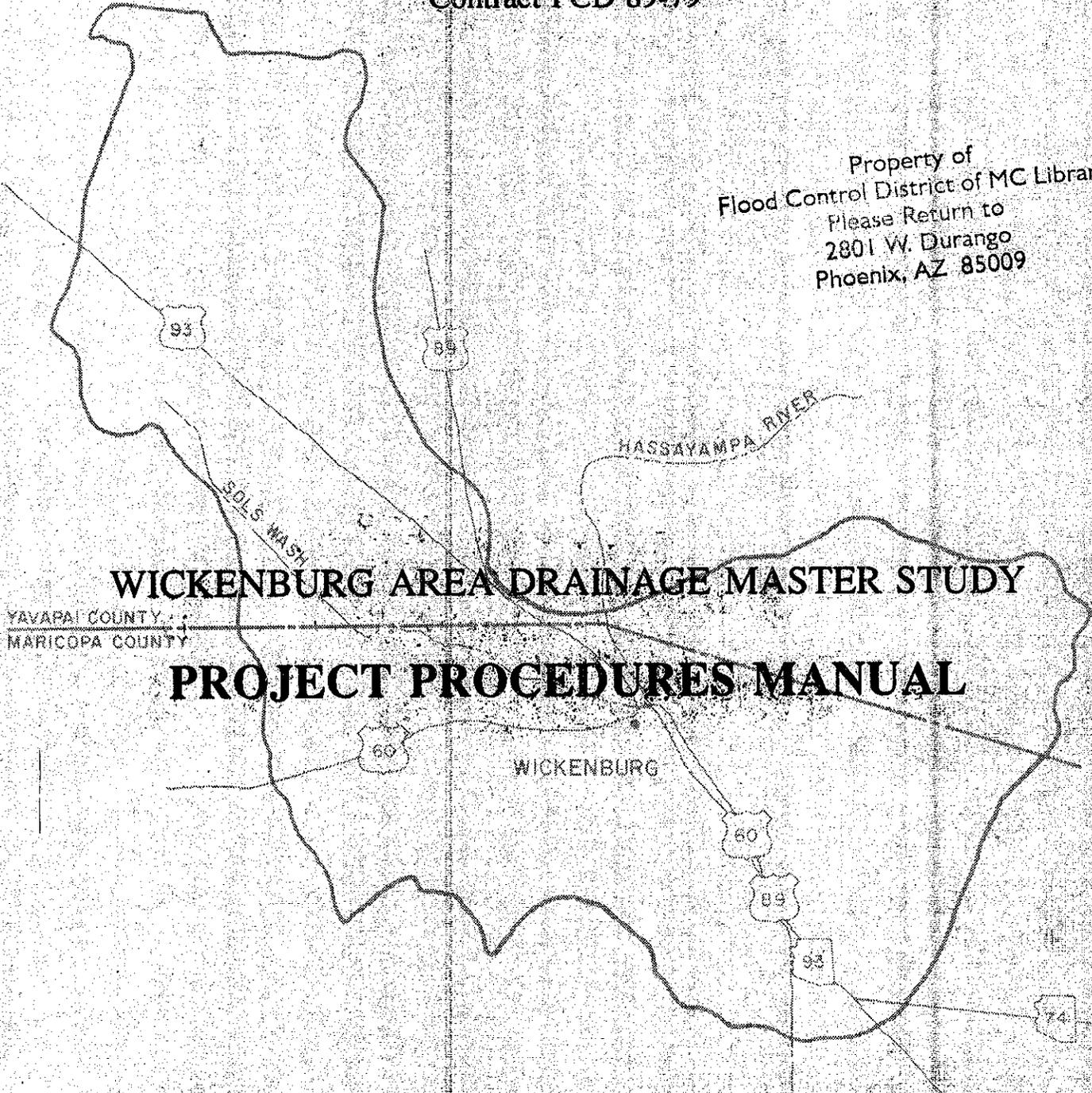


Flood Control District of Maricopa County
Contract FCD 89-79

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WICKENBURG AREA DRAINAGE MASTER STUDY

YAVAPAI COUNTY
MARICOPA COUNTY

PROJECT PROCEDURES MANUAL



BLACK & VEATCH
Progress By Design
Project No. 17676



COE & VAN LOO
PLANNING • ENGINEERING
LANDSCAPE ARCHITECTURE
CVL No. 1197-02

January, 1991

A343.117

Flood Control District of Maricopa County
Contract FCD 89-79

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Flood Control District of Maricopa County

PROJECT PROCEDURES MANUAL

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January, 1991

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INTRODUCTION

The purpose of the Project Procedures Manual is to present the manner in which Black & Veatch (B&V) will conduct the contract tasks associated with the Wickenburg Area Drainage Master Study. Black & Veatch personnel and subconsultants working on the study are to perform their assignments in accordance with these procedures.

Additional project instructions may be issued as required to clarify or expand on the procedures presented herein. Requests for clarification or modifications of these procedures are to be submitted in writing to the Project Director.

BACKGROUND

The Flood Control District of Maricopa County (District) has contracted with B&V to conduct an Area Drainage Master Study (ADMS) for the Town of Wickenburg and selected nearby unincorporated areas.

An ADMS consists of two parts. Part I is the completion of a Flood Insurance Study (FIS) under guidelines established by the Federal Emergency Management Agency (FEMA), Arizona Department of Water Resources (ADWR), and the District. Part II is the development of an Area Drainage Master Plan, which will identify alternative measures for mitigating flood damage identified during the FIS in Part I. The Scope of Services from the Prime Agreement is included in Appendix A. B&V has been selected to perform both Part I and Part II of the ADMS. The current contract and scope covers Part I only. The Scope of Services for Part II will depend on the findings of Part I. Contract development for Part II will commence after flooding problems have been identified and reviewed by the District.

The District has divided the study area into two parts. Part I comprises small washes south and east of Wickenburg that flow under Highway 74 and into the Hassayampa River without entering Wickenburg. Part II comprises several small washes and some larger channel systems that enter Wickenburg from the south or west. FIS reports for Part I washes will be submitted to FEMA following review by ADWR and the District.

PART I DESCRIPTION

Part I of the study consists of six parts as follows:

Data Collection 1)

Assemble and review pertinent maps, studies, land use plans, and private master plans, including existing Flood Control District studies within the area.

Data Collection 2)
Mapping

Prepare permanent topographic mylar sheets (24" x 36") with delineated floodplains and the preparation of Presentation Maps (U.S.G.S. 7.5 minute Quadrangle Maps) that will be used to show the study area, subwatersheds, existing drainage patterns, future drainage patterns, and the floodplain, floodway and ponding delineations.

HYDROLOGY 3)

Develop a hydrologic model for the area using the U.S. Army Corps of Engineers 1989 version of the HEC-1 computer program.

FTS
HYDRAULIC 4)

Delineate the floodplains and floodways using the U.S. Army Corps of Engineers HEC-2 Water Surface Profile computer program for the 100-year flood events.

Reports 5)

Prepare interim and draft final reports, coordination, agency review, and preparation of final report and documentation.

- 6) Manage and coordinate all aspects of the project, including meetings, progress report development, and communication with affected municipalities and agencies.

The contract scope of work for this project is included as Appendix A.

ORGANIZATION AND STAFFING

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

The owner of this project is the Flood Control District of Maricopa County.

The District personnel involved with the project are:

John Rodriguez, P.E.	-	Chief, Planning/Proj. Management
Greg Rodzenko	-	Project Manager
Dick Perreault	-	Coordination
Leanna Cumberland	-	Contracts
Joe Rumann	-	Technical Review of Hydrology Methods

- ✓ Davar Khalili - Technical Review of Hydrology Methods
- Steve Waters - Technical Review of Hydrology Methods
- ✓ Russ Cruff - Technical Review of Watershed Delineation
- Sandy Shillito - Technical Review of Watershed Delineation
- ✓ Joe Tram - Technical Review of Floodplain Delineation
- Besian Khatiblou - Technical Review of Floodplain Delineation
- Susan Fitzgerald - Public Involvement
- Catesby Moore - Environmental
- A.J. Blech - Environmental

BLACK & VEATCH

Black & Veatch's project team will be organized as follows:

- Dave Mahaffay - Regional Manager/Project Director
- Tim Meyer - Project Engineer
- Jay Horak - Staff Engineer

SUBCONSULTANTS

Subconsultants have been retained to add special expertise to the project team.

The specialty area and firms retained are as follows:

Coe & Van Loo Consulting Engineers, Inc. - CVL will provide project management for technical aspects of the work as well as substantial engineering for hydrologic and hydraulic analysis and reporting. The subcontract Scope of Services (Appendix B) defines responsibilities for CVL.

- Ashok Patel - Project Manager
- Paul Hoskin - Project Engineer

McLain Harbers Co., Inc. - McLain Harbers Co., Inc. will perform the aerial photogrammetry and ground surveys for the west area of the study.

- Lee Harbers - Photogrammetry
- Gordon McLain - Survey

Western Air Maps - Western Air Maps will perform the aerial photogrammetry for the East Area of the Study. Ground control and other surveying tasks will be performed by Morrison-Maierle/CSSA under subcontract to Western Air Maps.

Scott Perkins - Photogrammetry
Jim Spring - Survey (MM/CSSA)

PROCEDURES MANUAL HOLDERS

The distribution of Project Procedures Manuals is as follows:

Flood Control District

Greg Rodzenko
John Rodriquez
Leanna Cumberland

Black & Veatch

Dave Mahaffay
Tim Meyer
Jay Horak
John Stukenberg

Coe & Van Loo

Ashok Patel
Paul Hoskin
David Dust

Others

McLain Harbers
Western Air Maps

PART I SCHEDULE

The Part I schedule covers a 18 month period from November, 1990 through April 1992. The key target completion dates associated with the work are as follows:

<u>Task</u>	<u>Completion Date</u>
100 - Background	December 31, 1990
200 - Mapping	
(a) Ground Control	January 15, 1991
(b) Topographic Mapping	March 15, 1991
300 - Hydrology Draft Report	April 30, 1991
Hydrology Final Report	June 20, 1991
400 - Floodplain Delineation	February 1, 1992
600 - Supp. Documentation	March, 1992
700 - Management & Coordination	March, 1992

CONTACT LIST
(Updated September 26, 1990)

<u>AGENCY</u>	<u>ATTENTION</u>	<u>PHONE</u>
Federal Emergency Management Agency Natural and Technological Hazards Division Region IX Presidio of San Francisco, Building 105 San Francisco, CA 94129	Ray Lenaburg Project Officer	(415) 923-7177
Federal Emergency Management Agency Risk Studies Division Federal Insurance Administration 500 C Street, SW Room 422 Washington, D.C. 20472	Robert Weiss Brian Mrazik John Matticks Karl Mohr Alan Johnson Mrs. Cynthia M. Croxdale (Receptionist) Bill Judkins	(202) 646-3748 (202) 646-2769 (202) 646-2767 (202) 646-2770 (202) 646-3403 (202) 646-2767 (202) 646-3458
Department of the Army Los Angeles District, Corps of Engineers Attn: SPLPD-WF Chief, Planning Division Post Office Box 2711 Los Angeles, CA 90053-2325	John Karakawa John Pederson Jody Fischer Tony Nifas Glenn Mashburn	(213) 894-2245 (213) 894- (213) 894-4759 (213) 894-5497
(STREET ADDRESS)		
300 North Los Angeles Street Los Angeles, CA 90012		
Flood Control District of Maricopa County 3335 West Durango Phoenix, AZ 85009	Dan Sagramoso, P.E. Chief Engineer and General Manager Dave Johnson Chief Hydrologist Joe Tram Russ Cruff	(602) 262-1501
Michael Baker, Jr., Inc. 1420 Kings Street, Sixth Floor Alexandria, VA 22314	Bob Henschbarger Dave Greenwood (FAX) Michele Monde Bill Petrucci	(703) 838-0400 (703) 836-0130

CORRESPONDENCE, DOCUMENTATION AND RECORDS

CORRESPONDENCE

All formal correspondence to the Flood Control District is to be signed by the Project Director and the Project Manager. In general, Black & Veatch will originate correspondence pertaining to contractual matters, and Coe & Van Loo will originate correspondence pertaining to technical matters. Mapping subcontractors shall direct their communications to one contact person as instructed by the Project Director or Project Manager.

Copies of communications originated or received by Black & Veatch are to be provided to Coe & Van Loo. Copied communications originated or received by Coe & Van Loo are to be provided to Black & Veatch.

Black & Veatch to/from Coe & Van Loo.

Coe & Van Loo correspondence with Black & Veatch is to be directed to David

R. Mahaffay as follows:

Mr. David R. Mahaffay, P.E.
Regional Manager
Black & Veatch
2111 E. Highland, Suite 305
Phoenix, Arizona 85016-4734

Black & Veatch correspondence with Coe & Van Loo is to be directed to Ashok

C. Patel as follows:

Mr. Ashok C. Patel, P.E., R.L.S.
Coe & Van Loo
4550 N. 12th Street
Phoenix, Arizona 85014-4291

Each firm is to provide the other firm copies of all project related correspondence or communications with all other entities.

Black & Veatch/CVL to/from the Flood Control District of Maricopa County.

Correspondence with the Flood Control District of Maricopa County may be originated by either Black & Veatch or Coe & Van Loo. In general, however, Black & Veatch will originate and receive correspondence pertaining to contractual matters, and Coe & Van Loo will originate and receive correspondence pertaining to technical matters. Black & Veatch and Coe & Van Loo are responsible for apprising each other of correspondence and communication with the Flood Control District.

Correspondence with the Flood Control District should be directed to Mr. Greg Rodzenko as follows:

Mr. Greg Rodzenko
Project Manager
Flood Control District of Maricopa County
3335 W. Durango
Phoenix, Arizona 85009

Black & Veatch/CVL to/from Mapping and Surveying Firms.

Correspondence with McLain Harbers should be directed to Mr. Lee Harbers as follows:

Mr. Lee Harbers, C.P.
McLain Harbers Co., Inc.
720 Prince Road
Tucson, Arizona 85705

Correspondence with Western Air Maps or with Morrison Maierle/CSSA should be directed to Mr. Donald E. Wigger as follows:

Mr. Donald E. Wigger, R.L.S., C.P.
Western Air Maps, Inc.
P.O. Box 14988
Lenexa, Kansas 66215

Internal Memoranda. Internal B&V project memoranda are to be prepared as required to document the work effort. Memoranda are to be legibly handwritten or typed, and routed to the Project Director and Project Manager prior to being placed in the project files.

Telephone Memoranda. The B&V telephone memoranda format is to be used by project personnel making or receiving telephone calls associated with the project. Telephone memoranda are to be legibly handwritten, and routed to the Project Director prior to being placed in the project files.

DOCUMENTATION

Complete project files must document the process used in the study. This is to be accomplished by immediately preparing internal memoranda, telephone memoranda, meeting minutes as work progresses. Additionally, monthly reports are to be prepared to provide a basis for partial billing to track progress and budgeting the remainder of the project. All calculations, computer runs, correspondence, and other project documents are to show the following information:

FCP ← FDC 89-79
B&V PN 17676
CVL No. 1197-02

MEETING MINUTES

Meeting with Authority staff, regulatory agencies, subconsultants, and others interested in the project will be an important element of this work. Preparation, documentation, and distribution of meeting data is critical to the efficient completion of the project.

Agenda. In general, all meetings should have an agenda. The person calling the meeting is to prepare the agenda and review with the Project Manager. The

meeting agenda is to be distributed to the meeting participants approximately one week prior to the meeting date.

The meeting agenda is to indicate the meeting purpose, date and time, location, and participating personnel. If possible, the content should be selected to limit the meeting duration to one hour or less.

Meeting Minutes. The person initiating the meeting is responsible for preparing meeting minutes summarizing the meeting results. Meeting minutes are to be prepared within one week following completion of the meeting, and are to be distributed to all meeting participants, and to the Project Director, Project Manager and Project Engineers. Meeting minutes are to include the following:

- Meeting Date and Time
- Meeting Location
- List of Meeting Attendees and their Associates
- Action Items and/or Decisions Made
- Items Delivered
- Items Received
- Summary Comments

An example of the format for meeting minutes is in Appendix C.

MONTHLY REPORTS

A monthly report is to be prepared by the Project Manager, reviewed and supplemented by the Project Director, and delivered to the Flood Control District during the first week of each month. The monthly report is to summarize work completed, identify project issues, and update the status of the project with respect to schedule and budget. Copies will be distributed to the project team members.

PHASE NUMBERS

The project work is to be performed under Black & Veatch Project Number 17676 with the appropriate phase extension associated with the specific portion of the work being completed. Project phase numbers are as follows:

<u>Phase No.</u>	<u>Task</u>	<u>Description</u>
100 Background	101	Meeting w/ Agencies
	102	Review and Analyze Data
200 Mapping	201	Review Proposal & Coord. Assign.
	202	Monitor Ground Control Mapping
	203	Prepare Base & Sketch Maps
300 Hydrology	301	Review Hydrologic Parameters
	302	Field Reconnaissance
	303	Watershed Delineation
	304	Flow Diversions/Split
	305	Reservoir Storage
	306	Channel Routing
	307	Precipitation Data
	308	Existing Condition Model
	309	Ongoing Development Projects
	310	Future Condition Hydrologic Model
	311	Dam Breach Model Report
	312	Hydrology Report
400 Floodplain Delineation	401	Topographic Mapping
	402	Structure Surveys
	403	Hydraulic Cross-section
	404	Field Reconnaissance
	405	Field Observation Report
	406	F.P. Delineation
	407	Ponding Areas
	408	Model Adjustments
	409	FEMA/Agency Coordination
	410	Floodplan Delineations Report

<u>Phase No.</u>	<u>Task</u>	<u>Description</u>
600 Supporting Documentation	601	Assemble Documents
	602	Interim & Final Reports
700 Study Management & Coordination	701	Project Initiation
	702	Agency & FCD Coordination
	703	Public Meetings & Hearings
	704	Progress Reports
	705	Project Management

Phase numbers will be assigned as specific tasks are identified.

FILING SYSTEM

The permanent project file for all original correspondence and documents will be in the library of the Black & Veatch Phoenix office. Each document that is received is to have the received date stamped or otherwise indicated on the front of the documents. When action is required by two or more members of the project team, a note is to be written on the original document by each person taking action indicating the action taken, date, and the person's initials.

The file arrangement is shown below. All documents are to be filed in their respective section in chronological order.

File Designation

- A. Project Management
 - A.1 Preliminary Correspondence
 - A.2 Contract and Amendments
 - A.3 Project Procedures Manual
- B. Client Correspondence
- C. Not Used
- D. Not Used

File Designation (Cont'd)

- E. Reports and Technical Memoranda
 - E.1 Background Material
 - E.2 Mapping
 - E.3 Hydrology
 - E.4 Floodplain Delineations-Flood Insurance Study
 - E.5 Area Drainage Master Study
 - E.6 Supporting Documentation

- F. Federal, State, County, City Regulations and Requirements
 - F.1 FEMA
 - F.2 Corps of Engineers
 - F.3 EPA
 - F.4 ADWR
 - F.5 ADEQ
 - F.6 FCDMC
 - F.7 Wickenburg

- G. Not Used

- H. Quality Control Reviews

- I. Subcontracts
 - I.1 Coe & Van Loo
 - I.2 McLain-Harbers Mapping
 - I.3 Western Air Maps
 - I.4 R.H. French

- J. Third Party Correspondence

- K. Technical Data
 - K.1 Hydrology
 - K.2 Hydraulics
 - K.3 Mapping
 - K.4 Other

- L. Meeting Minutes, Telephone Memoranda, Other Correspondence
 - L.1 B&V / FCDMC
 - L.2 B&V / CVL
 - L.3 B&V / Government Agencies
 - L.3.1 FEMA
 - L.3.2
 - L.4 B&V / Mapping Subs.

File Designation (Cont'd)

- L.5 B&V / French
- L.6 Public Meetings
- L.7 Public Hearings
- L.8 Other Meetings

- M. Monthly Reports

- N. Publicity
 - N.1 Legal Advertising
 - N.2 Newspaper Articles

- X. Internal Memoranda

CALCULATIONS

Calculations are to be prepared on B&V or Coe & Van Loo grid calculation paper or on data compilation forms developed for this project, and are to have the complete project reference information included. The basis for each set of calculations is to be clearly stated at the beginning of the work along with the assumptions that are used. Equations are to be identified and the source referenced. Where appropriate, calculations are to be accompanied by schematics or layout sketches to clearly define the work being completed.

Void calculations are to be identified and retained until the quality control review is completed. Void calculations are to be removed from the project files and discarded after the project is completed.

QUALITY CONTROL

All elements of the project work are to be reviewed internally by Black & Veatch for accuracy and completeness prior to the work being finalized. The Project Director will coordinate the quality control review.

The interim draft of each section of the Report is to be submitted for quality control review. All review comments are to be resolved and incorporated into the work where applicable.

INFORMATION RELEASES

Members of the project team are not to release the findings, reports, or other information pertaining to the project either verbally or in writing without the prior written approval of the Project Director and the District. Any requests for information are to be directed to the Project Director.

AGENCY COORDINATION

Coordination with interested agencies is part of the project effort. Agency coordination status should be included with the monthly report to the District's Project Manager.

R. 6 W.

R. 5 W. To S. R. 71

R. 5 W.

R. 4 W.

R. 3 W.

220 000 FEET

240 000 FEET

260 000 FEET

280 000 FEET

300 000 FEET



FOR ENLARGEMENT SEE PAGE 23A

FOR ENLARGEMENT SEE PAGE 24A

FOR ENLARGEMENT SEE PAGE 25A

Circle City

APPENDIX A
SCOPE OF WORK

EXHIBIT 'A'

SCOPE OF WORK
(DRAFT 9-06-90)

WICKENBURG AREA DRAINAGE MASTER STUDY

The Engineer shall make the necessary surveys and studies, and shall prepare a report setting forth an Area Drainage Master Plan (ADMP) for stormwater management in the Wickenburg study area. The study area covers a portion of the Flood Control District Watershed No. 7. This area is roughly bounded on the North by Yavapai County, on the East by the Wittman watershed boundary, on the south by Morristown, and on the west by the Township 5W/6W boundary.

See attached map.

The purpose of this study is to identify problems and develop solutions associated with drainage in the existing and future, developed portions of the watershed. The Consultant, through the use of structural and non-structural methods, should develop solutions to drainage problems by identifying drainage outfalls for existing and proposed drainage/flood control structures. The study products will include:

- I. Background Materials
 - II. Mapping
 - III. Hydrology
 - IV. Floodplain Delineations
 - V. Area Drainage Master Plan
 - VI. Environmental Assessment
 - VII. Supporting Documentation
 - VIII. Project Coordination and Study Management
- 6A 4015

The study will be sub-divided into two Phases:

Phase I will include the work through Floodplain Delineations along with Project Coordination and Study Management, as required.

Phase II will include the Area Drainage Master Plan and the Environmental Assessment, and the remainder of the deliverables.

The results of Phase I are required to write a detailed Scope of Work for Phase II of the project.

The work for Phase I shall include the following tasks:

I. Background Materials:

Assemble and review pertinent maps, studies, land use plans, and private master plans, including existing Flood Control District studies within the area. Included in this data search will be the drainage studies for the Flood Control District of Maricopa County 1963 Comprehensive Plan; U.S. Army Corps of Engineers Wickenburg Report (December, 1965); 1972 Hassayampa River Floodplain Study (Corps-1972); Casandro Wash Alternatives for Flood Control (Corps-1980); Sols Wash Floodplain Study (Cella Barr Assoc.-1986); Hassayampa River & Cemetery Wash Floodplain Studies (Cella Barr Assoc. for FEMA-1989).

II. Mapping:

A. Procedures for General Mapping:

1. Prepare topographic mapping to a 2-foot contour interval (or, as noted on the attached map for 4-foot and 10-foot contour intervals), with spot elevations and/or 1-foot contours on all section line and mid-section line roads. This would be for the 35 square mile area as outlined on the attached map.
2. Ground Control:
 - a. The Consultant shall provide all survey control.
 - b. The Consultant shall systematically set panel points and establish horizontal and vertical control throughout the areas to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into the State Plane Coordinate System. Field control shall be sufficient to readily allow for compilation of maps by the aerial survey contractor at the desired map scale and contour interval and will be based on the National Geodetic Vertical Data (NGVD).
 - c. The horizontal and vertical control points shall be located and marked by the Contractor. The controls for the area mapping shall be in sufficient numbers and shall be in locations which will be compatible with the accuracy of the mapping requirements. The controls shall be of at least third order accuracy. Section corners, quarter corners, and mid-section points shall be used for control points wherever possible.

B. Map Standards:

1. Digital design, contour and planimetric data developed for this project shall be delivered in AutoCAD DXF ASCII format, as specified in Autodesk, Inc., publication TD106-009 (May 7, 1986). Layer names and graphics attributes shall be fully documented by the Consultant. The delivered DXF files shall be compatible with the requirements,

and subject to the limitations, of the ESRI DXFARC software translator as detailed in the January 1989 release of the "ARC/INFO Users Guide". All DXF file deliveries shall be in ASCII format on industry-standard 1/2" magnetic tape, 2400-foot reels, written in a generic unlabelled COPY format, with specified record-lengths and block sizes, OR

Digital design, contour and planimetric data developed for this project shall be delivered in Intergraph ISIF ASCII format, as specified in Intergraph publication DIX4110 (May 12, 1985). Layer names and graphics attributes shall be fully documented by the Consultant. The delivered ISIF files should be compatible with the requirements, and subject to the limitations, of the ESRI SIF2ARC software translator as detailed in the January 1989 release of the "ARC/INFO Users Guide". All ISIF file deliveries shall be in ASCII format on industry-standard 1/2" magnetic tape, 2400-foot reels, written in a generic unlabelled COPY format, with specified record-lengths and block sizes.

2. The Consultant shall provide permanent topographic mylar sheets 24" x 36" with a scale of 1-inch equal to 200 feet, and a contour interval of 2 feet or 4 feet as shown on the attached map. A cover sheet will be provided with the project title, date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. Each manuscript shall include a minimum of a north arrow, scale, section corners and quarter corners, current and proposed streets and highway names, State Plane Coordinate System, major drainage features, city limits, cross section lines, channel station center line, index map, description and elevation of control points and ERMs, and reference marks used in ground control. The mapping will have an accuracy such that ninety percent (90%) of all contours shall be within one-half contour of the true elevations and the remaining ten percent (10%) of the contours shall not be in error by more than one contour interval.] ← M H Wain
3. The Consultant shall provide permanent topographic mylars as described above in Section B.2 with delineated floodplains included.
4. Sketch maps no larger than 11" x 17" for the study area, and for each alternative must be included in the narrative report.] BV
5. The Presentation Maps shall be on U.S.G.S. 7.5 minute Quadrangle Maps and include:
 - a. The study area: all current and proposed streets, major arterials and freeways, section lines, major drainage features, presently delineated floodplains areas, and city limits. This map shall serve as a base map.

- b. Maps showing the existing drainage patterns, the subwatersheds, and indicating the flows at major intersections and concentration points.
 - c. Maps showing the future drainage patterns, if different from existing.
 - d. Maps of the floodplain, floodway, and ponding delineations.
6. Hydrologic Work Maps should be at a scale of 1 inch = 1200 feet and shall include: overlay maps of existing drainage patterns, subwatersheds; major flow paths; and general topographic maps.

III. Hydrology:

- A. The Consultant shall use the U.S. Army Corps of Engineers computer program HEC-1, 1989 Version, to develop a hydrologic model for the area. Using appropriate hydrologic judgement, sub-basins are to be identified that provide a reasonable depiction of the watershed condition. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations, or assumptions used in developing sub-basin or routing parameters shall be documented and made a part of the appendix for the hydrology report.

The specific hydrologic techniques to be used in this study are:

- 1. Rainfall : 6-hour storm, FCD Distribution(s) for peak discharge; 24-hour storm, SCS Type IIA Distribution for peak volumes; for 2, 10, 25, 50, 100 year flood frequencies.
- 2. Excess : Green - Ampt: based on soil texture data
- 3. Unit Hydrograph : Clark & S-graph: Clark Method should be used for sub-basins of less than 5 square miles or having a time of concentration of less than 1.5 hours. The S-graph method should be used with sub-basins having an area of more than 5 square miles. For those sub-basins at the 5 square mile threshold, the time of concentration should be the over-riding factor in the selection of a method.
- 4. Time of Concentration : Papadakis should be used with the Clark Unit Hydrograph. The S-graph lag equation should be used for the appropriate S-graph (Phoenix Mountain or Phoenix Valley) hydrograph.

5. Routing : Methods chosen from those provided in the HEC-I, "Flood Hydrograph Package" Users Manual (pp A-61 thru A-69, as revised in June 1988) are not to be used without specific written concurrence from the District.

All hydrologic and hydraulic parameters shall be assessed for realistic values such as velocities and quantities of flows.

- B. The hydrology should be developed for 2-, 10-, 25-, 50-, and 100 year flood frequencies.
- C. An existing condition model shall be developed and shall be based on existing land uses as identified at the time of mapping, or other recent area wide aerial mapping. All identified pending drainage improvements will be listed with anticipated completion dates. The Consultant and Flood Control District staff will then meet to identify which features will be assumed to be in place for the purposes of the existing condition hydrology. The assumption will be based on those facilities that are proposed to be in place roughly within one year from the completion of this study, with satisfactory documentation in the model. Significant private and regional retention, and agricultural tailwater sumps shall be incorporated into the model. This will include several small dams which FCD staff have identified on the upper reaches of washes in the Wickenburg area. However, pre-1987 retention for private development shall only be included if it is a common basin (not on-lot), and field verification indicates substantial conformance to the approved plans. As this study progresses towards final approval of the hydrology, if any development of 200 acres or larger is approved and construction is imminent, the drainage facilities for this feature shall be included in the existing condition hydrology.
- D. The future condition hydrology model will identify specific alternatives. Required changes should only be related to changes in land use, modification of routing reaches, or the inclusion/exclusion of specific structures and/or management practices. The future condition model should be based on a fully developed watershed as envisioned by current planning documents (at the time the modeling is initiated), and in general, assume that current retention criteria are fully enforced.
- E. Include a 100 year 24 hour HEC I model with dam breach calculations for those small dams outside of Wickenburg as designated by the District.
- F. Specific deviations from this hydrologic scope shall not be undertaken without the specific written concurrence from the Flood Control District.

IV. Floodplain Delineations:

A. Procedures for Topographic Mapping of Flood Hazard Areas:

- 1. Prepare photo-topographic maps to the same specifications as in "Procedures for General Mapping" of this document, or FEMA criteria, whichever is more stringent, for all floodplain delineation areas as identified in Section C.4.

2. Ground Control for Floodplain Delineations:

- a. 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, Appendix 4, September 1985. This would include, but is not limited to: the establishment of "permanent" elevation reference marks (ERM's); field control; and verification of profiles by the ground survey profile procedure.
- b. Horizontal and Vertical Control: systematically set panel points and establish horizontal and vertical control throughout the area to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into State Plane Coordinate System. Field control shall be sufficient, at least one "permanent" point per mile, such point(s) being used as Elevation Reference Marks (ERMs). Surveys will be based on National Geodetic Vertical Datum (NGVD), per FEMA guidelines. "Permanent" survey points shall consist of existing monumentation, such as brass caps or similar survey monuments. Where additional monumentation is needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade. Where installation of Type C monuments is not practical, brass caps may be mounted on drive rod or driveshaft drilled in rock. Elevation Reference Marks will be labelled on available maps and described in a manner which allow them to be readily located in the field.
- c. "As-Built" plans or surveys of all bridges and hydraulic structures are to be obtained by the Study Contractor.
- d. The Consultant shall verify profiles for mapped floodplains. The ground survey profile procedure as described in FEMA Document 37 or other methods approved by FEMA.

B. Field Survey:

Cross sections: Stationing will be from left to right looking downstream. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise. Identification of cross sections will be in river miles, increasing upstream.

The channel station centerline will be designated as station 10,000. The location and alignment of cross sections and channel centerline will be submitted for the Flood Control District's review and approval prior to digitizing cross section data.

C. Floodplain and Floodway Delineation:

1. The Consultant will prepare the study using the guidelines

established in 'The Flood Insurance Study Guidelines and Specification for Study Contractors', dated September 1985 and 'Appeals, Revisions, and Amendments to Flood Insurance Maps', September 1985.

2. The Consultant will conduct a field reconnaissance of all study reaches. This will include observation of channel and floodplain conditions for estimation of Manning's 'N' values; photographic documentation of floodplain characteristics; overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions which are not available from as-built plans.
3. A written summary of the field inspection, including photographs to document 'N' value estimation will be submitted to the Flood Control District for review and approval.
4. The Consultant will delineate the floodplains and floodways using the U.S. Army Corps of Engineers HEC-2 Water Surface Profiles computer model for the 100-year flood event for the channels listed below and shown on the attached map. If there are any discrepancies between the channel lengths listed below and these shown on the map, the lengths listed below shall prevail.

PART I. [Results of floodplain analyses are to be submitted, on a continuing basis, to FEMA following review by FCD staff; all of the work in Part II will be completed as a unit, reviewed by FCD staff, presented to the Wickenburg Town Council, and then submitted to FEMA].

- | | | | |
|------|---|----------|--------------------------|
| + a. | Amir Wash -
From the confluence with the Hassayampa River north west to the County line. | Detailed | 2.30 ✓ |
| + b. | Calamity Wash -
From the confluence with the Hassayampa river north east to the County line. | Detailed | 2.20 ✓ |
| + c. | Blue Tanks Wash -
From the confluence with the Hassayampa River north east to the County line. | Detailed | 1.00 |
| + d. | Monarch Wash and Tributaries -
From confluence with the Hassayampa River north east to the County line, includes the north and south split. | Detailed | 2.75 [3.0] 11.80
1.75 |
| + e. | Mockingbird Wash and Tributaries -
From confluence with the Eassayampa River northeast to the County line, includes the north and south split. | Detailed | 1.5 6.7
.5 |

- x f. Unnamed Wash #1 -
From the confluence of the Hassayampa River, Sec 3 T6N R4W,
continuing north east into the Wickenburg Mountains.
Detailed 0.50
Approximate 0.50
- y g. Unnamed Wash #2 -
From the confluence of the Hassayampa River, Sec 33 T7N
R4W, continuing north east into the Wickenburg Mountains.
Detailed 1.00
Approximate 0.50
- y h. Unnamed Wash #3 -
From the confluence of the Hassayampa River, Sec 33 T7N
R4W, continuing north east into the Wickenburg Mountains.
Detailed 1.5
Approximate 3.50
- y i. Unnamed Wash #4 -
From the confluence of Hassayampa River, Sec 28 T7N R4W
continuing north east into the Wickenburg Mountains.
Detailed 1.0 3.7
/
- y j. Unnamed Wash #5 -
From the confluence of the Hassayampa River, Sec 28 T7N
R4W, continuing north east into the Wickenburg Mountains.
Detailed 0.50
Approximate 0.50
- x k. Unnamed Wash #6 -
From the confluence of the Hassayampa River, Sec 20 T7N
R4W, continuing north east into the Wickenburg Mountains.
Detailed 3.40
Approximate 2.00
- l. Unnamed Wash #7 -
From the confluence of the Hassayampa River, Sec 20 T7N
R4W, continuing north east into the Wickenburg Mountains.
Detailed 1.00
Approximate 0.50
- y m. Unnamed Wash #8 -
From the confluence of the Hassayampa River, Sec 20 T7N
R4W, continuing north east into the Wickenburg Mountains.
Detailed 0.50
Approximate 0.50
- y n. Unnamed Wash #11 -
From the confluence of the Hassayampa River, Sec 1 T7N
R5W, between Powder House Wash and Blue Tank Wash,
continuing north east.
Detailed 0.50
Approximate 0.25

8

- o. Unnamed Wash #12 -
 From the confluence with the Hassayampa River, Sec 18 T7N R4W, between Mockingbird Wash and Calamity Wash, continuing north east to the county line (Wickenburg Mts.).

Detailed	1.5	4.70	
			.50

- p. Unnamed Wash #13 -
 From the confluence of the Hassayampa River, Sec 35 T8N R5W, continuing east to the County line.

Detailed	0.35		
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- q. Unnamed wash #14 -
 From the confluence with the Hassayampa River, Sec 18 T7N R4W, between Turtleback Wash and Cemetery Wash, continuing south east.

Detailed	1.00		
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- r. Cemetery Wash and Tributaries -
 From the confluence of the Hassayampa River, Sec 7 T7N R4W, continuing south east to the Venture Peak Mountain (IF HYDROLOGY SIGNIFICANTLY DIFFERENT).

Detailed	10.8	[11.3]	11.3
Approximate	4.5	[5.0]	5.0

- s. Little San Domingo Wash and Tributaries
 From the confluence with the Hassayampa River, north east to the White Cloud Mine (IF HYDROLOGY SIGNIFICANTLY DIFFERENT).

Detailed	3.0	7.27	
			2.62

- t. San Domingo Wash and Tributaries -
 From the confluence with the Hassayampa River, Sec 3 T6E R4W, continuing north east to the county line.

Detailed	2.0	14.92	
			2.0

- u. Tub Spring Wash (San Domingo Wash tributary) -
 From the confluence with the San Domingo Wash, Sec 24 T7N R4W, continuing north east to the county line.

Detailed	3.25	3.9	
			.76

- taken out of scope

- v. OX Wash and Tributaries -
 From the confluence with the Hassayampa River, Sec 10 T6N R4W, north east to the head waters within the Wickenburg Mts.

Detailed	1.6	8.52	
			2.55

x w. ~~Turtleback Wash and Tributaries~~

From the Confluence with the Hassayampa south west to its head waters within the Vulture Mts.

Detailed	2.0	5.2
Approximate	2.5	6.33

The total Floodplain Delineations for Part I are 60.4 river miles.

PART II.

x aa. Powder House Wash -

From the confluence with the Hassayampa River north east to the County line.

Detailed	2.00
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ab. Flying E Wash and Tributaries -

From the confluence with Sols Wash south west.

Detailed	11.0	[11.4]	11.4
Approximate	3.0		3.0

ac. Casandro Wash -

From the confluence with Sols Wash south west.

Detailed	3.00
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[This wash to be delineated first, along with an economic analysis of flood mitigation alternatives immediately following the delineation.]

ad. Sunset Wash -

From the confluence of the Hassayampa River south west, along with the floodplain for the emergency spillway downstream from the dam.

Detailed	3.00	?	1.00
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ae. Sunny Cove Wash -

From the confluence of the Sunset Wash south west to the vicinity of the Vulture Mine Road along with the floodplain for the emergency spillway downstream from the dam.

Detailed	5.00	?	3.00
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af. Unnamed Wash #9 -

From the confluence of the Hassayampa River, Sec 12 T7N R4W, between Calamity Wash and Powder House Wash, continuing north east onto the Wickenburg Mountains.

Detailed	0.50
Approximate	0.50

ag. Unnamed Wash #10 -

Located between Cemetery Wash and Sunset Wash, Sec 12 T7N R5W, runs south west along the town cemetery.

Detailed	0.75
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x ah. Sols Wash Tributaries -
 From the confluence with the Hassayampa River north west
 to the County line.

Detailed	19.5	[20.8]	27.50
Approximate	1.3		1.25

x ai. Hartman Wash -
 From the confluence of Sols Wash, south west to the
 headwaters within the Vulture Mts.

Detailed	7.5	[8.0]	7.0
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aj. Ponding along the south side of the Atchisson Topeka & Santa Fe
 Railroad.

Detailed	6.00		
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The total Floodplain Delineations for Part II are 63.1 river
 miles.

5. Cross section orientation may need to be altered after running of the HEC-2 model to adjust for normality to flow per FEMA criteria.
6. Bridges and Culverts must be modeled in compliance with HEC-2 modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately.
7. All cross sections will be plotted using a pen plotter or laser printer. The cross section plots will show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information.
8. For floodplains identified as ponding areas, it is preferable to analyze the area by using the HEC-1 or HEC-2 model, as approved by the District, which will provide the District with water surface elevations. If appropriate, the Consultant shall identify a floodway within the ponded floodplains. The purpose of this floodway is to allow the pond to seek a constant stage throughout the areal extent of the ponds.
9. Flood zones must be determined according to FEMA criteria.
10. The Contractor will prepare working maps and models of the 100-year floodplain and floodway during the course of the hydraulic modeling analysis for review by the Flood Control District at progress meetings.
11. The delineation work shall meet requirements for floodplain delineations as prescribed by FEMA and the Arizona Department of Water Resources.
12. The Consultant shall review pertinent Flood Insurance Studies and Floodplain delineations and include this information when detailing the need for revisions and effects on the floodplain.

13. The Consultant shall prepare a floodplain delineation report to be submitted to FEMA, independent from and prior to the ADMS report, for FEMA's review and approval. The Consultant is responsible for all changes requested by FEMA and is responsible for gaining report approval.

D. FEMA Coordination:

1. The Consultant will submit the HEC I model, maps, and report to FEMA, through FCD and the Arizona Department of Water Resources (ADWR), for review by the Technical Evaluation Contractor (TEC). The HEC I will be submitted as the work is accomplished, prior to the submittal of the HEC II analysis. The Consultant will respond to questions by the Flood Control District, the Arizona Department of Water Resources, and the TEC, and make modifications to the hydrologic maps, model, and report if necessary.
2. The Consultant will submit maps, report, and HEC-2 model to FEMA through FCD and ADWR, for review by the Technical Evaluation Contractor (TEC). The Consultant will respond to questions by the reviewers, and make modifications to maps, models and report if required.

PHASE II

The information generated from Phase I of this project will be used to develop a detailed scope of work for Phase II. Following is a preliminary scope.

V. Area Drainage Master Plan:

A. The Consultant shall develop a comprehensive list of known flood problems on the watershed. This list will require coordination with the officials from each of the municipalities, transportation agencies, irrigation districts, and other sources. The Consultant will then categorize these problems on the basis of being independent or dependent problems, to be used in identifying drainage alternatives.

B. The Consultant shall prepare a comprehensive drainage inventory of existing drainage facilities in the watershed, their condition, capacity, and ownership, including natural washes. These facilities are to be part of the base map for alternatives. The Consultant should make maximum use of incorporating these facilities, where feasible, as part of the stormwater management plan alternatives (at least two alternatives).

Elements of the alternate plans may include, but are not limited to:

1. Detention or retention basins.
2. Channels and/or pipes.
3. Regulatory or policy changes affecting density or orientation of development, or detention/retention standards.
4. Nonstructural concepts.
5. Combinations of the above.

C. Evaluate the alternatives in terms of capital costs, effectiveness, environmental impacts, potential for staged construction, acceptability to local residents, and compatibility with other projects and plans. Perform a cursory cost benefit analysis for the different alternatives at each of the different frequencies, i.e., drainage alternative #1 for the 100 year frequency flood flow, 50 year, 10 year, 5 year and 2 year flows; alternative #2 for the five different frequencies, alternative #3 for each of the five different frequencies... By "cursory study" is meant that in investigating flood damages, it is not necessary to survey individual finished floor elevations for structures along with an inventory of the individual structure's contents. Rather, "building counts" can be done from aerial photographs, elevations determined from topographic maps, and the worth of structures and their contents may be determined from published averages for various categories of structures. Prepare a generalized working matrix for a ranked comparison of the alternative drainage plans, along with their respective benefits and costs.

- D. Present the ranked alternatives to the Flood Control District staff in an oral presentation format. Provide sufficient background and cost information to the decision process for selection of the preferred alternative plan.
- E. Recommend, and submit to the District for approval, the design criteria and objectives to be applied during the development of this area under the Area Drainage Master Plan, including:
1. Maximum allowable velocities.
 2. Channel characteristics, e.g., alignments and cross sections.
 3. Type(s) of drop structures.
 4. Provision for runoff in excess of design capacity and maximum depth of flow in streets.
 5. Maximum depth of basin and time required to drain basin.
 6. Maximum size or frequency-capacity for pipes and box culverts.
 7. Selection of dip vs. culvert crossings, and 100-year "all weather" crossings.
 8. Water quality
 - a) Stormwater runoff: characterize pollutants as a function of precipitation and land use, i.e., rainfall on an industrial area will produce some number of "average" pollutants per unit area in the stormwater runoff; likewise in a suburban residential area, and in an agricultural area.
 - b) Point source pollution: identify major point sources of pollution, i.e., industrial; generally characterize the pollutants and the manner or circumstances under which they are being introduced to the environment at large.
- F. Develop the selected system proposed for the Area Drainage Master Plan, to concept plan level only. The level of detail for the drainage plan will be limited to drainage areas of at least one square mile, or peak flows of not less than 800 cfs, unless extraordinary local conditions warrant Flood Control District participation at a more detailed level.
1. Establish approximate sizes, slopes, profiles, alignments, and plan and profile of proposed channels and pipes at 1"=200'; locations as appropriate for channels, pipes, trunk mains, culverts, and detention/retention basins.
 2. Determine the existing and required rights-of-way.
 3. Determine critical utility "interferences".

4. Estimate preliminary quantities and costs for each element of the system for the 100-year design flood and the 2-, 10-, 25-, and 50-year level of protection based on size reduction for each plan.
5. Estimate maintenance requirements and costs for the recommended (or all) ADMP.
6. Recommend a phased program for implementation of the system and estimate the phased program costs, assuming a planning horizon of the year 2015.
7. Water quality-mitigation of stormwater sources/point sources.
 - a. Stormwater: industrially zoned areas produce "normal" pollutants as rainwater falls on the buildings and parking lots; likewise with residential and agricultural areas. At present, such pollution is considered "normal, background" pollution. Mitigation would presumably consist of some type of area-wide collection and treatment system.
 - b. Point source: major point source polluters would have to mitigate their pollution consistent with EPA and Arizona Department of Environmental Quality regulations.

VI. ENVIRONMENTAL ASSESSMENT:

The Consultant will conduct an Environmental Assessment of the various drainage alternatives. Consistent with the Corps of Engineer's Section 404 permit guidelines, the environmental impact of the various drainage alternatives will be one of the criteria by which the FCD identifies the preferred drainage alternative.

VII. Supporting Documentation will include but is not limited to:

A. Mapping:

1. One complete set of 9" X 9" contact prints of the aerial stereo photographs sequentially numbered and catalogued.
2. One complete set of contour maps, blue-line, draft copy for Flood Control District reference during the project, delivered immediately following the topographic mapping.
3. One complete set of contour (base) maps at 1"=200' scale, in reproducible form (mylar); final format.
4. Two overlays for the above mylars: one overlay with the delineated floodplains; the second depicting the various elements of the area drainage master plan.

5. One complete set of contour maps at 1" = 200' scale with the floodplain delineations in reproducible form (mylar); final format.
6. One complete set of contour maps at 1" = 1200' scale, in reproducible form (mylar); final copies.
7. Three overlays or information layers (digitized) for the above mylars: one with the hydrologic subwatersheds; a second layer with the delineated floodplains; a third depicting the various elements of the area drainage master plan.
8. One complete set of presentation maps: USGS quad sheets mounted on foam board with overlays for the existing and the new delineated floodplains, drainage patterns, and the subwatersheds.
9. One complete set of mylars for the foldout maps (no larger than 11" x 17") used in the report. One sheet for each of the following: topography, delineated floodplains, sub-basins for the watershed, the various elements of the ADMP, land use patterns (zoning), and hydrologic soil groups.
10. One-half inch magnetic tape formatted at 1600 bpi containing the topographic data and the digitized floodplain/floodway boundaries in either the AutoCAD DXF ASCII format or the Intergraph ISIF ASCII format.
11. A hardcopy of the HEC-2 and HEC-1 printouts and a copy of the HEC-2 and HEC-1 model input/output on 5-1/4", 1.2 Mb diskettes compatible with an "IBM-AT" personal computer.
12. Tabular list of control points (ERM's) used with descriptions, elevations, and coordinates.

B. Reports:

The Contractor will produce a final report incorporating the comments of the District, FEMA and other reviewers using the latest Association of State Floodplain Management (ASFPM) mapping and engineering standards committee outline for FIS reports.

REPORT FORMAT:

A. SUMMARY

1. Description of Study Area
2. Scope of Project
3. Selection of Alternative Plan
4. Recommended Alternative
 - a. Proposed Structural Improvements
 - b. Non-structural Improvements
 - c. Floodplain Management Recommendations
5. Construction and Maintenance Programs
 - a. Costs

- B. EXISTING DRAINAGE BASIN CONDITIONS
 - 1. Basin and Sub-Basin Descriptions
 - 2. Drainage Conditions
 - a. Natural Drainage Features
 - b. Existing Improvements
 - 3. Runoff Concentration Points
- C. HYDROLOGY
 - 1. Rainfall
 - 2. Peak Discharge Determinations
 - 3. Flood Routing Methods and Results
- D. FLOODPLAINS AND AREAS OF POTENTIAL FLOODING
 - 1. Summary of Existing Flooding Complaints
 - 2. Determination of 100-year Floodplains: Methods and Results
 - 3. Areas and Locations of Potential Flooding
- E. BASIN MANAGEMENT ALTERNATIVES
 - 1. Structural Improvements
 - 2. Non-Structural Solutions
 - 3. Floodplain Management Recommendations
- F. ENVIRONMENTAL ASSESSMENT
- G. IMPLEMENTATION PROGRAM
 - 1. Phasing of Structural and Non-Structural Solutions
 - 2. Costs
- H. REFERENCES
- I. PLAN AND PROFILE DRAWINGS
- J. LIST OF FIGURES
 - Location Map
 - Topographic map
 - Maps of hydrologic Basins and Sub-Basins
 - Flood Routing Hydrographs
 - 100-year Floodplains and Areas of Potential Flooding
 - Land use/zoning map
 - Map depicting proposed ADMP
 - Map of hydrologic soil groups
- K. LIST OF TABLES
 - Hydrologic Sub-Basin Characteristics
 - Peak Discharges
 - Unit Costs for ADMP features
 - Projected Costs for future condition watershed conditions and ADMP features
 - Elevations of spillways and inverts of key drainage structures; water surface elevations at those same points for the design discharges
 - Elevation Reference Marks (ERM's)

VIII. Study Management Tasks will include the following:

A. The Consultant shall participate in conferences and liaison with the appropriate officials and agencies during the progress of the work, up to final acceptance by the District. The following is a list of the required meetings for coordination, review, and approval of the work in progress:

1. Review and approval of study hydrology and preliminary review of mapping.
2. Regular coordination (at least every three weeks) with the District's Project Manager.
3. Milestone coordination meetings in the development of the selected alternative system, will be held at the 33%, 67%, and 90% completion points with the Review Committee. The Review Committee will review all of the drainage alternatives and identify the preferred drainage plan at the 67% progress meeting.
4. Presentation of the final Area Drainage Master Plan and maps to the Review Committee.
5. Coordinate and support the public involvement presentations. There will be three meetings, each given at two locations, at the progress points noted on the attached "Major Task Phases", to inform the public of the status and results of the project. The Consultant will be responsible for the presentations, and all presentation materials, including hand-outs, slides, overheads, and presentation boards. The meetings will be held at locations to be specified.

B. The Consultant shall provide briefing summaries and appropriate printed materials at each of the scheduled meetings in 10 copies, and an additional 5 copies for milestone meetings. The Consultant shall provide meeting summaries or minutes within one week after each meeting for distribution by the District.

The final draft report and draft Executive Summary shall be submitted in 10 copies to reach the District 10 days prior to the scheduled presentation briefing. The required maps and one copy of the final Master Plan report shall be submitted to the District for proofing within 14 days following the presentation briefing meeting. It shall include all corrections and address all comments raised during the briefing. The final Master Plan shall be printed and bound, and 20 copies furnished to the District together with 30 copies of the Executive Summary within two weeks of return of the proof copy. A reproducible of each page/sheet of printed material in the report shall be delivered to the District together with the printed copy. A copy of all calculation sheets and computer input data (HEC-1, and HEC-2 model diskettes) produced by the Consultant in developing the report shall also be furnished at that time. All materials generated to produce this report are the property of the District, although the Consultant may retain a copy for their own use.

The District shall provide any existing data, maps, and plans deemed pertinent by the Consultant and the District in assisting in the progress of the study. The originals of all data, maps, and plans provided by the District and other agencies shall be returned to the District at the time of final contract billing by the Consultant.

APPENDIX B

CVL SCOPE OF SERVICES

EXHIBIT "A"
WICKENBURG ADMS

This proposal is submitted to Black & Veatch (B&V) as part of the division of financial and project work responsibilities.

For a detailed description of Scope of Work, reference should be made to the attached "Project Approach," as submitted to the Flood Control District of Maricopa County. The Project Approach defines:

- Part I - Mapping Hydrology and Floodplain Delineation, and
- Part II - Area Drainage Master Plan

The detailed Scope of Work included herein is for Part I of the Project. The Part II portion of Scope of Work is excluded and will be defined at a later date.

The following portion of Scope of Work defines Coe & Van Loo's (CVL's) responsibility in the Part I portion of the Project.

General

Black & Veatch will be the prime contractor to which CVL will provide consulting services. Mr. Ashok Patel of CVL will be the Project Manager with responsibilities to administer project work tasks and coordinate with the District for both CVL and Black & Veatch.

Prior to beginning the work, CVL shall furnish Black & Veatch for approval the names of its key employees to be used on this PROJECT. Any subsequent changes are subject to the written approval of Black & Veatch.

For each of the following described tasks, CVL will perform the work outlined for the percentage indicated in parenthesis. The work will be divided according to these percentages, the total fee being summarized in Tables 1, 2 and 3.

Table 1 Project Fee Summary: This table depicts the division of fees per tasks between Black & Veatch and CVL.

Table 2 Project Fee Summary by Subtasks: This table is prepared in conjunction with the consulting services to be provided by CVL. Detailed description for the services is included for each subtask in the text portion of this Exhibit "A". It is understood that completion of any subtask requires, at a minimum, preliminary drafts of any maps, tables, figures, and supporting text required for the corresponding section of the final report. The final report is outlined in the Scope of Services from the Prime Agreement (included as Exhibit "B" to this Agreement).

Table 3 Floodplain Delineation: The floodplain delineation work is divided into four separate study areas: Studies A, B, C and D. These study areas include a group of washes, which are defined by name, type of study (D=Detailed, A=Approximate), length

of water course, and estimated manhours to complete the study. CVL will be responsible specifically for the study areas "B" and "D" as defined in Table 3.

Task 100 - CVL will take a leading role for completion of this task (80%) as outlined in the attached "Project Approach." This task will be completed within two months from the date of Notice To Proceed (NTP). B&V will provide input to this task and assist CVL on an as-needed basis. B&V's contribution will end as soon as they have exhausted their budgeted amount.

This task excludes specifically any field investigation, reconnaissance and any report of other work which will be available after the two month period. CVL will be responsible for the completion of this task. As part of completing this task, CVL will draft and submit the REFERENCES section of the final report to B & V.

Task 200 - Responsibilities for this task will be divided equally between B&V and CVL. The work will be performed per detailed outline in the attached Project Approach.

Task 201 - CVL will coordinate the review and selection of aerial mapping consultants (80%). B&V will provide input and guidance for the review of mapping proposal and mapping schedules. A majority of this work has already been completed prior to submittal of this proposal.

B&V will take a leading role in the performance of the following tasks:

Task 202 - CVL will provide input for the ground control and mapping (20%).

Task 203 - B&V will coordinate with the mapping companies for the preparation of base maps. CVL will provide input and suggestions for the preparation of base and sketch maps (20%).

It should be noted that the following items are not included in Task 200 as outlined in the "Project Approach" but are covered under the tasks noted.

- Global Positioning System is not included in this Scope of Work.
- Geographic Information System is included in Task 406.
- Base Mapping is included in Task 406.
- Sketch Mapping is not applicable and is to be included in Part II.
- Presentation Mapping is included as applicable with Tasks 406 and 600.
- Hydrology Mapping is included with Task 600.

Task 300 - B&V will take a leading role and responsibility for completion of this task. The overall manpower effort provided by CVL will be 28% of the project fee and manhours. Detailed breakdown of responsibilities for each subtask is outlined below:

Task 301 - Review Hydrology Parameters: This will be a joint equal effort by CVL and B&V for reviewing and analyzing hydrology parameters for the purpose of setting guidelines (50%).

Task 302 - Field Reconnaissance: CVL will be responsible for field reconnaissance for the (24%) subareas assigned to them. These subareas are denoted in Figure 1.

Task 303 - Watershed Delineation: CVL will be responsible for watershed delineation for the (24%) subarea assigned to them.

Task 304 - Flow Diversions/Splits: CVL will be responsible for all flow diversions/splits associated with the (24%) subarea assigned to them.

Task 305 - Reservoir Storage: There are four reservoir storage areas identified within the entire watershed. Two of these storage areas are located within the (24%) subarea assigned to CVL, and the remaining two are in the (76%) subarea assigned to B&V. Therefore, the storage analysis responsibility will be equally (50%) divided between CVL & B&V.

Task 306 - Channel Routing: CVL will be responsible for channel routing functions in conjunction with the (24%) subarea assigned to them.

Task 307 - Precipitation Data: This subtask will be a joint effort and be performed equally (50%) between CVL & B&V.

Task 308 - Existing Condition Hydrology Model: CVL will be responsible for the preparation and analysis of Existing Condition Hydrology Model for the (24%) subarea assigned to them. Copies of the final model will be given to B&V for inclusion in the final report.

Task 309 - On-going Development Projects: CVL will be responsible for the (24%) subarea assigned to them.

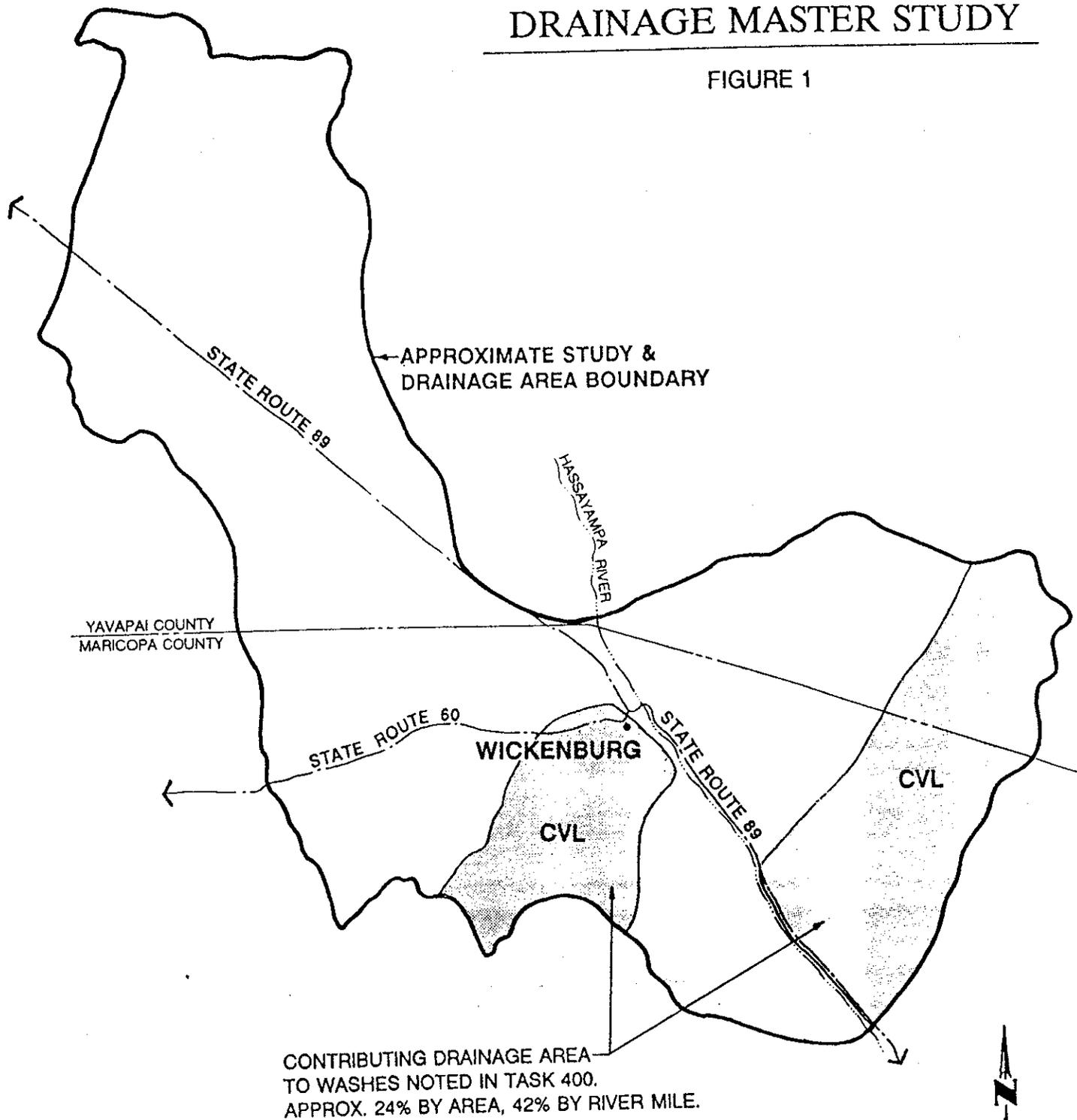
Task 310 - Future Condition Hydrology Model: CVL will be responsible for all subtasks associated with the (24%) subarea assigned to them.

Task 311 - Dam Break Model Report: CVL will provide input and suggestions regarding the Dam Break report. CVL anticipates only a very minor role in this task (20%) and B&V will be responsible for the task completion.

Task 312 - Hydrology Report: CVL will provide basic information needed for the completion of the report in the final format currently used by the FCDMC, along with preliminary drafts of supporting text, maps and documentation. CVL's responsibility will be for the (24%) subarea assigned. It is understood that the report will be assembled by B&V in Tasks 601, 602a and 603a.

WICKENBURG AREA DRAINAGE MASTER STUDY

FIGURE 1



CONTRIBUTING DRAINAGE AREA
TO WASHES NOTED IN TASK 400.
APPROX. 24% BY AREA, 42% BY RIVER MILE.



Task 400 - Flood Plain Delineation: CVL will take a leading role in completing this task. However, both CVL & B&V will be directly responsible for completion of floodplain delineations for the washes assigned to them. B & V will provide basic information needed for the completion of the report in the final format currently used by the FCDMC, along with the preliminary drafts of supporting text, maps and documentation. Completion of floodplain delineations will require development of preliminary drafts of maps, tables, figures and supporting text as well as organized files of calculations, computer analyses, and any documentation required under the Prime Agreement.

CVL will be responsible specifically for the study areas "B" and "D" (46%) which include 14 washes as listed below:

Study B

- | | | |
|----|--|---|
| f. | <p>Unnamed Wash #1
From the confluence of the Hassayampa River, Sec. 3 T6N R4W, continuing north east into the Wickenburg Mountains.</p> | <p>Detailed 0.50
Approximate 0.50</p> |
| g. | <p>Unnamed Wash #2 -
From the confluence of the Hassayampa River, Sec 33 T7N R4W, continuing north east into the Wickenburg Mountains.</p> | <p>Detailed 1.00
Approximate 0.50</p> |
| h. | <p>Unnamed Wash #3
From the confluence of the Hassayampa River, sec 33 T7N R4W, continuing north east into the Wickenburg Mountains.</p> | <p>Detailed 1.5
Approximate 3.50</p> |
| s. | <p>Little San Domingo Wash and Tributaries
From the confluence with the Hassayampa River, north east to the White Cloud Mine (If hydrology significantly different).</p> | <p>Detailed 3.0</p> |
| t. | <p>San Domingo Wash and Tributaries -
From the confluence with the Hassayampa River, sec 3 T6E R4W, continuing north east to the county line.</p> | <p>Detailed 2.0</p> |
| v. | <p>Ox Wash and Tributaries
From the confluence with the Hassayampa River, Sec 10 T6N R4W, north east to the head waters within the Wickenburg Mountains.</p> | <p>Detailed 1.6</p> |

Study D

- q. Unnamed Wash #14
From the confluence with the Hassayampa River, Sec 18 T7N R4W, between Turtleback Wash and Cemetery Wash, continuing south east.
Detailed 1.00
- r. Cemetery wash and Tributaries
From the confluence of the Hassayampa River, Sec 7 T7N R4W, continuing south east to the Vulture Peak Mountain. (if hydrology significantly different).
Detailed 10.8 [11.3]
Approximate 4.5 [5.0]
- w. Turtleback Wash and Tributaries -
From the confluence with the Hassayampa south west to its head waters within the Vulture Mountains.
Detailed 2.0
Approximate 2.5
- ac. Casandro Wash -
From the confluence with Sols Wash south west.
Detailed 3.00
- (This wash to be delineated first, along with an economic analysis of flood mitigation alternatives immediately following the delineation.)
- ad. Sunset Wash -
From the confluence of the Hassayampa River south west along with the floodplain for the emergency spillway downstream from the dam.
Detailed 3.0
- ae. Sunny Cove Wash -
From the confluence of the sunset Wash south west to the vicinity of the Vulture Mine Road along with the floodplain for the emergency spillway downstream from the dam.
Detailed 5.00
- ag. Unnamed Wash #10 -
Located between Cemetery Wash and Sunset Wash, Sec 12 T7N R5W, runs south west along the town cemetery.
Detailed 0.75
- aj. Ponding along the south side of the Atchisson Topeka & Santa Fe Railroad.
Detailed 2.50

For effectiveness and simplicity, responsibility is assigned for subtasks as follows:

Task 401 - Topographic Mapping: This task is directly related to the manhours to complete Task 406 "Floodplain Delineation". The work is therefore split according to that ratio, B & V (58%), CVL (42%).

Task 402 - Structure Surveys: This subtask work will be performed by a mapping subconsultant. Any effort needed by CVL or B&V is included in the subtask 406.

Task 403 - Hydraulic Cross-Sections: This subtask will be performed by CVL in conjunction with the washes (42%) assigned to them as listed in Task 400.

Task 404 - Field Reconnaissance: Any effort needed for this subtask by CVL or B&V is included in Task 406.

Task 405 - Field Observation Report: For this subtask, CVL will take a leading role in preparation of report (60%). B&V will provide to CVL indexed photographs for the (58%) subarea washes assigned to them. CVL's role will include photograph inventory for the (42%) subarea washes, plus responsibility for completion of the document and report text.

Task 406 - Floodplain/Floodway Delineation: CVL will perform this subtask (42%) in conjunction with all washes assigned to them as outlined in Task 400. CVL will take full responsibility for completion of work for all washes listed.

Task 407 - Ponding Areas: CVL will be responsible for evaluation of ponding areas associated with all washes assigned to them per Task 400. The workload will be divided according to the ratio in Task 406, B & V (58%), CVL (42%).

Task 408 - Model Adjustments: This subtask is included in Task 406.

Task 409 - FEMA/Agency Coordination: CVL will take a leading role in this subtask for the coordination effort (90%). Any changes or corrections needed to satisfy the reviewing agency's comments shall be the responsibility of the consultant who initially prepared the work.

Task 600 - B&V and CVL will both assume equal responsibilities for the final documents (50% each). A detailed breakdown of responsibilities for each subtask is outlined below:

Task 601 - Assemble Documents: This effort will be equally supported by both companies.

Task 602 - Task 602 as outlined in the Scope of Work is divided into two subtasks, Task 602a and Task 602b. Task 602a is the preparation of Interim and Final Hydrology Reports. B&V will take the leading role for Task 602a with support provided by CVL (10%). Task 602b is the preparation of Interim and Final

Floodplain Delineation Reports. CVL will take the leading role for Task 602b (90%).

Task 603 - Task 603 was not noted in the Scope of Work, but is added herein. This task entails Quality Control of the Final Report Documents. Distribution of responsibility and fees is as for Task 602a (10%) and 602b (90%).

Task 700 - B&V and CVL will both assume equal responsibilities for the Study Management and Coordination tasks as defined in the "Project Approach." Not included in Task 700 are Tasks 704 and 705. The study fees and manhours for these tasks have been reallocated to Task 603.

Task 701, 702, 703 - B&V and CVL will each have equal responsibilities (50%) for "Project Initiation," "Agency and FCD Coordination," and "Public Meetings."

APPENDIX C

FORMAT FOR
MEETING MINUTES

BLACK & VEATCH

MEETING MEMORANDUM

Flood Control District of Maricopa County
Wickenburg Area Drainage Master Study
Contract FCD 89-79

B&V Project 17676._
B&V File L._
Date

TO: Meeting Participants

FROM: (Person Reporting Minutes)

RE: (Meeting Subject and Purpose)
Date: (Day and Date of Meeting)
Location: (Meeting Location)

ATTENDING: (List of Persons Attending and Affiliations)

ACTION ITEMS

(List of specific actions requested at this meeting, including person responsible and schedule for completion as appropriate)

ITEMS DELIVERED

(List all data, documents, and other information provided each agency listed)

TO FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TO BLACK & VEATCH

TO COE & VAN LOO CONSULTING ENGINEERS, INC.

TO (Other agencies as appropriate)

SUMMARY COMMENTS

(Provide short paragraph summarizing the discussion of each topic covered. Add sub-paragraphs as needed for critical details.)

cc: Greg Rodzenko (FCDMC)
Ash Patel (Coe & Van Loo)
Paul Hoskin (Coe & Van Loo)
Tim Meyer (Black & Veatch)

APPENDIX D

MISCELLANEOUS PROJECT CONTACTS

APPENDIX D
MISCELLANEOUS PROJECT CONTACTS
WICKENBURG ADMS
CONTRACT FCD 89-79
(Updated November 27, 1990)

Black & Veatch
2111 East Highland Ave., Suite 305
Phoenix, Arizona 85016

B&V PN 17676
CVL 1197-02

Project Director - David R. Mahaffay, P.E.
Project Engineer - Timothy K. Meyer, P.E.

Office (602) 381-4406
Office (602) 381-4418
FAX (602) 381-4440

Coe & Van Loo Consulting Engineers, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

Office (602) 264-6831
FAX (602) 264-0928

Project Manager - Ash Patel, P.E.
Project Engineer - Paul Hoskin, P.E.

Flood Control District of Maricopa County
3335 West Durango

Office (602) 262-1501
FAX (602) 269-4601

Chief, Planning/Proj. Mgmt. - John Rodriguez, P.E.
Project Manager - Greg Rodzenko

Coordination - Dick Perreault
Contracts - Leanna Cumberland

Technical Review

Hydrology Methods

- Joe Rumann
- Davar Khalili
- Steve Waters

Watershed

- Russ Cruff
- Amir Motamedi
- Sandy Shilto

Floodplain

- Joe Tram
- Besian Khatiblou

Public Involvement

- Susan Fitzgerald

Environmental

- Catesby Moore
- A.J. Blech

Mapping Consultants

West Area

McLain Harbers Co., Inc.
Aerial Mapping & Surveying
720 W. Prince Road
Tucson, Arizona 85705

Office (602) 887-7272
FAX (602) 887-7296

Lee Harbers, V.P. (Photogrammetry)
Gordon McLain (Survey)

East Area

Western Air Maps, Inc.
13001 West 95th Street
Lenexa, Kansas 66215

Local Office (602) 866-7391
Office (913) 888-5266
FAX (913) 888-5361

Scott Perkins (Photogrammetry)

Morrison Maierle/CSSA (Survey subconsultant)
Engineers Planners Surveyors
4621 North 16th Street, Suite D-401
Phoenix, Arizona 85016

Office (602) 277-2828
FAX (602) 279-2554

James G. Spring, R.L.S. (Survey)

Town of Wickenburg
P.O. Box 1269
Wickenburg, Arizona 85358

Office (602) 684-5451

Skip Blunt (Building Inspector)

Glen Bush, P.E. (Town Engineer)
Yost & Gardner Engineers
2619 N. 3rd Street
Phoenix, Arizona 85004

Office (602) 264-6424
FAX (602) 277-6716

APPENDIX E

FLOOD INSURANCE STUDIES
CONTACT LIST

CONTACT LIST
(Updated September 26, 1990)

<u>AGENCY</u>	<u>ATTENTION</u>	<u>PHONE</u>
Federal Emergency Management Agency Natural and Technological Hazards Division Region IX Presidio of San Francisco, Building 105 San Francisco, CA 94129	Ray Lenaburg Project Officer	(415) 923-7177
Federal Emergency Management Agency Risk Studies Division Federal Insurance Administration 500 C Street, SW Room 422 Washington, D.C. 20472	Robert Weiss Brian Mrazik John Matticks Karl Mohr Alan Johnson Mrs. Cynthia M. Croxdale (Receptionist) Bill Judkins	(202) 646-3748 (202) 646-2769 (202) 646-2767 (202) 646-2770 (202) 646-3403 (202) 646-2767 (202) 646-3458
Department of the Army Los Angeles District, Corps of Engineers Attn: SPLPD-WF Chief, Planning Division Post Office Box 2711 Los Angeles, CA 90053-2325	John Karakawa John Pederson Jody Fischer Tony Nifas Glenn Mashburn	(213) 894-2245 (213) 894- (213) 894-4759 (213) 894-5497
(STREET ADDRESS)		
300 North Los Angeles Street Los Angeles, CA 90012		
Flood Control District of Maricopa County 3335 West Durango Phoenix, AZ 85009	Dan Sagramoso, P.E. Chief Engineer and General Manager Dave Johnson Chief Hydrologist Joe Tram Russ Cruff Tim Murphy	(602) 262-1501
Michael Baker, Jr., Inc. 1420 Kings Street, Sixth Floor Alexandria, VA 22314	Bob Henchbarger Dave Greenwood (FAX) Michele Monde Bill Petrucci	(703) 838-0400 (703) 836-0130

