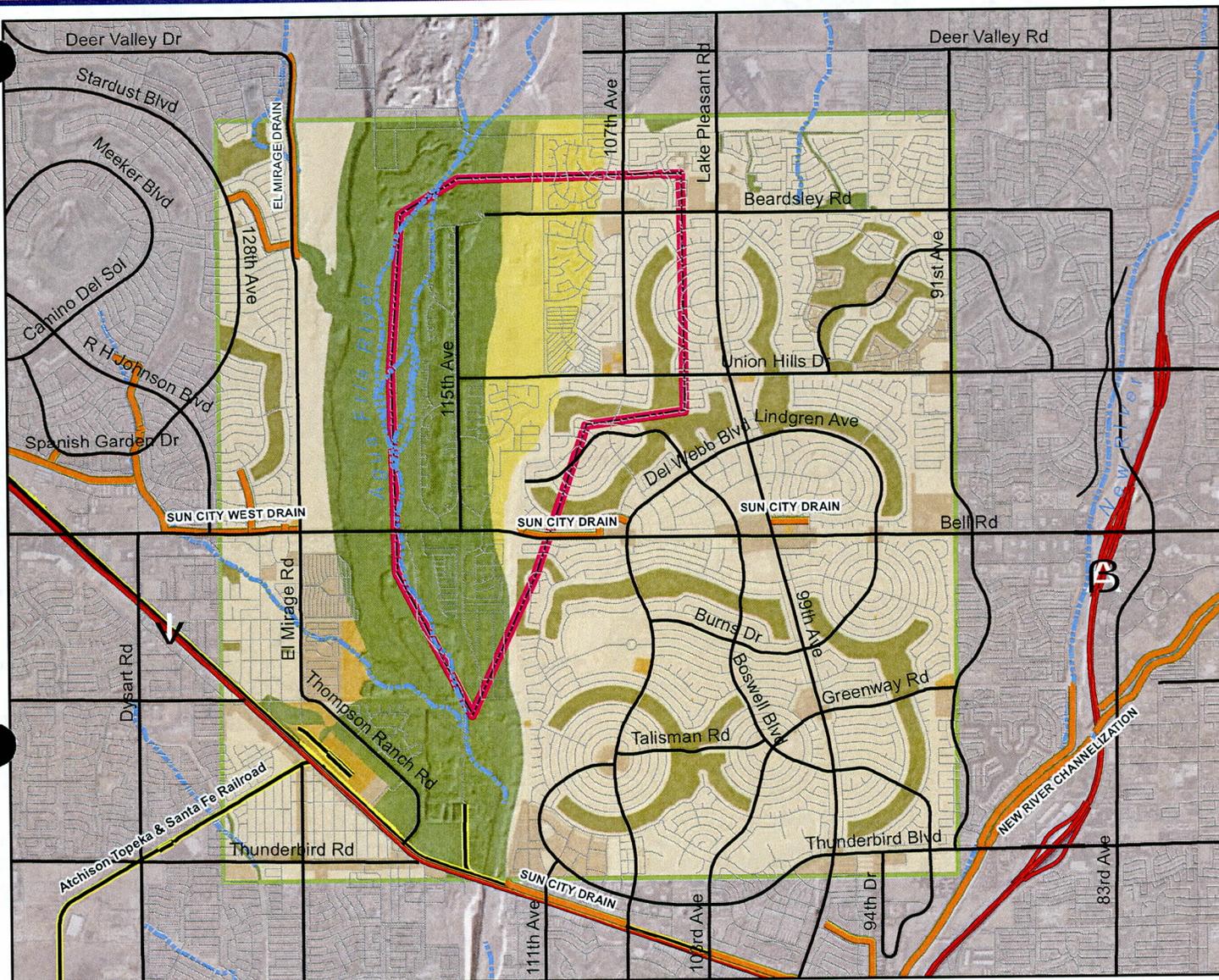


1 inch = 1 miles

Figure 16



107th Avenue and Union Hills Drive DCR Future Combined Structure Types Compatibility



Future Combined Structure Types Compatibility

- Compatibility Class 1
- Compatibility Class 5.1
- Compatibility Class 5.2
- Compatibility Class 5.4
- Compatibility Class 5.5
- Compatibility Class 6.3
- Compatibility Class 6.4
- Compatibility Class 6.5

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA)
- Future Landscape Character Units Structure Types Compatibility Map, 2008
- Parks & Recreation Resources Structure Types Compatibility Map, 2008
- Open Space Resources Structure Types Compatibility Map, 2008

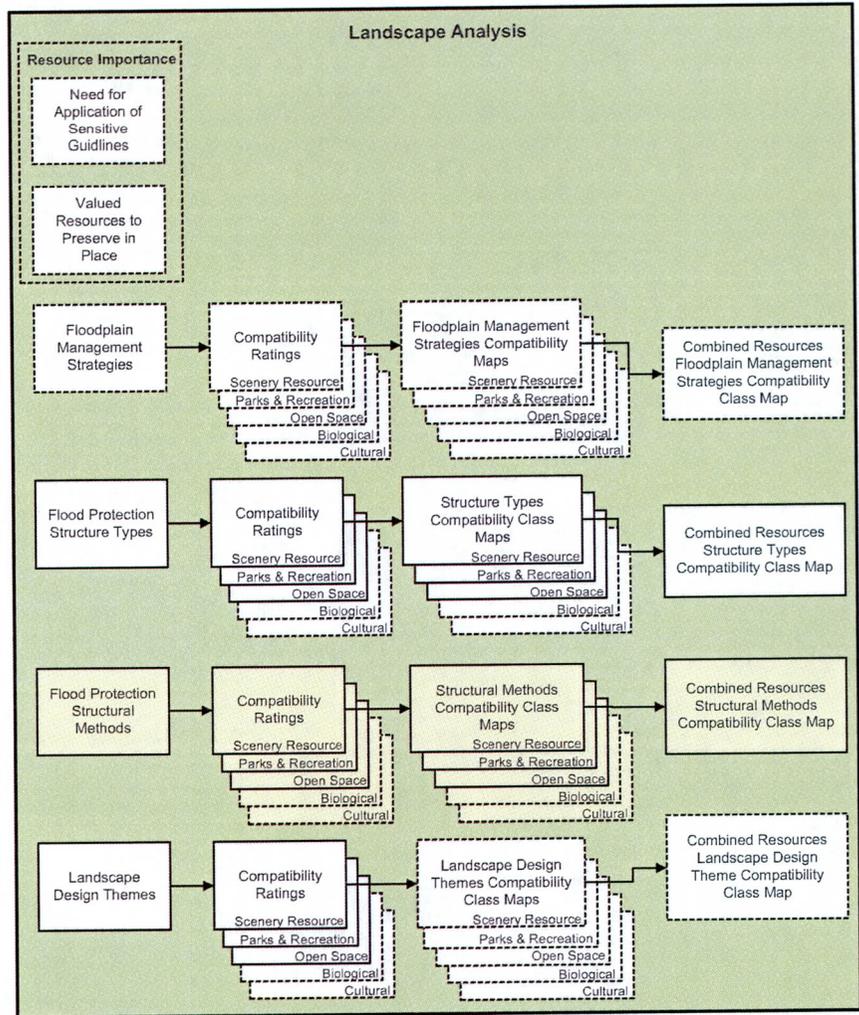
Prepared by
Flood Control District of Maricopa County
June 2010



1 inch = 1 miles

Figure 17

Structural Methods Compatibility Analysis





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.

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

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.

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 ↑ ↓ Lowest
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	
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



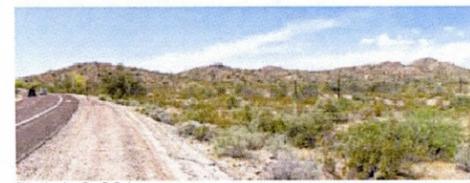
Gila River



Estrella Ranch Natural Upland Basin - Natural



Agua Fria River



Ridge Line along Estrella Parkway

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



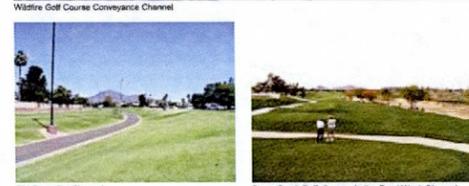
Wildfire Golf Course Conveyance Channel



Oak Basin



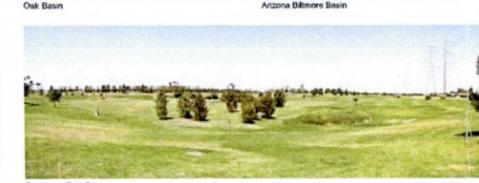
Arizona Billmore Basin



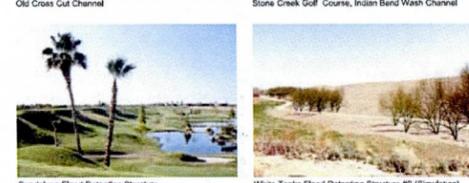
Old Cross Gul Channel



Stone Creek Golf Course, Indian Bend Wash Channel



Freestone Park Basin



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



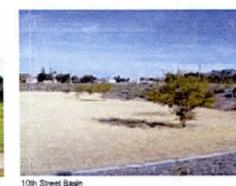
Wildfire Golf Course Conveyance Channel



Laveen Area Conveyance Channel



El Dorado Park - Indian Bend Wash



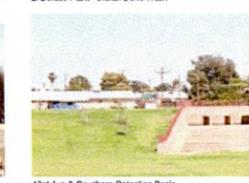
10th Street Basin



Vala Del Centro Park - Indian Bend Wash



Thunderbird Paseo Conveyance Channel



43rd Ave & Southern Detention Basin



Bethany Home Outfall Channel



Bethany Home Outfall Channel



El Dorado Park - Indian Bend Wash



Guadalupe Flood Retarding Structure

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

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



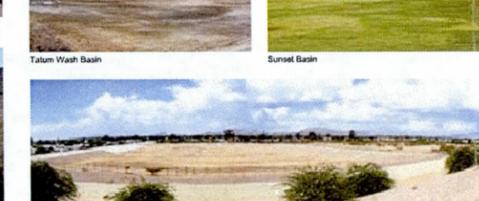
Sunset Basin



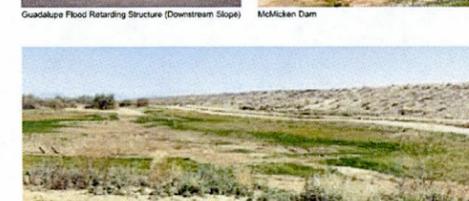
Guadalupe Flood Retarding Structure (Downstream Slope)



McMicken Dam



Soosaman Basin



White Tanks Flood Retarding Structure #3

Hard Structural Method

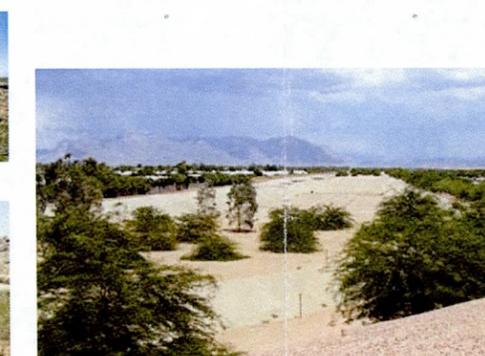
- Superstructure is constructed of hard (concrete) materials
- Overall form is geometric & contrasts with natural landforms
- Structural components are hard & geometric
- Aesthetic features are absent
- Structure strongly dominates the character of the setting
- Compatible with limited landscape settings



Spookhill Flood Retarding Structure Conveyance Channel



White Tanks Inlet Conveyance Channel



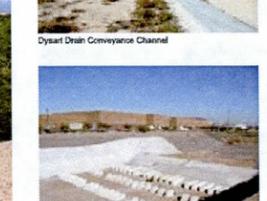
US 60 Arizona Department of Transportation Basin



Dysart Drain Conveyance Channel



City of Mesa Conveyance Channel



Skunk Creek 4 Drop Structure



City of Williams Dam

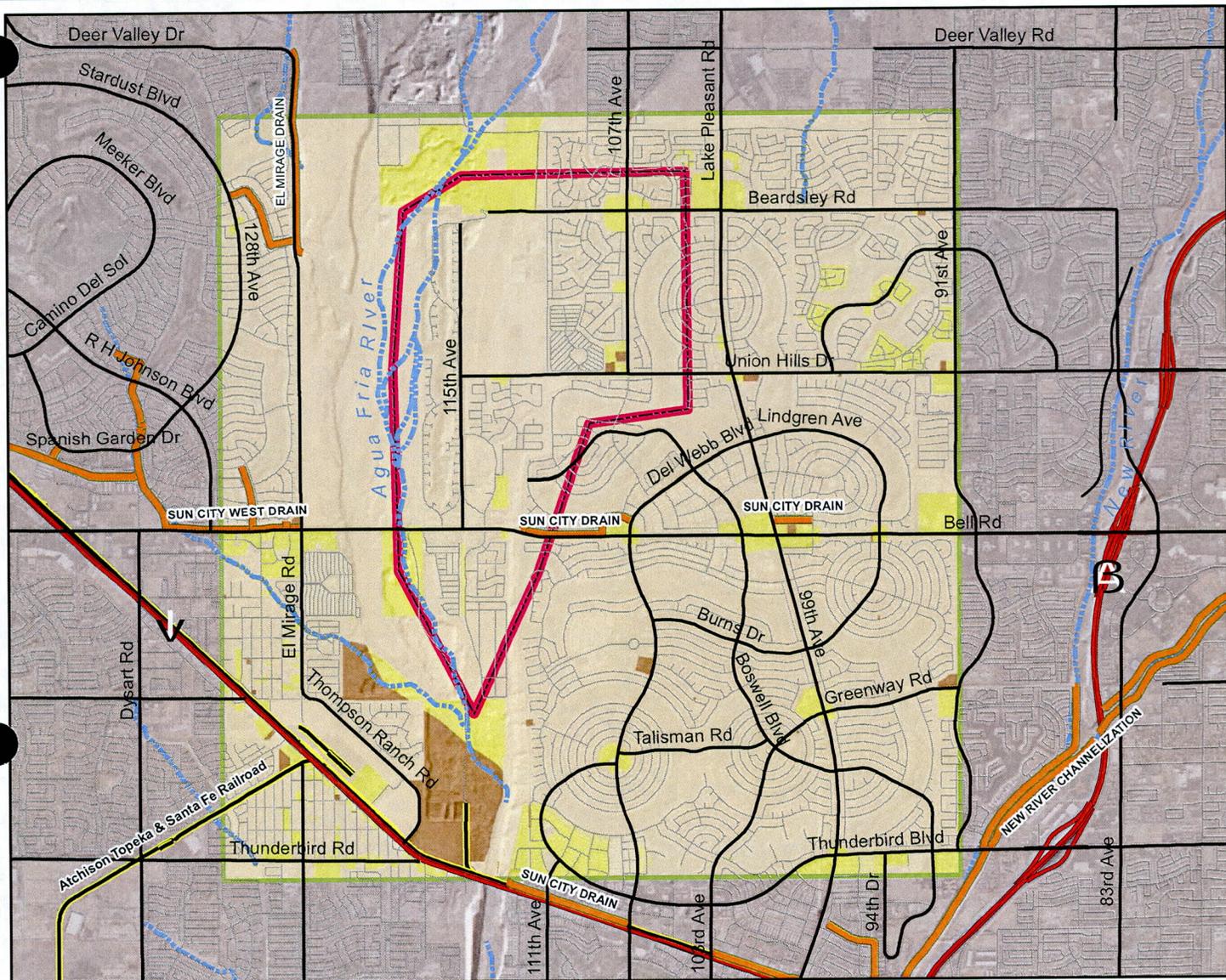
Structure Types Compatibility Classes Matrix

TABLE 4

Compatibility Class	Non Structural	Soft Structural	Semi-Soft Structural	Enhanced Hard Structural	Semi-Hard Structural	Hard Structural
Class 1						
Class 2						
Class 3						
Class 4						
Class 5						
Class 6						



107th Avenue and Union Hills Drive DCR Existing Landscape Character Units Structural Methods Compatibility



Existing Landscape Character Units Structural Methods Compatibility

- Compatibility Class 1
- Compatibility Class 3
- Compatibility Class 4
- Compatibility Class 6

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Existing Landscape Character Flood Protection Structural Methods Compatibility Ratings Matrix, 2008
- Existing Landscape Character Units Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

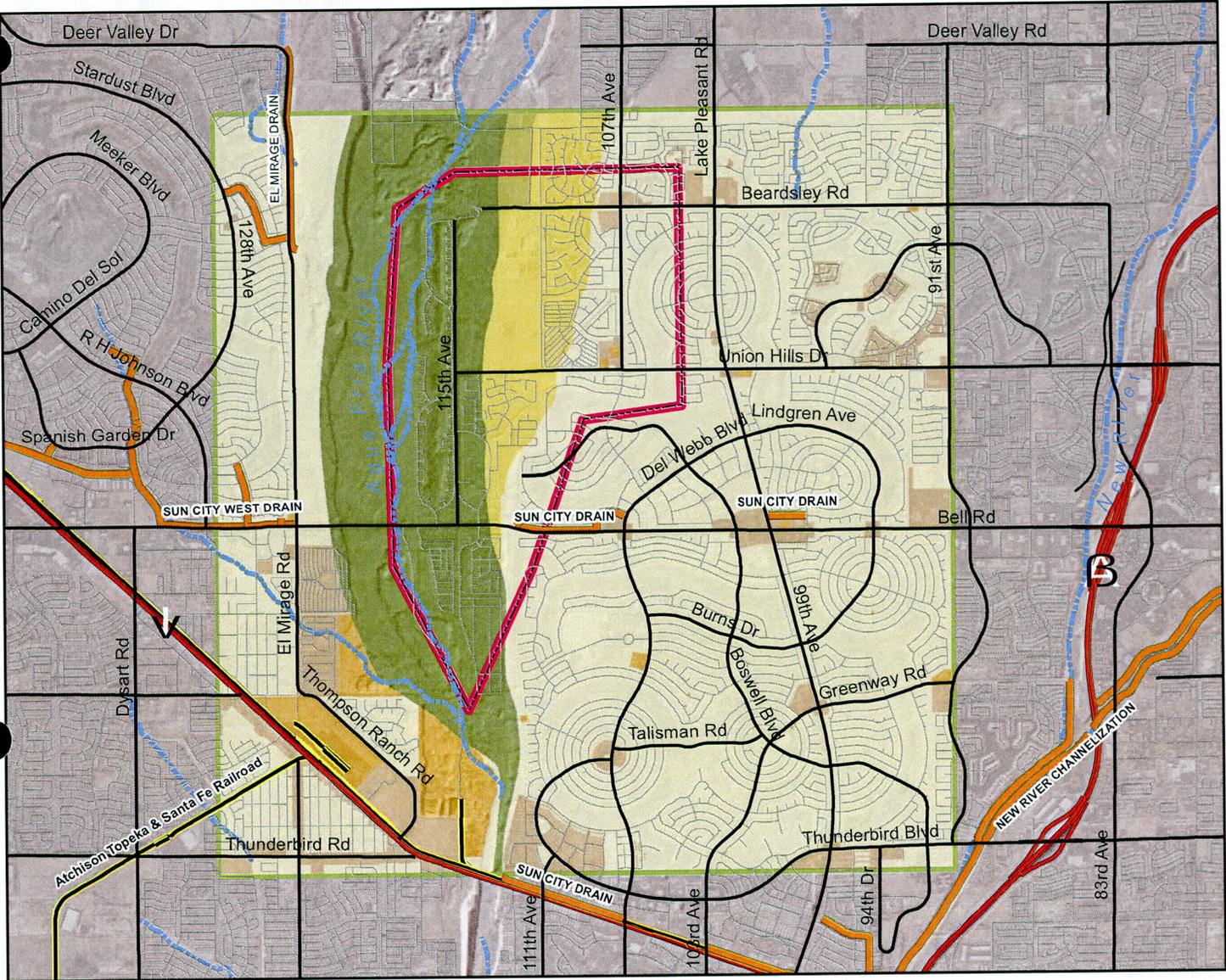


1 inch = 1 miles

Figure 18



107th Avenue and Union Hills Drive DCR Future Landscape Character Units Structure Types Compatibility



Future Landscape Character Units Structure Types Compatibility

- Compatibility Class 1
- Compatibility Class 5.1
- Compatibility Class 5.2
- Compatibility Class 6.3
- Compatibility Class 6.4
- Compatibility Class 6.5

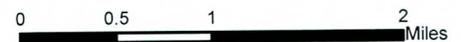
Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Future Landscape Character Units Structure Types Compatibility Ratings Matrix, 2008
- Future Landscape Character Units Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

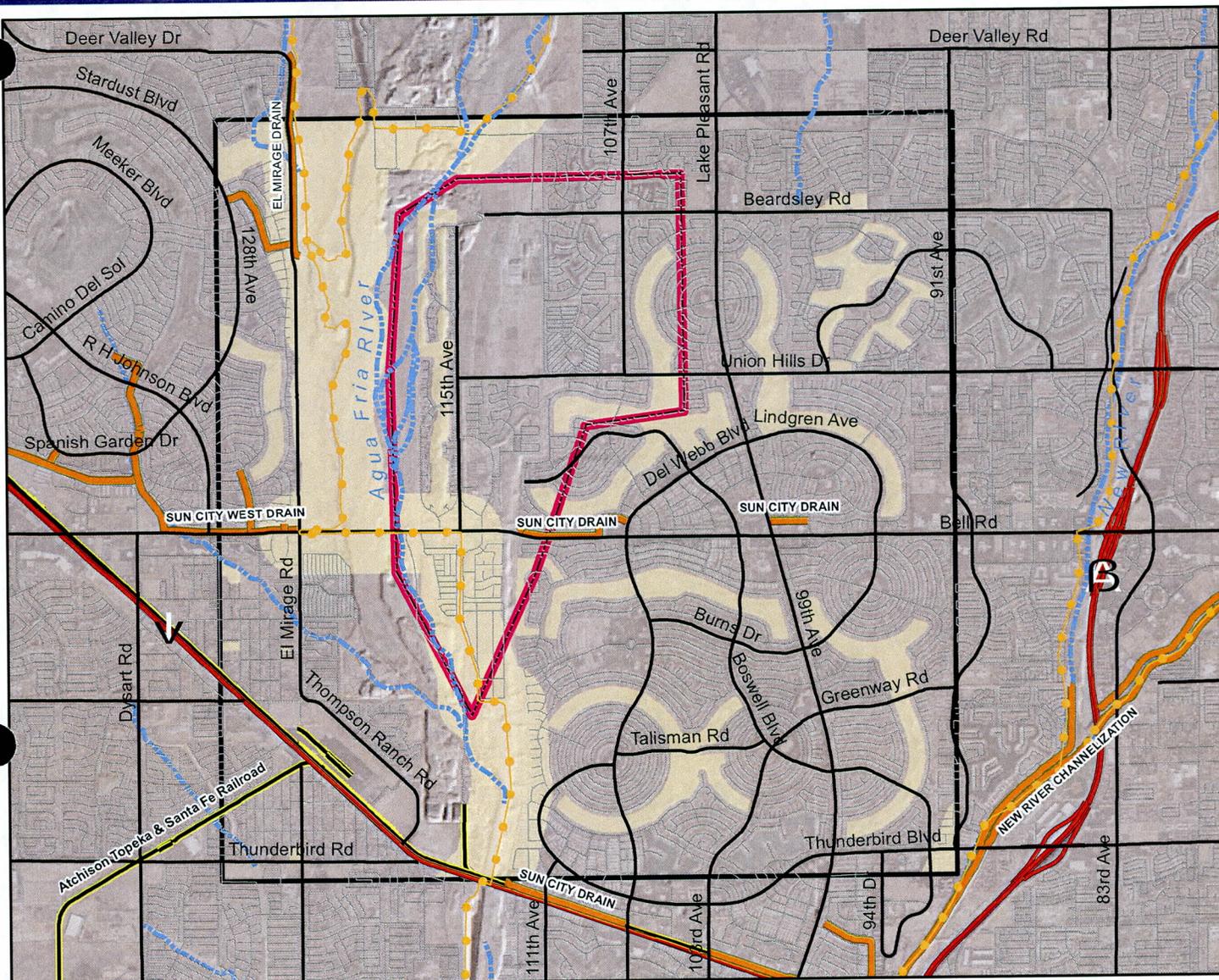


1 inch = 1 miles

Figure 19



107th Avenue and Union Hills Drive DCR Parks & Recreation Resources Structural Methods Compatibility



Parks & Recreation Resources Structural Methods Compatibility

- Compatibility Class 3
- Maricopa Regional Trail System

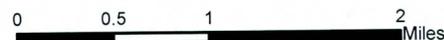
Reference Features

- | | |
|--|--|
| Study Area | Major Arterial |
| Project Site | Collector Streets |
| Highways | Streams |
| Rail-Road | FCD Structures |

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Parks & Recreation Resources Flood Protection Structural Methods Compatibility Ratings Matrix, 2008
- Parks & Recreation Resources Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

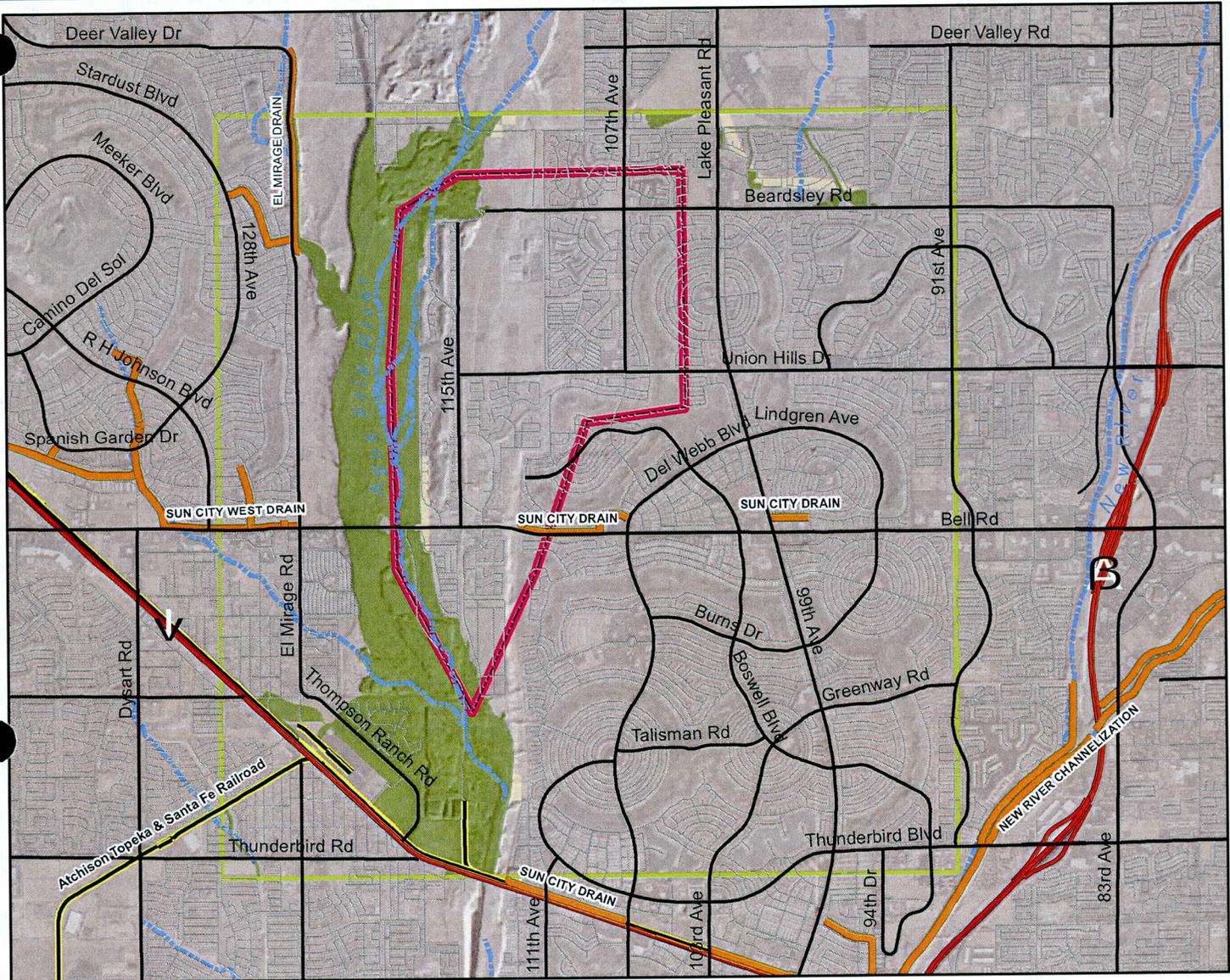


1 inch = 1 miles

Figure 20



107th Avenue and Union Hills Drive DCR Open Space Resources Structural Methods Compatibility



Open Space Resources Structural Methods Compatibility

- Compatibility Class 1
- Compatibility Class 3

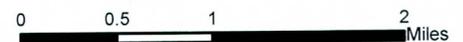
Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Maricopa Association of Governments
- USDI Bureau of Land Management
- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA), 2008
- Open Space Resources Flood Protection Structural Methods Compatibility Ratings Matrix, 2008
- Open Space Resources Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

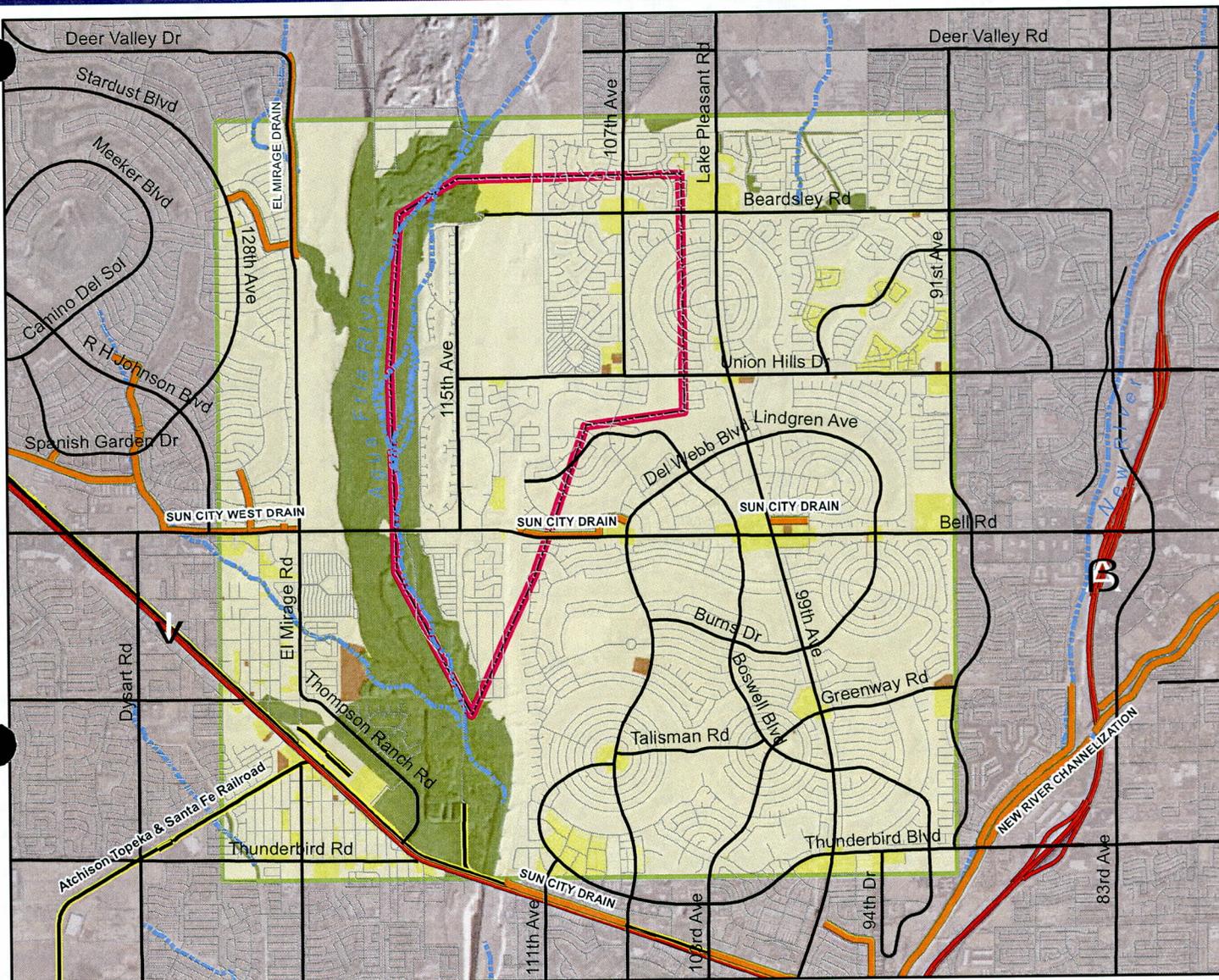


1 inch = 1 miles

Figure 21



107th Avenue and Union Hills Drive DCR Existing Combined Structural Methods Compatibility



Existing Combined Structural Methods Compatibility

- Compatibility Class 1
- Compatibility Class 3
- Compatibility Class 4
- Compatibility Class 6

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA)
- Existing Landscape Character Units Flood Protection Structural Methods Map, 2008
- Parks & Recreation Resources Flood Protection Structural Methods Map, 2008
- Open Space Resources Flood Protection Structural Methods Map, 2008

Prepared by
Flood Control District of Maricopa County
June 2010

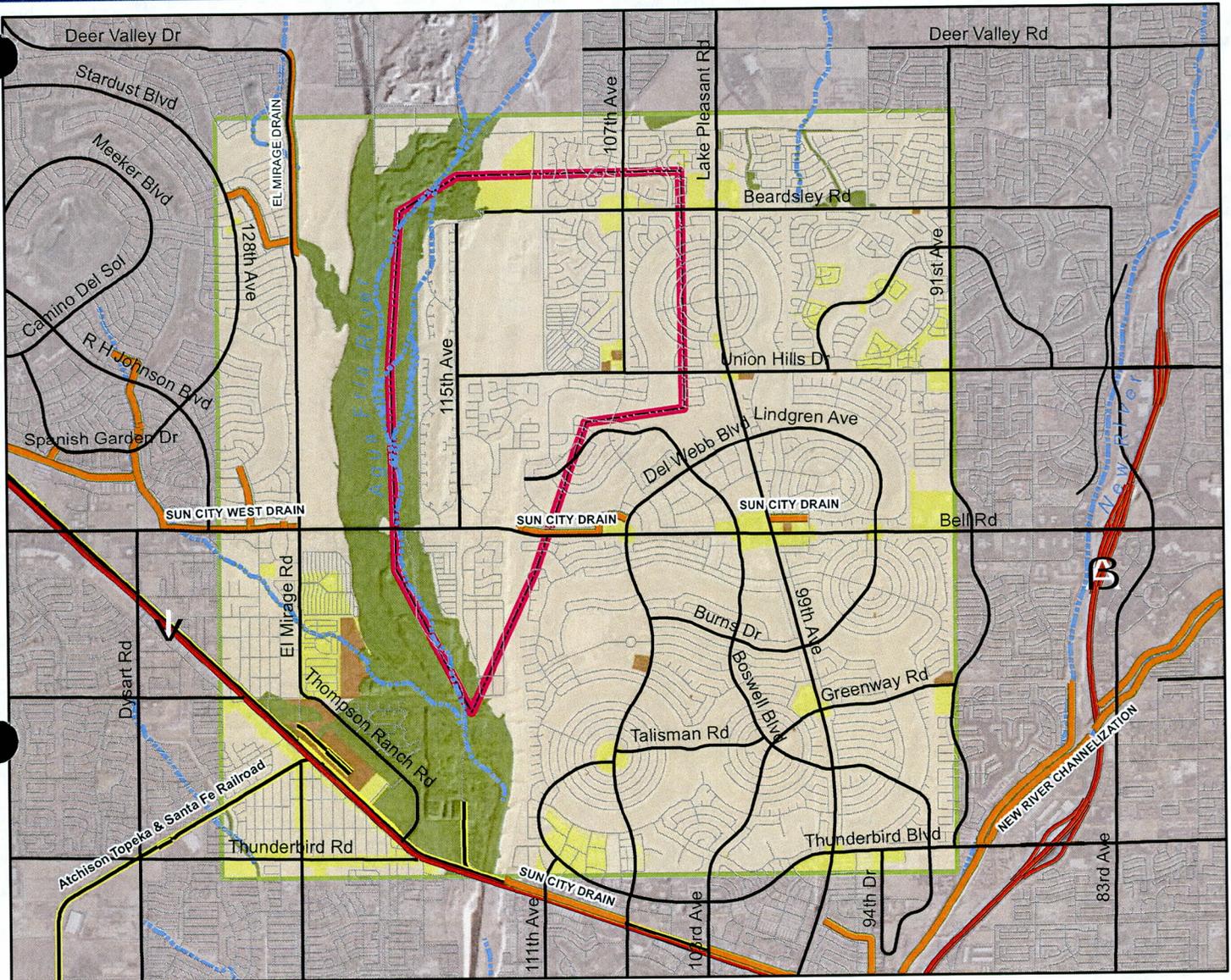


1 inch = 1 miles

Figure 22



107th Avenue and Union Hills Drive DCR Future Combined Structural Methods Compatibility



Future Combined Structural Methods Compatibility

- Compatibility Class 1
- Compatibility Class 3
- Compatibility Class 4
- Compatibility Class 6

Reference Features

- Study Area
- Project Site
- Highways
- Rail-Road
- Major Arterial
- Collector Streets
- Streams
- FCD Structures

Sources

- Flood Control District of Maricopa County Landscape Inventory & Analysis (LIA)
- Future Landscape Character Units Flood Structural Protection Methods Map, 2008
- Parks & Recreation Resources Flood Protection Structural Methods Map, 2008
- Open Space Resources Flood Protection Structural Methods Map, 2008

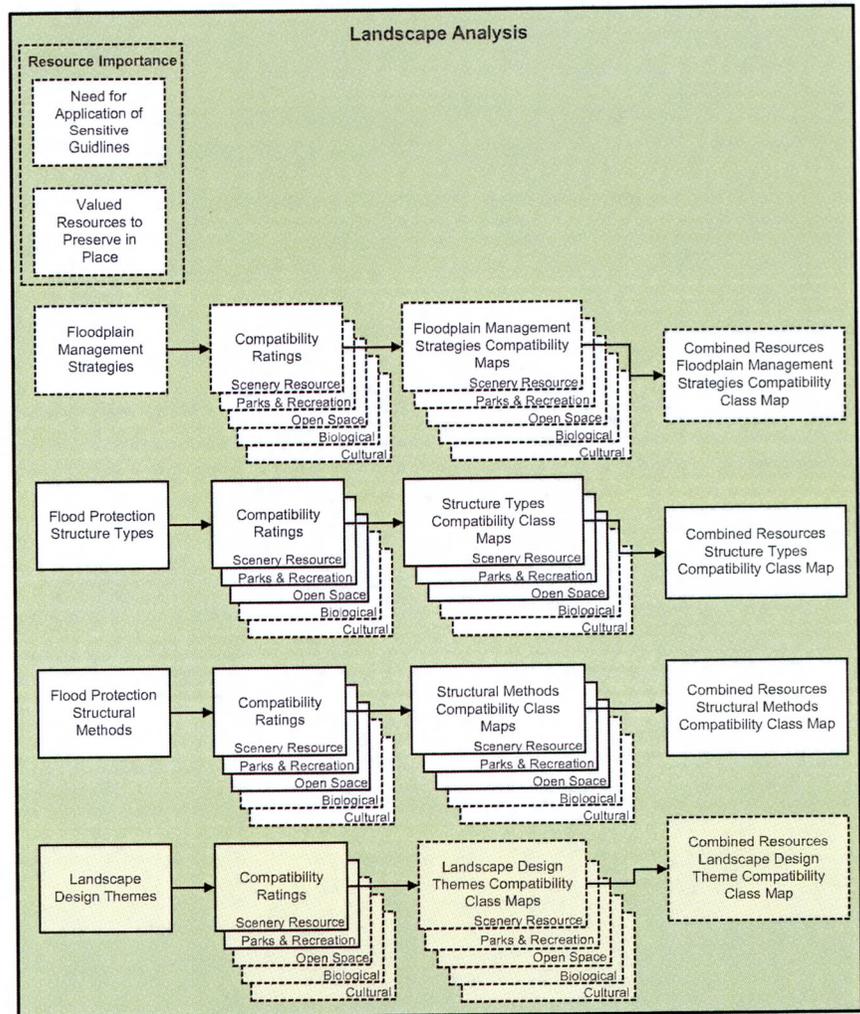
Prepared by
Flood Control District of Maricopa County
June 2010



1 inch = 1 miles

Figure 23

Landscape Design Themes Compatible Analysis





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.

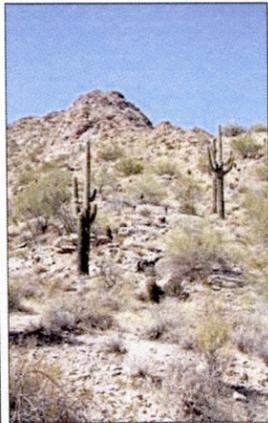
Landscape design themes identify the desired overall "look" for flood control projects for specific landscape settings. The landscape design theme, as intended herein, is a visual design concept that is established to unify the visual appearance of flood control projects with the visual character of 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.

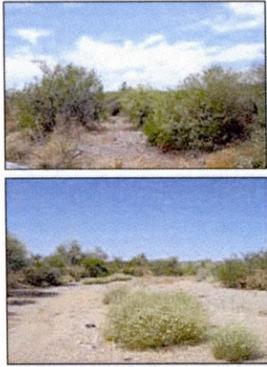
Natural Sonoran Desert Uplands Theme

- 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 Saguro 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 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 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 patterns that are typically associated with the drainage features found in this 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.



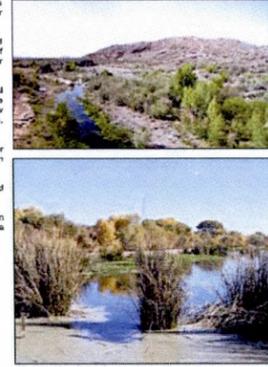
Natural Sonoran Desert Uplands Riparian Theme

- 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 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 terraces.
- 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.



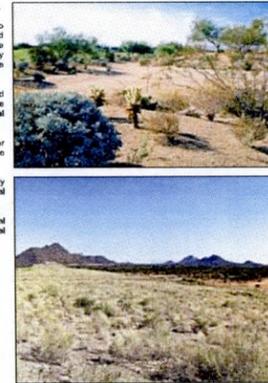
Natural Lower Sonoran Desert Theme

- 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, Bursage 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.



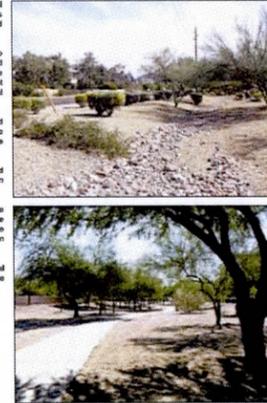
Semi-Natural Sonoran Desert Theme

- 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 palette 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, enhance 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 have 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, enhance 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, enhance 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 landscape 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.



Landscape Design Themes Compatible with Landscape Character Units

TABLE 5

Sonoran Desert Character Type	1	2	3	4	5	6	7	8	9	10
	Natural Sonoran Desert Upland	Natural Sonoran Desert Upland Riparian	Natural Lower Sonoran Desert	Natural Lower Sonoran Desert Riparian	Natural Sonoran Desert Hydro Riparian	Semi-Natural Sonoran Desert	Enhanced Desert	Desert Park	Desert Oasis	Urban Plaza
Landscape Character Units										
Natural River Channel	IC	IC	IC	C	C	C	IC	IC	IC	IC
Rural River Channel	IC	IC	IC	C	C	C	IC	IC	IC	IC
Suburban River Channel	IC	IC	IC	C	C	C	C	C	C	C
Urban River Channel	IC	IC	IC	C	C	C	C	C	C	C
Industrial River Channel	IC	IC	IC	C	C	C	C	C	C	C
Natural River Terrace	IC	IC	IC	C	C	C	IC	IC	IC	IC
Rural River Terrace	IC	IC	IC	C	C	C	IC	IC	IC	IC
Suburban River Terrace	IC	IC	IC	C	C	C	C	C	C	C
Urban River Terrace	IC	IC	IC	C	C	C	C	C	C	C
Industrial River Terrace	IC	IC	IC	C	C	C	C	C	C	C
Natural Valley Plain	IC	IC	C	C	C	C	IC	IC	IC	IC
Rural Valley Plain	IC	IC	C	C	C	C	IC	IC	IC	IC
Suburban Valley Plain	IC	IC	C	C	C	C	C	C	C	C
Urban Valley Plain	IC	IC	C	C	C	C	C	C	C	C
Industrial Valley Plain	IC	IC	C	C	C	C	C	C	C	C
Natural Valley Wash	IC	IC	IC	C	C	C	IC	IC	IC	IC
Rural Valley Wash	IC	IC	IC	C	C	C	IC	IC	IC	IC
Suburban Valley Wash	IC	IC	IC	C	C	C	C	C	C	C
Urban Valley Wash	IC	IC	IC	C	C	C	C	C	C	C
Industrial Valley Wash	IC	IC	IC	C	C	C	C	C	C	C
Natural Arroyo	IC	C	IC	IC	C	C	IC	IC	IC	IC
Rural Arroyo	IC	C	IC	IC	C	C	IC	IC	IC	IC
Suburban Arroyo	IC	C	IC	IC	C	C	C	C	C	C
Urban Arroyo	IC	C	IC	IC	C	C	C	C	C	C
Industrial Arroyo	IC	C	IC	IC	C	C	C	C	C	C
Natural Upper Bajada	C	C	IC	IC	C	C	IC	IC	IC	IC
Rural Upper Bajada	C	C	IC	IC	C	C	IC	IC	IC	IC
Suburban Upper Bajada	C	C	IC	IC	C	C	C	C	C	C
Urban Upper Bajada	C	C	IC	IC	C	C	C	C	C	C
Industrial Upper Bajada	C	C	IC	IC	C	C	C	C	C	C
Natural Lower Bajada	C	C	IC	IC	C	C	IC	IC	IC	IC
Rural Lower Bajada	C	C	IC	IC	C	C	IC	IC	IC	IC
Suburban Lower Bajada	C	C	IC	IC	C	C	C	C	C	C
Urban Lower Bajada	C	C	IC	IC	C	C	C	C	C	C
Industrial Lower Bajada	C	C	IC	IC	C	C	C	C	C	C
Natural Volcanic Field	C	C	IC	IC	C	C	IC	IC	IC	IC
Rural Volcanic Field	C	C	IC	IC	C	C	IC	IC	IC	IC
Suburban Volcanic Field	C	C	IC	IC	C	C	C	C	C	C
Urban Volcanic Field	C	C	IC	IC	C	C	C	C	C	C
Industrial Volcanic Field	C	C	IC	IC	C	C	C	C	C	C
Natural Foothills	C	C	IC	IC	C	C	IC	IC	IC	IC
Rural Foothills	C	C	IC	IC	C	C	IC	IC	IC	IC
Suburban Foothills	C	C	IC	IC	C	C	C	C	C	C
Urban Foothills	C	C	IC	IC	C	C	C	C	C	C
Industrial Foothills	C	C	IC	IC	C	C	C	C	C	C
Natural Mountains	C	C	IC	IC	C	C	IC	IC	IC	IC
Rural Mountains	C	C	IC	IC	C	C	IC	IC	IC	IC
Suburban Mountains	C	C	IC	IC	C	C	C	C	C	C
Urban Mountains	C	C	IC	IC	C	C	C	C	C	C
Industrial Mountains	C	C	IC	IC	C	C	C	C	C	C

C = Compatible with Landscape Design Theme
 IC = Incompatible with Landscape Design Theme
 Landscape Character Units within Lower EI Mirage CAR

Landscape Design Themes Compatible with Parks & Recreation Resources

TABLE 6

Sonoran Desert Character Type	1	2	3	4	5	6	7	8	9	10
	Natural Sonoran Desert Upland	Natural Sonoran Desert Upland Riparian	Natural Lower Sonoran Desert	Natural Lower Sonoran Desert Riparian	Natural Sonoran Desert Hydro Riparian	Semi-Natural Sonoran Desert	Enhanced Desert	Desert Park	Desert Oasis	Urban Plaza
Federal										
Wilderness Areas	C	C	C	C	C	IC	IC	IC	IC	IC
National Monuments	C	C	C	C	C	IC	IC	IC	IC	IC
National Wildlife Refuges / Preserves	C	C	C	C	C	IC	IC	IC	IC	IC
Other BLM Lands	C	C	C	C	C	C	C	C	IC	IC
Other National Forest Lands	C	C	C	C	C	C	C	C	IC	IC
State										
State Parks (None)	C	C	C	C	C	IC	IC	IC	IC	IC
Wildlife Areas	C	C	C	C	C	IC	IC	IC	IC	IC
Regional										
County Regional Parks	C	C	C	C	C	IC	IC	IC	IC	IC
County Recreation Areas	C	C	C	C	C	C	IC	IC	IC	IC
City Regional Parks	C	C	C	C	C	C	IC	IC	IC	IC
City Mountain Preserves	C	C	C	C	C	IC	IC	IC	IC	IC
Maricopa Regional Trail System	C	C	C	C	C	C	C	C	C	C
Local										
City and County Parks										
Rural	C	C	C	C	C	C	C	C	C	C
Suburban	C	C	C	C	C	C	C	C	C	C
Urban	C	C	C	C	C	C	C	C	C	C
Other Recreation Areas										
Golf Courses	C	C	C	C	C	C	C	C	C	C

C = Compatible with Landscape Design Theme

IC = Incompatible with Landscape Design Theme

Parks & Recreation Resources within Lower El Mirage CAR

Landscape Design Themes Compatible with Open Space Resources

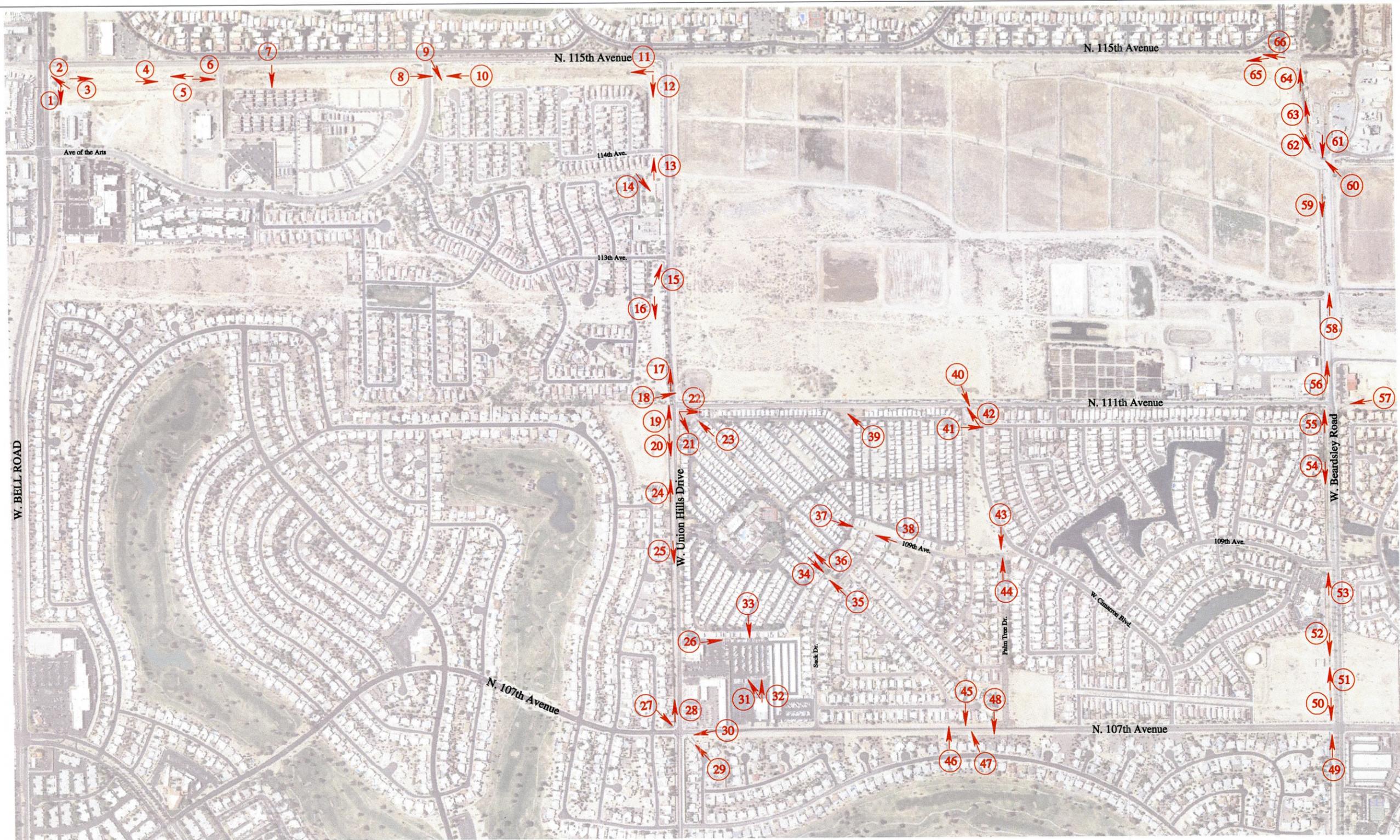
TABLE 7

Sonoran Desert Character Type	1	2	3	4	5	6	7	8	9	10
	Natural Sonoran Desert Upland	Natural Sonoran Desert Upland Riparian	Natural Lower Sonoran Desert	Natural Lower Sonoran Desert Riparian	Natural Sonoran Desert Hydro Riparian	Semi-Natural Sonoran Desert	Enhanced Desert	Desert Park	Desert Oasis	Urban Plaza
Desert Spaces Open Space Plan										
Secured Open Space										
Federal										
Wilderness Areas	C	C	C	C	C	C	IC	IC	IC	IC
National Monuments	C	C	C	C	C	C	IC	IC	IC	IC
National Wildlife Refuges / Preserves	C	C	C	C	C	C	IC	IC	IC	IC
State										
State Parks (None)	C	C	C	C	C	IC	IC	IC	IC	IC
Wildlife Areas	C	C	C	C	C	IC	IC	IC	IC	IC
Regional										
County Regional Parks	C	C	C	C	C	C	IC	IC	IC	IC
County Recreation Areas	C	C	C	C	C	C	IC	IC	IC	IC
City Regional Parks	C	C	C	C	C	IC	IC	IC	IC	IC
City Mountain Preserves	C	C	C	C	C	C	IC	IC	IC	IC
Conservation Open Spaces	C	C	C	C	C	IC	IC	IC	IC	IC
Retention Open Spaces	C	C	C	C	C	C	C	C	IC	IC
Other Federal Open Space Lands										
BLM	C	C	C	C	C	C	C	C	IC	IC
National Forest Lands	C	C	C	C	C	C	C	C	IC	IC
Floodplain Lands										
Floodways	IC	C	IC	C	C	C	IC	IC	IC	IC
Floodplain Fringe Areas & Other Floodplain Zones	C	C	C	C	C	C	C	C	C	IC

C = Compatible with Landscape Design Theme
 IC = Incompatible with Landscape Design Theme

Open Space Resources within Lower EI Mirage CAR





LEGEND

 DCR SITE PHOTO NUMBER AND LOCATION



ENGINEER/PLANNER:
GOODWIN & MARSHALL
 CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS
 6909 W. Ray Rd. #15, Chandler, AZ 85226
 Metro (602) 218-7285

PHOTO LOCATION EXHIBIT
 FOR
107TH AVENUE AND UNION HILL DRIVE
 CONTRACT: FCD 2009C036
 CITIES OF PEORIA AND SURPRISE
 MARICOPA COUNTY, ARIZONA
 MAY, 2010



Photo 5 - Facing south in channel adjacent to N. 115th Ave. approx. 950 feet north of W. Bell Rd.



Photo 6 - Facing north in channel adjacent to N. 115th Ave. approx. 1300 feet north of W. Bell Rd.



Photo 7 - Facing east along N. 115th Ave. approx. 1800 feet north of W. Bell Rd.



Photo 8 - Facing north overlooking channel adjacent to N. 115th Ave. at its intersection with the Ave. of the Arts.



Photo 9 - Facing east along N. 115th Ave. approx. 1850 feet south of W. Union Hills Dr.



Photo 10 - Facing south in channel adjacent to N. 115th Ave. approx. 1800 feet south of W. Union Hills Dr.

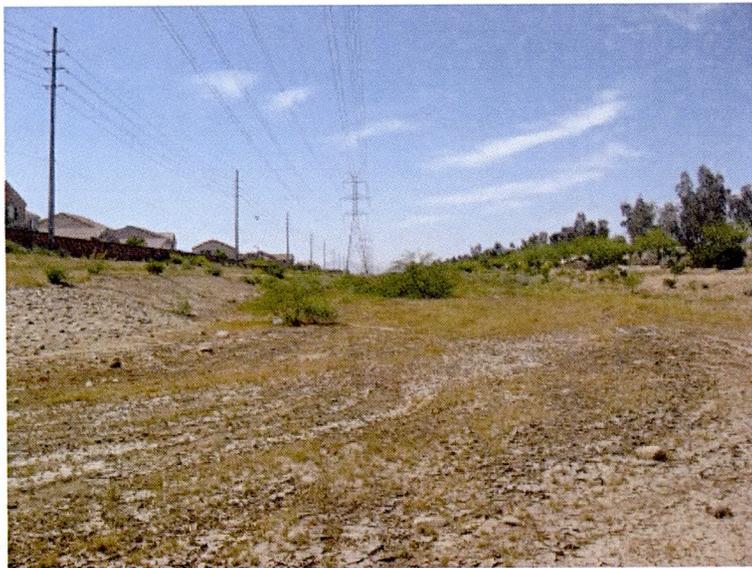


Photo 11 - Facing south in channel at southeast corner of intersection N. 115th Ave. and W. Union Hills Dr.



Photo 12 - Facing east in channel at southeast corner of intersection N. 115th Ave. and W. Union Hills Dr.



Photo 13 - Facing west in channel at southeast corner of intersection W. Union Hills Dr. and 114th Ave.



Photo 14 - Facing east in channel at southeast corner of intersection W. Union Hills Dr. and 114th Ave.



Photo 15 - Facing west in channel at southeast corner of intersection W. Union Hills Dr. and 113th Ave.



Photo 16 - Facing east near channel at southeast corner of intersection W. Union Hills Dr. and 113th Ave.



Photo 17 - Facing west near northwest corner of intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 18 - Facing northwest near southwest corner of intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 19 - Facing west along south side of W. Union Hills Dr. immediately east of N. 111th Ave.



Photo 20 - Facing east near southeast corner of intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 21 - Facing northeast , northeast corner of intersection at N. 111th Ave. and W. Union Hills Dr.

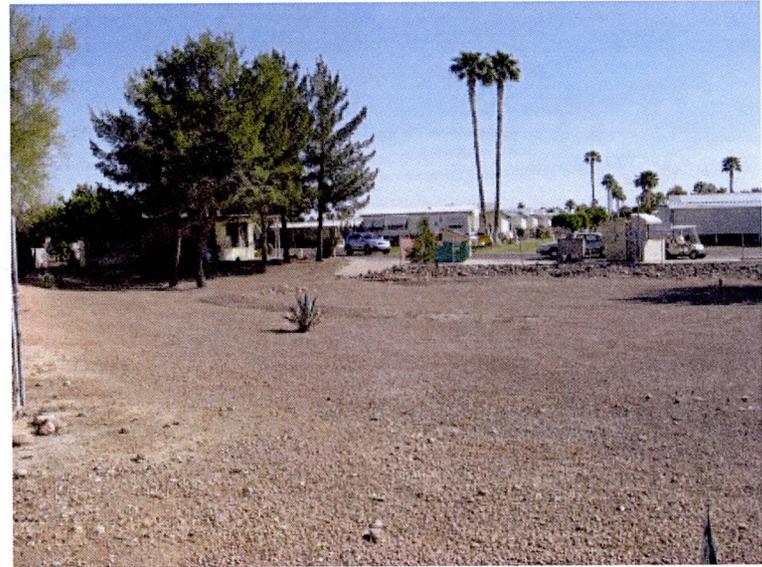


Photo 22 - Facing north, northeast corner of intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 23 - Facing southwest, northeast corner of intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 24 - Facing west, adjacent to W. Union Hill Dr. approx. 800 feet east of the intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 25 - Facing east, adjacent to W. Union Hills Dr. approx. 1200 feet east of the intersection at N. 111th Ave. and W. Union Hills Dr.



Photo 26 - Facing north approx. 800 feet west of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 27 - Facing northeast, southwest corner of intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 28 - Facing west, southwest corner of intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 29 - Facing southwest in Channel, northeast corner of intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 30 - Facing south near Channel, northeast corner of intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 31 - Facing southwest in parking lot, approx. 700 feet northwest of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 32 - Facing west in parking lot, approx. 700 feet northwest of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 33 - Facing east approx. 1000 feet northwest of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 34 - Facing northeast approx. 1000 feet north and 1400 feet west of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 35 - Facing southwest approx. 1300 feet north and 1000 feet west of the intersection at N. 107th Ave. and W Union Hills Dr.



Photo 36 - Facing northeast approx. 800 feet north and 1600 feet west of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 37 - Facing northeast approx. 1300 feet north and 1700 feet west of the intersection at N. 107th Ave. and W. Union Hills Dr.



Photo 38 - Facing southwest approx. 1000 feet east and 700 feet south of the intersection at N. 111th Ave. and W. Cimarron Blvd.

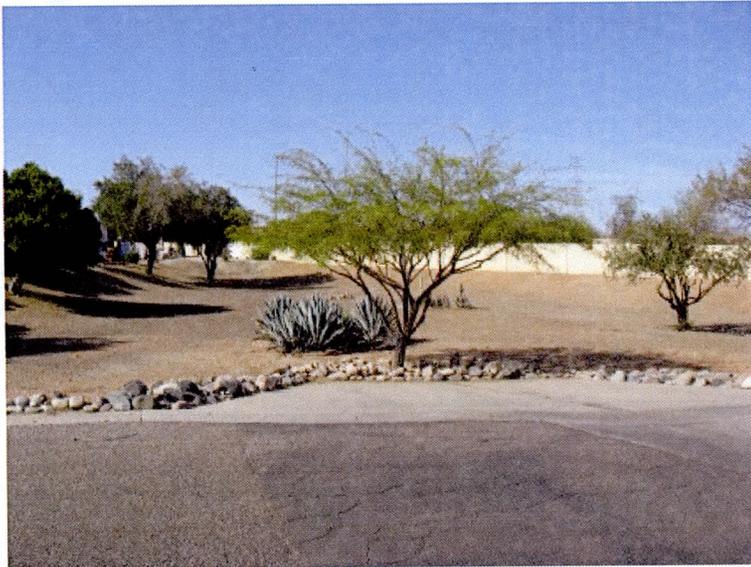


Photo 39 - Facing southwest, adjacent to N. 111th Ave., approx. 1100 feet south of W. Cimarron Blvd.



Photo 40 - Facing east along west side of N. 111th Ave. immediately south of W. Cimarron Blvd.

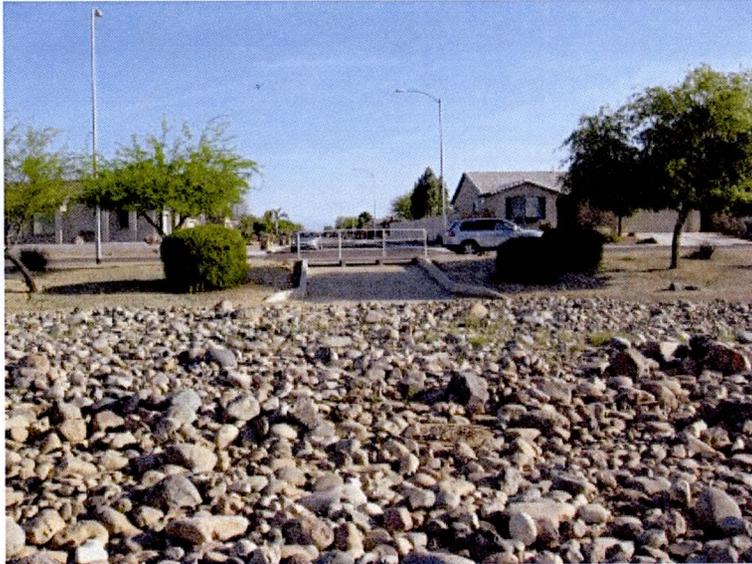


Photo 41 - Facing north, southeast corner of the intersection at N. 111th Ave. and W. Cimarron Blvd.



Photo 42 - Facing west, southeast corner of the intersection at N. 111th Ave. and W. Cimarron Blvd.



Photo 43 - Facing east adjacent to Palm Tree Dr. approx. 1200 feet east of N. 111th Ave.



Photo 44 - Facing west adjacent to Palm Tree Dr. approx. 1300 feet east of N. 111th Ave.



Photo 45 - Facing east adjacent to N. 107th Ave. approx. 2300 feet north of W. Union Hills Blvd.



Photo 46 - Facing west adjacent to N. 107th Ave. approx. 2150 feet north of W. Union Hills Blvd.



Photo 47 - Facing west adjacent to N. 107th Ave. approx. 2400 feet north of W. Union Hills Blvd.



Photo 48 - Facing east adjacent to N. 107th Ave. approx. 2550 feet north of W. Union Hills Blvd.



Photo 49 - Facing west in channel, southeast corner of the intersection at N. 107th Ave. and W. Beardsley Rd.



Photo 50 - Facing east in channel, southwest corner of the intersection at N. 107th Ave. and W. Beardsley Rd.



Photo 51 - Facing west in channel adjacent to W. Beardsley Rd., approx. 500 feet west of N. 107th Ave.



Photo 52 - Facing east in channel adjacent to W. Beardsley Rd., approx. 650 feet west of N. 107th Ave.



Photo 53 - Facing west in channel, southeast corner of the intersection at W. Beardsley Rd. and 109th Ave.



Photo 54 - Facing east in channel adjacent to W. Beardsley Rd. approx. 500 feet east of N. 111th Ave.

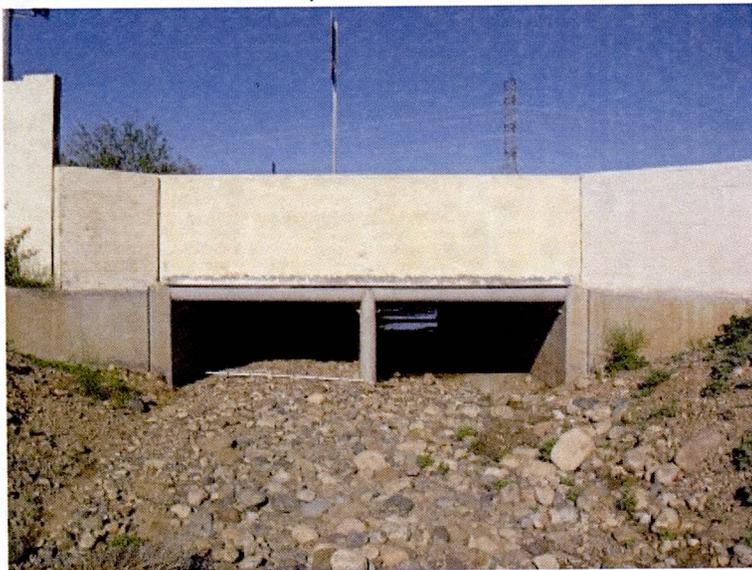


Photo 55 - Facing west in channel, southeast corner of the intersection at N. 111th Ave. and W. Beardsley Rd.

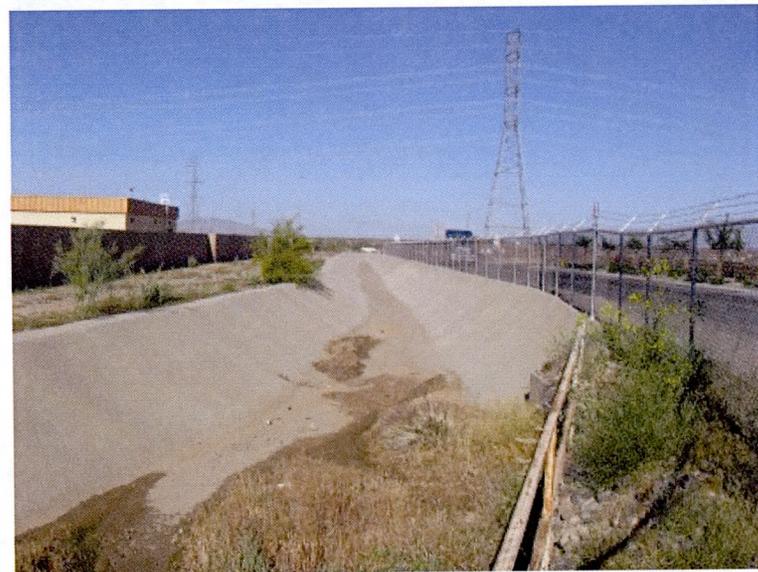


Photo 56 - Facing west, southwest corner of the intersection at N. 111th Ave. and W. Beardsley Rd.



Photo 57 - Facing south in channel, along north side of W. Beardsley Rd. and immediately west of N. 111th Ave.



Photo 58 - Facing west in channel, adjacent to W. Beardsley Rd., approx. 900 feet west of N. 111th Ave.



Photo 59 - Facing east adjacent to W. Beardsley Rd., approx. 1300 feet east of N. 115th Ave.



Photo 60 - Facing southwest, approx. 800 feet east of the intersection at N. 115th Ave. and W. Beardsley Rd.



Photo 61 - Facing east, approx. 675 feet east of the intersection at N. 115th Ave. and W. Beardsley Rd.



Photo 62 - Facing northeast, approx. 600 feet east of the intersection at N. 115th Ave. and W. Beardsley Rd.



Photo 63 - Facing west, approx. 350 feet east of the intersection at N. 115th Ave. and W. Beardsley Rd.



Photo 64 - Facing west, southeast corner of the intersection at N. 115th Ave. and W. Beardsley Rd.



Photo 65 - Facing south, southeast corner of the intersection at N. 115th Ave. and W. Beardsley Ave.



Photo 66 - Facing south, southwest corner of the intersection at N 115th Ave. and W. Beardsley Ave.





AGENDA

**2009C036 Assignment #2
MEETING #1 - KICKOFF
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
September 23, 2010
1:00 p.m. – 3:00 p.m.**

Attendees: Burke Lokey – FCDMC
Bobbie Ohler – FCDMC
Steven Tucker – FCDMC
Dennis Holcomb – FCDMC
Chuck Christiansen – MCDOT (unavailable)
Burton Charron – City of Peoria
Jeff Davidson – City of Surprise
Warren Russell - Goodwin and Marshall, Inc.
Matt Goodwin - Goodwin and Marshall, Inc.
Andy Baron - Anderson-Baron
Tom Durant - Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

**1:00 p.m. –
3:00 p.m.**

- Introductions
- Project History
- Phase 1 DCR Findings
- Overview of Expanded Project Boundary
- Context and Sensitive Flood Hazard Mitigation Planning and Design Approach - Overview
- CSFHM – Goals
- Stakeholder Input and Responsibilities
- Alternative Analysis Goals
- Current Project Scheduling
- Phase 2 Revised Hydrology Findings
- Phase 2 Preliminary HEC-RAS / Flood Plain Delineation Findings



MEETING NOTES

**2009C036 Assignment #2
MEETING #1 - KICKOFF
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
September 23, 2010
1:00 p.m. – 3:00 p.m.**

Attendees: Burke Lokey (BL) – FCDMC
Bobbie Ohler (BO) – FCDMC
Steven Tucker (ST) – FCDMC
Burton Charron (BC) – City of Peoria (COP)
Jeff Davidson (JD) – City of Surprise (COS)
Warren Russell (WR) – Goodwin and Marshall, Inc. (GM)
Matt Goodwin (MG) – Goodwin and Marshall, Inc.
Andy Baron (AB) – Anderson-Baron (A-B)
Tom Durant (TD) – Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

The purpose of this meeting was to serve as the Phase 2 kick-off for the above referenced project. Discussions were primarily focused on project history, findings of the Phase 1 report, explanation of the expanded project boundary, preliminary hydrologic and hydraulic findings, scheduling and CSFHM and Alternative Analysis study goals.

The results of the Phase 1 report were in concert with the flooding complaints received by the City of Peoria (COP) and the City Surprise (COS) for the areas discussed above. Additionally, the DCR determined the flood hazards appear to be largely caused by the fact the 107th Avenue, Union Hills Drive, and the subject developments do not have an organized storm drain system and rely upon overland flow and undersized roadside swales to convey storm water through the study area.

Through discussions with the District it was determined that the Phase 2 study area would extend south approximately 1 mile to the watershed area confluence with the Agua Fria River. The expansion of the study area is necessary to ensure any flood mitigation alternatives explored do not have a negative effect on downstream properties.

The preliminary hydrology and hydraulic findings indicate that the existing drainage facilities along Union Hills Drive, 115th Avenue, and the channel section south of Bell Road do not have sufficient capacity to convey the 100 year design event. A technical memorandum for the revised hydrology and the existing conditions HEC-RAS model will be complete by Monday, October the 4th and submitted to the District for review Tuesday, October the 5th.



Discussions were had regarding the fact that, the project hydrology utilizes NOAA2 rainfall data and based on the findings of current District projects revising Hydrology from NOAA2 to NOAA14, the storm discharges may be substantially reduced should NOAA14 rainfall data be utilized. However due to the extensive nature of the project watershed area and for continuity sake, the NOAA2 discharges will be utilized in the Phase 2 study until such time the District directs otherwise. Additionally it was noted that the COS has completed the construction of the north lane, curb and sidewalk of Union Hills Drive from 111th to 115th Avenue - GM will coordinate with District survey staff on obtaining as built survey information for Union Hills Drive for potential inclusion in the HEC-RAS model.

Discussions were had by the stakeholders regarding the limits of the Alternative Analysis study area, the result of which was substantially in concert with the Phase 2 scope of work. The Alternative Analysis study area will include the following corridors:

- 107th Avenue - Beardsley Road to Union Hills Drive
- Union Hills Drive - 107th Avenue to 115th Avenue
- 111th Avenue - Beardsley Road to Union Hills Drive
- 115th Avenue - Beardsley Road to Bell Road

CSFHM Overview

The District has provided the Landscape Inventory & Analysis (LIA) for use in the CSFHM process. Anderson Baron will be responsible for verification of LIA data and coordination with the City of Surprise, City of Peoria and Maricopa County planning on the Community Inventory and Analysis (CIA). Goodwin and Marshall, Inc. will be responsible for the Flood Inventory & Analysis and coordination and implementation of all data above into the CSFHM Base Map. The CSFHM process is intended to culminate in the stakeholder meeting currently scheduled for the CSFHM work session in which the range of possible flood mitigation solutions will be analyzed for acceptability, compatibility, effectiveness; resulting in a total of four solutions (including one do nothing) chosen for further study.

Project Goals

Through input from all stakeholders the project goals were identified as following:

- Provide Solutions for the flooding occurring on 107th Avenue, Union Hills Drive, and 115th Avenue. The 100 year design event is preferable however solutions utilizing the 10 year event will be analyzed should the 100 year event become infeasible.
- Provide Solutions that take into consideration the ultimate Transportation needs of 107th Avenue, Union Hills Drive, and 115th Avenue.
- Provide Solutions that take into consideration the ultimate utility needs for the City of Peoria, and the City of Surprise.
- Provide Solutions that take into consideration the ultimate Parks/Trails/Multi-use requirements of the City of Peoria, the City of Surprise, Maricopa County and neighborhood/public input.
- Provide Solutions that may be phased and accomplish the goals above.

The considerations discussed above should focus on allowing adequate ROW, identifying facility locations in cross-section, and balancing the cost of temporary solution elements with the ultimate solution goals.



Design

For continuity, all drainage design criteria shall be performed per the FCDMC manuals (City of Surprise and City of Peoria drainage criteria are not applicable for this alternative analysis).

Based on current right-of-way ownership, roadway and utility design input for 107th Avenue will be provided by City of Peoria, 115th Avenue will be provided by the City of Surprise, and 111th Avenue and Union Hills Drive will be provided by City of Surprise, City of Peoria and MCDOT. It was determined that the Alternative Analysis is not the appropriate forum to identify maintenance responsibilities for the roadways or drainage facilities that ownership is in question – this would be done as part of the IGA prepared in conjunction with the final design.

Action List

Goodwin and Marshall

- Finalize Hydrology and HEC-RAS for submittal to the District for Review
- Coordinate with COS and COP on Roadway/Utility Cross Sections
- Coordinate with AB, COS, COP, MCDOT on LIA and CIA findings
- Coordinate with AB on preparation of CSFHM Base Map
- Coordinate with District on obtaining as-built information for Union Hills Drive.
- Prepare a predictive analysis to be utilized indicating whether each Flood Hazard Mitigation solution is acceptable, compatible or effective.

Anderson-Baron

- Contact Maricopa County Trails Department (Chris Cougar), COS Parks (Hobart Wingard), and COP Parks (Jeff Sargent) in order to development CIA.
- Review District LIA report, review aerial photography and perform field reconnaissance to ensure the report is conformance with existing conditions. Review appropriate general plan information to ensure LIA report is in conformance with future conditions.
- Prepare the CSFHM project base map that includes data gathered from the CIA, LIA and FIA inventories.

Flood Control District

- Review project schedule to ensure public meeting dates proposed are appropriate when compared to the projected status of the project.

Please contact Warren Russell at wrussell@gmcivil.com or 602-218-7285 should any revisions or corrections be requested.



AGENDA

**2009C036 Assignment #2
MEETING #1 – CSFHM Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
October 20, 2010
2:00 p.m. – 5:00 p.m.**

Prospective Attendees:

Burke Lokey	– FCDMC
Bobbie Ohler	– FCDMC
Steven Tucker	– FCDMC
Dennis Holcomb	– FCDMC
Chuck Christiansen	– MCDOT
Burton Charron	– City of Peoria
Jeff Davidson	– City of Surprise
Warren Russell	- Goodwin and Marshall, Inc.
Matt Goodwin	- Goodwin and Marshall, Inc.
Andy Baron	- Anderson-Baron
Tom Durant	- Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

**2:00 p.m. –
5:00 p.m.**

- Review Meeting 1 Notes and Project Goals
- Review Findings of the Flood Context Inventory, Land Resources Inventory, and Community Context Inventory
- Review Findings of Flood Hazard Mitigation Solutions Analysis and Context Sensitive Flood Hazard Mitigation Solution Analysis
- Review Study Area Roadway Cross-Section Analysis
- Alternatives Formulation and Evaluation Work Session



MEETING NOTES

2009C036 Assignment #2
MEETING #2 – CSFHM Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
October 20, 2010
2:00 p.m. – 5:00 p.m.

Attendees:

Burke Lokey (BL)	– FCDMC
Bobbie Ohler (BO)	– FCDMC
Dennis Holcomb (DH)	– FCDMC
Chuck Christiansen (CC)	– MCDOT
Burton Charron (BC)	– City of Peoria
Jeff Davidson (JD)	– City of Surprise
Warren Russell (WR)	- Goodwin and Marshall, Inc.
Tom Durant (TD)	- Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

The purpose of this meeting was to serve as a CSFHM and Alternative Analysis Formulation and Evaluation Work Session.

- Review Meeting 1 Notes and Project Goals
 - CC asked that the 10 year design event be removed from Goal 1.
 - JD asked that Bell Road be added to Goal 2.
 - DH asked that additional CSFHM Goals be added.
 - BO asked that Blue Stake information be surveyed and included in the 15% set of plans.
 - BO stated that the district surveyors will most likely not be able to survey the blue stake markings based on their current workload. Surprise, Peoria, and MCDOT volunteered their survey services (if available) for this work.

Please find the **Revised Project Goals** below –

- Develop Context Sensitive Solutions for the flooding occurring on 107th Avenue, Union Hills Drive, and 115th Avenue. The 100 year design event is preferable however solutions utilizing a lesser event will be analyzed should the 100 year event become infeasible.
- Develop solutions that are context sensitive with the landscape setting of the project study area.
- Provide solutions that preserve existing recreation & open space resources and take into consideration the ultimate Parks/Trails/Multi-use requirements of the City of Peoria, the City of Surprise, Maricopa County and neighborhood/public input.
- Provide solutions that take into consideration the ultimate transportation and utility needs of 107th Avenue, Union Hills Drive, and 115th Avenue and Bell Road.
- Provide solutions that may be phased and accomplish the goals above.



- Review Findings of the Flood Context Inventory
 - CC found the Overall Flood Hazard Rating methodology to be a potential liability for MCDOT and if the group wished to publish any of the Risk Assessment findings or risk descriptors then he would need to obtain approval from MCDOT's legal department.
 - It was recommended and agreed that the Flood Hazard Rating be removed from this projects CSFHM process as it has no bearing on the final outcome.
 - DH would look into the methodology developed by G&M and evaluate if the CSFHM Design Guidelines should be amended.

- Review Findings of the Land Resources Inventory and Community Context Inventory
 - The findings in the Land Resources Inventory were confirmed by Anderson-Baron.
 - The Community Context Inventory revealed the following:
 - Jeff Sargent at the City of Peoria:
 - Would like to see pedestrian connectivity to complete an already started trail system that runs along Beardsley Road.
 - The idea was to use existing walks and trails to connect along 107th or 111th Ave. to Union Hills West to 115th and South to Bell Road.
 - Discussed a preference for 12' trails but 8' will work. (He does understand that the existing conditions don't allow for all surfaces to be the same, hard or soft, also that width may vary)
 - Possibility of Trees for shade along area that is undeveloped from Arts of the Ave to Bell Road on the east side.
 - Does not see any need or opportunities for Recreational components

 - Hobart Wingard at the City of Surprise:
 - Stated that no additional facilities are required or planned for this area of work.
 - Would like to also see Pedestrian Connectivity, would be onboard with the recommendations made by the City of Peoria

 - Chris Coover- Maricopa County Parks and Recreation Department:
 - This is the Priority 2 area for the regional trail system which would be implemented 10-15 years from now. Since the County participated on the City of Peoria Master Planning effort, they are confident that any alignment issues will be covered by the city in the interim.

- Review Findings of Flood Hazard Mitigation Solutions Analysis and Context Sensitive Flood Hazard Mitigation Solution Analysis
 - DH approved of the CSFHM Structure Types predictive matrices and asked that they be completed for Structural Methods – the matrices are not required for Landscaping.

- Review Study Area Roadway Cross-Section Analysis
 - The Cross-Section Analysis was approved in concept. In review of the various transportation master plans in was noted that conflicts existed in the various road designations – The City of Peoria and MCDOT will pass along the conflicts identified.
 - Peoria – 111th Avenue (Identified as Minor Arterial – should be Major Collector)
 - Peoria – Union Hills Drive (Identified as a Major Collector – should be Minor Arterial)
 - MCDOT – 107th Avenue (Identified as a Principal Arterial should be Minor Arterial)



- Alternatives Formulation and Evaluation Work Session
 - CC noted that based historic flooding events and the preliminary findings DCR hydraulic analysis that Bell Road is subject to overtopping due to the inadequate size of the box culverts under Bell Road. MCDOT request that the alternative analysis attempt to mitigate this flooding condition at Bell Road.
 - Reconstruction of these boxes to convey the existing conditions flows is deemed unfeasible due to the existing infrastructure in Bell Road and the high volume of daily traffic experienced on Bell Road.
 - Bell Road may be over topped in a 100 year event however based on county drainage design guidelines overtopping is limited to a maximum of 6" of depth.
 - Upon approval of the methodology contained in the existing conditions hydraulic model by the District, the flows contained in the model will be modified to identify the maximum allowable flows that the box culverts can convey.
 - Once the maximum allowable flows have been identified, various storage alternatives will be input into the HEC-1 model in order to identify the location and size of acceptable detention facilities.
 - Possible location of detention facilities identified in the work session were
 - 111th Avenue and Union Hills Drive (Peoria Property)
 - 115th Avenue and Union Hills Drive (Arizona American Property)
 - Existing Canyon Ridge Detention Facilities
 - 115th Avenue and Bell Road (Commercial properties located both on the west and east side of 115th Avenue)
 - JD and DH noted that an alternative to convey the flows west to the Agua Fria at Bell Road should be investigated.
 - The work session also identified the following flood mitigation methods, or combination of methods, be evaluated for the following segment of the project:
 - 107th Avenue (north of Union Hills Drive) – Underground Pipe
 - 111th Avenue (north of Union Hills Drive) – Capture Flows at Union Hill Drive
 - Union Hills Drive (107th Ave. to 111th Ave.) – Underground Pipe
 - Union Hills Drive (111th Ave. to 115th Ave.) – Underground Pipe / Utilize Existing Canyon Ridge Drainage Channel / Detention Basin / Channel along the north side of Union Hill Drive (Channel could serve as buffer from the WWTF)
 - 115th Avenue (north of Union Hills Drive) – Not a part of alternative analysis
 - 115 Avenue (south of Union Hills Drive) – Underground Pipe / Expand Existing Canyon Ridge Detention Ponds / Detention Basin (various locations) / Convey Flows west to Agua Fria (Channel or Underground Pipe)
 - Existing Channel (South of Bell Road) – Not a part of alternative analysis



Action List

Goodwin and Marshall

- Coordinate obtaining additional survey data with stakeholders for incorporation into the HEC-RAS model.
- Revise HEC-RAS model to establish allowable outfall flows at Bell Road.
- Evaluate property acquisition potential (Cost/Motivation/Constraints) for construction of new drainage facilities
- Complete CSFHM Matrix Scenarios
- Update schedule based on additional HEC-RAS study requirements.
- Coordinate Public Notices and Public Hearing Dates.

Flood Control District

- Complete review of existing conditions HEC-RAS model.

City of Peoria

- Confirm availability of land at south end of the WWTP for drainage facilities.
- Coordinate additional survey data.

City of Surprise

- Coordinate additional survey data.

MCDOT

- Coordinate additional survey data.

Please contact Warren Russell at wrussell@gmcivil.com or 602-218-7285 should any revisions or corrections be requested.



MEETING NOTES

2009C036 Assignment #2
MEETING #3 – Alternative Analysis Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
November 18, 2010
9:00 a.m. – 11:30 a.m.

Attendees:

Burke Lokey	– FCDMC
Bobbie Ohler	– FCDMC
Steven Tucker	– FCDMC
Greg Jones	– FCDMC
Burton Charron	– City of Peoria
Warren Russell	- Goodwin and Marshall, Inc.
Matt Goodwin	- Goodwin and Marshall, Inc.
Tom Durant	- Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

The purpose of this meeting was to serve as an Alternative Analysis Work Session for the above referenced project.

- Review Meeting 2 Notes, Project Goals, and Previous Action Items
 - The revised project goals were approved.
 - The CSFHM Matrix Scenarios were approved.
 - Additional Survey Data will be coordinated through the FCD should the FCD not be able to perform the survey work in a timely fashion then a change order shall be issued to Goodwin and Marshall to perform the work.
 - The FCD shall contact property owners (Arizona American, Stearns Bank, and various property owners in Coyote Lakes Commercial development) to present the project and gauge the potential for property acquisition (Cost/Motivation/Constraints) for construction of new drainage facilities.
 - The Public Hearing Date has been set for December 8, 2010 6:00 – 8:00 p.m. @ Paradise RV Resort 10950 W. Union Hills Dr., Sun City.



- Review Findings of the Revised HEC-RAS Model
 - Based on further review of the topographic information provided by the district (flown 2000), it was determined that substantial improvements had occurred in the study reach that was not reflected in the topo. Based on this information, Goodwin and Marshall revised the HEC-RAS model to reflect the improvements contained in the As-built construction plans for the area.
 - The FCD shall perform additionally surveying in the reach south of Bell to the Agua Fria, as well as on the existing culverts north bell along 115th Avenue and Union Hills Drive for incorporation into the model.
 - It was also discussed that the improvements associated with this project should take into consideration the existing capacity of the channel south of the Bell – with the intent being to alleviate any breakout conditions that may exist.

- Review Findings Existing Infrastructure Conflict Research
 - Existing 6" Sanitary Sewer located at 107th Avenue and Union Hills Drive. Additional survey information required to evaluate conflict.
 - Existing 20" El Paso Gas located at 111th Avenue and Union Hills Drive. Additional coordination with El Paso Gas necessary to evaluate conflict (required clearance, potential to lower/cost). May need pothole information in order to determine if crossing is feasible.
 - Existing 18" Force Main west of 114th Avenue on Union Hills Drive. Relocation/DIP section is feasible.
 - Various sewer and water crossings in the existing Canyon Ridge Channel along 115th Avenue. These lines are not anticipated to be impacted.
 - Due to the existing traffic loading and various utility conflicts on Bell Road it is not feasible to expand the existing culvert system under Bell Road.



- Alternatives Formulation and Evaluation Work Session

Below is a list of the various alternatives that will be pursued at this time. As previously discussed the system will be evaluated in segments with each segment containing various alternatives.

1. 107th Avenue
 - a. Underground Pipe
2. Union Hills Drive (107th Avenue to 111th Avenue)
 - a. Underground Pipe
 - b. Temporary Channel
3. 111th Avenue
 - a. Do Nothing
4. Union Hills Drive (111th Avenue to 115th Avenue)
 - a. Utilize Existing Canyon Ridge Channel & Construct New Underground Pipe
 - b. Utilize Existing Canyon Ridge Channel & Construct New Detention Basin at the Union Hills Drive / 111th Avenue Intersection (Peoria Property)
 - c. Utilize Existing Canyon Ridge Channel & Construct New Channel along the north side of Union Hills Drive (Peoria Property and Arizona American Property) & Construct New Detention Basin at the Union Hills Drive / 115th Avenue Intersection or the Union Hills Drive / 113th Avenue Intersection (Arizona American Property)
5. 115th (North of Union Hills Drive)
 - a. Do Nothing
6. 115th (South of Union Hills Drive)
 - a. Utilize Existing Canyon Ridge Detention Basins & Construct New Detention Basins at the 115th Avenue / Bell Road Intersection. (Various Ownerships)
 - b. Utilize Existing Canyon Ridge Channel & Construct New Diversion Channel/Pipe north of Bell Road west to the Agua Fria River (Various Ownerships)

Action List

Goodwin and Marshall

- Coordinate obtaining additional survey data with FCD for incorporation into the HEC-RAS model.
- Revise HEC-RAS model with survey data to establish allowable outfall flows at Bell Road and downstream reach (from Bell to Agua Fria)
- Research sewer system ownership.

Flood Control District

- Perform additional survey work needed for HEC-RAS model.
- Contact area property owners regarding property acquisition potential.

Please contact Warren Russell at wrussell@gmcivil.com or 602-218-7285 should any revisions or corrections be requested.



AGENDA

2009C036 Assignment #2
MEETING #3 – Alternatives Analysis Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
November 18, 2010
9:00 a.m. – 12:00 p.m.

Prospective Attendees:

Burke Lokey	– FCDMC
Bobbie Ohler	– FCDMC
Steven Tucker	– FCDMC
Dennis Holcomb	– FCDMC
Greg Jones	– FCDMC
Burton Charron	– City of Peoria
Jeff Davidson	– City of Surprise
Warren Russell	- Goodwin and Marshall, Inc.
Matt Goodwin	- Goodwin and Marshall, Inc.
Andy Baron	- Anderson-Baron
Tom Durant	- Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

9:00 a.m. –
12:00 p.m.

- Review Meeting 2 Notes and Revised Project Goals
 - Review Findings of the HEC-RAS Model and Existing Infrastructure Limitations
 - Review Findings of Existing Infrastructure Research and Discuss Potential Conflicts with Proposed Drainage Facilities
 - Alternatives Formulation and Evaluation Work Session
-



MEETING NOTES & Technical Summary

2009C036 Assignment #2
MEETING #4 – Alternative Analysis Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
December 16, 2010
10:00 a.m. – 11:30 a.m.

Attendees:

Burke Lokey	– FCDMC
Bobbie Ohler	– FCDMC
Steven Tucker	– FCDMC
Greg Jones	– FCDMC
Dennis Holcomb	– FCDMC
Burton Charron	– City of Peoria
Warren Russell	- Goodwin and Marshall, Inc.
Matt Goodwin	- Goodwin and Marshall, Inc.
Tom Durant	- Anderson-Baron
Andy Baron	- Anderson-Baron

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

The purpose of this meeting was to serve as an Alternatives Analysis Work Session for the above referenced project.

- General Discussion

- G&M has completed the HEC-RAS file modifications based on additional Topographic information obtained by the District surveyors.
- The District has coordinated with El Paso Natural Gas (EPNG) on potholing the 20" gas line where it will cross the Union Hill Drive drainage system. It is anticipated this will occur before the end of the year.
- Burton has had further discussions regarding the use of the City of Peoria Waste Water Treatment plant property for possible detention facilities – it was determined that the area located approximately 800 ft. north of Union Hills Drive centerline may potentially be used for basins.
- The district has indicated that they would like to expand the current DCR/Alternatives Analysis to include the Beardsley Road flows.
- All Sections downstream of 111th shall be designed for the 100-year 24 hour event.
- The 107th Ave. and Union Hill Drives design event is to be determined.



- Hydrologic & Hydraulic Boundary Condition

- Based on the revised hydraulic model, the Bell Road Culvert system is shown to have a capacity of +/-1,150 cfs at a headwater elevation of 1163.75. The existing low top of curb of elevation for Bell Road is 1164.40 resulting in approximately 0.65 ft. of freeboard.
- The existing channel downstream of Bell Road has varying capacity with a segment of approximately 1,200 ft. in length having a limited capacity of approximately 850 cfs. The remainder of the channel system (approximately 1 mile in length) was shown to have a capacity exceeding the 1,150 cfs capacity of the Bell Road culverts.
- It was agreed that the 1,200 ft. of channel with limited capacity could be reconstructed to convey a higher flow.
- Based on the findings above, the maximum allowable flow rate from the project area (at Bell Road) has been established to be 1,150 cfs.
- In Phase 1 of the DCR, the 100 year 24 hour existing conditions discharge at Bell Road was found to be 1,920 cfs, approximately 770 cfs greater than the allowable.

- Alternatives Analysis and Evaluation Work Session

The project was presented in six segments and two basins with various alternatives for each.

1. Attenuation

In Phase 1 of the DCR, the 100 year 24 hour existing conditions discharge at Bell Road was found to be 1,920 cfs. In order to match the allowable peak discharge of 1,150 cfs, two alternatives of attenuation were explored a) detention and b) detention with diversion. The detention alternative modeled 2 basins, the first located generally at the northwest corner of 111th Ave and Union Hills Drive (Basin B) and the second located generally at the northeast corner of 115th Ave and Bell Road (Basin C). Basin A has been combined with Basin B for the purpose of this evaluation. The detention with diversion utilizes the Basin B detention and removes Basin C and replaces the attenuation affect with a diversion west along Bell Road to the Agua Fria.

2. Segment 1 - 107th Avenue

a. Underground Pipe

- *The drainage area for 107th was delineated to be approximately 18 acres from Beardsley Road to West Palm Tree Drive with an additional 8.4 acres accumulating from W. Palm to Union Hills Drive (UHD).*
- *The associated discharges at UHD were approximated to be 30 cfs for the 10-year event and 64 cfs for the 100-year event.*
- *The design event to be utilized for 107th system will be revisited upon completion of the EPNG potholing and further refinement of the UHD storm drain system.*



3. Segment 2 - Union Hills Drive (107th Avenue to 111th Avenue)

The 100 year discharge for this segment is approximated to be 156 cfs. Additional hydrologic refinement will need to be performed to account for the 107th Ave. and UHD flows as the alternatives are finalized.

a. Underground Storm Drain

- The use of an underground storm drain system is preferred, however, the use of the 7'x3' box system was viewed as being difficult to maintain and to have a high initial construction cost. It is preferred that the use of parallel pipe systems be utilized in lieu of the single box system.
- It was understood that two options of a pipe system are available for UHD.
 - 1 – Bridge the system over the EPNG pipe line (subject to EPNG approval).
 - This alternative results in a shallow storm drain system that would work well with the existing grade differential between the south ROW line and future grades however presents challenges in functioning with future UHD grades.
 - Additionally, the shallow storm drain system may result in a potential conflict with an existing gravity sewer line at 107th Ave and UHD.
 - The current design of the 7'x3' box is shown to cross above the existing sanitary sewer line however illustrates the fact that the intersection of 107th Ave. and UHD will need to be reconstructed to provide adequate cover over the storm drain system.
 - 2 – Construct the pipe system under the EPNG pipe line (subject to EPNG Approval).
 - Current design of this alternative utilizes a bubbler box and drywell located within the existing Canyon Ridge channel system to discharge storm water flows.
 - This alternative results in a deeper storm drain system that could be reduced in size due to the additional hydraulic head available to pressurize the system.
 - Due to the depth of the storm drain system and its proximity to the existing slopes and retaining walls along the south ROW line it is recommended that coordination occur with District construction management personnel.
- The design event and selected alternative to be utilized for UHD system will be revisited upon completion of the EPNG potholing.

b. Open Channel

Due to the temporary nature of the open channel system it was determined that this alternative would not be pursued.

4. Segment 3 - 111th Avenue Culvert

a. Culvert Crossing

- The approved DCR hydrology model (100 year 24 hour) reveals that approximately 457 cfs is being routed to the existing Paradise Resort & RV Park retention pond located at the northeast corner of UHD and 111th Ave. The model also shows that approximately 345 cfs is being routed through the existing retention pond located south of W. Cimarron Blvd. in the Ventana Lakes development. The Ventana Lakes flows are currently routed south along 111th Ave. to the UHD intersection where they are combined with the flows from the Paradise Resort flows.



- The 111th Ave. storm water is currently modeled flowing full street width and contained by the existing walls located at the east and west ROW lines. As the flows approach UHD they are proposed to be captured by scuppers and taken to the existing Paradise Resort basin and to a proposed channel located north of UHD. These flows approximated to be split with half exiting 111th Ave to the east and half exiting 111th Ave to the west.
 - The hydrologic model has been modified to reflect this condition and returns a combined 100-year flow of 500 cfs for the 111th Avenue culvert.
 - These flows may be conveyed with 2-10'x3' boxes, however an inlet structure/weir will be required in the Paradise Resort retention basin due to the grade differential in the basin bottom and the proposed culvert flow line. Additional discussions with EPNG are necessary in order to determine if this inlet structure may be constructed within their easement.
5. Segment 3 - Union Hills Drive (111th Avenue to Basin B)
- a. Utilize Existing Canyon Ridge Channel & Construct New Channel along the north side of Union Hills Drive (Peoria Property) / 113th Avenue Intersection (Arizona American Property)
 - The 500 cfs from the 111th culvert is currently shown to be conveyed in 30' bottom width 4:1 side slope open channel.
 - Basin B is proposed to be located in Arizona American slope area located north of UHD approximately at the 113th Avenue intersection. The current model utilizes approximately 55 acre-feet of storage for this basin. A grading configuration that provides 1 foot of freeboard and minimizes the earthen embankments and results in a non-regulatory dam shall be pursued.
 - The configuration of this basin may be redesigned to utilize City of Peoria property. A decision regarding basin redesign shall be revisited once it is determined how the Beardsley Road flows will be dealt with.
 - Excess spoils from Basin B may be spread on Peoria property to reduce project cost (in lieu of haul off). This will require additional coordination/research with Peoria staff.
6. Segment 4 – 115th Avenue (Union Hills Drive to Bell Road)
- The existing conditions hydraulic model indicates that various culverts are undersized for the 100 year event from UHD & 111th Avenue to Bell Road (738 cfs along UHD & 1,013 cfs along 115th Ave.).
 - The hydrologic model has been revised to account for Basin B storage resulting in flows of 160 cfs along UHD & 590 cfs along 115th Ave. The Hydraulic Models have been revised for these flows and indicate that the existing channel system and existing culverts have capacity to convey the 100 year event.



7. Segment 4 – Basin C; Segment 5 - Diversion

a. Basin C Detention –

- *The 590 cfs from the combination at Union Hills Drive and 115th Ave. is conveyed south through the existing channel/detention facilities to the existing east-west running Bell Road channel located along the north right-of-way. Under existing conditions the flows from the 115th channel system overtop the Bell Road channel bank and combine north of the Bell Road culverts for a total of 1,500 cfs.*
- *In order to attenuate the flows to the allowable 1,150 cfs two scenarios were evaluated.*
 - *Detention - Basin C is proposed to expand the existing 115th detention facility to the west utilizing an undeveloped tract adjacent to the east. The current model utilizes approximately 67 acre-feet of storage for this basin (including freeboard).*
 - *Diversion (Segment 5) – The Bell Road diversion proposed to divert approximately 368 cfs west to Agua Fria in a double barrel 10'x3' box culvert. This alternative will not be pursued due to the lack of a defined outfall at the Agua Fria, the potential for frequent backwater inundation due to the Agua Fria water surface elevations and the maintenance issues associated with the 1,500 L.F. of 10'x3' box culvert.*

Beardsley Road Flows

In the December 8th public meeting, many discussions were had regarding flooding occurring at the Beardsley Road / 115th intersection. This intersection is bound on the west by the Coyote Lakes Golf Course development and on the south, east and north by an active mining operation. Per the Phase 1 DCR hydrologic study, the Beardsley Road flows are conveyed through the mining area via open channel to the east property line of the Coyote Lakes development where 2-42" culverts intercept the flows and a portion (140 cfs) is directed west through the golf course, with remainder (378 cfs) traveling south the down 115th Avenue to the UHD intersection at which point the flows spill into the existing 115th Ave. channel/detention facilities. Conversations with local residents and photo records of recent storm events verified the hydrologic findings, with the major complaints being 115th Avenue being impassable 1-2 times annually due to inundation, and frequent flood damage occurring within the golf course..

Based on the public input, the District has indicated that they would like to evaluate intercepting the Beardsley Road flows at approximately the 113th Avenue / Beardsley Road intersection. The flows would then be conveyed south to an expanded Basin B configuration, attenuated then released into the existing Canyon Ridge channel. The results of this diversion are anticipated to mitigate the existing flooding at Beardsley Road and 115th Avenue and to reduce the required size Basin C.

The introduction of the Beardsley Road flows will affect the current alternatives for Basin B, Segment 3, Segment 4, and Basin C, with the assumption that the Bell Road Culverts are still a boundary condition and Bell Road Diversion is not a viable alternative.



Action List

Goodwin and Marshall

- Integrate the EPNG line location into current designs when the potholing is complete.
- Coordinate with the District on:
 - Preferred EPNG crossing type
 - Design event 107th and Union Hills Drive system.
 - Constructability of storm drain based on proximity to the existing slopes and walls along the south ROW line.
- Coordinate with the District on preparing scope modification to include the Beardsley Road flows.

Flood Control District

- Coordinate with G&M on items discussed above.

Please contact Warren Russell at wrussell@gmcivil.com or 602-218-7285 should any revisions or corrections be requested.



AGENDA

2009C036 Assignment #2
MEETING #6 – Alternatives Analysis Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
April 26, 2011
1:30 p.m. – 3:00 p.m.

Prospective Attendees:

Burke Lokey	– FCDMC	Burton Charron	– City of Peoria
Bobbie Ohler	– FCDMC	Steven Tucker	– FCDMC
Dennis Holcomb	– FCDMC	Greg Jones	– FCDMC
Michael Boule	– City of Surprise	James Shano	– City of Surprise
Warren Russell	- G&M	Matt Goodwin	- G&M
Tom Durant	- Anderson-Baron		

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

**1:30 p.m. –
3:00 p.m.**

- Review Recent Project Events
 - Inclusion of Beardsley Road Flows
 - Amended Design Criteria for Detention Basins
- Review Beardsley Road Diversion Design
 - Channel X-sections
 - Channel Profile
 - Grading Encroachments
- Review Basin A & B Design
 - Grading Design, Depth, Side Slopes
 - Hydraulic Function
 - Outfall Criteria
- Review Basin C Design
 - 115th Retention
 - Outfall Criteria
- Land Acquisition Requirements
- Union Hills Drive Alternative
 - EPNG Pothole Findings
 - 107th / Union Hills Design Challenges
 - Select Design Alternative
- Evaluate Multi-use and recreational opportunities
- Evaluate CSFHM Impacts
- Select Preferred Alternative



MEETING NOTES & Technical Summary

2009C036 Assignment #2
MEETING #6 – Alternatives Analysis Work Session
107th Avenue and Union Hill Drive
Phase 2 – Alternatives Analysis
April 28, 2011
1:30 p.m. – 4:00 p.m.

Prospective Attendees:

Burke Lokey	– FCDMC	Burton Charron	– City of Peoria
Bobbie Ohler	– FCDMC	James Shano	– City of Surprise
Steven Tucker	– FCDMC	Michael Boule	– City of Surprise
Matt Goodwin	- G&M	Tom Durant	- Anderson-Baron
Warren Russell	- G&M		

Location: Flood Control District Offices
2801 West Durango Street
Phoenix, Arizona 85009

The purpose of this meeting was to serve as an Alternatives Analysis Work Session for the above referenced project and to select the preferred alternative that will be identified in the DCR and 15% plans.

- General Discussion

- The district has expanded the current DCR/Alternatives Analysis to include the Beardsley Road flows.
- G&M has completed the HEC-1 revision for the base line conditions and provided the associated technical memorandum to Steven Tucker for his review and comment. The purpose of the revision was to better model the Canyon Ridge routing and associated channel system.
- G&M has coordinated with Mr. Tom Trujello (and area engineer) at El Paso Natural Gas (EPNG) regarding the recent potholing of the 20" gas line where it will cross the Union Hill Drive drainage system. Based on the current design and conflict, EPNG strongly recommended that the storm drain system be placed under the gas line. EPNG also asked that an onsite meeting be setup as soon as schematic drawings are available for review.
- Ms. Kimberly Moreland with Arizona American was contacted regarding design alternative that affect their property. She stated that it appears Arizona American would be amenable to working with the FCD on acquisition of portions of their property. However, due to the fact that the Arizona Corporation Commission is currently reviewing documentation regarding the sale of the company, they would not be able to discuss until end of first quarter 2012.



- Alternatives Analysis and Evaluation Work Session

1. Segment 1 - 107th Avenue

- Underground Pipe
 - *The drainage area for 107th was delineated to be approximately 18 acres from Beardsley Road to West Palm Tree Drive with an additional 8.4 acres accumulating from W. Palm to Union Hills Drive (UHD).*
 - *The associated discharges at UHD were approximated to be 30 cfs for the 10-year event and 64 cfs for the 100-year event.*
 - *The 15% plan for the UHD storm drain system are intended to accommodate the 107th flows, however the design event will be revisited during the CIP final design in conjunction with the potential intersection reconstruction and Peoria's 107th Avenue storm drain design.*

2. Segment 2 - Union Hills Drive (107th Avenue to 111th Avenue)

The 100 year discharge for this segment is approximated to be 156 cfs. Additional hydrologic refinement will need to be performed to account for the local 107th Ave. and UHD flows during the final design. It is important to note that the 107th Ave. and UHD intersection will also need to be closely evaluated to insure positive overflow is maintained to the west should a storm event less than the 100 year be selected for final design.

- Underground Storm Drain
 - *The use of parallel pipe systems is preferred over a box system.*
 - *Construction the pipe system under the EPNG pipe line (subject to EPNG Approval) shall be pursued.*
 - *Current design of this alternative utilizes a bubbler box and drywell located within the existing Canyon Ridge channel system to discharge storm water flows. The design shall be revised to maintain the minimum clearance from the EPNG line and perform downstream grading if necessary with the intent to eliminate the bubbler box scenario.*
 - *The use of a siphon drain was not viewed acceptable due to the potential maintenance issues.*
 - *The design event and selected alternative to be utilized for the UHD system will be the 100 year event for the 15% plans however recommendations will be made to revisit in the final design.*

3. Segment 3.a - 111th Avenue Culvert

- Culvert Crossing
 - *The approved DCR hydrology model (100 year 24 hour) reveals that approximately 457 cfs is being routed to the existing Paradise Resort & RV Park retention pond located at the northeast corner of UHD and 111th Ave. The model also shows that approximately 425 cfs is being routed through the existing retention pond located south of W. Cimarron Blvd. in the Ventana Lakes development. The Ventana Lakes flows are currently routed south along 111th Ave. to the UHD intersection where they are combined with the flows from the Paradise Resort flows.*



- The 111th Ave. storm water is currently modeled flowing full street width and contained by the existing walls located at the east and west ROW lines. As the flows approach UHD they are proposed to be captured by scuppers and taken to the existing Paradise Resort basin and to the proposed basins located north of UHD. These flows approximated to be split with half exiting 111th Ave to the east and half exiting 111th Ave to the west.
 - The hydrologic model has been modified to reflect this condition and returns a combined 100-year flow of 500 cfs for the 111th Avenue culvert.
 - These flows may be conveyed with 2-10'x3' boxes, however an inlet structure/weir will be required in the Paradise Resort retention basin due to the grade differential in the basin bottom and the proposed culvert flow line. Additional discussions with EPNG are necessary in order to determine if this inlet structure may be constructed within their easement.
4. Segment 3.b - Beardsley Road Diversion Channel
- The Beardsley Road Diversion Channel is currently shown utilizing a 15' bottom width, 2:1 side slope, concrete channel with 4:1 earthen tie-in slopes. The channel is generally located in the slope area along the eastern property line of the Arizona American Property. The horizontal alignment and cross-section of the channel was selected in order to minimize the channel's footprint thus reducing the potential for conflicts with the existing Arizona American and City of Peoria Wastewater treatment facilities. The channel design shall be amended to maintain a maximum Froude number of 0.78 for the DCR recommended alternative.
 - The alignment for the diversion channel was generally viewed acceptable by all stakeholders however; the City of Peoria will have additional input regarding the final conveyance structure (open channel or piped) and the location/need for service roads at the time of final design.
5. Segment 3.c - Basin A and B Attenuation
- Design Constraints –
 - Per recent discussions with the City of Peoria, the criteria for basins were amended to a max depth of 12 feet (as measured from bottom to positive overflow elevation). Channels and detention facilities should be incised and should not have a bermed condition that could be construed as being a non-certified levee in the future. Basin bottoms shall be sloped to insure positive runoff while side slopes shall not exceed 4:1 slope however should meander and incorporate grading for trails and service roads.
 - Utilize Existing Canyon Ridge Channel & Construct New Basins along the north side of Union Hills Drive (Peoria Property) / 113th Avenue Intersection (Arizona American Property)
 - Basin A.1 and A.2 are proposed to be generally located along the south property line of the City of Peoria Waste Water Treatment facility (encroaching no more than +/- 300 ft north of the north ROW line). The 500 cfs from the 111th culvert shall be conveyed through a series of stair stepped ponds (A.1 & A.2). The current model utilizes approximately +/-46 acre-feet of storage for these basins and will be connected with 2-24" RCP pipes to convey the nuisance flows while the larger events will be conveyed via a rectangle weir (or similar) to the downstream pond (B.3).



- Basin B.1, B.2 & B.3 are proposed to be located in Arizona American slope area located north of UHD approximately at the 113th Avenue intersection. The current model utilizes approximately +/-85 acre-feet of storage for these basins. The ponds will be stair stepped and connected as discussed in Basins A.1 and A.2. However Basin B.3 will require a bleed off pipe to be constructed approximately 900 ft. downstream in the existing Canyon Ridge development in order to allow for complete drainage of the pond.
 - Additional discussion with Peoria will be required during final design to address potential seepage issues along the storm drain system. The seepage issues are two fold
 - 1) Shallow seepage from the Peoria sludge drying basins that could show up as continual flow in the channel and basin system or in the Arizona American recharge ponds.
 - 2) Deep seepage from the channel and basin system that could show up as contaminants in the AZ American monitoring wells.
6. Segment 4.a – 115th Avenue (Union Hills Drive to Bell Road)
- The existing conditions hydraulic model indicates that various culverts are undersized for the existing conditions 100 year event from UHD & 111th Avenue to Bell Road (729 cfs capacity at 114th & UHD & 527 cfs capacity at Museum Driveway and 115th Ave.).
 - The improved conditions hydrologic model has been revised to account for the flow reduction caused by Basin A & B storage and indicate that the existing channel system and existing culverts have capacity to convey the 100 year event.
7. Segment 4.b – Basin C
- Basin C Detention –
 - The storm water flows from the combination at Union Hills Drive and 115th Ave. is conveyed south through the existing channel/detention facilities to the existing east-west running Bell Road channel located along the north right-of-way. Under existing conditions the flows from the 115th channel system overtop the Sun City Drain channel bank and combine north of the Bell Road culverts for a total of 1,980 cfs.
 - In order to attenuate the flows to the allowable 1,150 cfs the following design alternative will be implemented for the 15% design.
 - Detention - Basin C is proposed to expand the existing 115th detention facility to the west (+/-100ft) utilizing an adjoining undeveloped tract. The current model utilizes approximately 29 acre-feet of storage for this basin.
 - Separate retention facilities for the existing inlets in 115th Avenue will be required due to the design water surface elevation in Basin C being higher than the 115th Avenue curb elevations.



8. Segment 6 – Sun City Drain Channel

- *As discussed in our previous coordination meetings, the Bell Road Culvert system is shown to have a capacity of +/-1,150 cfs at a headwater elevation of 1163.75. The existing low top of curb of elevation for Bell Road is 1164.40 resulting in approximately 0.65 ft. of freeboard. Though the freeboard is not a full 1.0 ft., it is greater than the Maricopa County allowable 6 inches of overtop, therefore, the design was viewed as being acceptable by the project stakeholders.*
- *The existing channel downstream of Bell Road has varying capacity with a segment of approximately 1,200 ft. in length having a limited capacity of approximately 850 cfs. The remainder of the channel system (approximately 1 mile in length) was shown to have a capacity exceeding the 1,150 cfs capacity of the Bell Road culverts.*
- *It was agreed that the 1,200 ft. of channel with limited capacity could be reconstructed to convey the higher flow.*
- *Based on the findings above, the maximum allowable flow rate from the project area (at Bell Road) has been established to be 1,150 cfs.*
- *The District is currently establishing ownership and maintenance of the Sun City Drain Channel and will pursue this independently of the DCR process.*

Action List

Goodwin and Marshall

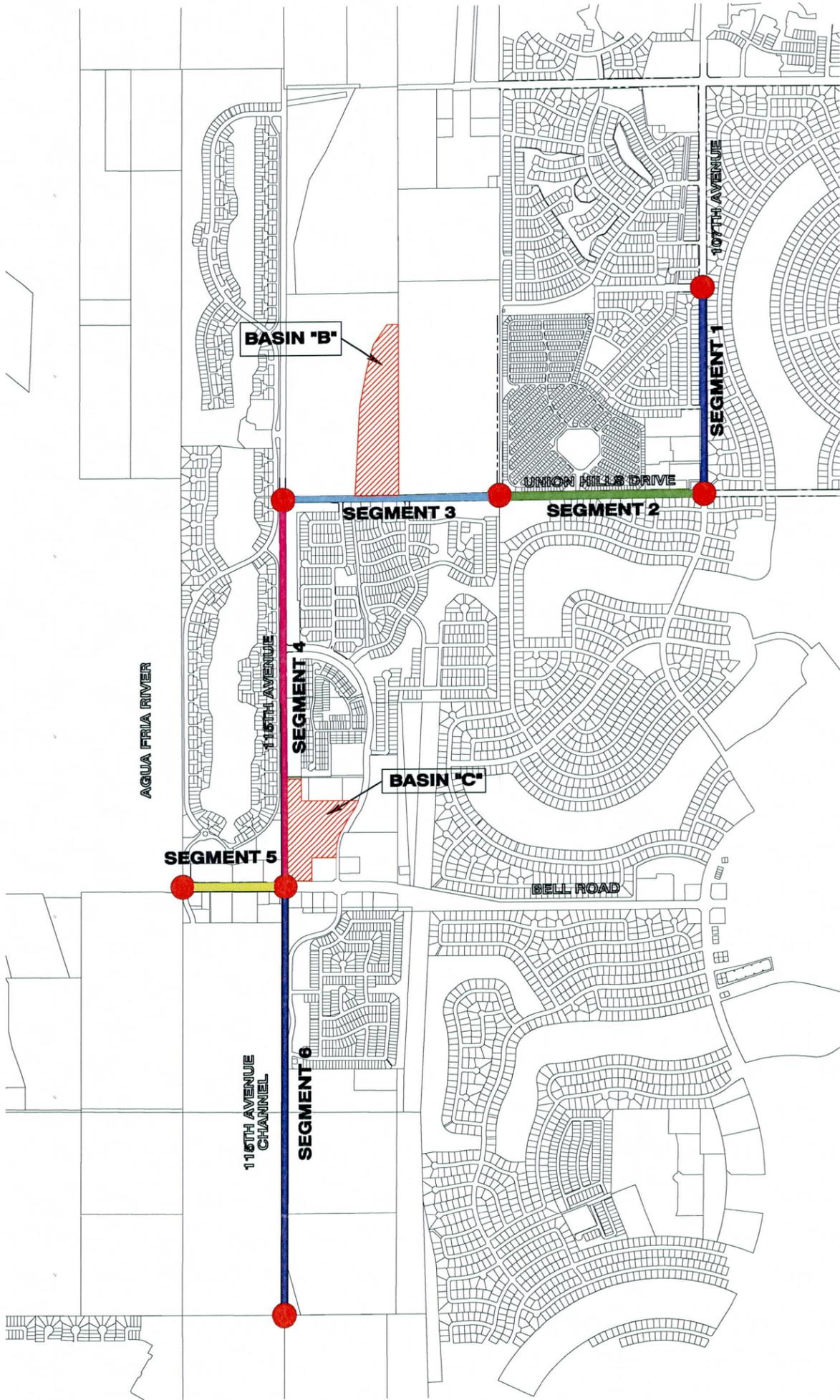
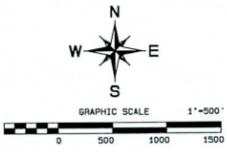
- Additional Basin C cross sections will be provided to the City of Surprise to illustrate the elevation differential in regards to the highwater elevations, berm height, and adjoining top of curb for 115th Avenue and Bell Road.

Flood Control District

- Provide G&M with notice to proceed with the DCR report and the 15% plans.

Please contact Warren Russell at wrussell@gmcivil.com or 602-218-7285 should any revisions or corrections be requested.





LANDSCAPE ARCHITECTS



ENGINEER/PLANNERS

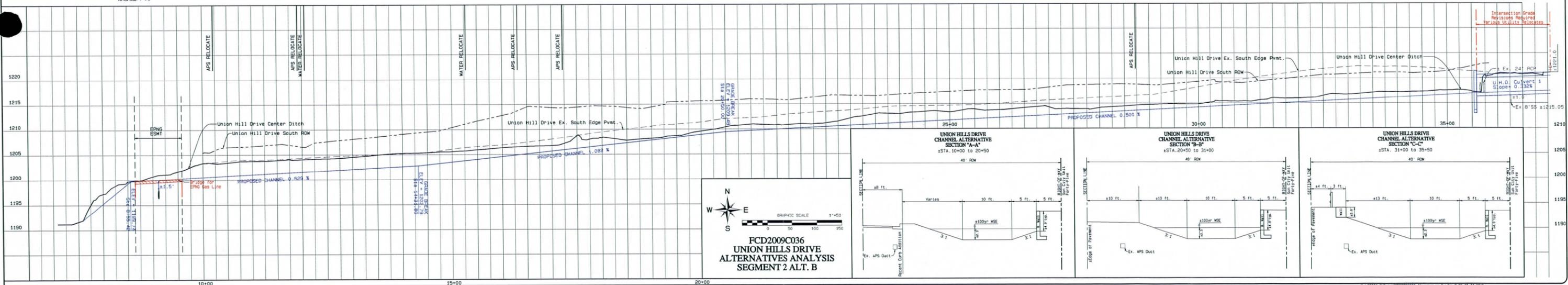
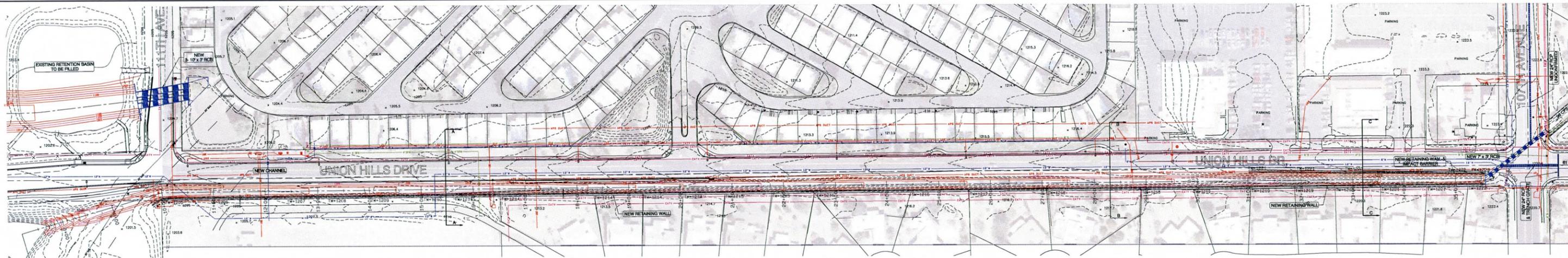


CIVIL ENGINEERS - PLANNERS - SURVEYORS

8000 W. Ray Road #15
Chandler, Arizona 85226
(602) 218-7285

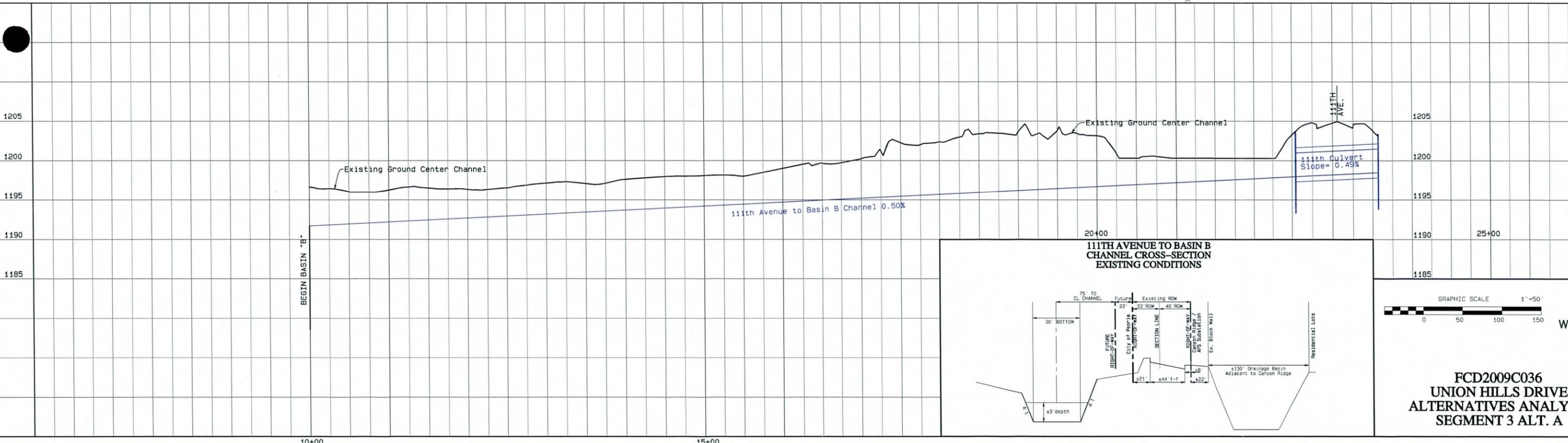
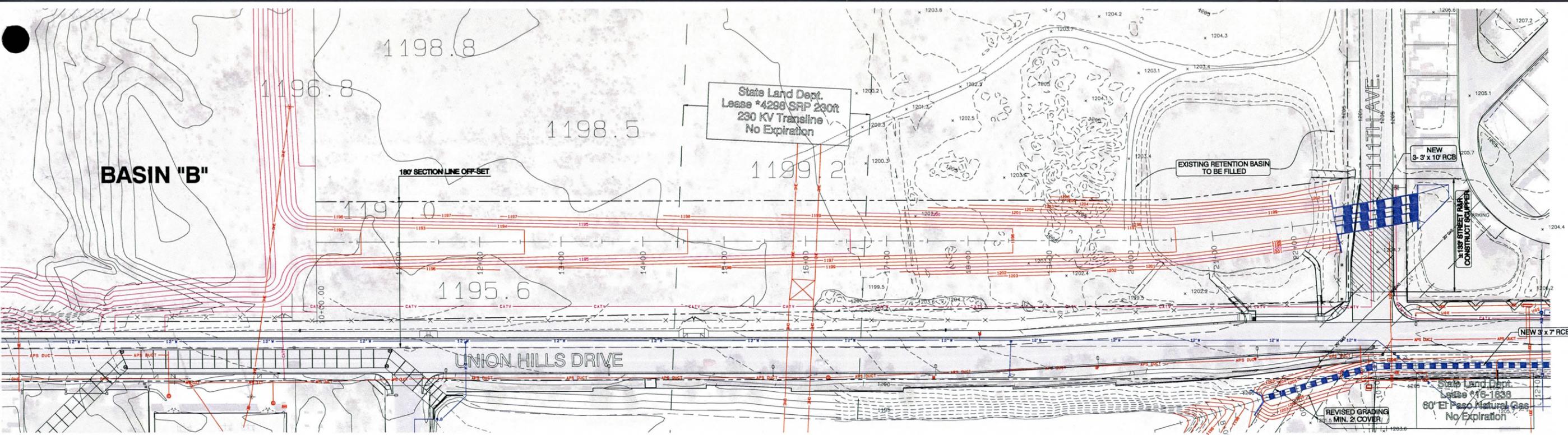
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107TH AVE/ AND UNION HILLS DR.
ALTERNATIVES ANALYSIS
WORKSHEET**

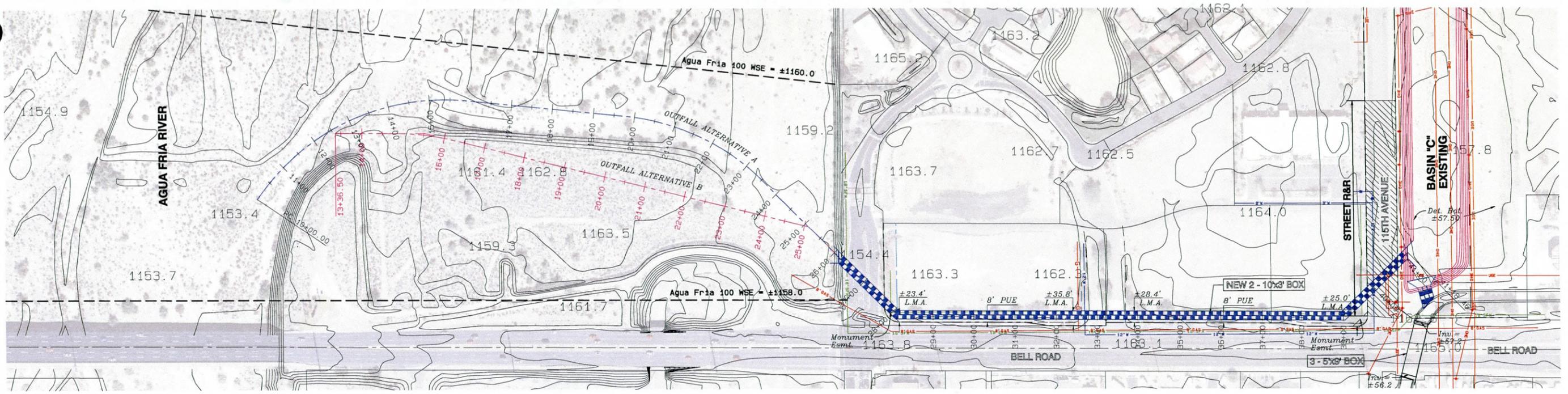
SITUATED IN THE
CITY OF PEORIA, CITY OF SURPRISE, AND
UNINCORPORATED MARICOPA COUNTY, ARIZONA
DECEMBER 2010



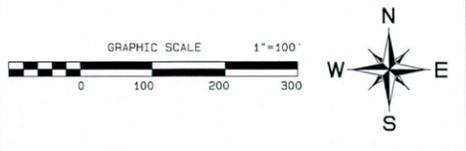
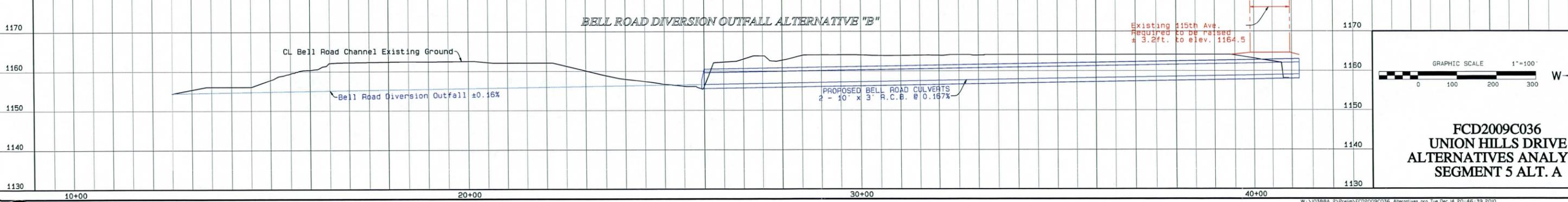
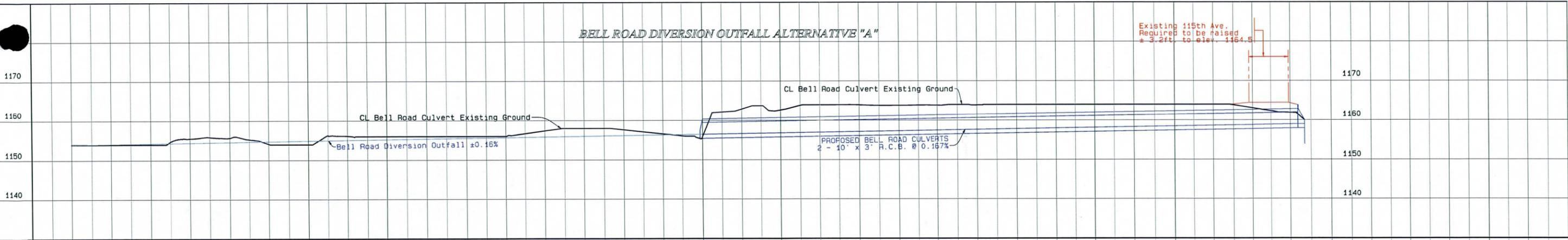
GOODWIN AND MARSHALL, INC.

JOB NO. 100884.2 - UNION HILLS DRIVE SEGMENT 2 ALTERNATIVE B



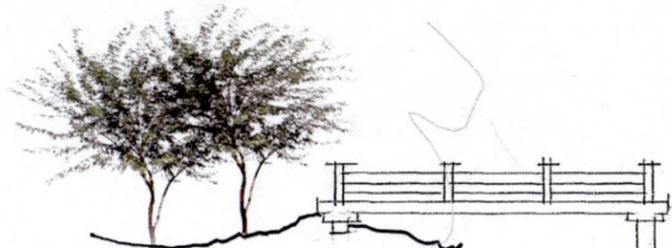


PROFILE SCALE
 Horizontal Scale: 1" = 50'
 Vertical Scale: 1" = 5'



FCD2009C036
 UNION HILLS DRIVE
 ALTERNATIVES ANALYSIS
 SEGMENT 5 ALT. A

City of Peoria
WWTP



OVERLOOK PLATFORM

24 CAR PARKING LOT
8 X 12 INFORMATION KIOSK



Basin B

HABITAT LOOP

LEARNING LOOP

AZ American
WWTP

DESERT PARK
LANDSCAPE THEME

VARIABLE SIDESLOPES
FROM 4:1 TO 6:1

8'-0" WIDE GRANULAR PEDESTRIAN TRAIL
WITH 24" WIDE SHOULDER BOTH SIDES FOR
MAINTENANCE ACCESS.

UNION HILLS DRIVE



LANDSCAPE ARCHITECTS

ab | plan·design·achieve
58 w buffalo suite 100, chandler, az 85226
an andersonbaron company p. 480.699.7956 f. 480.899.7988

ENGINEER/PLANNERS

GOODWIN & MARSHALL

CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS

6909 W. Ray Road #15
Chandler, Arizona 85226
(602) 218-7285



HABITAT LOOP



LEARNING LOOP



INFORMATIONAL SIGNAGE

Basin B- Alternate #1
FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FDC 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND INCORPORATED MARICOPA
COUNTY, ARIZONA
DECEMBER, 2010

City of Peoria
WWTP

12 CAR PARKING LOT
12 X 12 INFORMATION KIOSK

Basin B

AZ American
WWTP

DESERT PARK
LANDSCAPE THEME

VARIABLE SIDESLOPES
FROM 4:1 TO 6:1

8'-0" WIDE GRANULAR
PEDESTRIAN TRAIL.



LANDSCAPE ARCHITECTS

ab | plan·design·achieve
58 W Buffalo Suite 100, Chandler, AZ 85225
an andersonbaron company p. 480.899.7956 f. 480.899.7956

ENGINEER/PLANNERS

GOODWIN AND
MARSHALL INC

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Chandler, Arizona 85226
(602) 218-7285

Basin B- Alternate #2
FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FDC 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND INCORPORATED MARICOPA
COUNTY, ARIZONA
DECEMBER, 2010



EXISTING 5'-0" GRANULAR TRAIL TO BE MODIFIED TO 8'-0" WIDE.

ENHANCED DESERT LANDSCAPE ALONG 115TH AVE. TO AVE. OF THE ARTS TO THE NORTH.

DESERT PARK LANDSCAPE THEME

VARIABLE SIDESLOPES FROM 4:1 TO 6:1

SPORTS FIELD RAISED 24" ABOVE LINEAR BASIN DEPTH.

18 TO 20 CAR PARKING LOT

8'-0" WIDE CONCRETE SIDEWALK CONNECTION THROUGH BASIN AND FOR CONNECTIVITY TO ADJACENT NEIGHBORHOODS AND FACILITIES.



LANDSCAPE ARCHITECTS

ab | plan·design·achieve

58 w buffalo suite 100, chandler, az 85225
an andersenbaron company p. 480.699.7106 f. 480.699.7100

ENGINEER/PLANNERS

GOODWIN & MARSHALL

CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS

8909 W. Ray Road #15
Chandler, Arizona 85226
(602) 218-7285

Basin C- Alternate #1

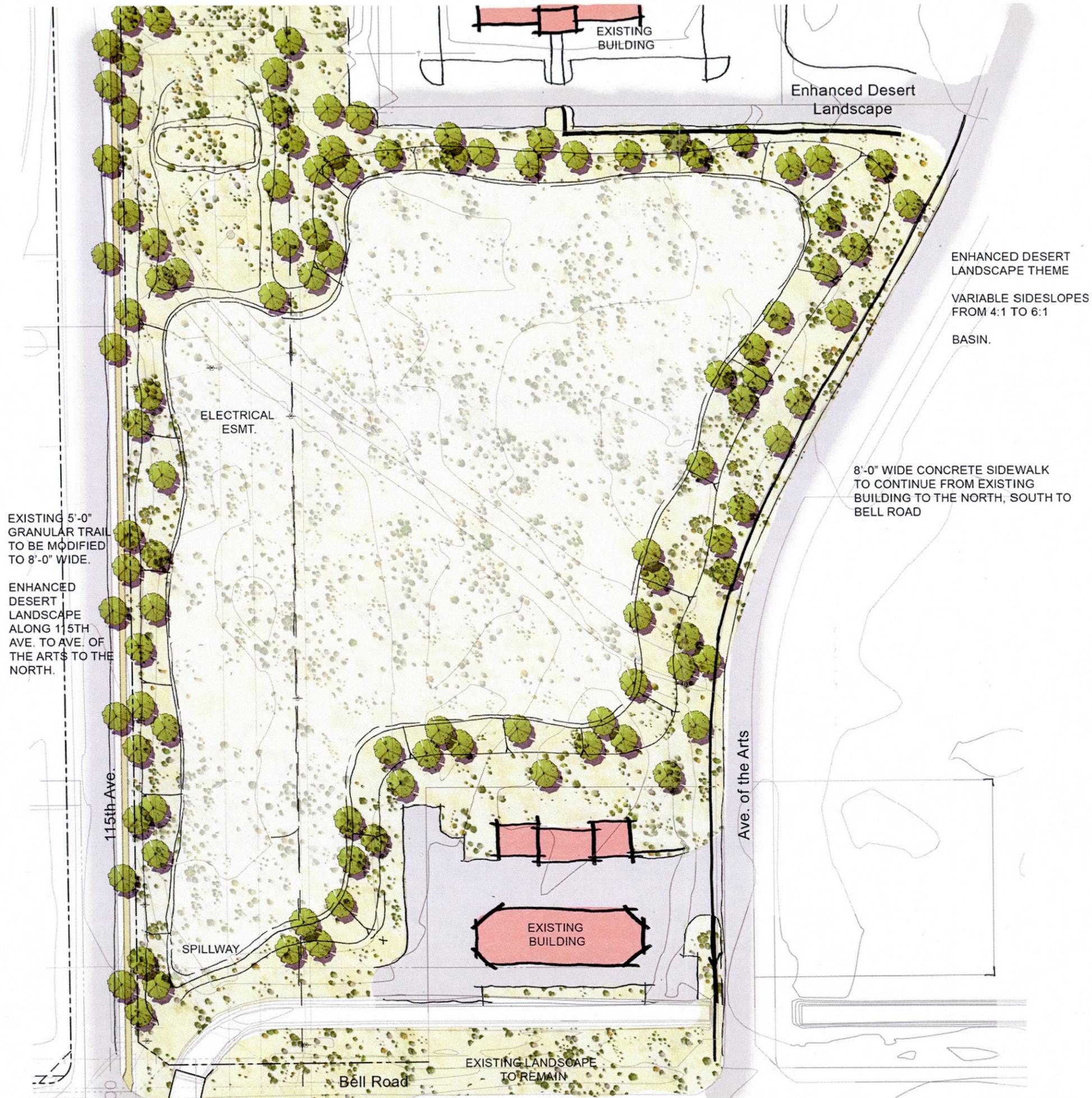
FOR

107TH AVENUE AND UNION HILLS DRIVE

CONTRACT: FDC 2009C036.2

CITIES OF PEORIA AND SURPRISE AND INCORPORATED MARICOPA COUNTY, ARIZONA

DECEMBER, 2010



LANDSCAPE ARCHITECTS

ab | plan-design-achieve
 58 w buffalo suite 100, chandler, az 85225
 an andersonbaron company p. 480.699.7996 f. 480.699.7996

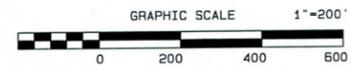
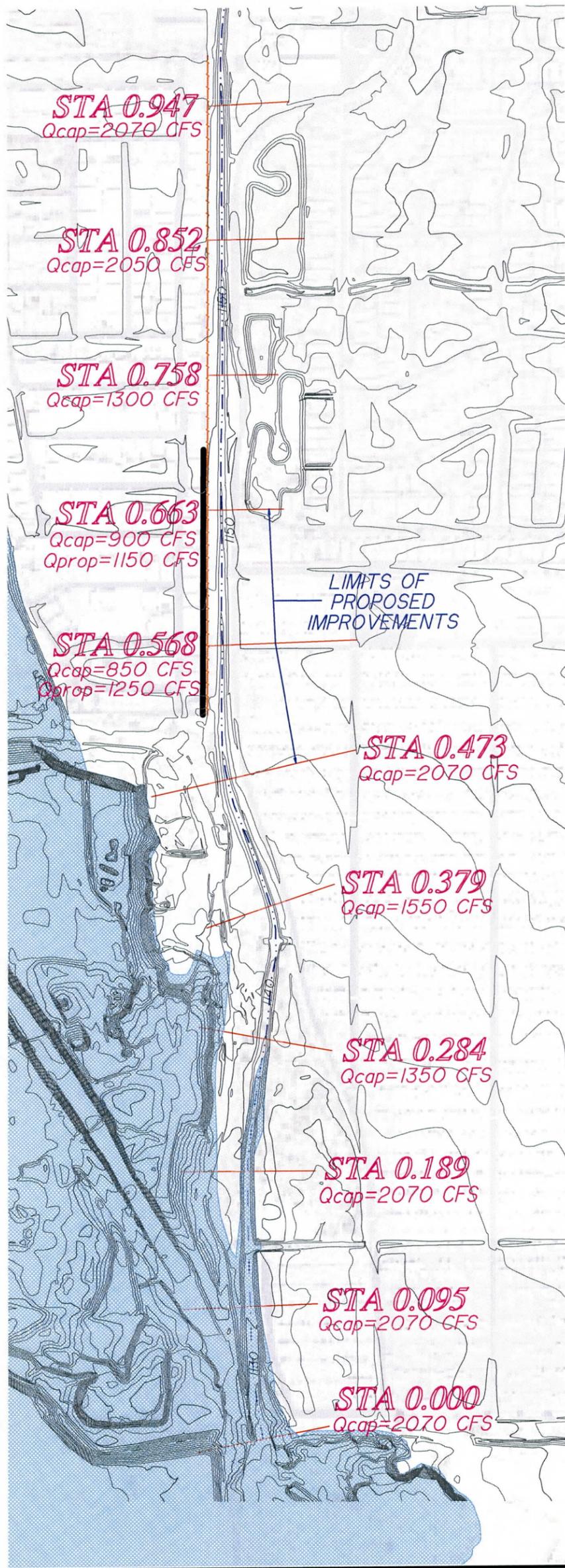
ENGINEER/PLANNERS

GOODWIN AND MARSHALL INC.

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 Chandler, Arizona 85226
 (602) 218-7285

Basin C- Alternate #2
 FOR
107TH AVENUE AND UNION HILLS DRIVE
 CONTRACT: FDC 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND INCORPORATED MARICOPA COUNTY, ARIZONA
 DECEMBER, 2010



LEGEND	
	CENTERLINE
	CROSS SECTION LOCATION
STA 3.007	CROSS SECTION STATION
	EXISTING CULVERTS
	EXISTING WALL LOCATION
	EXISTING WALL FOUNDATION
	EXISTING 100-YR FLOODPLAIN



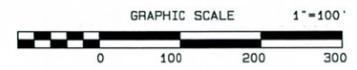
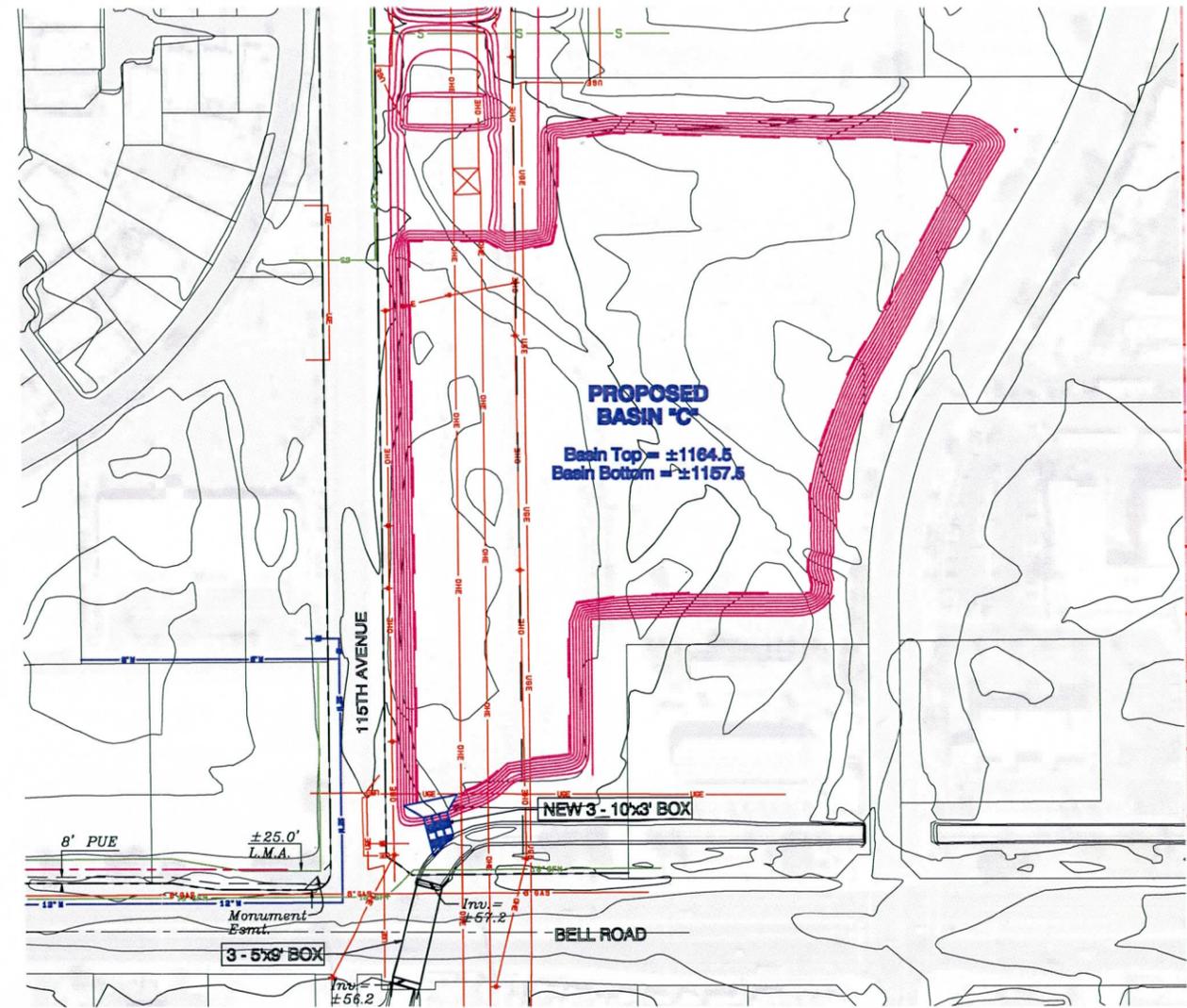
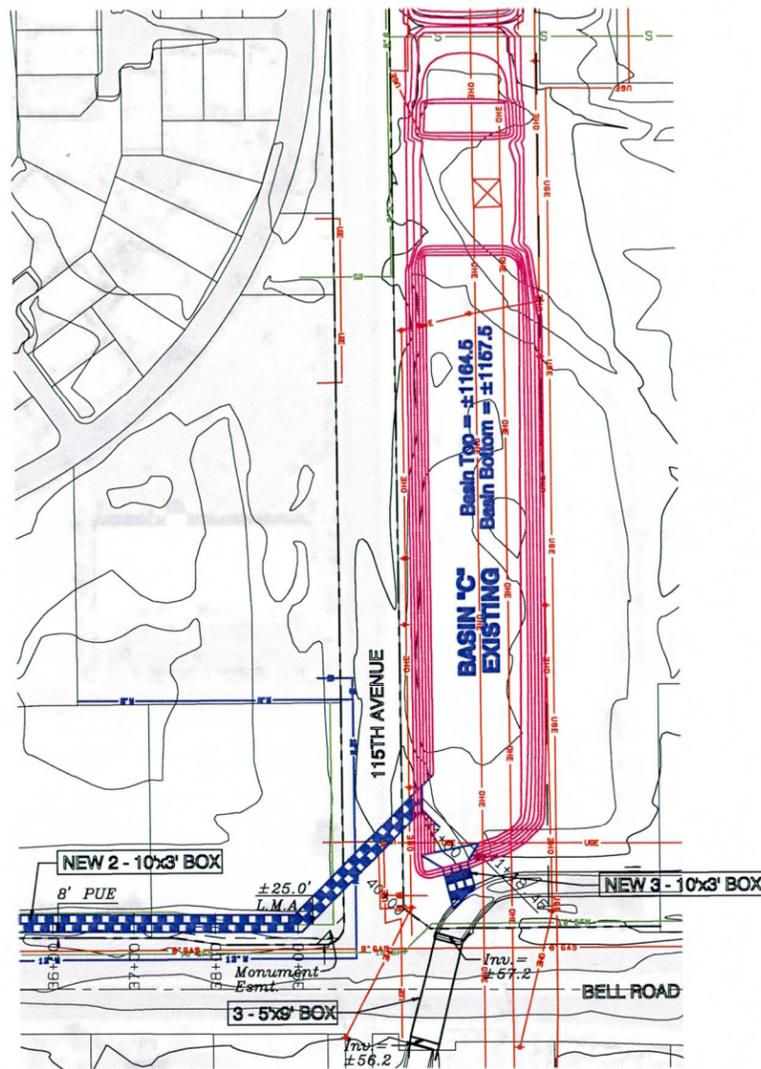
ENGINEER/PLANNER:

GOODWIN & MARSHALL

CIVIL ENGINEERS - PLANNERS - SURVEYORS

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Metro (602) 218-7285

DOWNSTREAM CHANNEL
 MODIFICATION EXHIBIT
 FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FCD 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND UNINCORPORATED
 MARICOPA COUNTY, ARIZONA
 DECEMBER, 2010



ENGINEER/PLANNER:
GOODWIN!
MARSHALL &
 CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS
 6909 W. Ray Rd. #15, Chandler, AZ 85226
 Metro (602) 218-7285

EXISTING AND PROPOSED
 BASIN "C" GRADING
 FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FCD 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND UNINCORPORATED
 MARICOPA COUNTY, ARIZONA
 DECEMBER, 2010

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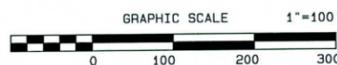


ENGINEER/PLANNER:

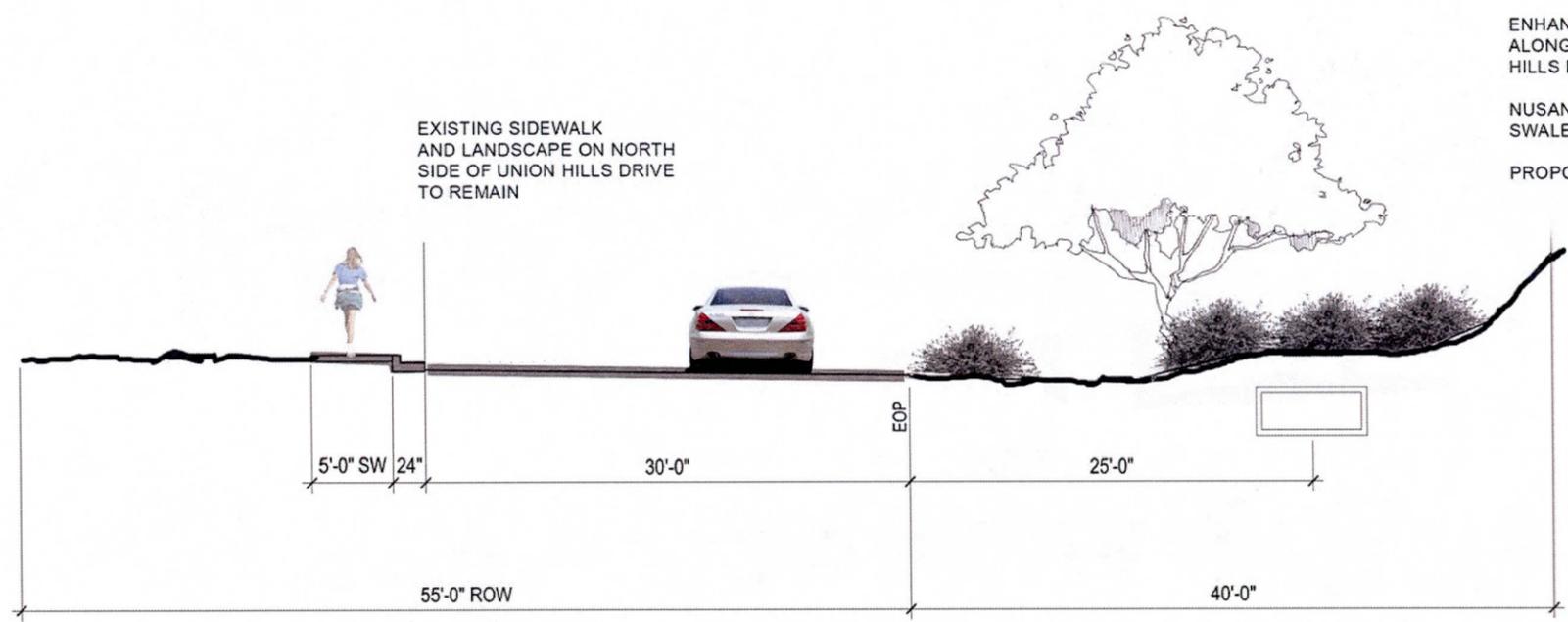
GOODWIN & MARSHALL

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 Metro (602) 218-7285



**PROPOSED GRADING FOR
 BASINS "B.1" AND "B.2"**
 FOR
**107TH AVENUE AND
 UNION HILLS DRIVE**
 CONTRACT: FCD 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND UNINCORPORATED
 MARICOPA COUNTY, ARIZONA
 DECEMBER, 2010



UNION HILLS DRIVE BOX CULVERT

ENHANCED DESERT LANDSCAPE ALONG SOUTH SIDE OF UNION HILLS ROAD.

NUSANCE DRAINAGE SWALE

PROPOSED BOX CULVERT



LANDSCAPE ARCHITECTS

ab | plan·design·achieve

58 w buffalo suite 100, chandler, az 85225
an andersonbaron company p. 480.699.7956 f. 480.699.7986

ENGINEER/PLANNERS

GOODWIN & MARSHALL

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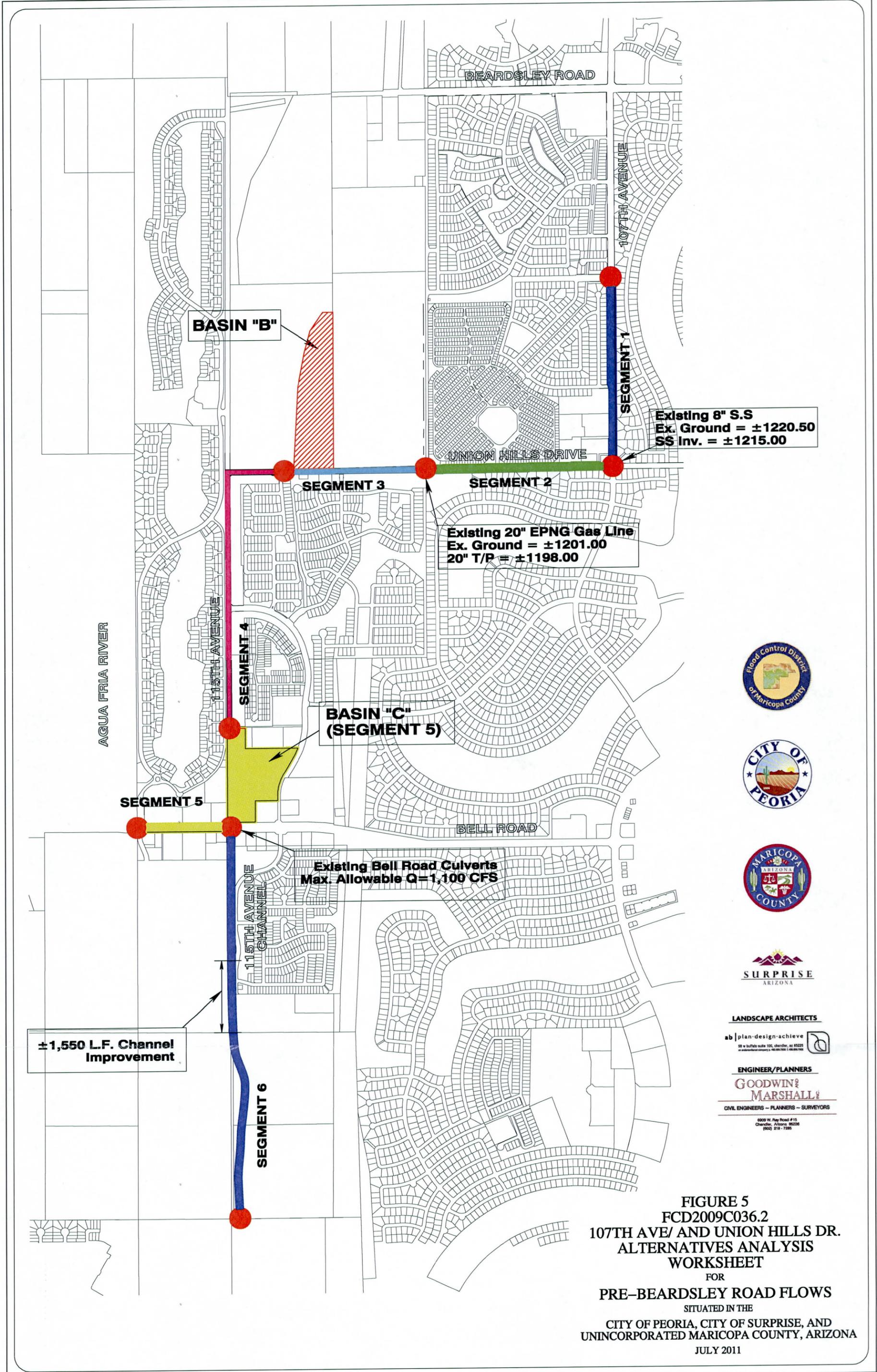
6909 W. Ray Road #15
Chandler, Arizona 85226
(602) 218-7285

**Union Hills Drive - Box Culvert
Alternative #1**

FOR
**107TH AVENUE AND
UNION HILLS DRIVE**

CONTRACT: FDC 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND INCORPORATED MARICOPA
COUNTY, ARIZONA
DECEMBER, 2010





LANDSCAPE ARCHITECTS
 ab | plan-design-achieve
 58 W. Bell Rd. Suite 100, Chandler, AZ 85225
 480-948-8888

ENGINEER/PLANNERS
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 6909 W. Ray Road #15
 Chandler, Arizona 85226
 (602) 218-7285

FIGURE 5
FCD2009C036.2
107TH AVE/ AND UNION HILLS DR.
ALTERNATIVES ANALYSIS
WORKSHEET
 FOR
PRE-BEARDSLEY ROAD FLOWS
 SITUATED IN THE
 CITY OF PEORIA, CITY OF SURPRISE, AND
 UNINCORPORATED MARICOPA COUNTY, ARIZONA
 JULY 2011

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
SEGMENT 2 - ALT A					
Union Hills Drive - 107th Avenue to 111th Avenue					
Box Culvert Alternative					
1	Clearing and Grubbing	Ac.	2.3	\$600.00	\$1,404.00
2	Unclassified Excavation	C.Y.	6,200	\$2.75	\$17,050.00
3	Export	C.Y.	6,200	\$5.50	\$34,100.00
4	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
5	7'x3' ADOT Box Culvert (Class IV)	L.F.	2,850	\$474.75	\$1,353,037.50
6	7'x3' ADOT Culvert Inlet Wings	Ea.	1	\$2,639.25	\$2,639.25
7	7'x3' ADOT Culvert Outlet Wings	Ea.	1	\$4,610.25	\$4,610.25
8	24" RCP (Class IV)	L.F.	200	\$40.00	\$8,000.00
9	Neenah Trench Grate - R-4999-L6	L.F.	43	\$215.00	\$9,245.00
10	5'x15' Junction Box	Ea.	1	\$17,500.00	\$17,500.00
11	Rip Rap, D50 = 6", Depth = 12"	C.Y.	37	\$65.00	\$2,407.41
12	Traffic Control	Month	6.0	\$15,000.00	\$90,000.00
13	20" EPNG Gas Crossing	L.S.	1.0	\$20,000.00	\$20,000.00
14	12" WL DIP	L.S.	1.0	\$3,000.00	\$3,000.00
15	APS Feed Relocates	Ea.	8.0	\$4,000.00	\$32,000.00
16	8" & 6" WL Relocate	L.F.	200.0	\$55.00	\$11,000.00
17	107th & UHD Intersection Reconstruct	S.Y.	3,000.0	\$45.00	\$135,000.00

Box Culverts Cost are based on \$450/CY.

Subtotal	\$1,748,193.41
Contingency (20%)	\$349,638.68
Grand Total	\$2,097,832.09

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

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 CIVIL ENGINEERS - PLANNERS - SURVEYORS
 FORT WORTH - PHOENIX - MEMPHIS

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 2 - ALT B
Union Hills Drive - 107th Avenue to 111th Avenue
Open Channel Alternative

1	Clearing and Grubbing	Ac.	2.3	\$600.00	\$1,380.00
2	Unclassified Excavation	C.Y.	5,890	\$2.75	\$16,197.50
3	Export	C.Y.	5,890	\$5.50	\$32,395.00
3	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
4	7'x3' ADOT Box Culvert (Class IV)	L.F.	150	\$474.75	\$71,212.50
5	7'x3' ADOT Culvert Inlet Wings	Ea.	1	\$2,639.25	\$2,639.25
6	7'x3' ADOT Culvert Outlet Wings	Ea.	1	\$4,610.25	\$4,610.25
7	24" RCP (Class IV)	L.F.	200	\$40.00	\$8,000.00
8	Neenah Trench Grate - R-4999-L6	L.F.	43	\$215.00	\$9,245.00
9	Rip Rap, D50 = 6", Depth = 12"	C.Y.	222	\$65.00	\$14,444.44
10	Rip Rap, D50 = 3", Depth = 6"	C.Y.	1,945	\$45.00	\$87,525.00
11	Traffic Control	Month	6.0	\$15,000.00	\$90,000.00
12	Retaining Wall 1'-4' Height	Front Face	7,550.0	\$20.00	\$151,000.00
13	Retaining Wall 4'-6' Height	Front Face	4,000.0	\$25.00	\$100,000.00
14	Impact Barrier	L.F.	450.0	\$125.00	\$56,250.00
15	20" EPNG Gas Crossing	L.S.	1.0	\$20,000.00	\$20,000.00
16	12" WL DIP	L.S.	1.0	\$3,000.00	\$3,000.00
17	APS Feed Relocates	Ea.	8.0	\$4,000.00	\$32,000.00
18	8" & 6" WL Relocate	L.F.	200.0	\$55.00	\$11,000.00
19	107th & UHD Intersection Reconstruct	L.S.	1.0	\$75,000.00	\$75,000.00
20	Demo Existing Storm Drain Facilities	L.S.	1.0	\$15,000.00	\$15,000.00

Box Culverts Cost are based on \$450/CY.

Subtotal	\$808,098.94
Contingency (20%)	\$161,619.79
Grand Total	\$969,718.73

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

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 FORT WORTH - PHOENIX - MEMPHIS

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 3 - ALT A
Union Hills Drive - 111th Avenue to Basin B

111th Avenue Culvert

1	Clearing and Grubbing	Ac.	1.0	\$600.00	\$600.00
2	Unclassified Excavation	C.Y.	1,000	\$2.75	\$2,750.00
3	Dust/Storm Water Management	Month	1.0	\$1,200.00	\$1,200.00
4	3-10'x3' ADOT Box Culvert (Class IV)	L.F.	130	\$1,282.95	\$166,783.50
5	3-10'x3' ADOT Culvert Inlet Wings	Ea.	1	\$3,690.00	\$3,690.00
6	3-10'x3' ADOT Culvert Outlet Wings	Ea.	1	\$6,619.50	\$6,619.50
7	Rip Rap, D50 = 6", Depth = 12"	C.Y.	74	\$65.00	\$4,814.81
M	MAG 206.3 Concrete Scupper	L.F.	266	\$110.00	\$29,260.00
8	Traffic Control	Month	1.0	\$15,000.00	\$15,000.00
9	Demo Existing 111th	L.S.	1.0	\$10,000.00	\$10,000.00
10	111th Reconstruction	S.Y.	711.0	\$45.00	\$31,995.00

Subtotal **\$272,712.81**

111th Avenue Culvert to Basin B

Open Channel

1	Clearing and Grubbing	Ac.	3.5	\$600.00	\$2,100.00
2	Unclassified Excavation	C.Y.	19,013	\$2.75	\$52,286.67
3	Export	C.Y.	19,013	\$5.50	\$104,573.33
3	Dust/Storm Water Management	Month	2.0	\$1,200.00	\$2,400.00
4	Rip Rap, D50 = 6", Depth = 12"	C.Y.	56	\$65.00	\$3,611.11
5	Rip Rap, D50 = 3", Depth = 6"	C.Y.	3,412	\$45.00	\$153,540.00
6	*Land Acquisition (City of Peoria)	Acre	3.5	\$43,560.00	\$152,460.00

Subtotal **\$470,971.11**

Total **\$743,683.93**

Contingency (20%) **\$148,736.79**

Grand Total **\$892,420.71**

Box Culverts Cost are based on \$450/CY / Land Values are taken from the Maricopa County Assessors Site.

Export and LandCost could be eliminated with participation of the City of Peoria.

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

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 FORT WORTH ~ PHOENIX ~ MEMPHIS

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 3 - Basin B.1
Union Hills Drive

1	Clearing and Grubbing	Ac.	25.0	\$600.00	\$15,000.00
2	Unclassified Excavation	C.Y.	200,000	\$2.75	\$550,000.00
3	Export	C.Y.	0	\$5.50	\$0.00
4	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
5	Rip Rap, D50 = 6", Depth = 12"	C.Y.	200	\$65.00	\$13,000.00
6	36" RCP	L.F.	250	\$85.00	\$21,250.00
7	36"HDWL - MAG 501-1	Ea.	1	\$3,200.00	\$3,200.00
8	Outlet Wier	L.F.	35	\$425.00	\$14,875.00
9	12" WL DIP	L.S.	1.0	\$3,000.00	\$3,000.00
10	APS Feed Relocates	Ea.	1.0	\$4,000.00	\$4,000.00
11	Union Hills Drive - Open cut - R&R	L.S.	1.0	\$75,000.00	\$75,000.00
12	Land Acquisition (AZ American)	Acre	25.0	\$43,560.00	\$1,089,000.00
13	15' O&M Road (4"ABC over 2" DG)	L.F.	5,500.0	\$16.50	\$90,750.00
14	Traffic Control	Month	1.0	\$15,000.00	\$15,000.00

Subtotal	\$1,901,275.00
Contingency (20%)	\$380,255.00
Grand Total	\$2,281,530.00

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 3 - Basin B.2
Union Hills Drive

1	Clearing and Grubbing	Ac.	25.0	\$600.00	\$15,000.00
2	Unclassified Excavation	C.Y.	350,000	\$2.75	\$962,500.00
3	Export	C.Y.	340,000	\$5.50	\$1,870,000.00
4	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
5	Rip Rap, D50 = 6", Depth = 12"	C.Y.	200	\$65.00	\$13,000.00
6	2 - 36" RCP	L.F.	250	\$170.00	\$42,500.00
7	2- 36"HDWL - MAG 501-1	Ea.	1	\$5,400.00	\$5,400.00
8	Outlet Wier	L.F.	35	\$425.00	\$14,875.00
9	12" WL DIP	L.S.	1.0	\$3,000.00	\$3,000.00
10	APS Feed Relocates	Ea.	1.0	\$4,000.00	\$4,000.00
11	Union Hills Drive - Open cut - R&R	L.S.	1.0	\$75,000.00	\$75,000.00
12	Land Acquisition (AZ American)	Acre	25.0	\$43,560.00	\$1,089,000.00
13	15' O&M Road (4"ABC over 2" DG)	L.F.	5,500.0	\$16.50	\$90,750.00
14	Traffic Control	Month	1.0	\$15,000.00	\$15,000.00

* Basin B has been revised to minimize the berm height (max 3 ft.) required along the southwest corner and west side of the basin.

Subtotal	\$4,207,225.00
Contingency (20%)	\$841,445.00
Grand Total	\$5,048,670.00

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 4 - ALT A
115th Avenue -Basin C

1	Clearing and Grubbing	Ac.	16.2	\$600.00	\$9,720.00
2	Unclassified Excavation	C.Y.	110,000	\$2.75	\$302,500.00
3	Export	C.Y.	110,000	\$5.50	\$605,000.00
4	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
5	Rip Rap, D50 = 6", Depth = 12"	C.Y.	200	\$65.00	\$13,000.00
6	Existing Electric Tower Protection	Ea.	3	\$4,500.00	\$13,500.00
7	APS Feed Relocates	L.F.	700.0	\$190.00	\$133,000.00
8	15' O&M Road (4"ABC over 2" DG)	L.F.	3,000.0	\$16.50	\$49,500.00
9	Land Acquisition (Stearns Bank)	Acre	11.8	\$100,000.00	\$1,180,000.00
Basin C Outfall to 115th Channel					
10	3-10'x3' ADOT Box Culvert (Class IV)	L.F.	50	\$1,282.95	\$64,147.50
11	3-10'x3' ADOT Culvert Inlet Wings	Ea.	1	\$3,690.00	\$3,690.00
12	2-10'x3' ADOT Culvert Outlet Wings	Ea.	1	\$6,619.50	\$6,619.50
13	Outlet Wier	L.F.	80	\$425.00	\$34,000.00
14	Rip Rap, D50 = 6", Depth = 12"	C.Y.	125	\$65.00	\$8,125.00

Subtotal	\$2,430,002.00
Contingency (20%)	\$486,000.40
Grand Total	\$2,916,002.40

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

**GOODWIN &
MARSHALL**
CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS
FORT WORTH ~ PHOENIX ~ MEMPHIS

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
----------	-------------	------	----------	------------	------------

SEGMENT 5 - ALT A
Bell Road Diversion
Box Culvert Alternative

1	Clearing and Grubbing	Ac.	1.4	\$600.00	\$826.45
2	Unclassified Excavation	C.Y.	6,200	\$2.75	\$17,050.00
3	Export	C.Y.	6,200	\$5.50	\$34,100.00
4	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
5	2-10'x3' ADOT Box Culvert (Class IV)	L.F.	1,500	\$884.25	\$1,326,375.00
6	2-10'x3' ADOT Culvert Inlet Wings	Ea.	1	\$3,060.00	\$3,060.00
7	2-10'x3' ADOT Culvert Outlet Wings	Ea.	1	\$5,490.00	\$5,490.00
8	Outlet Wier	L.F.	80	\$425.00	\$34,000.00
9	Rip Rap, D50 = 6", Depth = 12"	C.Y.	125	\$65.00	\$8,125.00
10	Traffic Control	Month	3.0	\$15,000.00	\$45,000.00
11	12" WL DIP	Ea.	2.0	\$3,000.00	\$6,000.00
12	APS Feed Relocates @ 115th Ave	L.S.	1.0	\$25,000.00	\$25,000.00
13	6" Gas Relocate	Ea.	1.0	\$9,500.00	\$9,500.00
14	115th Avenue - Open cut - R&R	L.S.	1.0	\$75,000.00	\$75,000.00
15	Private Access - Open cut - R&R	L.S.	1.0	\$55,000.00	\$55,000.00
16	Coyote Lake Pkwy - Open cut - R&R	L.S.	1.0	\$55,000.00	\$55,000.00
17	Land Acquisition (Various)	Acre	1.4	\$100,000.00	\$137,741.05

Basin C Outfall to 115th Channel

10	3-10'x3' ADOT Box Culvert (Class IV)	L.F.	50	\$1,282.95	\$64,147.50
11	3-10'x3' ADOT Culvert Inlet Wings	Ea.	1	\$3,690.00	\$3,690.00
12	2-10'x3' ADOT Culvert Outlet Wings	Ea.	1	\$6,619.50	\$6,619.50
13	Outlet Wier	L.F.	80	\$425.00	\$34,000.00
14	Rip Rap, D50 = 6", Depth = 12"	C.Y.	125	\$65.00	\$8,125.00

Box Culverts Cost are based on \$450/CY.

Subtotal	\$1,961,049.49
Contingency (20%)	\$392,209.90
Grand Total	\$2,353,259.39

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

**GOODWIN &
MARSHALL**
 CIVIL ENGINEERS - PLANNERS - SURVEYORS
 FORT WORTH - PHOENIX - MEMPHIS

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
<u>SEGMENT 5 - ALT B</u>					
<u>Bell Road Diversion</u>					
<u>Open Channel Alternative</u>					
1	Clearing and Grubbing	Ac.	2.8	\$600.00	\$1,652.89
2	Unclassified Excavation	C.Y.	6,826	\$2.75	\$18,770.64
3	Export	C.Y.	6,826	\$5.50	\$37,541.29
4	Dust/Storm Water Management	Month	6.0	\$1,200.00	\$7,200.00
5	2-10'x3' ADOT Box Culvert (Class IV)	L.F.	560	\$1,282.95	\$718,452.00
6	2-10'x3' ADOT Culvert Inlet Wings	Ea.	3	\$3,690.00	\$11,070.00
7	2-10'x3' ADOT Culvert Outlet Wings	Ea.	3	\$6,619.50	\$19,858.50
8	Outlet Wier	L.F.	80	\$425.00	\$34,000.00
9	Rip Rap, D50 = 6", Depth = 12"	C.Y.	378	\$65.00	\$24,555.56
10	Rip Rap, D50 = 3", Depth = 6"	C.Y.	892	\$45.00	\$40,140.00
11	Traffic Control	Month	3.0	\$15,000.00	\$45,000.00
12	12" WL DIP	Ea.	2.0	\$3,000.00	\$6,000.00
13	APS Feed Relocates @ 115th Ave	L.S.	1.0	\$25,000.00	\$25,000.00
14	6" Gas Relocate	Ea.	1.0	\$9,500.00	\$9,500.00
15	115th Avenue - Open cut - R&R	L.S.	1.0	\$75,000.00	\$75,000.00
16	Private Access - Open cut - R&R	L.S.	1.0	\$55,000.00	\$55,000.00
17	Coyote Lake Pkwy - Open cut - R&R	L.S.	1.0	\$55,000.00	\$55,000.00
18	Land Acquisition (Various)	Acre	2.8	\$100,000.00	\$275,482.09

Basin C Outfall to 115th Channel

10	3-10'x3' ADOT Box Culvert (Class IV)	L.F.	\$50.00	\$1,282.95	\$64,147.50
11	3-10'x3' ADOT Culvert Inlet Wings	Ea.	\$1.00	\$3,690.00	\$3,690.00
12	2-10'x3' ADOT Culvert Outlet Wings	Ea.	\$1.00	\$6,619.50	\$6,619.50
13	Outlet Wier	L.F.	\$80.00	\$425.00	\$34,000.00
14	Rip Rap, D50 = 6", Depth = 12"	C.Y.	\$125.00	\$65.00	\$8,125.00

Box Culverts Cost are based on \$450/CY.

Subtotal	\$1,575,804.98
Contingency (20%)	\$315,161.00
Grand Total	\$1,890,965.97

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

GOODWIN & MARSHALL
 CIVIL ENGINEERS - PLANNERS - SURVEYORS
 FORT WORTH - PHOENIX - MEMPHIS

ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: June 6, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 6 - ALT A
115th Channel Revisions

1	Clearing, Grubbing, Demo Ex. Channel	Ac.	4.0	\$600.00	\$2,400.00
2	Export	C.Y.	2,000	\$2.75	\$5,500.00
3	Unclassified Excavation	C.Y.	2,000	\$5.50	\$11,000.00
4	Dust/Storm Water Management	Month	2.0	\$1,200.00	\$2,400.00
5	Rip Rap, D50 = 3", Depth = 6"	C.Y.	13,361	\$45.00	\$601,245.00

Channel Improvements from Section 0.473 to Section 0.663 (+/- 1,200 L.F.)

Subtotal	\$622,545.00
Contingency (20%)	\$124,509.00
Grand Total	\$747,054.00

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

**GOODWIN &
MARSHALL**
 CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS
 FORT WORTH ~ PHOENIX ~ MEMPHIS





FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

IN COOPERATION WITH
THE CITY OF PEORIA AND THE CITY OF SURPRISE

15% PLANS FOR THE CONSTRUCTION OF

107TH AVENUE AND UNION HILLS DRIVE DESIGN CONCEPT PLANS - PHASE 2 RECOMMENDED ALTERNATIVE

APPROVED:

CITY OF SURPRISE
PUBLIC WORKS DIRECTOR

DATE

APPROVED:

CITY OF PEORIA
PUBLIC WORKS DIRECTOR

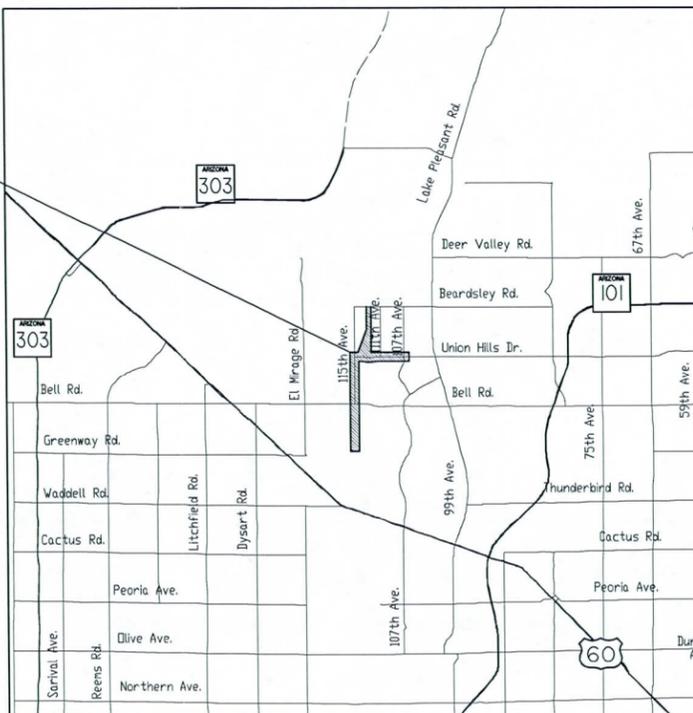
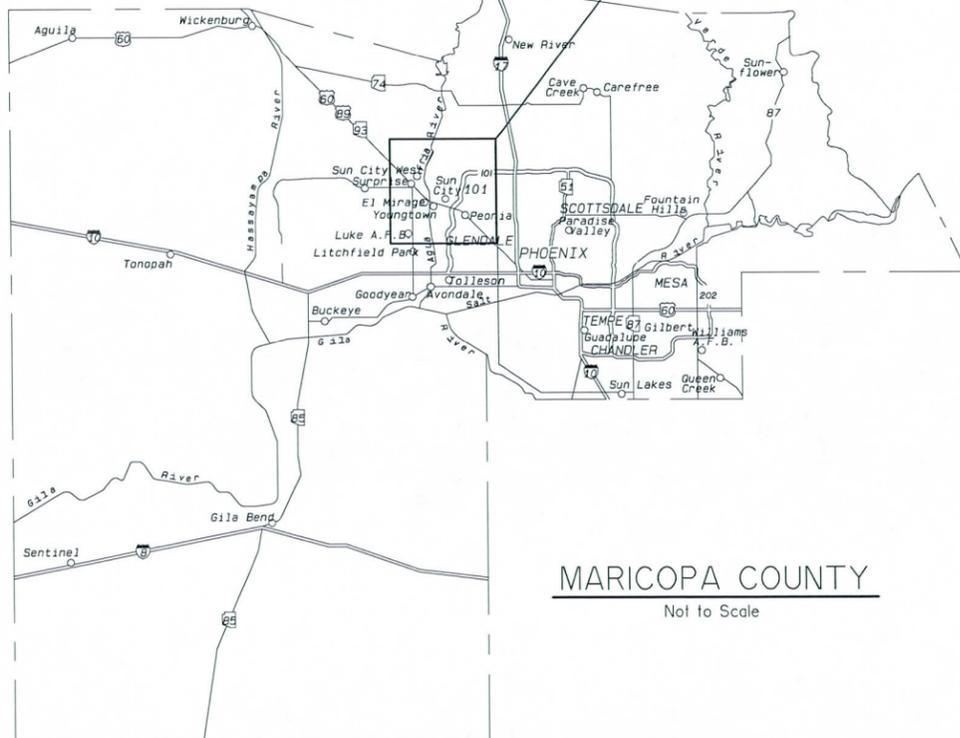
DATE



PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX



PROJECT LOCATION



GOODWIN & MARSHALL

CIVIL ENGINEERS - PLANNERS - SURVEYORS

6909 W. Ray Road #15
Chandler, Arizona 85226
(602) 518-7255

THIS DOCUMENT IS FOR
INTERIM REVIEW ONLY.
IT IS NOT INTENDED FOR
BIDDING, CONSTRUCTION,
OR PERMIT PURPOSES.
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

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

GOODWIN AND MARSHALL, INC.

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX

UTILITY NOTIFICATION

PHONE NO.	COMPANY	CONTACT
(602) 236-2962	SRP	Aaron Dick
(602) 630-1392	Qwest Communications	Ron Floyd
(602) 484-5277	Southwest Gas	Benjamin Balch
(623) 328-3535	Cox Communications	Ron Gandara
(602) 371-7546	APS Electric	Pete Dolance
(785) 610-6166	PUSD/MP Nexlevel	Tom Trujillo
(602) 438-4237	El Paso Natural Gas	Ronald Amaya
(623) 773-7602	City of Peoria - Traffic	Joe Kurrus
(623) 773-7753	City of Peoria - Engineering	Javier Setovich
(623) 773-7734	City of Peoria - Utilities	

INDEX OF SHEETS

DRAWING NO.	TITLE	SHEET NO.
G1	COVER SHEET & VICINITY MAY	1
G2	GENERAL NOTES & INDEX OF SHEETS	2
G3	LEGEND & DETAILS SHEET	3
C1	KEY PLAN	4
C2	TYPICAL CHANNEL SECTIONS	5
C3	PLAN-PROFILE 1	6
C4	PLAN-PROFILE 2	7
C5	PLAN-PROFILE 3	8
C6	PLAN-PROFILE 4	9
C7	PLAN-PROFILE 5	10
C8	PLAN-PROFILE 6	11
C9	PLAN-PROFILE 7	12
C10	PLAN-PROFILE 8	13
C11	PLAN-PROFILE 9	14
C12	PLAN-PROFILE 10	15
C13	PLAN-PROFILE 11	16
C14	PLAN-PROFILE 12	17
C15	PLAN-PROFILE 13	18
C16	PLAN-PROFILE 14	19
C17	PLAN-PROFILE 15	20
C18	PLAN-PROFILE 16	21
C19	PLAN-PROFILE 17	22
C20	PLAN-PROFILE 18	23
C21	PLAN-PROFILE 19	24
C22	PLAN-PROFILE 20	25
C23	PLAN-PROFILE 21	26
C24	PLAN-PROFILE 22	27
C25	DETENTION BASIN C	28
C26	DETENTION BASIN A	29
C27	DETENTION BASIN B	30
C28	DETENTION BASIN B	31

GENERAL NOTES

- ALL CONSTRUCTION TO BE PERFORMED ACCORDING TO APPLICABLE MAG STANDARD DETAILS AND MAG SPECIFICATIONS, DATED 1998 AND THROUGH 2011. AND THE CITY OF PEORIA AND THE CITY OF SURPRISE.
- FACILITIES WHICH ARE NOT SPECIFICALLY LOCATED WITH ACTUAL HORIZONTAL AND VERTICAL CONTROLS ARE APPROXIMATE AND TO THE BEST AVAILABLE INFORMATION.
- EXISTING UTILITIES AND OTHER FACILITIES HAVE BEEN PLACED ON THE PLANS FROM FIELD SURVEYS, EXISTING MAPS AND OTHER CURRENT PLANS WITHIN THE AREA OF THIS PROJECT. THE CONTRACTOR WILL DETERMINE THE EXACT LOCATION AND/OR ELEVATION OF EXISTING UTILITIES WHICH PERTAIN TO AND AFFECT THE CONSTRUCTION OF THIS PROJECT.
- TWO (2) WORKING DAYS PRIOR TO EXCAVATING, THE CONTRACTOR SHALL CALL FOR BLUE STAKE AT THE BLUE STAKE CENTER CENTER (PHONE: 1800-STAKE-IT).
- THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION.
- THE FLOOD CONTROL DISTRICT OR THE CITY OF PEORIA OR THE CITY OF SURPRISE IS NOT RESPONSIBLE FOR LIABILITY ACCRUED DUE TO DELAYS AND/OR DAMAGE TO UTILITIES IN CONJUNCTION WITH THIS CONSTRUCTION.
- ANY WORK PERFORMED WITHOUT THE APPROVAL OF THE FLOOD CONTROL DISTRICT AND/OR THE ENGINEER THE ENGINEER AND ALL WORK AND MATERIALS NOT IN CONFORMANCE WITH THE SPECIFICATIONS IS SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
- THE ENGINEER WILL DETERMINE THE NUMBER AND LOCATION OF THE REQUIRED COMPACTION TESTS FOR STRUCTURAL BACKFILL.
- TRAFFIC CONTROL SHALL BE MAINTAINED IN ACCORDANCE WITH MAG SPECIFICATION 401, PART VI OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (1988 EDITION) INCLUDING REVISION 3 DATED SEPTEMBER 3, 1993).
- CONTRACTOR SHALL REPLACE PAVEMENT TO THE PROPOSED GRADES SHOWN ON THE PAVING DESIGN SHEETS. WHERE PAVING REVISIONS ARE NOT PROPOSED, THE CONTRACTOR SHALL REPLACE PAVEMENT TO THE EXISTING GRADES SHOWN ON THE PLANS.
- EXACT POINT OF MATCHING TERMINATION AND OVERLAY WILL BE DETERMINED IN THE FIELD BY THE ENGINEER.
- NO JOB WILL BE CONSIDERED COMPLETED UNTIL CURBS, PAVEMENT AND SIDEWALKS HAVE BEEN SWEEPED CLEAN OF ALL DIRT AND DEBRIS.
- PRIOR TO FINAL APPROVAL AND ACCEPTANCE OF THE WORK, THE CONTRACTOR WILL BE REQUIRED TO CLEAN ADJACENT (OFF-PROJECT) ROADWAYS USED DURING THE COURSE OF CONSTRUCTION.
- CATCH BASIN CONNECTOR PIPES SHALL BE LAID ON A STRAIGHT ALIGNMENT AND SLOPE UNLESS OTHERWISE SPECIFIED. IF BREAKS IN ALIGNMENT AND SLOPE ARE NECESSARY TO MEET FIELD CONDITIONS. THE MAXIMUM DEFLECTION SHALL BE 22.5 DEGREES. CONTRACTOR SHALL PROVIDE A PIPE COLLAR PER MAG DETAIL 505 AT EACH DEFLECTION.

BENCHMARK NOTE:

THE GIS INFORMATION PROVIDED BY THE FCD IS ON NAVD 88 DATUM HOWEVER THE PROJECT DATUM IS NAVD 88 IN ORDER THAT THE AERIAL TOPOGRAPHIC INFORMATION MAY BE UTILIZED FOR THE ALTERNATIVES ANALYSIS AND FUTURE DESIGN TOPOGRAPHY. THE FLOOD CONTROL DISTRICT TOPOGRAPHY HAS BEEN ADJUSTED TO NAVD 88.

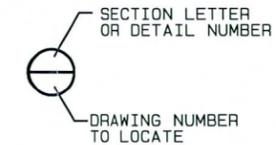
PROJECT BENCHMARK
ELEVATION= 1262.17 NAVD 88 DATUM (PROJECT DATUM)
ELEVATION= 1260.30 NAVD 88 DATUM
BENCHMARK HELD IS A NOS CONTROL POINT
DESIGNATION= 1461 PD= A.8858
STATE/COUNTY= AZ/MARICOPA
1988 QUAD= CALDERWOOD BUTTE (1981)
LOCATION= 445 FEET +/- SOUTHWEST OF A PARKING LOT AT DEER VILLAGE PARK ON DEANNA DRIVE EAST OF 91ST AVENUE

AERIAL TOPOGRAPHIC SURVEY NOTE:

AERIAL PHOTOGRAPHY WAS FLOWN IN 2010 FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FOR THE PURPOSE OF THE PHASE 1 & 2 ANALYSIS.

DISTRICT FIELD SURVEY NOTE:

FIELD SURVEY WORK WAS PERFORMED ON NOVEMBER 19, 2010 FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FOR THE PURPOSE OF THE PHASE 1 & 2 ANALYSIS.



UTILITY CONFLICT TABLE				
NO.	UTILITY	STATION	SHEET	ACTION
1	10" SANITARY SEWER FORCE MAIN	Sta 57+99.36	11	RELOCATE
2	UNDERGROUND ELECTRIC	Sta 58+20.08	11	RELOCATE
3	UNDERGROUND ELECTRIC	Sta 58+50.00 - Sta 65+00.00	12	RELOCATE
4	POWER POLE	Sta 58+89.14	12	RELOCATE
5	POWER POLE	Sta 60+89.20	12	RELOCATE
6	POWER POLE	Sta 61+12.10	12	PROTECT IN PLACE
7	POWER POLE	Sta 61+70.55	12	RELOCATE
8	POWER POLE	Sta 64+18.41	12	REMOVE
9	POWER POLE	Sta 64+51.51	12	RELOCATE
10	POWER POLE	Sta 64+71.64	12	PROTECT IN PLACE
11	POWER POLE	Sta 64+87.32	12	PROTECT IN PLACE
12	12" WATER LINE	Sta 106+29.50	16	RELOCATE OR PROTECT IN PLACE *
13	APS DUCT	Sta 106+29.50	16	RELOCATE
14	12" WATER LINE	Sta 106+29.50	16	RELOCATE
15	12" WATER LINE	Sta 112+71.61	17	RELOCATE OR PROTECT IN PLACE *
16	APS DUCT	Sta 112+86.78	17	RELOCATE
17	18" SANITARY SEWER FORCE MAIN	Sta 112+92.12	17	RELOCATE
18	12" WATER LINE	Sta 113+02.82	17	RELOCATE
19	8" WATER LINE	Sta 121+29.14	18	RELOCATE
20	20" HP GAS	Sta 132+03.88	19	PROTECT IN PLACE
21	UNDERGROUND ELECTRIC	Sta 132+65.31	19	RELOCATE
22	UNDERGROUND ELECTRIC	Sta 132+76.05	19	RELOCATE
23	UNDERGROUND ELECTRIC	Sta 132+85.30	19	RELOCATE
24	UNDERGROUND ELECTRIC	Sta 133+13.01	19	RELOCATE
25	12" WATER LINE	Sta 133+34.42	19	RELOCATE
26	UNDERGROUND ELECTRIC	Sta 134+83.77	19	RELOCATE
27	6" WATER LINE	Sta 134+99.00	19	RELOCATE
28	12" WATER LINE	Sta 138+18.97	19	RELOCATE
29	4" SANITARY SEWER FORCE MAIN	Sta 139+04.01	19	RELOCATE
30	UNDERGROUND ELECTRIC	Sta 139+25.19	19	RELOCATE
31	UNDERGROUND ELECTRIC	Sta 139+31.09	19	RELOCATE
32	UNDERGROUND ELECTRIC	Sta 140+14.34	20	RELOCATE

UTILITY CONFLICT TABLE				
NO.	UTILITY	STATION	SHEET	ACTION
33	UNDERGROUND ELECTRIC	Sta 151+66.68	21	RELOCATE
34	APS DUCT	Sta 158+77.96	21	RELOCATE
35	12" WATER LINE	Sta 158+84.36	21	RELOCATE
36	FIBER OPTIC	Sta 159+00.46	21	RELOCATE
37	6" WATER LINE	Sta 159+00.47	21	RELOCATE
38	12" WATER LINE	Sta 159+16.72	21	RELOCATE
39	8" SANITARY SEWER	Sta 159+23.03	21	RELOCATE
40	FIBER OPTIC	Sta 159+47.31	21	RELOCATE
41	UNDERGROUND ELECTRIC	Sta 159+77.48	21	RELOCATE
42	UNDERGROUND ELECTRIC	Sta 159+86.25	21	RELOCATE
43	8" SANITARY SEWER & MANHOLE	Sta 159+91.61	21	RELOCATE
44	FIBER OPTIC	Sta 159+95.66	21	RELOCATE
45	FIBER OPTIC	Sta 159+98.20	21	RELOCATE
46	UNDERGROUND ELECTRIC	Sta 160+02.04	21	RELOCATE
47	TRANSMISSION TOWER	Sta 125+76.91	18	PROTECT IN PLACE
48	FIBER OPTIC	Sta 132+92.56	19	RELOCATE
49	UNDERGROUND ELECTRIC	Sta 133+12.65	19	RELOCATE
50	FIBER OPTIC	Sta 133+21.27	19	RELOCATE
51	POWER POLE	Sta 12+10.12	30	RELOCATE
52	POWER POLE	Sta 14+92.90	30	RELOCATE
53	POWER POLE	Sta 17+74.61	30	RELOCATE
54	POWER POLE	Sta 20+79.55	31	RELOCATE
55	POWER POLE	Sta 23+55.23	31	RELOCATE
56	POWER POLE	Sta 26+35.10	24	RELOCATE
57	POWER POLE	Sta 29+46.20	24	RELOCATE
58	POWER POLE	Sta 32+25.39	24	RELOCATE

* CURRENTLY THERE IS NOT SUFFICIENT INFORMATION REGARDING UTILITY LOCATION TO DETERMINE WHETHER OR NOT IT WILL NEED TO BE RELOCATED OR PROTECTED IN PLACE. UTILITY SHALL BE LOCATED AS PART OF THE FINAL DESIGN AND A DECISION REGARDING THE CONFLICT MADE AT THAT TIME.

Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			
NO.	REVISION	BY	DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

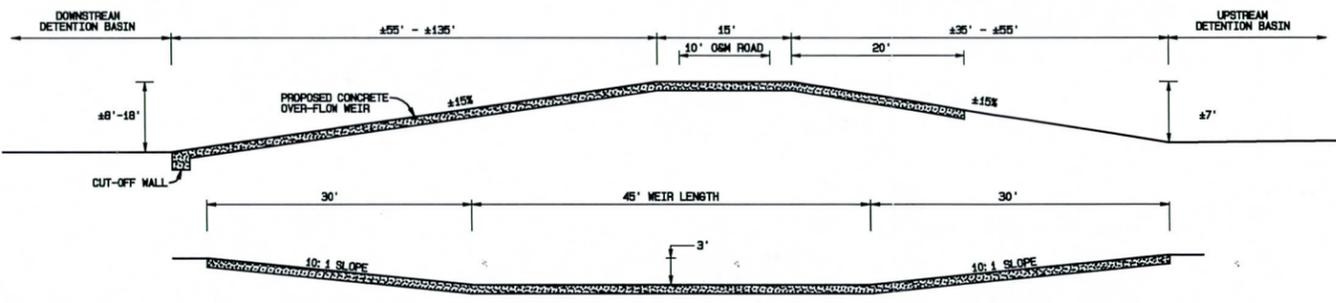
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
8007 W. NAV ROAD #16, CHANDLER, ARIZONA, 85226

DRAWING NO.	GENERAL NOTES & INDEX OF SHEETS	SHEET OF
G2		2 / 31

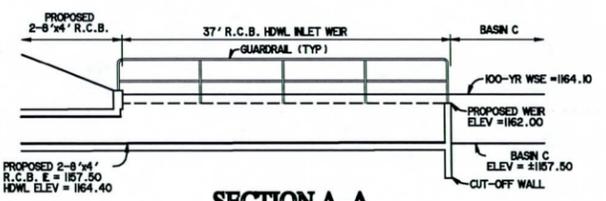
LINESTYLES & SYMBOLS

- - - - - Existing Contour (Aerial Survey)
- x 1200.2 Existing Spot Elevation (Aerial Survey)
- x 1150.30 Existing Spot Elevation (Field Survey)
- Existing Slope Indicator
- Proposed Slope Indicator
- 1200 Proposed Contour
- Section Corner
- Centerline
- Existing Right-of-Way
- Parcel Lines (FCDMC)
- Easement
- Existing 1.5" Water Line
- Existing 6" Water Line
- Existing 8" Water Line
- Existing 12" Water Line
- Existing 8" Sanitary Sewer
- Existing Sanitary Sewer (Size Undetermined)
- Existing 4" Sewer Force Main
- Existing 18" Sewer Force Main
- Existing 8" Gas Line
- Existing 20" Gas Line
- Existing Telecommunications Line
- Existing APS Electric Duct
- Existing Underground Electric
- Existing Overhead Electric
- Existing Power Pole
- Existing Electric Transmission Tower
- Existing Box Culvert
- Proposed RCP w/HDWL & Erosion Protection
- Proposed 10' O&M Road

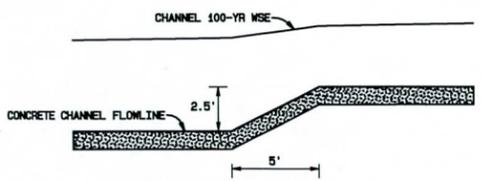


DETAIL #1
DETENTION BASIN "A" & "B" CONCRETE OVER-FLOW WEIR *
 (SEE SHEETS 23 & 29-31 FOR PLAN VIEW INFORMATION)

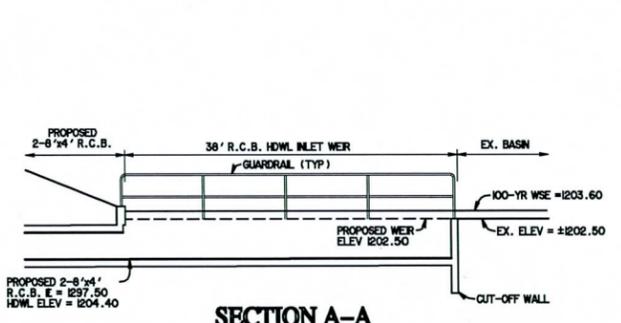
* FINAL OVER-FLOW WEIR DESIGN PARAMETERS TO BE DISCUSSED WITH DISTRICT.



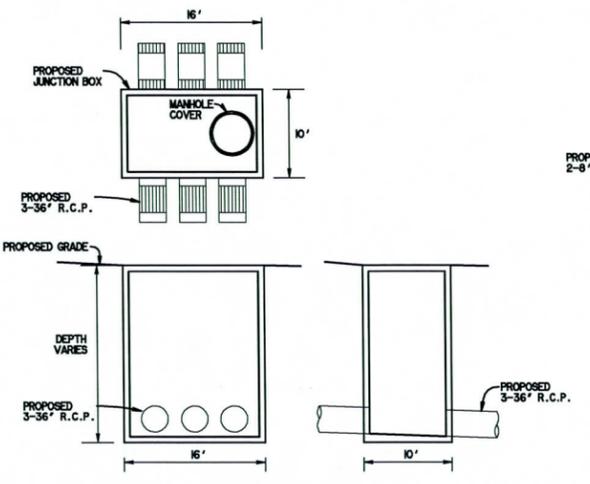
SECTION A-A



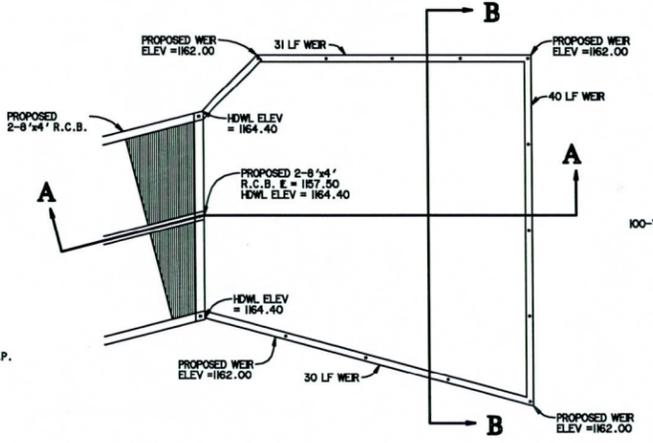
DETAIL #2
BEARDSLEY CHANNEL DROP STRUCTURE
 (SEE SHEETS 26 & 27 FOR PLAN & PROFILE VIEW INFORMATION)



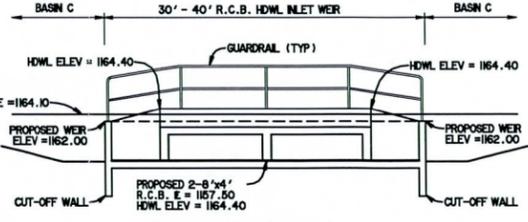
SECTION A-A



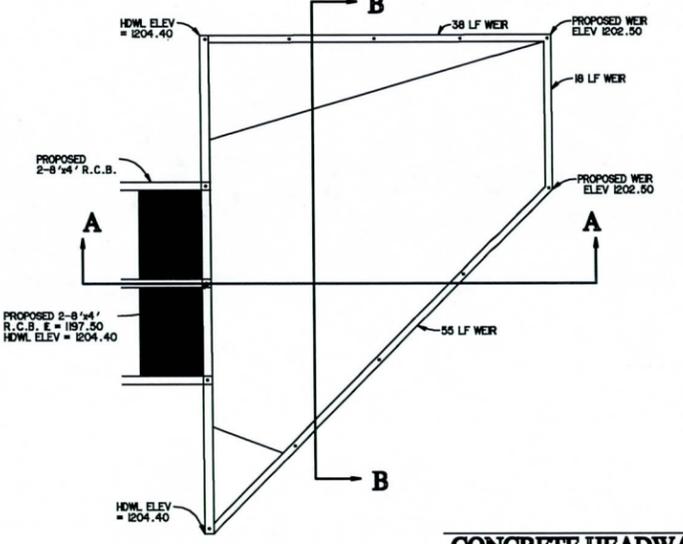
DETAIL #5
R.C.P. JUNCTION BOX
 (SEE SHEETS 19 & 21 FOR PLAN & PROFILE VIEW INFORMATION)



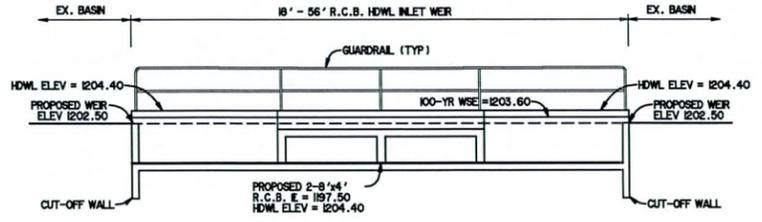
DETAIL #3
CONCRETE HEADWALL STAGED OUTFALL STRUCTURE
 (SEE SHEETS 11 & 28 FOR PLAN VIEW INFORMATION)



SECTION B-B



DETAIL #4
CONCRETE HEADWALL STAGED OUTFALL STRUCTURE
 (SEE SHEET 29 FOR PLAN VIEW INFORMATION)

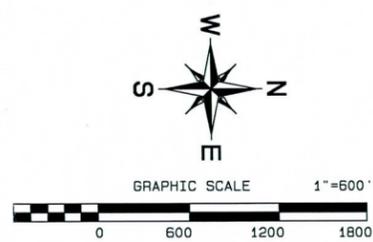
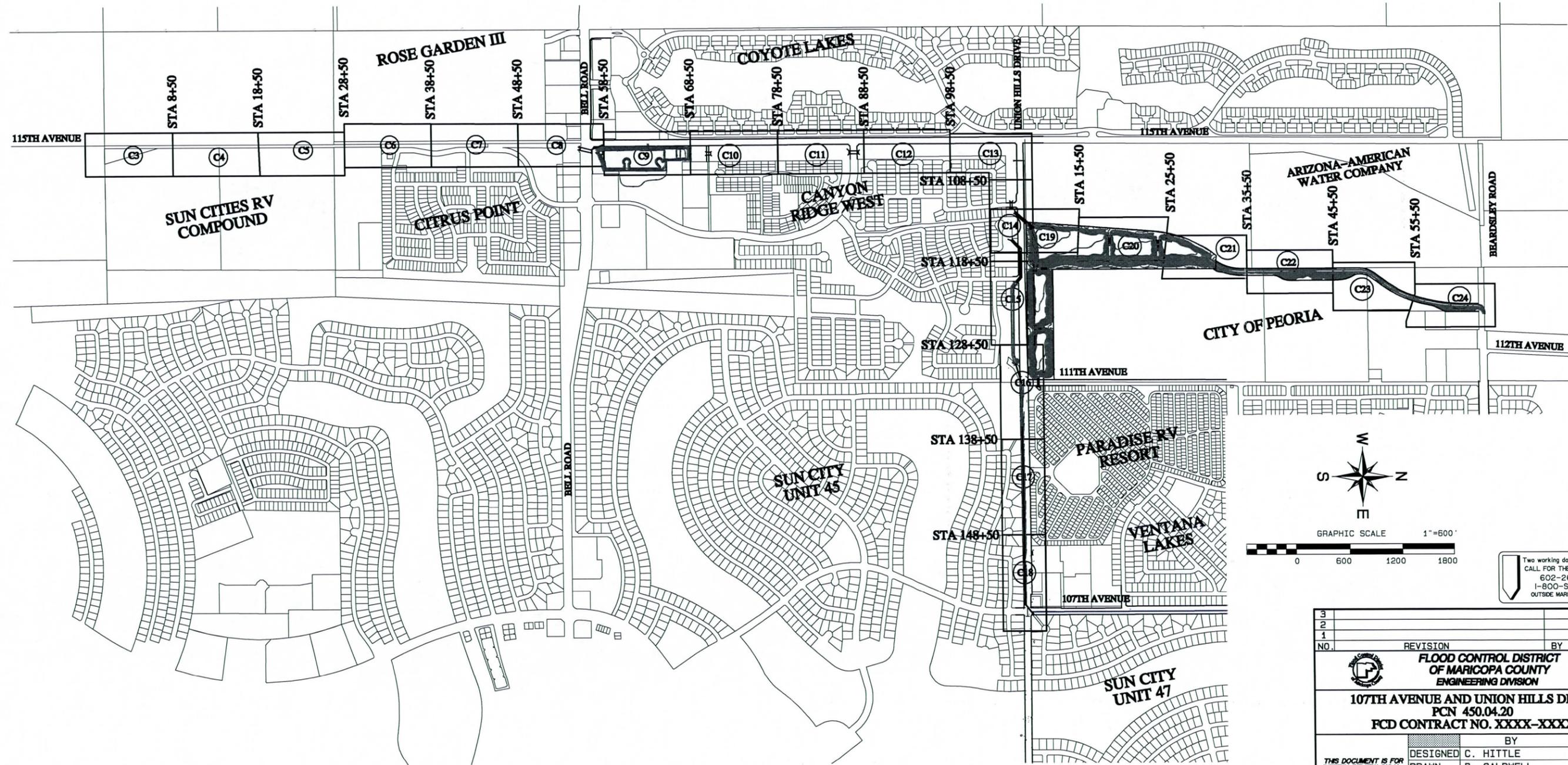


SECTION B-B

Two working days before you dig
 CALL FOR THE BLUE STAKES
 602-263-1100
 1-800-STAKE-IT
 OUTSIDE MARICOPA COUNTY

3			
2			
1			
NO.	REVISION	BY	DATE
107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
DESIGNED	C. HITTLE	05/27/11	
DRAWN	B. CALDWELL	05/27/11	
CHECKED	W. RUSSELL	05/27/11	
THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.		GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS 807 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226	
DRAWING NO. 63		LEGEND & DETAILS SHEET	SHEET OF 31

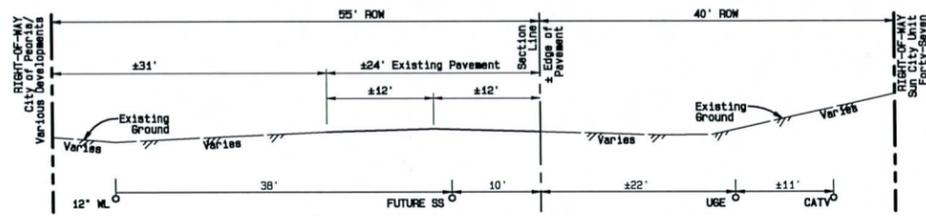
GOODWIN AND MARSHALL, INC. JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX



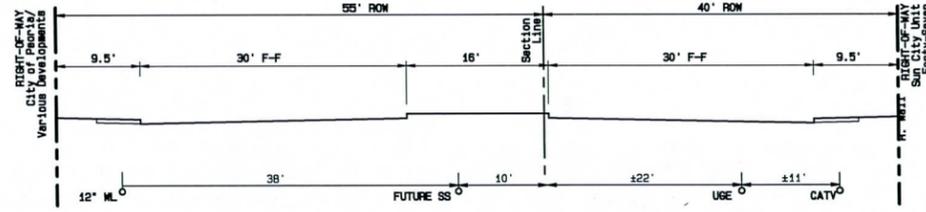
Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

3			
2			
1			
NO.	REVISION	BY	DATE
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION 107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
	DESIGNED	C. HITTLE	05/27/11
	DRAWN	B. CALDWELL	05/27/11
	CHECKED	W. RUSSELL	05/27/11
<small>THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.</small> <small>WARREN C. RUSSELL ARIZONA P.E. NO. 39620</small>		GOODWIN & MARSHALL <small>CIVIL ENGINEERS-PLANNERS-SURVEYORS</small> <small>800 W. RAY ROAD #15, CHANDLER, ARIZONA, 85226</small>	
DRAWING NO.	KEY PLAN	SHEET OF 4 31	

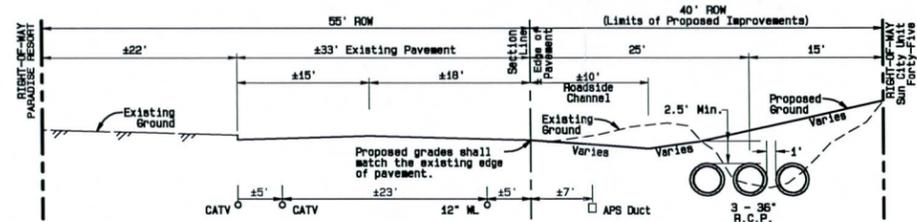
JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



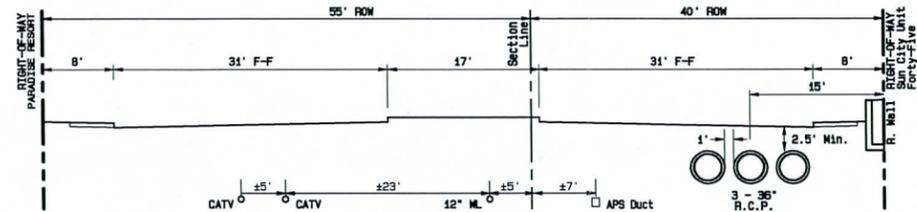
SECTION 1.1
107TH AVENUE (EXISTING CONDITION)
(SEE SHEET 21 FOR PLAN VIEW INFORMATION)



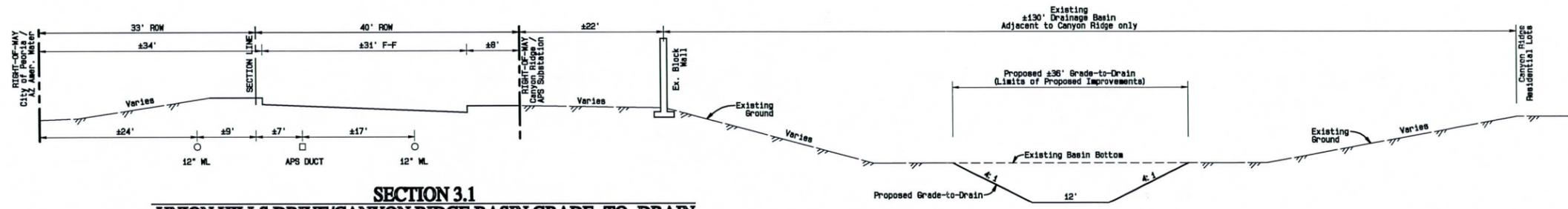
SECTION 1.1
107TH AVENUE (ULTIMATE CONDITION)
(SEE SHEET 21 FOR PLAN VIEW INFORMATION)



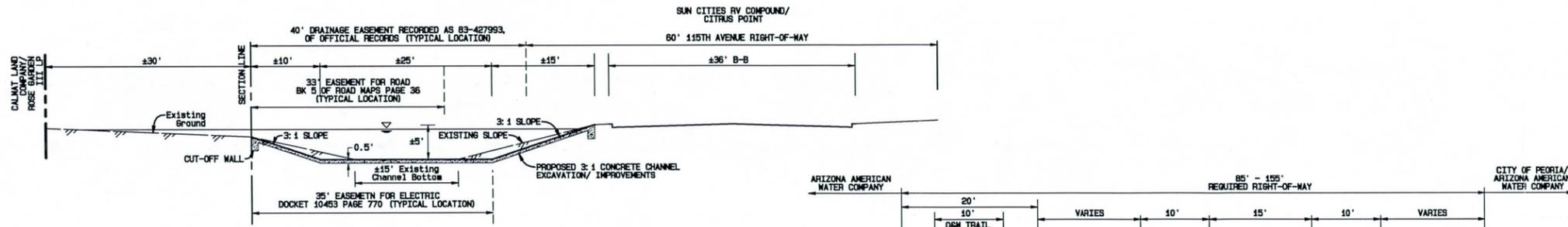
SECTION 2.1
UNION HILLS DRIVE 3 - 36" R.C.P. ALTERNATIVE (INTERIM CONDITION)
(SEE SHEETS 19 - 21 FOR PLAN & PROFILE VIEW INFORMATION)



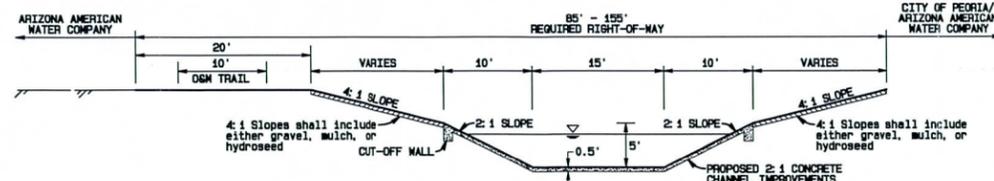
SECTION 2.1
UNION HILLS DRIVE 3 - 36" R.C.P. ALTERNATIVE (ULTIMATE CONDITION)
(SEE SHEETS 19 - 21 FOR PLAN & PROFILE VIEW INFORMATION)



SECTION 3.1
UNION HILLS DRIVE/CANYON RIDGE BASIN GRADE-TO-DRAIN
(SEE SHEETS 18 - 19 FOR PLAN & PROFILE VIEW INFORMATION)



SECTION 6.1
115TH AVENUE CHANNEL PROPOSED IMPROVEMENTS
(SEE SHEETS 18 - 19 FOR PLAN & PROFILE VIEW INFORMATION)



SECTION 7.1
BEARDSLEY CHANNEL PROPOSED IMPROVEMENTS
(SEE SHEETS 24 - 27 FOR PLAN & PROFILE VIEW INFORMATION)

Two working days before you dig
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602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 PCD CONTRACT NO. XXXX-XXXX			
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DRAWN		B. CALDWELL	05/27/11
CHECKED		W. RUSSELL	05/27/11
<small>THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.</small> WARREN C. RUSSELL ARIZONA P.E. NO. 39620		GOODWIN & MARSHALL <small>CIVIL ENGINEERS-PLANNERS-SURVEYORS</small> <small>800 W. GAY ROAD #15, CHANDLER, ARIZONA, 85226</small>	
DRAWING NO. C2	CHANNEL TYPICAL SECTIONS	SHEET OF 5	31

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.

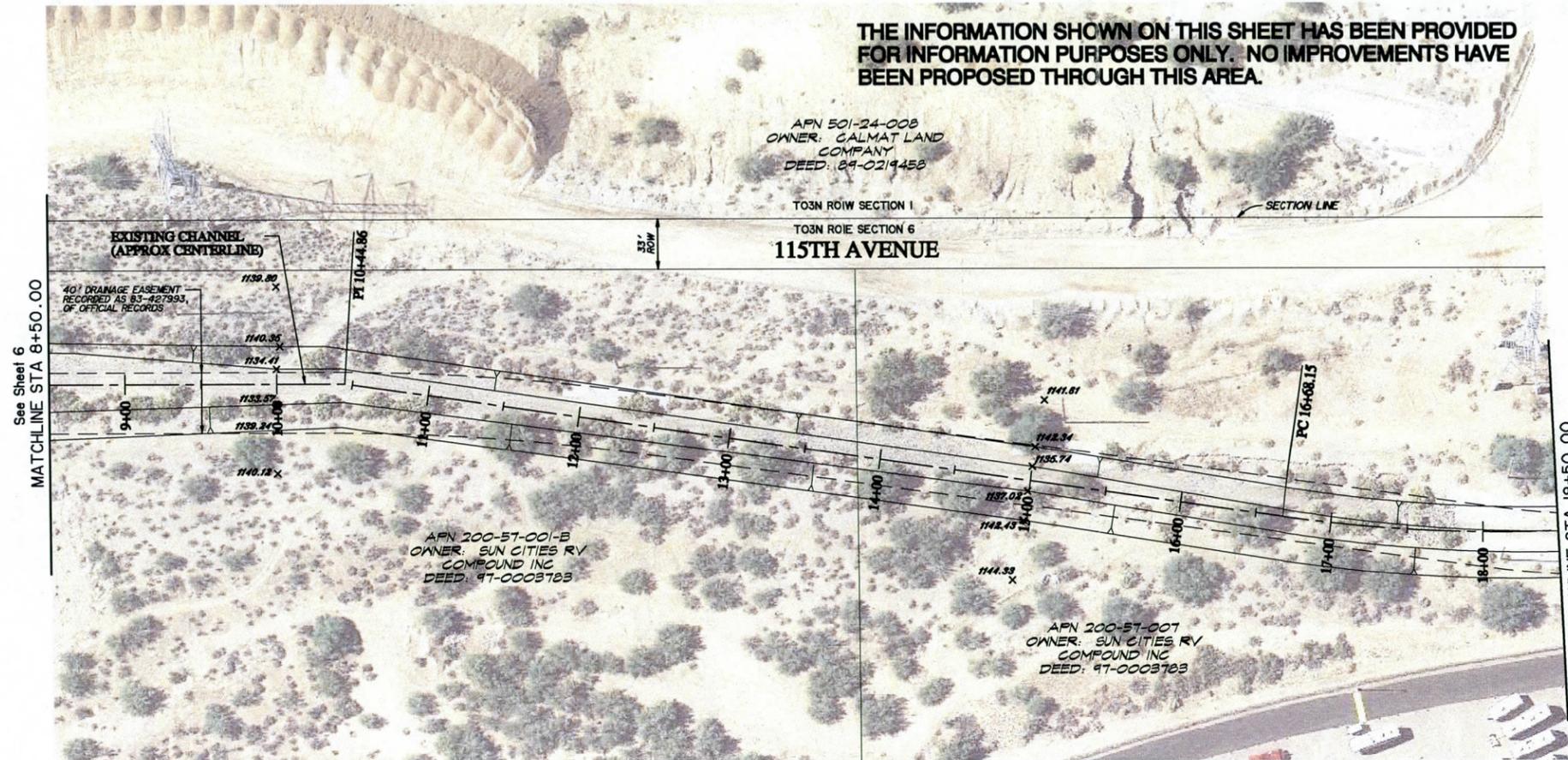
THE INFORMATION SHOWN ON THIS SHEET HAS BEEN PROVIDED FOR INFORMATION PURPOSES ONLY. NO IMPROVEMENTS HAVE BEEN PROPOSED THROUGH THIS AREA.

APN 501-24-008
OWNER: CALMAT LAND COMPANY
DEED: 04-0219458

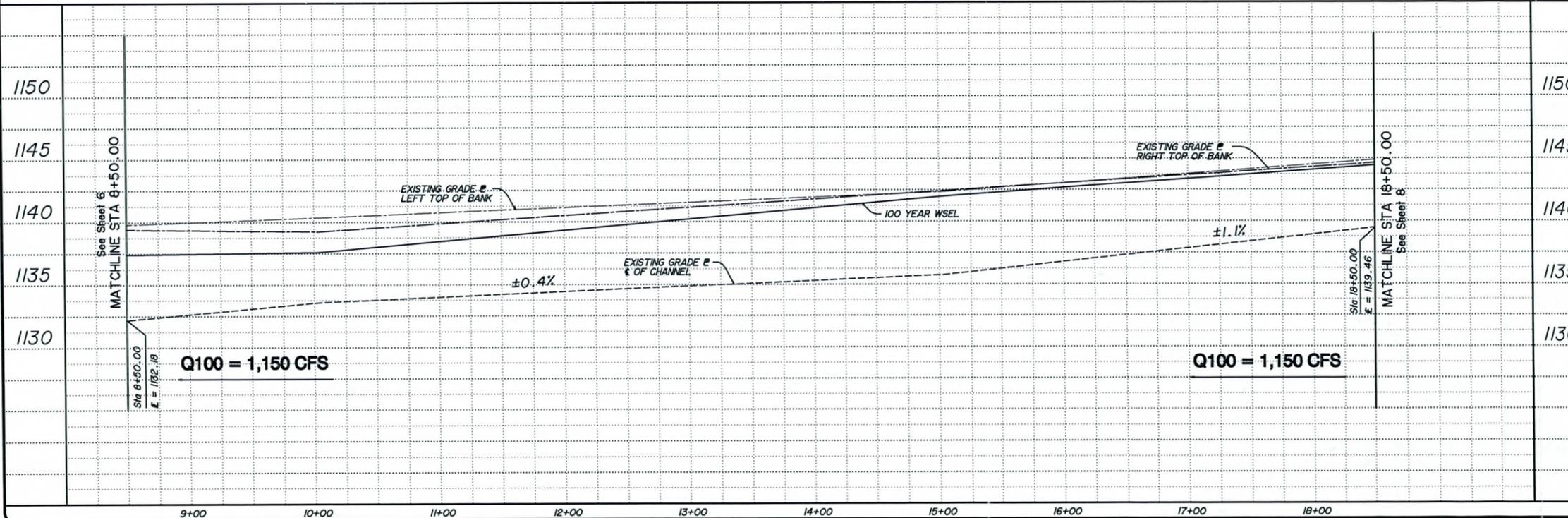
TO3M ROW SECTION I
TO3M ROW SECTION 6
115TH AVENUE

APN 200-57-001-B
OWNER: SUN CITIES RV COMPOUND INC
DEED: 97-0003783

APN 200-57-007
OWNER: SUN CITIES RV COMPOUND INC
DEED: 97-0003783



SEGMENT 6



- △ REMOVE △
- ⊗ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
- 1 CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
 - 2 GRADE-TO-DRAIN EXCAVATION/CONSTRUCTION PER TYPICAL CANYON RIDGE BASIN GRADE-TO-DRAIN SECTION ON SHEET C2.
 - 3 ROAD SIDE SWALE/GRADING PER TYPICAL UNION HILLS DRIVE STREET SECTION ON SHEET C2.
 - 4 18" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 5 24" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 6 2 - 24" RGRCP, CLASS III STORM DRAIN PIPE, LENGTH PER PLAN.
 - 7 2 - 24" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 8 3 - 36" RGRCP, CLASS III STORM DRAIN PIPE, LENGTH PER PLAN.
 - 9 3 - 36" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 10 2 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.20. LENGTH PER PLAN.
 - 11 3 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.30. LENGTH PER PLAN.
 - 12 HEADWALL PER A.D.O.T. STD. DTL. B-II.11.
 - 13 OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10.
 - 14 INLET HEADWALL PER A.D.O.T. STD. DTL. B-04.30.
 - 15 3 - 36" RGRCP, CLASS III STORM DRAIN JUNCTION BOX.
 - 16 CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3.
 - 17 08M ROAD ACCESS RAMP
 - 18 08M ROAD PER TYPICAL SECTION ON SHEET 3.
 - 19 CONCRETE WEIR STRUCTURE PER DETAIL #1 ON SHEET 3.
 - 20 CHANNEL DROP STRUCTURE PER DETAIL #2 ON SHEET 3.
 - 21 ROCK RIP-RAP (D₅₀ = 12 in.) HDWL. PROTECTION OR APPROVED EQUIVALENT.
 - 22 CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.

GENERAL NOTES

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4. VERTICAL CONTROL THROUGH SEGMENT 6 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010.
5. VERTICAL CONTROL THROUGH BASIN C AND SEGMENT 4 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010 AND THE CANYON RIDGE WEST AS-BUILT GRADING PLANS.
6. VERTICAL CONTROL THROUGH SEGMENT 7 WAS ESTABLISHED BASED ON AERIAL DISTRICT TOPOGRAPHY DATED NOVEMBER 28, 2010.

Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

**107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX**

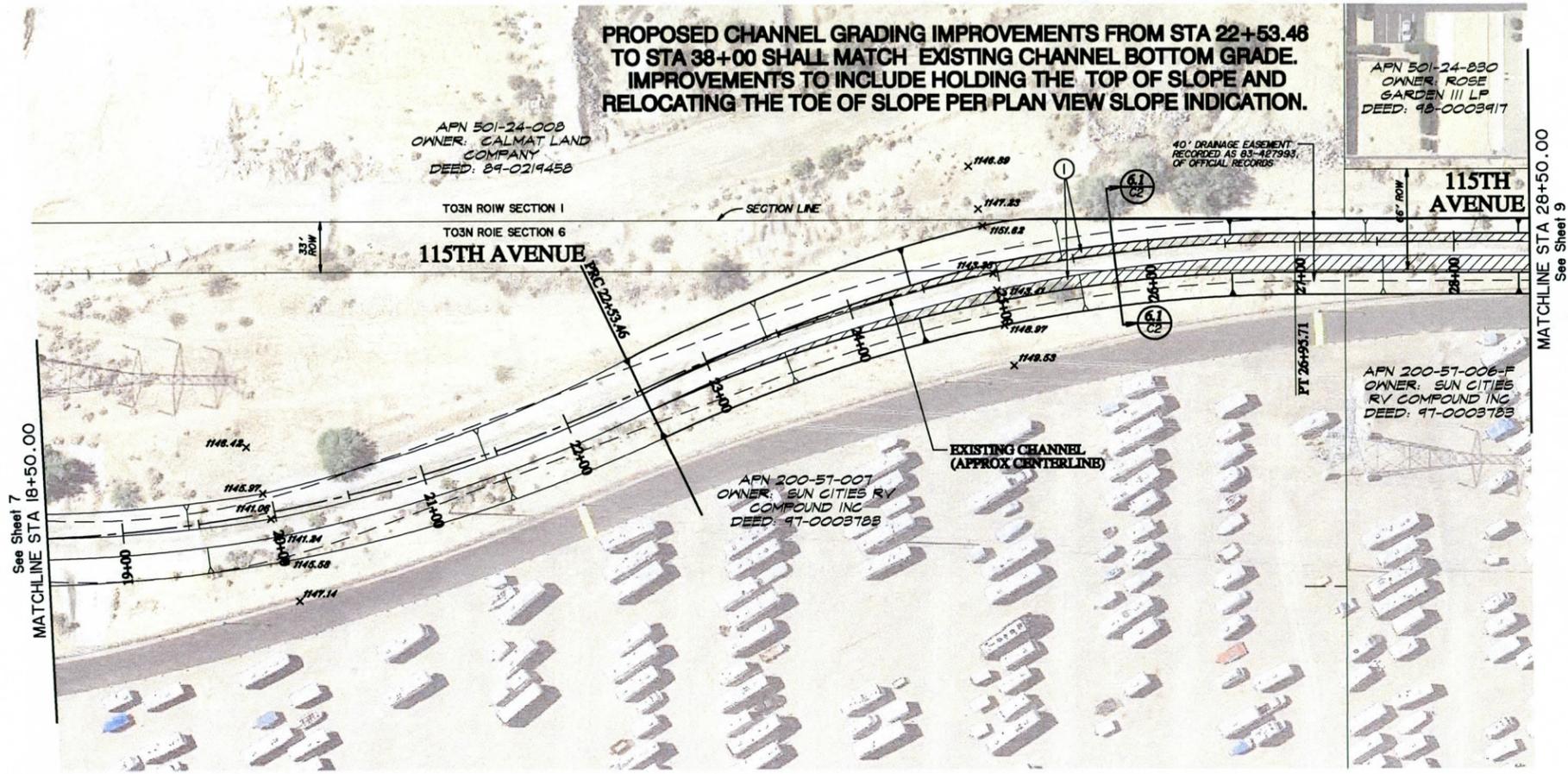
	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

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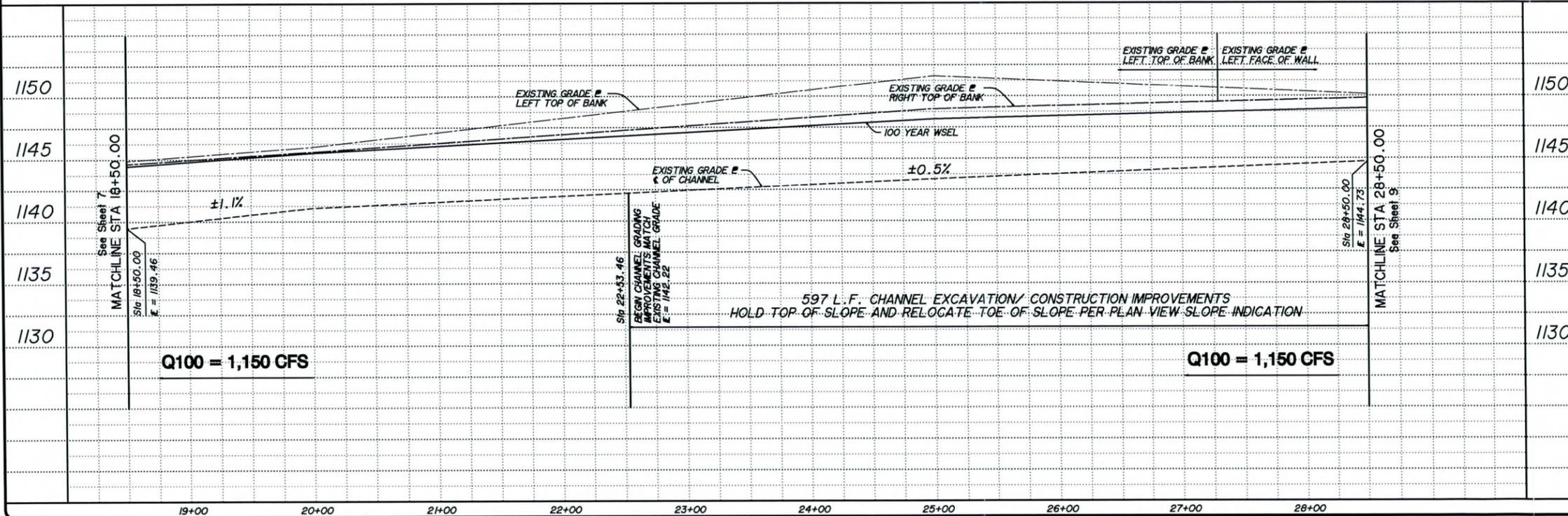
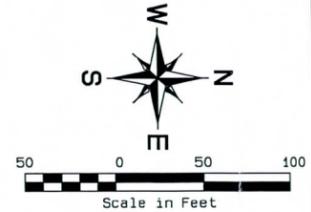
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
8001 W. SAGE ROAD #15, CHANDLER, ARIZONA, 85226

DRAWING NO. C4	PLAN-PROFILE 2	SHEET OF 31
----------------	----------------	-------------



SEGMENT 6



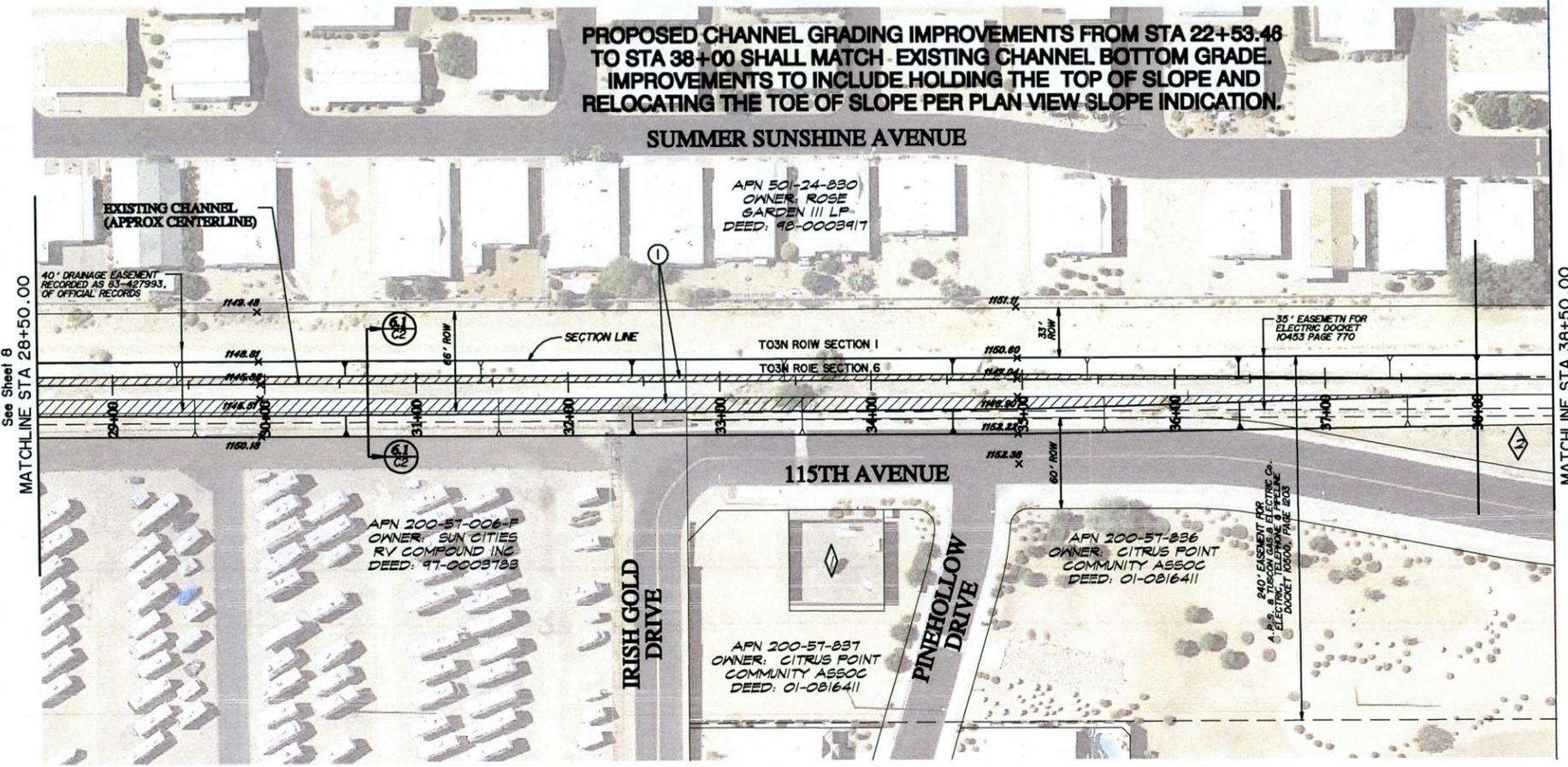
- △ REMOVE △
- ⊗ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
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 - 11 3 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.30. LENGTH PER PLAN.
 - 12 HEADWALL PER A.D.O.T. STD. DTL. B-II.II.
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 - 16 CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3.
 - 17 OBM ROAD ACCESS RAMP
 - 18 OBM ROAD PER TYPICAL SECTION ON SHEET 3.
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 - 22 CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.

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 4. VERTICAL CONTROL THROUGH SEGMENT 6 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010.
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- Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			
<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX</p>			
DESIGNED	C. HITTLE	BY	DATE
DRAWN	B. CALDWELL		05/27/11
CHECKED	W. RUSSELL		05/27/11
<p>THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.</p> <p>WARREN C. RUSSELL ARIZONA P.E. NO. 39620</p> <p>GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS 800 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226</p>			
DRAWING NO.	C5	PLAN-PROFILE 3	SHEET OF 8 31

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



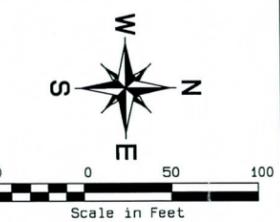
PROPOSED CHANNEL GRADING IMPROVEMENTS FROM STA 22+53.48 TO STA 38+00 SHALL MATCH EXISTING CHANNEL BOTTOM GRADE. IMPROVEMENTS TO INCLUDE HOLDING THE TOP OF SLOPE AND RELOCATING THE TOE OF SLOPE PER PLAN VIEW SLOPE INDICATION.

SUMMER SUNSHINE AVENUE

SEGMENT 6

- APN 200-57-833
OWNER: SUN CITY
SEWER COMPANY
DEED: 01-0147306E
- APN 200-57-838
OWNER: CITRUS POINT
COMMUNITY ASSOC
DEED: 01-0816411

MATCHLINE STA 38+50.00
See Sheet 10

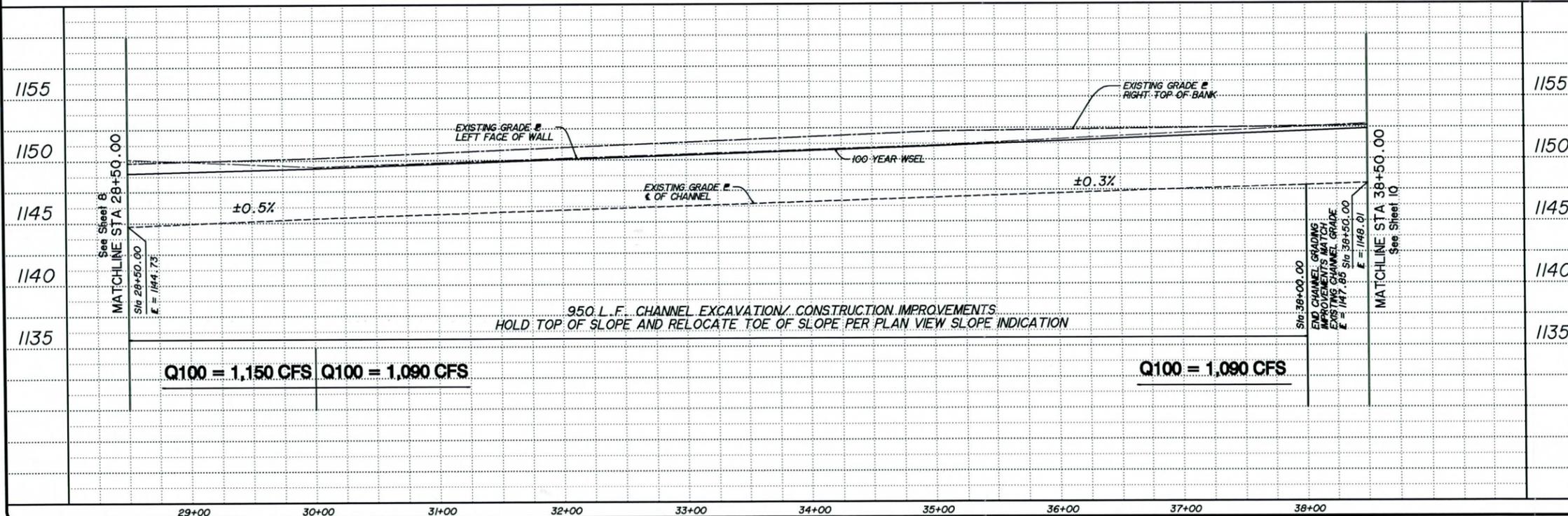


- △ REMOVE △
- ⊗ CONSTRUCT ⊙
- 1 CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
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1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY



NO.	REVISION	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION**

**107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX**

	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

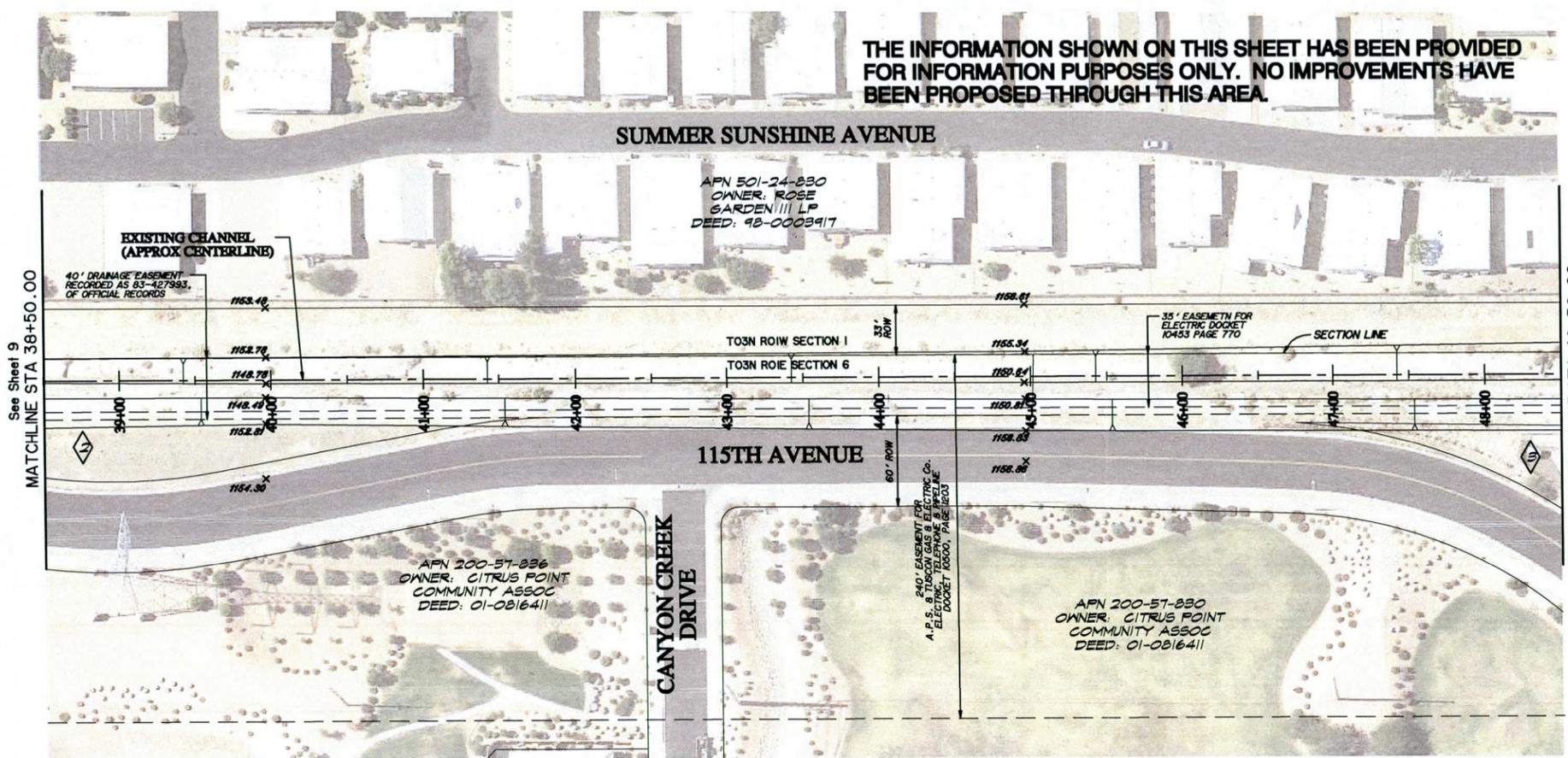
**GOODWIN &
MARSHALL**
CIVIL ENGINEERS-PLANNERS-SURVEYORS
6000 W. BAY ROAD #18, CHANDLER, ARIZONA, 85226

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WARREN C. RUSSELL
ARIZONA P.E. NO. 33620

DRAWING NO. C6 PLAN-PROFILE 4 SHEET OF 9 31

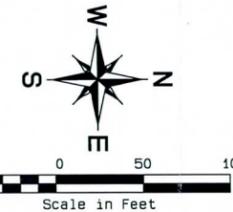
GOODWIN AND MARSHALL, INC.
JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX

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APN 200-57-838
OWNER: CITRUS POINT COMMUNITY ASSOC
DEED: 01-081641

APN 200-57-933-A
OWNER: AVENUE OF THE ARTS LLC
DEED: 10-0660741



SEGMENT 6

- △ REMOVE △
- ⊗ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
- ① CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
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 - ⑧ 3 - 36" RGRCP, CLASS III STORM DRAIN PIPE, LENGTH PER PLAN.
 - ⑨ 3 - 36" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - ⑩ 2 - 8" x 4" BOX CULVERT PER A.D.O.T. STD. DTL. B-02.20. LENGTH PER PLAN.
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 - ⑫ HEADWALL PER A.D.O.T. STD. DTL. B-II.11.
 - ⑬ OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10.
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 - ⑯ CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3.
 - ⑰ O&M ROAD ACCESS RAMP
 - ⑱ O&M ROAD PER TYPICAL SECTION ON SHEET 3.
 - ⑲ CONCRETE WEIR STRUCTURE PER DETAIL #1 ON SHEET 3.
 - ⑳ CHANNEL DROP STRUCTURE PER DETAIL #2 ON SHEET 3.
 - ㉑ ROCK RIP-RAP (D₅₀ = 12 in.) HDWL. PROTECTION OR APPROVED EQUIVALENT.
 - ㉒ CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.

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5. VERTICAL CONTROL THROUGH BASIN C AND SEGMENT 4 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010 AND THE CANYON RIDGE WEST AS-BUILT GRADING PLANS.
6. VERTICAL CONTROL THROUGH SEGMENT 7 WAS ESTABLISHED BASED ON AERIAL DISTRICT TOPOGRAPHY DATED NOVEMBER 28, 2010.

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1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
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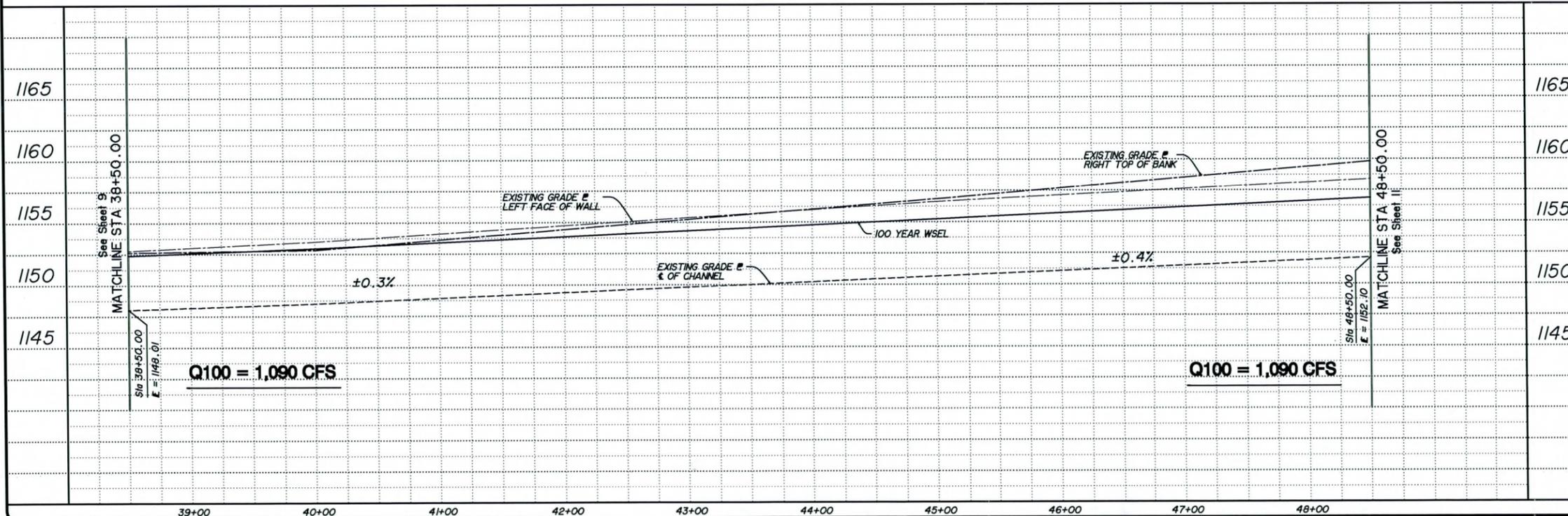
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION
107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

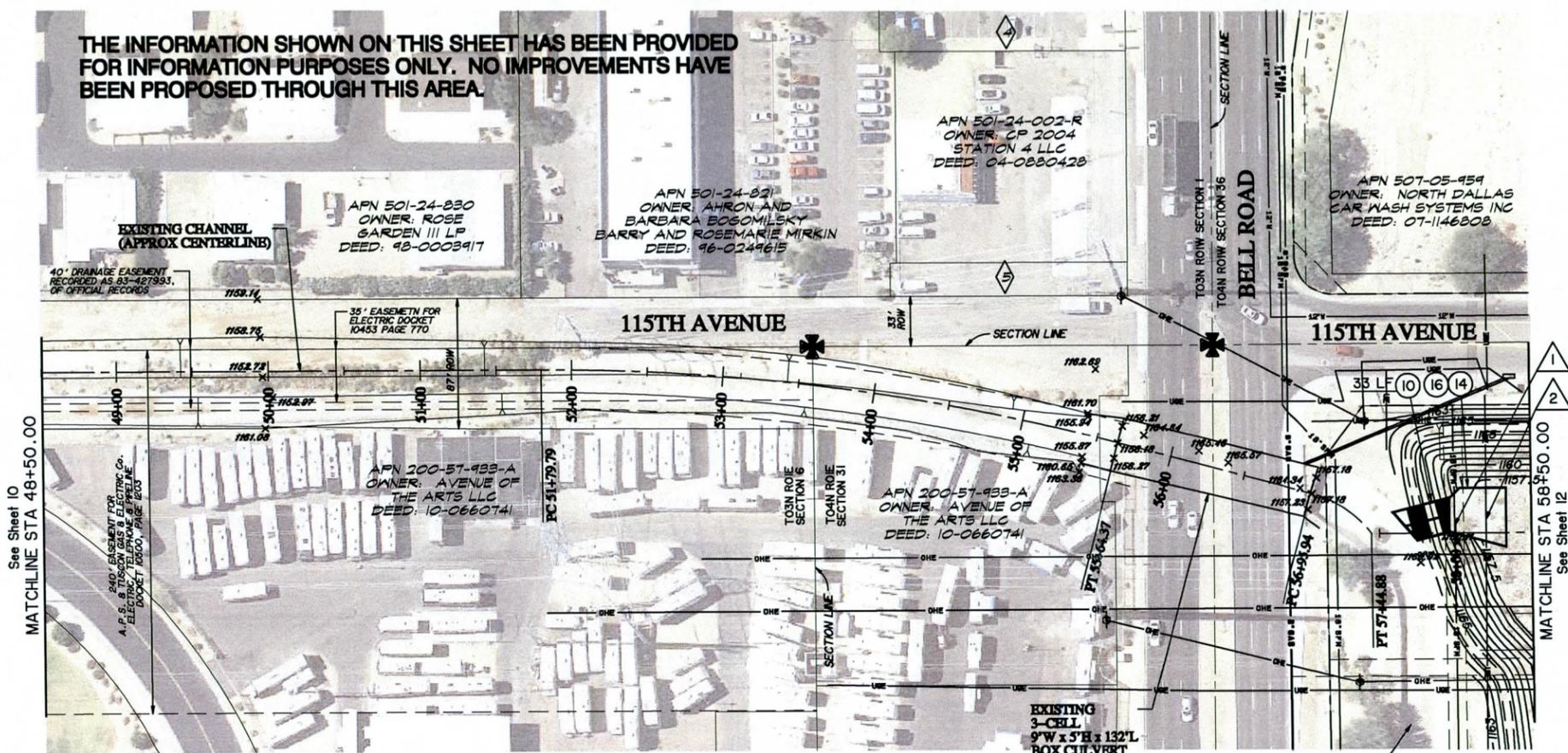
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
8001 W. RAY ROAD, PHOENIX, ARIZONA 85026

DRAWING NO. C7	PLAN-PROFILE 5	SHEET OF 10 31
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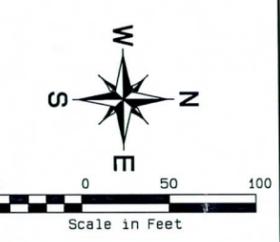


THE INFORMATION SHOWN ON THIS SHEET HAS BEEN PROVIDED FOR INFORMATION PURPOSES ONLY. NO IMPROVEMENTS HAVE BEEN PROPOSED THROUGH THIS AREA.



SEGMENT 6

- APN 501-24-002-W
OWNER: GOTTLIEB MILTON & PAT
DEED: 92-0227411
- APN 501-24-002-E
OWNER: CP 2004 STATION 4 LLC
DEED: 04-0880428
- APN 507-05-959
OWNER: NORTH DALLAS CAR WASH SYSTEMS INC
DEED: 07-1146808
- APN 501-24-821
OWNER: AHRON AND BARBARA BOSOMILSKY BARRY AND ROSEMARIE MIRKIN
DEED: 96-0249615
- APN 501-24-830
OWNER: ROSE GARDEN III LP
DEED: 98-0003917
- APN 200-57-933-A
OWNER: AVENUE OF THE ARTS LLC
DEED: 10-0660741

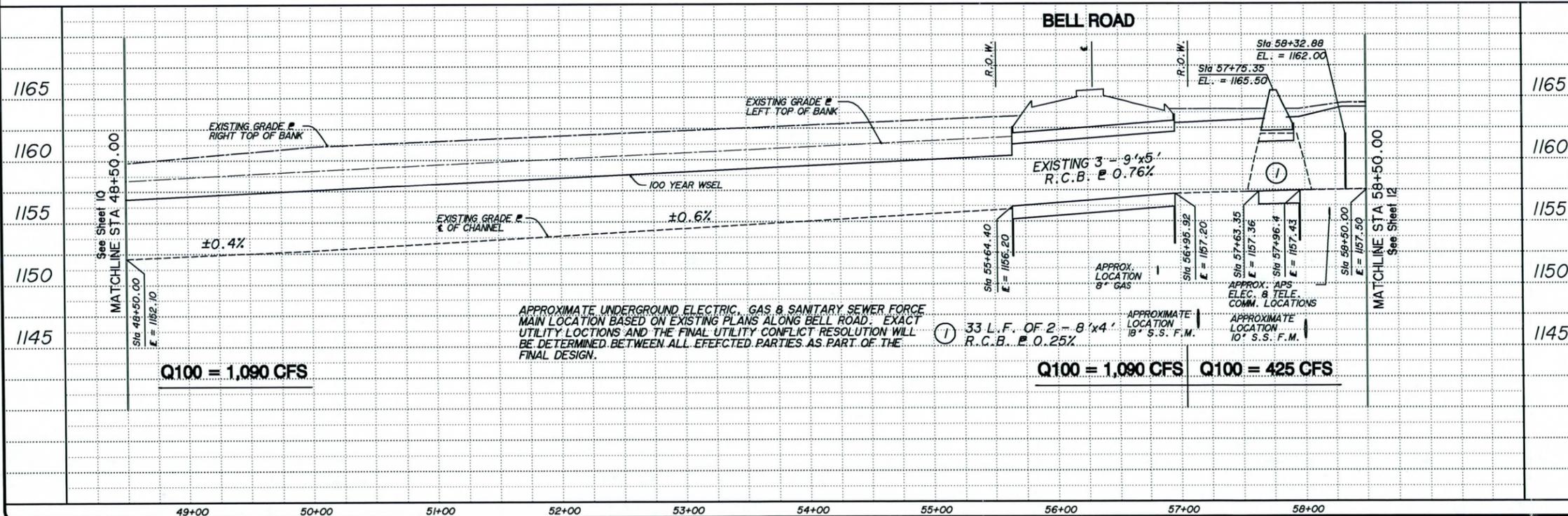


- △ REMOVE △
- ⊗ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
- ① CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
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- ⑰ OBM ROAD ACCESS RAMP
- ⑱ OBM ROAD PER TYPICAL SECTION ON SHEET 3.
- ⑲ CONCRETE WEIR STRUCTURE PER DETAIL #1 ON SHEET 3.
- ⑳ CHANNEL DROP STRUCTURE PER DETAIL #2 ON SHEET 3.
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- ㉒ CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

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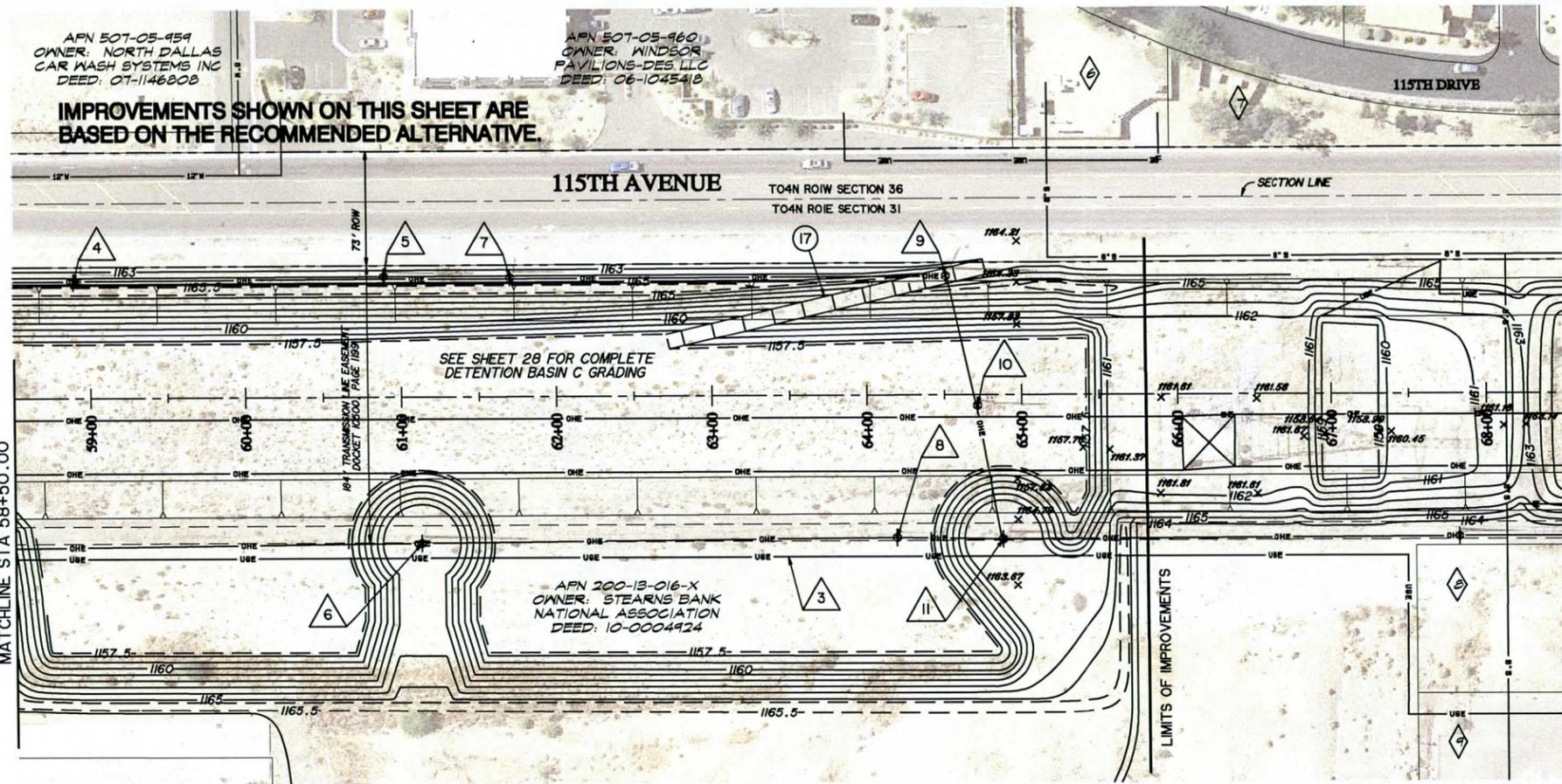
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
800 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226

DRAWING NO. CB	PLAN-PROFILE 6	SHEET OF 11 31
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JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



APN 507-05-959
OWNER: NORTH DALLAS
CAR WASH SYSTEMS INC
DEED: 07-1146808

APN 507-05-960
OWNER: WINDSOR
PAVILIONS-DES LLC
DEED: 06-104548

APN 507-05-802
OWNER: ARIZONA-AMERICAN
WATER COMPANY
DEED: 02-0045604

APN 507-05-803
OWNER: COYOTE LAKES
COMMUNITY ASSOCIATION
DEED: 01-0028763

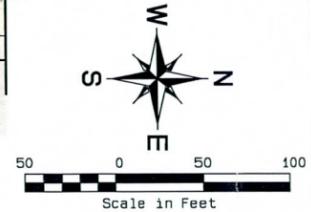
APN 200-13-016-S
OWNER: AOTA
INVESTMENTS LLC
DEED: 09-1121687

APN 200-13-001-M
OWNER: AOTA
INVESTMENTS LLC
DEED: 09-1121687

SEE SHEET 28 FOR COMPLETE
DETENTION BASIN C GRADING

APN 200-13-016-X
OWNER: STEARNS BANK
NATIONAL ASSOCIATION
DEED: 10-0004924

BASIN C



- | | |
|----|---|
| | REMOVE |
| | EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2. |
| | CONSTRUCT |
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| 11 | 3 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.30. LENGTH PER PLAN. |
| 12 | HEADWALL PER A.D.O.T. STD. DTL. B-II.11. |
| 13 | OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10. |
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| 15 | 3 - 36" RGRCP, CLASS III STORM DRAIN JUNCTION BOX. |
| 16 | CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3. |
| 17 | OBM ROAD ACCESS RAMP |
| 18 | OBM ROAD PER TYPICAL SECTION ON SHEET 3. |
| 19 | CONCRETE WEIR STRUCTURE PER DETAIL #1 ON SHEET 3. |
| 20 | CHANNEL DROP STRUCTURE PER DETAIL #2 ON SHEET 3. |
| 21 | ROCK RIP-RAP (D ₅₀ = 12 in.) HDWL. PROTECTION OR APPROVED EQUIVALENT. |
| 22 | CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3. |
| 23 | STORM DRAIN MANHOLE |

GENERAL NOTES

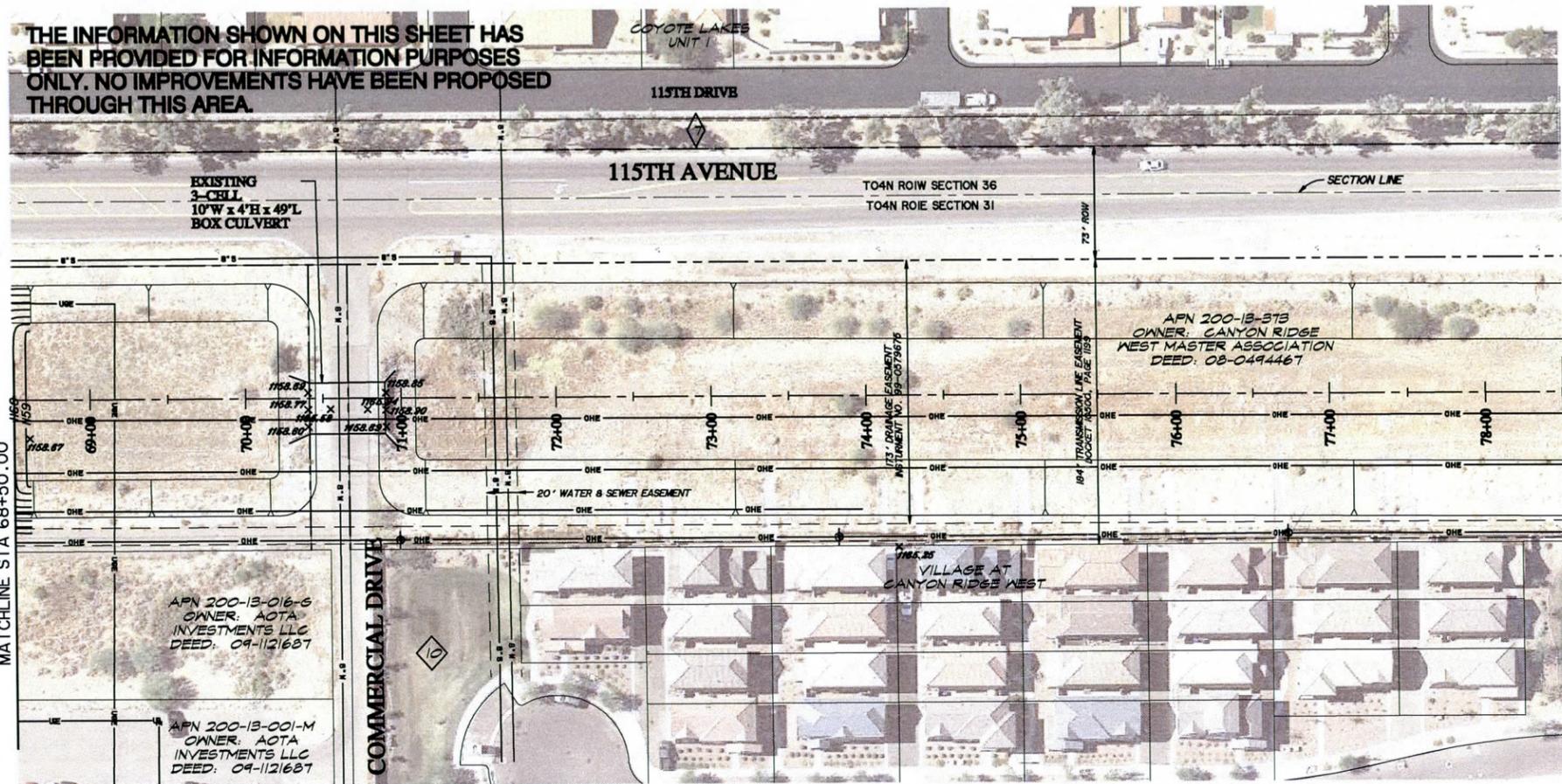
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OUTSIDE MARICOPA COUNTY

1170		1170
1165		1165
1160		1160
1155		1155
1150		1150
59+00	60+00	61+00
62+00	63+00	64+00
65+00	66+00	67+00
68+00		

NO.	REVISION	BY	DATE
3			
2			
1			
107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
DESIGNED	C. HITTLE	BY	DATE
DRAWN	B. CALDWELL		05/27/11
CHECKED	W. RUSSELL		05/27/11
WARREN C. RUSSELL ARIZONA P.E. NO. 39620			
DRAWING NO.	PLAN-PROFILE 7	SHEET OF	12 31

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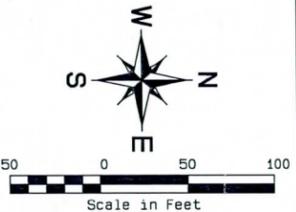
SEGMENT 4

APN 507-05-803
OWNER: COYOTE LAKES
COMMUNITY ASSOCIATION
DEED: 01-0028763

APN 200-13-374
OWNER: CANYON RIDGE
WEST MASTER ASSOCIATION
DEED: 08-0494467

MATCHLINE STA 68+50.00
See Sheet 12

MATCHLINE STA 78+50.00
See Sheet 14

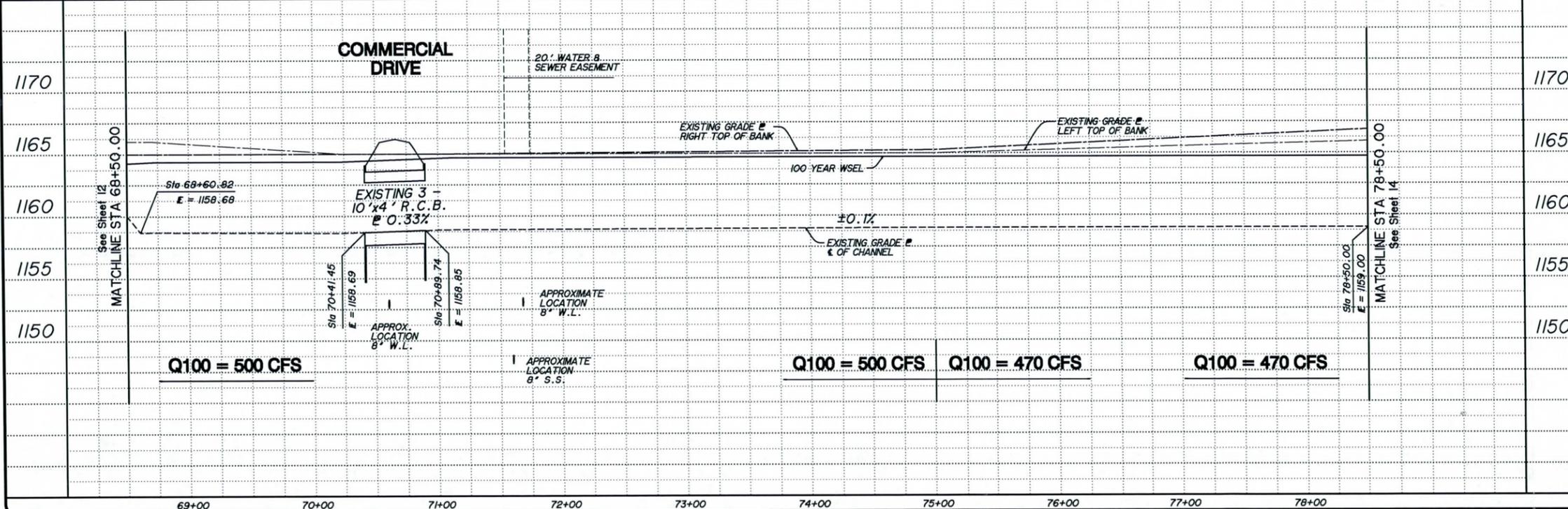


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 - HEADWALL PER A.D.O.T. STD. DTL. B-II.II.
 - OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10.
 - INLET HEADWALL PER A.D.O.T. STD. DTL. B-04.30.
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 - OBM ROAD PER TYPICAL SECTION ON SHEET 3.
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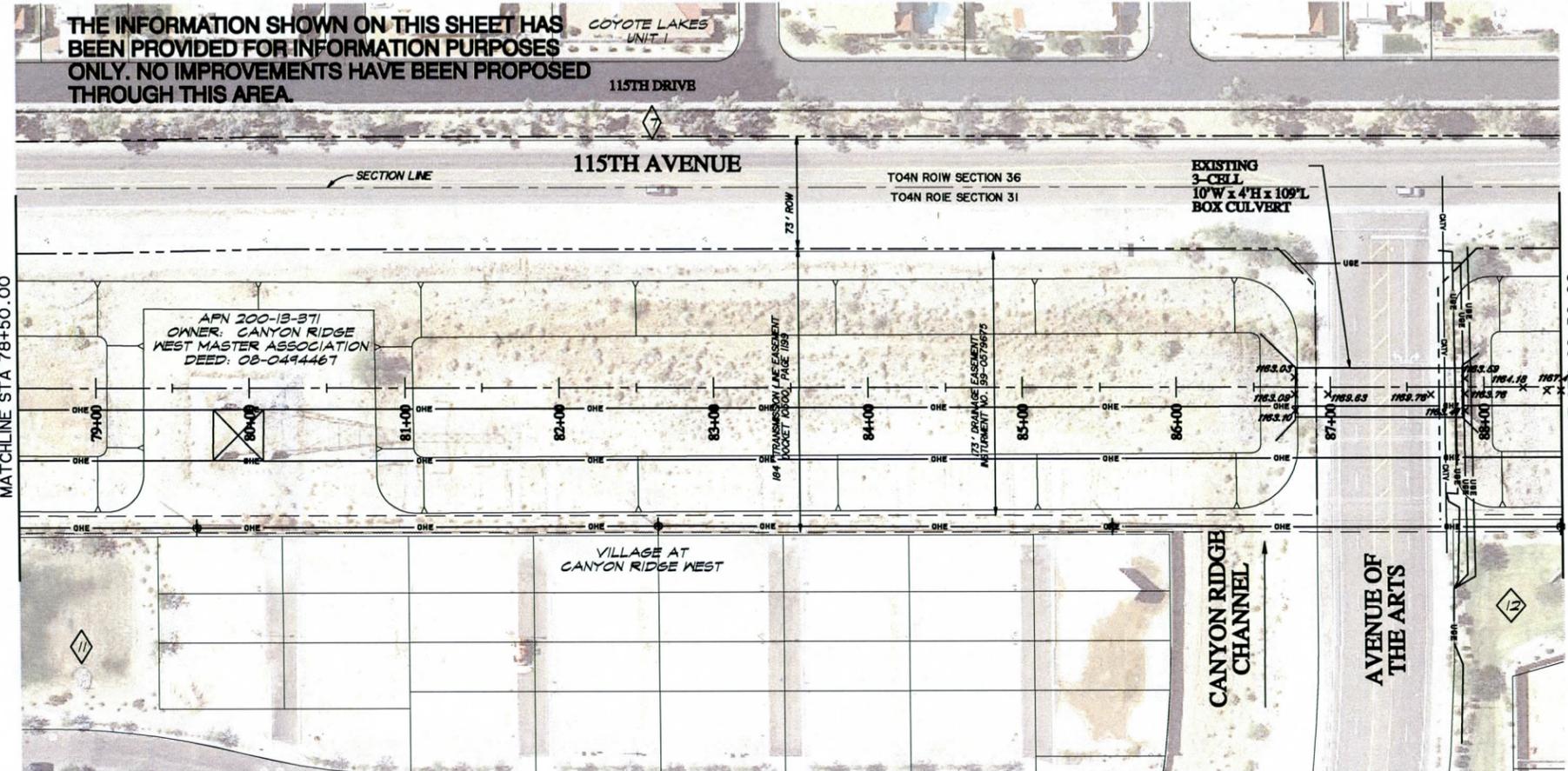
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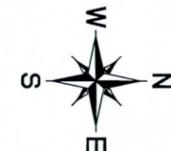
NO.	REVISION	BY	DATE
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<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX</p>			
DESIGNED		C. HITTLE	05/27/11
DRAWN		B. CALDWELL	05/27/11
CHECKED		W. RUSSELL	05/27/11
<p>GOODWIN & MARSHALL</p> <p>CIVIL ENGINEERS-PLANNERS-SURVEYORS</p> <p>800 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226</p>			
DRAWING NO.		PLAN-PROFILE 8	SHEET OF 13 31
C10			

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SEGMENT 4

- APN 507-05-803
OWNER: COYOTE LAKES
COMMUNITY ASSOCIATION
DEED: 01-0028763
- APN 200-13-378
OWNER: CANYON RIDGE
WEST MASTER ASSOCIATION
DEED: 08-0494467
- APN 200-13-171-A
OWNER: CANYON RIDGE
WEST MASTER ASSOCIATION
DEED: 08-1571203



- REMOVE
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- CONSTRUCT
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DESIGNED BY DATE
C. HITTLE 05/27/11

DRAWN BY DATE
B. CALDWELL 05/27/11

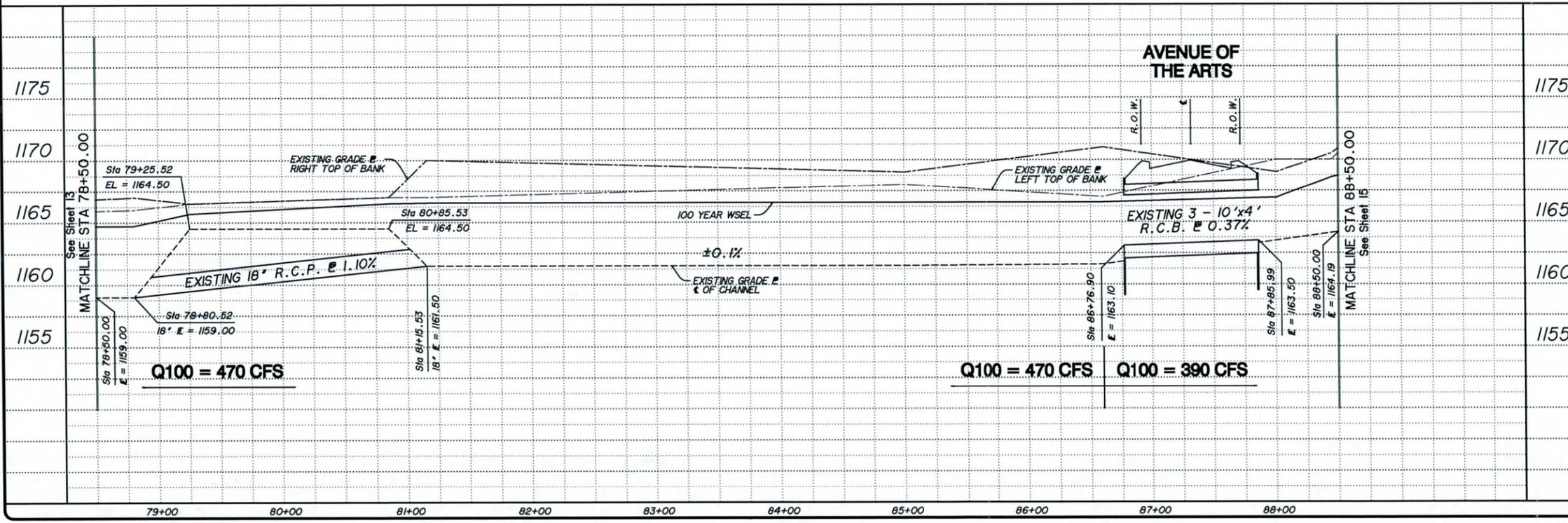
CHECKED BY DATE
W. RUSSELL 05/27/11

107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
800 W. SAVANNAH BLVD., CHANDLER, ARIZONA, 85226

DRAWING NO. C11 PLAN-PROFILE 9 SHEET OF 14 31



JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.

THE INFORMATION SHOWN ON THIS SHEET HAS BEEN PROVIDED FOR INFORMATION PURPOSES ONLY. NO IMPROVEMENTS HAVE BEEN PROPOSED THROUGH THIS AREA.

COYOTE LAKES UNIT 1

115TH DRIVE

115TH AVENUE

T04N ROIW SECTION 36
T04N ROIE SECTION 31

SECTION LINE

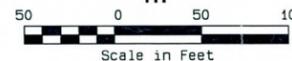
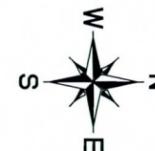
APN 200-13-171-B
OWNER: CANYON RIDGE WEST MASTER ASSOCIATION
DEED: 08-0494467

VILLAGE AT CANYON RIDGE WEST

SEGMENT 4

APN 507-05-203
OWNER: COYOTE LAKES COMMUNITY ASSOCIATION
DEED: 01-0028763

APN 200-13-171-A
OWNER: CANYON RIDGE WEST MASTER ASSOCIATION
DEED: 06-1571803



- △ REMOVE △
- ⊗ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
- 1 CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
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 - 8 3 - 36" RGRCP, CLASS III STORM DRAIN PIPE, LENGTH PER PLAN.
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 - 11 3 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.30. LENGTH PER PLAN.
 - 12 HEADWALL PER A.D.O.T. STD. DTL. B-II.11.
 - 13 OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10.
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 - 15 3 - 36" RGRCP, CLASS III STORM DRAIN JUNCTION BOX.
 - 16 CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3.
 - 17 OBM ROAD ACCESS RAMP
 - 18 OBM ROAD PER TYPICAL SECTION ON SHEET 3.
 - 19 CONCRETE WEIR STRUCTURE PER DETAIL #1 ON SHEET 3.
 - 20 CHANNEL DROP STRUCTURE PER DETAIL #2 ON SHEET 3.
 - 21 ROCK RIP-RAP (D₅₀ = 12 in.) HDWL. PROTECTION OR APPROVED EQUIVALENT.
 - 22 CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.

GENERAL NOTES

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4. VERTICAL CONTROL THROUGH SEGMENT 6 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010.
5. VERTICAL CONTROL THROUGH BASIN C AND SEGMENT 4 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010 AND THE CANYON RIDGE WEST AS-BUILT GRADING PLANS.
6. VERTICAL CONTROL THROUGH SEGMENT 7 WAS ESTABLISHED BASED ON AERIAL DISTRICT TOPOGRAPHY DATED NOVEMBER 28, 2010.

Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

3			
2			
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REVISION BY DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

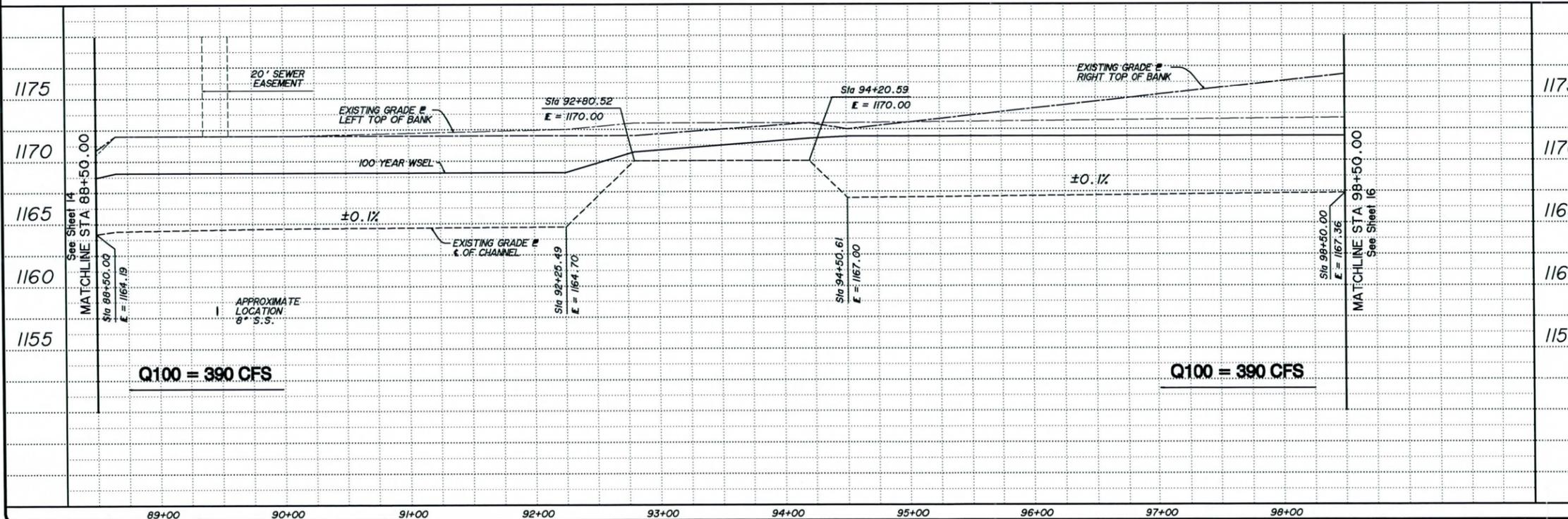
	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

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WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
800 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226

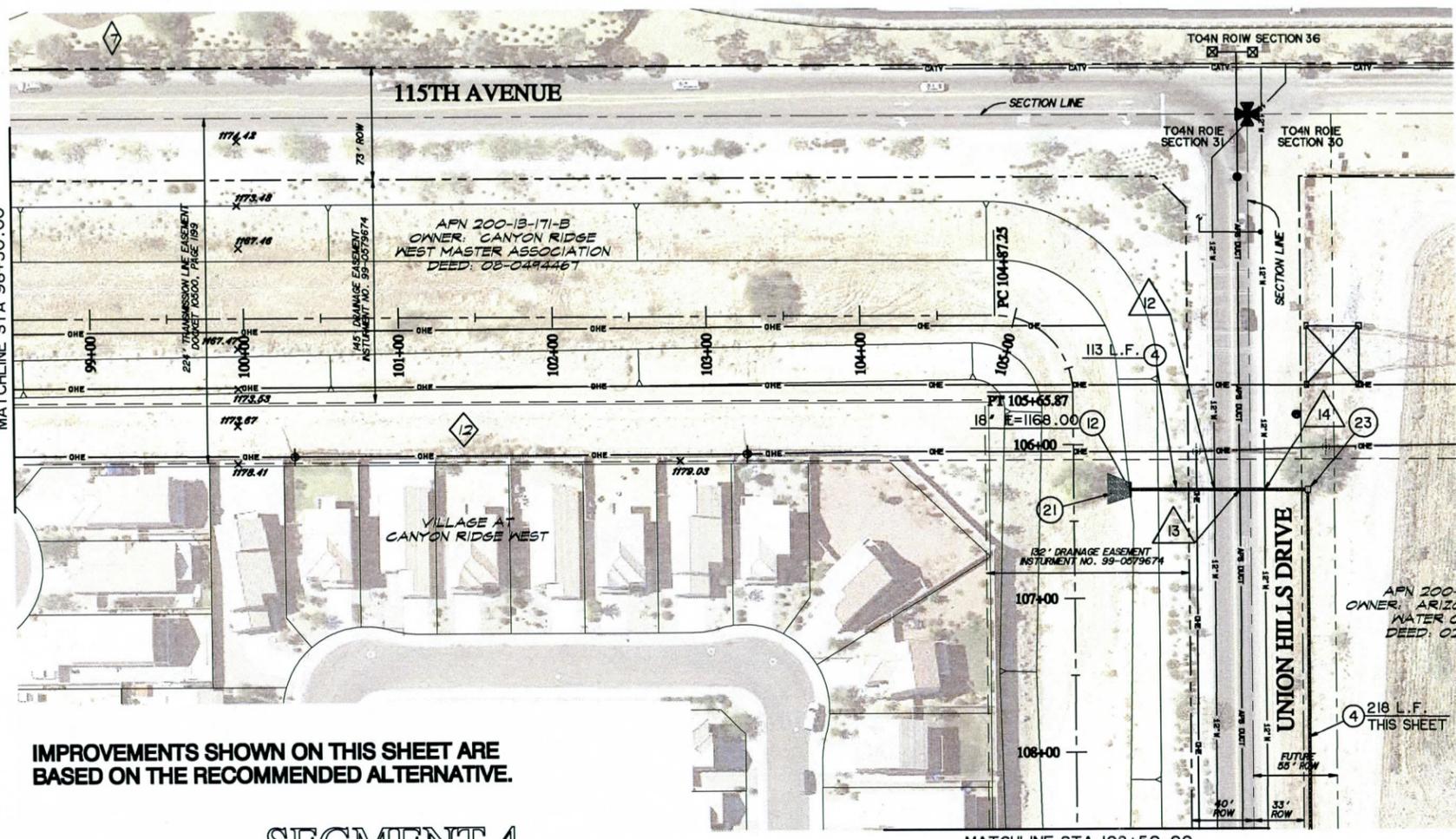
DRAWING NO.	PLAN-PROFILE 10	SHEET OF
C12		15 31



See Sheet 14
MATCHLINE STA 88+50.00

MATCHLINE STA 98+50.00
See Sheet 16

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



APN 507-05-803
OWNER: COYOTE LAKES
COMMUNITY ASSOCIATION
DEED: 01-0028763

APN 200-13-171-A
OWNER: CANYON RIDGE
WEST MASTER ASSOCIATION
DEED: 06-1571803



IMPROVEMENTS SHOWN ON THIS SHEET ARE
BASED ON THE RECOMMENDED ALTERNATIVE.

SEGMENT 4

1180	See Sheet 15 MATCHLINE STA 99+50.00	MATCHLINE STA 108+50.00 See Sheet 17	1180						
1175			1175						
1170			1170						
1165			1165						
1160			1160						
99+00	100+00	101+00	102+00	103+00	104+00	105+00	106+00	107+00	108+00

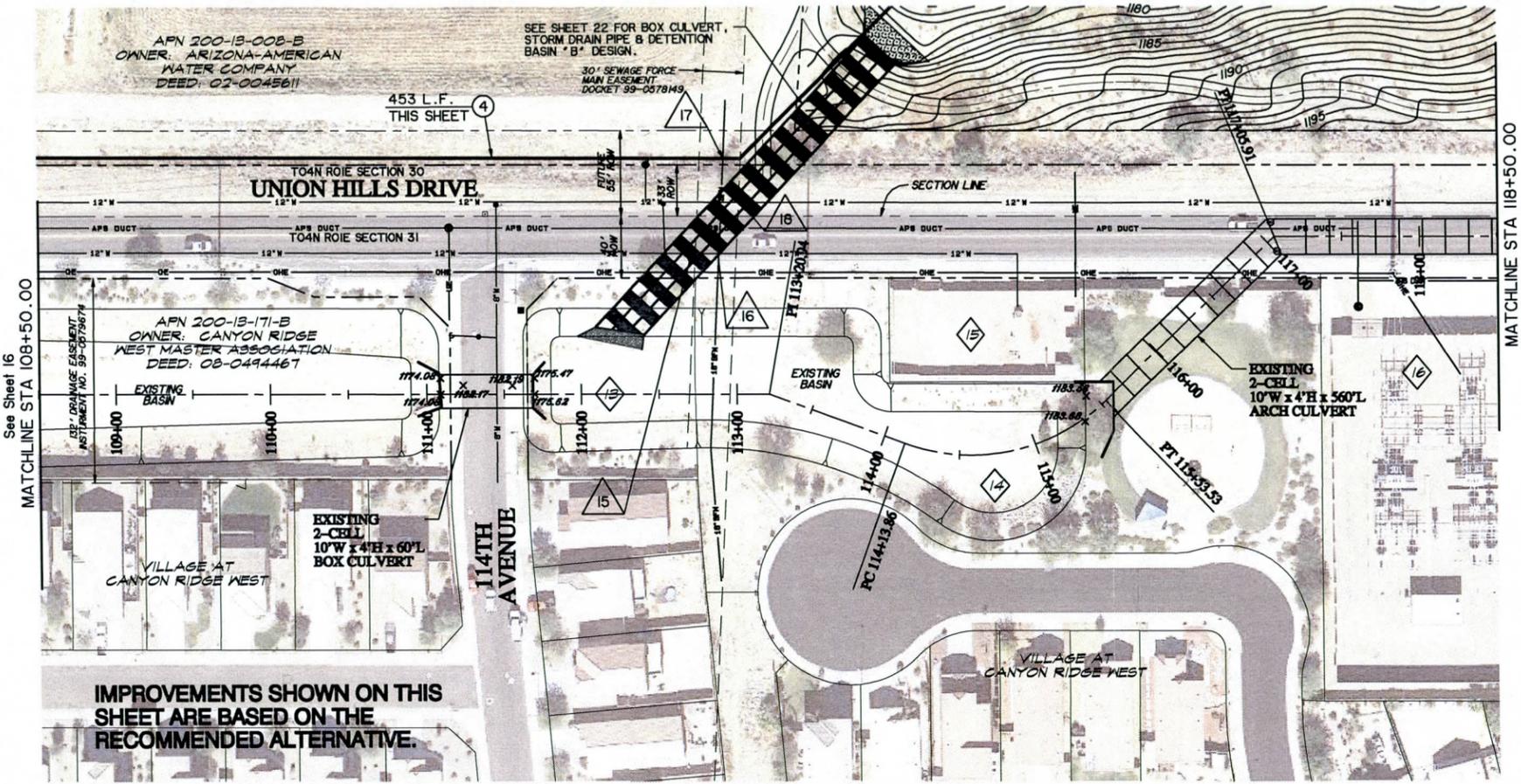
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 - 23 STORM DRAIN MANHOLE

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Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

3			
2			
1			
NO.	REVISION	BY	DATE
107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
	DESIGNED	C. HITTLE	05/27/11
	DRAWN	B. CALDWELL	05/27/11
	CHECKED	W. RUSSELL	05/27/11
GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS <small>6000 W. BAY ROAD #18, CHANDLER, ARIZONA, 85226</small>			
DRAWING NO.	PLAN-PROFILE 11		SHEET OF 16 31
C13			

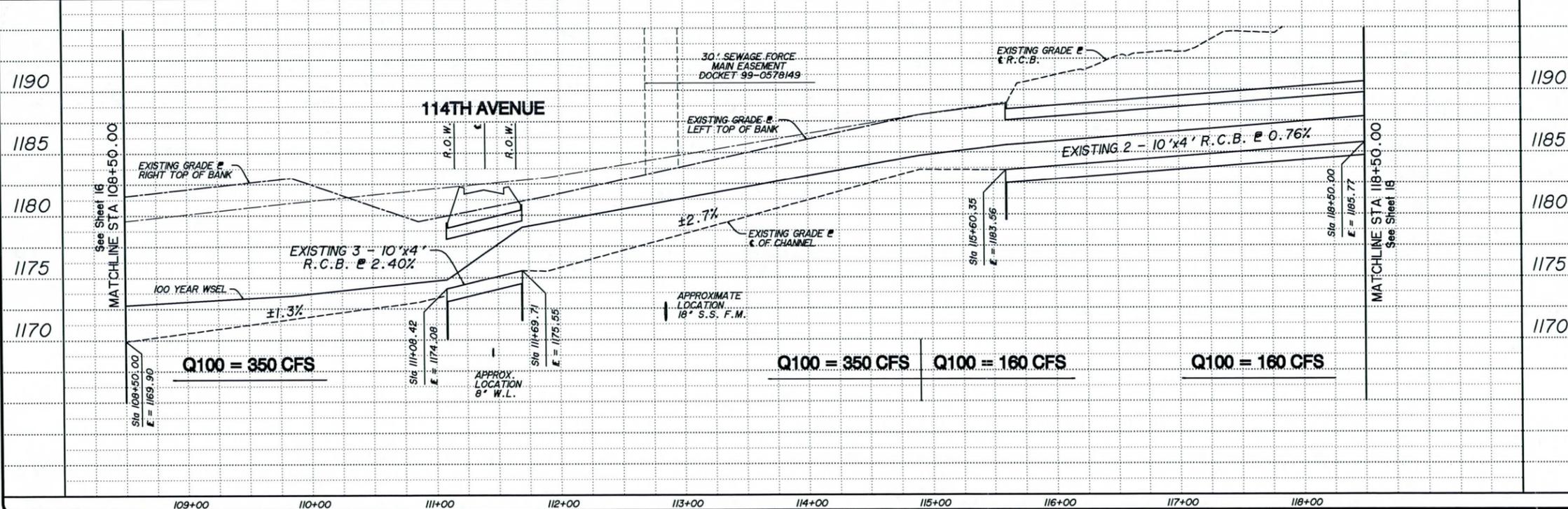
JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



- 13 APN 200-13-172
OWNER: CANYON RIDGE WEST PARCEL 5
DEED: 06-1571206
- 14 APN 200-13-390
OWNER: CANYON RIDGE WEST PARCEL 6
DEED: 99-1036883
- 15 APN 200-13-010-A
OWNER: ARIZONA AMERICAN WATER COMPANY
DEED: 02-0045610
- 16 APN 200-13-385
OWNER: ARIZONA PUBLIC SERVICE COMPANY
DEED: 86-0063267



SEGMENT 3



- △ REMOVE △
- X EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
- 1 CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
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602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

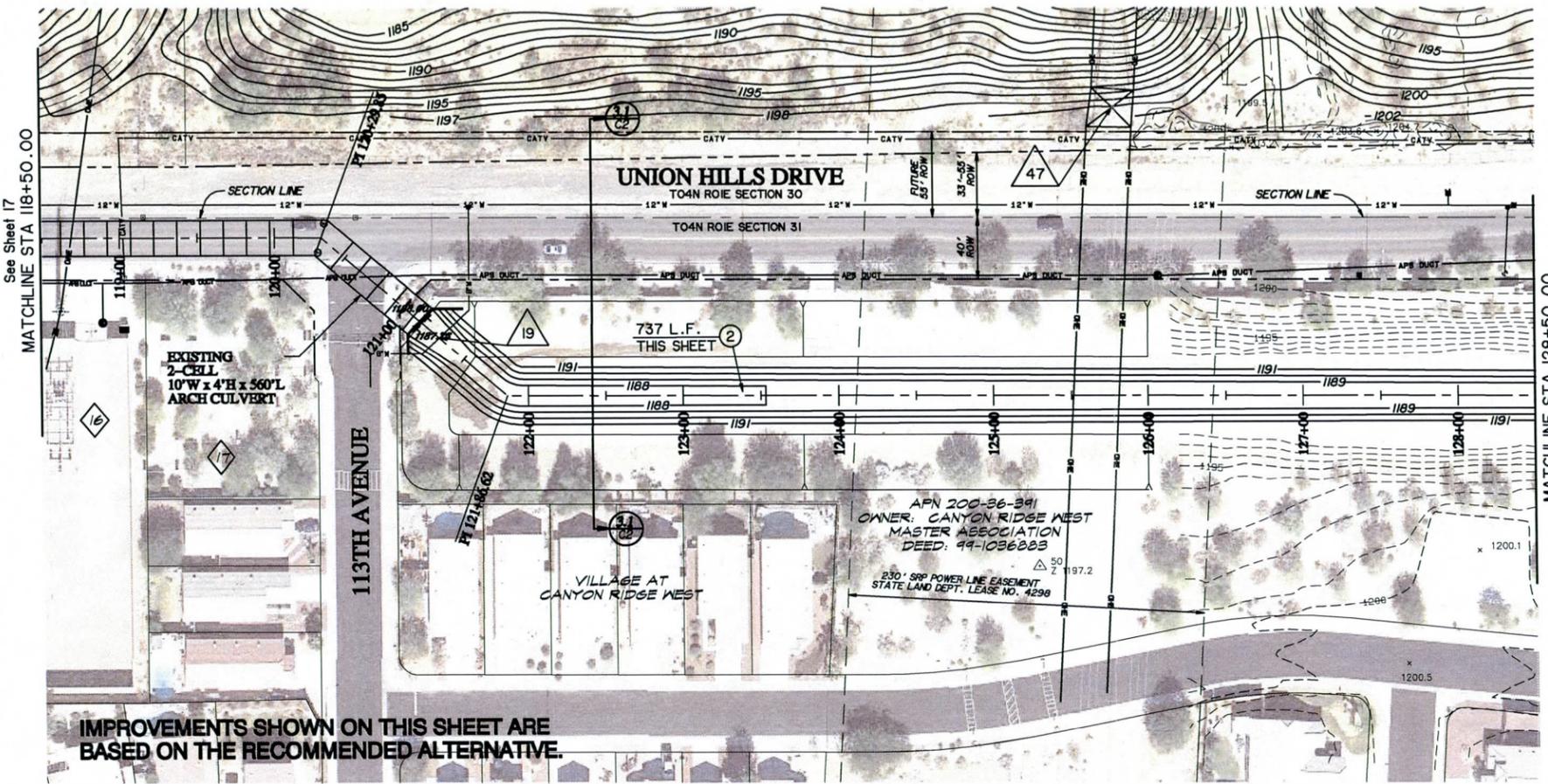
	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

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 WARREN C. RUSSELL
 ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
 CIVIL ENGINEERS-PLANNERS-SURVEYORS
800 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226

DRAWING NO. C14	PLAN-PROFILE 12	SHEET OF 17 31
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JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



IMPROVEMENTS SHOWN ON THIS SHEET ARE BASED ON THE RECOMMENDED ALTERNATIVE.

SEGMENT 3

APN 200-13-385
OWNER: ARIZONA PUBLIC SERVICE COMPANY
DEED: 86-0063267

APN 200-36-385
OWNER: ARIZONA PUBLIC SERVICE COMPANY
DEED: 99-1036883

APN 200-36-391
OWNER: CANYON RIDGE WEST MASTER ASSOCIATION
DEED: 99-1036883



- REMOVE**
- CONSTRUCT**
- 1 CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
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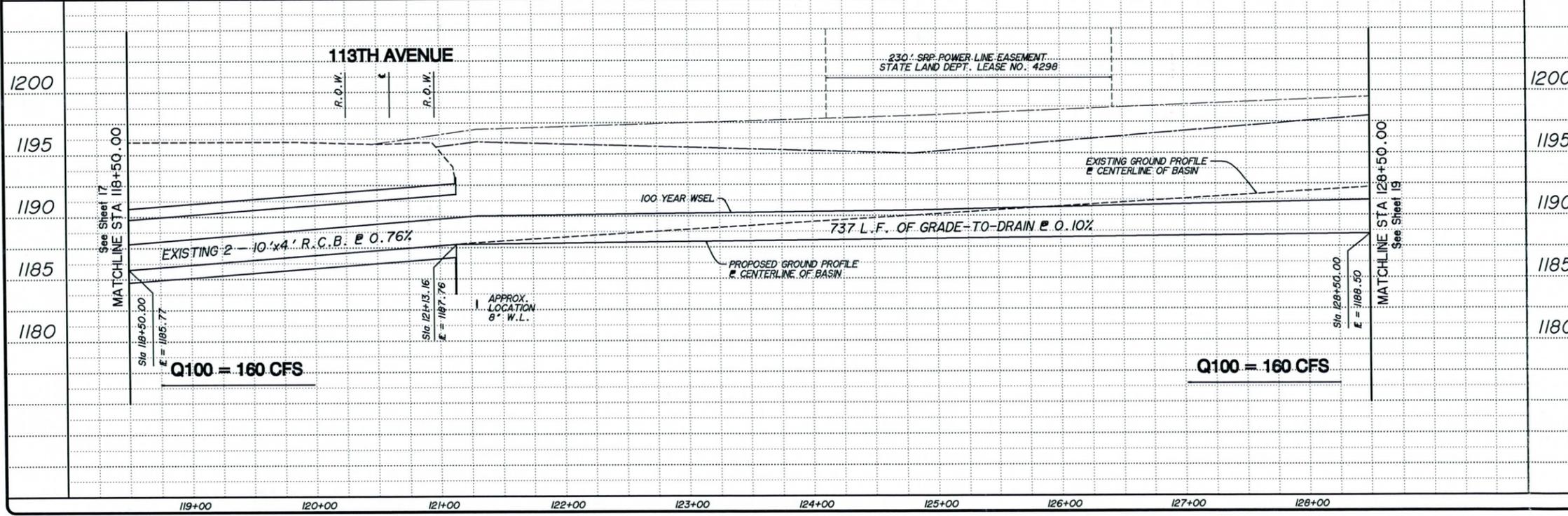
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX

	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

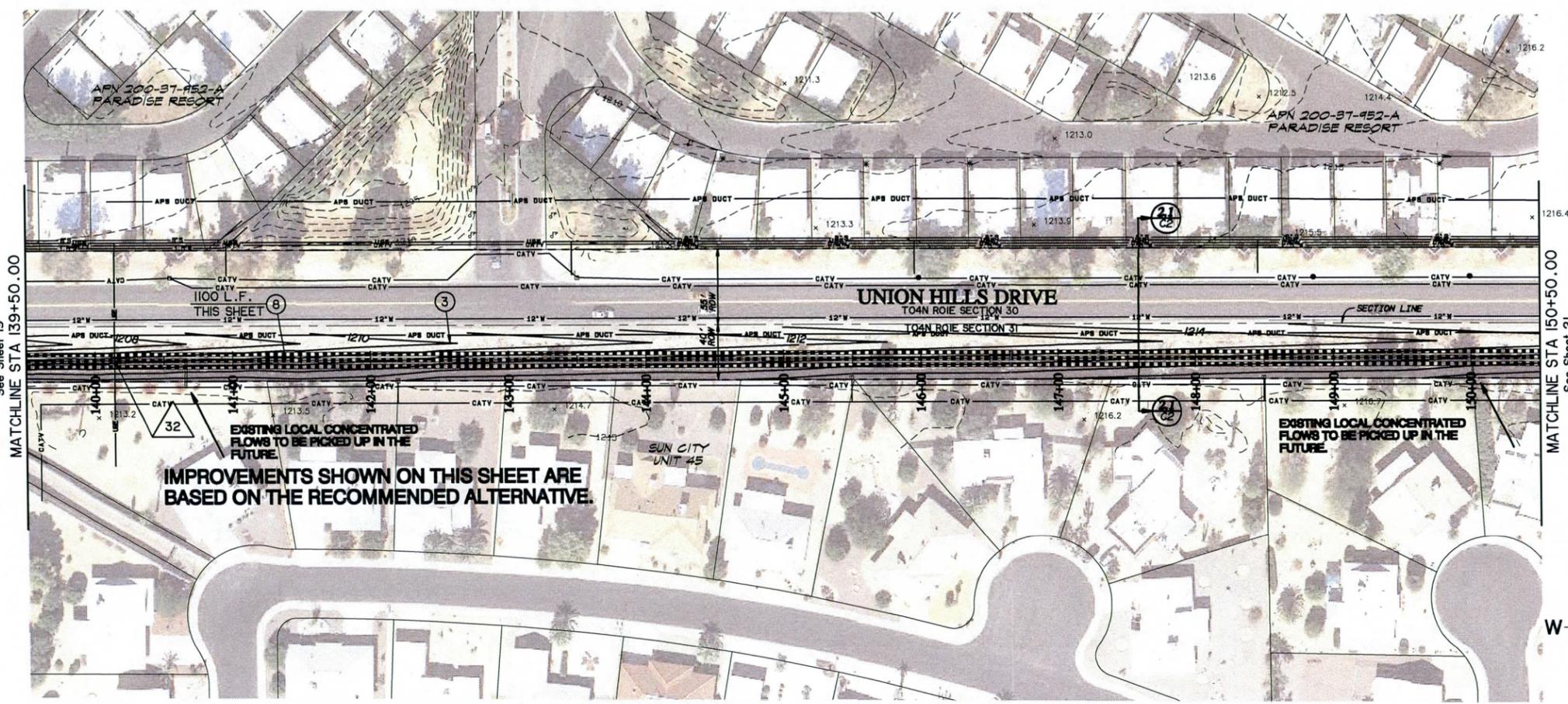
GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
8001 W. RAYROAD #15, CHANDLER, ARIZONA, 85226

DRAWING NO. C15 PLAN-PROFILE 13 SHEET OF 18 31



GOODWIN AND MARSHALL, INC. JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX

GOODWIN AND MARSHALL, INC.
JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX



SEGMENT 2



- △ REMOVE △
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Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			

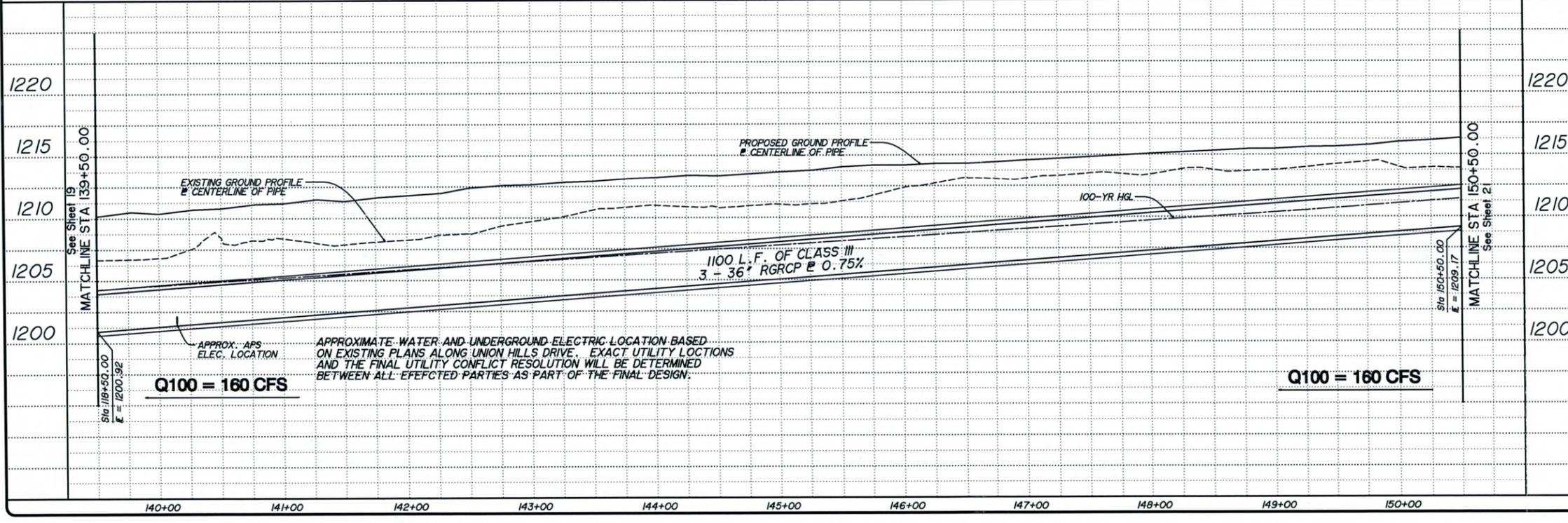
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

**107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX**

DESIGNED	BY	DATE
C. HITTLE		05/27/11
B. CALDWELL		05/27/11
W. RUSSELL		05/27/11

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
800 W. BAY ROAD #18, CHANDLER, ARIZONA, 85226

DRAWING NO. C17 PLAN-PROFILE 15 SHEET OF 20 31



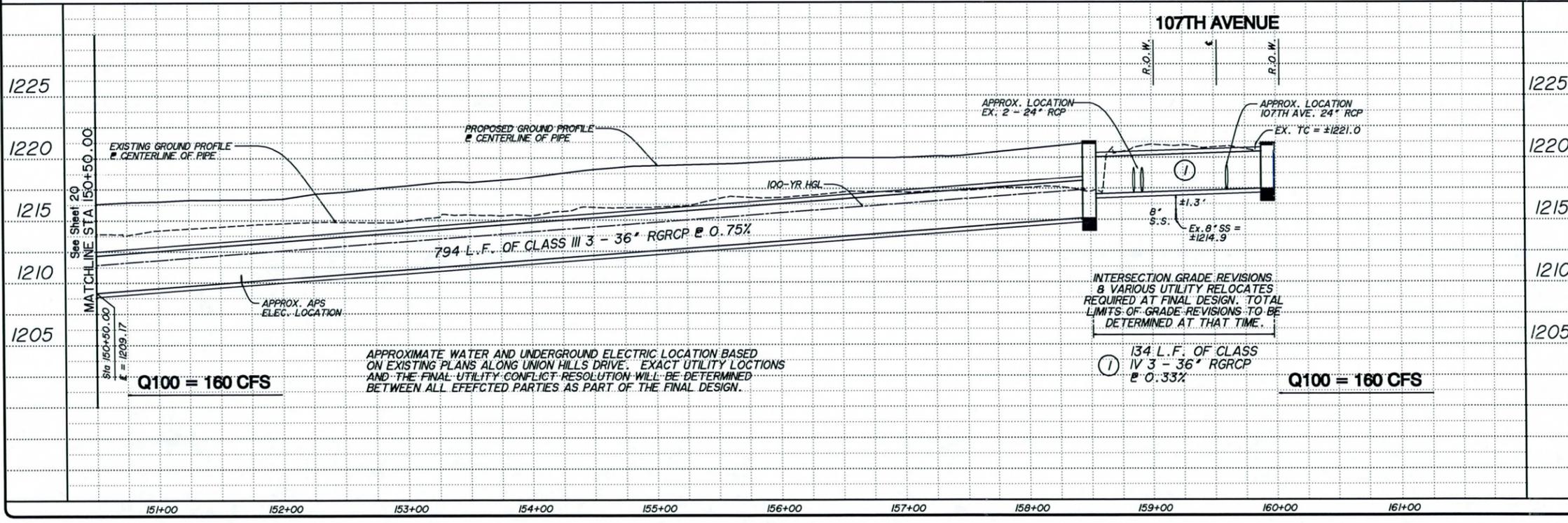
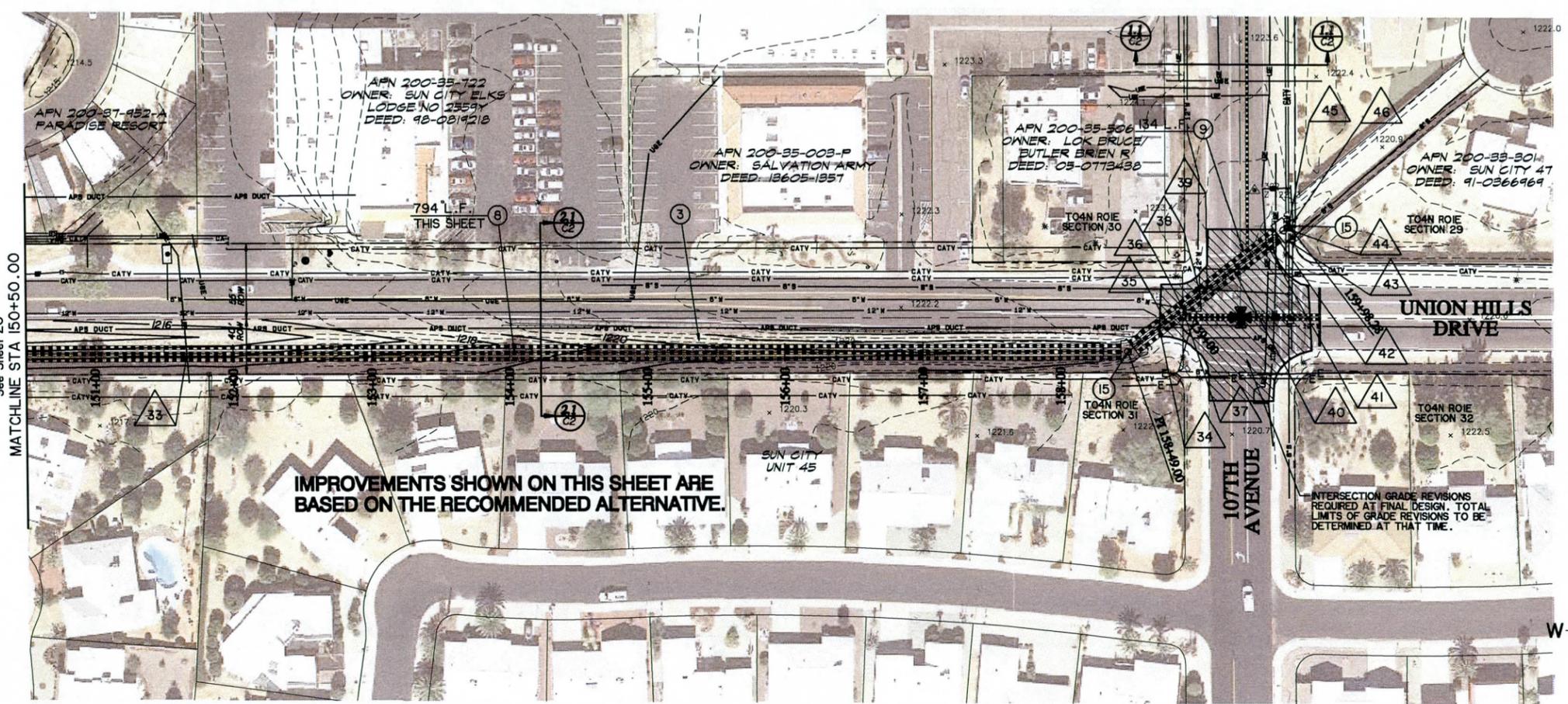
APPROXIMATE WATER AND UNDERGROUND ELECTRIC LOCATION BASED ON EXISTING PLANS ALONG UNION HILLS DRIVE. EXACT UTILITY LOCATIONS AND THE FINAL UTILITY CONFLICT RESOLUTION WILL BE DETERMINED BETWEEN ALL EFFECTED PARTIES AS PART OF THE FINAL DESIGN.

See Sheet 19
MATCHLINE STA 139+50.00

MATCHLINE STA 150+50.00
See Sheet 21

GOODWIN AND MARSHALL, INC.
JOB NO. 10388A-2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX

- △ REMOVE △
- △ X △ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
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 - ⑬ OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10.
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 - ㉒ CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.



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NO.	REVISION	BY	DATE

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION**

**107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX**

DESIGNED	BY	DATE
C. HITTLE	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

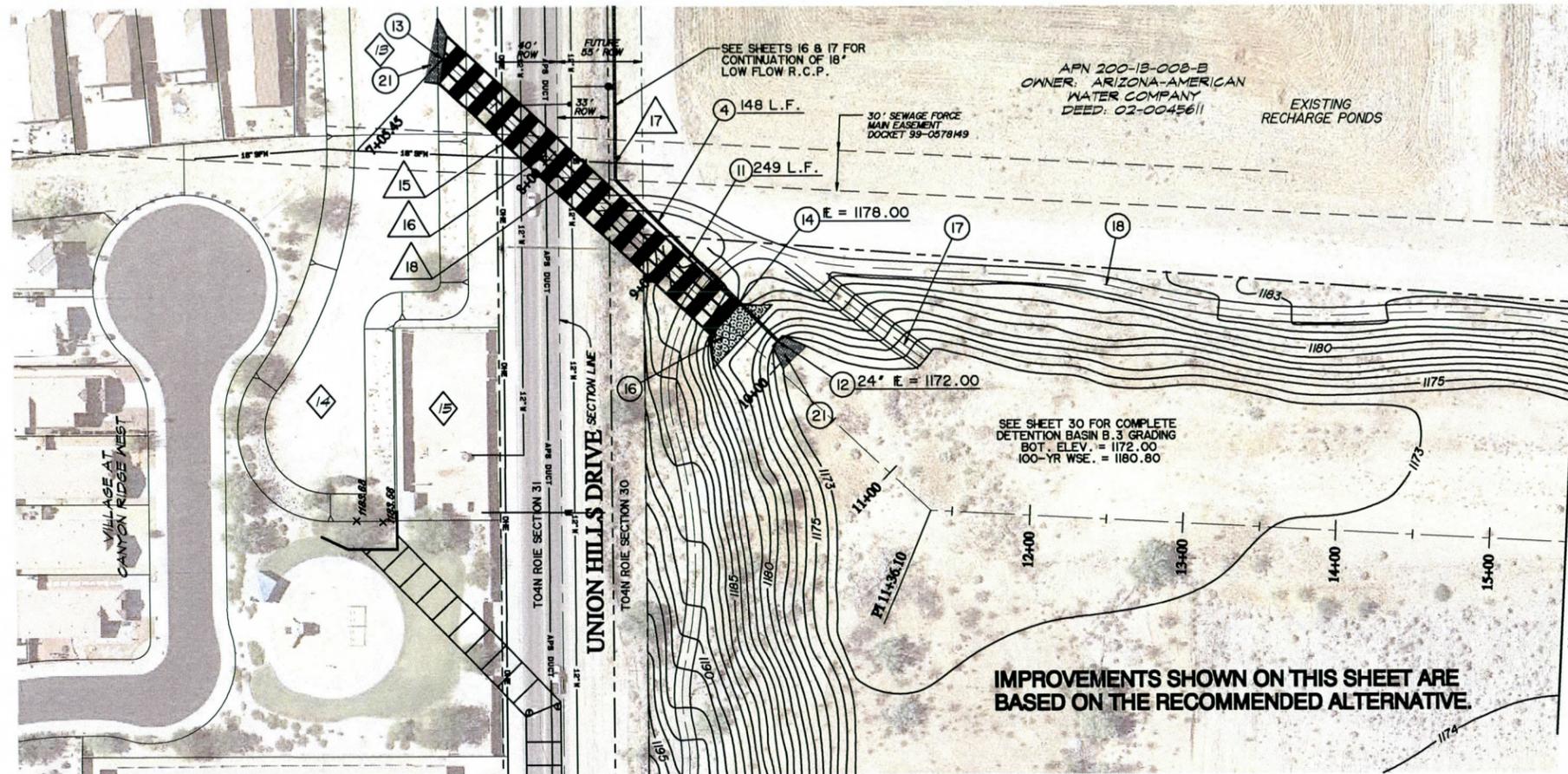
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

GOODWIN & MARSHALL
CIVIL ENGINEERS-PLANNERS-SURVEYORS
800 W. BAY ROAD #18, CHANDLER, ARIZONA, 85226

DRAWING NO. C18	PLAN-PROFILE 16	SHEET OF 21 31
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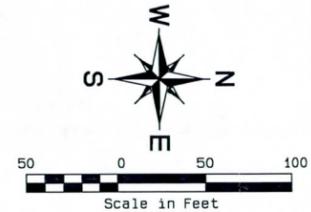
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W:\10388A-2\Prelim\107th Avenue & Union Hills Drive 15% Plans.pro Wed Aug 03 09:10:55 2011

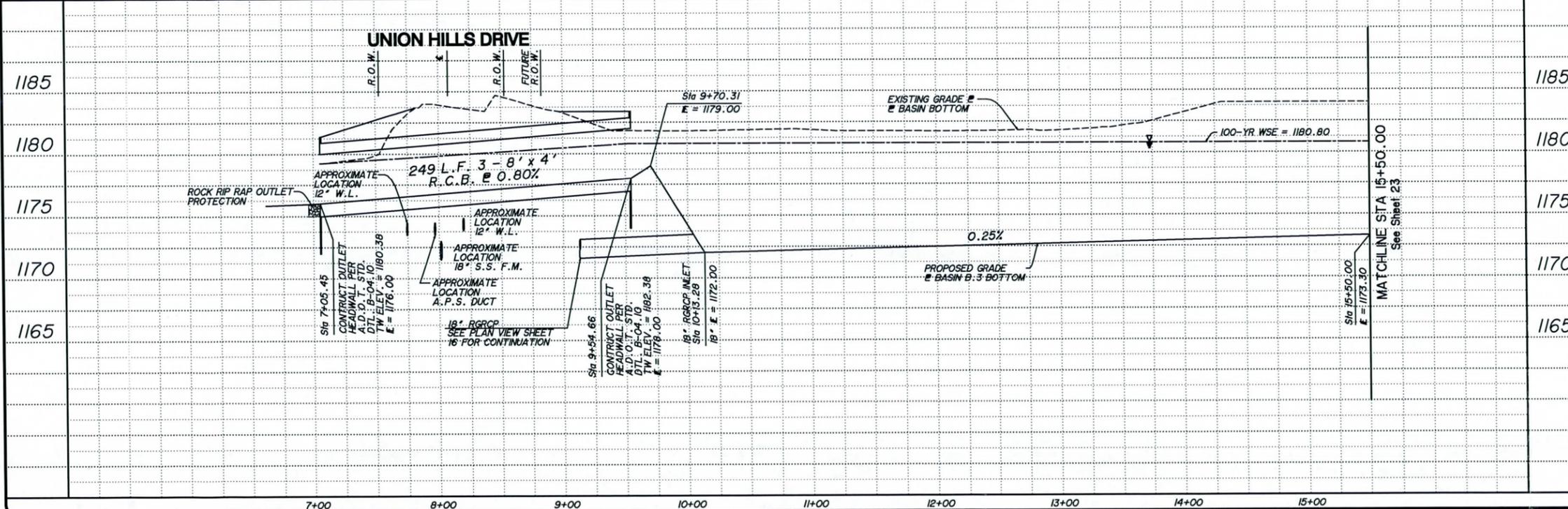


- APN 200-13-172
OWNER: CANYON RIDGE
WEST PARCEL 5
DEED: 06-1571206
- APN 200-36-390
OWNER: CANYON RIDGE
WEST PARCEL 6
DEED: 99-1036223
- APN 200-13-010-A
OWNER: ARIZONA
AMERICAN
WATER COMPANY
DEED: 02-0045610

IMPROVEMENTS SHOWN ON THIS SHEET ARE
BASED ON THE RECOMMENDED ALTERNATIVE.



BASIN B

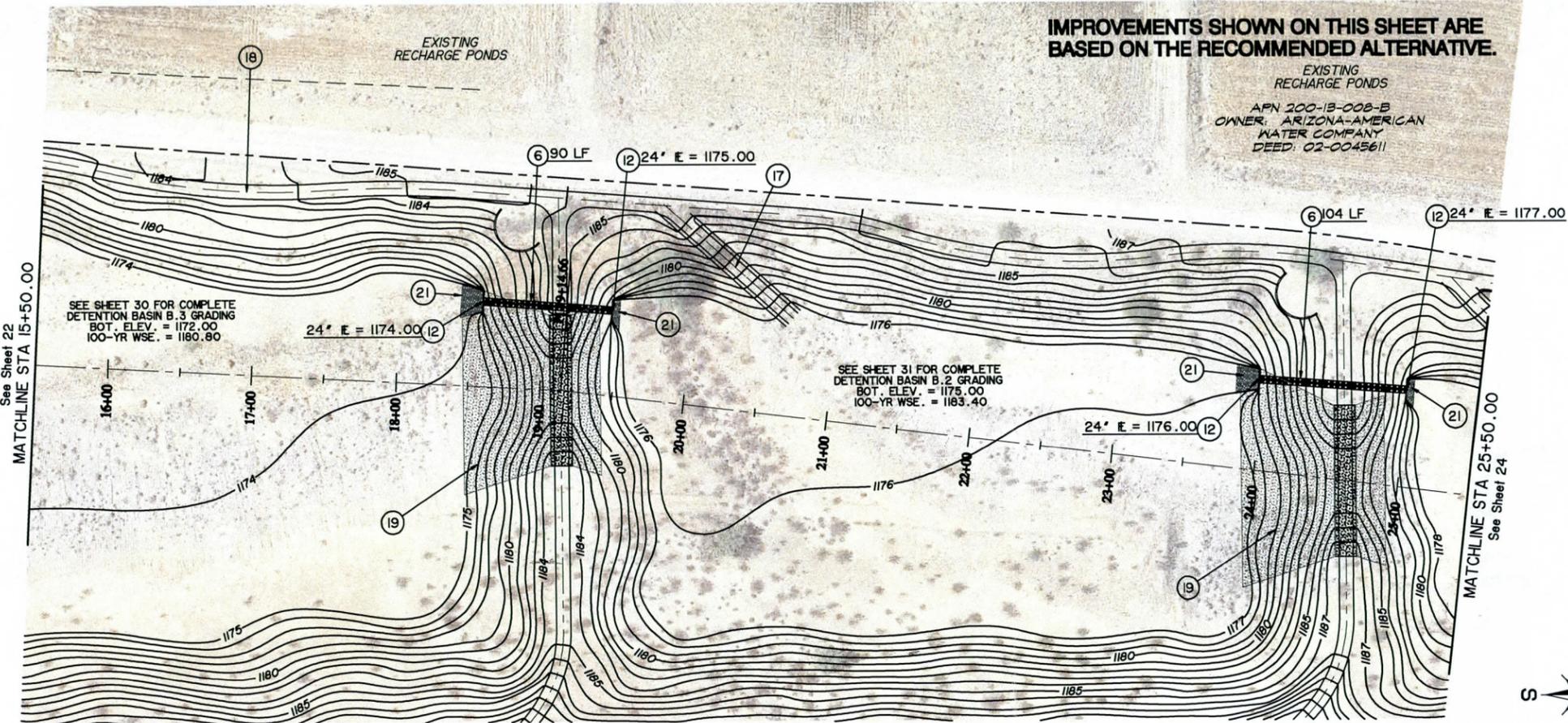


- | REMOVE | CONSTRUCT |
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| (X) | (O) |
| (1) | (1) |
| (2) | (2) |
| (3) | (3) |
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| (20) | (20) |
| (21) | (21) |
| (22) | (22) |
| (23) | (23) |

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3			
2			
1			
NO.	REVISION	BY	DATE
107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
	DESIGNED	C. HITTLE	05/27/11
	DRAWN	B. CALDWELL	05/27/11
	CHECKED	W. RUSSELL	05/27/11
GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS <small>6001 W. RAY ROAD, P.O. BOX 1000, PHOENIX, ARIZONA 85044</small>			
DRAWING NO.	PLAN-PROFILE 17		SHEET OF 22 31
C19			

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.

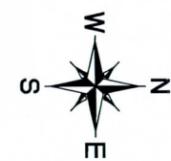


IMPROVEMENTS SHOWN ON THIS SHEET ARE BASED ON THE RECOMMENDED ALTERNATIVE.

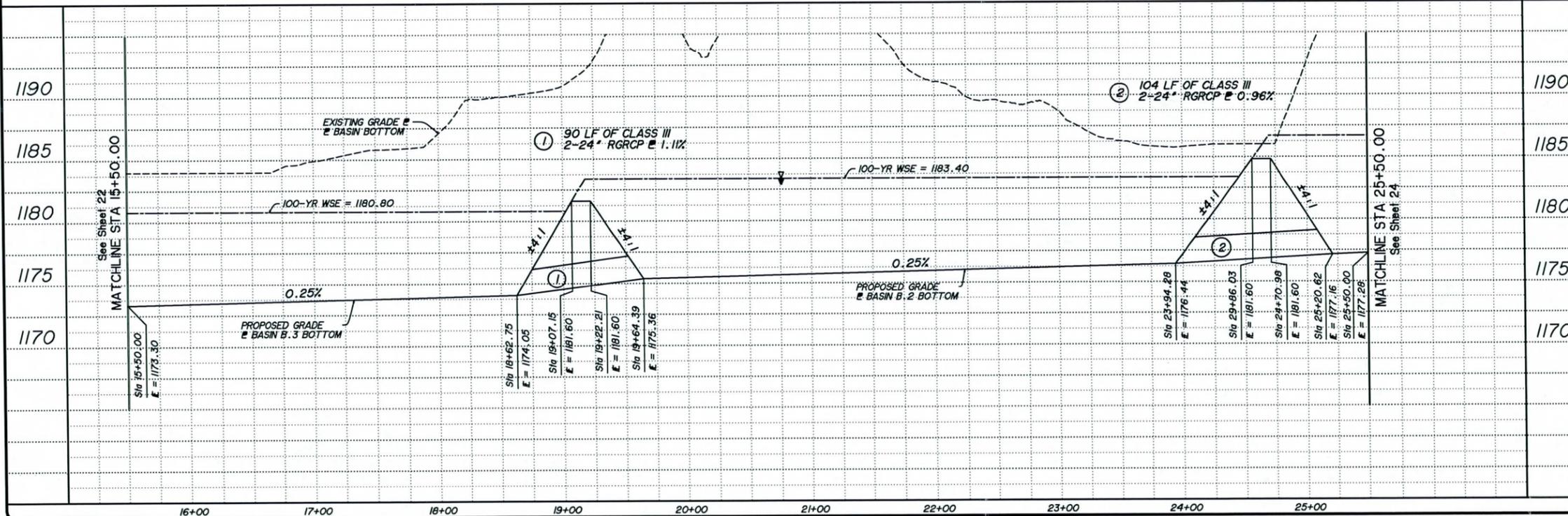
EXISTING RECHARGE PONDS
 APN 200-13-008-B
 OWNER: ARIZONA-AMERICAN WATER COMPANY
 DEED: 02-0045611

SEE SHEET 30 FOR COMPLETE DETENTION BASIN B.3 GRADING
 BOT. ELEV. = 1172.00
 100-YR WSE. = 1180.80

SEE SHEET 31 FOR COMPLETE DETENTION BASIN B.2 GRADING
 BOT. ELEV. = 1175.00
 100-YR WSE. = 1183.40



BASIN B



- | |
|---|
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| ④ 18\"/> |
| ⑤ 24\"/> |
| ⑥ 2 - 24\"/> |
| ⑦ 2 - 24\"/> |
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| ㉒ CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3. |
| ㉓ STORM DRAIN MANHOLE |

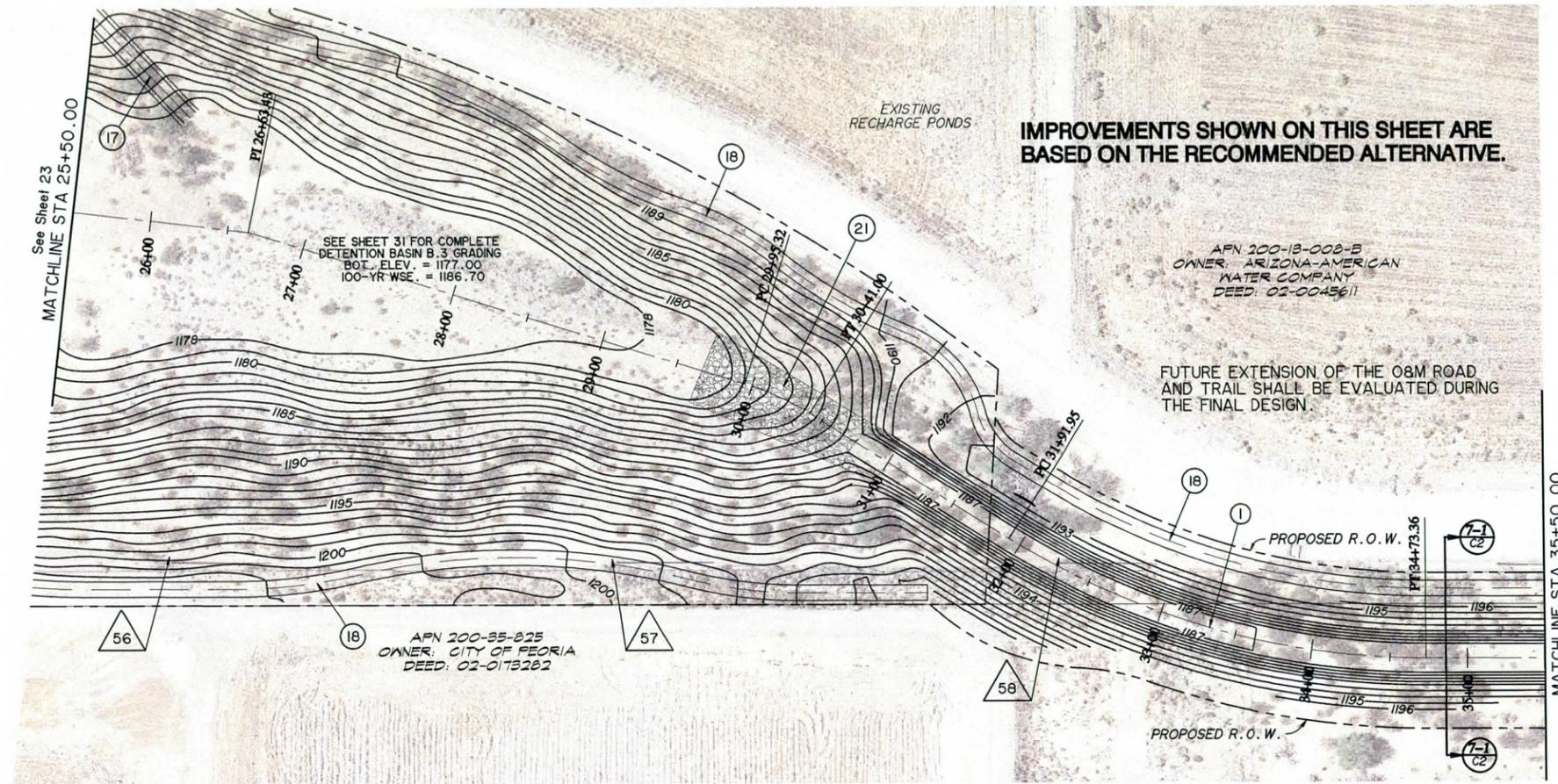
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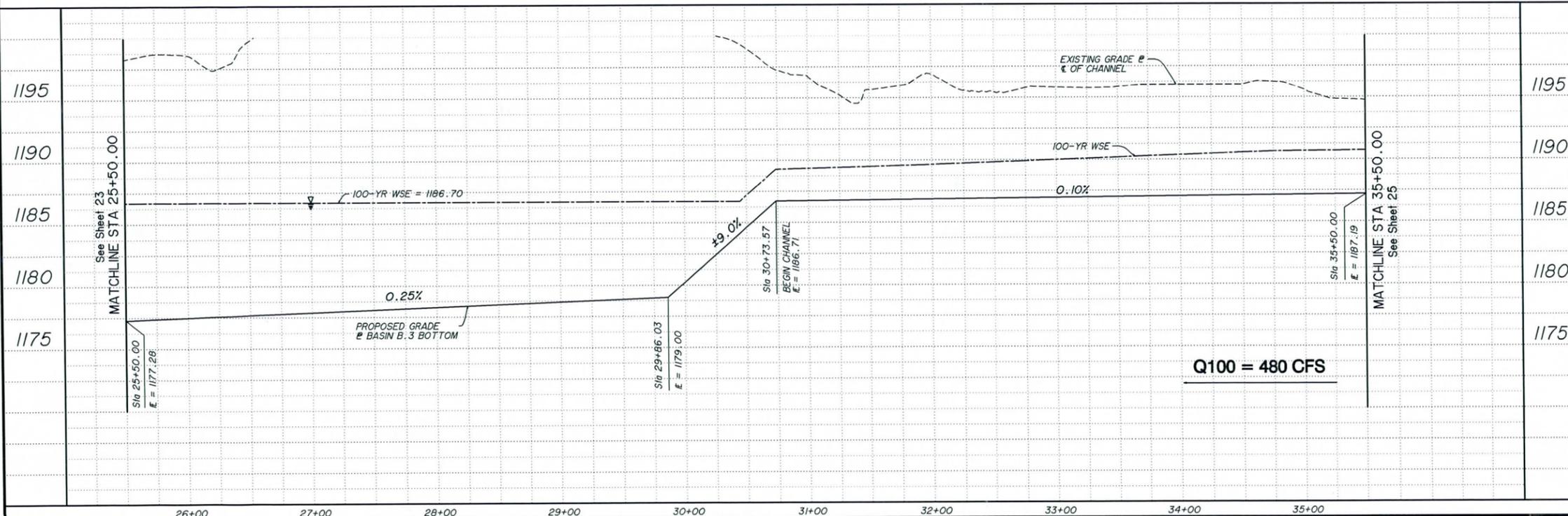
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	DRAWN	B. CALDWELL	05/27/11
	CHECKED	W. RUSSELL	05/27/11
GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS <small>8007 W. BAYVIEW #118, CHANDLER, ARIZONA, 85226</small>			
DRAWING NO. C20	PLAN-PROFILE 18	SHEET OF 23 31	

GOODWIN AND MARSHALL, INC.
 JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX



BASIN B

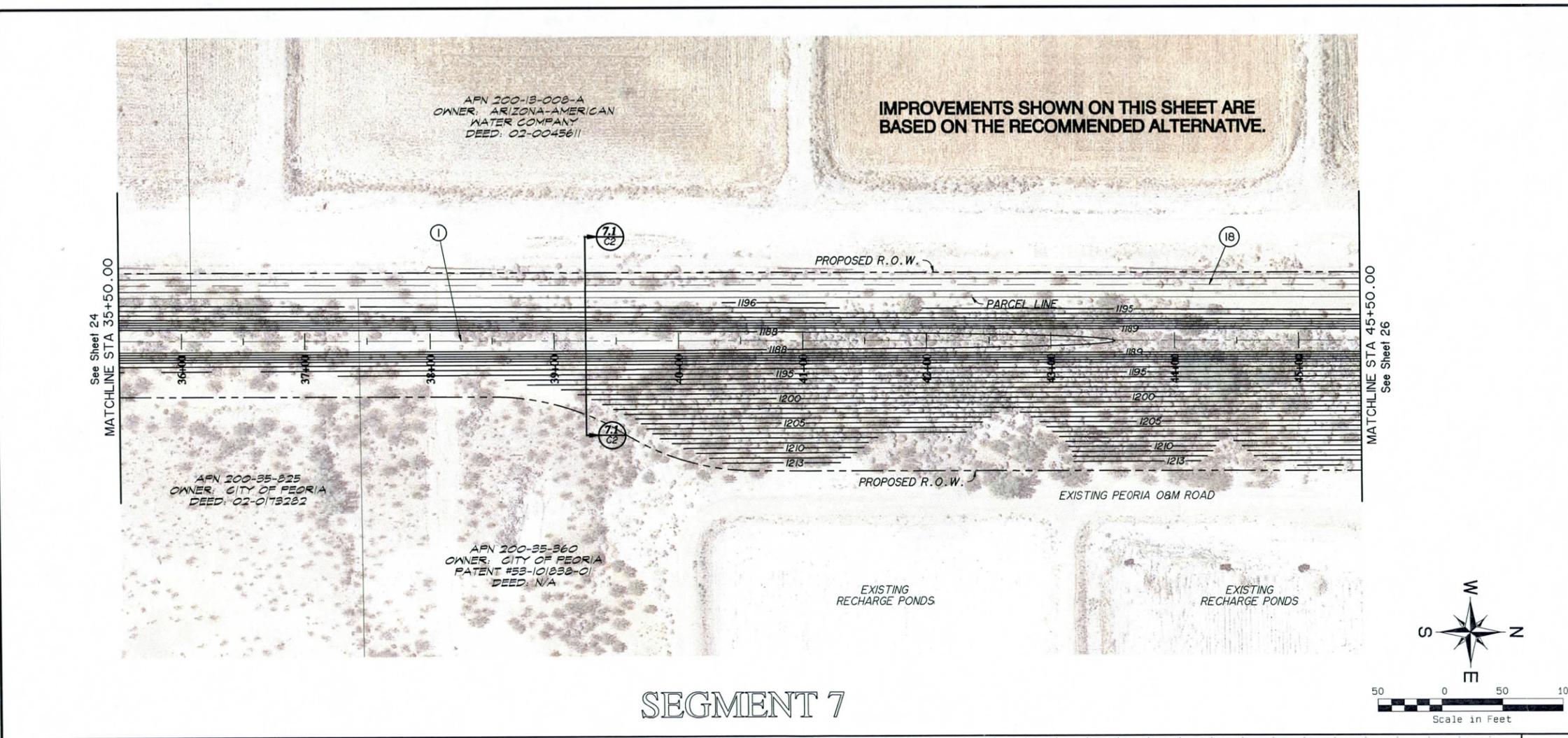


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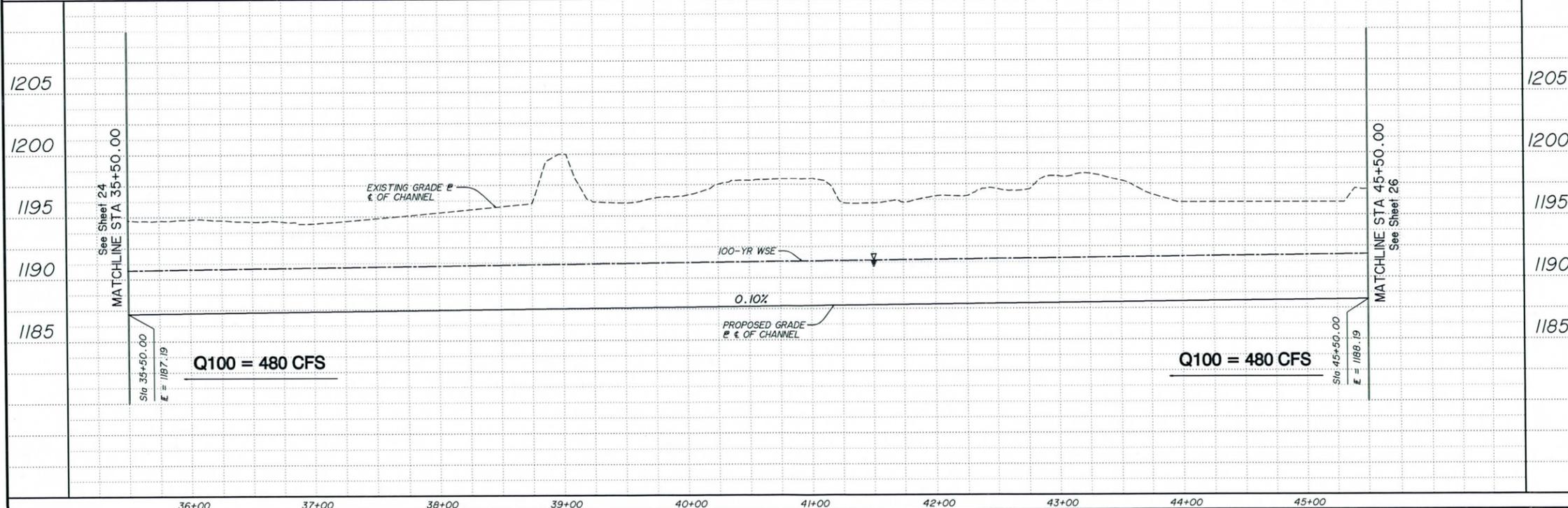
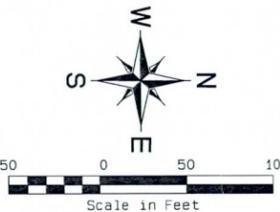
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<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX</p>			
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WARREN C. RUSSELL ARIZONA P.E. NO. 39620		DRAWN	B. CALDWELL
		CHECKED	W. RUSSELL
		BY	DATE
			05/27/11
			05/27/11
			05/27/11
		<p>GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS 6000 W. RAY ROAD #15, CHANDLER, ARIZONA, 85226</p>	
DRAWING NO.	PLAN-PROFILE 19		SHEET OF 24 31

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



SEGMENT 7



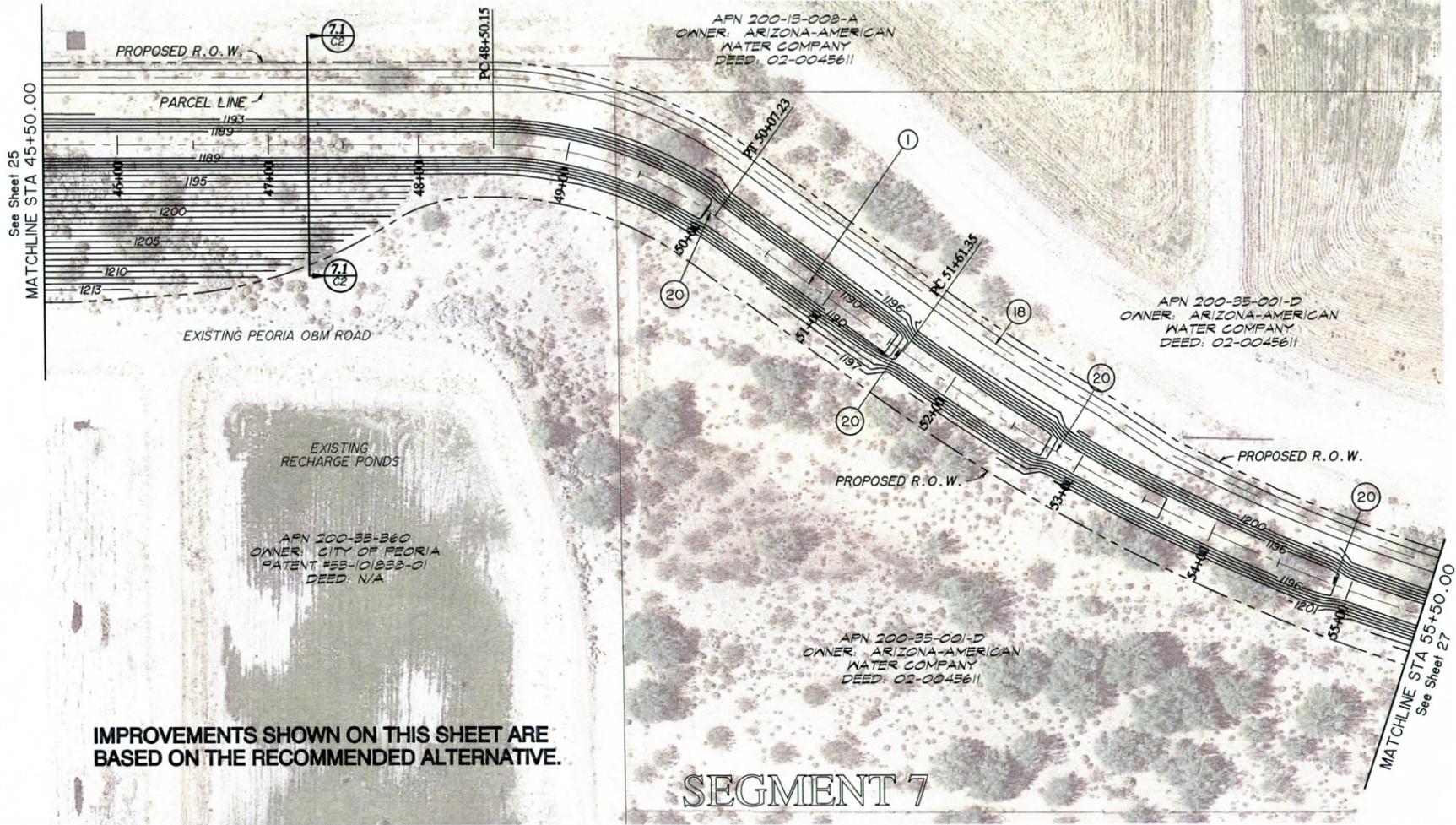
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- VERTICAL CONTROL THROUGH BASIN C AND SEGMENT 4 WAS ESTABLISHED BASED ON THE FIELD CONTROL OBTAINED BY THE DISTRICT ON NOVEMBER 19, 2010 AND THE CANYON RIDGE WEST AS-BUILT GRADING PLANS.
- VERTICAL CONTROL THROUGH SEGMENT 7 WAS ESTABLISHED BASED ON AERIAL DISTRICT TOPOGRAPHY DATED NOVEMBER 28, 2010.

Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			
<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX</p>			
DESIGNED	C. HITTLE	BY	05/27/11
DRAWN	B. CALDWELL	DATE	05/27/11
CHECKED	W. RUSSELL	DATE	05/27/11
<p>GOODWIN & MARSHALL</p> <p>CIVIL ENGINEERS-PLANNERS-SURVEYORS</p> <p>6000 W. BAY ROAD #15, CHANDLER, ARIZONA, 85226</p>			
DRAWING NO.	PLAN-PROFILE 20	SHEET OF	25 31
C22			



IMPROVEMENTS SHOWN ON THIS SHEET ARE
BASED ON THE RECOMMENDED ALTERNATIVE.

SEGMENT 7



- △ REMOVE △
- ⊗ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED
IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- CONSTRUCT ○
- 1 CHANNEL EXCAVATION/CONSTRUCTION PER TYPICAL CHANNEL SECTIONS ON SHEET C2.
 - 2 GRADE-TO-DRAIN EXCAVATION/CONSTRUCTION PER TYPICAL CANYON RIDGE BASIN GRADE-TO-DRAIN SECTION ON SHEET C2.
 - 3 ROAD SIDE SWALE/GRADING PER TYPICAL UNION HILLS DRIVE STREET SECTION ON SHEET C2.
 - 4 18" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 5 24" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 6 2 - 24" RGRCP, CLASS III STORM DRAIN PIPE, LENGTH PER PLAN.
 - 7 2 - 24" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 8 3 - 36" RGRCP, CLASS III STORM DRAIN PIPE, LENGTH PER PLAN.
 - 9 3 - 36" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
 - 10 2 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.20. LENGTH PER PLAN.
 - 11 3 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.30. LENGTH PER PLAN.
 - 12 HEADWALL PER A.D.O.T. STD. DTL. B-II.11.
 - 13 OUTLET HEADWALL PER A.D.O.T. STD. DTL. B-04.10.
 - 14 INLET HEADWALL PER A.D.O.T. STD. DTL. B-04.30.
 - 15 3 - 36" RGRCP, CLASS III STORM DRAIN JUNCTION BOX.
 - 16 CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3.
 - 17 OBM ROAD ACCESS RAMP
 - 18 OBM ROAD PER TYPICAL SECTION ON SHEET 3.
 - 19 CONCRETE WEIR STRUCTURE PER DETAIL #1 ON SHEET 3.
 - 20 CHANNEL DROP STRUCTURE PER DETAIL #2 ON SHEET 3.
 - 21 ROCK RIP-RAP (D₅₀ = 12 in.) HDWL. PROTECTION OR APPROVED EQUIVALENT.
 - 22 CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.
 - 23 STORM DRAIN MANHOLE

GENERAL NOTES

1. THESE PRELIMINARY PLANS ARE NOT FOR CONSTRUCTION.
2. EXISTING UTILITY LOCATIONS ARE SCHEMATIC BASED ON AVAILABLE INFORMATION. ALL EXISTING UTILITY LOCATIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO ANY CONSTRUCTION.
3. LOCATION OF 40' DRAINAGE EASEMENT RECORDED AS 83-427993, OF OFFICIAL RECORDS IS APPROXIMATE BASED ON EASEMENT LANGUAGE AND THE CITRUS POINT FINAL PLAT, DEED #: 01-0816411.
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602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

NO.	REVISION	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION**

**107TH AVENUE AND UNION HILLS DRIVE
PCN 450.04.20
FCD CONTRACT NO. XXXX-XXXX**

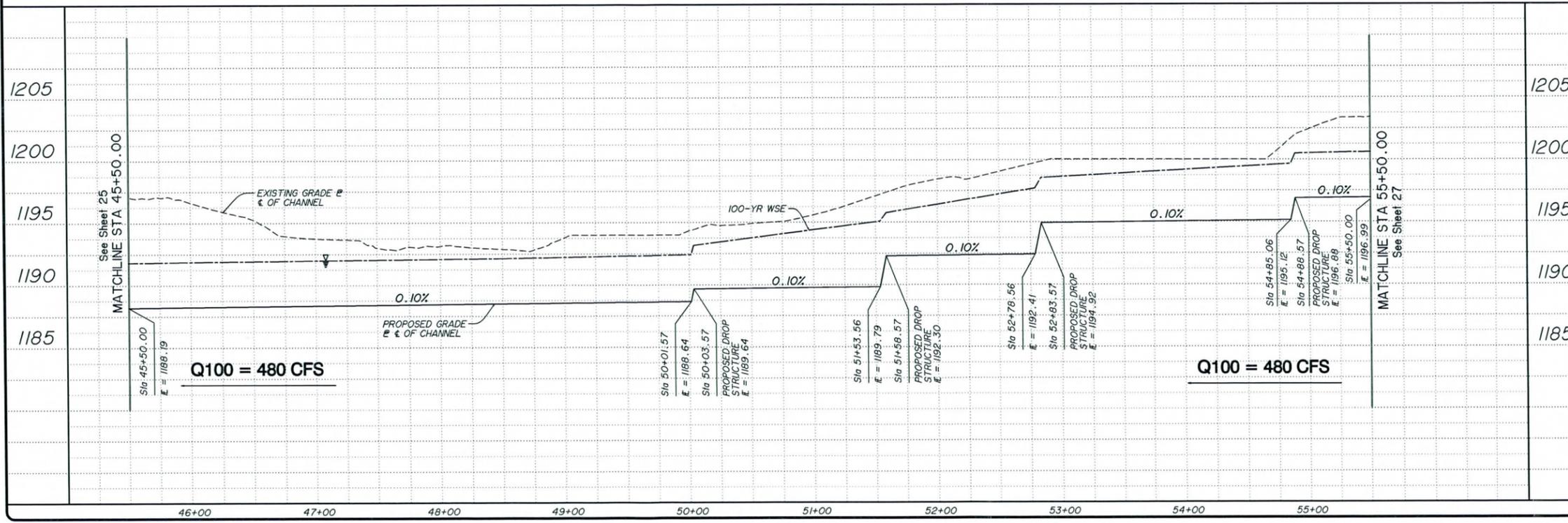
	BY	DATE
DESIGNED	C. HITTLE	05/27/11
DRAWN	B. CALDWELL	05/27/11
CHECKED	W. RUSSELL	05/27/11

THIS DOCUMENT IS FOR
INTERIM REVIEW ONLY.
IT IS NOT INTENDED FOR
BIDDING, CONSTRUCTION,
OR PERMIT PURPOSES.

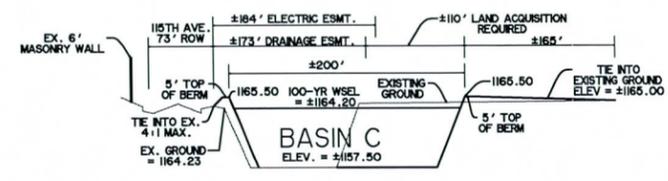
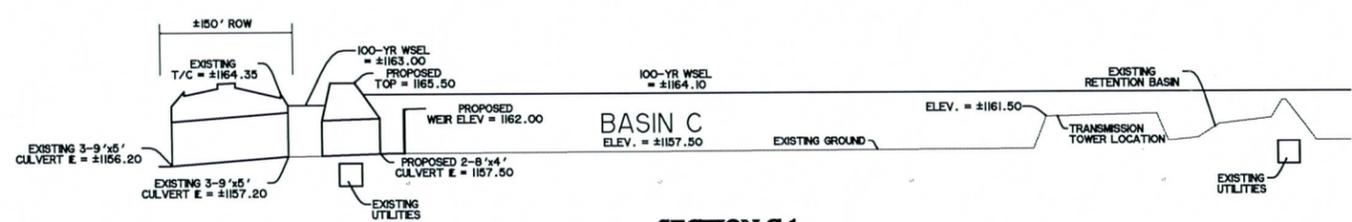
WARREN C. RUSSELL
ARIZONA P.E. NO. 39620

**GOODWIN &
MARSHALL**
CIVIL ENGINEERS-PLANNERS-SURVEYORS
8007 W. SAGE ROAD #15, CHANDLER, ARIZONA 85226

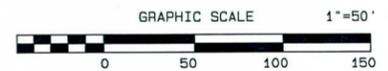
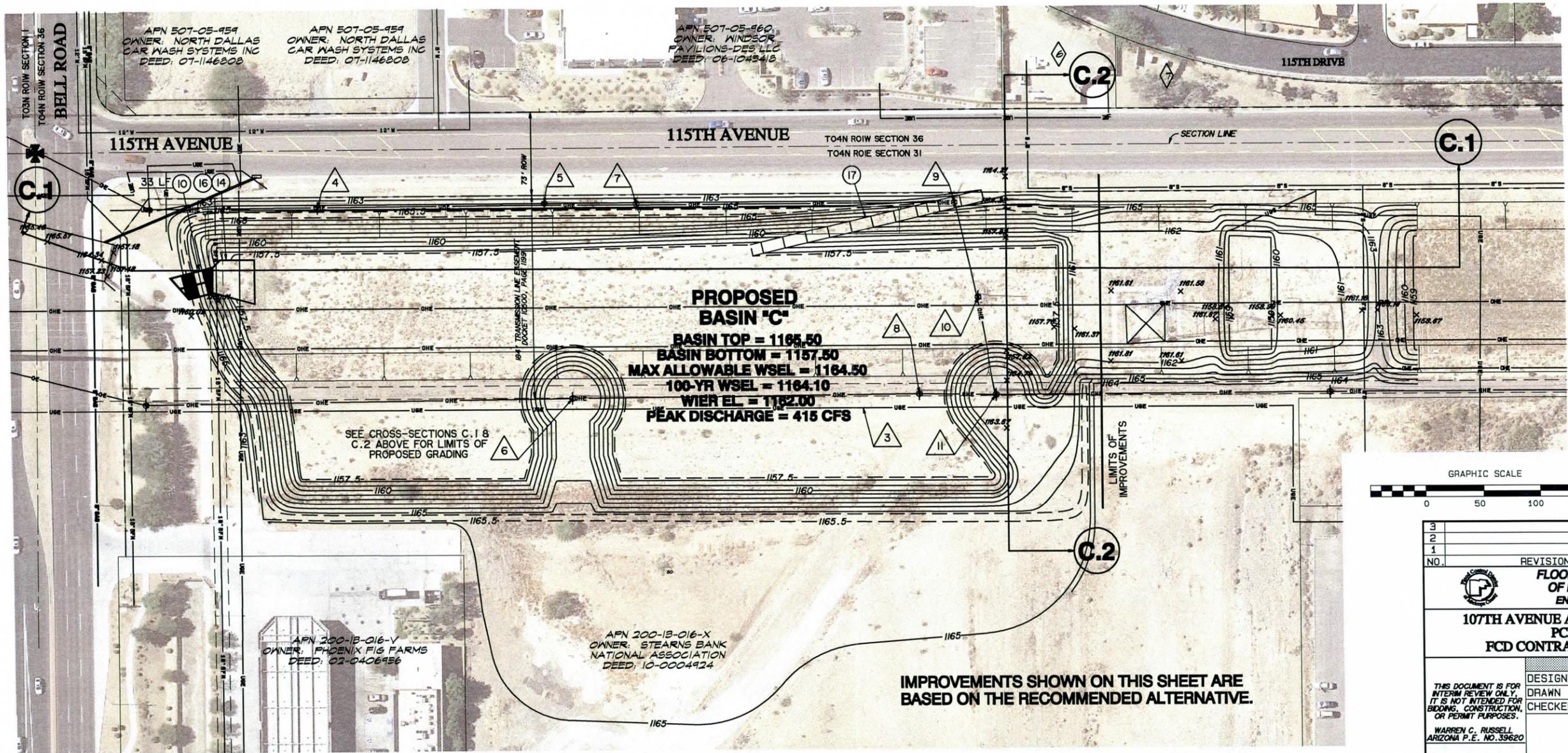
DRAWING NO. C23	PLAN-PROFILE 21	SHEET OF 26 31
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GOODWIN AND MARSHALL, INC.
JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX



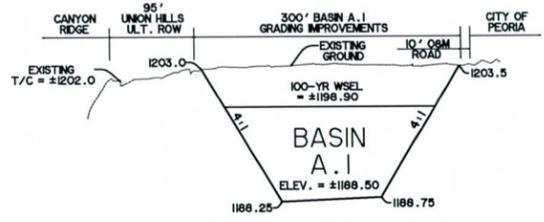
- △ EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
- ⑩ 2 - 8' x 4' BOX CULVERT PER A.D.O.T. STD. DTL. B-02.20. LENGTH PER PLAN.
- ⑭ INLET HEADWALL PER A.D.O.T. STD. DTL. B-04.30.
- ⑯ CONCRETE HDWL STAGED OUTFALL STRUCTURE PER DETAIL #3 ON SHEET 3.
- ⑰ ROCK RIP-RAP (D = 12 in.) HDWL. PROTECTION OR APPROVED EQUIVALENT.



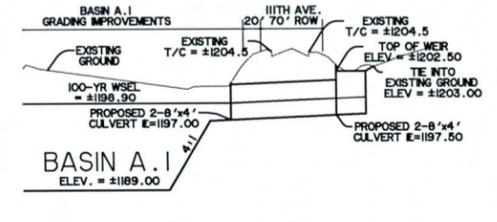
Two working days before you dig
CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

3			
2			
1			
NO.	REVISION	BY	DATE
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION 107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.		DESIGNED	C. HITTLE 05/27/11
		DRAWN	B. CALDWELL 05/27/11
		CHECKED	W. RUSSELL 05/27/11
WARREN C. RUSSELL ARIZONA P.E. NO. 39620		GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS <small>800 W. WYOMING AVENUE, PHOENIX, ARIZONA, 85001</small>	
DRAWING NO.	C25	DETENTION BASIN C	SHEET OF 28 31

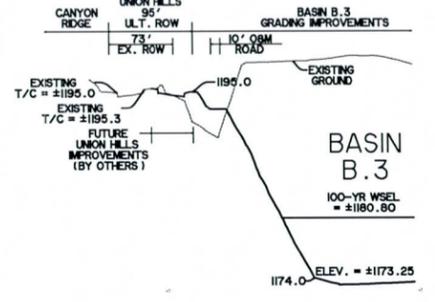
JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.



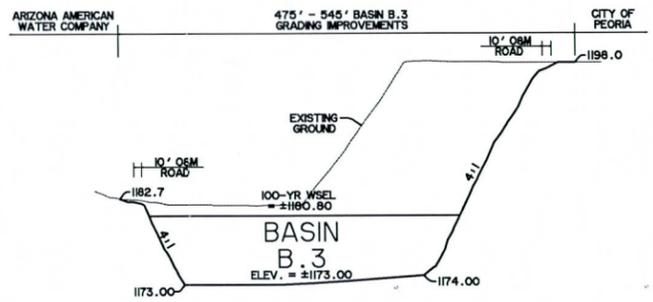
SECTION A.1
PROPOSED DETENTION BASIN "A.1"



SECTION A.2
PROPOSED DETENTION BASIN "A.1"



SECTION B.1
PROPOSED DETENTION BASIN "B.3"
(SEE SHEET 30 FOR PLAN VIEW INFORMATION)

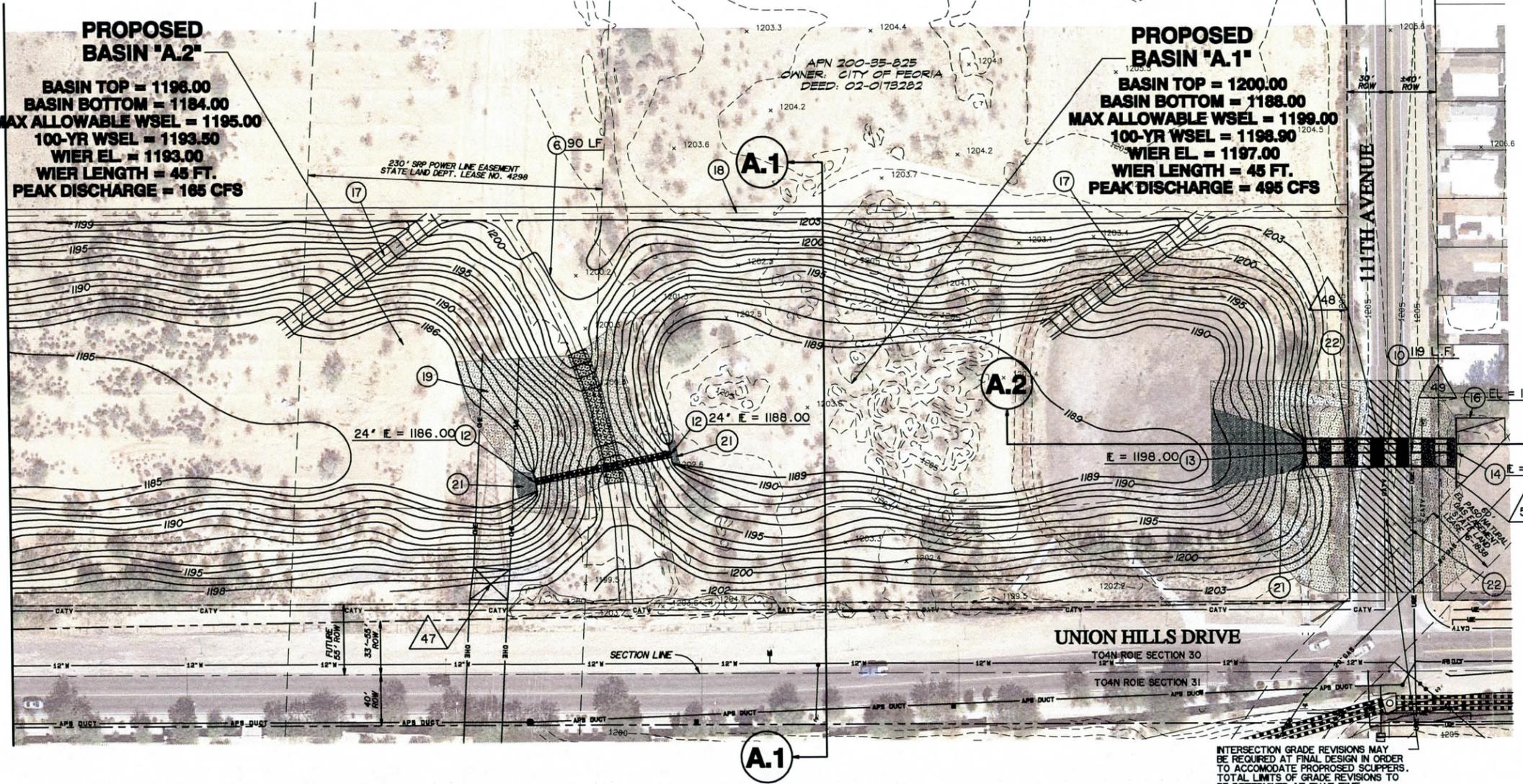


SECTION B.2
PROPOSED DETENTION BASIN "B.3"
(SEE SHEET 30 FOR PLAN VIEW INFORMATION)

IMPROVEMENTS SHOWN ON THIS SHEET ARE BASED ON THE RECOMMENDED ALTERNATIVE.



MATCHLINE - SEE SHEET 30

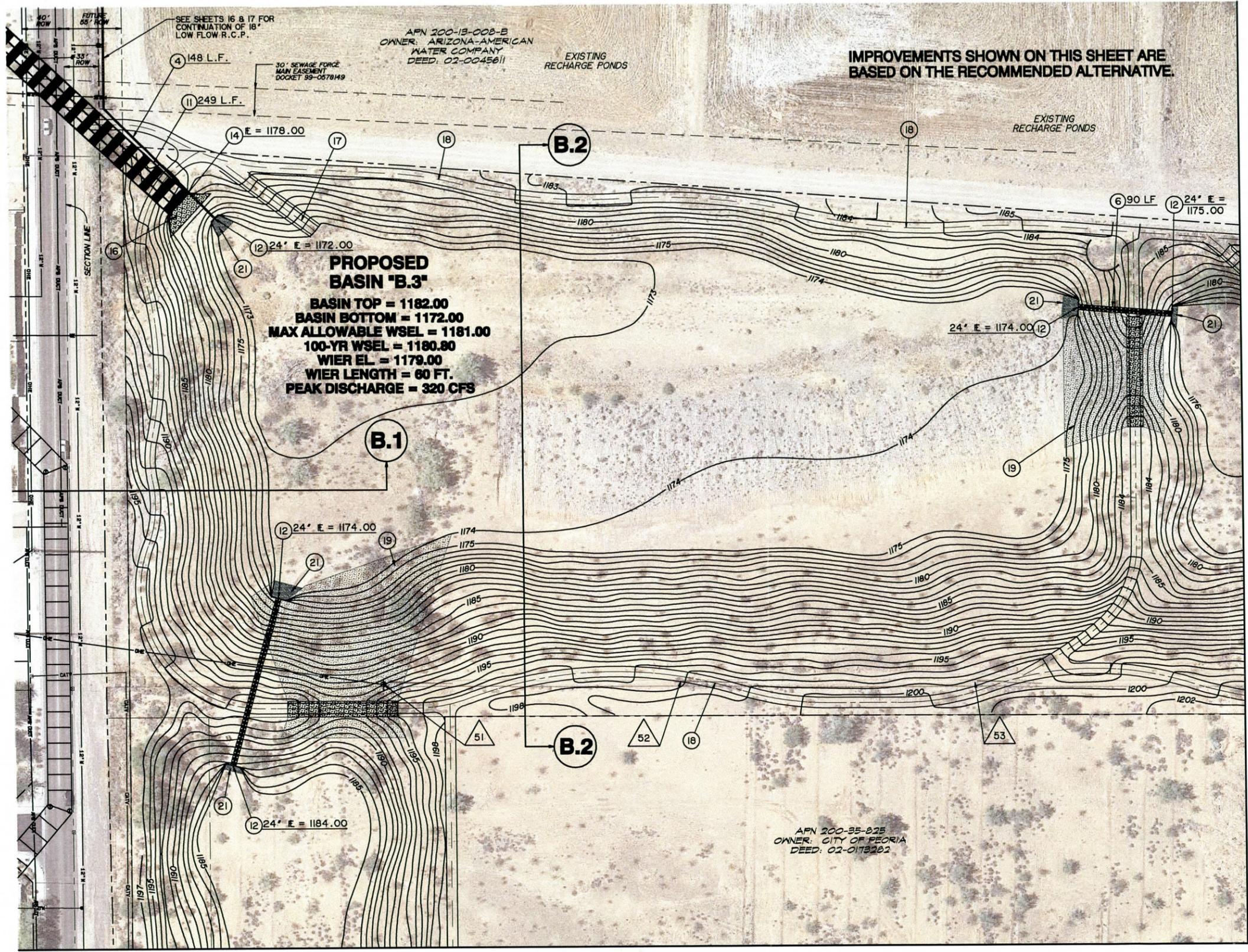


- 1 EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
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- 4 18" RGRCP, CLASS IV STORM DRAIN PIPE, LENGTH PER PLAN.
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- 22 CONCRETE SCUPPER PER MAG STD. DTL 206-1, 206-2 & 206-3.

Two working days before you dig CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT OUTSIDE MARICOPA COUNTY

3			
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1			
NO.	REVISION	BY	DATE
107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX			
		BY	DATE
DESIGNED		C. HITTLE	05/27/11
DRAWN		B. CALDWELL	05/27/11
CHECKED		W. RUSSELL	05/27/11
THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.			
GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS <small>800 W. BAY ROAD #115, CHANDLER, ARIZONA, 85226</small>			
DRAWING NO. C26		DETENTION BASIN A	SHEET OF 29 31

INTERSECTION GRADE REVISIONS MAY BE REQUIRED AT FINAL DESIGN IN ORDER TO ACCOMMODATE PROPOSED SCUPPERS. TOTAL LIMITS OF GRADE REVISIONS TO BE DETERMINED AT THAT TIME.



IMPROVEMENTS SHOWN ON THIS SHEET ARE BASED ON THE RECOMMENDED ALTERNATIVE.

PROPOSED BASIN "B.3"
 BASIN TOP = 1182.00
 BASIN BOTTOM = 1172.00
 MAX ALLOWABLE WSEL = 1181.00
 100-YR WSEL = 1180.80
 WIER EL. = 1179.00
 WIER LENGTH = 60 FT.
 PEAK DISCHARGE = 320 CFS

B.1

B.2

B.2

APN 200-35-825
 OWNER: CITY OF PEORIA
 DEED: 02-0173262

SEE SHEETS 16 & 17 FOR CONTINUATION OF 18" LOW FLOW R.C.P.

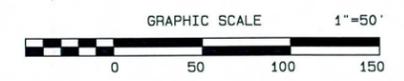
APN 200-13-008-B
 OWNER: ARIZONA-AMERICAN WATER COMPANY
 DEED: 02-0045611

EXISTING RECHARGE PONDS

EXISTING RECHARGE PONDS

- 1 EXISTING UTILITIES TO BE RELOCATED OR PROTECTED IN PLACE PER UTILITY CONFLICT TABLE ON SHEET 2.
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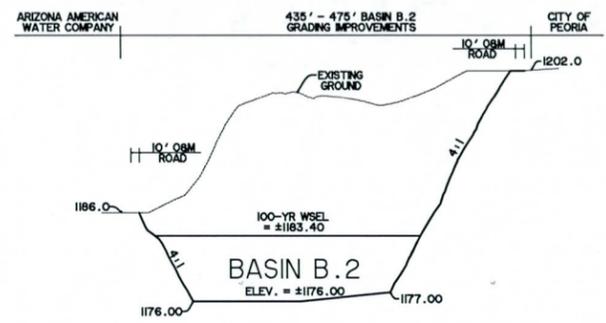
MATCHLINE - SEE SHEET 31



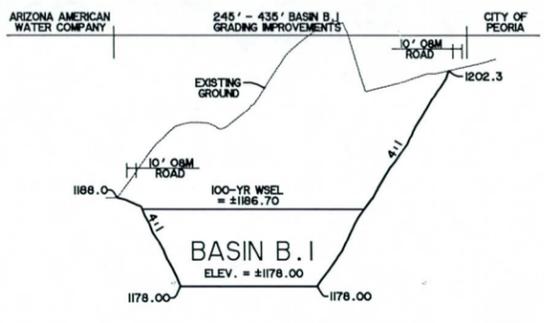
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3			
2			
1			
NO.	REVISION	BY	DATE
<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>107TH AVENUE AND UNION HILLS DRIVE PCN 450.04.20 FCD CONTRACT NO. XXXX-XXXX</p>			
THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES. WARREN C. RUSSELL ARIZONA P.E. NO. 39620	DESIGNED	C. HITTLE	05/27/11
	DRAWN	B. CALDWELL	05/27/11
	CHECKED	W. RUSSELL	05/27/11
GOODWIN & MARSHALL CIVIL ENGINEERS-PLANNERS-SURVEYORS <small>800 W. BAYVIEW PK. CHANDLER, ARIZONA, 85226</small>		BY	DATE
DRAWING NO. C27	DETENTION BASIN B	SHEET OF 30	31

MATCHLINE - SEE SHEET 29



SECTION B.3
PROPOSED DETENTION BASIN "B.2"

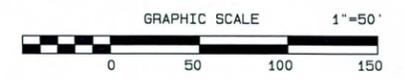
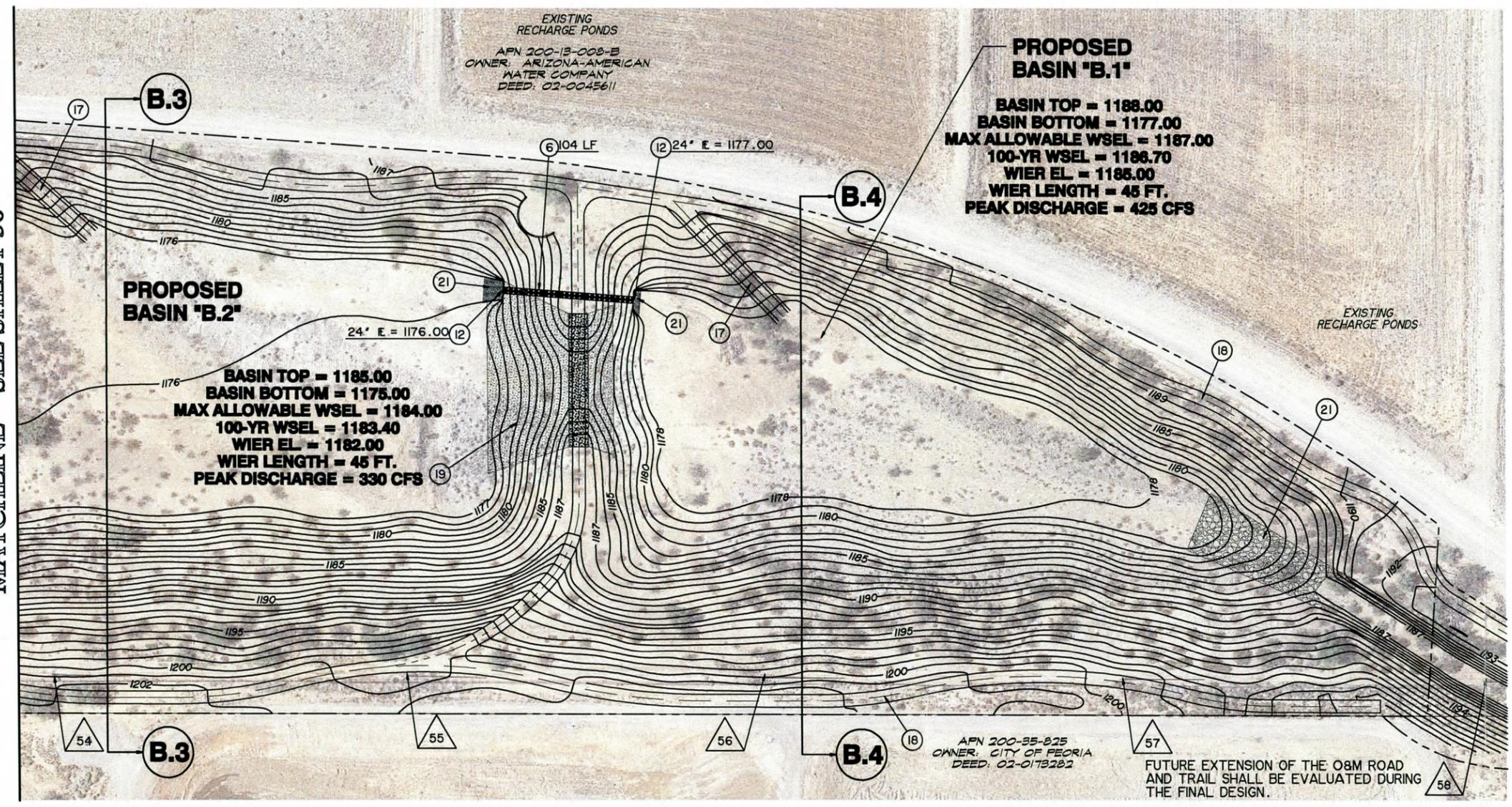


SECTION B.4
PROPOSED DETENTION BASIN "B.1"

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IMPROVEMENTS SHOWN ON THIS SHEET ARE BASED ON THE RECOMMENDED ALTERNATIVE.

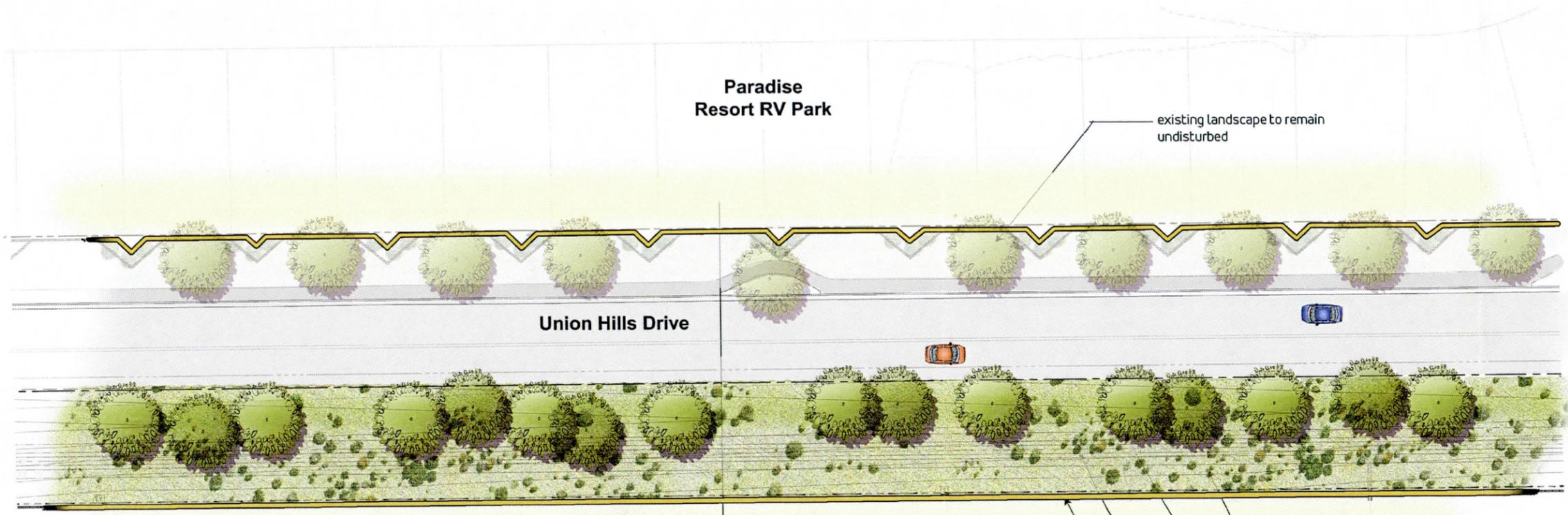
MATCHLINE - SEE SHEET 30



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602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

3			
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		BY	DATE
	DESIGNED	C. HITTLE	05/27/11
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	CHECKED	W. RUSSELL	05/27/11
<small>THIS DOCUMENT IS FOR INTERIM REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING, CONSTRUCTION, OR PERMIT PURPOSES.</small> <small>WARREN C. RUSSELL</small> <small>ARIZONA P.E. NO. 39620</small>		GOODWIN & MARSHALL <small>CIVIL ENGINEERS-PLANNERS-SURVEYORS</small> <small>800 W. RAY ROAD #15, CHANDLER, ARIZONA, 85226</small>	
DRAWING NO.	DETENTION BASIN B		SHEET OF
C28			31 31

JOB NO. 10388A.2 - 107TH AVENUE AND UNION HILLS DRIVE - PCN 450.04.20 - FCD CONTRACT NO. XXXX-XXXX GOODWIN AND MARSHALL, INC.

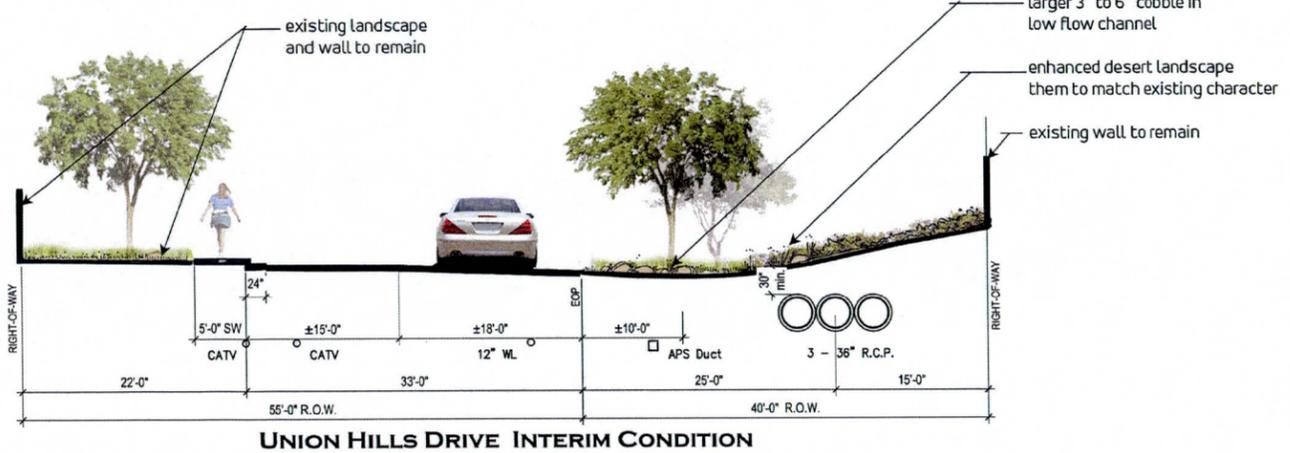


plan

Sun City Unit 45

aa
typical landscape condition for south side of union hills drive from the intersection of 107th avenue to 111th avenue

- 2" deep granite topdressing over entire landscape area.
- enhanced desert landscaping to match existing surrounding character, plant palette shall include mesquites, palo verdes, desert willow, bursage, leucophyllums, tecoma, dalea and lantana species.
- (3) 36" RCP pipes -see engineering
- existing wall



aa -section - facing east



example of enhanced desert landscape



LANDSCAPE ARCHITECTS

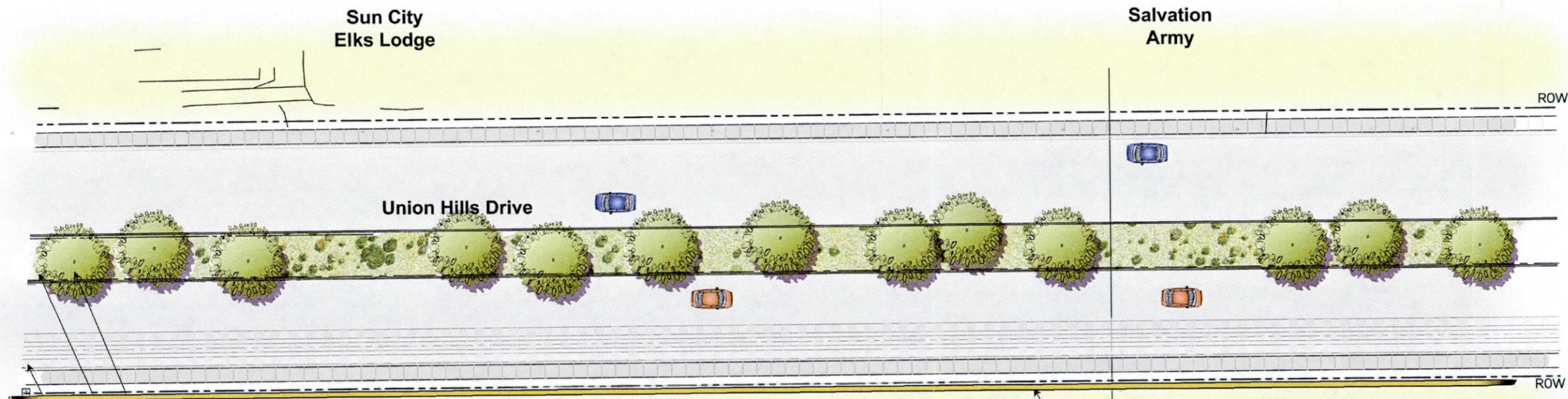


ENGINEER/PLANNERS



6909 W. Ray Road #15
Chandler, Arizona 85226
(602) 218-7265

Union Hills Drive
Interim Conditions
FOR
107TH AVENUE AND
UNION HILLS DRIVE
CONTRACT: FDC 2009C036.2
CITIES OF PEORIA AND SURPRISE
AND INCORPORATED MARICOPA
COUNTY, ARIZONA
MAY, 2011

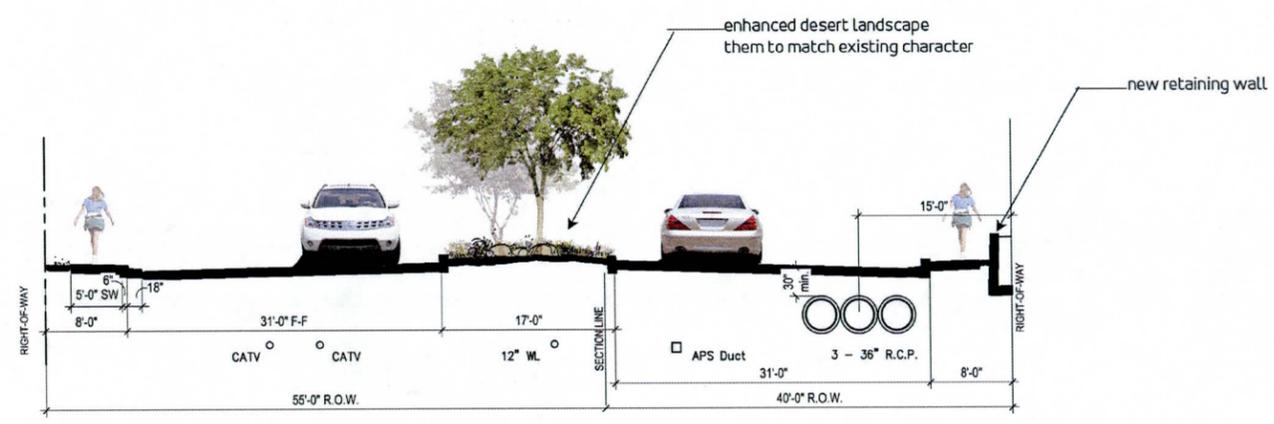


typical landscape condition for south side of union hills drive from the intersection of 107th avenue to 111th avenue

- plan
- 2" deep granite topdressing over entire landscape area.
 - enhanced desert landscaping to match existing surrounding character, plant palette shall include mesquites, palo verdes, desert willow, bursage, leucophyllums, tecoma, dalea and lantana species.
 - (3) 36" RCP pipes -see engineering

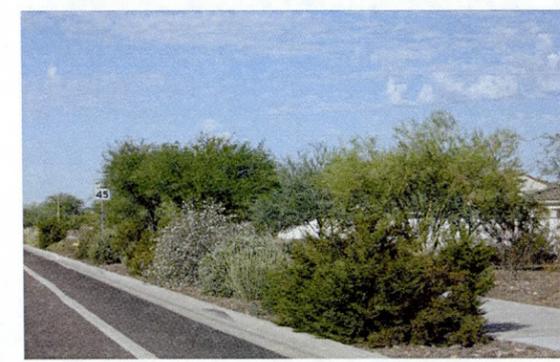
Sun City Unit 45

retaining wall-see section below



UNION HILLS DRIVE ULTIMATE CONDITION

aa -section - facing east



example of enhanced desert landscape



LANDSCAPE ARCHITECTS

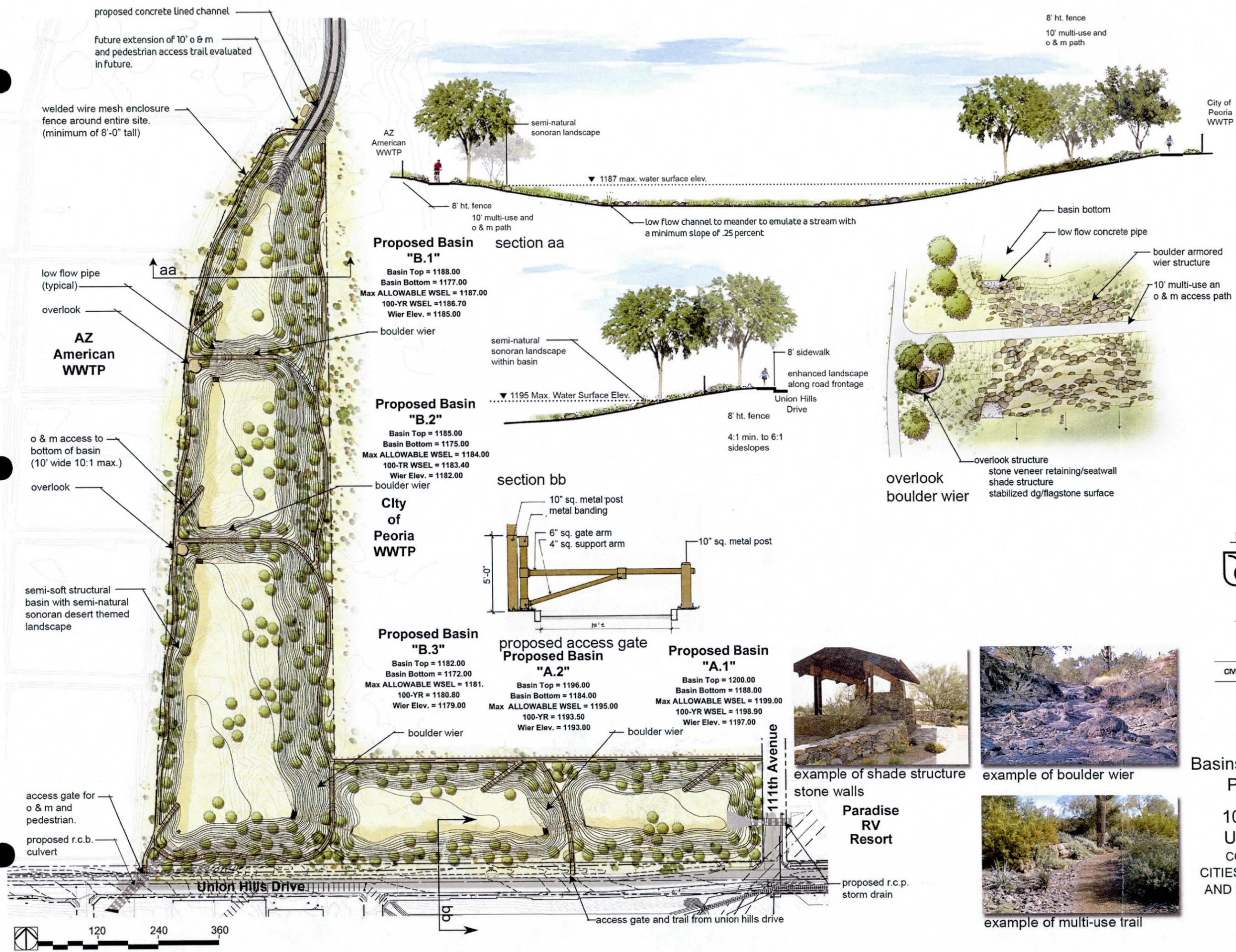
andersonbaron
 plan · design · achieve
 88 s. san marcos pl, ste 101
 chandler, arizona 85225

ENGINEER/PLANNERS

GOODWIN & MARSHALL INC.
 CIVIL ENGINEERS ~ PLANNERS ~ SURVEYORS

6909 W. Ray Road #15
 Chandler, Arizona 85226
 (602) 218-7285

Union Hills Drive
 Ultimate Conditions
 FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FDC 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND INCORPORATED MARICOPA
 COUNTY, ARIZONA
 MAY, 2011



LANDSCAPE ARCHITECTS



ENGINEER/PLANNERS



CIVIL ENGINEERS - PLANNERS - SURVEYORS

6909 W. Ray Road #15
 Chandler, Arizona 85226
 (602) 218-7295

Basins, A.1, A.2, B.1, B.2, B.3
 Preferred Alternative
 FOR
 107TH AVENUE AND
 UNION HILLS DRIVE
 CONTRACT: FDC 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND INCORPORATED MARICOPA
 COUNTY, ARIZONA
 MAY, 2011



example of shade structure stone walls



example of boulder wier



example of multi-use trail

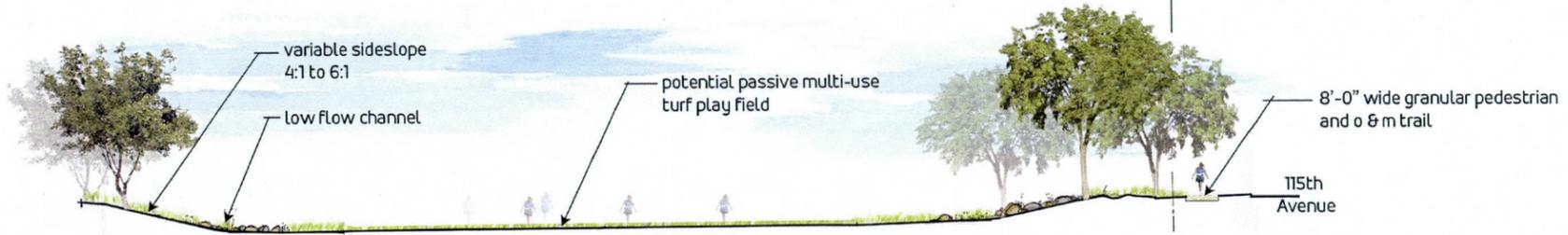
Paradise RV Resort

proposed r.c.p. storm drain





Proposed Basin "C"
 Basin Top = 1165.50
 Basin Bottom = 1157.50
 MAX. ALLOWABLE WSEL = 1164.50
 100-YR WSEL = 1164.10
 Wier Elev. = 1162.00

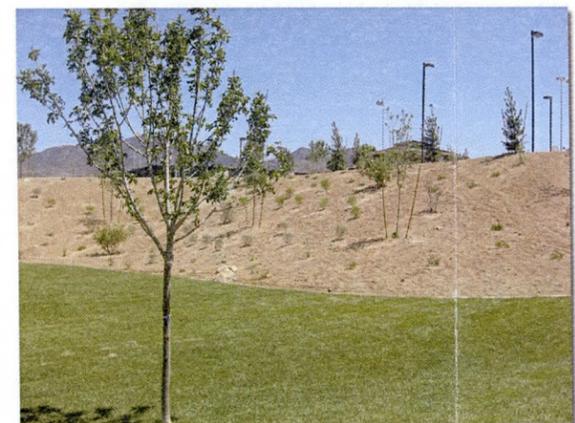


section aa

- Design Criteria Configuration - Basin C
- The basin and channel shall have warping side slopes with meandering slope from 4:1 to 6:1 creating a more natural undulating character and matching the existing character of the current landforms;
 - The existing stabilized granular trail along the east side 115th Avenue shall be modified from the current 5'-0" wide to 8'-0" wide with 3" deep " minus stabilized granite (color to match existing). The trail is to be modified from Bell Road to the south side of Avenue of the Arts;
 - At a minimum the basin is to be designed to a level that is consistent with the surrounding conditions and basins to the north. Vegetation
 - Plant material shall match existing species and shall respond to the specific landscape design themes identified;
 - Hydro-seed shrubs and groundcover shall match existing species and landscape themes identified;
 - Dust control shall be proved for all landscape surfaces utilizing a combination of granite mulch, stabilized granite for multi-use trails and O&M paths along with desert pavement for areas within basins to provide naturalistic conditions;
 - Salvage and re-establish indigenous vegetation where possible;
 - Place rocks and boulders in an irregular pattern along the side slopes of the channel;
 - Salvage surface soil (6"-8") from the basin area and replace in the landscape. Maximum stockpile height for surface soil should be to 8 feet;
 - Trees shall be located along the side slopes in an irregular pattern;
 - Avoid disturbance to saguaros, ironwoods, mesquites, palo verdes and to the existing xero-riparian vegetation as much as possible;
 - Structural component;
 - Use materials, shapes, and colors that blend in with the surroundings for basins and road frontages



passive multi-use turf field



example of semi soft structural basin

LANDSCAPE ARCHITECTS

andersonbaron
 plan · design · achieve
 88 s. san marcos pl, ste 101
 chandler, arizona 85225

ENGINEER/PLANNERS

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6909 W. Ray Road #15
 Chandler, Arizona 85226
 (602) 218-7285

Basins C
Preferred Alternative
 FOR
107TH AVENUE AND
UNION HILLS DRIVE
 CONTRACT: FDC 2009C036.2
 CITIES OF PEORIA AND SURPRISE
 AND INCORPORATED MARICOPA
 COUNTY, ARIZONA
 MAY, 2011



ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 1
107th Avenue - Palm Tree Drive to Union Hills Drive
Recommended Alternative

1	* Cut/Export	C.Y.	2,400	\$5.50	\$13,200.00
2	Dust/Storm Water Management	Month	6.0	\$1,000.00	\$6,000.00
3	30" RCP (Class IV)	L.F.	2,640	\$70.00	\$184,800.00
4	Type D Catch Basin w/ 10' wing	Ea.	4	\$4,000.00	\$16,000.00
5	Traffic Control	Month	6.0	\$7,500.00	\$45,000.00
	Subtotal				\$265,000.00
	Contingency (20%)				\$53,000.00
	Grand Total				\$318,000.00

* All excavation quantities assumed to be export based upon excessive cut volumes from proposed detention basins.

This Engineer's opinion of probable construction cost is made on the basis of the Engineer's experience and best judgment as a design professional. It must be recognized that any evaluation of work to be performed to construct this project must by necessity be speculative in nature until completion of its actual detailed design. In addition the engineer has no control over the cost of labor, material, or services to be furnished by others or over market conditions. Accordingly Goodwin & Marshall, Inc. can not guarantee that actual costs will not vary from the opinions expressed here in.

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 2

Union Hills Drive - 107th Avenue to 111th Avenue
Recommended Alternative

1	Clearing and Grubbing	Ac.	2.3	\$600.00	\$1,404.00
2	* Cut/Export	C.Y.	6,200	\$5.50	\$34,100.00
3	Dust/Storm Water Management	Month	6.0	\$2,400.00	\$14,400.00
4	3 - 36" RCP	L.F.	2,900	\$255.00	\$739,500.00
5	3 - 36"HDWL - MAG 501-1	Ea.	1	\$4,000.00	\$4,000.00
6	24" RCP (Class IV)	L.F.	200	\$40.00	\$8,000.00
7	Neenah Trench Grate - R-4999-L6	L.F.	43	\$215.00	\$9,245.00
8	Multi-barrel RCP Junction Box (Depth)	V.F.	60	\$850.00	\$51,000.00
9	Rip Rap, D50 = 6", Depth = 12"	C.Y.	37	\$65.00	\$2,407.41
10	Traffic Control	Month	6.0	\$15,000.00	\$90,000.00
11	** 20" EPNG Gas Crossing	L.S.	1.0	\$20,000.00	\$20,000.00
12	12" WL DIP	L.S.	1.0	\$3,000.00	\$3,000.00
13	APS Feed Relocates	Ea.	8.0	\$4,000.00	\$32,000.00
14	8" & 6" WL Relocate	L.F.	200.0	\$55.00	\$11,000.00
15	107th & UHD Intersection Reconstruct	S.Y.	3,000.0	\$45.00	\$135,000.00

Subtotal					\$1,155,056.41
Contingency (20%)					\$231,011.28
***Landscape Cost (see Anderson-Baron Estimate for Details)	S.F.	105,000		\$1.00	\$105,000.00
Grand Total					\$1,491,067.69

* All excavation quantities assumed to be export based upon excessive cut volumes from proposed detention basins.

** EPNG Crossing includes Permitting and Inspection only

*** Landscape estimates are based on maximum District participation and are not in support of the concept presented in the 15% landscape plans.

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 3
Union Hills Drive - 111th Avenue Culvert
Recommended Alternative

1	Clearing and Grubbing	Ac.	1.0	\$600.00	\$600.00
2	* Cut/Export	C.Y.	1,000	\$5.50	\$5,500.00
3	Dust/Storm Water Management	Month	1.0	\$600.00	\$600.00
4	2-10'x3' RCB Culvert	L.F.	120	\$664.00	\$79,680.00
5	2-10'X3' RCB Culvert Inlet HDWL	Ea.	1	\$3,119.00	\$3,119.00
6	2-10'X3' RCB Culvert Outlet HDWL	Ea.	1	\$5,360.00	\$5,360.00
7	2-10'x3' RCB Culvert Inlet Wier Structure	L.S.	1	\$12,500.00	\$12,500.00
8	Rip Rap, D50 = 6", Depth = 12"	C.Y.	10	\$65.00	\$650.00
9	MAG 206.3 Concrete Scupper	L.F.	266	\$110.00	\$29,260.00
10	Traffic Control	Month	1.0	\$15,000.00	\$15,000.00
11	Demo Existing 111th	L.S.	1.0	\$10,000.00	\$10,000.00
12	111th Reconstruction	S.Y.	711.0	\$45.00	\$31,995.00
	Subtotal				\$194,264.00
	Contingency (20%)				\$38,852.80
	Grand Total				\$233,116.80

* All excavation quantities assumed to be export based upon excessive cut volumes from proposed detention basins.

** Box culvert cost based on concrete price of \$450/CY

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
<u>Basin "A"</u>					
<u>Recommended Alternative</u>					
1	Clearing and Grubbing	Ac.	8.7	\$600.00	\$5,244.00
2	* Cut/Export	C.Y.	110,000	\$5.50	\$605,000.00
3	Dust/Storm Water Management	Month	6.0	\$3,000.00	\$18,000.00
4	Rip Rap, D50 = 6", Depth = 12"	C.Y.	45	\$65.00	\$2,925.00
5	2-24" RCP	L.F.	275	\$135.00	\$37,125.00
6	2-24"HDWL - ADOT	Ea.	4	\$2,000.00	\$8,000.00
7	Basin A.1 Outlet Weir Structure	L.S.	1	\$100,000.00	\$100,000.00
8	Basin A.2 Outlet Weir Structure	L.S.	1	\$130,000.00	\$130,000.00
12	2-10'x3' RCB Culvert Inlet Weir Structure	Ea.	1	\$12,500.00	\$12,500.00
13	15' O&M Road (4"ABC over 2" DG)**	L.F.	1,950.0	\$16.50	\$32,175.00
	Subtotal				\$950,969.00
	Contingency (20%)				\$190,193.80
	Total				\$1,141,162.80
	*** Land Acquisition (City of Peoria)	Acre	8.7	\$43,560.00	\$380,714.40
	****Landscape Cost (see Anderson-Baron Estimate for Details)	S.F.	380,714	\$1.00	\$380,714.40
	Grand Total				\$1,902,591.60

* Basins A.1 & A.2 excavation quantity is the result of 110,000 C.Y. of cut and export.

** 15' O&M Road located along perimeter of each basin.

*** Land Values are based on Maricopa County Assessors 2011 Values

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
<u>Basin "B"</u>					
<u>Recommended Alternative</u>					
1	Clearing and Grubbing	Ac.	22.0	\$600.00	\$13,200.00
2	Cut/Fill*	C.Y.	2,500	\$2.75	\$6,875.00
3	Cut/Export*	C.Y.	404,000	\$5.50	\$2,222,000.00
4	Dust/Storm Water Management	Month	6.0	\$3,000.00	\$18,000.00
5	Rip Rap, D50 = 6", Depth = 12"	C.Y.	35	\$65.00	\$2,275.00
6	2-24" RCP	L.F.	200	\$135.00	\$27,000.00
7	2-24"HDWL - ADOT	Ea.	4	\$2,000.00	\$8,000.00
8	18" RCP	L.F.	1,000	\$33.00	\$33,000.00
9	4'x4' Storm Drain Manhole	Ea.	2	\$2,500.00	\$5,000.00
10	18" RCP HDWL - ADOT	L.F.	2	\$1,500.00	\$3,000.00
11	Union Hills Drive - Bore	L.F.	100	\$600.00	\$60,000.00
12	Basin B.1 Outlet Weir Structure	Ea.	1	\$85,000.00	\$85,000.00
13	Basin B.2 Outlet Weir Structure	Ea.	1	\$70,000.00	\$70,000.00
14	3-8'x3' RCB Culvert	L.F.	249	\$996.00	\$248,004.00
15	3-8'X3' RCB Culvert Inlet HDWL	Ea.	1	\$3,319.00	\$3,319.00
16	3-8'X3' RCB Culvert Outlet HDWL	Ea.	1	\$6,110.00	\$6,110.00
17	Basin B.3 Outlet Weir Structure	L.S.	1	\$7,500.00	\$7,500.00
18	12" WL DIP	L.S.	1	\$3,000.00	\$3,000.00
19	APS Feed Relocates	Ea.	1	\$4,000.00	\$4,000.00
20	Union Hills Drive - Open cut - R&R	L.S.	1	\$75,000.00	\$75,000.00
21	15' O&M Road (4"ABC over 2" DG)	L.F.	7,500	\$16.50	\$123,750.00
22	Traffic Control	Month	1	\$15,000.00	\$15,000.00
23	OHE Line Relocation	L.S.	1	\$85,000.00	\$85,000.00
24	18" S.S. FM Relocation	L.F.	100	\$150.00	\$15,000.00
	Subtotal				\$3,139,033.00
	Contingency (20%)				\$627,806.60
	Total				\$3,766,839.60
	*** Land Acquisition (AZ American)	Acre	22.0	\$43,560.00	\$958,320.00
	Landscape Cost (see Anderson-Baron Estimate for Details)	S.F.	898,248	\$1.00	\$898,247.60
	Grand Total				\$5,623,407.20
	* Basins B.1, B.2, & B.3 excavation quantity is the result of 2,500 C.Y. of fill, 406,500 C.Y. of cut, and 404,000 C.Y. of export.				
	** 15' O&M Road located along perimeter of all basins.				
	*** Land Values are based on Maricopa County Assessors 2011 Values				

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 5
115th Avenue -Basin C
Recommended Alternative

1	Clearing and Grubbing	Ac.	5.0	\$600.00	\$3,000.00
2	Cut/Export*	C.Y.	10,000	\$5.50	\$55,000.00
3	Dust/Storm Water Management	Month	6.0	\$3,000.00	\$18,000.00
4	Existing Electric Pole Protection	Ea.	2	\$4,500.00	\$9,000.00
5	APS Feed Relocates	L.F.	700.0	\$190.00	\$133,000.00
6	10" S.S. FM Relocation	L.F.	225.0	\$100.00	\$22,500.00
7	18" S.S. FM Relocation	L.F.	200.0	\$150.00	\$30,000.00
8	2-10'x3' RCB Culvert	L.F.	30	\$885.00	\$26,550.00
9	2-10'x3' RCB Culvert Inlet Headwall	Ea.	1	\$3,060.00	\$3,060.00
10	Inlet Weir Structure	L.S.	1	\$15,000.00	\$15,000.00
Subtotal					\$315,110.00
Contingency (20%)					\$63,022.00
Total					\$378,132.00

**** Land Acquisition**

Land Acquisition (Stearns Bank) within Exi	Acre	3.15	\$100,000.00	\$315,000.00
Land Acquisition (Stearns Bank) within Existing Drainage Easement	Acre	5.50	\$43,560.00	\$239,580.00

*** Landscape Cost (see Anderson-Baron Estimate for Details) S.F. 305,700 \$1.00 \$305,700.00

Grand Total **\$1,238,412.00**

* Basin C excavation quantity is the result of 10,000 C.Y. of cut and export.

** Land Values are based on Maricopa County Assessors 2011 Values

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 6
Sun City Drain Channel
Recommended Alternative

1	Clearing, Grubbing, Demo Ex. Channel	Ac.	2.0	\$600.00	\$1,200.00
2	*Unclassified Excavation	C.Y.	2,000	\$2.75	\$5,500.00
3	Cut/Export	C.Y.	2,000	\$5.50	\$11,000.00
4	Dust/Storm Water Management	Month	2.0	\$2,000.00	\$4,000.00
5	Concrete Channel Lining	C.Y.	1,625	\$375.00	\$609,481.28

* Sun City Drain is in a severely deteriorated condition and the use of an alternate channel lining shall be evaluated by the District at the time of final design.

Subtotal	\$631,181.28
Contingency (20%)	\$126,236.26
Grand Total	\$757,417.53

*Channel Improvements from Section 0.473 to Section 0.663 (+/- 1,550 L.F.)
 ** Estimate Assumes Channel ROW is Owned and Maintained by the DISTRICT.

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

ITEM No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
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SEGMENT 7
Beardsley Channel
Recommended Alternative

1	Clearing, Grubbing, Demo Ex. Channel	Ac.	6.7	\$600.00	\$4,020.00
2	* Cut/Fill	C.Y.	750	\$2.75	\$2,062.50
3	* Cut/Export	C.Y.	36,500	\$5.50	\$200,750.00
4	Dust/Storm Water Management	Month	3.0	\$3,000.00	\$9,000.00
5	Rip Rap, D50 = 12", Depth = 24"	C.Y.	30	\$90.00	\$2,700.00
6	** 15' O&M Road (4"ABC over 2" DG)	L.F.	5,280.0	\$16.50	\$87,120.00
7	Drop Structures	Ea.	8	\$2,500.00	\$20,000.00
8	Concrete Channel Lining	C.Y.	2,576	\$375.00	\$965,812.50
Subtotal					\$1,291,465.00
Contingency (20%)					\$258,293.00
Total					\$1,549,758.00

***** Land Acquisition**

Land Acquisition (City of Peoria)	Acre	4.2	\$43,560.00	\$182,952.00
Land Acquisition (AZ American)	Acre	2.5	\$43,560.00	\$108,900.00

Grand Total **\$1,841,610.00**

* Beardsley Channel excavation quantity is the result of 1,250 C.Y. of fill, 37,250 C.Y. of cut, and 36,500 C.Y. of export.

** 15' O&M road currently not shown in plans. Location to be further discussed with FCD. Quantity shown corresponds to O&M roads placed on both sides of channel.

*** Land Values are based on Maricopa County Assessors 2011 Values

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ENGINEER'S OPINION OF PROBABLE COST

Project FCD2009C036-107th Ave. and Union Hills Dr.
Date: July 25, 2011
Location: Maricopa County, Arizona
Job No. 10388A.2

Item No.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
Civil					
1	107th Avenue - Palm Tree Drive to Union Hills Drive				\$265,000.00
2	Union Hills Drive - 107th Avenue to 111th Avenue				\$1,155,056.41
3	Union Hills Drive - 111th Avenue Culvert				\$194,264.00
4	Basin "A"				\$950,969.00
5	Basin "B"				\$3,139,033.00
6	115th Avenue -Basin C				\$315,110.00
7	Sun City Drain Channel				\$631,181.28
8	Beardsley Channel				\$1,291,465.00
	Civil Subtotal				\$7,942,078.68
	Contingency (20%)				\$1,588,415.74
	Civil Total				\$9,530,494.42

* Civil Total Cost Includes approximately \$3.1 million in earthwork.

**** Landscape**

9	Union Hills Drive - 107th Avenue to 111th Avenue				\$104,984.00
10	Basin "A"				\$380,706.35
11	Basin "B"				\$898,204.93
12	115th Avenue -Basin C				\$305,699.29
	Landscape Total				\$1,383,895.28

***** Land Acquisition**

	Land Acquisition (City of Peoria)	Acre	12.9	\$43,560.00	\$563,666.40
	Land Acquisition (AZ American)	Acre	24.5	\$43,560.00	\$1,067,220.00
	Land Acquisition (Stearns Bank)	Acre	3.15	\$100,000.00	\$315,000.00
	Land Acquisition (Stearns Bank) within existing Drainage Esmt.	Acre	5.50	\$43,560.00	\$239,580.00
	Land Acquisition Total				\$2,185,466.40

Miscellaneous

	Engineering & Landscape Design		10% of Construction Total		\$953,049.44
	Construction Administration		8% of Construction Total		\$762,439.55
	Testing		4% of Construction Total		\$381,219.78
	Miscellaneous Total				\$2,096,708.77

Grand Total

\$15,196,564.87

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Conceptual Landscape

Estimate of
Probable Construction Costs

andersonbaron
landscape architecture

District Cost Ceiling

FCD2009C036 _Union Hills Drive - Interim Condition

Landscape Area	105,000	s.f.
Total Site Area	105,000	s.f.

Planting

24" Box Trees (Minimum per City requirements)	48	ea.	\$ 200.00	\$ 9,600.00
15 Gallon Trees (Minimum per City requirements)	48	ea.	\$ 75.00	\$ 3,600.00
5 Gallon Shrubs	448	ea.	\$ 15.50	\$ 6,944.00
1 Gallon Shrubs	112	ea.	\$ 7.50	\$ 840.00
Planting subtotal				\$ 20,984.00

Irrigation

Drip Irrigation	105,000	s.f.	\$ 0.55	\$ 57,750.00
Irrigation subtotal				\$ 57,750.00

Inerts

3/4" Minus Decomposed Granite (1" depth blended with native material)	105,000	s.f.	\$ 0.25	\$ 26,250.00
Inerts subtotal				\$ 26,250.00
Landscape Total				\$ 104,984.00

Total \$ 104,984.00
Cost per sf \$ 1.00
Cost per acre \$ 43,553.36

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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Cost estimate shown is based on the Flood Control District Landscape Ceiling Cost of \$40,000 per acre with an additional 6% added for additional aesthetic features and 10% for Contingency

Conceptual Landscape

**Estimate of
Probable Construction Costs**

andersonbaron
landscape architecture

District Cost Ceiling

FCD2009C036 _Basin A.1, A.2

Landscape Area	361,604	s.f.
Hardscape Area	19,110	s.f.
Total Site Area	380,714	s.f.

Planting

24" Box Trees	47	ea.	\$ 200.00	\$ 9,400.00
15 Gallon Trees	71	ea.	\$ 75.00	\$ 5,325.00
5 Gallon Shrubs	1,326	ea.	\$ 15.50	\$ 20,553.00
1 Gallon Shrubs	1,989	ea.	\$ 7.50	\$ 14,917.50
Hydroseed (seeding for erosion control)	127,755	s.f.	\$ 0.05	\$ 6,387.73
Planting subtotal				\$ 56,583.23

Irrigation

Drip Irrigation	233,849	s.f.	\$ 0.55	\$ 128,617.12
Irrigation subtotal				\$ 128,617.12

Hardscape

10'-0" Wide Granular O & M Access Trail (1/4" Minus)	19,110	s.f.	\$ 5.50	\$ 105,105.00
Hardscape subtotal				\$ 105,105.00

Inerts

3/4" Minus Decomposed Granite (1" depth blended with native material)	361,604	s.f.	\$ 0.25	\$ 90,401.00
Inerts subtotal				\$ 90,401.00

Landscape Total \$ 275,601.35
Hardscape Total \$ 105,105.00

Total \$ 380,706.35
Cost per sf \$ 1.00
Cost per ac. \$ 43,559.13

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Street ROW Sidewalk, Grading, Paving Consultant Fees and Review Fees.

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District Cost Ceiling

FCD2009C036 _Basin B.1, B.2, B.3

Landscape Area	835,278	s.f.
Hardscape Area	62,970	s.f.
Total Site Area	898,248	s.f.

Planting

24" Box Trees	56	ea.	\$ 200.00	\$ 11,200.00
15 Gallon Trees	129	ea.	\$ 75.00	\$ 9,675.00
5 Gallon Shrubs	1,529	ea.	\$ 15.50	\$ 23,699.50
1 Gallon Shrubs	3,568	ea.	\$ 7.50	\$ 26,760.00
Hydroseed (seeding for erosion control)	375,374	s.f.	\$ 0.05	\$ 18,768.70
Planting subtotal				\$ 90,103.20

Irrigation

Drip Irrigation	459,904	s.f.	\$ 0.55	\$ 252,947.24
Irrigation subtotal				\$ 252,947.24

Hardscape

10'-0" Wide Granular O & M Access Trail (1/4" Minus)	62,970	s.f.	\$ 5.50	\$ 346,335.00
Hardscape subtotal				\$ 346,335.00

Inerts

3/4" Minus Decomposed Granite (1" depth blended with native material)	835,278	s.f.	\$ 0.25	\$ 208,819.50
Inerts subtotal				\$ 208,819.50

Landscape Total \$ 551,869.93
Hardscape Total \$ 346,335.00

Total \$ 898,204.93
Cost per sf \$ 1.00
Cost per ac. \$ 43,557.91

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Street ROW Sidewalk, Grading, Paving Consultant Fees and Review Fees.

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Conceptual Landscape

**Estimate of
Probable Construction Costs**

andersonbaron
landscape architecture

District Cost Ceiling

FCD2009C036 _Basin C

Landscape Area	302,200	s.f.
Hardscape Area	3,500	s.f.
Total Site Area	305,700	s.f.

Planting

24" Box Trees	126	ea.	\$ 200.00	\$ 25,200.00
15 Gallon Trees	103	ea.	\$ 75.00	\$ 7,725.00
5 Gallon Shrubs	2,325	ea.	\$ 15.50	\$ 36,037.50
1 Gallon Shrubs	2,325	ea.	\$ 7.50	\$ 17,437.50
Hydroseed (seeding for erosion control)	74,371	s.f.	\$ 0.05	\$ 3,718.57
Planting subtotal				\$ 90,118.57

Irrigation

Drip Irrigation	227,829	s.f.	\$ 0.55	\$ 125,305.72
Irrigation subtotal				\$ 125,305.72

Hardscape

10'-0" Wide Granular O & M Access Trail (1/4" Minus)	800	s.f.	\$ 5.50	\$ 4,400.00
3'-0" Wide Granular Trail Extension	2,700	s.f.	\$ 3.50	\$ 9,450.00
Hardscape subtotal				\$ 13,850.00

Inerts

3/4" Minus Decomposed Granite (1" depth blended with native material)	305,700	s.f.	\$ 0.25	\$ 76,425.00
Inerts subtotal				\$ 76,425.00

Landscape Total \$ 291,849.29

Hardscape Total \$ 13,850.00

Total \$ 305,699.29

Cost per sf \$ 1.00

Cost per ac. \$ 43,559.90

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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Conceptual Landscape

**Estimate of
Probable Construction Costs**

andersonbaron
landscape architecture

15% Concept Plans

FCD2009C036 _Union Hills Drive - Interim Condition

Landscape Area	105,000	s.f.
Total Site Area	105,000	s.f.

Planting

24" Box Trees (Minimum per City requirements)	44	ea.	\$ 225.00	\$ 9,900.00
15 Gallon Trees (Minimum per City requirements)	44	ea.	\$ 95.00	\$ 4,180.00
5 Gallon Shrubs	440	ea.	\$ 15.50	\$ 6,820.00
1 Gallon Shrubs	90	ea.	\$ 9.50	\$ 855.00
Planting subtotal				\$ 21,755.00

Irrigation

Drip Irrigation	105,000	s.f.	\$ 1.00	\$ 105,000.00
Irrigation subtotal				\$ 105,000.00

Inerts

3/4" Minus Decomposed Granite (2" depth)	105,000	s.f.	\$ 0.50	\$ 52,500.00
Pre-Emergent	105,000	s.f.	\$ 0.03	\$ 3,150.00
Mass Grade Earthwork	7,778	c.y.	\$ 1.95	\$ 15,166.67
Fine Grading	105,000	s.f.	\$ 0.08	\$ 8,400.00
Inerts subtotal				\$ 79,216.67
Landscape Total				\$ 205,971.67

Total	\$ 205,971.67
10% Contingency	\$ 20,597.17
Grand Total	\$ 226,568.83
Cost per sf	\$ 2.16

Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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Conceptual Landscape

**Estimate of
Probable Construction Costs**

andersonbaron
landscape architecture

15% Concept Plans

FCD2009C036 _Union Hills Drive - Ultimate Condition

Landscape (median Only)	43,282	s.f.
Total Site Area	43,282	s.f.

Planting

24" Box Trees (Minimum per City requirements)	43	ea.	\$ 225.00	\$ 9,675.00
15 Gallon Trees (Minimum per City requirements)	43	ea.	\$ 95.00	\$ 4,085.00
5 Gallon Shrubs	258	ea.	\$ 15.50	\$ 3,999.00
1 Gallon Shrubs	90	ea.	\$ 9.50	\$ 855.00
Planting subtotal				\$ 18,614.00

Irrigation

Drip Irrigation	43,282	s.f.	\$ 1.00	\$ 43,282.00
Irrigation subtotal				\$ 43,282.00

Hardscape

5'-0" Wide Concrete Sidewalk (South Side)	2,546	l.f.	\$ 4.50	\$ 11,457.00
Hardscape subtotal				\$ 11,457.00

Inerts

3/4" Minus Decomposed Granite (2" depth)	43,282	s.f.	\$ 0.50	\$ 21,641.00
Pre-Emergent	43,282	s.f.	\$ 0.03	\$ 1,298.46
Mass Grade Earthwork	3,206	c.y.	\$ 1.95	\$ 6,251.84
Fine Grading	43,282	s.f.	\$ 0.08	\$ 3,462.56
Inerts subtotal				\$ 32,653.86

Landscape Total	\$ 94,549.86
Hardscape Total	\$ 11,457.00
Total	\$ 138,660.73
10% Contingency	\$ 13,866.07
Grand Total	\$ 152,526.80
Cost per sf	\$ 3.52

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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Conceptual Landscape

Estimate of
Probable Construction Costs

andersonbaron
landscape architecture

15% Concept Plans

FCD2009C036_Basin A.1, A.2,

Landscape Area	361,604	s.f.
Hardscape Area	19,110	s.f.
Total Site Area	380,714	s.f.

Planting

24" Box Trees	167	ea.	\$ 225.00	\$ 37,575.00
15 Gallon Trees	233	ea.	\$ 95.00	\$ 22,135.00
5 Gallon Shrubs	630	ea.	\$ 15.50	\$ 9,765.00
1 Gallon Shrubs	1,260	ea.	\$ 9.50	\$ 11,970.00
Hydroseed (seeding for erosion control)	361,604	s.f.	\$ 0.05	\$ 18,080.20
Planting subtotal				\$ 99,525.20

Irrigation

Drip Irrigation	361,604	s.f.	\$ 1.00	\$ 361,604.00
Irrigation subtotal				\$ 361,604.00

Hardscape-Districts Cost

10'-0" Wide Granular O & M Access Trail	19,110	l.f.	\$ 8.00	\$ 152,880.00
Hardscape-District cost subtotal				\$ 152,880.00

Hardscape-Project Cost

8'-0" wide Concrete Sidewalk	2,690	l.f.	\$ 16.50	\$ 44,385.00
Boulder Wier	Lump Sum		\$ 74,000.00	\$ 74,000.00
Hardscape-Project Cost subtotal				\$ 118,385.00

Inerts

3/4" Minus Decomposed Granite (1" depth)	361,604	s.f.	\$ 0.30	\$ 108,481.20
Pre-Emergent-O & M Access trail only	19,110	s.f.	\$ 0.03	\$ 573.30
Mass Grade Earthwork	26,785	c.y.	\$ 1.95	\$ 52,231.69
Fine Grading	361,604	s.f.	\$ 0.08	\$ 28,928.32
Inerts subtotal				\$ 190,214.51

Landscape Total	\$ 651,343.71
Hardscape-District Cost Total	\$ 152,880.00
Hardscape-Project Cost Total	\$ 118,385.00
Total	\$ 922,608.71
10% Contingency	\$ 92,260.87
Grand Total	\$ 1,014,869.58
Cost per sf	\$ 2.67

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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15% Concept Plans

FCD2009C036 _Basin B.1, B.2, B.3

Landscape Area	835,278	s.f.
Hardscape Area	62,970	s.f.
Total Site Area	898,248	s.f.

Planting

24" Box Trees	167	ea.	\$ 225.00	\$ 37,575.00
15 Gallon Trees	233	ea.	\$ 95.00	\$ 22,135.00
5 Gallon Shrubs	630	ea.	\$ 15.50	\$ 9,765.00
1 Gallon Shrubs	1,260	ea.	\$ 9.50	\$ 11,970.00
Hydroseed (seeding for erosion control)	835,278	s.f.	\$ 0.05	\$ 41,763.90
Planting subtotal				\$ 123,208.90

Irrigation

Drip Irrigation	835,278	s.f.	\$ 1.00	\$ 835,278.00
Irrigation subtotal				\$ 835,278.00

Hardscape-Districts Cost

10'-0" Wide Granular O & M Access Trail	62,970	l.f.	\$ 8.00	\$ 503,760.00
Hardscape -District Cost subtotal				\$ 503,760.00

Hardscape-Project Cost

8'-0" wide Concrete Sidewalk	2,690	l.f.	\$ 16.50	\$ 44,385.00
Retaining Seatwall	112	l.f.	\$ 40.00	\$ 4,480.00
Trail Benches	10	ea.	\$ 1,200.00	\$ 12,000.00
Concrete Benches	4	ea.	\$ 1,450.00	\$ 5,800.00
Shade Ramda	2	ea.	\$ 15,000.00	\$ 30,000.00
Entry Gate	Lump Sum		\$ 15,000.00	\$ 15,000.00
Enclosure Fence (8'-0" Tall)	7,655	l.f.	\$ 18.50	\$ 141,617.50
Boulder Wier	Lump Sum		\$ 74,000.00	\$ 74,000.00
Hardscape-Project Cost subtotal				\$ 327,282.50

Inerts

3/4" Minus Decomposed Granite (1" depth)	835,278	s.f.	\$ 0.30	\$ 250,583.40
Pre-Emergent-O & M Access trail only	62,970	s.f.	\$ 0.03	\$ 1,889.10
Mass Grade Earthwork	61,872	c.y.	\$ 1.95	\$ 120,651.27
Fine Grading	835,278	s.f.	\$ 0.08	\$ 66,822.24

Inerts subtotal \$ 439,946.01

Landscape Total \$ 1,398,432.91

Hardscape-District Cost Total \$ 503,760.00

Hardscape-Project Cost Total \$ 327,282.50

Total \$ 2,229,475.41

10% Contingency \$ 222,947.54

Grand Total \$ 2,452,422.95

Cost per sf \$ 2.73

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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15% Concept Plans

FCD2009C036_Basin C

Landscape Area	305,700	s.f.
Total Site Area	305,700	s.f.

Planting-District Cost

24" Box Trees	186	ea.	\$ 225.00	\$ 41,850.00
15 Gallon Trees	164	ea.	\$ 95.00	\$ 15,580.00
5 Gallon Shrubs	830	ea.	\$ 15.50	\$ 12,865.00
1 Gallon Shrubs	1,460	ea.	\$ 9.50	\$ 13,870.00
Planting District Cost subtotal				\$ 84,165.00

Planting-Project Cost

Turf	69,989	s.f.	\$ 0.65	\$ 45,492.85
Planting Project Cost subtotal				\$ 45,492.85

Irrigation-District Cost

Drip Irrigation	270,735	s.f.	\$ 1.00	\$ 270,735.00
Irrigation District Cost subtotal				\$ 270,735.00

Irrigation-Project Cost

Turf Irrigation	69,989	s.f.	\$ 1.10	\$ 76,987.90
Irrigation Project Cost subtotal				\$ 76,987.90

Hardscape-District Cost

10'-0" Wide Granular O & M Access Trail (east side)	600	l.f.	\$ 8.00	\$ 4,800.00
Hardscape District Cost subtotal				\$ 4,800.00

Hardscape-Project Cost

10'-0" Wide Granular O & M Access Trail (west side)	600	l.f.	\$ 8.00	\$ 4,800.00
3'-0" Wide Granular Trail Extension	2,700	l.f.	\$ 6.00	\$ 16,200.00
Soccer Goal and Net	3	ea.	\$ 5,000.00	\$ 15,000.00
Trash Receptacles	6	ea.	\$ 1,200.00	\$ 7,200.00
Park Benches	8	ea.	\$ 1,200.00	\$ 9,600.00
Hardscape Project Cost subtotal				\$ 52,800.00

Inerts

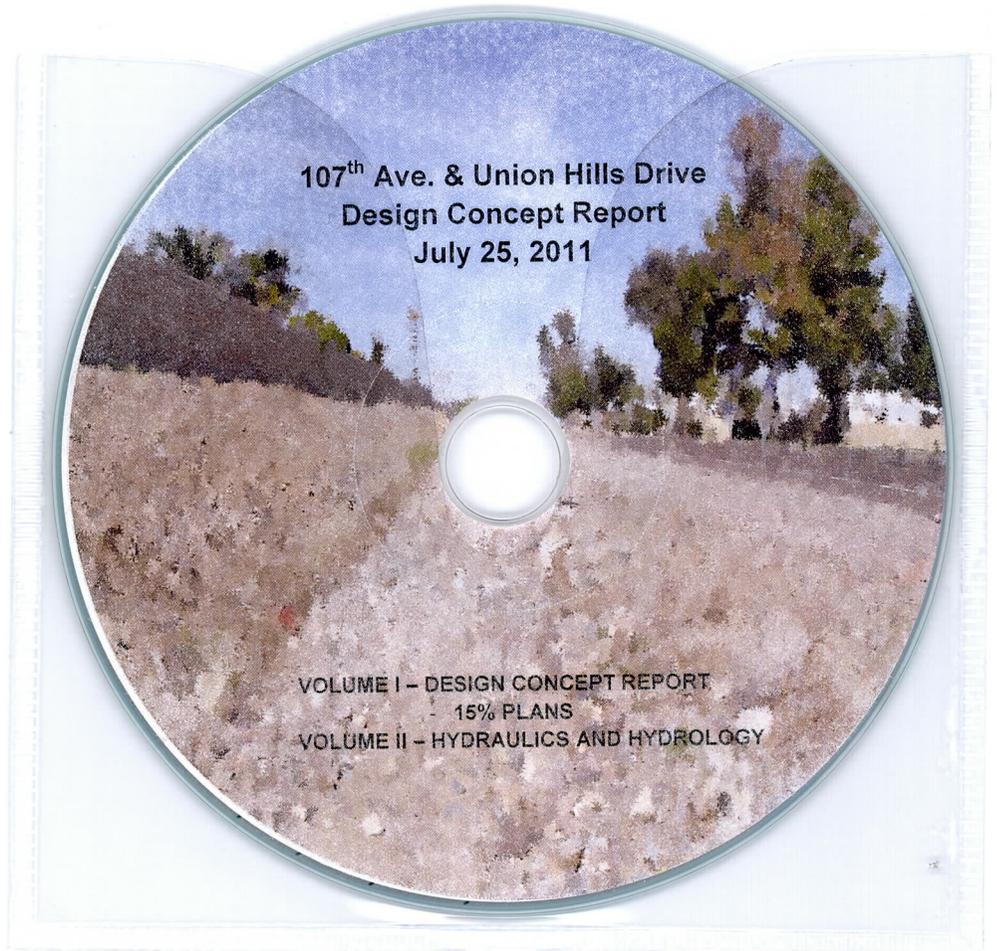
3/4" Minus Decomposed Granite (2" depth)	305,700	s.f.	\$ 0.50	\$ 152,850.00
Pre-Emergent	270,735	s.f.	\$ 0.03	\$ 8,122.05
Mass Grade Earthwork	22,644	c.y.	\$ 1.95	\$ 44,156.67
Fine Grading	305,700	s.f.	\$ 0.08	\$ 24,456.00

Inerts subtotal	\$ 229,584.72
Landscape District Cost Total	\$ 584,484.72
Landscape Project Cost Total	\$ 122,480.75
Hardscape District Cost Total	\$ 4,800.00
Hardscape Project Cost Total	\$ 52,800.00
Total	\$ 764,565.47
10% Contingency	\$ 76,456.55
Grand Total	\$ 841,022.01
Cost per sf	\$ 2.75

*Total excludes bonding, Excavation, Box culverts and Bridges, Electrical conduits, High voltage wiring, Site utilities, Pumping, Electric, Water Meters, Existing or new Signage, Street Lighting, Permit Fees, Paving Consultant Fees and Review Fees.

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Appendix K

CD Containing Digital Data





FINAL DESIGN APPROACH MEMO

107th Avenue and Union Hill Drive Phase 2 – Alternative Analysis

The following items have been identified by the District and Stakeholders as critical design parameters/choices that shall be evaluated as part of the final design process.

General Plan Comments

1. Evaluate number of section per sheet and text size to ensure legibility.
2. Bid items that apply to a particular sheet should be the only items contained one that sheet. Each bid item shall associated quantities added on a per sheet basis.
3. Potholing of existing utilities should occur for all crossings.
4. SRP Power approval is required for all crossings and proposed basins within their easements.
5. Riprap should be placed at all boxes/culverts inlet and outlet surrounding headwalls and wingwalls. Riprap should be placed where ever there is a concrete-soil connection.
6. Also there should be two additional HECRAS runs performed with the final design
 - o A low “n” value about .02 for velocity used to size riprap and scour.
 - o A high “n” value about .07 for capacity
7. Evaluate the need for additional rip-rap or pipe systems in the existing Canyon Ridge drainage system.
8. Evaluate the need for redundant pipe systems to drain the basins.

107th Avenue and Union Hills Drive Intersection

1. 15% Plan Sheet 21 – Very little cover over pipe, this could be a problem. Any reason not to put pipe in deeper at this location?

Due to sanitary sewer conflicts the storm drain pipe has been designed at maximum depth. It is understood that the intersection of 107th Avenue and Union Hills Drive will require redesign to accommodate adequate cover for the triple barrel 36” pipe system. Special care should be given to ensure positive overflow continues to the west along Union Hills Drive.



111th Avenue and Union Hills Drive Intersection

1. Sheet 29 – how will water coming down 111th Avenue get into Basin A?

Water coming down 111th Avenue will be conveyed into Basin A by a series of flumes along both sides of 111th Avenue. The water collected on the west side of the roadway will be dumped directly into the proposed Basin A.1, while the water collected on the east side of the roadway will be dumped directly into the existing Paradise Resort basin before out falling to the proposed 2-8'x4' box culverts conveying the flows to Basin A.1. The location of the proposed flumes and possible regarding of the 111th Avenue have been identified with a cross-hatch. The street grade revision will be performed as part of the final design.

Union Hills Drive Storm Drain System

1. Sheet 18 – why 4.2 feet below HPG? The higher we can go, the less grading will be needed in Canyon Ridge.

The location of the RGRCP approximately 4.2 below the high pressure gas line was a design choice made with a high level of importance placed on safety. The RGRCP was located with the maximum amount of separation between it and the gas line while still being able outfall to the existing Canyon Ridge box culvert. The final design elevation is to be evaluated during the final design process.

Beardsley Road Diversion Channel

1. The recommended drainage alternatives propose to use property which is intended for Beardsley Water Reclamation Facility (WRF). Any other use of the property cannot in any way limit the use of the property for its intended purpose. The Beardsley WRF is master planned to expand several times in the future. The facility treats wastewater to near-drinking water quality and recharges treated effluent on site for groundwater storage and recovery. There are no other means of effluent disposal for this facility. The subject property was purposefully acquired to allow for this expansion and the addition of recharge basins (the property was purchased by the Wastewater Enterprise Fund). Water is discharged into the recharge basins and allowed to percolate into the ground. Water from these basins tends to migrate both laterally and vertically. Each basin has been designed to account for lateral migration of water without interfering with the operation of the adjacent basins. This is a key consideration in the design of the proposed drainage facilities. Any drainage basin constructed next to existing or planned recharge basins will need to be designed to avoid or prevent lateral migration of water from the recharge basins.
2. The dedication of the right-of-way adjacent to the Beardsley WRF will need to be confirmed (there were no dedications when the City acquired the property from the State Land Department).
3. The Beardsley WRF is a critical facility and as such site security must be maintained.
4. Discussions with Arizona American are required to gain approval of the proposed channel and maintenance road.
5. The section of the channel (concrete, earthen, pipe) shall be reevaluated at the time of final design in conjunction with the items above.



Basin Design

Revisit basin contouring to possibly accommodate the following recommendations from the District's Landscape Branch.

"The line forming the boundary along the top and bottom of slope will be a dominant visual line in the landscape when the project is completed. Use of slope warping techniques will provide variation in the surface of the slope but does not contribute significantly to producing form variation along the edge of the channel or basin inverts. The visual effect of the proposed slope warping is likely to recede as the native vegetation that is proposed to be installed on the slope increases in size. For this reason I recommend that slope warping be deleted in favor of a uniform 4:1 or 5:1 slope that is varied to create greater undulation (bays and peninsulas) over the entire slope, thereby creating more variability along the top and bottom of the slope and more visually apparent form variation along the edge of the invert of the basin that will continue to be evident after the vegetation has become established."

Landscape Design

Recommend landscape architect to submit preliminary landscape architectural direction for each channel and pipe project in the recommended plan. If various existing developments are situated in proximity to the various proposed flood control structures have particular color schemes or design motifs that might be incorporated into the structural design elements of each of these projects to make them more context sensitive, please include them as part of the recommended design guidelines.

July 25, 2011

Mr. Burke Lokey
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

RE: Responses to the 1st Review of the -
GLENDALE / PEORIA ADMPU 107TH AVENUE AND UNION HILLS DRIVE
DESIGN CONCEPT REPORT - PHASE 2 - ALTERNATIVES ANALYSIS

Dear Mr. Lokey:

We offer the following responses to the Districts comments on the 107th and union Hills Drive Design Concept Report. The responses are located underneath the original comments and in italics for ease of reference.

Ms. Bobbie Ohler, Project Manager, FCDMC

1. General – Can page numbers be added? Would have been helpful with these comments.
The pages of the DCR are currently numbered. The page numbers are located at the bottom of the each sheet as part of the footer note.
2. Section 4 – It would be helpful to have a schematic of roadway ownership and maintenance. If there is already one, reference it here.
Figure 3 has been referenced in this section.
3. 4.1.5 and 4.1.6 - $33 + 40 = 77$?
The math has been corrected to show 73'.
4. 4.2 Drainage systems – It would be helpful to have schematics or a map showing each of these systems. If there is already one, reference it here.
A figure has been created and added to the report to illustrate the existing drainage systems.
5. 4.2.3- last sentence – who at the District is doing this and how will it be resolved if it has not been resolved to date?
Burke Lokey has provided the following text to be included within the report: "Ownership and maintenance responsibility for the Drain from 112th Avenue east was transferred to FCD from

MCDOT in 2005. From 112th Avenue west to the Agua Fria outfall, the Drain is located in a dedicated public drainage easement on private parcels within unincorporated Maricopa County. At this time, Maricopa County (including FCD and MCDOT) has no responsibility to maintain this facility from 112th Avenue west to the outfall. The proposed project will not change the location of storm flows entering the Drain at the northeast corner of 115th Avenue and Bell Road, but will in fact control and reduce those flows thereby protecting the Drain and the associated Bell Road culvert. It is anticipated that the District will need to work with the property owners or HOA's responsible for the relevant drainage easements to ensure adequate long term maintenance of the Sun City Drain channel."

6. 5.3 Please explain why the big changes in some of the numbers from the entellus and current studies.

The G&M 2011 Revised hydrology revised the ADMSU routing to reflect best available data (topography and as-built plans). Details of the Revisions may be viewed in Volume II.

7. Figure 2 only shows Union Hills to Bell Road. Is there another H/H map that includes Beardsley and Agua Fria River? If so, reference it here.

Figure 2 has been revised to show all concentration points identified in Table 1 and Table 2.

8. Section 6 – It would be helpful to have schematics or a map showing these different reaches. If there is already one, reference it here.

A figure has been created and added to the report to illustrate the existing drainage systems.

9. Section 8 – since the decision has been made to include Beardsley channel, why still include “Pre-Beardsley”? What additional info is provided by including the “pre-Beardsley”?

“Pre-Beardsley Road Channel Diversion” has been renamed to “Introduction of Beardsley Road Flows”.

10. Section 9.1 at bottom of page – where at Bell Road is the discharge 1980 cfs?

The sentence has been clarified to read “...the 100 year 6 hour existing conditions discharge for channel system crossing under Bell Road...”.

11. Section 10 – It would be helpful to show schematics of the alternatives, or if there already are schematics, reference them here.

A note has been added to the report referencing the reader to the December 16, 2010 – Meeting 4, Meeting Notes contained in Appendix G for schematics of the various alternatives.

12. Section 11 – general comment – many bullet points are here that are not explained fully. Would be preferable to change the format and explain statements better. Please ensure that what is recommended for each segment is clear and substantiated. Please include all relevant info about the segments in these sections; what is proposed, known utility conflicts, Q's in and

out, recommended aesthetics (for example, if 2 acres is needed for a basin, how much additional acreage will be needed to allow aesthetics?)

Section 11 has been rewritten per the recommendations above.

13. Section 11 – Reference the schematic with the recommended segments.

A schematic has been added that shows the recommended segments.

14. Section 11 – Please add the statement that final design may determine that more r/w is needed for channels and basins.

This statement has been added.

15. 11.1 - I don't understand the third bullet, either elaborate or delete. (What potential intersection reconstruction? What Peoria 107th Ave. storm drain design?) What is proposed for this segment (not stated here, or on Figure 5) – is this for future City implementation, or part of this project?

Section 11.1 has been rewritten for clarification.

16. 11.2 Why does the hydrology need to be refined during final design? 160 cfs at upstream end of this segment? Please elaborate.

This comment has been deleted.

17. 11.2 - “The use of parallel pipe systems is preferred over a box system because a box system would only be three feet high and difficult to maintain and very costly” - please add reasoning and explanations for all of these bullets. Also, what size and number of pipes is proposed? What utilities could be in conflict?

Section 11.1 has been rewritten for clarification.

18. 11.3 – Label map with Cimarron Blvd. and Ventana Lakes development

The figure showing Cimarron Blvd and Ventana Lakes has been referenced.

19. 11.3 - 10' X3' boxes along 111th Avenue are not feasible (can't maintain).

The box culverts have been revised to a minimum 4' height.

20. 11.3 - Can resort basin take more flows? What is purpose of weir to resort basin? Need a schematic, or if one exists please reference.

The resort basin cannot take more flow. The purpose of the weir is to capture the flows coming from the resort basin and convey via culvert to Basin A.

21. 11.3 – EPNG has an easement here – what is the utility conflict and recommendation for resolving it?
The intent is to stay out of the EPNG easement with permanent structures. The construction of the facilities will need to be coordinated with EPNG as construction equipment will be working within their esmt.
22. 11.4 – Acreage for this segment and others – does this include sufficient land for aesthetic purposes?
A reference to the ROW acquisition exhibit has been added. The ROW includes land for aesthetic treatment if additional ROW is required for buffering then detailed conversation should occur as part of the final design.
23. 11.4 What are the Q's for this segment? Is a diversion structure needed at Beardsley Road? How will water be diverted to basin? Reference where a schematic is located.
These items have been addressed in the report.
24. 11.5 – What is the reason for maximum depth of 12 feet? Utility conflict? Outlet drainage? City of Peoria or Surprise requirement?
The depth of the pond was established by the following criteria: 1) The basin is required to be incised. Construction of a dam or berm to impound storm water was not viewed as being acceptable by the City of Peoria. 2) Ability to drain Basin A – By incising Basin B the basin bottom/outfall was determined to be lower than the Canyon Ridge channel (located along the south side of Union Hills Drive). In order to drain Basin B a bleeder pipe is proposed to run parallel to the channel along the north side of Union Hills Drive until such time that it could tie into the Canyon Ridge Channel. This resulted in pond depth of approximately 12' – the remaining ponds were made a maximum depth of 12; based on input from the City of Peoria and the FCD.
25. 11.5 – Reference Figure 6 for basin locations – I don't see A1, A2, B1, B2, B3 on Figure 5 or Figure 6 – add Figure 7 to this volume instead of Volume II, and reference?
The reference to the appropriate figure has been added to this section.
26. Figure 5 – state what each segment is on this schematic (storm drain, channel, basin) and provide the Q100, at least at beginning and end of each segment. Show where structures are proposed and existing.
The conveyance Q has been added to Figure 8 (Figure 8 replaces Figure 5 in this context).
27. 11.7 – Please expand on what is desired for the trail – where should it start and end and what part of it is to be included in this Project?
This is an existing trail and is to remain in place.

28. 11.7 – Do you mean, expand the existing basin C to the east, or is the Figure 7 wrong. What is the temporary grading easement for, on Figure 7?

This has been revised to state expand to the east. The temporary grading is necessary to elevate the remainder of the vacant property above the 100 yr. water surface elevation.

29. Figure 5 – R/W for basin B now looks tiny – can't the Peoria WWTP spare more acreage?
The City of Peoria has stated that the maximum acreage they can spare is 300 feet north of the Union Hills Drive ROW line.

30. There is a substantial section on Context-Sensitive Approach, but the Recommendations don't seem to incorporate this information.

Mr. Dennis Holcomb, Landscape Branch Manager, FCDMC

Mr. Holcomb, as you are aware, implementation of the CSFHM process has evolved substantially during the course of this project and continues to evolve as part of the ongoing Martin Acres project we are actively working with you on. We feel confident that we (with the Landscape Branch's help) will develop a step by step process that may be used to implement the CSFHM approach on Martin Acres and future projects. With this in mind, the degree of separation for the Context Sensitivity method of analysis implemented in the 107th Avenue and Union Hills Drive when compared to the Martin Acres process precludes us from making major modifications as part of this DCR.

It is important to note that the recommended alternatives presented in the DCR were chosen through an exhaustive alternative analysis involving all project stakeholders. Specific discussions were had with the District, the City of Surprise and the City of Peoria in regards to potential multiuse functionality, landscape approach, and flood control effectiveness. In short the City of Surprise and the City of Peoria indicated that they viewed the project as a flood control project first and foremost and that City owned and maintained active or passive recreational components are not identified in their master plans nor are they desired in the project area. Furthermore, it was made very clear by the group that funds were extremely limited for the project and special care should be taken in regards to construction cost of the alternatives and ROW acquisition for storm management facilities.

With the discussion above in mind, we have made a considerable effort to address your DCR comments; however, due to the rational previously discussed, comments not addressed have been noted as such.

Our project team truly values the CSFHM approach outlined by the Landscape Branch and we look forward to continuing our effort in refining the process to meet the District's goals for implementation on future projects.

Plan Report (pages 1-43)

1. A flood hazard mitigation solution that achieves compatibility with the land and resource context is one that is able to meet the following tests:
 - a. Utilizes a compatible structure type as defined in the project LIA
The Recommended Alternatives meets this requirement.
 - b. Utilizes a structure type whose size, depth or height is limited to or is reasonably within the limits of the compatible structure type scale sub-classes as defined in the project LIA.
We were unable to meet this test for the depth of Basin A & B due to the required function of the basin (acre foot of storage) with limited land available (foot print). The acceptable basin depth was established by the City of Peoria – see discussion in item 13 below.
 - c. Utilizes a compatible Flood Protection Method as defined in the project LIA.
The Recommended Alternatives meets this requirement with the exception of the concrete Beardsley Road Diversion Channel and the minor improvements to the Sun City Drain. The Beardsley channel is proposed to be concrete based on the project stakeholder's requirements to minimize the channel foot print. Note that the DCR identifies the fact that this reach shall be reevaluated as part of the final design process. The Sun City drain is proposed to be concrete in order to match the channel section upstream and downstream of the improvement area.
 - d. Applies a compatible landscape design theme as defined in the project LIA.
The Recommended Alternative meets this requirement
 - e. Includes the aesthetic features identified in the District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Structures in the 15% design, including landscape setbacks and an organic naturalistic configuration and topographic form.
The Recommended Alternative meets this requirement with the exception of the Beardsley Road Diversion Channel as noted in section 1.b and 1.c above.
 - f. Fully implements the goals, objectives and guidelines contained in the document titled: Landscape Aesthetics & Multiple-Use Design Guidelines
The Recommended Alternative meets the basic premises as noted in the reference document. A more specific explanation can be found in Section 14 of the DCR

While I think the Consultant can reasonably claim the Recommended Alternative meets tests a, and d, and might meet c based upon the info provided in the DCR, it does not appear it is able to fully meet the other tests above, even though I believe the Consultant made a good faith

effort to do so. For these reasons, the Consultants statements in the 2nd paragraph on page 2 somewhat overstate the actual results that are reflected in the 15% plans of the recommended alternative in achieving a fully context sensitive solution. This is further discussed under item 21 below. Accordingly, I recommend the Consultant replace the 2nd paragraph on page 2 with the following:

“The Flood Control District’s Context Sensitive Flood Hazard Mitigation Planning and Design Approach was utilized in this study. This approach entails the inventory and analysis of information pertaining to the flooding, land and resource and community contexts in an effort to produce a Recommended Plan that will be effective in reducing the risks of flooding in ways that will be compatible with the environment and acceptable to local communities to the maximum degree possible. Flood protection structure types that were determined to be acceptable to the local communities and compatible with the landscape settings in which they are placed were utilized in the development of the alternatives and the recommended alternative. These structures include use of underground pipes in areas where rights of ways constraints posed limitations on the use of other solutions, use of existing and proposed open channel systems, along with use of detention basins to attenuate peak flows where needed. Additionally, flood protection methods for building the structure types that were determined to be compatible with the landscape settings of the study area, such as the Semi-soft Structural Method, have been incorporated into the Recommended Plan along with other aesthetic and multi-use features to achieve compatibility with the land and resource context and acceptability with the community context to the greatest degree possible.”

The 2nd Paragraph on page 2 has been replaced with the recommended paragraph above.

2. Recommend section 2.2 on page 3 be expanded to include the flood risk reduction, land and resource and other (community) project goals and objectives that established the focus and direction for the data collection, analysis, alternatives formulation and the recommended alternative. Alternatively, recommend adding a new section 2.3 to contain this material

The project goals have been added to this section.

3. Page 16: Recommend adding the word Approach to the title of section 7

The title has been amended.

4. Page 17 - Section 7.1: Recommend this section be re-organized so that the flooding context inventory is listed first in sub-section 7.1.1 followed by the Land and Resource Context Inventory in sub-section 7.1.2 and the Community Context in sub-section 7.1.3 (ie ACE!)

This section has been reorganized.

A biological assessment was not provided as part of the LIA the District delivered to the Consultant. Unless a separate biological assessment was carried out by the Consultant and

integrated into the LIA that was provided by the District, I recommend deleting the Biological and Cultural Resources listed under 7.1.1

This section has been deleted.

5. Page 18 – Section 7.2: The discussion in this section refers to FHM solutions, which should be spelled out. Flood hazard mitigation solutions as it pertains to CSFHM, refers collectively to the range of structure types, flood protection methods and landscape design themes that are routinely considered and examined as a part of District flood hazard mitigation planning and design studies. Although the project LIA provided by the District identified the range of structure types, methods and themes that are compatible with the landscape settings of the study area, it appears from the report that only the structure types were analyzed in terms of their flood reduction effectiveness and community acceptability. The report should clarify the extent and scope of the CSFHM analysis in this study.
Given the reasoning stated in opening of the response section this comment has not been fully addressed.
6. Page 18 – Section 7.2.1: Recommend a fuller description of the approach that was used to analyze the range of compatible structure types within the study area and how it was implemented. Also recommend referencing the Report Appendix where this analysis may be found (appendix D)
Given the reasoning stated in opening of the response section this comment has not been fully addressed.
7. Page 18- Section 7.2.2: Recommend removing the words “sustain and” in the first sentence. Also recommend referencing the LIA report that was provided by the District and the Report Appendix where it may be found (Appendix D)
Given the reasoning stated in opening of the response section this comment has not been fully addressed. A response has been created by the consultant in Appendix D addressing the recommended solutions within the project LIA.
8. Page 19- Section 7.2.4: Recommend changing the word “endetify” (typo) to identify.
This comment has been addressed.
9. Page 19 - Section 7.3 – This section seems a little out of place here. I recommend it be incorporated into above Recommendation 2.
This section has been deleted.
10. Page 19 – Section 7.4.1: See recommendation 9.
This section has been moved to the project introduction.

11. Page 20 – Section 7.4.2: Recommend this section be expanded to include a brief description of the structure types, methods and landscape design themes that are referenced in the table and include photo examples of each from the Districts Handbooks that were provided to the consultant.

The Districts' LIA guidelines have been referenced for photo examples.

I was unable to find the map referenced in Appendix D that depicts the extent of Areas A thru D. I recommend this map be included in Section 7.4.2 as well as Appendix D.

A detailed description of the areas has been provided in lieu of a map.

The information provided in the 2nd table indicates CSFHM structural methods and landscape design themes were determined as a part of this study. This information does not appear in Appendix D along with the other information pertaining to the analysis of CSFHM Structure Types. Please describe the source of this information and explain how it was developed or derived and include it in Appendix D. If it was derived solely from the LIA, then so state this in the report.

The information was derived from the LIA and has been referenced accordingly.

With regard to the identified CSFHM Landscape Design Themes in this section, please explain how they were derived. Also, did the Consultant undertake an assessment of existing landscape design themes within the project study area to confirm the validity of the range of Compatible landscape design themes that were identified the project LIA? The Existing Trails and Landscape Themes map in Appendix D seems to indicate this was done. A key question is: whether or not the recommended landscape design themes that are shown in the 15% plans were derived from the Consultant's data collection or the project LIA that was provided by the District. This should be clarified in this section of the report.

The information was reviewed in the project LIA and utilized as a baseline for documentation. Through an iterative process the consultant performed Stakeholder interviews performed multiple site reviews to verify the LIA's findings. The result of the research and documentation is represented on the 15% plans. Further clarification can be found in Section 14 of the DCR within Appendix D where the recommendations of the LIA Section 4.0 are addressed.

12. Page 30 – Section 11: I realize that placing all of the graphic maps in a separate section is easier for the Consultant but from the reader's perspective, it is exceedingly difficult to understand the descriptions of the alternatives without having the map associated with each alternative description in this section of the report. Therefore, I recommend the graphic maps and other illustrations in the Figures section of the report be interleaved into their related narrative sections.

Figure 8 has been interleaved within this section of the report.

13. Page 32 – Section 11.4: Please describe the top width of the channel, the available rights of way for Alternative 7.3 and whether or not the 40 foot wide landscape setback specified in the District's Aesthetic Treatment Policy is provided as a part of this solution. Also please indicate the overall length of this channel segment and the extent to which it will be concrete lined. Also please indicate whether or not the overall alignment of this channel will be configured to meander in the landscape. If a significant part of this structure is to be concrete lined, or the landscape setback is not provided and the overall form of the structure will not be sinuous in the landscape, then the facility is likely to have a strongly industrial appearance that will not be compatible or context sensitive with the landscape settings of the project area and should be so stated in the report along with any proposed measures to mitigate these adverse impacts.

Due to the proximity of the existing Arizona American recharge facilities and the existing City of Surprise wastewater treatment facilities the project stakeholder determined that a 2:1 concrete channel with 4:1 tie slopes per pursued in order to minimize the Beardsley Road Diversion Channel footprint. The aesthetic and multiple-use design guidelines for channel conveyance facilities require a setback and buffer zone ranging in size variably by a minimum of 30' to 50'. Due to the Project Stakeholder and City request to minimize the land acquisition for financial reasons, the minimum area required for conveyance and O&M facilities were recommended as part of the 15% design plans leaving no additional land area for the setback and buffer zone. Additionally, the area has historical issues with groundwater seeping from the COS drying beds into the Arizona American Facilities. An earth lined channel was not viewed favorably do to the structural stability and continual maintenance issues the saturated soils would create. It is the intent of the District to investigate a closed conduit in lieu of the open channel at the time of final design.

14. Page 37 – Section 14: The text of the 1st two sentences of the 1st paragraph describing the landscape approach is ambiguous and needs to be clarified. Recommend the 3rd thru last sentences of the 1st paragraph be moved to section 13.

The sentences referenced above have been deleted.

The 2nd paragraph describing the CSFHM solutions is confusing and needs to be clarified in terms of what is being described as a compatible solution. The purpose and intent of this paragraph is also not clear. The compatible Structure Types as indicated in the project LIA range from Class 5.1, and 5.2 to 6.3 for a majority of the study area. These classes indicate both the range of the different types of structures that have been determined to be compatible with the landscape settings of the study area as well as the compatible scale sub-classes (size and depth of channels and basin structures). The compatible structural methods as indicated in the project LIA is Class 3 indicating that the non-structural, soft structural and semi-soft structural methods are compatible with the landscape settings of the study area.

The narrative simply indicates Structure Type Class 5 and then goes on to describe that structure type in terms of Structural Method Class 3 (Semi-Soft Structural)!

The bottom line here is that what is important to know is the specific structure type, method and theme that is being prescribed for each structure, segment or project in the recommended plan.

See Appendix D for data tables and graphics described the acceptable structures, methods and themes.

Accordingly, I recommend that this entire section be re-written and re-organized on a project by project basis in which the following information is provided for landscape aesthetics and multi-use functions for each project (Basin, Channel or pipe segment):

- The prescribed structural method

- The prescribed landscape design theme

- The prescribed landscape aesthetic features including but not limited to:

 - Overall configuration

 - Landscape setback dimension and topographic form

 - Side slope and invert area topographic form

 - Low flow feature form and surface treatment

 - Plant pallet and arrangement/composition guidelines

 - Hard structural feature (inlets, outlets, grade control structures, etc) aesthetic treatments

 - Location, configuration and surface treatment of the O&M road

 - Any prescribed design guidelines for multiple use functions

Additionally, the extent of each project area should be described along with the extent of area to receive landscape treatments and the rationale for why they are different for various projects.

Section 14 has been reformatted and rewritten.

I also recommend that a companion narrative piece be written for each project that describes the hydraulic/flood control/engineering requirements for the various features of each project to provide a complete, fully integrated set of design guidelines that will guide each project thru the next design phase (final design).

Given the reasoning stated in opening of the response section this comment has not been fully addressed.

I further recommend the 15% engineering and rendered landscape concept plans be inserted here with the narrative descriptions for each project identified in the DCR.

Given the reasoning stated in opening of this response section this comment has not been addressed.

15. Page 38 – Section 14.1: See above comments in 14.

16. Page 39 – Section 14.2: See above comments in 14.

Additionally please clarify what is meant by an “access point”. If this is a ramp to provide O&M and public access into the invert of the channel or basin, please so state.

The ramp is to serve as an O&M access to the basin. The ramp could also provide public access if the owner of the basins deems it appropriate. Section 14 has been rewritten to include a more detailed description.

Recommend revising the 7th bullet. The line forming the boundary along the top and bottom of slope will be a dominant visual line in the landscape when the project is completed. Use of slope warping techniques will provide variation in the surface of the slope but does not contribute significantly to producing form variation along the edge of the channel or basin inverts. The visual effect of the proposed slope warping is likely to recede as the native vegetation that is proposed to be installed on the slope increases in size. For this reason I recommend that slope warping be deleted in favor of a uniform 4:1 or 5:1 slope that is varied to create greater undulation (bays and peninsulas) over the entire slope, thereby creating more variability along the top and bottom of the slope and more visually apparent form variation along the edge of the invert of the basin that will continue to be evident after the vegetation has become established.

This requirement has been added to the “Final Design Approach” Appendix.

Recommend re-wording bullet 9: I think what the Consultant is trying to say here is that the low flow needs to be designed to maintain positive flow from east to west thru the basin inverts and through the outlet/inlet pipes that interconnect the basins to one another. It might help to specify a minimum desired slope gradient along the profile of the low flow channel.

Section 14 has been reformatted and rewritten.

Page 40: Recommend providing a new section 14.3 for the Design Criteria for Basin C and renumbering the following sections and including the concept plans for this structure with the narrative.

Section 14 has been reformatted and rewritten.

17. Page 40: Recommend expanding section 14 to include sub-sections to provide landscape architectural direction for each channel and pipe project in the recommended plan.

Section 14 has been reformatted and rewritten.

18. Pages 40- 41 – Sections 14.3 & 14.4: Recommend incorporating this material into the specific direction for each project. If various existing developments that are situated in proximity to these various proposed flood control structures have particular color schemes or design motifs that might be incorporated into the structural design elements of each of these projects to make them more context sensitive, please include them as part of the recommended design guidelines.

Given the reasoning stated in opening of the response section this comment has not been fully addressed. This requirement has been added to the “Final Design Approach” Appendix.

19. Page 41 & 42: Since it is unlikely that all or most of the projects in the recommended plan will achieve full compatibility with the land and resource context for the reasons cited below in item 21, the statement in the last paragraph is misleading and should be revised. Accordingly I recommend eliminating or modifying the last paragraph along the lines of my recommendation in item 1 above.

The last paragraph has been revised as recommended.

20. I Recommend that a section be included in the plan that summarizes the performance of each of the projects in terms of their overall context sensitivity, ie. their effectiveness in reducing the risks of flooding, compatibility with the landscape settings of the study area, and acceptability to the community in terms of their consistency with local community plans as well as other project goals and objectives (influences listed in section 7.3).

Given the reasoning stated in opening of the response section this comment has not been fully addressed.

It is apparent from the information contained in the report, that compromises in achieving compatibility with the land and resource context and, perhaps, the community context, were made for at least some of the projects in the recommended plan that stem from a desire to meet the wishes of certain landowners, stakeholders or city departments and to reduce costs for carrying out these projects. Examples of these short falls include the use of concrete lined channel methods in certain locations, selection of sloping sites for several of the basins that will result in depths and cut slopes up to 25 feet in height that far exceed the scale sub class limits to achieve compatibility, and in some cases, selection of structure types with footprints that exceed the available rights of way limits to enable inclusion of landscape setbacks and a meandering form needed to achieve compatibility with the landscape setting in order to reduce costs. These results and the reasons for them should be fully documented in the DCR report. Additionally, the Consultant should include recommendations in the design guidelines for each individual project that responds to these shortfalls and attempts to reduce their negative effects.

Given the reasoning stated in opening of the response section this comment has not been fully addressed.

Appendix D:

1. I recommend adding text to explain in some detail how the analysis of the flooding, land and resource and community contexts was undertaken, what sources of information were used, how the approach was organized, and how each table was developed and contributed to the ratings of the effectiveness, compatibility and acceptability of the different structure types, methods and themes.

Based on our recent coordination meetings for Martin Acres, a narrative has not been added to Appendix D due to the change in approach to develop the final CSFHM array.

2. I recommend including the map showing areas A, B, C and D and narrative text explaining how the information pertaining to the flooding, land and resource and community contexts was derived for these areas.

This section has been deleted from the DCR.

3. I recommend the table that related the Flooding Types directly to the Structure Types, that may have been developed as an intermediate step to producing the FIA table, to be included in this section, if this table was developed by the Consultant. This would be one of the most useful products for conveying how the FIA table was developed for possible use on future projects.

Based on recent meetings with District Staff the table has been completed.

4. I recommend that the map showing the Flooding Types within the project study area be included in Appendix D if one was developed by the Consultant.

A description of the areas was added in lieu of a map.

5. I recommend the Consultant reference the source of the data in the LIA assessment and how it was used with the Areas A-D map to produce the LIA table in the report.

Based on our recent coordination meetings for Martin Acres, the LIA assessment referenced in the comment above is being performed for future projects but was not implemented in the development of areas A-D for this project.

6. Again, I recommend the Consultant document the source of mapped information for the community context and explain how it was utilized to develop the acceptability ratings shown in the CIA table. I also recommend the Consultant include copies of the community plan maps that were utilized in the CIA inventory and analysis and explain how the land designations on these maps were utilized to develop the acceptability ratings for the structure types, methods and themes.

See the community context maps in Appendix D that detail the range of acceptable solutions within the project area.

7. I recommend deleting the strikeouts in the table on the next to last page of Appendix D.

The strikeouts have been deleted.

8. I recommend the Consultant provide a brief narrative explaining information sources and how the last table in the Appendix was prepared.

The last table was derived from the comparison tables on the previous sheets. A note has been added for clarity.

Appendix I

1. Sheet 28 and Basin C Rendered Concept Plan: As presently graded, this plan is reflective of the Semi-Hard Structural Method and is not context sensitive with the landscape setting of the project area. Accordingly, I recommend revising the contour grading of this basin to: 1) vary the edge of the basin invert and side slopes; 2) provide greater rounding and softening of ten the corners of the basin; and 3) reduce the geometric form of the tower pads located In the interior of the basin if this can be accomplished and meet the required storage capacity of the basin and the function of the tower pads.

Please see section 14.7. of the project DCR for explanation

2. Basins A.1, A.2, B.1, B.2, and B.3 Preferred Alternative Rendered Plan: I recommend the addition of the low feature in these basins drawn with a sinuous alignment to the inlets and outlets of each basin. I recommend additional tree planting on the slopes of these basins arranged in a pattern to break up and help reduce the apparent height of these cut slopes. I recommend additional trees be located on the causeways separating the basins from one another. I recommend the topographic form of the causeways be redesign to appear more variable along their length and to allow for a sinuous alignment of the multi-purpose road located on top. I recommend the inclusion of trees in the bottom of the basins arranged to create spatial variety in the basin bottoms. I recommend that all flood control structural features be shown on these drawings and labeled.

The items have been addressed.

Interim and Ultimate Conditions Rendered Plan Sheets: It is not clear to me what part of the aesthetic treatments and landscaping shown on these plans is related to the flood control solution (s).

Please see section 14.2. for a description on the segment

3. Please provide landscape architectural concept drawings for the Channel segments to be constructed as projects in the DCR.

Please see section 14.1., 14.3., 14.4., 14.6., 14.8. for explanation on concept drawing exclusions for the channel and pipe segments referenced above.

Appendix J

1. Several items are listed in the cost estimate for the Conceptual landscape plan for the project that are a project cost or a cost that will not be shared by the District.
Two landscaping cost estimates have been prepared – one containing the minimum landscaping to be shared by the District – the second being the cost estimate representative of rendered landscape plans. The cost estimates have been reformatted for clarification purposes.
2. The purpose of hydroseeding is for erosion control and dust abatement. This is a project cost and should not be listed under the costs for aesthetic treatment and landscaping.
The Policy for Aesthetic Treatment and Landscaping of Flood Control Projects in Table 1 lists seeding, provisions of soils amendments and other types of mulches as included expenditures.
3. Likewise, if the boulders in the weir structure are intended to perform a structural function of flood control, they should be listed as a project cost and not an aesthetic treatment cost. Only the part of the cost of these structures that is related to performing only an aesthetic function should be listed as an aesthetic treatment cost. Most often, we use the aesthetic treatment guidelines reflected in the cost ceiling tables of the District's aesthetic treatment policy for setting out the estimate of costs for treating the surface of hard structural features of District projects at this stage of design.
The cost estimates have been reformatted for clarification purposes.
4. The policy of the Flood Control District of Maricopa County is to not expend District funds for features that serve purely recreational purposes and do not have a flood control function or purpose. The walkways, seat walls, benches, ramadas, and other features that are listed in the cost estimate that do not perform a flood control function should not be included in the estimate of probable costs for the aesthetic treatment and landscaping of the flood control structures. They may be shown separately as a cost to be borne by others.
The cost estimates have been revised to reflect this condition.
5. Please provide a breakdown of the costs for the aesthetic treatment and landscaping of the channel structural improvements related to the landscape architectural concept plan for these structures that was requested above under Appendix I.
There are currently no aesthetic treatments for landscaping budgeted for the Beardsley Road Diversion channel.

Mr. William Mattingly, Public Works – Utilities Director, City of Peoria

1. The recommended drainage alternatives propose to use property which is intended for Beardsley Water Reclamation Facility (WRF). Any other use of the property cannot in any way limit the use of the property for its intended purpose. The Beardsley WRF is master planned to expand several times in the future. The facility treats wastewater to near-drinking water quality and recharges treated effluent on site for groundwater storage and recovery. There are no other means of effluent disposal for this facility. The subject property was purposefully acquired to allow for this expansion and the addition of recharge basins (the property was purchased by the Wastewater Enterprise Fund). Water is discharged into the recharge basins and allowed to percolate into the ground. Water from these basins tends to migrate both laterally and vertically. Each basin has been designed to account for lateral migration of water without interfering with the operation of the adjacent basins. This is a key consideration in the design of the proposed drainage facilities. Any drainage basin constructed next to existing or planned recharge basins will need to be designed to avoid or prevent lateral migration of water from the recharge basins.

This requirement has been added to the "Final Design Approach" Appendix.

2. The report refers to "sludge drying basins". There are no such facilities on the Beardsley WRF property.

The reference to sludge drying basins has been removed from the report. The correct reference to recharge basins has been made.

3. Figure "5" illustrates "Basin A" which appears to cover substantially more area than required (more than 300' north of the right-of-way).

Figure 5 has been corrected to illustrate the accurate amount of land required for Basin A.

4. The dedication of the right-of-way adjacent to the Beardsley WRF will need to be confirmed (there were no dedications when the City acquired the property from the State Land Department).

This requirement has been added to the "Final Design Approach" Appendix.

5. The Beardsley WRF is a critical facility and as such site security must be maintained.

This requirement has been added to the "Final Design Approach" Appendix.

6. The report does not discuss who will assume responsibility for maintenance of the proposed drainage facilities.

It is our understanding that the District is addressing all ownership and maintenance responsibilities via the Inter-Governmental Agreement (I.G.A.) currently being negotiated for the project.

Thank you and please feel free to call me at (602) 218-7285 with any questions or comments.

Sincerely,

Goodwin and Marshall, Inc.

Warren C. Russell, P.E.

July 25, 2011

Mr. Burke Lokey
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009

RE: Responses to the 1st Review of the -
GLENDALE / PEORIA ADMPU 107TH AVENUE AND UNION HILLS DRIVE
DESIGN CONCEPT REPORT - PHASE 2 – 15% PLANS

Dear Mr. Lokey:

Thank you for your review of the 107th Avenue and Union Hills Drive Design Concept Report -15% Plans. We offer the following responses to the staff comments. For ease of reference, the responses from the project design team are located underneath the original staff comments.

Ms. Bobbie Ohler

If there is time for engineering to review this next week, let me know and I will pass this on to them (would be worthwhile to get their comments).

1. Title sheet – Vicinity map – don't 107th and 111th Avenues intersect Union Hills? (111th isn't an arterial, but 107th does)

The vicinity map on the title sheet has been revised to address this comment.

2. General – The contract number on the sheets will be the future construction contract number (has not been assigned yet) – should probably leave this as “XXXX” for now.

The contract number on each sheet has been revised to address this comment.

3. General – Our engineering staff prefers that only bid items that apply to a particular sheet be listed on that sheet, and they are numbered from 1 through x for that particular sheet.

Per discussion with the Project Manager, this revision will not be made at this stage of design. This format for construction notes will be provided as part of the final design documents.

4. Sheet 2:

- a. Comment 1 – Specify order of precedence.

The notes utilized have been taken directly from the Flood Control District website under Engineering CAD Resources. The order precedence will be determined at the time of final design.

- b. Comment 3 – Delete 2nd Sentence, potholing will be done by future design team, not contractor.

This note has been revised per the comment.

- c. Comment 4 – Blue Stake, not Stakes
This note has been revised per the comment.
 - d. Comment 6 – Cities of Surprise and Peoria
This note has been revised per the comment.
 - e. Comment 9 – Nothing more recent?
Please provide direction with regards to most recent standard. The notes utilized have been taken directly from the Flood Control District website under Engineering CAD Resources.
 - f. Comment 10 – true everywhere?
This statement is not true everywhere and therefore has been replaced with the following note: "Contractor shall replace pavement to the proposed grades shown on the paving design sheets. Where paving revisions are not proposed, the contractor shall replace pavement to the existing grades found in the field."
 - g. Comment 15 is a repeat, see comment 14.
Note No. 15 has been removed per this comment.
5. Sheet 3 – Weir may not be correct terminology for these inlet structures.
The detail has been renamed to "Concrete Headwall Staged Outfall Structure."
 6. Sheet 4 – Stationing is too small to read.
The text height on the stationing on the Key Plan has been increased.
 7. Sheet 5 – too many sections on one sheet, recommend breaking this into 5a and 5b.
Per the telephone conversation with the Project Manager on July 8th, the sections on sheet 5 have remained unchanged. The size of the details and number per sheet will be reevaluated at the time of final design.
 8. Sheet 5 – sections – show existing ground and where project meets it at all sections. Show extent of existing pavement.
The existing ground and extent of existing pavement have clearly been labeled on each section.
 9. Sheet 5 – Section 6.1 – 3:1 slope is too steep for an earthen channel. 4:1 is acceptable. Ensure that a 4:1 slope is feasible.
The 3:1 channel side slopes are only called out where a concrete channel section will be utilized.
 10. Sheet 5 – Need spacing between the rcp's.
Typical 1-foot spacing has been called out between the proposed reinforced concrete pipes.
 11. Sheet 5 – 7-1 – Add gravel mulch or hydroseed to 4:1 side slope to prevent/minimize rilling. Channel material will need to be 6" reinforced concrete.
Additional labels have been provided with Section 7.1 to indicate that gravel, mulch or hydroseed will be utilized on the 4:1 slopes to minimize rilling. The channel bottom and sides illustrate a 6" reinforced concrete lining.

12. It may be feasible to construct an earthen channel for the south part of the Beardsley Channel.

This design choice has been added as an alternative within the "Final Design Approach" Appendix of the Design Concept Report.

13. Sheet 11 and 12 – From profile, it looks like proposed ground is existing ground, hard to see what we are doing here. Add construction items and quantities. Is it necessary to add the new box culvert, or can the existing function as the outlet? This basin configuration should be shown to the power company to get its input and see if we meet their requirements – may need to expand the footprint.

The profile callouts have been revised to clearly indicate that the bottom of the basin is not being altered through this segment. The existing slope indicators have also been added to clearly indicate the proposed grading versus the existing grades. The cross-sections for Basin C on Sheet 28 have also been revised to illustrate that the only improvements through this segment involve expanding the width of the existing basin.

Per discussion with the Project Manager, quantities will not be added to the notes at this stage of design. Quantities will be provided with the notes as part of the final design documents.

The box culvert is necessary based on detention necessary to alleviate the magnitude of the peak flows through this segment. This cannot be achieved through sole use of the existing concrete channel and box culvert.

As part of the resubmittal of the 15% Plans and Design Concept Report, a set of plans will be forwarded to the owners of the overhead electric facilities within Basin C in order to obtain their input and approval regarding the proposed expansion of this basin within their easement and adjacent to their facilities.

14. Sheet 8 and 9 – Difficult to see where excavation starts. Use lighter line-type for existing features and darker line type for new cut lines.

The existing channel slope has been shown in a lighter line type. The areas of proposed excavation where the channel bottom will be widened has have been identified with a cross hatch and called out to more clearly illustrate the proposed improvements.

15. Sheet 16 and others – quantify any items that are included on the drawing, in the notes column, not on the drawing. Show best known info for existing utilities and show either pip or relocate by contractor or relocate by others, for all conflicts. Any catch basins needed along Union Hills?

Per discussion with the Project Manager, quantities will not be presented in the notes at this stage of design. Quantities will be provided in the notes column with final design documents. The best known information for existing utilities has been identified. Due to the number of total conflicts, a Utility Conflict Table has been prepared and placed on Sheet 2, which illustrates the location, type, and proposed action for each identified utility conflict. No catch basins are needed for Union Hills Drive on this sheet.

16. Sheet 17 and others – don't use circled numbers for property owners – these circled numbers are already construction items.

Property owner numbers have been enclosed within a diamond in order to avoid any possible confusion with the circles used with the construction notes.

17. Sheet 17 – is the only work on this sheet the 18-inch rgp? If so, and a note to basins "existing basins" for clarification.

The existing basins have been labeled accordingly.

18. Sheet 18 – this sheet shows a “grade to drain” construction item but report says we don’t need to do any work within Canyon Ridge?

The design report has been modified to include a discussion regarding the proposed grading within the Canyon Ridge subdivision.

19. Sheet 18 – why 4.2 feet below HPG? The higher we can go, the less grading will be needed in Canyon Ridge.

The location of the RGRCP approximately 4.2 below the high pressure gas line was a design choice made with a high level of importance placed on safety. The RGRCP was located with the maximum amount of separation between it and the gas line while still being able outfall to the existing Canyon Ridge box culvert. The final design elevation is to be evaluated during the final design process.

20. Sheet 19 – did we consider acquiring 4 acre area at se corner of UH and 111th Ave. and turn this into small shallow basin, outlet pipes to this basin, then weir over HP gas line into Canyon Ridge? Not feasible for some reason?

Yes, the project team evaluated the alternative of acquiring the 4 acre tract at the southeast corner of Union Hills Drive and 111th Avenue and utilizing the area as a shallow basin. Several factors eliminated this alternative as a viable option. Through coordination with El Paso Natural Gas, they indicated that they would not authorize a drainage solution that crossed over the top of their 20” gas line. Arizona American Water Company was also hesitant to discuss selling off a parcel where they currently have operating wells and facilities. Lastly, the relative elevation difference between this location and the Paradise Resort retention basin made this drainage alternative difficult to achieve.

21. Sheet 19 – What is meant by “existing local concentrated flows to be picked up in the future” – aren’t we adding catch basins to pick up flows? Suggest changing these notes to read “catch basins to be added as needed”.

Local concentrated flows have been identified for informational purposes only. The method for collecting and conveying these flows to the roadside channel and/or the 3-36” RGRCP shall be determined as part of the final design. Both the roadside channel and the 3-36” RGRCP have been designed to accommodate these local flows.

22. Sheet 21 – Very little cover over pipe, this could be a problem. Any reason not to put pipe in deeper at this location?

At the time of final design likely grading revisions will be required to the Unions Hills and 107th Avenue intersection, further evaluation will be performed to ensure that adequate cover is available over the top of the pipe both in the interim and ultimate phases of Union Hills Drive and 107th Avenue.

23. Sheet 21 – May not be able to get pipe in over sanitary sewer, with sufficient cover over pipe.

Cross hatching and a note similar to the one used in the profile have been added to the plan view. The note states that, “Intersection grade revisions required at final design. Total limits of grading revisions to be determined at the time of final design.”

24. Sheet 22 – how will basin drain? Outlet structure is several feet above invert.

The basin will drain with the use of a “low flow” 18” RGRCP that has been added to the profile to illustrate how the basin will drain during less intense storm events, where the water surface elevation does not reach the height to outfall into the 3-8’x4’ reinforced concrete box culverts.

25. Sheet 23 – Show storm drain interconnections between basins on profile. What are trapezoids above berms between cells? Show slopes of berms between cells as 4:1, not 15%.

The 2-24" RGRCP interconnect pipe has been shown in the profile between each sub basin. The trapezoids shown above each weir section is just a matter of overlapping callout lines and the water surface elevation. The callouts have been relocated beneath the section to avoid any possible confusion. The line type for the water surface elevation has also been revised to address this confusion. The slopes between the two sub basins have been revised to illustrate a 4:1 slope as opposed to a 15% slope.

26. Sheet 24 and others – add O&M road along at least one side of Beardsley Channel.

An O&M road has been added to the west side of the channel.

27. Sheet 28 – need existing ground elevations to see what kind of berming will be needed – provide another cross section through basin that shows existing ground, including roadway,

Cross-section C.2 has been revised to include the existing retention basin ground profile. The existing ground profile illustrates the extent of the proposed grading versus the existing ground elevation.

28. Sheet 28 – what work needs to be done on this sheet? What is existing and what is proposed? Add construction items and quantities.

The only work that is required within Detention Basin C on this sheet is the construction of the concrete headwall staged outfall structure and the expansion of the existing detention basin, which includes grading operations to expand the existing basin width and raise top of basin height adjacent to 115th Avenue by constructing a berm. Cross-section C.2 illustrates the extent of the proposed grading. Construction notes and the existing slope indicator line type have also been added for additional clarity.

29. Sheet 29 – where is the west side of Basin A-2? Label this sheet Basin A, not B.

A match line has been added to the plans to clearly indicate the configuration of each basin.

30. Sheet 29 – how will water coming down 111th Avenue get into Basin A?

Water coming down 111th Avenue will be conveyed into Basin A by a series of flumes along both sides of 111th Avenue. The water collected on the west side of the roadway will be dumped directly into the proposed Basin A.1, while the water collected on the east side of the roadway will be dumped directly into the existing Paradise Resort basin before outfalling to the proposed 2-8'x4' box culverts conveying the flows to Basin A.1. The location of the proposed flumes and possible regarding of the 111th Avenue have been identified with a cross-hatch. The street grade revision will be performed as part of the final design.

31. Sheet 29 – 3-foot high box culverts will be difficult to maintain, City may prefer pipes.

As part of the plan revisions, we have revised the box culvert heights from a 3' to 4' to address this concern.

32. Sheet 29 through 31 – need cross sections for Basins A and B, including existing ground and roadways.

Cross-sections, which include existing ground, roadways and the proposed ground profiles, have been added for both Basin A and Basin B.

Mr. Gary Shapiro

General:

Looks like SRP power constraints (clearings vertical and horizontal, loadings and access). These could have major design change implications.

The vertical clearance, loadings, and access for SRP facilities has been considered, however the construction plans have been provided SRP and we are awaiting comments.

Riprap should be placed at all boxes/culverts inlet and outlet surrounding headwalls and wingwalls. Riprap should be placed where ever there is a concrete-soil connection.

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Do not place all items in construct notes on plan and profile sheets. Each sheet has its own items.

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Drawing G3

For detail #5 RCP junction box the manhole is placed in the center of the box. Change this to place the manhole against the wall without pipes and provide steps.

This comment has been addressed.

Drawings C3 to C8

The slopes appear to be steep resulting in high velocity. Looking at the HECRAS model velocities are in the range of 6 to 10 ft/s with “n” values around .03. This does not look good for an earthen channel velocity should be around 2,3,4 ft/s. Also there should be two other HECRAS runs.

1. A low “n” value about .02 for velocity used to size riprap and scour.
2. A high “n” value about .07 for capacity

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Drawing C4 and C6

Freeboard seems shy around station 18+00 and 38+00 and this is with an “n” value of .03.

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Drawing C9

Looks like SRP power constraints (clearings vertical and horizontal, loadings and access). These could have major design change implications.

The vertical clearance, loadings, and access for SRP facilities has been considered, however the construction plans have been provided SRP and we are awaiting comments.

Around station 58+50 it appears that ponding will result. A pipe from basin to basin will be needed.

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Drawing C12

Add pipe around SRP power

This construction sheet represents existing drainage facilities – no improvements are proposed. This has been added to the “Final Design Approach” Appendix of the Design Concept Report for verification at the time of final design.

Drawing C13

Add riprap around bend Station 104 to 106

This construction sheet represents existing drainage facilities – no improvements are proposed. This has been added to the “Final Design Approach” Appendix of the Design Concept Report for verification at the time of final design.

Drawing C17

Around station 145 there needs to be a manhole

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Drawing C18

It is unclear how pipes come together at the intersection of 107th Avenue and Union Hills

This has been added to the “Final Design Approach” Appendix of the Design Concept Report.

Drawing C19 and C20

One drain pipe per basin. What happens if the pipe gets clogged? Recommend two outlet/opening system.

This has been added to the "Final Design Approach" Appendix of the Design Concept Report.

Drawing C21 to C24

The concrete lined channel will need to be 6" reinforced and gravel mulch for upper bank.

In drawing C2 detail cutoff wall it appears that it is coming to a point.

This has been added to the "Final Design Approach" Appendix of the Design Concept Report.

I believe that this addresses all outstanding issues for the 107th Avenue and Union Hills Drive 15% Plans. Please do not hesitate to call me if you have any questions regarding this issue.

Sincerely,
Goodwin & Marshall, Inc.

Warren Russell, P.E.