

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

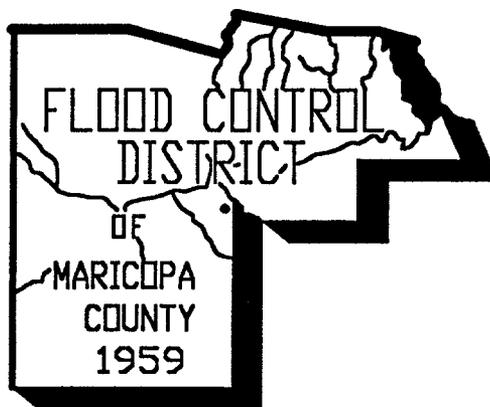
## VALUE ENGINEERING REPORT

ON

Contract FCD 98-13

### Queen Creek & Sanokai Wash Hydraulic Master Plan East Mesa Floodway Capacity Mitigation Analysis

Property of  
Flood Control District of MC Library  
Please Return to  
2801 W. Durango  
Phoenix, AZ 85009



**SUBJECT:** Project Scoping and Budgeting

**DATE:** July 28-30, 1998

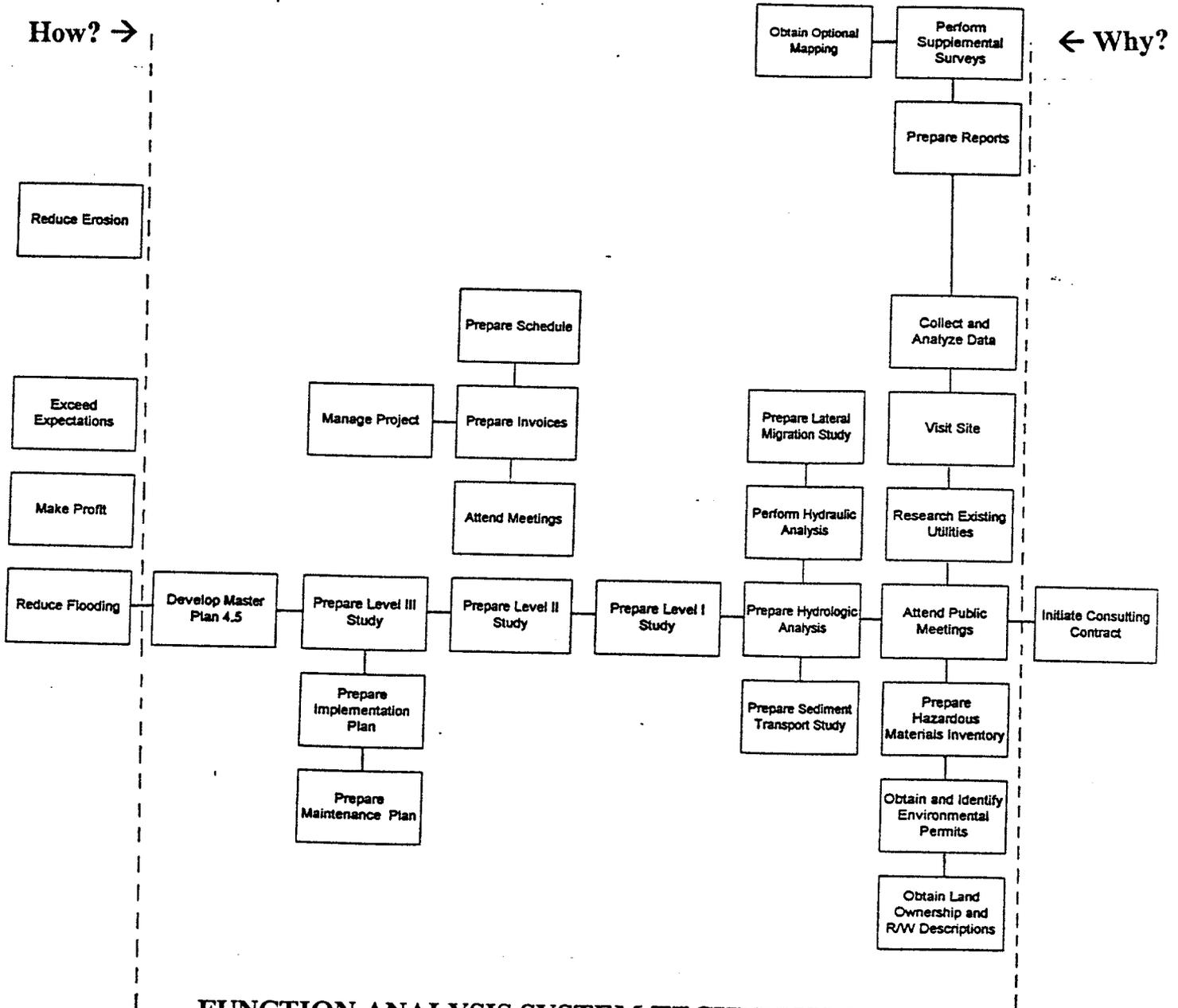
**TEAM:** FCDMC and HUITT ZOLLARS Team Members

**VE FACILITATOR:** Geza Kmetty, P.E. EEC/MKE 248-7702

## Labor Hour Estimates

Task #	Task Description	FCD	H-Z	Agreed
2.0	Data collection & existing conditions analysis	240	1337	751
2.2	Level I Analysis	560	1070	900
2.3	Level II Analysis	600	828	470
2.4	Level III Analysis	1040	1134	130 opt. 874
2.5	Sediment Transport	1600	2120	160 opt.
2.6	Lateral Migration	80	220	
2.7	Maintenance Plan	120	200	163
2.8	Implementation Plan	200	188	200
3.0	General Tasks	400	769	804
3.2	Hydraulic Analysis	60	1048	895
3.3	Hydrologic Analysis	800	960	960
3.4	Land Ownership, R/W and Easements	200	574	254
3.5	Environmental Permits and Approvals	40	90	52
3.6	Biological Survey Analysis	104	240	112
3.7	Cultural Resources	198	644	474
3.8	Environmental Regulation Records Review	76	560	184
3.9	Utilities	80	104	100
3.10	Site Visits	200	436	336
3.11	Meetings	300	1009	929
3.12	Public Involvement	100	452	200
3.13	CLOMR Submittal	200	210	optional 210 optional

Task #	Task Description	FCD	H-Z	Agreed
4.1	Schedule	60	40	50
4.2	Invoices	0	85	0
4.3	Project Management	520	551	540
4.4	Subcontractor Management	0	80	0
4.5	Reports	200	619	?
4.6	Deliverables	?	?	?
	<b><u>TOTALS</u></b>	<b><u>7978</u></b>	<b><u>15568</u></b>	<b><u>11077</u></b> 290 opt. & Geotech



**FUNCTION ANALYSIS SYSTEM TECHNIQUE (FAST)  
DIAGRAM**

Issues

Hydro - Alternatives  
Risks vs Costs  
Channelization  
Pinal County Inflows  
Environmental Limits ?

Purpose

Maintain Conveyance  
Landscape, recreation  
Queen Creek - Planning

Constraints

Budget  
Schedule  
Design Freeboard 1'  
Environmental Impacts

Schedule

Initiate Project.....September 1998  
Completed.....December 1999

Issues/Goals/Objectives

Accomodate Development  
Land Fill Site  
Recharge Site  
East Maricopa Floodway (26 miles ±)  
Queen Creek ADMT, FIS, EMF Cap. Study, East Mesa ADMP  
CIPP

**Agency Coordination**

**FCDMC  
Town of Queen Creek  
Pinal County  
Queen Creek Irrigation District  
Town of Gilbert  
MCDOT  
R.W.C.D.  
NRCS  
City of Mesa  
USCOE  
SWM of MC  
Railroad (B & SF)  
ADWR  
USGS  
State Land  
Arizona State Museum  
CAP/USBR  
Planning & Zoning - Maricopa County  
Parks & Recreation - Maricopa County  
Arizona State Trails (Coord.)  
ASG & F  
SHPO  
GRIC  
USF & W  
FEMA  
ADEQ**

## Function Analysis

Task No.	
Objective	Reduce Flooding
2.10	Define Background
Objective	Reduce Erosion
Objective	Reduce Deposition
2.1.3	Create Project Data Bank
2.1.0	Collect Data
2.1.0	Interrogate Agencies
2.4.2	Design Concept Plan
2.2.0	Develop Alternatives
2.1.0	Evaluate Data
3.3	Evaluate Hydrology
3.2	Evaluate Hydraulics
2.1.1/2.3	Identify Project Features
3.1	Add Prepare Base Maps
2.2	Add Provide Recreational Opportunities
2.2	Add Develop Landscaping
EMF	Mitigate Capacity Concerns
3.11	Obtain Public Input
3.11	Obtain Public Acceptance
2.4.2	Establish Min. Design Criteria
2.4.2	Develop Conceptual Plans
3.1	Evaluate Mapping Needs
3.3	Update Hydrology
3.1	Provide Additional Mapping
2.4.1	Develop Master Plan
2.1	Establish Evaluation Criteria
2.3/2.4	Select Alternatives
2.3.5/3.6/3.7	Identify Project Impacts
3.13	Prepare CLOMR Submittal
4.1	Meet Schedule
4.2	Meet Budget
Objective	Make <u>Profit</u>
2.1	Define Study Area
Objective	Exceed Expectations
3.4	Identify R/W and TCE Requirements
2.7	Evaluate Reg's and Ord's for Implementation

3.8	Evaluate Utilities
3.4	Evaluate Land Ownership and Rights
ADDITIONAL	Evaluate Re-Charge Options
2.2.5	Coordinate Sand & Gravel Impacts
3.4	Evaluate Zoning
2.2	Evaluate Bridge Crossings
2.2.5	Estimate Sed. Inflows
2.1/2.7	Evaluate Drainage Reg's
2.3.5/2.3.6	Evaluate Costs & Benefits
4.0 ADD	Perform Quality Control
2.2.5/3.2.0	Define Models
2.1	Develop Constraints
2.2.5	Collect Sediment Samples
3.6	Determine Permit Needs
3.1	Conduct Survey & Mapping
2.2.5	Evaluate Channel Stability
4.3	Manage Project
3.11	Attend Public Meeting
2.1.3	Coordinate with Developers
3.6	Perform Veg. Survey
4.6	Prepare Reports
3.6/3.7	Identify Cultural & Bio. Resources
3.7	Identify Environmental Constraints and Hazards
2.7	Identify Implementation
2.6	Identify Maint. Requirements
3.2/3.3	Update Hydro. & Hydra.
2.2.6	Evaluate Lat. Migration
2.2 ADD	Identify Water Sources
2.2 ADD	Identify Water Quality
2.2 ADD	Identify Water Features

### Implementation

**Scope:** Huitt-Zollars finalize  
FCD Review

**Budget:** Fee Proposal by 8-12-98

**Manhour Estimate Update:** By Huitt-Zollars 8-3-98

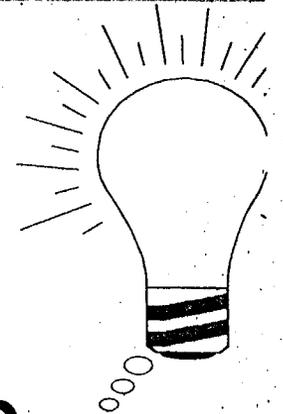
**NTP:** Pending - Tim



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# Vision Statement

**Develop cooperation and understanding between team members, reach agreement on the Scope of Work, and provide high quality engineering services, to achieve the necessary functions at a reasonable cost in a profitable manner.**



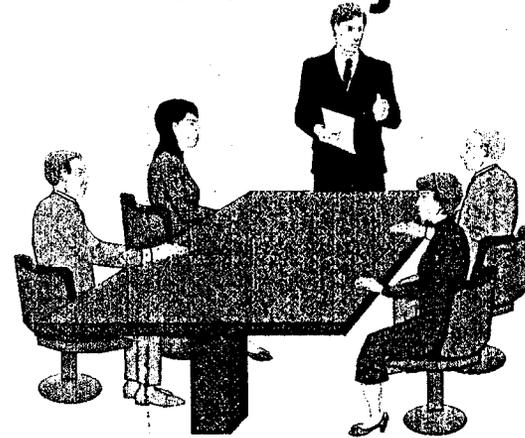
# Goals

- **Efficient use of public funds**
- **Agreement on Scope of Work**
- **Agreement on Budget**
- **Reduced contracting cycle**
- **Development of team spirit**
- **Achieving a Win-Win environment**
- **Allowing reasonable profitability**



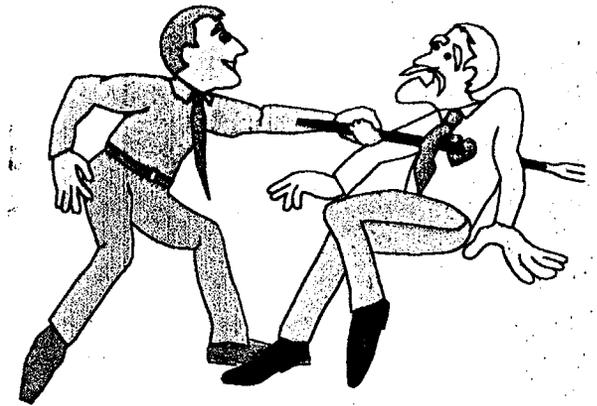
# First Day Agenda

- 8:00 Introductions
- 8:30 Methodology
- 9:00 Background
- 9:30 Constraints
- 10:00 Break
- 10:15 FCD Scope
- 10:45 Functions
- 12:00 Lunch
- 1:00 Functions
- 2:00 FAST Diagram
- 3:00 Break
- 3:15 Labor-hours
- 5:00 Adjourn



# Second Day Agenda

- 8:00 Value Index (V.I. = Worth/Cost)
- 10:00 Break
- 10:15 Brainstorming
- 12:00 Lunch
- 1:00 Scope Modifications
- 3:00 Break
- 3:15 Labor-hour Modifications
- 4:30 Agreement Finalization
- 5:00 Adjourn



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# Third Day Agenda

(Optional)

- **8:00 - 5:00 Agreement Finalization  
(continuation)**



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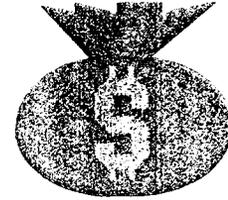
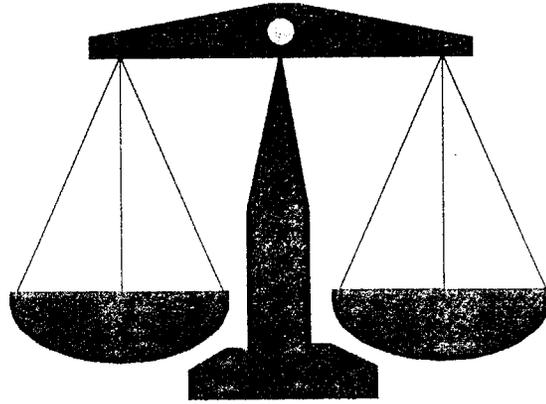
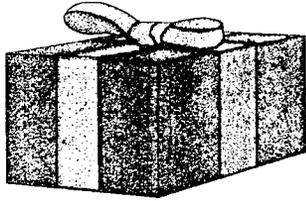
$$1 + 1 = 3$$

**Why VE ?**



**To provide a function - oriented, systematic, team approach to add value to the project.**





## What is Value Index ?



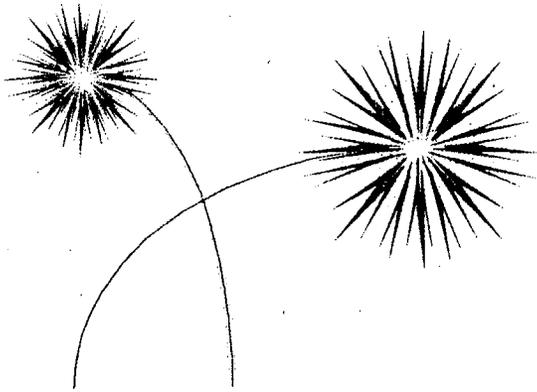
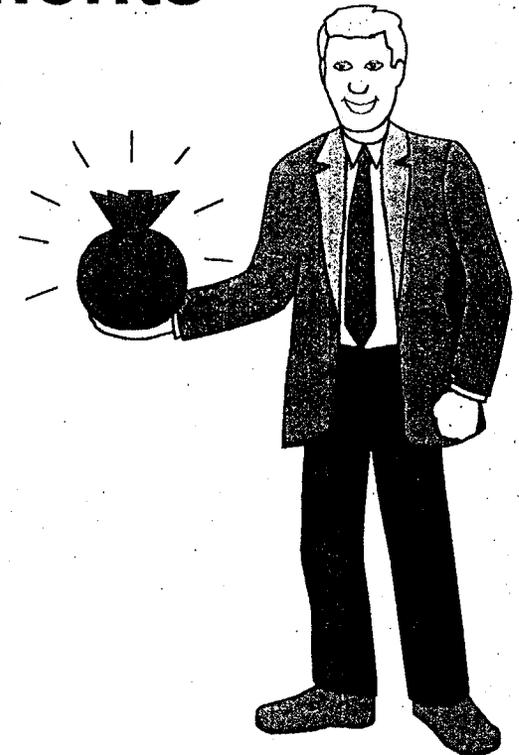
**V.I. = Worth / Cost**

**V.I. > 1 Desired**

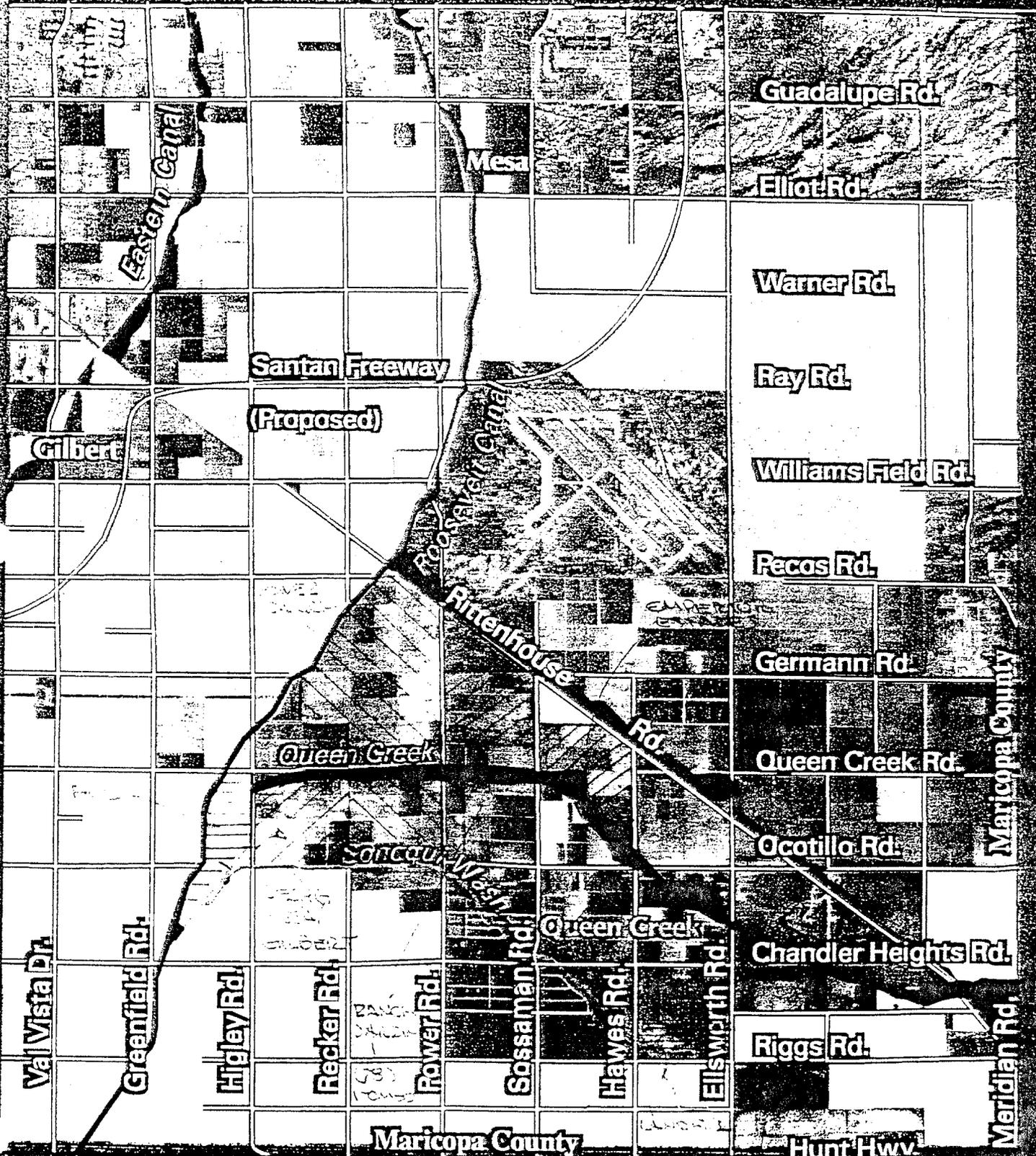
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# Expected Results

- **Scope of Work Refinements**
- **Labor-hour Agreement**
- **Action Items**
- **Good Team Spirit**



# Queen Creek & Sonoqui Wash ADMP



100-year  
Floodplains



**FLOOD CONTROL DISTRICT of Maricopa County  
Queen Creek & Sanokai Wash Hydraulic Master Plan  
Scope of Work**

**1.0 GENERAL DESCRIPTION**

**1.1 PROJECT DESCRIPTION**

1.1.1 Flow in Queen Creek is retarded by the Corps of Engineers Whitlow Dam located in Pinal County. Flow from Whitlow Dam continues in Queen Creek and again is retarded by the United States Bureau of Reclamation Sanokai Wash Flood Retarding Structure upstream of the Central Arizona Canal. Flow is conveyed from this structure in Queen Creek until it discharges into the East Maricopa Floodway (EMF). Queen Creek is bordered by vacant, irrigated, residential, and commercial properties.

1.1.2 Sanokai Wash originates in Pinal County and flows north, northwest, and then west and ultimately discharging into the East Maricopa Floodway. It varies from being ill defined to being entrenched and well defined.

1.1.3 This study consists of providing professional engineering services necessary for developing a hydraulic master plan to maintain the 100-year hydraulic conveyance capacity of both Queen Creek and Sanokai Wash. The EMF will be the outlet control and modifications to its invert should be considered in the analyses.

1.1.4 The consultant shall evaluate alternatives for channel modifications including consideration for future landscaping, proposed recreation, conveyance capacity of the 100-year runoff, dominant flow and recommend a preferred alternative. The Consultant shall identify locations for side inflow and recommend alternative inlet and spillways structures.

**1.2 PURPOSE**

1.2.1 The purpose of this project is to: evaluate hydraulic alternatives; select and adopt a preferred alternative; and to generate plan and profile plans which would include typical cross sections, limits of channel construction, invert, bank, and water profiles maintenance roads. These plans and profiles would be used in plan review and project development to assure that future development designs into their projects conveyance capacity for the 100-year discharges in Queen Creek and Sanokai Wash without adversely impacting the East Maricopa County Floodway.

**1.3 LOCATION**

1.3.1 This project is located within Pinal County, unincorporated areas of Maricopa County, and portions of Queen Creek and Gilbert. In the upper reaches, Queen Creek is a natural drainage feature, whereas through the irrigated farmlands and developed areas, it has been altered. Just prior to the confluence with the East Maricopa County Floodway, it is a perched channel and discharges through a sediment basin. The limits for this masterplan/feasibility study are from the CAP outlet on the east, the Maricopa/Pinal county boundary on the south and the East Maricopa County Floodway on the west.

**1.4 AGENCIES**

1.4.1 The CONSULTANT shall coordinate with the following representatives who will be receiving copies of project submittals and will act as a point of contact:

Mr. Lonnie Frost, Town of Gilbert  
Mr. Dick Shanier, Town of Queen Creek  
Mr. Steve Jimenez, Arizona Department of Transportation  
Mr. Joel Lieberman, Maricopa County Department of Transportation

**1.5 CONTRACT TIME**

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1.5.1 All work must be completed within 210 days (calendar) from the Notice to Proceed, which includes a minimum of 60 days for District reviews. This time would exclude the processing of the CLOMR through FEMA, but would include public meetings and presentations.

**1.6 PROJECT REFERENCES**

1.6.1 The DISTRICT will provide the CONSULTANT with base mapping from the DISTRICT s GIS. Base mapping will include land ownership, land use types, soil types, and hydrologic points of concentration. The land ownership maps will indicate whether property is publicly or privately held and the owning agency. The CONSULTANT will use digital information provided by the DISTRICT to prepare base maps for the interim and final reports.

1.6.2 The DISTRICT will make available to the CONSULTANT the following project related references and information:

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**2.0 SPECIFIC TASKS**

**2.1 DATA COLLECTION & EXISTING CONDITIONS ANALYSIS**

2.1.1 The CONSULTANT shall collect and review pertinent data from the DISTRICT and other outside sources. Data to be collected will include materials relevant to the project such as previous hydrology for the study area, existing topographic mapping, record drawings for existing structures, FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, drainage reports, site plans and future drainage improvement plans and other pertinent information. The CONSULTANT shall prepare a list summarizing the collected data.

2.1.2 The CONSULTANT shall develop a comprehensive list of known flooding issues within the study area including aerial extent of previous flooding events and resulting damage cost estimate.

2.1.3 The CONSULTANT shall prepare an inventory of drainage facilities that are being planned by other public jurisdictions, irrigation districts or private development. These will be illustrated on the Existing Facilities Exhibit.

2.1.4 The CONSULTANT shall develop a comprehensive list of existing and future development planned within the study area. The investigation should detail the existing and planned impacts and/or encroachments with Queen Creek and Sanokai Wash.

2.1.5 The CONSULTANT shall investigate overall master plans for the Towns of Queen Creek and Gilbert.

2.1.6 The CONSULTANT shall develop a comprehensive list of existing and future recreational facilities within the study area.

2.1.7 The CONSULTANT shall become familiar with concepts for landscaping within the water courses as provided by the involved jurisdictions.

2.1.8 The CONSULTANT shall prepare an Existing Facilities Exhibit illustrating the location of major natural washes and man-made drainage facilities in the watershed. The condition, capacity and ownership of facilities will be noted. These facilities will become part of the base map for alternatives. The base map for the exhibit will be developed from base mapping provided by the DISTRICT.

2.1.9 The CONSULTANT shall prepare a Data Collection Report with an Existing Facilities Exhibit summarizing the data collection effort. The report shall include land use, features, flooding and plans for facilities by other agencies. The CONSULTANT shall submit a draft of this report and include the final report in the Project Final Report.

**2.2 LEVEL I ANALYSIS – ALTERNATIVES FORMULATION/PRELIMINARY ANALYSIS**

2.2.1 The CONSULTANT will generate a minimum of three preliminary hydraulic alternatives and will include profiles and cross sections reflecting incisement of Queen Creek for the optimum cross section and slope to convey the design discharge while minimizing scour and lateral migration. Queen Creek shall be evaluated from the Central Arizona Project Canal overshoot to the East Maricopa Floodway. The CONSULTANT shall incorporate and assess proposed channelization by development, potential landscaping and recreational uses.

2.2.2 The CONSULTANT will generate a minimum of three preliminary hydraulic alternatives and will include profiles and cross sections reflecting incisement of Sanokai Wash reflecting the optimum cross section and slope to convey the design discharge while minimizing scour and lateral migration. Sanokai Wash shall be evaluated from the County line to the confluence with the East Maricopa Floodway. The

**FLOOD CONTROL DISTRICT of Maricopa County  
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CONSULTANT shall incorporate and assess proposed channelization by development, potential landscaping and recreational uses.

2.2.3 The CONSULTANT shall identify alternatives including concepts and designs suggested by the public, the local jurisdictions, and the DISTRICT. Recommendations, preferences, and comments from applicable public meetings shall be considered, and additional alternatives shall be developed or existing alternatives may need to be modified.

2.2.4 The CONSULTANT shall develop a minimum of (4) four alternatives for the confluence of Queen Creek and Sanokai Wash with the East Maricopa County Floodway (EMF). Suggested alternatives include but not limited to 1) existing location and invert. 2) existing location and modification of invert if the drop structure in the EMF was moved upstream of the confluence, 3) moving the confluence of Queen Creek and the drop structure in the EMF to a location downstream of Queen Creek Road and 4) relocation of the confluence adjacent to Queen Creek Road with no relocation of the drop structure in the EMF.

2.2.5 The CONSULTANT shall develop a minimum of three alternatives for a sedimentation basin to be located immediately upstream of the confluence of Queen Creek and/or Sanokai Wash and the East Maricopa Floodway.

2.2.6 The CONSULTANT shall identify and eliminate from further consideration those alternatives which can be initially eliminated with no or minimal analysis. The alternatives so eliminated shall be documented in the Alternatives Analysis Report.

2.2.7 The CONSULTANT shall consider elements of each alternative plan including, but is not limited to, alternative design concepts ranging from a natural undisturbed appearance to fully developed type improvements, alternative alignments, alternative encroachments into the floodway fringe, and alternative construction materials.

2.2.8 The CONSULTANT shall submit sketches and/or schematic drawings and a narrative description of the potential alternatives for review. The purpose is to approve the alternatives prior to proceeding with the analysis. The drawings shall be sufficient to describe and compare the project requirements and alignment of the alternative. The narrative shall describe the alternatives and identify the advantages and disadvantages. The alternatives shall be based upon the available topographic mapping, surveys and available hydrology.

2.2.9 The CONSULTANT shall meet with the DISTRICT and the Towns of Gilbert and Queen Creek to review and discuss the alternatives, and to select the alternatives for further consideration. The list of alternatives shall be reduced by not more than three major alternatives.

**2.3 LEVEL II ANALYSIS - ALTERNATIVE ANALYSIS**

2.3.1 The CONSULTANT shall provide project cost estimates for major construction items. An allowance for unlisted or miscellaneous items shall be included as appropriate. The cost estimates shall include as separate line items for the major construction items, rights-of-way, utility relocations, contingencies.

2.3.2 The CONSULTANT shall base the designs on available topographic mapping supplemented with field surveys at hydraulically or structurally critical locations as required.

2.3.3 The CONSULTANT shall evaluate the selected hydraulic alternatives for each water course, outfalls and sedimentation basins at a comparative level of detail, e.g. based upon generalized hydraulics and cost estimates, to determine the engineering feasibility and approximate costs.

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2.3.4 The CONSULTANT shall use a level of detail sufficient to identify appropriate environmental impacts, such as approximate depths or areas of disturbance, the types of vegetation, and the properties that will be impacted by the project.

2.3.5 The CONSULTANT shall evaluate the selected alternatives on any or all of the following evaluation criteria:

- Potential benefits to adjacent property.
- Engineering feasibility
- Approximate costs.
- Capital costs, effectiveness
- Environmental impacts
- Potential for staged construction, maintenance
- Acceptability to local residents
- Compatibility with other projects and plans
- Desired level of flood protection
- Multiple use potential
- Landscaping and aesthetic treatments
- Potential for removal of existing FEMA flood zones
- Site accessibility, inconvenience and loss of productivity
- Major or minor transportation routes
- Sole access

2.3.6 The CONSULTANT shall prepare a matrix by which alternatives will be evaluated by assigning scores to each of the evaluation criteria. The recommended alternative will be the alternative receiving the highest composite score based on the scores assigned by the reviewers. The 100-year level of protection will be considered as the baseline with more frequent events given consideration based upon the evaluation criteria.

2.3.7 The CONSULTANT shall prepare an Alternatives Analysis Report that shall describe all the alternatives. The report shall discuss the selected alternatives, the discarded alternatives, the results of the alternative analysis, and the associated cost estimates. The report shall also include discussion on public preferences, environmental impacts, and the overall success of each alternative in meeting the objectives of the Project. The CONSULTANT shall submit a draft report for review and comment. The CONSULTANT shall address all appropriate comments when the Alternatives Analysis Report is incorporated into the final draft of the Project Final Report.

**2.4 LEVEL III ANALYSIS - PREFERRED ALTERNATIVE ANALYSIS**

2.4.1 The CONSULTANT shall refine the design and cost estimate for the recommended plan identified in the Alternatives Analysis Report and recommend the preferred alternative for channel limits, outfalls and sedimentation basins for each water course as appropriate based on the alternative analysis, and utilization of the evaluation criteria and cost estimates. Landscaping and aesthetic treatments shall be evaluated and included into the design and cost estimates. The CONSULTANT shall provide a draft for review and input by appropriate agencies and the DISTRICT.

2.4.2 The CONSULTANT shall prepare 30% Design Plans which will identify the approximate sizes, slopes, profiles, alignments, and plan and profile of proposed channels and features at 1" = 400' scale, 2 foot contour. Plans shall include hydraulic grade lines, and typical cross sections.

2.4.3 The CONSULTANT shall document the results of the Preferred Alternative Analysis in the Preferred Alternative Analysis Report.

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**2.5 SEDIMENT TRANSPORT**

2.5.1 The CONSULTANT shall include the Level I, Level II and Level III analysis as defined in Arizona Department of Water Resources State (ADWR) Standard 5-96 the State Standard for Watercourse System Sediment Balance, dated September 1996. Documentation of the procedures, methodologies and computer models shall be submitted and approved by the DISTRICT. Proprietary computer programs will not be allowed.

2.5.2 The CONSULTANT shall complete an analysis of the stability of the existing channel to determine the long-term stability of the channel and to estimate the potential scour depths. The HEC-2 or HEC-RAS model water surface profile channel hydraulics, supplied by the DISTRICT, shall be used to establish averaged hydraulic conditions for existing and proposed conditions within the study reach. Alternative channel configurations considered for the project shall be evaluated to assess the impact of the proposed alternative on the channel stability. Scour estimates shall be used to estimate the depth of toe down required for bank armor and grade control structures. The CONSULTANT shall prepare narratives of the evaluations that shall be included in the Project Final Report, and the appropriate calculations shall be included in a Project Technical Report.

2.5.3 The CONSULTANT shall conduct sediment sampling and testing by obtaining and testing samples of the existing channel bed and banks throughout the study reach and the upstream sediment source area. Samples shall be obtained at intervals of approximately 2,600 feet, and at two depths, at ground level and preferably at five feet. The sampling procedures shall be consistent with procedures described in the Bureau of Reclamation's, Computing Degradation and Local Scour, January 1984, or the US Army, Corps of Engineers, Sedimentation Investigations of Rivers and Reservoirs, 31 October 1995. Gradations of the sediment samples shall be plotted for both the channel bed and banks. Changes in the gradations throughout the study reach shall be documented.

2.5.4 The CONSULTANT shall document the results such as test data, gradation plots, plots of the longitudinal change in size, and any other supporting data of the Sediment Transport Analysis in the Project Technical Report.

**2.6 LATERAL MIGRATION**

2.6.1 The CONSULTANT shall rely upon existing data to determine the lateral migration of flows within each water course. The CONSULTANT shall collect and review pertinent data from the DISTRICT and other outside sources. The CONSULTANT shall research and locate the existence of historical photographs, historical surveys, existing remote sensing, and geomorphologic data.

2.6.2 The CONSULTANT shall determine the potential lateral migration of each watercourse using methodologies defined in the ADWR State Standard 5-96 and by analyzing historical information gathered during the data collection phase, and by geological investigations. The methods for determining the lateral migration include:

2.6.2.1 The collection and analysis of existing remote-sensing data. The purpose of this effort is to determine the availability remote-sensing data, and its applicability in determining the historic lateral migration of each water course.

2.6.2.2 Analysis of geological formations, such as caliche formations. Sampling for this effort should be coordinated with the Sediment Sampling for locations and rights-of-entry. The results of this analysis shall be used to determine the inundation areas along each water course due to lateral migration. Caliche formation should correspond with the interval of time that an area has been inundated with water.

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2.6.2.3 Other analytical/dating methods or techniques, determined by the CONSULTANT as necessary to the success of this project, must be approved by the DISTRICT.

2.6.3 The CONSULTANT shall determine the factors that exist within the Project that may impact its potential lateral migration. Activities such as sand and gravel mining shall be identified, and their impacts shall be analyzed in accordance with State of Practice Report, Evaluation of River Stability Impacts associated with Sand and Gravel

2.6.4 The CONSULTANT shall document the results of the Lateral Migration Analysis in the Project Final Report. The report shall discuss how the potential lateral migration was determined, and how it may effect flood control issues within the area. The CONSULTANT shall submit a draft report for review and comment.

**2.7 MAINTENANCE PLAN**

2.7.1 The CONSULTANT shall estimate maintenance requirements and costs for the preferred alternatives on an cost annual basis. The life cycle to be used in calculations shall be 50 years. The DISTRICT will provide maintenance and cost data to the CONSULTANT. Maintenance requirments shall include but not be limited to channel and sedimentation basin maintenance.

2.7.2 The CONSULTANT shall document the Maintenance Plan in the Project Final Report.

**2.8 IMPLEMENTATION PLAN**

2.8.1 The CONSULTANT shall prepare an implementation plan for the preferred alternatives that shall document the available tools or procedures for implementing the results of the Master Plan. The CONSULTANT shall identify tools, such as existing ordinances and regulations, for each jurisdiction within the study area that may be modified or created to encourage development standards that are compatible with the Project.

2.8.2 The CONSULTANT shall document the Implementation Plan in the Project Final Report.

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Queen Creek & Sanokai Wash Hydraulic Master Plan  
Scope of Work**

**3.0 GENERAL TASKS**

**3.1 FIELD SURVEY AND MAPPING**

- 3.1.1 The CONSULTANT shall use existing mapping to be provided by the DISTRICT supplemented with additional field survey as required.
- 3.1.2 The CONSULTANT shall conduct all field surveys and prepare all mapping necessary to complete the project. A registered land surveyor shall supervise and stamp all survey work.
- 3.1.3 The CONSULTANT shall provide field surveys of bridges, culverts, and drainage structures when existing record drawings are not available.
- 3.1.4 The CONSULTANT shall provide field mapping which meets the DISTRICTS' GIS standards and formatting requirements.
- 3.1.5 The CONSULTANT shall document field mapping and survey in the Project Survey Report.

**3.2 HYDRAULIC ANALYSIS**

- 3.2.1 The CONSULTANT shall utilize existing hydraulic models developed for existing conditions to be provided by the DISTRICT.
- 3.2.2 The CONSULTANT shall complete hydraulic computations and water surface profiles consistent with the procedures as provided in the Drainage Design Manual for Maricopa County, Volume II Hydraulics, and the supplement to this scope of work.
- 3.2.3 The CONSULTANT shall use and update the HEC-2 or HEC-RAS computer models developed for the FIS, to document the hydraulic conditions resulting from each of the project alternatives to include existing, approved or planned developments within the floodplain that have occurred since the completion of the topographic mapping for the respective FIS. The CONSULTANT shall modify the HEC-2 or HEC-RAS model during the development of the Master Plan. Floodplain encroachments for each alternative shall be documented to ensure that they are consistent with the procedures in the supplement to this scope of work.
- 3.2.4 The CONSULTANT shall revise the model for the preferred alternative sufficiently to support submittal to FEMA of a Conditional Letter of Map Revision.
- 3.2.5 The CONSULTANT shall document the hydraulic analysis in the Project Technical Report.

**3.3 HYDROLOGIC ANALYSIS**

- 3.3.1 The CONSULTANT shall base this project on a 100-year, 24-hour design event using HEC 1 models provided by the DISTRICT.
- 3.3.2 The CONSULTANT shall bring any concerns or discrepancies concerning modeling to the DISTRICTS attention. The modeling concerns will then be addressed by the DISTRICT and resolved with the CONSULTANT prior to completing the revised hydrology.
- 3.3.3 The CONSULTANT shall research, become familiar and give consideration to existing hydrologic studies and models, and assumptions made and will assess the reasonableness of the input data and results.
- 3.3.4 The CONSULTANT shall assume that existing condition land use is considered the worst case for

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drainage master planning. This is due to the reduction in peak discharges that will result from the retention requirement implemented with development. Identified features are to be sized based on the existing conditions land use.

3.3.5 The CONSULTANT will update the hydrologic model following selection of the recommended alternative and as a means to test the effectiveness of potential alternatives, the CONSULTANT will re-run the existing condition hydrology with plan elements in place. This condition will be analyzed for the 100-year, 24-hour event and the recommended design event.

3.3.6 The CONSULTANT shall follow the procedures outlined in the "Drainage Design Manual for Maricopa County, Volume I Hydrology" for all hydrologic modeling and calculations.

3.3.7 The CONSULTANT shall document the hydrologic analysis in the Project Technical Report.

**3.4 LAND OWNERSHIP, RIGHT-OF-WAY AND EASEMENTS**

3.4.1 The CONSULTANT shall review parcel ownership maps and identify which properties will be affected by the preferred alternatives.

3.4.2 The CONSULTANT shall research and identify existing rights of way adjacent to the preferred alternatives.

3.4.3 The CONSULTANT shall identify permanent and temporary right-of-way and easement requirements necessary for the preferred alternatives.

3.4.4 The CONSULTANT shall complete a drawing showing the anticipated rights-of-way and easements required to be purchased or dedicated for the preferred alternative. Estimated costs to purchase the right of way shall be based upon unit cost values to be provided by the DISTRICT and shall include relocation costs if relocation of businesses or residences are required. The required acreage and costs shall be included in the project cost estimate as a separate line item.

3.4.5 The CONSULTANT will obtain any necessary Rights of Entry for the study area, furnish the DISTRICT with a list of all property owners notified and provide a sample Right of Entry letter.

3.4.6 The CONSULTANT shall identify any temporary construction easements required to complete the project.

3.4.7 The CONSULTANT shall document the land ownership, right-of-way and/or easements in the Project Technical Report.

**3.5 ENVIRONMENTAL PERMITS AND APPROVALS**

3.5.1 The CONSULTANT shall be responsible for determining if plan approvals, permits, or licenses from other agencies will be required. Other agencies may include, but may not be limited to: municipalities, tribal governments, the County Health Department, the Arizona Department of Environmental Quality, the Arizona Department of Water Resources, the Army Corps of Engineers, railroads, utilities, and water districts.

3.5.2 The DISTRICT will be responsible for coordination with the US Army Corps of Engineers regarding the Clean Water Act Section 404, and the Arizona Department of Environmental Quality for 401 permits.

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3.5.3 The CONSULTANT shall provide the material to be submitted to the US Army Corps of Engineers. The US Army Corps of Engineers generally requires submittal of aerial photographs, scale 1 inch equals 200 feet, upon which they will delineate their jurisdictional limits.

3.5.4 The CONSULTANT shall digitize the jurisdictional limits, using photo-identified references for horizontal control, and superimpose the limits on appropriate project drawings.

3.5.5 The CONSULTANT shall provide the total surface area, in acres, of impact within the jurisdictional boundaries and shall provide an estimate of the volume of material to be excavated or placed within the jurisdictional limits. Where possible the CONSULTANT shall modify designs to minimize the impacts of the project to qualify for a nationwide permit.

3.5.6 The CONSULTANT shall provide analysis and cost estimates to assist the DISTRICT in identifying modifications to the project, which may provide environmental enhancements and may serve to mitigate adverse project impacts.

3.5.7 The CONSULTANT shall document the environmental permitting and approvals in the Project Technical Report.

**3.6 BIOLOGICAL SURVEY ANALYSIS**

3.6.1 Documentation of the Threatened and Endangered Species and Wildlife of Special Concern in Arizona.

3.6.1.1 The purpose of this study is to document the potential existence of Threatened and Endangered (T&E) species (flora and fauna) and Wildlife of Special Concern (WSCA) within the project area and any impacts on the T&E species or WSCA that may result from the project design and alternatives. The DISTRICT desires to develop appropriate professional documentation of the project area as identified in the Scope of Work to meet the compliance requirements and recommendations of the Endangered Species Act of 1973, and supplements, Executive Order 11990 (Protection of Wetlands), and the Arizona Native Plant Law. The CONSULTANT shall conduct all vegetative and wildlife surveys and prepare documentation in accordance with these Federal and State regulations and policies.

3.6.1.2 The CONSULTANT shall request from the U.S. Fish and Wildlife Service (USFWS) and the Arizona Department of Game and Fish (ADGF) a list of the T&E species and WSCA that may potentially inhabit the project area.

3.6.1.3 If there are listed T&E species or WSCA that may exist within the project area, the CONSULTANT shall conduct a non-intensive reconnaissance of the project area in order to assess if the project area potentially contains habitat that supports the listed T&E species and WSCA.

3.6.1.4 The CONSULTANT shall prepare a brief letter report and map documenting the results of the reconnaissance. The report and map shall document and designate the existing habitat types within the project area that may meet the habitat requirements for the T&E species or WSCA. Any observations of T&E species or WSCA must be noted in the letter report and on the map.

3.6.1.5 The CONSULTANT will determine whether the project design or alternatives will impact the existence of the T&E species or WSCA or habitat that supports the T&E species or WSCA and the extent of the impact(s).

3.6.1.6 The CONSULTANT shall also include recommendations for further study, including intensive surveys and a Biological Assessment, if required.

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3.6.1.7 The CONSULTANT shall coordinate with the DISTRICT, USFWS, ADGF, and others as appropriate to determine the need and specific requirements for an intensive biological survey.

**3.6.2 PLANT COMMUNITY SURVEY**

3.6.2.1 The CONSULTANT shall survey all existing plant communities utilizing aerial photography and field inspection. The limits of the vegetation shall be digitally mapped as a layer to the topographic mapping to allow superimposing of the project alternatives and the extent of project impacts. A description of the existing plant community shall be provided in a report describing the type of vegetation, density, size, maturity, and condition. During the survey, the CONSULTANT shall document all observed plant and wildlife species identified. The wildlife species may include both terrestrial and aquatic species.

3.6.2.2 Based on the results of the plant community survey, the CONSULTANT shall document whether the project area contains suitable habitat (including wetlands and riparian areas) that may potentially support listed, proposed, or candidate species, as protected by the Endangered Species Act of 1973, and supplements. All areas will be assessed for habitat quality.

3.6.2.3 The CONSULTANT shall determine the amount and type of vegetation that may be impacted from the project design and alternatives. Based on these impacts, the CONSULTANT shall propose alternatives to avoid, minimize, and compensate for the impacts to the vegetation. In addition, the CONSULTANT shall propose several mitigation plans with the associated costs of implementation to compensate for the potential impacts to vegetation.

**3.6.3 WETLAND DELINEATION**

3.6.3.1 This work is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon the results of the reconnaissance. The CONSULTANT shall submit separate cost estimates for this work in the fee proposal and all invoices shall separately identify costs for work under this paragraph.

3.6.3.2 If wetlands are identified based upon the results of the plant community survey, the CONSULTANT shall perform a Wetlands Delineation, in accordance with the Army Corps of Engineers Wetlands Delineation Manual, 1987. The delineation shall describe wetlands indicators observed in the field - soils, vegetation, and hydrology - and shall discuss methods in which wetlands impacts may be avoided, minimized or mitigated.

3.6.4 The CONSULTANT shall document the results of the Biological Analysis in the Project Final Report.

**3.7 CULTURAL RESOURCES**

3.7.1 The CONSULTANT shall conduct an Archeological Assessment to identify previously documented surveys and historic properties within the proposed project area boundaries. The purpose of the assessment is to provide the DISTRICT with a predictive model regarding the probable nature and disposition of the historic resources within the project area. This assessment includes but is not limited to literature research, an Arizona State Museum (ASM) site file check and State Historic Preservation Office (SHPO) records review to evaluate documentary records dealing with historic properties in the project area and region. The literature search shall obtain published information pertaining to the local environment and historic properties, conducted at other archives, government offices and repositories as appropriate.

3.7.2 The CONSULTANT shall prepare a report documenting the results of the archival and literature search. The report shall describe the significance of any known recorded sites and the potential impact of

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the preliminary project design and alternatives on the sites. The report shall include recommendations for further study, including intensive surveys, if required.

3.7.3 The CONSULTANT shall coordinate with the DISTRICT, ASM, SHPO, and others as appropriate to determine the need and specific requirements for a 100 percent intensive archaeological survey for a documented historical site within the project area.

3.7.4 The CONSULTANT shall document the results of the Cultural Resources Assessment in the Project Final Report.

**3.8 ENVIRONMENTAL REGULATORY RECORDS REVIEW**

3.8.1 The CONSULTANT shall prepare an environmental regulatory records review that documents the location and description of the following regulatory sites located within the Study Area:

- A. Federal National Priority List (NPL)/ Superfund Sites
- B. Federal Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Sites
- C. Federal Resource Conservation Recovery Act (RCRA) Treatment Storage and Disposal (TSD) Sites
- D. Federal RCRA Generator Sites
- E. Federal Emergency Response Notification System (ERNS) Listed Sites
- F. RCRA Compliance Log Sites
- G. Water Quality Assurance Fund (WQARF) Sites
- H. Arizona CERCLA Information and Data Systems (ACIDS) Sites
- I. Leaking Underground Storage Tank (LUST) Sites
- J. Open and Closed Landfills/Solid Waste Disposal Sites

3.8.2 The CONSULTANT shall document the locations of the regulatory sites on the area map. Each type of regulatory site must be depicted with different symbols to distinguish the types of sites.

3.8.3 The CONSULTANT shall include a brief description of the regulatory sites which should include, if applicable, the boundaries and descriptive location of the site, the type of regulated substance or waste at the site, the extent of the contamination, the status of the site (i.e. closed or open status), remediation plans of the site, and the named potentially responsible party(ies).

3.8.4 If the preliminary design appears to require land that is listed as a regulatory site or may be affected by a regulatory site, the CONSULTANT shall provide a cost estimate to remediate the potential problem resulting from the regulatory site(s). In addition, the CONSULTANT will recommend alternative locations and/or solutions to avoid costly remediation.

3.8.5 The CONSULTANT shall document the results of the Environmental Regulatory Records Review in the Project Final Report.

**3.9 UTILITIES**

3.9.1 The CONSULTANT shall identify major existing utility corridors. Utilities shall be identified within the project construction limits which may impact the project. The alignment of the utilities shall be shown on the project layout. Estimates of the cost to relocate or realign the utilities shall be included in the project cost estimates as a separate line item. The CONSULTANT shall contact each utility company that has facilities, known or suspected, within the project area, to request the alignment and size of the utilities facilities. Record drawings shall be obtained to ascertain all underground utility locations. Where record drawings are not available, blue stake services shall be utilized to locate the horizontal alignment of the underground facilities. The vertical location of sanitary and storm sewers will be

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determined from field surveys as appropriate. Utility companies with other major utilities within the project alignment will be contacted and pothole information requested.

3.9.2 The CONSULTANT shall identify potholing requirements and shall survey the location and elevation of utilities at locations where potholes are completed. The CONSULTANT shall submit in writing a proposed plan and associated costs to complete the required potholing. Performance of potholing is not authorized with the NTP for this scope of work but, upon review of the CONSULTANT plan, the DISTRICT may authorize the work under a separate NTP. The unit base costs for performance of potholing will be included in the fee schedule as a separated item to be negotiated by the DISTRICT.

3.9.3 The CONSULTANT shall identify and show utilities on the planimetric mapping and project layout.

3.9.4 The CONSULTANT shall establish permanent survey ties where the project corridor crosses major streets. The purpose of these ties is to provide horizontal and vertical control from which the location of utility relocations can be easily verified by inspectors. The CONSULTANT shall determine the need for temporary monuments, and recommend their locations to the DISTRICT for approval.

3.9.5 The CONSULTANT shall include existing utility locations on the 30% plan submittal.

3.9.6 The CONSULTANT shall coordinate any utility relocations with the jurisdiction that owns the facilities to determine the procedures, costs, and time requirements for the relocations. Relocation of municipally or privately owned facilities shall be in accordance with the standards of the owner.

3.9.7 The CONSULTANT shall provide for the preferred alternative design calculations, plans, and specifications for the relocation of all utility relocations.

3.9.8 The CONSULTANT shall document the data from the utilities analysis in the Project Technical Report.

**3.10 SITE VISITS**

3.10.1 The CONSULTANT shall make site visits as necessary to become familiar with existing conditions and to facilitate the design and preparation of the contract documents.

3.10.2 The CONSULTANT will make at least three site visits as follows:

3.10.2.1 The purpose of the first site visit is to orient the CONSULTANT and the DISTRICT with the project area, and to determine any initial conflicts or opportunities.

3.10.2.2 The second site visit will occur near the end of the Alternative Analysis.

3.10.2.3 The third site visit will occur during the Preferred Alternative Analysis and will serve to verify that the conditions have not significantly changed during the final stages of the project.

3.10.3 The CONSULTANT shall document the results of site visits in the Project Administrative Report.

**3.11 MEETINGS**

3.11.1 The CONSULTANT shall meet with the jurisdictions, other affected agencies and utilities as required and shall generally be held at their offices. The DISTRICT shall be kept informed of all such meetings, and shall attend the meetings whenever possible as required. The DISTRICT shall be copied on all meeting minutes.

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3.11.2 Meetings with the DISTRICT shall generally be held at the DISTRICT offices.

3.11.3 The CONSULTANT is responsible for the minutes of any meetings and shall include copies of minutes of meetings, telephone conversations, and correspondence to the DISTRICT in the Technical Data Notebook.

3.11.4 The CONSULTANT shall participate in three public meetings as required. The CONSULTANT will be responsible for all meeting preparation, lead the meeting, and follow-up with meeting minutes.

3.11.5 The CONSULTANT shall participate in the following project meetings:

3.11.5.1 Kick Off Meeting - The CONSULTANT shall meet with the DISTRICT to submit the project schedule that shall include dates of all proposed submittals and review meetings, and to discuss the schedule and the tasks necessary to accomplish it. The CONSULTANT shall bring the key project team members, including the project checkers, to the meeting to introduce them to the DISTRICT staff who will be working on the project. The DISTRICT will give the aerial topographic mapping to the CONSULTANT at this time.

3.11.5.2 Data Collection Report Review Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to review the overall project status and to discuss the Data Collection Report review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT should be prepared to explain all information and any assumptions made up to this point. Any problems will be identified and discussed. The first Performance Evaluation shall be completed at this time.

3.11.5.3 Alternatives Analysis Report Review Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to review the overall project status and to discuss the Alternatives Analysis Report review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT should be prepared to discuss alternative flood mitigation solutions and the preliminary cost estimates.

3.11.5.4 Preferred Alternative Review and 30% Plans Submittal Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to review the overall project status and to discuss the Preferred Alternative Report review comments and the 30% plans review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT will be prepared to explain all assumptions and calculations completed up to this point. Any problems will be identified and corrective actions agreed upon at this meeting. The CONSULTANT will make any necessary corrections and provide written responses to all comment and will resubmit the Preferred Alternative and 30% plans as required to the satisfaction of the DISTRICT.

3.11.5.5 Final (100%) Submittal Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to make the final submittal of the hydrology and hydraulic analyses, the alternative flood mitigation solutions, the cost estimates, and the final recommended solution as revised per the Recommended Design Report review comments. The CONSULTANT shall supply the hydraulic data and plans on 3.5" or 5.25" diskettes. The plans should be in AUTOCAD version 12 format. A Final Performance Evaluation will be completed at this time.

**3.12 PUBLIC INVOLVEMENT**

3.12.1 The CONSULTANT will plan and conduct the following neighborhood meetings in conjunction with this study:

3.12.1.1 The first meeting will be to inform the public of the purpose and scope of the study and to receive comments and concerns.

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3.12.1.2 The second meeting will be to present project alternatives to be studied and receive public comments. The purpose of the meeting shall be to request public input regarding the alternatives, their preferences, and any recommendations they may have for other alternatives that need to be evaluated.

3.12.1.3 The third meeting will be to inform the public and obtain public comment on the study results. The purpose of the meeting is to present the results of the alternative analysis and the recommended alternative.

3.12.2 The CONSULTANT will provide, in digital and printed format, an exhibit (8 1/2 inch X 11 inch) showing the general project features or project impact area suitable for reproduction or publication.

3.12.3 The CONSULTANT will be responsible for the preparation of all the graphic displays for neighborhood meetings and public agency board meetings.

3.12.4 The CONSULTANT shall participate in the presentation at the public meetings, and respond to questions as required by making formal presentations or by written document addressing the issue.

3.12.5 The CONSULTANT shall prepare all necessary notices and display materials for the public meetings, such as display boards, information summaries, questionnaires, and other meeting documents.

3.12.6 The CONSULTANT shall submit to the DISTRICT for review and approval any item to be released to the public prior to being released.

3.12.7 The CONSULTANT will shall be responsible for all aspects of the neighborhood meetings and public agency board presentations to include:

3.12.7.1 Notification and placement of the legal advertising, notifying the public of the study. The advertisement will be run in a widely circulated newspaper twice, with approximately one week between runs. The advertisement must also run twice in a local newspaper that serves the area being studied. After the advertisement is run the CONSULTANT will supply the DISTRICT with the original affidavit of publication from each of the newspapers for each day that the advertisement ran.

3.12.7.2 Preparation of a news release announcing the public meeting shall be developed for distribution to local media which explains the study and its purpose and informs them of the meeting date, time, and location, along with a phone number to call for additional information.

3.12.7.3 Selection and arrangements for the location of the meetings.

3.12.7.4 Preparation of handouts and display boards. Typical handouts are a fact sheet explaining the purpose of the study, how it is conducted, a description of the study area, and a study map.

3.12.7.5 Chairing and presenting the information at the meetings.

3.12.7.6 Refreshments

3.12.7.7 Preparation of minutes of the neighborhood meetings, including concerns raised by the public.

**3.13 CLOMA SUBMITTAL (Optional Task)**

3.13.1 At the discretion of the DISTRICT, the DISTRICT may ask the CONSULTANT to prepare

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documentation for a Conditional Letter of Map Approval (CLOMA) for FEMA based upon the approved alternative plan. Performance of the CLOMA is not authorized with the NTP for this scope of work but, upon review of preferred alternative by the DISTRICT, the DISTRICT may authorize preparation of the CLOMA under a separate NTP. The CONSULTANT shall provide a separate cost estimate for performance of this work as a unauthorized option in the fee schedule.

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**4.0 PROJECT ADMINISTRATION**

**4.1 SCHEDULE**

4.1.1 The CONSULTANT shall submit within 14 days of Notice To Proceed (NTP) a project schedule to the DISTRICT's project manager showing coordination meetings, dates of all proposed submittals for each of the tasks in the scope and significant project milestones. The CONSULTANT will update this project schedule when appropriate.

4.1.2 The CONSULTANT shall develop the project schedule in a computerized format that contains the anticipated beginning and end dates for the tasks identified, the time duration of each task, a bar chart (Gantt Chart) showing the tasks and the overall duration of the project. The computer program MS PROJECT 4.0 or compatible is preferred. The schedule will be submitted in both printed and digital format, and updated as required to reflect significant changes in schedule.

4.1.3 The CONSULTANT shall schedule the project for completion of the work within the contract time unless the DISTRICT accepts an extension. The schedule shall include a minimum of the major project milestones, project meetings, and submittal of deliverables.

4.1.4 The CONSULTANT shall allow for a 3-week review period (unless otherwise indicated by the DISTRICT) for review and comment by the DISTRICT and other involved parties, for each report and data submittal in the schedule.

4.1.5 The CONSULTANT shall develop an anticipated construction schedule and duration in the form of a GANTT Chart which will be used by the DISTRICT to establish a construction contract duration in the bidding documents.

**4.2 INVOICES**

4.2.1 The CONSULTANT will submit a quarterly estimation of the projected billing within 14 days of Notice to Proceed. Thereafter, this estimation will be updated and submitted to the DISTRICT's Project Manager at least 10 days prior to the end of each quarter.

4.2.2 The CONSULTANT will submit monthly (or other time intervals approved by the DISTRICT) invoices which reflects work accomplished during the invoice period. The invoices shall identify this contract number and shall include: the amount for each work task and subcontracted service identified in the negotiated fee proposal times the percent complete and a total amount and percent complete for all work tasks; the amounts previously billed; and the amount due for the period.

4.2.3 The CONSULTANT shall submit invoices to Accounts Payable, Flood Control DISTRICT of Maricopa County, 2801 West Durango, Phoenix, Arizona, 85009.

**4.3 PROJECT MANAGEMENT**

4.3.1 The CONSULTANT shall appoint a Project Manager who shall be knowledgeable of the progress of each phase of the project. The Project Manager shall be the same person listed in the CONSULTANT's Technical Proposal unless otherwise approved by the DISTRICT. The Project Manager shall be the point of contact for the DISTRICT.

4.3.2 The CONSULTANT's Project Manager shall submit to the DISTRICT a Project Status Update on the first of each month activities for the same time period as included in the monthly invoices. The report shall be brief and should be no longer than two typed pages. The update shall provide at a minimum the following:

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4.3.2.1 The status of the project to date.

4.3.2.2 Project accomplishments with a description of the work accomplished by task during the reporting month, percent (%) completed for the month and percent (%) cumulative completed for each task. The tasks shall be the same as the tasks contained in the project cost proposal.

4.3.2.3 Problems and resolutions identified since the last report.

4.3.2.4 Tasks to be accomplished before the next report.

4.3.2.5 A description of any outstanding issues requiring resolution.

4.3.3 The CONSULTANT's Project Manager shall call the DISTRICT's project manager once a week to provide a weekly progress report.

4.3.4 The CONSULTANT's Project Manager shall attend all meetings as required by the DISTRICT.

4.3.5 The CONSULTANT's Project Manager shall keep the DISTRICT informed of all coordination with outside agencies and other affected parties.

4.3.6 The DISTRICT may terminate this agreement if the Project Manager is not available or if the CONSULTANT is unable to provide a replacement Project Manager acceptable to the DISTRICT.

4.3.7 The DISTRICT may request replacement of the Project Manager if the DISTRICT determines that this would be in the best interest of the project.

4.3.8 The CONSULTANT shall participate in regular coordination/status meetings at least every 2 weeks (or more or less frequently as determined by the DISTRICT Project Manager) with the DISTRICT's Project Manager.

**4.4 SUBCONTACTOR MANAGEMENT**

4.4.1 The CONSULTANT shall review the work of any sub-CONSULTANT utilized by the prime CONSULTANT for this contract (i.e., civil design, structural design) shall be reviewed by the prime CONSULTANT for compliance with this scope of work and these specifications prior to submittal for review by the DISTRICT. In particular, all calculations sheets shall be initialed and dated by both a designer and a checker.

**4.5 REPORTS**

4.5.1 Data Collection Report - The Data Collection Report will contain a description of the known flooding problems within the study area, the data collected, the existing drainage structures in the area and discuss any surveying that has been performed. Existing major natural washes and existing and planned man-made drainage facilities in the watershed will be shown on the Existing Facilities Exhibit to be submitted with the Data Collection Report. The Existing Facilities Exhibit will be prepared in AutoCAD format based on the DISTRICT's GIS base mapping which will be provided by the DISTRICT in AutoCAD format. The report shall be submitted in draft form for review by the DISTRICT. Upon receipt of review comments, the CONSULTANT shall incorporate appropriate revisions and complete the report.

4.5.2 Project Survey Report - Survey data will be documented in a Project Survey Report. Copies of all survey note books or printout of digital files developed with data collectors will be provided. The horizontal and vertical benchmarks used for the survey shall be documented along with documentation of the datum upon which the benchmark was originally established. Conversion to other datums as required

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herein shall be documented in the report. A summary table of the ERM's and bench marks shall be included. The report shall be submitted in draft form for review by the DISTRICT. Upon receipt of review comments, the CONSULTANT shall incorporate appropriate revisions and complete the report.

4.5.3 Alternative Analysis Report - The Alternative Analysis Report shall be prepared containing narrative descriptions of the alternatives considered and discarded, the alternatives selected for analysis, the results of the analysis of alternatives, and comparative cost estimates. The advantages and disadvantages and general environmental impacts of each alternative shall be identified. The recommended alternative shall be identified in the report. Results from the brainstorming sessions and the alternatives analysis meeting will be documented in the Alternatives Analysis Report.

4.5.3.1 The Alternatives Analysis Report Format should include the following as a minimum;

- Summary
- Description of Study Area
- Scope of Project
  
- Current Conditions
- Areas of Flooding
- Summary of Existing Flooding Complaints
- Areas and locations of Potential Flooding
- Current Plans
  
- Sediment Transport
  
- Lateral Migration
  
- Alternatives Evaluation
- Evaluation Criteria
- Evaluation of Alternatives
  
- References
- List of Figures
- Location Map
- Topographic Map
- Areas of Potential Flooding
- Land Use/Zoning Map
- Map depicting proposed ADMP
- List of Tables
- Peak Discharges
- Unit Costs for Features

4.5.3.2 The report shall be submitted in draft form for review by the DISTRICT. Upon receipt of review comments, the CONSULTANT shall incorporate appropriate revisions and complete the report.

4.5.4 Preferred Alternative Report - The CONSULTANT shall prepare a design, cost estimates and plans prepared to the 30% level of detail. The 30% level of detail includes inlets and catch basins, and the resolution of any utility conflicts.

4.5.4.1 Upon acceptance of the recommended alternative, the CONSULTANT shall prepare a Recommended Design Report which summarizes the study data. Environmental impacts and project permitting requirements shall be summarized. The major project construction items and special design considerations shall be described. The report shall include drawings and exhibits

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which show the major project features and typical sections. The CONSULTANT shall develop hydrology for the final plan in place using the hydrologic model prepared by the DISTRICT and submitted to the CONSULTANT. The revision will include the effects of the recommended drainage design. The report will contain the design criteria and objectives applied during the development of this area under the Area Drainage Master Plan, including:

- Maximum allowable velocities.
- Channel characteristics, e.g., alignments and cross sections.
- Type(s) of drop structures.
- Provision for runoff in excess of design capacity and maximum depth of flow in streets.
- Maximum depth of basin and required drain time.
- Maximum size or frequency-capacity for pipes and box culverts.
- Selection of dip vs. culvert crossings, and 100-year "all weather" crossings.

4.5.4.2 The Recommended Design Report should include the following as a minimum:

- Summary
- Description of Study Area
- Scope of Project
  
- Selection of Alternative Plan
- Recommended Alternatives
- Proposed structural Improvements
- Non-structural Improvements
- Costs
  
- Areas of Flooding
- Summary of Existing Flooding Complaints
- Areas and locations of Potential Flooding
  
- Sediment Transport
  
- Lateral Migration
  
- Basin Management Alternatives
- Structural Improvements
- Non-Structural Solutions
  
- Alternatives Evaluation
- Evaluation Criteria
- Evaluation of Alternatives
- Recommended Alternative
  
- References
  
- List of Figures
- Location Map
- Topographic Map
- Areas of Potential Flooding
- Land Use/Zoning Map
- Map depicting proposed ADMP
  
- List of Tables
- Peak Discharges

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Unit Costs for Features

4.5.4.3 The report shall be submitted to the DISTRICT for review. Upon receipt of review comments, the CONSULTANT shall make appropriate revisions and submit the report.

4.5.4.4 30% Construction Drawings

Indicate existing topography.

Indicate lateral alignment, plan/profile, cross-section requirements.

Include the approximate size and configuration of project features.

Indicate conflicting utilities that may require relocation and/or protection.

Structural drawings and details need not be included.

4.5.5 Project Final Report - Upon approval of the Preferred Alternative Report, the CONSULTANT shall incorporate review comments and make required corrections, changes, etc., to the hydrology, hydraulic, civil, and structural calculations, and incorporate comments and make changes and corrections as appropriate. If incomplete and/or incorrect incorporation of those comments is found, the original documents shall be returned to the CONSULTANT for correction and resubmittal.

4.5.5.1 Final Engineer's Construction Cost Estimate. The cost estimate will be delivered to the DISTRICT in a sealed envelope marked with the date, the project name and "Engineer's Estimate". A registered engineer shall seal the cost estimate.

4.5.5.2 The CONSULTANT shall submit a Final Design Report with final versions of all reports applicable to the Project including:

- Data Collection Report
- Alternatives Formulation Report
- Project Administrative Report
- Geotechnical Report
- Preferred Alternative Design Report
- Alternative Analysis Report
- Project Survey Report

4.5.5.3 The report shall contain plan-profile drawings with sufficient detail to either continue the completion of the preliminary final design, or to implement the Project. The Report shall be reproducible and a digital original version shall be submitted to the DISTRICT. The CONSULTANT shall submit a draft version of the Report for review and comment. The CONSULTANT shall address all appropriate comments and submit the Final Design Report.

4.5.5.4 The CONSULTANT shall prepare a separate, reproducible Executive Summary of the Final Design Report.

4.5.5.5 Construction Drawings - Plans shall be complete with the exception that details and schedules may be preliminary in nature

4.5.5.6 The Recommended Design Report should include the following as a minimum:

- Summary
- Description of Study Area
- Scope of Project

- Design Criteria and Objectives

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Existing Utilities and Site Constraints  
Design Features  
Environmental and Permit Issues  
Recommendations for Implementation and Phasing

References  
Plan and Profile Drawings  
List of Figures  
Location Map  
Map depicting phasing plan for proposed ADMP  
List of Tables  
Peak Discharges  
Preliminary Design Costs

4.5.6 Project Technical Report - The CONSULTANT shall maintain a design report throughout the project, which contains documentation of the designs, analysis, and calculations. The report shall be organized to include, but not limited to, the following sections as appropriate to the project:

- A recommendation of lateral design, configuration, alignment, and feature locations. (Include a 1"=100' scale plan).
- Location of conflicting utility relocations and pot-holing locations.
- Requirements for public and private access.
- Right-of-way and easement information.
- Environmental and permitting requirements.
- Construction duration and schedule.
- Special project features, including unusual construction techniques, special materials, and/or conditions.
- Maps, sketches, calculations, and other supporting documentation as required.
- Hydrology, hydraulics, civil, and structural analyses.
- Cost estimate.
- Sediment Transport
- Lateral Migration
- Traffic control requirements.
- Indicate right-of-way and easements required.
- Indicate conflicting utilities that are to be relocated and/or protected.
- Preliminary hydrology and hydraulics analysis and calculations.
- Environmental and 404 Permit requirements.

4.5.7 Project Administration Report - The Project Administration Report shall include copies of all correspondence, minutes of meetings and conversations with the DISTRICT, affected agencies and others as appropriate.

4.5.8 Project Geotechnical Report - The CONSULTANT shall have soils tests prepared and shall provide the DISTRICT the original and copies of the report and any subsequent revisions. The report shall be prepared by the CONSULTANT or SUBCONSULTANT named in the CONSULTANT's proposal. The report shall provide narrative, sieve analysis, PI, moisture content, optimum moisture, shrinkage and swell factors, expected ground compaction, subsidence potential in the area, "R" values, resistivity values and recommendations to support or reject the use of metal pipes and specific recommendations. The report shall also include foundation requirements and supporting calculations for design loading. A qualified registered engineer shall seal the report.

**4.6 DELIVERABLES**

4.6.1 The CONSULTANT shall submit all items 'sealed' by a registered civil engineer. Upon receipt of

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the final submittal, the DISTRICT shall review the report and preliminary plans for the accurate incorporation of all final comments. If incomplete and/or incorrect incorporation of those comments is found, the original documents shall be returned to the CONSULTANT for correction and resubmittal.

4.6.2 The CONSULTANT shall submit computer files of the information to the DISTRICT delivered on 3.5" or 5.25" diskettes. Reports should be in Word 6.0 or a DISTRICT acceptable software. Plans should be in AUTOCAD version 12 format.

4.6.3 The CONSULTANT shall submit three (3) copies for each DRAFT report, estimates, schedules or drawings to the DISTRICT and one (1) copy for each DRAFT report, estimates, schedules or drawings to each participating agency.

4.6.4 The CONSULTANT shall submit five (5) copies for each FINAL report, estimates, schedules or drawings to the DISTRICT and two (2) copies for each FINAL report, estimates, schedules or drawings to each participating agency.

4.6.5 The CONSULTANT shall provide drawings in full size sets, and floppy disks containing .DGN or .DWG files.

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**5.0 REFERENCES AND STANDARDS**

This section provides general requirements, methodologies, and procedures to be followed in completing work for the DISTRICT. If the Scope of Work requires work tasks described herein, the work is to be completed consistent with this section. Specific variations from this section of the Scope of Work shall not be undertaken without the specific written concurrence from the DISTRICT.

**5.1 STANDARD DETAILS AND SPECIFICATIONS**

- 5.1.1 "Uniform Standard Details for Public Works Construction", Maricopa Association of Governments (MAG), 1979;
- 5.1.2 "Uniform Standard Specifications for Public Works Construction", MAG, 1979;
- 5.1.3 City of Phoenix (COP) "Supplement to the MAG Uniform Standards Details and Specifications, together with current revisions shall be utilized as part of the design criteria.
- 5.1.4 Use standard MAG details on plans unless otherwise requested by FCDMC. ADOT standard details may be used, as approved and when appropriate, then modified to be referenced to MAG specifications.
- 5.1.5 "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects", latest revision.

**5.2 DESIGN MANUALS, POLICIES AND PROCEDURES**

- 5.2.1 "Drainage Design Manual for Maricopa County, Arizona, Volume I Hydrology", latest edition.
- 5.2.2 "Drainage Design Manual for Maricopa County Arizona, Volume II Hydraulics", latest edition.
- 5.2.3 "Drainage Design Manual for Maricopa County, Arizona, Volume III Erosion Control", latest edition.
- 5.2.4 "Urban Highways, Channel Lining Design Guidelines", February 1989, ADOT.
- 5.2.5 Structural design shall be in accordance with current AASHTO Specifications. Street and maintenance road crossings shall be designed to accommodate HS20-44 loading. Calculations shall be based on service loads and the working stress method.
- 5.2.6 "Policy on Geometric Design of Highways and Streets", AASHTO, 1990, commonly referred to as the "Green Book", and "Maricopa County Department of Transportation Roadway Design Manual" latest edition and revisions shall be used, unless otherwise requested by FCDMC.
- 5.2.7 "Roadside Design Guide", 1989, AASHTO, to be used to establish clear distances and other related safety issues.
- 5.2.8 "Landscaping and Irrigation Design Manual for the Flood Control DISTRICT of Maricopa County", latest edition.
- 5.2.9 "Channel Design Criteria for Major Watercourses", MCFCD, latest edition.
- 5.2.10 "A Levee Policy for the National Flood Insurance Program", National Research Council, 1982.

**5.3 STANDARDS**

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**5.3.1 GIS/HIS**

5.3.1.1 The CONSULTANT shall prepare digital data in conformance with the DISTRICT's Hydrologic Information System (HIS) FCDMC, Ver. 2.0, June 1995, for the following themes:

NDXPRJ (Project map Index)	LP-40
CORNERS (PLSS Survey Control Points)	LP-210
CTRL (Miscellaneous Survey Points)	LP-215
STRCT (Structures: bridges, culverts, ...)	LP-360
DQ.REL (Data Quality)	LP-410
PRJ.REL (Project Information Table)	LP-430
FPBLN (Floodplain Baseline)	LP-520
FPSRFFCD (Surface Water Elevation)	LP-535
FPXFCD (Cross Sections from HEC2)	LP-540
STRDTL (Street Detail)	LP-660
UTLTY (Utilities)	LP-670
ELV (Contours and Spot Elev., for new topo)	LP-710
RIVER (Stream flow lines)	LP-960

**5.3.2 HYDROLOGY**

5.3.2.1 The CONSULTANT shall use the 1991 U.S. Army Corps of Engineers computer program HEC-1, 4.01 Version, to develop hydrologic models for the area. The methods and procedures in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology will also be used.

5.3.2.2 The CONSULTANT will develop the hydrologic base maps using the topographic mapping supplied by the DISTRICT. For those areas not covered by the supplied mapping, U.S. Geological Survey (USGS) topographical quadrangle maps will be used.

5.3.2.3 An overall watershed drainage basin map with sheet index will be prepared at a scale of 1 inch = 2000 feet, or as appropriate.

5.3.2.4 Using appropriate hydrologic judgement, sub-basins are to be identified that provide reasonable depiction of the watershed condition. Sub-basin break down will be done in sufficient detail to provide peak discharges at critical concentration points and at other intermediate points as necessary for the modeling process.

5.3.2.5 The specific hydrologic techniques to be used are:

5.3.2.5.1 Rainfall Depth: Point precipitation values will be determined using the information and procedures described in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology.

5.3.2.5.2 Rainfall Distribution: Peak discharges and peak volumes for the 100-year, 6-hour storm will be estimated using the DISTRICT's Distribution(s). Peak discharges and peak volumes for the 100-year 24-hour storm will be estimated using the SCS Type II rainfall distribution.

5.3.2.5.3 Areal Reduction: The point precipitation values will be areally reduced for critical concentration points. Areal reduction for the 6 hour rainfall duration will be applied using the curves in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology, or MCUHP1.

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5.3.2.5.4 NOAA HYDRO-40 will be used with the 24 hour rainfall reduction. Copies can be obtained from the DISTRICT.

5.3.2.5.5 Rainfall Excess: The Green and Ampt methodology will be utilized for estimation of rainfall losses. The soil data maps will be provided to the CONSULTANT by the DISTRICT in the form of GIS files. These files will be used for soil calculations.

5.3.2.6 Unit Hydrograph: The Clark method should be used following the procedures outlined in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology, and as implemented in MCUHPI.

5.3.2.7 Time of Concentration: The Papadakis and Kazan method should be used with the Clark unit hydrograph, along with the MCUHPI computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result.

5.3.2.8 Channel Routing: Channel routing will be accomplished using either the Muskingum-Cunge or the Normal-Depth or the Kinematic Wave option of HEC-1. The choice of methodology will be at the discretion of the CONSULTANT, with consent from the DISTRICT. Average cross sections will be developed utilizing available mapping and field reconnaissance data. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

5.3.2.9 Reservoir Routing: Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.

5.3.2.10 The CONSULTANT shall obtain approval from the DISTRICT at each of the following steps:

- Watershed boundary maps
- HEC-1 parameter estimation
- Flow diagram and input parameters
- HEC-1 results

5.3.2.11 The DISTRICT will provide appropriate references to facilitate parameter estimation.

5.3.2.12 The CONSULTANT shall review the hydrologic models' results for accuracy and reasonableness. Adjustments to input for obtaining the most realistic results are normal to the scope.

5.3.2.13 Every attempt must be made to recover historic stream gage data and to use it to compare with the results obtained by the hydrologic models. Major differences between the models' results and historic data must be discussed with the DISTRICT prior to the finalization of the analysis.

### **5.3.3 HYDRAULICS**

5.3.3.1 The CONSULTANT shall follow the procedures outlined in the "Drainage Design Manual for Maricopa County, Volume II Hydraulics" for all hydraulics calculations.

5.3.3.2 The CONSULTANT shall provide HEC-II Cross Section Files data files of the DTM data which will allow extrapolation of HEC-II cross-sections.

5.3.3.3 The final submittal of all maps, computer files, and other data shall be prepared and submitted in the manner defined for input by the guidelines in "Data Delivery Specifications: The Hydrologic Information System (HIS)" which is available from the DISTRICT.

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**5.3.4 SURVEY AND MAPPING**

5.3.4.1 Accuracy and Procedural Standards. All topographic mapping and survey work shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This would include, but is not limited to: the establishment of "permanent" elevation reference marks (ERMs); field control; and verification of profiles by the ground survey profile procedure.

5.3.4.2 Horizontal Control Datum. All surveys shall be completed with horizontal controls necessary to tie all field data to the State Plane Coordinate System 1927. The NAD83 coordinate points and their coordinates shall be listed in the text regarding the control and survey information provided to the DISTRICT and shall also be noted along the margins of the appropriate plan sheets.

5.3.4.3 Vertical Control Datum. Surveys will be based on National Geodetic Vertical Datum (NGVD) 1929, per FEMA guidelines. A conversion factor, including documentation of how it was derived, will be provided by the CONSULTANT to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in the Technical Data Notebook. The conversion processes outlined in FEMA 37 shall be used.

5.3.4.4 Elevation Datum. Plans shall be based on state plane ground coordinate system of 1927 and NGVD 1929 datum, with conversions to NAD83 horizontal datum and NAVD88 vertical datum. Elevation Reference Marks (ERMS) shall be labeled on the plans and described in a manner, which allows them to be relocated in the field.

5.3.4.5 Structure Surveys. Field surveys of bridges, culverts, and hydraulic structures are to be obtained by the CONSULTANT when as-built plans are not available or when changes significant to the HEC-2 or HEC-RAS modeling, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the DSR. The information presented in the drawing should be in a format appropriate for use in the HEC-2 model. Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1929 NGVD.

5.3.4.6 Restoration of lost or obliterated section corners shall be set in accordance with current publications of the following and shall be per MAG Standard Detail 120-1, type C: "Minimum Standards for Arizona Land Boundary Surveys" by Arizona State Board of Technical Registration and "Restoration of Lost or Obliterated Corners and Subdivision of Sections" by the United States Department of Interior Bureau of Land Management.

5.3.4.7 Documentation of Survey Data. Benchmarks and control points shall be shown on maps and plan sheets. Survey data will be documented in a project survey report. The project survey report shall be initially submitted during the Preliminary Design Phase, and the final report shall be submitted during the Final Design Phase. The report shall include the following:

5.3.4.8 Copies of all survey note books and office calculations or printout of digital files developed with data collectors.

5.3.4.9 A summary table which lists horizontal and vertical benchmarks and includes the horizontal coordinates and elevations of each point, the datum upon which the benchmarks were originally established, and a description of the locations of the points which will allow them to be readily located in the field.

5.3.4.10 A drawing with a base map of suitable scale to show the location of the benchmarks, and

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aerial control points.

5.3.4.11 Conversion to other datum's as required herein.

5.3.4.12 Data Format. All field collected survey data obtained using conventional survey methods shall be noted in standard 5" x 7" hardbound survey books. All survey data collected electronically shall be submitted in an ASCII text file on 3.5" or 5.25" diskettes.

5.3.4.13 All topographic features including existing drainage swales, bridges, storm drainage outfalls, gravel mining operations, fences, buildings, roads, etc.

5.3.4.14 Aerial Photography. The CONSULTANT shall use the correct scale stereo aerial coverage to maximize the efficiency of the project layout and still meet the accuracy requirements. If aerial photography is used, the CONSULTANT shall complete a ground survey check to verify the accuracy.

5.3.4.15 Digital Topographic Mapping. The CONSULTANT shall use digital terrain modeling (DTM) and contour generating software to create data files.

5.3.4.16 Documentation of Survey Data. Survey data will be documented in a Project Survey Report. Copies of all survey note books or printout of digital files developed with data collectors will be provided. The horizontal and vertical benchmarks used for the survey shall be documented along with documentation of the datum upon which the benchmark was originally established. Conversion to other datums as required herein shall be documented in the report. A summary table of the ERM's and bench marks shall be included.

5.3.4.17 The final submittal shall include a permanent, reproducible set of the survey and mapping information on 3 mil mylar sheets and shall be sealed by a registered land surveyor.

**5.3.5 CONSTRUCTION SPECIAL PROVISIONS**

5.3.5.1 The Construction Special Provisions shall be numbered, named, and sequenced in the same order as MAG Specifications. Each Construction Special Provision item referenced shall state whether it replaces all or part of, or is added to, the corresponding MAG Specification Section numbers. The DISTRICT shall provide an example of Construction Special Provisions for the CONSULTANT to follow. The CONSULTANT shall modify the example only as necessary to satisfy project specific requirements.

**5.3.6 QUANTITIES/ENGINEERS ESTIMATE**

5.3.6.1 The CONSULTANT shall prepare a Bidding Schedule and an Engineer's Estimate for all elements of the design including costs for alternative materials. The items in the Engineer's Estimate shall conform exactly to the Bidding Schedule Items. Item numbers in the Bidding Schedule shall follow MAG Specification Section numbers.

5.3.6.2 The Engineer's Estimate shall be prepared based on the most up-to-date cost data available. This includes recent bid tabulations from the DISTRICT, ADOT, MCDOT, City of Phoenix, and any other resource available to the CONSULTANT. The CONSULTANT shall also evaluate the construction and construction materials market for recent fluctuations, shortages, work loads, etc. which may affect the unit costs used in the Engineer's Estimate.

5.3.6.3 The CONSULTANT shall prepare an Engineer's Estimate that will be within ten percent (10%) of the low bid amount received.

5.3.6.4 Complete and detailed quantity calculations shall be prepared and checked supporting the

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bid quantities to be used in the Bidding Schedule.

**5.3.7 DRAFTING**

5.3.7.1 Design plans and construction documents will include, but not limited to:

Flood Control DISTRICT standard cover sheet

General notes

Summary Sheets - The plans shall include a summary table of concrete, excavation, and structure backfill quantities for each structure. These quantities shall be shown on an appropriate structures summary sheet showing the structure; a separate quantity sheet shall not be prepared. The quantities in the table shall add up to the bid item quantities for each bid item, including the appropriate class and strength of concrete.

Plan and profile sheets, and cross sections

Utility relocations

Special details

Soils Borings Log

5.3.7.2 FCDMC sample plans may be provided with the intention that they shall be used as a guide, and are not a substitute for design criteria, technical assistance, or sound engineering judgement. The CONSULTANT shall use plan symbols shown in the MAG Standard Details and COP Supplement to the MAG Standard Details, unless otherwise requested. FCDMC makes extensive use of reduced plan sets. The CONSULTANT shall submit sample plans for approval prior to commencing work. Plans not capable of producing high quality prints by FCDMC in reduced form shall be considered unacceptable and shall be redrawn by the CONSULTANT at no additional cost to FCDMC.

5.3.7.3 The DISTRICT uses a "Xerox" process for final reproduction of drawings for bid sets. The CONSULTANT shall not draw on the back side of drawings, or use any form of shading techniques that will not reproduce clearly using this form of reproduction.

5.3.7.4 Unless otherwise approved in writing by the DISTRICT, the CONSULTANT shall use the following scales.

Rural Areas 1" = 40' Horizontally, 1" = 4' Vertically

Urban Areas 1"=20" Horizontally, .1" = 4' Vertically

5.3.7.5 The CONSULTANT shall use a larger scale if necessary to obtain good clarity in the plans and reduced prints. The CONSULTANT shall be responsible for using a scale that results in good plan clarity.

5.3.7.6 Drawings shall be prepared using MicroStation PC, Version 4 or AutoCad, Release 12 per DISTRICT standards.

5.3.7.7 All lettering on drawings shall be vertical, plain, and legible. 'Architectural' style lettering shall not be accepted. The following lettering sizes apply:

1/8"	Lettering and Notes
5/32"	Subtitles
7/32"	Main Titles

5.3.7.8 The final (100%) submittal shall be plotted at a minimum of 400 dots per square inch on 4 mil mylar. The final plot shall be plotted or photo reproduced on 4 mil mylar without sticky backs. If plans have been hand drafted, the final (100%) submittal shall be rapidograph-inked drawings on 4 mil mylar. If sticky backs have been used, 4 mil photo reproducible mylars shall be submitted,

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with original seal and signature on the photo mylars. All seals and signatures shall be in smudge-proof ink.

5.3.7.9 The DISTRICT shall provide the CONSULTANT with a diskette containing .DWG or .DGN files for the standard cover sheet and working drawing sheets.

5.3.7.10 The plans shall include a summary table of concrete, excavation and structural backfill quantities for each structure. These quantities shall be shown on an appropriate structure sheet, a separate quantity sheet shall not be prepared. The quantities in the table shall add up to the bid item quantities for each bid item, including the appropriate class and strength of concrete (i.e., Class "A", Class "AA").

**5.3.8 CALCULATION**

5.3.8.1 The CONSULTANT shall independently check all design drawings and calculations. Each drawing shall be initialed and dated by both the designer and checker for each and every submittal of design drawings and calculations. The CONSULTANT shall verify the completeness of the check before submitting drawings or calculations to the DISTRICT.

5.3.8.2 All design calculations submitted to the DISTRICT shall be complete in detail and shall be checked. All engineering assumptions made during the design other than standard engineering judgements shall be documented with appropriate references on the calculation sheets.

5.3.8.3 The person checking the calculations shall not be the originator, and shall be of equal or better qualifications than the originator.

5.3.8.4 Calculations can be either hand calculations or computer generated calculations. Computer generated calculations can be used for either the design or the check, but cannot be used for both the design and the check. All hand calculations and computer generated calculations shall be sealed prior to submittal to the DISTRICT. HEC-1 and HEC-2 modeling are excepted from the hand calculation requirement.

5.3.8.5 All design calculations and drawings shall be complete in detail, independently checked in the CONSULTANT's office, and shall be initialed and dated by both the designer and checker for each submittal. The CONSULTANT shall verify the completeness of the check before submitting drawings or calculations to the DISTRICT. The person checking the calculations shall not be the originator, and shall be of equal or better qualifications than the originator.

5.3.8.6 The CONSULTANT shall use methods and procedures which are normal and customary standards of the industry. All calculations, sketches, computer printouts, or other written or printed data used in the final design shall be included in the design data report.

**5.3.9 GEOTECHNICAL**

5.3.9.1 In-situ soils testing, if required, shall be in accordance with NAVFAC DM-7.1, Soil Mechanics Design Manual 7.1, May 1982. Boring and test pit locations must be submitted to the DISTRICT for review and approval. An attempt shall be made to extend all test borings through the significant zone by auger, however, if refusal is met at a lesser depth, each test boring shall extend at least five (5) feet beyond the anticipated depth of the invert, unless bedrock is hit. If ground water is encountered, then standard penetration tests shall be performed with the water level in the hole at or above the ground water level.

5.3.9.2 Allowable soil bearing values and lateral load capacities shall be determined in accordance with NAVFAC DM-7.2, Foundations and Earth Structure Design Manual 7.2, May 1982, and in accordance with current AASHTO Specifications as interpreted by the DISTRICT. In case of

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conflict between AASHTO and NAVFAC specifications, AASHTO specifications shall govern. The effect of future elevated moisture content or saturated condition of the soil due to potential future seepage from the drainage structure should be considered and included in the soil report. The maximum allowable soil bearing values recommended in sections 4.2.3 of AASHTO shall not be exceeded without prior consultation with the DISTRICT.

**5.3.10 LANDSCAPE**

5.3.10.1 The CONSULTANT shall identify requirements and estimated costs for replacement of landscaping in kind where the landscaping will be impacted by the project.