

WEST FORK JIMMY CAMP CREEK
DRAINAGE BASIN PLANNING STUDY

Prepared for:

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EXECUTIVE SUMMARY
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING
STUDY
REVISED OCTOBER 17, 2003

Authorization

The Drainage Basin Planning Study (DBPS) for the West Fork Jimmy Camp Creek Drainage Basin was authorized by New Generation Homes, Inc., under the terms of agreement between New Generation Homes and Kiowa Engineering Corporation. The requirement to prepare the DBPS is associated with the Glen at Widefield development plan submittal, which is a proposed land development that lies within the West Fork Jimmy Camp Creek basin. This basin lies within El Paso County, and within portions of the incorporated areas of the City of Fountain and the City of Colorado Springs.

Purpose and Scope

The purpose of the study is to identify feasible stormwater management plans to satisfy the existing and future needs within the West Fork Jimmy Camp Creek Drainage Basin. The West Fork Jimmy Camp Creek basin is to be referred to throughout this study and is inclusive of the mainstem and "Drainageway A" watersheds.

Mapping and Surveying

Mapping used in the planning effort for the West Fork Jimmy Camp Creek basin consisted of USGS 7-1/2 minute quadrangles and two-foot contour mapping for selected areas of the basin. Two-foot contour interval, 1-inch to 200-foot scale planimetric topographic maps were used within the developments known as Cross Creek at Mesa Ridge and the Glen at Widefield in order to confirm basin divides and to layout major drainageway facilities and detention basins within these areas. The City FIMS mapping was utilized in the area north of Fontaine Boulevard.

Basin Description

The West Fork Jimmy Camp Creek basin covers a total of 4 square miles in unincorporated El Paso County, the City of Fountain and the Colorado Springs, Colorado. Of this total, approximately 0.7 square miles is encompassed by the Drainageway "A" basin, and 2.9 square miles for the mainstem West Fork Jimmy Camp Creek basin. The remainder of the basin is direct flow area (DFA), to Jimmy Camp Creek. The basin trends in generally a south to

southeasterly direction, entering Jimmy Camp Creek at approximately one-half mile upstream of Link Road. At this time, approximately 10 percent of the basin is developed. Strong development pressure now exists within the balance of the basin.

The maximum basin elevation is approximately 6,010 feet above mean sea level, and falls to approximately 5,620 feet at the confluence with Jimmy Camp Creek. The headwaters of the basin originate in grassland covered areas of the southeastern portion of the Colorado Springs Municipal Airport property. The surface characteristics of the basin are typified by rolling range land with fair to good vegetative cover associated with semi-arid climates. There are three open water storage areas that exist along the West Fork Jimmy Camp Creek and Drainageway "A" channel. These open water areas are remnants of the earlier irrigation facilities associated with the former ranch land operations. The Fountain Mutual Irrigation Canal traverses the basin from southwest to northeast.

Hydrology

A hydrologic analysis was conducted in order to determine peak discharges and runoff volumes for various storm types, and basin development conditions. This data was used in the evaluation of floodplains and in the evaluation of drainageway alternatives. Hydrology has been prepared for the West Fork Jimmy Camp Creek watershed in previous reports. The hydrologic analysis contained within the DBPS has been prepared in conformance with the City/County Storm Drainage Criteria Manual. The runoff model used to determine the peak flows and volumes within the study area is the U. S. Army Flood Hydrograph Package (HEC-1). The use of this hydrological model is in compliance with the City of Colorado Springs/El Paso County Drainage Criteria Manual.

Results

The results of the hydrologic analysis have been presented in several formats within the DBPS. A basin hydrologic map presents the major basin boundary, sub-basin boundaries and numbers, routing elements, and design points. A summary of flow rates for key design points is presented on Figure 3 within the DBPS. The peak discharges at the confluence with Jimmy Camp Creek for the existing and developed conditions (i.e., 3,550 cfs and 4,900 cfs respectively), compare well with the discharges presented in the Jimmy Camp Creek Drainage Basing Planning Study prepared by Wilson and Company and the El Paso County Flood Insurance Study (FIS). Differences in sub-basin delineation and flow routing parameters between the DBPS and past hydrology evaluations are responsible for the variations in peak discharges at comparable design points within the West Fork Jimmy Camp Creek basin.

Hydraulic Analysis

A hydraulic analysis was conducted to ascertain the conveyance capacity of existing hydraulic structures along the major drainageways of the West Fork Jimmy Camp Creek Basin. Field verifications of roadway crossings and existing channel improvements were conducted and the physical condition of the structure(s) noted. In some areas of the basin, a hydraulic analysis was conducted using the U. S. Army Corps of Engineers (COE), HEC-2 water-surface profile program. Cross-section data for the areas analyzed were obtained by using the two-foot contour interval planimetric topographic mapping.

Hydraulic Structure Inventory

As part of the field investigation, the existing drainage facilities were verified and inventoried. The size, type, and condition was recorded for all the bridges, culverts, channels, inlets, pipes, and miscellaneous drainage features in the basin. Hydraulic capacities were estimated for the culverts and bridges over the major drainageways. The physical condition of the major drainageways was reviewed in the field and using existing topographic mapping.

Alternative Analysis

Alternative drainageway improvement concepts have been examined that address the existing and future stormwater management needs of the basin. Quantitative and qualitative comparisons are presented in the DBPS, and a recommendation made as to which concepts are most feasible to advance to preliminary design and eventually implementation. The general planning goals to be achieved during the alternative evaluation phase were:

1. Identify stormwater facilities that will reduce existing floodplains and flooding problems within urbanized areas;
2. Provide stormwater management within developing areas of the basin in order to reduce the detrimental effects of runoff and sedimentation from disturbed areas;
3. Provide stormwater facilities that preserve and/or enhance the existing drainageway and areas adjacent to the drainageway that provide an environmental resource in the area;
4. Identify facilities which will minimize future operations and maintenance costs; and
5. Provide stormwater management facilities that will at least maintain and/or enhance the water quality characteristics of the basin.

Evaluation Parameters

The following list of parameters were considered when evaluating alternatives for addressing the long-term stormwater management needs for the basin:

- Flood Control
- Open Space/Aesthetics

- Erosion Control
- Operation and Maintenance
- Recreation
- Right-of-way
- Transportation - Roadway and Trails
- Land Use
- Water Quality
- Habitat
- Construction Cost
- Administration and Implementation

Environmental Resource Review

An environmental resource review was conducted for the major drainageways of the West Fork Jimmy Camp Creek basin. The resource review was conducted using aerial photographs of the basin and field visits to view areas of significant environmental resource. The most significant factors that have created the existing vegetative setting along the major drainageway (i.e., the West Fork and Drainageway A), has been the irrigation facilities and the land uses within the basin. Irrigation facilities that lie within basin include the Fountain Mutual Irrigation Ditch and two open water storage areas that lie below the irrigation canal. Seepage from the ditch as well as from the lakes is the source of the water supply that has created and supported wetland areas along some of segments of Drainageway A. Wetland and riparian zones were identified along several segments within the basin. It is likely that disturbance and/or encroachment into these areas resulting from land development activities will require notification of the U. S. Army Corps of Engineers and probably the issuance of a 404 permit.

Selected Improvements

The recommended channel sections for each reach of drainageway has been presented on preliminary plans contained within the DBPS. In general, the banks of the West Fork of Jimmy Camp Creek within segments below future Mesa Ridge Parkway are to be lined with riprap to 100-year flow depth. For the drainageways north of Mesa Ridge Parkway the low flow areas should have selectively lined riprap bank protection such as at outside bends, at bridge or culvert outlets, and at the confluence with side tributaries. In conjunction with the selective improvement measures, the 100-year floodplain should be preserved and regulated. Check structures have been sited along the drainageways in order to maintain the channel invert at a stable gradient. A degraded slope of no more than one-half of the existing slope was assumed when estimating the number of check structures needed along a given segment. The checks have been conceptually designed to allow for a maximum drop of three feet once the degraded slope has been reached.

Detention

The recommended plan calls for the construction of regional detention basins within the West Fork Jimmy Camp Creek Basin. The locations of the regional detention basins are shown

on the design plans. The purpose of the detention basins is to limit peak discharges at the basin's outfall to Jimmy Camp Creek to the existing hydrologic condition. The regional basins have also been sited within each of the major land developments to more locally control runoff to existing levels. Wherever practical, the regional detention basins should be designed so as to take advantage of the adjacent roadway embankments. It is not anticipated that any of the regional detention basins will be subject to State Engineer's regulations. Stormwater quality measures should be designed into the regional stormwater detention basins. These measures would include the provision of a water quality and sediment pool area in addition to the volume required for stormwater detention.

Right-of-Way

For the most part the main channels within the basin which pass through undeveloped areas and the right-of-way can be dedicated as part of the land development process. For those segments of the drainageway where floodplain preservation is the recommended plan, a combination of open space dedication (such as park-land and greenbelts), in combination with a more narrow dedicated right-of-way along the low flow area of the drainageway should be obtained through the land development process. Land acquisition will be required for the regional detention basins. The dedication of easements and right-of-way for the drainageways and detention basins would be accomplished at the time of development planning and platting of the parcels that lie adjacent to or upstream of the stormwater facility.

Cost Estimates and Drainage Basin Fees

Cost estimates have been prepared and are contained within the DBPS. The cost of the major drainageway facilities has been determined for each jurisdiction. The facility cost estimate will be used in the determination of the drainage and bridge fees for this basin. Bridge crossing costs have been determined as well for the basin.

Presented on Table 17 through 19 is the cost and plattable acreage (i.e., that area available for platting into subdivisions), data associated with the determination of drainage and bridge fees for the basin. The plattable acreage has been determined using a combination of assessor's maps, aerial photographs and topographic mapping that covering the watershed. As presented on Table 17, the reductions in the area available for platting have been listed. The reductions are mostly attributable to areas that are already platted, known roadway or planned road right-of-ways for minor and major arterials, and the area underlying the proposed detention basins.

Drainage basin fees have been determined for those areas that are within the City of Colorado Springs and El Paso County. The City of Fountain does not have a drainage basin fee system and therefore no fees have been calculated for the areas within the City of Fountain. The

area of the basin within the City of Colorado Springs lies within the Colorado Centre development and the Banning-Lewis Ranch Flood Conservancy District (District). It is the intent of the City of Colorado Springs that the District will be responsible for all drainage, detention and bridge improvement construction and maintenance. Prior to any development within the City, specific agreements will have to be finalized between the City and the District. The drainage and bridge fees calculated for the County areas have been determined in accordance with Resolution No. 99-383. The percent impervious values listed on Exhibit 3 of this resolution where applied when calculating the weighted percent impervious value for the sub-basins within the County.

TABLE 17
SUMMARY OF PLATTABLE ACREAGE
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING

JURISDICTION		ACREAGE (AC)
EL PASO COUNTY	TOTAL ACREAGE	1658.0
REDUCTIONS	THE GLEN FILINGS 1 AND 2	70.7
	PEACEFUL VALLEY ESTATES #1	135.0
	PEACEFUL VALLEY ESTATES #2	23.0
	SUNRISE RIDGE	72.2
	FOUNTAIN MUTUAL IRRIGATION PARCE	40.0
	MAJOR ROADWAYS	
	MESA RIDGE PARKWAY	1.8
	POWERS BOULEVARD	3.2
	FONTAINE BOULEVARD	0.6
	DETENTION BASINS	7.0
	TOTAL REDUCTIONS	353.5
	NET PLATTABLE ACREAGE	1304.5
	IMPERVIOUS PLATTABLE ACREAGE (1)	820.5
COLORADO SPRINGS	TOTAL ACREAGE	1392.0
REDUCTIONS	DETENTION BASIN 3021	10.3
	NET PLATTABLE ACREAGE	1381.7

(1) Based upon weighted percent imperviousness of 62.9 for County basins on

TABLE 18
BRIDGE FEE CALCULATION
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING

JURISDICTION		TOTAL COST (AC)
EL PASO COUNTY	WFJCC FUTURE COLLECTOR	\$ 248,000.00
	MESA RIDGE PARKWAY	\$ 700,000.00
	WFJCC EAST ARTERIAL	\$ 448,000.00
	TOTAL	\$ 1,396,000.00
	ENGINEERING, 10%	\$ 139,600.00
	CONTINGENCY, 5%	\$ 69,800.00
	TOTAL	\$ 1,605,400.00
	IMPERVIOUS PLATTABLE ACREAGE	820.5
	BRIDGE FEE (\$/AC)	\$ 1,956.61

TABLE 19
FEE CALCULATIONS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING

JURISDICTION	TOTAL COST (AC)
EL PASO COUNTY ROADWAY CROSSING AND DRAINAGEW AND DETENTION BASINS	\$ 4,889,866.00
TOTAL	\$ 4,889,866.00
ENGINEERING, 10%	\$ 488,986.60
CONTINGENCY, 5%	\$ 244,493.30
SUBTOTAL	\$ 5,623,345.90
DETENTION BASIN LAND COST	
7.0 ACRES @\$36,000 PER ACRE	\$ 252,000.00
TOTAL	\$ 5,875,345.90
IMPERVIOUS PLATTABLE ACREAGE	820.5
DRAINAGE FEE (\$/AC)	\$ 7,160.69
COLORADO SPRINGS ROADWAY CROSSING AND DRAINAGEW AND DETENTION BASINS	\$ 3,827,036.00
TOTAL	\$ 3,827,036.00
ENGINEERING, 10%	\$ 382,703.60
CONTINGENCY, 5%	\$ 191,351.80
TOTAL	\$ 4,401,091.40
PLATTABLE ACREAGE	1381.7
DRAINAGE FEE (\$/AC)	\$ 3,185.27
COLORADO SPRINGS DETENTION BASIN LAND ACQUISITION AND DETENTION BASINS	
10.3 ACRES @\$35,280 PER ACRE	\$ 363,384.00
TOTAL	\$ 363,384.00
PLATTABLE ACREAGE	1381.7
DETENTION BASIN LAND FEE (\$/AC)	\$ 263.00

LIST OF TABLES

	<u>Page</u>
Table 1: Land Use Data	6
Table 2: Summary of Sub-basin Discharges	7
Table 3: Summary of Design Point Discharges	7
Table 4: Summary of Hydraulic Structures – Crossings	11
Table 5: Summary of Hydraulic Structures – Drainageways	11
Table 6: Summary of Design Point Discharges with Regional Detention	19
Table 7: Summary of Detention Basin Data	20
Table 8: Summary of Major Roadway Crossings	20
Table 9: Summary of Bridge Costs	22
Table 10: Summary of Major Roadway Crossing Costs	23
Table 11: Summary of Detention Basin Data and Costs	23
Table 12: Summary of Major Drainageway Costs	24
Table 13: Summary of Costs for the City of Fountain	24
Table 14: Summary of Costs for the City of Colorado Springs	25
Table 15: Summary of Costs within El Paso County	25
Table 16: Summary of Bridge Costs within El Paso County	26
Table 17: Summary of Unplatted Acreage	26
Table 18: Bridge Fee Calculation	27
Table 19: Drainage Fee Calculation	27

LIST OF FIGURES

	<u>Page</u>
Figure 1: Vicinity Map	3
Figure 2: Major Development and Land Use Map	4
Figure 3: Hydrologic Sub-basin Map	Map Pocket
Figure 3A: Hydrologic Sub-basin Map, The Glen at Widefield	8
Figure 4: Inventory of Existing Drainage Structures	12
Figure 5: Flood Insurance Study Floodplains	13

TABLE OF CONTENTS

	Page	
LIST OF TABLES	ii	
LIST OF FIGURES	ii	
I. INTRODUCTION		
Authorization	1	
Purpose and Scope	1	
Summary of Data Obtained	1	
Mapping and Surveying	1	
II. STUDY AREA DESCRIPTION		
Basin Description	2	
Climate	2	
Soils	2	
Property Ownership and Impervious Land Densities	2	
III. HYDROLOGIC ANALYSIS		
Runoff Model	5	
Basin Characteristics	5	
Curve Numbers	5	
Design Rainfall	5	
Hydrologic Modeling	5	
Results	5	
IV. HYDRAULIC ANALYSIS AND FLOOD PLAIN DESCRIPTION		
Hydraulic Structure Inventory	9	
West Fork Jimmy Camp Creek Drainageways	9	
Drainageway "A" Drainageways	10	
Fountain Mutual Irrigation Ditch	10	
Floodplains	10	
V. EVALUATION OF CONCEPTUAL ALTERNATIVES		
Introduction	14	
Evaluation Parameters	14	
Environmental Review	14	
Preliminary Matrix of Conceptual Alternatives	15	
		Drainageway System Alternatives 15
		Conclusions 16
		VI. SELECTED PLAN
		Criteria 17
		Hydrology 17
		Channels 17
		Check Structures 17
		Detention 17
		Roadway Crossings 18
		Trails 18
		Maintenance and Revegetation 18
		Right-of-Way 18
		Erosion and Sedimentation Control 18
		VII. PLAN IMPLEMENTATION
		General 21
		Cost Estimate 21
		Jurisdictions and Unplatted Acreage 21
		Drainage and Bridge Fee Calculations 22
		SELECTED PLAN DRAWINGS SHEETS 1 THROUGH 7
		<u>TECHNICAL ADDENDUM: Under separate cover</u>
		APPENDIX A: HYDROLOGIC CALCULATIONS
		APPENDIX B: HYDRAULIC CALCULATIONS

I. INTRODUCTION

Authorization

The Drainage Basin Planning Study (DBPS) for the West Fork Jimmy Camp Creek Drainage Basin was authorized by New Generation Homes, Inc., under the terms of agreement between New Generation Homes and Kiowa Engineering Corporation. The requirement to prepare the DBPS is associated with the Glen at Widefield development plan submittal, which is a proposed land development that lies within the West Fork Jimmy Camp Creek basin. This basin lies within El Paso County, and within portions of the incorporated areas of the City of Fountain and the City of Colorado Springs.

Purpose and Scope

The purpose of the study is to identify feasible stormwater management plans to satisfy the existing and future needs within the West Fork Jimmy Camp Creek Drainage Basin. The West Fork Jimmy Camp Creek basin is to be referred to throughout this study and is inclusive of the mainstem and "Drainageway A" watersheds. The specific scope of work for this study included the following tasks:

1. Meet with the Client and County to: insure compliance with the City/County Storm Drainage Criteria Manual, obtain existing data and general information from participating entities, solicit desires of participating entities and other interested agencies or groups in order to develop alternate plans, procure current information relative to development plans in the basin, procure information relative to right-of-way limitations, proposed stormwater projects, potential hazards due to flooding, and avoid duplication of effort whenever possible by utilizing existing information available from other agencies and past studies.
2. Contact the City(s), County, individuals, and other agencies who have knowledge and/or interest in the study area.
3. Utilize City/County policies and criteria and applicable information wherever possible.
4. Perform hydraulic and hydrologic analyses within the study area.
5. Identify environmental setting of basin.
6. Identify existing and potential drainage and/or flooding problems.
7. Develop improvement alternatives to reduce existing and potential flooding problems, and to mitigate the impact of stormwater runoff upon environmentally significant areas along the drainageway(s).
8. Recommend and prepare a conceptual design for a selected alternative plan.

10. Prepare written report for submittal to the County, City of Fountain and the City of Colorado Springs discussing items examined in the study.

Summary of Data Obtained

Listed below are the technical reports collected for the review as part of preparing this study:

1. Soil Survey for El Paso County, Colorado, dated June 1981.
2. "City of Colorado Springs/El Paso County Drainage Criteria Manual", prepared by City of Colorado Springs, El Paso County, dated May 1987, revised 1996.
3. "Flood Insurance Studies for Colorado Springs, and El Paso County, Colorado", prepared by the Federal Emergency Management Agency (FEMA), revised March, 1997.
4. Jimmy Camp Creek Drainage Basin Planning Study prepared by Wilson & Company, dated January, 1987, (unapproved).
5. Flood Plain Information Report, Jimmy Camp Creek, El Paso County, Colorado, prepared by the U. S. Army Corps of Engineers, dated December, 1976.
6. Peaceful Valley Estates Filing No. 2, Preliminary and Final Drainage Plan, prepared by Rockwell Minchow, Inc., dated March, 1995.
7. Cross Creek at Mesa Ridge, Master Development Drainage Plan, prepared by Rockwell Minchow, Inc., dated January 1999.
8. Peaceful Valley Road and Powers Boulevard Final Drainage Report, prepared by Wilson & Company, December, 1994.
9. The Glen at Widefield Master Development Drainage Plan, prepared by Kiowa Engineering Corporation, dated December 1999.

Mapping and Surveying

Mapping used in the planning effort for the West Fork Jimmy Camp Creek basin consisted of USGS 7-1/2 minute quadrangles and two-foot contour mapping for selected areas of the basin. Two-foot contour interval, 1-inch to 200-foot scale planimetric topographic maps were used within the developments known as Cross Creek at Mesa Ridge and the Glen at Widefield in order to confirm basin divides and to layout major drainageway facilities and detention basins within these areas. The City FIMS mapping was utilized in the area north of Fontaine Boulevard.

Drainageway site inspections were conducted throughout the study area, and photographs were taken documenting the key drainage features.

II. STUDY AREA DESCRIPTION

The West Fork Jimmy Camp Creek drainage basin is a right-bank tributary to Jimmy Camp Creek lying in the west-central portions of El Paso County. The West Fork Jimmy Camp Creek drainage basin covers approximately 4 square miles. Approximately 1.7 square miles are inside the City of Colorado Springs corporate limits. Approximately 1.5 square miles of the basin lies within the City of Fountain corporate limits. The balance of the basin lies within unincorporated El Paso County. The basin is divided into two major sub-basins, the West Fork Jimmy Camp Creek mainstem, and the Drainageway "A" basin. There is one direct flow area to Jimmy Camp Creek also contained within the study area. Figure 1 shows the location of the West Fork Jimmy Camp Creek basin.

Basin Description

The West Fork Jimmy Camp Creek basin covers a total of 4 square miles in unincorporated El Paso County, the City of Fountain and the Colorado Springs, Colorado. Of this total, approximately 0.7 square miles is encompassed by the Drainageway "A" basin, and 2.9 square miles for the mainstem West Fork Jimmy Camp Creek basin. The remainder of the basin is direct flow area (DFA), to Jimmy Camp Creek. The basin trends in generally a south to southeasterly direction, entering Jimmy Camp Creek at approximately one-half mile upstream of Link Road. At this time, approximately 10 percent of the basin is developed. Strong development pressure now exists within the balance of the basin.

The maximum basin elevation is approximately 6,010 feet above mean sea level, and falls to approximately 5,620 feet at the confluence with Jimmy Camp Creek. The headwaters of the basin originate in grassland covered areas of the southeastern portion of the Colorado Springs Municipal Airport property. The surface characteristics of the basin are typified by rolling range land with fair to good vegetative cover associated with semi-arid climates. There are three open water storage areas that exist along the West Fork Jimmy Camp Creek and Drainageway "A" channel. These open water areas are remnants of the earlier irrigation facilities associated with the former ranch land operations. The Fountain Mutual Irrigation Canal traverses the basin from southwest to northeast.

Climate

This area of El Paso County can be described, in general as high plains, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry.

Precipitation ranges from 14 to 16 inches per year, with the majority of this precipitation occurring in spring and summer in the form of rainfall. Thunderstorms are common during the summer months, and are typified by quick-moving low-pressure cells that draw moisture from the Gulf of Mexico into the region. Average temperatures range from about 30°F in the winter to 75° in the summer. The relative humidity ranges from about 25 percent in the summer to 45 percent in the winter.

Soils

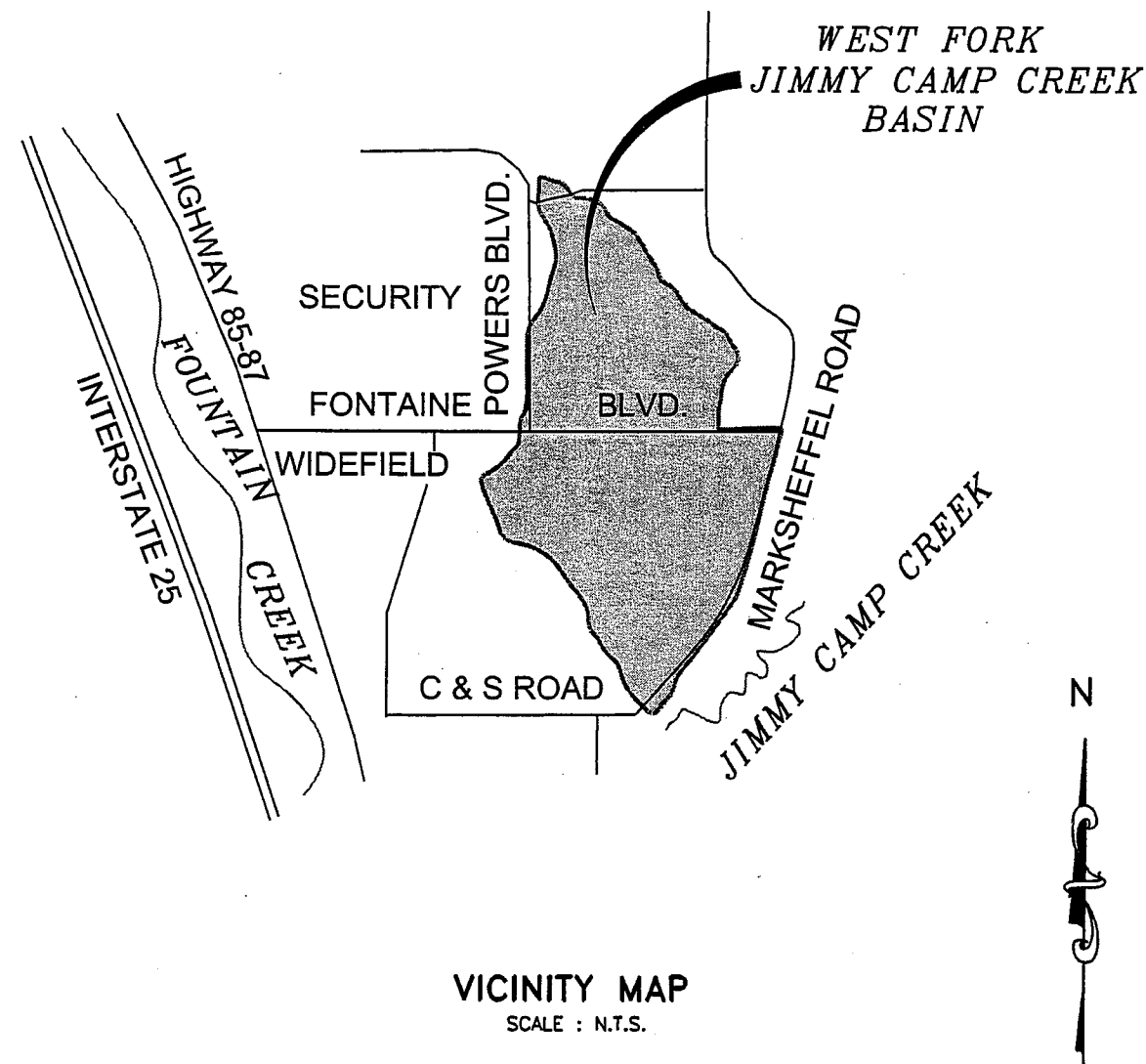
Surficial soils within the West Fork Jimmy Camp Creek basin vary between hydrologic types B through D, as identified by the U. S. Department of Agriculture, Soil Conservation Service. The predominant B-soil groupings are in the Stoneham sandy loam, Nelson Tassel fine sandy loam, Ustic Torrfluvents loam, Wiley silt loam, and Fort Collins loam soil associations. The predominant C-soil groupings are in the Razor-Midway complex, Nunn clay loam, and Manzanola loam soil associations. These soils consist of deep, well-drained soils that formed in alluvium and residuum, derived from sedimentary rock. The soils have high to moderate infiltration rates, and are extremely susceptible to wind and water erosion where poor vegetation cover exists.

Property Ownership and Impervious Land Densities

Property ownership along the major drainageways within the West Fork Jimmy Camp Creek basin is mostly private. The only existing developed areas of the basin are the Sunrise Ridge Phase I medium density single-family development and the Peaceful Valley Estates low-density residential development. Both of these developments drain to Drainageway "A", and lie west and east of future Powers Boulevard. Where development has not occurred, the drainageways remain under private ownership and there are no delineated drainage right-of-ways or easements.

The undeveloped land in the basin is primarily controlled by four major landowners. In the lower portion of the basin, the Cross Creek at Mesa Ridge Development is proposed. This area extends from Marksheffel Road to future Mesa Ridge Parkway (formerly known as Peaceful Valley Road). The Cross Creek at Mesa Ridge property lies within El Paso County. Between Mesa Ridge Parkway and Fontaine Boulevard the Glen at Widefield and the "Singer" properties exist. The "Singer" property, also known as the Crescent Heights Development, lies within the City of Fountain. The Glen at Widefield property lies within unincorporated El Paso County. North of Fontaine Boulevard is the Colorado Centre Development and a small portion of the City of Colorado Springs Municipal Airport. The majority of the area north of Fontaine Boulevard lies within the City of Colorado Springs corporate limits.

Land-use information related to the existing and future conditions were reviewed as part of the planning effort. This information is used in the hydrologic analysis to predict runoff rates and volumes for the purposes of facility evaluation. The identification of land uses abutting the drainageways is also useful in the identification of feasible plans for stabilization and aesthetic treatment of the creek. Presented on Figure 2 is the proposed land use map that was used in the development of soil curve numbers (i.e., CN-values). Figure 2 is not intended to reflect the future zoning or land use policies of the City(s) or the County. Land-use information for the areas described above were obtained from published drainage reports and master development plans.



Kiowa Engineering Corporation

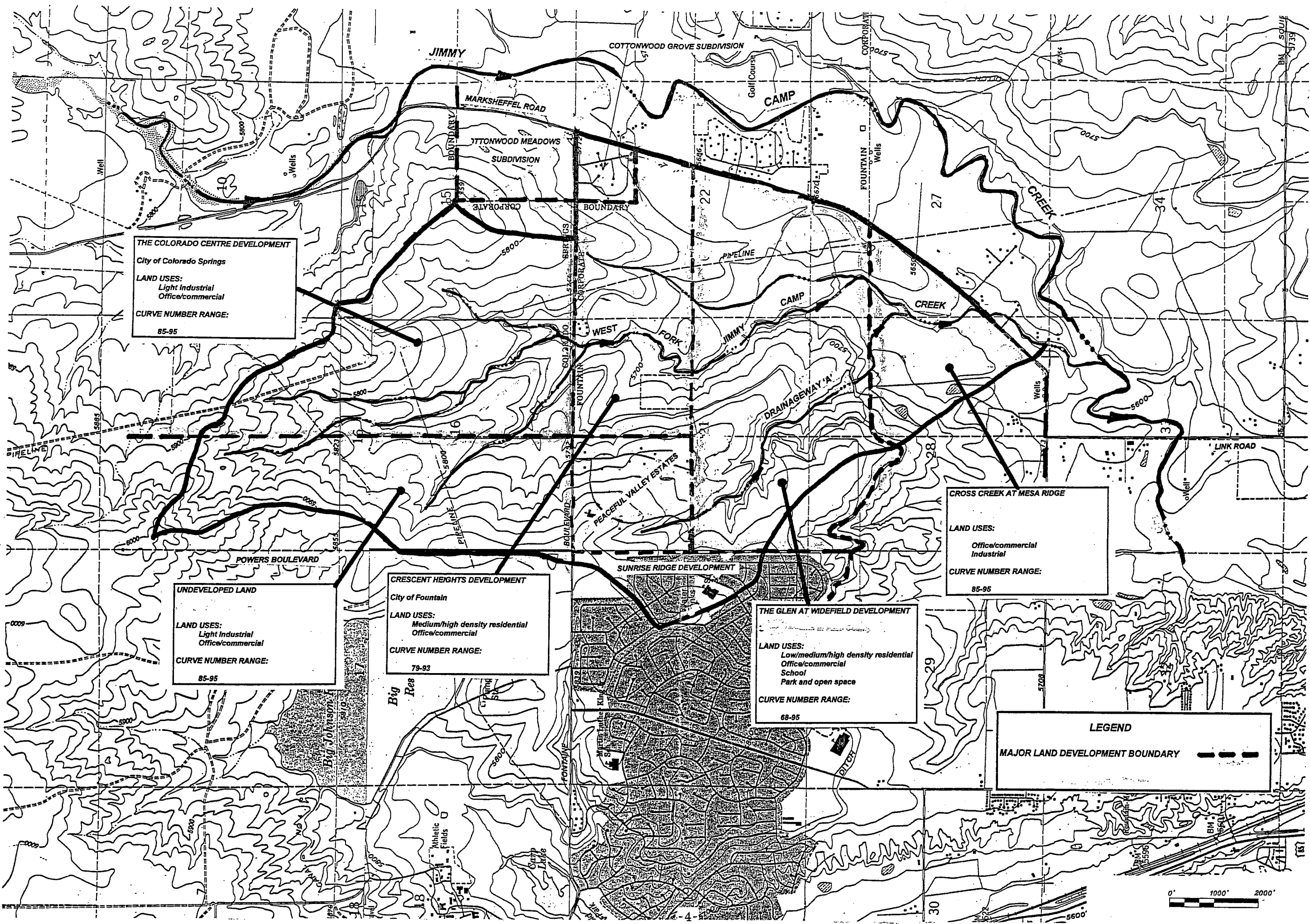
1604 South 21st Street
Colorado Springs, Colorado
80904-4208
(719) 630-7342

JIMMY CAMP CREEK WEST TRIBUTARY

COLORADO SPRINGS, COLORADO

FIGURE 1

PROJECT NO.: 98093
DATE: 03/10/04
DESIGN: RNW
REVISIONS:



Kiowa Engineering Corporation
 1604 South 21st Street
 Colorado Springs, Colorado
 80904
 (719) 630-7342

**West Fork Jimmy Camp Creek
 Drainage Basin Planning Study
 MAJOR DEVELOPMENT & LAND USE MAP**
 EL PASO COUNTY, COLORADO

Project No.:	9893
Date:	6/99
Design:	RNW
Drawn:	CAD
Check:	RNW
Revisions:	

FIGURE 2

III. HYDROLOGIC ANALYSIS

A hydrologic analysis was conducted in order to determine peak discharges and runoff volumes for various storm types, and basin development conditions. This data was used in the evaluation of floodplains and in the evaluation of drainageway alternatives. Hydrology has been prepared for the West Fork Jimmy Camp Creek watershed in some of the reports previously referenced. The hydrologic analysis contained within this report has been prepared in conformance with the City/County Storm Drainage Criteria Manual.

Runoff Model

The runoff model used to determine the peak flows and volumes within the study area is the U. S. Army Flood Hydrograph Package (HEC-1), Version 4.1 dated June 1998. The use of this hydrological model is in compliance with the City of Colorado Springs/El Paso County Drainage Criteria Manual.

Basin Characteristics

The study area subject to the hydrologic evaluation is the West Fork Jimmy Camp Creek basin. The basin was broken into sub-basins. Sub-basins numbered in the 2000s lie within the Drainageway A sub-tributary basin. Sub-basins numbered in the 3000s lie within West Fork Jimmy Camp Creek sub-tributary basin. Sub-basins numbered in the 4000s are direct flow areas to Jimmy Camp Creek that abut the West Fork Jimmy Camp Creek basin on the east. Basins numbered in the 5000s lie within the Cross Creek at Mesa Ridge property and are tributary to the mainstem of West Fork Jimmy Camp Creek.

Basin characteristics such as size, curve numbers (CN-values), basin slope, soils, flow path, time of concentration (Tc), time lag, channel type, slope, flow velocity and size were estimated. These parameters were determined from available topographic, land use and soils maps, and field investigation.

Curve Numbers

Land use for existing and future basin conditions were determined using a combination of zoning maps, City/County Comprehensive Plan(s), development plans, aerial photographs, and other related land use documents. Land use density and corresponding curve numbers were determined in accordance with the City/County Drainage Criteria Manual. Presented on Table 1 is a listing of the Curve Numbers (CN-values) for possible land uses which may occur within the

basin in the future. The Soil Conservation Service (SCS), curve number is an input parameter for the HEC-1 Hydrologic model. Curve numbers for both the existing and future conditions were estimated. The curve numbers applied were compared to the curve numbers used in past studies and reports. The curve numbers used to develop the peak discharges summarized in this report compare well with those applied in the referenced reports.

Design Rainfall

In accordance with the City/County Drainage Criteria Manual the 24-hour Type II-A storm with an antecedent moisture condition (AMC) of II was applied in the hydrologic modeling. The 24-hour duration storm events for the 5-year and 100-year recurrence intervals were evaluated. The rainfall depths used in this study were 4.4 inches and 2.5 inches for the 100-year and 5-year frequencies, respectively.

Hydrologic Modeling

The hydrologic model is a series of sub-basins, ranging in size from 60 to 200 acres, linked by drainageways or "routing elements." Presented on Figure 3 (in map pocket) is the Hydrologic Basin Map. Hydrographs are accumulated at design points along the major drainageways. No channel improvements have been assumed for the future condition hydrologic model. The input and output for the HEC-1 computer models are contained within the appendices of this report.

Results

The results of the baseline hydrologic analysis have been presented in several formats. A basin hydrologic map (Figure 3) presents the major basin boundary, sub-basin boundaries and numbers, routing elements, and design points. A summary of flow rates for key design points is presented on Figure 3. Presented on Table 2 is a summary of the sub-basin discharges for existing and future basin conditions. Presented on Table 3 is a summary of the design point discharges for existing and future basin conditions.

The peak discharge data presented in this section of the report and on Figure 3 represent the baseline hydrologic condition, and does not reflect improvements within the basin such as detention or drainageway facilities. Presented in Section VI of this report is peak discharge data for the recommended plan that incorporates the selected improvements for the basin.

The peak discharges at design point 5010 for the existing and developed conditions compare reasonably well with the discharges presented in the Jimmy Camp Creek Drainage Basing Planning Study prepared by Wilson and Company. Differences in sub-basin delineation and flow routing parameters between this study and past hydrology evaluations are responsible

for the variations in peak discharges at comparable design points within the West Fork Jimmy Camp Creek basin.

The hydrology contained in this report is not intended for use in the sizing of storm drainage facilities within individual residential or commercial subdivisions. Hydrology for areas smaller than those sub-basins shown in this report should be determined using the procedures outlined in the City/County Drainage Criteria Manual. The sub-basin boundaries shown on Figure 3 need to be verified using more definitive topographic mapping whenever possible so more exact limits of smaller sub-basins can be more accurately estimated.

Table 1: Land Use Data (1)

Land Use Classification	Percent Impervious	Land Use Density	SCS Curve Number (2)
Residential high density	65-80	10-24 DU/AC	88-94
Residential medium density	45-65	6-10 DU/AC	85-92
Residential medium-low density	40-45	4-6 DU/AC	72-86
Residential low density	20-40	3 DU/AC	68-84
Residential very low	5-20	1-2 DU/AC	66-82
Office/Commercial	80-90	N/A	85-95
Schools	50-70	N/A	75-80
Dedicated Open Space/Park	5-10	N/A	61-80

NOTES:

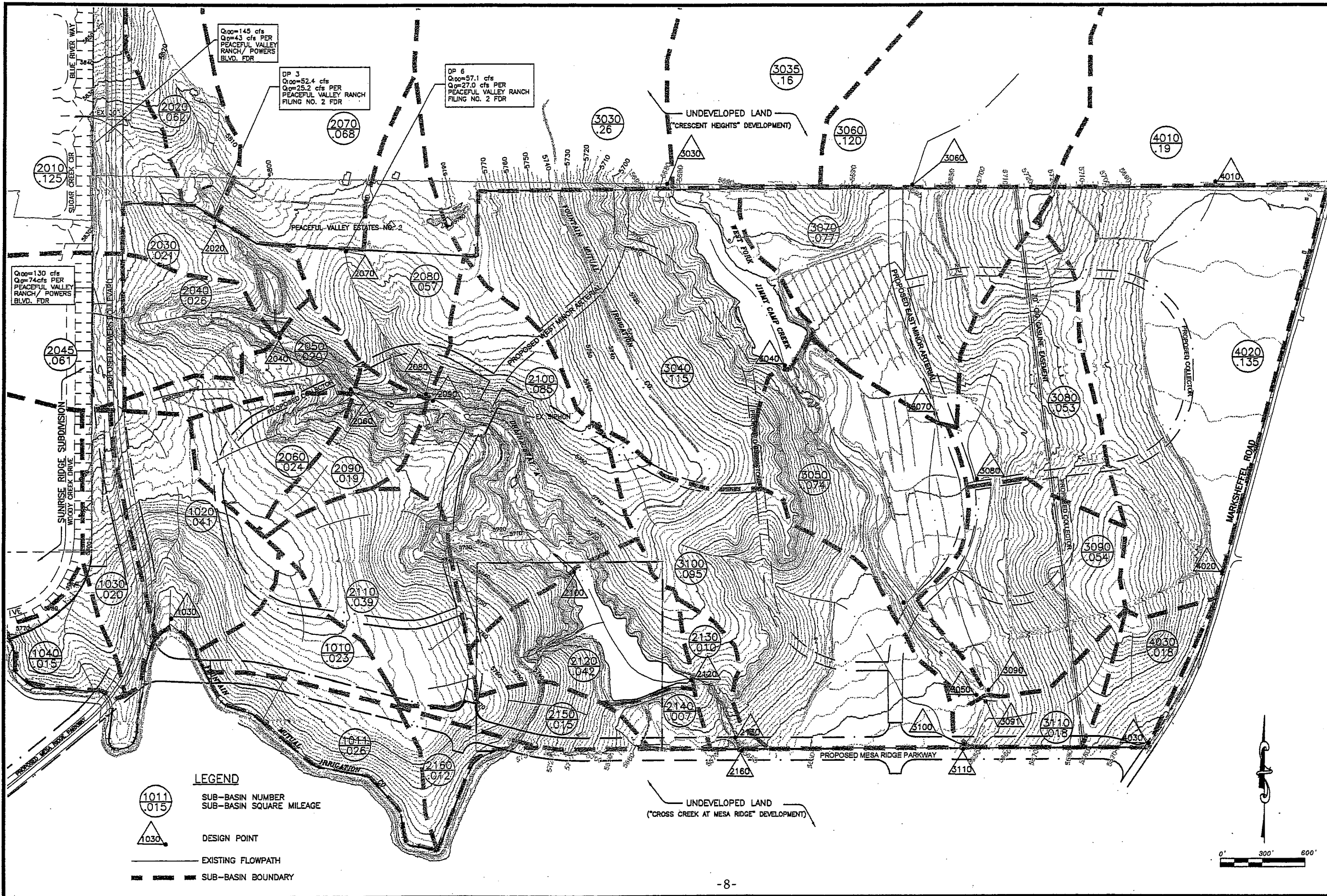
- (1) The above data was used in the preparation of the hydrologic analysis for the West Fork Jimmy Camp Creek Drainage Basin Planning Study. These data are not intended to reflect future land use development criteria within the City of Fountain, City of Colorado Springs or El Paso County.
- (2) The curve number applied depends upon hydrologic soil type. Curve number range on this table represents SCS Hydrologic Soils Groups B through D.

TABLE 2: SUMMARY OF SUB-BASIN DISCHARGES
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY





SUB-BASIN NUMBER	EX/FUT DRAINAGE AREA (sm)	EX/FUT DRAINAGE AREA (ac)	EXISTING CONDITION (cfs)		FUTURE CONDITION (cfs)	
			5 YR	100 YR	5 YR	100YR
2010	0.125	80.0	40	142	40	142
2020	0.062	39.7	9	47	19	68
2030	0.021	13.4	5	22	6	24
2040	0.026	16.6	5	26	7	29
2045	0.061	39.0	48	124	48	124
2050	0.020	12.8	4	17	4	19
2060	0.024	15.4	5	24	8	30
2070	0.068	43.5	8	44	17	65
2080	0.057	36.5	12	58	15	64
2090	0.019	12.2	3	14	5	19
2100	0.095	60.8	13	64	24	89
2110	0.034	21.8	6	29	8	33
2120	0.047	30.1	9	45	9	45
2130	0.010	6.4	2	11	2	11
2140	0.007	4.5	2	4	2	9
2150	0.015	9.6	6	20	6	21
2160	0.012	7.7	8	18	17	35
3000	0.420	268.8	140	474	190	568
3005	0.240	153.6	107	347	144	407
3010	0.220	140.8	81	288	138	383
3012	0.210	134.4	54	199	94	272
3015	0.110	70.4	55	181	75	212
3020	0.190	121.6	69	231	204	428
3025	0.260	166.4	82	324	347	712
3030	0.260	166.4	65	262	116	361
3035	0.160	102.4	63	234	106	306
3040	0.115	73.6	23	110	31	129
3050	0.049/074	31.4/47.4	18	61	56	136
3060	0.119	76.2	48	163	63	189
3070	0.077	49.3	23	78	27	87
3080	0.050	32.0	16	58	23	68
3090	0.082/.05	52.5/32.0	27	93	21	67
3100	0.095	60.8	35	123	61	166
3110	0.018	11.5	5	17	14	31
4010	0.190	121.6	38	153	108	279
4020	0.135	86.4	26	90	39	114
4030	0.018	11.5	7	25	20	44
5010	0.156	99.8	35	133	101	246
5020	0.200	128.0	52	200	1514	362

TABLE 3: SUMMARY OF DESIGN POINT DISCHARGES
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

DESIGN POINT NUMBER	EX/FUT DRAINAGE AREA (sm)	EX/FUT DRAINAGE AREA (acres)	EXISTING CONDITION		FUTURE CONDITION	
			5 YR cfs	100 YR cfs	5 YR cfs	100YR cfs
2020	0.190	121.6	47	189	57	210
2040	0.300	192.0	97	335	109	362
2060	0.340	217.6	105	372	120	406
2080	0.130	83.2	17	88	28	113
2090	0.480	307.2	123	473	152	535
2100	0.610	390.4	140	558	181	651
2120	0.660	422.4	148	600	189	692
2130	0.670	428.8	145	594	186	687
2160	0.700	448.0	151	624	196	723
3000	0.660	422.4	147	233	317	935
3020	1.650	1056.0	528	1857	1059	2737
3030	2.070	1324.8	601	2216	1209	3267
3040	2.180	1395.2	618	2316	1239	3364
3050	2.26/2.23	1446/1427	627	2351	1275	3444
3070	0.200	128.0	67	235	86	270
3080	.25/.05	160/32	82	290	23	72
3090	.33/.11	211/70	106	373	44	138
3091	2.560	1638.4	732	2722	1380	3843
3100	2.660	1702.4	757	2828	1428	3990
3110	2.670	1708.8	761	2845	1442	4022
4020	0.320	204.8	63	238	145	383
5010	3.730	2387.2	943	3550	1722	4904



LEGEND

 SUB-BASIN NUMBER
 SUB-BASIN SQUARE MILEAGE
 DESIGN POINT
 EXISTING FLOWPATH
 SUB-BASIN BOUNDARY

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**West Fork Jimmy Camp Creek
 Drainage Basin Planning Study
 HYDROLOGIC SUB-BASIN MAP
 EL PASO COUNTY, COLORADO**

Project No.:	9893
Date:	7/00
Design:	RNW
Drawn:	CAD
Check:	RNW
Revisions:	

FIG.3A

IV. HYDRAULIC ANALYSIS AND FLOODPLAIN DESCRIPTION

A hydraulic analysis was conducted to ascertain the conveyance capacity of existing hydraulic structures along the major drainageways of the West Fork Jimmy Camp Creek Basin. Field verifications of roadway crossings and existing channel improvements were conducted and the general physical condition of the structure(s) noted. In some areas of the basin, a hydraulic analysis was conducted using the U. S. Army Corps of Engineers (COE) HEC-2 water surface profile program. Cross section data for the areas analyzed were obtained by using the two-foot contour interval planimetric topographic mapping compiled in 1997 for the Glen at Widefield property. The future condition 100-year peak discharge data shown on Table 3 was used in the estimation of the 100-year flood profiles through the Glen at Widefield property.

The capacity of the existing roadway crossing culverts structures were estimated using the HYDRAIN culvert modeling program. The 5- and 100-year existing condition flow rates were used in determining whether an existing culvert was judged to have adequate capacity.

The West Fork Jimmy Camp Creek floodplain has been included within the City of Colorado Springs and El Paso County Flood Insurance Study (FIS), from its confluence with Jimmy Camp Creek to Fontaine Boulevard. No other tributaries to the West Fork have been studied in the FIS. The floodplain data and associated base flood elevations presented in the FIS is used in the regulation of the floodplain as it relates to the County's participation in the National Flood Insurance Program. The floodplains developed in this report are not intended to replace the FIS data and are only being used to determine the area along the drainageways which would be prone to flooding in the 100-year event.

Hydraulic Structure Inventory

As part of the field investigation, the existing drainage facilities were verified and inventoried. The size, type, and condition were recorded for all the bridges, culverts, channels, inlets, pipes, and miscellaneous drainage features in the basin. Hydraulic capacities were estimated for the culverts and bridges over the major drainageways. An inventory of the roadway crossings along the major drainageways is presented on Table 4. The hydraulic capacity of crossings was calculated for a headwater to depth ratio of 1.2. Culvert capacity was assumed to be reached when the 100-year, future condition undetained discharge overtopped the culvert. The location of the structures listed on Table 4 is shown on Figure 4.

The physical condition of the major drainageways was reviewed in the field and using existing topographic mapping. Presented on Table 5 is a summary of the major drainageway characteristics. A description of each drainageway segment follows. The locations of the segments are presented on Figure 4.

West Fork Jimmy Camp Creek Drainageways

Segment 5010: This segment is the outfall drainageway to Jimmy Camp Creek. The channel cross-section is poorly defined and passes through a low density residential area. The drainageway is fully contained within the Jimmy Camp Creek floodplain. This segment of channel is currently stable and generally well vegetated. No base flow exists. The existing channel slope is estimated at 0.3 percent.

Segment 3110: This segment passes through the proposed Cross Creek at Mesa Ridge development. The channel cross-section is poorly defined and has no apparent base flow. The drainageway has a wide but shallow floodplain. This segment of channel is currently stable and generally well vegetated. The existing channel slope is estimated at 0.6 percent.

Segment 3030: This segment passes through the proposed Glen at Widefield development. The channel is well defined and has a base flow. The drainageway has a generally narrow floodplain except at the outfall point to segment 3110. Within this segment is an embankment which stores water behind it, but has limited flood storage capacity above the mean water surface. It is believed that this impoundment is fed by groundwater and irrigation seepage. There is no record of this impoundment at the State Engineer's office. This segment of channel is currently stable and well vegetated. The existing channel slope is estimated at 0.7 percent.

Segment 3020: This segment passes through the proposed Crescent Heights development. The channel is well defined and has a base flow. The drainageway has a generally narrow floodplain with depths ranging from two to four feet. As in segment 3030, this segment is an embankment which stores water behind it, but has limited flood storage capacity above the mean water surface. It is believed that this impoundment is fed by groundwater and irrigation seepage. There is no record of this impoundment at the State Engineer's office. This segment of channel is currently stable and well vegetated. The existing channel slope is estimated at 0.8 percent.

Segment 3000: This segment is contained within the Colorado Centre development. The channel is well defined and has no base flow. This segment of channel is currently stable and well vegetated. The existing channel slope is estimated at 1.0 percent.

Segment 3010: This segment is contained within the Colorado Centre development. The channel is well defined and has no base flow. This segment of channel is currently stable and well vegetated. The existing channel slope is estimated at 1.0 percent.

Segment 3021: This segment is contained within the Colorado Centre development. The channel is well defined and has no base flow. This segment of channel is currently stable and well vegetated. The existing channel slope is estimated at 0.8 percent.

Drainageway "A" Drainageways

Segment 2160: This segment outfalls to West Fork Jimmy Camp Creek. This segment lies within the proposed Cross Creek development. The channel cross-section is poorly defined. This segment of channel is currently stable and generally well vegetated. No base flow exists. The existing channel slope is estimated at 2.6 percent.

Segment 2090: This segment passes through the proposed Glen at Widefield development. The channel is well defined and has a base flow. The drainageway has a generally narrow floodplain with depths ranging from two to four feet. Within this segment is an embankment which stores water behind it, but has limited flood storage capacity above the mean water surface. It is believed that this impoundment is fed by groundwater and irrigation seepage. The impoundment lies within a parcel of land owned by the Fountain Mutual Irrigation Company. There is no record of this impoundment at the State Engineer's office. This segment of channel is currently stable and well vegetated. The existing channel slope is estimated at 1.8 percent.

Fountain Mutual Irrigation Ditch

The Fountain Mutual Irrigation ditch traverses the study area in generally a southwest to northeast direction. The ditch crosses through portions of the proposed Cross Creek at Mesa Ridge, the Glen at Widefield and the Crescent Heights developments. There is one siphon along the ditch within the study area which takes the flow in the ditch under Drainageway A, just downstream of design point 2090. As part of the drainage planning for the West Fork Jimmy

Camp Creek basin, it was assumed that the irrigation ditch would convey only the adjudicated water right through the basin. Existing and proposed runoff was assumed to be passed over or under the ditch in the hydrologic modeling of the basin. There was no diversion of runoff by the ditch assumed in compilation of the hydrologic model for this basin.

Floodplains

Floodplains for the 100-year existing condition discharge have been delineated for the West Fork Jimmy Camp Creek within the Colorado Springs and El Paso County Flood Insurance Study (FIS). Shown on Figure 5 is the FIS floodplain and base flood elevation data. There are no other drainageways within this basin which have been studied by FEMA. As part of the Master development drainage planning process the floodplains along the major drainageways should be determined. Channel improvements along the West Fork Jimmy Camp Creek which would alter the floodplain information as developed by FEMA would require the preparation of a Letter of Map Revision in accordance with FEMA technical criteria and specifications.

There are not any significant areas of existing flood hazard within the basin mainly because of the undeveloped nature of the basin and because the drainageways are unencroached at this time. Some damage could occur to roadway crossings wherever culverts lack sufficient capacity to convey the runoff reaching them without overtopping the roadway. The affect of development within the basin will be to generally increase runoff rate, frequency and velocity along the major drainageways.

TABLE 4: SUMMARY OF EXISTING HYDRAULIC STRUCTURES - CROSSINGS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

LOCATION	CULVERT #	SIZE	TYPE	PROPOSED FLOW		CAPACITY EXISTING	CAPACITY FUTURE (1)	COMMENTS
				Q5	Q100			
				(cfs)	(cfs)			
FONTAINE BLVD	3000-1	12'x28'	CBC	770	1,970	ADEQUATE	ADEQUATE	STRUCTURE HAS ADEQUATE CAPACITY TO PASS THE PROPOSED 100-YEAR FLOW
FONTAINE BLVD	3010-1	36"x54"	CMP ARCH	N/A	N/A	N/A	N/A	FOUNTAIN MUTAL IRRIGATION DITCH ROADWAY CROSSING
FONTAINE BLVD	3020-1	30"	CMP	530	1,100	INADEQUATE	INADEQUATE	CULVERT CAN CONVEY ONLY LOCALIZED ROADWAY DRAINAGE WHICH REACHES IT
FONTAINE BLVD	3020-2	36"x54"	CMP ARCH	NA	NA	N/A	N/A	FOUNTAIN MUTAL IRRIGATION DITCH ROADWAY CROSSING
FONTAINE BLVD	3020-3	30"	CMP	N/A	N/A	ADEQUATE	INADEQUATE	CULVERT CAN CONVEY ONLY LOCALIZED ROADWAY DRAINAGE WHICH REACHES IT
MARKSHEFFEL ROAD	5010-1	36"	CMP	1,700	4,830	INADEQUATE	INADEQUATE	PARTIALLY PLUGGED
MARKSHEFFEL ROAD	5020-1	36"	CMP	150	360	INADEQUATE	INADEQUATE	PARTIALLY PLUGGED
POWERS BOULEVARD	2010-1	30"	CMP	40	142	ADEQUATE	ADEQUATE	CULVERT TO BE REPLACED WITH CONSTRUCTION OF POWERS BOULEVARD
MARKSHEFFEL ROAD	4010-1	N/A	DETENTION BASIN	N/A	N/A	ADEQUATE	ADEQUATE	DETENTION BASIN SERVES THE COTTONWOOD GROVE SUBDIVISION
MARKSHEFFEL ROAD	4020-1	36" (est)	CMP	145	383	INADEQUATE	INADEQUATE	PARTIALLY PLUGGED

-11-

TABLE 5: SUMMARY OF EXISTING HYDRAULIC STRUCTURES - DRAINAGEWAYS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

LOCATION	SEGMENT #	SLOPE (Percent)	TYPE	100-YEAR FLOW RANGE		COMMENTS
				Q _{ex}	Q _{fut}	
				(cfs)	(cfs)	
WEST FORK JIMMY CAMP CREEK						
JIMMY CAMP CREEK TO MARKSHEFFEL ROAD	5010	0.3	UNIMPROVED	3,590	4,830	DRAINAGEWAY OUTFALLS TO JIMMY CAMP CREEK
MARKSHEFFEL ROAD TO MESA RIDGE PARKWAY	3110	0.6	UNIMPROVED	2,860-3,590	3,390-4,830	WIDE AND SHALLOW FLOODPLAIN
MESA RIDGE PARKWAY TO N PL OF THE GLEN	3030	0.7	UNIMPROVED	2,275-2,860	3,190-3,390	CHANNEL STABLE AND WELL VEGETATED WITH WETLAND AND NATIVE GRASSES
NORTH PL OF THE GLEN TO FONTAINE BOULEVARD	3020	0.8	UNIMPROVED	1,930-2,275	2,710-3,190	
FONTAINE BLVD TO STUDY LIMITS	3000	1.0	UNIMPROVED	880	1,050	CHANNEL LIES WITHIN COLORADO CENTRE DEVELOPMENT
FONTAINE BLVD TO STUDY LIMITS	3010	1.0	UNIMPROVED	480	640	CHANNEL LIES WITHIN COLORADO CENTRE DEVELOPMENT
FONTAINE BLVD TO STUDY LIMITS	3021	0.8	UNIMPROVED	620	1,100	CHANNEL LIES WITHIN COLORADO CENTRE DEVELOPMENT
DRAINAGEWAY A						
CONFLUENCE WITH WEST FORK JIMMY TO LAKE	2160	2.6	UNIMPROVED	620	720	
LAKE TO DESIGN POINT DP2040	2090	1.8	UNIMPROVED	335-620	360-720	CHANNEL STABLE AND WELL VEGETATED WITH WETLAND AND NATIVE GRASSES

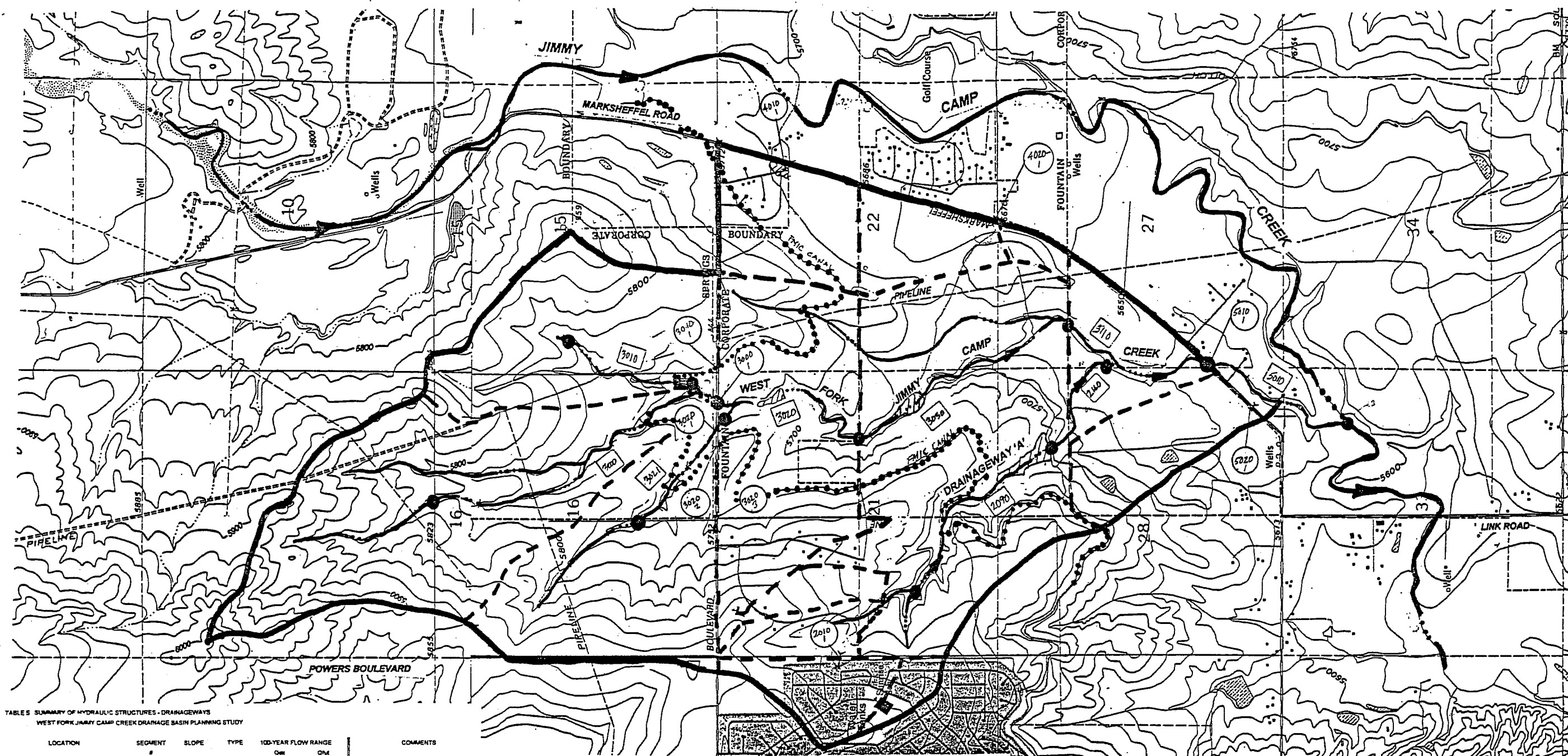


TABLE 5 SUMMARY OF HYDRAULIC STRUCTURES - DRAINAGEWAYS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

LOCATION	SEGMENT #	SLOPE (Percent)	TYPE	100-YEAR FLOW RANGE (cfs)	COMMENTS
WEST FORK JIMMY CAMP CREEK					
JIMMY CAMP CREEK TO MARKSHEFFEL ROAD	3010	0.3	UNIMPROVED	3,500 - 4,800	DRAINAGEWAY OFFFALLS TO JIMMY CAMP CREEK
MARKSHEFFEL ROAD TO MESA RIDGE PARKWAY	3110	0.6	UNIMPROVED	2,400 - 3,300	WIDE AND SHALLOW FLOODPLAIN
MESA RIDGE PARKWAY TO N PL OF THE GLEN	3000	0.7	UNIMPROVED	2,275 - 3,150	CHANNEL STABLE AND WELL VEGETATED WITH WETLAND AND NATIVE GRASSES
NORTH PL OF THE GLEN TO FONTAINE BOULEVARD	3000	0.8	UNIMPROVED	1,900 - 3,150	
FONTAINE BLVD TO STUDY LIMITS	3000	1.0	UNIMPROVED	800 - 1,050	CHANNEL LIES WITHIN COLORADO CENTRE DEVELOPMENT
FONTAINE BLVD TO STUDY LIMITS	3010	1.0	UNIMPROVED	400 - 640	CHANNEL LIES WITHIN COLORADO CENTRE DEVELOPMENT
FONTAINE BLVD TO STUDY LIMITS	3021	0.8	UNIMPROVED	600 - 1,100	CHANNEL LIES WITHIN COLORADO CENTRE DEVELOPMENT
DRAINAGEWAY A					
CONFLUENCE WITH WEST FORK JIMMY TO LAKE	2100	2.6	UNIMPROVED	600 - 700	
LAKE TO DESIGN POINT OF 2000	3300	1.8	UNIMPROVED	305-600 - 390-720	CHANNEL STABLE AND WELL VEGETATED WITH WETLAND AND NATIVE GRASSES

TABLE 4 SUMMARY OF HYDRAULIC STRUCTURES - CROSSINGS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

LOCATION	CULVERT #	SIZE	TYPE	PROPOSED FLOW OS (cfs)	PROPOSED FLOW O100 (cfs)	CAPACITY EXISTING	CAPACITY FUTURE (I)	COMMENTS
FONTAINE BLVD	3000-1	12'-08"	CBC	770	1,070	ADEQUATE	ADEQUATE	STRUCTURE HAS ADEQUATE CAPACITY TO PASS THE PROPOSED 100-YEAR FLOW
FONTAINE BLVD	3010-1	36"-54"	CMP ARCH	N/A	N/A	N/A	N/A	FONTAINE MUTUAL IRRIGATION DITCH ROADWAY CROSSING
FONTAINE BLVD	3020-1	30"	CMP	500	1,100	INADEQUATE	INADEQUATE	CULVERT CAN CONVEY ONLY LOCALIZED ROADWAY DRAINAGE WHICH REACHES IT
FONTAINE BLVD	3020-2	36"-54"	CMP ARCH	NA	NA	N/A	N/A	FONTAINE MUTUAL IRRIGATION DITCH ROADWAY CROSSING
FONTAINE BLVD	3020-3	30"	CMP	N/A	N/A	ADEQUATE	INADEQUATE	CULVERT CAN CONVEY ONLY LOCALIZED ROADWAY DRAINAGE WHICH REACHES IT
MARKSHEFFEL ROAD	3010-1	36"	CMP	1,700	4,800	INADEQUATE	INADEQUATE	PARTIALLY PLUGGED
MARKSHEFFEL ROAD	3020-1	36"	CMP	100	300	INADEQUATE	INADEQUATE	PARTIALLY PLUGGED
POWERS BOULEVARD	2010-1	30"	CMP	40	142	ADEQUATE	ADEQUATE	CULVERT TO BE REPLACED WITH CONSTRUCTION OF POWERS BOULEVARD
MARKSHEFFEL ROAD	4010-1	N/A	DETENTION BASIN	N/A	N/A	ADEQUATE	ADEQUATE	DETENTION BASIN SERVES THE COTTONWOOD GROVE SUBDIVISION
MARKSHEFFEL ROAD	4020-1	36" (all)	CMP	145	383	INADEQUATE	INADEQUATE	PARTIALLY PLUGGED

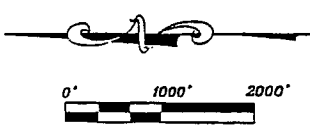
LEGEND

ROADWAY CROSSING DESIGNATION

DRAINAGEWAY DESIGNATION

FONTAINE MUTUAL IRRIGATION DITCH

EXISTING IMPOUNDMENT

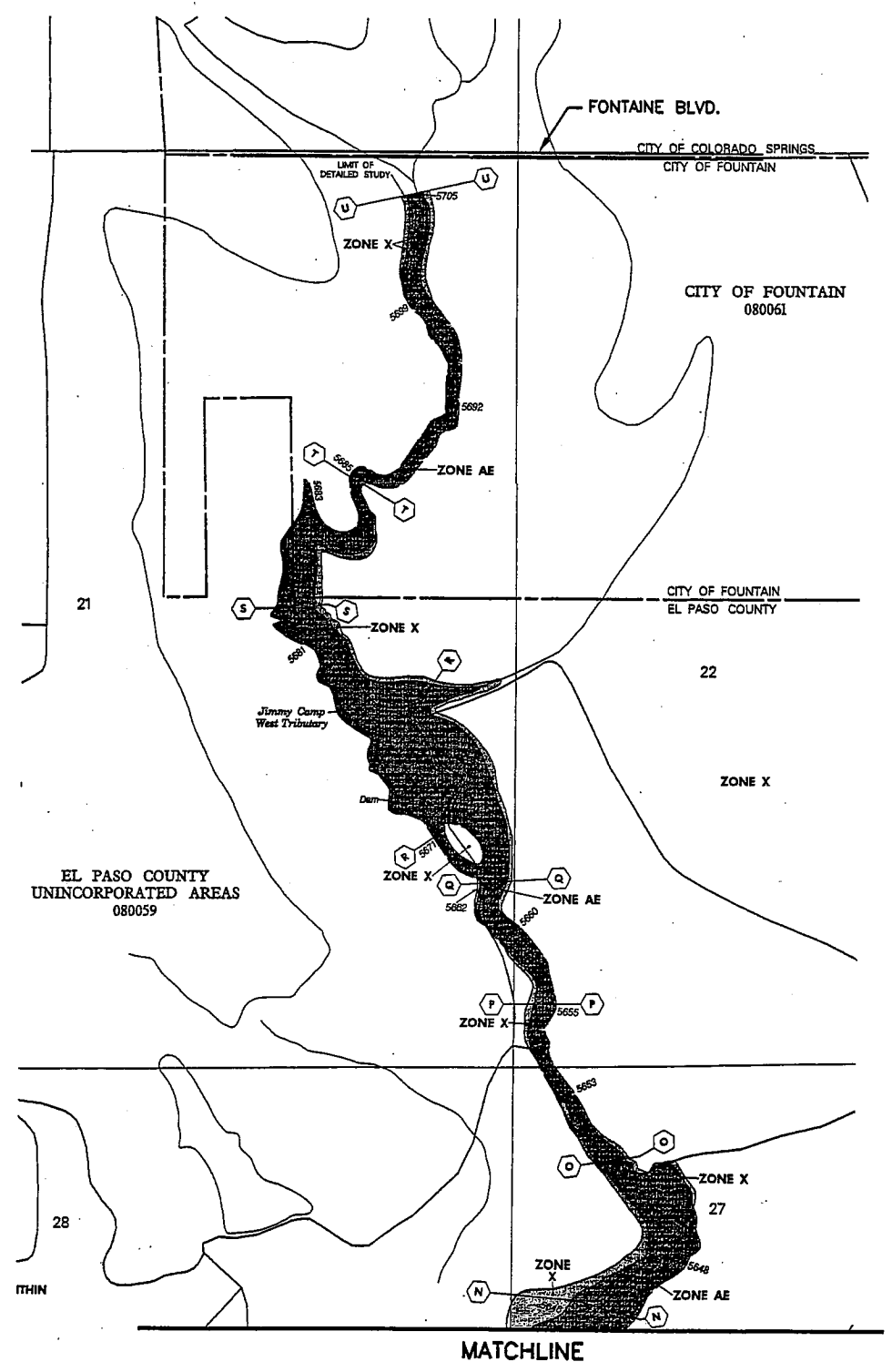
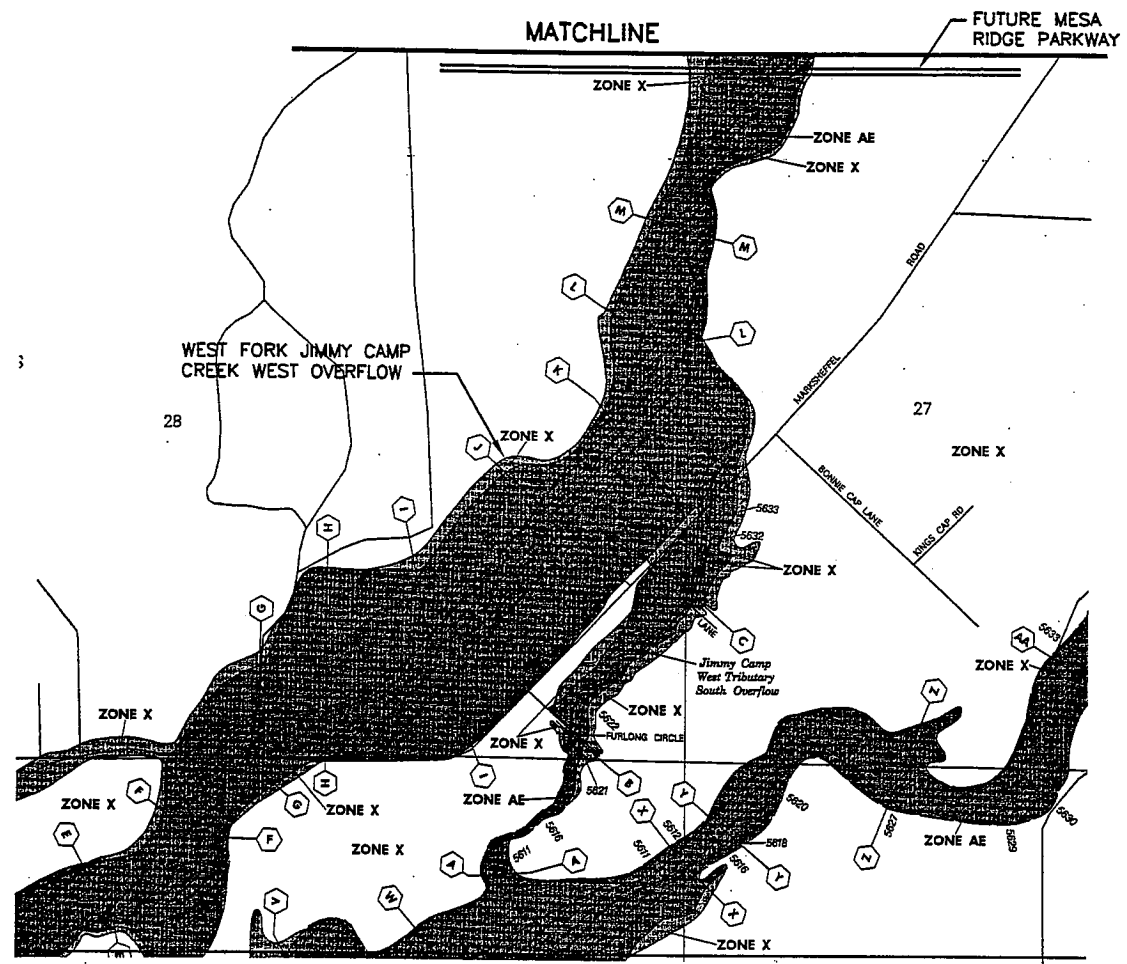


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**West Fork Jimmy Camp Creek
 Drainage Basin Planning Study
 INVENTORY OF EXISTING DRAINAGE STRUCTURES
 EL PASO COUNTY, COLORADO**

Project No.: 9893
 Date: 6/99
 Design: RNW
 Drawn: CAD
 Check: RNW
 Revisions:

FIGURE 4



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 28 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

DATE: 3/17/97

MAP NUMBER
080410058 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 22 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

DATE: 3/17/97

MAP NUMBER
080410056 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

SCALE: 1" = 1000'

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West Fork Jimmy Camp Creek
Drainage Basin Planning Study
FLOOD INSURANCE STUDY FLOODPLAINS
EL PASO COUNTY, COLORADO

Project No.:	9893
Date:	3/04
Design:	RNW
Drawn:	CAD
Check:	RNW
Revisions:	

FIG.5

V. EVALUATION OF ALTERNATIVES

Introduction

Alternative drainageway improvement concepts have been examined that address the existing and future stormwater management needs of the basin. Quantitative and qualitative comparisons are presented, and a recommendation made as to which concepts are most feasible to advance to preliminary design and eventually implementation.

The general planning goals to be achieved during the alternative evaluation phase were:

1. Identify stormwater facilities that will reduce existing floodplains and flooding problems within urbanized areas;
2. Provide stormwater management within developing areas of the basin in order to reduce the detrimental effects of runoff and sedimentation from disturbed areas;
3. Provide stormwater facilities that preserve and/or enhance the existing drainageway and areas adjacent to the drainageway that provide an environmental resource in the area;
4. Identify facilities which will minimize future operations and maintenance costs; and
5. Provide stormwater management facilities that will at least maintain and/or enhance the water quality characteristics of the basin.

The City/County Drainage Criteria Manual was used as a guide in the conceptual sizing of facilities. Planning goals were developed through the agency/individual coordination process.

Evaluation Parameters

The following list of parameters were considered when evaluating alternatives for addressing the long-term stormwater management needs for the basin:

- | | |
|---------------------------------------|-------------------------------------|
| - Flood Control | - Open Space/Aesthetics |
| - Erosion Control | - Land Use |
| - Operation and Maintenance | - Water Quality |
| - Recreation | - Habitat |
| - Right-of-way | - Construction Cost |
| - Transportation - Roadway and Trails | - Administration and Implementation |

By reviewing the relative impact of future storm water runoff upon the major drainageways, each of the above evaluation parameters can be ranked. A minimal impact was assumed wherever the increase of runoff due to urbanization would cause little physical change

along the drainageways with respect to a specific parameter. Neutral impact upon a given parameter was considered wherever the negative effects of increased runoff due to urbanization can be planned and mitigated for. High impact was considered wherever the existing channel section would be rendered unsuitable to provide for a given parameter in the future flow condition. Using data gathered with respect to flood hazard, habitat, erosion control, open space, transportation (more specifically trails), and right-of-way, conceptual alternatives were compared.

Environmental Resource Review

An environmental resource review was conducted for the major drainageways of the West Fork Jimmy Camp Creek basin. The resource review was conducted using aerial photographs of the basin and field visits to view areas of significant environmental resource. The most significant factors that have created the existing vegetative setting along the major drainageway (i.e., the West Fork and Drainageway A), have been the irrigation facilities and the land uses within the basin. Irrigation facilities that lie within the basin include the Fountain Mutual Irrigation Ditch and two open water storage areas that lie below the irrigation canal. Seepage from the ditch as well as from the lakes is the source of the water supply that has created and supported wetland areas along some segments of Drainageway A. Previous agricultural land use within the basin has changed the native vegetative cover due to over grazing and cultivation. Large areas of non-native vegetation has developed over the years along the drainageway and significant areas of weed infestation has occurred. It was also noted while viewing historic photographs of the basin that some of the wetland vegetation that has developed along Drainageway A has occurred after the development of the land that lies west of Powers Boulevard. It is suspected that lawn watering within these areas has contributed to the groundwater resources that support the growth of the wetland vegetation.

Two open water lakes exist within the basin. One occurs along segment 2160 of Drainageway A, north of future Mesa Ridge Parkway, and the other along segment 3040 of the West Fork Jimmy Camp Creek. Historically these lakes were used as a water supply to support the agricultural use of the land. At the perimeter and for three to four hundred feet upstream of the lakes, significant medium to high quality wetland and riparian zones exist. It is the intent of the landowner of the property adjacent to and upstream of these lakes to leave the lakes and the drainageways that outfall to them as open space.

Wetland and riparian zones were identified along segments 2090, 2050 and 2040 of Drainageway A. Wetland and riparian zones were identified along segments 3110, 3090, 3040, and 3030 of the West Fork Jimmy Camp Creek drainageway. The only other wetland resource

identified occurs just north of Fontaine Boulevard, and below the Fountain Mutual Irrigation Canal. It is likely that disturbance and/or encroachment into these areas resulting from land development activities will require notification of the U. S. Army Corps of Engineers and probably the issuance of a 404 permit. Because of the quality and extent of the wetland and riparian areas the 404 permitting of drainageway improvements to handle the anticipated increase in runoff due to urbanization will have to consider avoidance and minimization of impact in the development of channel and detention basin alternatives.

Preliminary Matrix of Conceptual Alternatives

The alternative planning process included the evaluation of general drainageway planning concepts. The alternatives that are generally available when planning stormwater management facilities include:

1. Floodplain preservation (do nothing alternative),
2. Channelization, using various materials and of varying capacity,
3. Detention, on-site or regional,
4. Selective stabilization, and
5. Combinations of the above.

These concepts were qualitatively evaluated for each of the major drainageways and to some degree within each of the major land development parcels presented on Figure 2. The qualitative assessments were made using the information gathered in the field and from past or ongoing drainage assessments for areas within the West Fork Jimmy Camp Creek basin. A table that summarizes the qualitative evaluation of impacts is contained within Appendix B of this report.

Drainageway System Alternatives

A review of each drainageway alternative with respect to the evaluation parameters listed earlier was conducted. Based upon the technical work and field visits the alternative drainage concepts were developed. Alternatives for floodplain and channel sections and detention facilities have been evaluated.

Detention

As presented in the Hydrology Section of this report, it has been estimated that peak discharges and volumes will increase significantly along the major drainageways of the West Fork Jimmy Camp Creek as a result of urbanization within the basin. Another impact that urbanization will have upon the basin hydrology is that "everyday" rainfall events will increase in

their peak rates of runoff, frequency, and duration. This will create greater instability in the existing channel sections as well as increase flood hazards if the runoff is allowed to flow through the basin in the developed condition. Detention schemes were analyzed in the alternative planning process in order to address this situation. Because of the high level of urbanization that has been assumed for this basin, increases in peak flows for the frequencies analyzed can double or triple. The increase in runoff becomes a significant burden for those properties lying low in the basin, such as the Glen at Widefield and the Cross Creek at Mesa Ridge developments. At this time the City of Fountain requires detention to limit flows to downstream drainageways to historic levels.

Two distinct types of detention can be considered within this basin. One form of stormwater detention is onsite detention. Onsite detention is accomplished within a single subdivision or within each developed parcel. Onsite detention basins are generally small with 100-year storage volumes typically less than two to three acre-feet. These detention basins typically discharge to a storm sewer system or collector channels that in turn discharge to the major drainageways. One of the negative aspects of this concept is that the detention basins present a long-term maintenance responsibility to private property owners and for the local agencies that may provide for stormwater facility maintenance. In Colorado Springs and El Paso County, onsite detention basins have generally been categorized as private drainage facilities and the long-term maintenance is left up to the property owner(s). There is currently one onsite detention facility in the basin within the Cottonwood Grove Subdivision.

The other form of detention is regional stormwater detention. Regional detention basins usually serve a greater drainage area and many times more than one property. Regional detention basins have storage volumes in excess of 5-acre feet. Regional detention basins can be constructed along of and off of the main drainageways. Whether on stream or off stream regional detention basins are to be considered depend upon the total flow volume, site availability and peak flow rates. For the West Fork Jimmy Camp Creek basin, on stream detention facilities are feasible within the upper portions of the West Fork Jimmy Camp Creek (i.e., above Fontaine Boulevard), and along Drainageway A. In the lower reaches of the West Fork Jimmy Camp Creek drainageway, the use of on stream detention is not as feasible since site availability is limited.

Based upon the qualitative review of impacts, it is recommended that regional detention be considered over onsite detention. The primary reasons for this recommendation is founded on the environmental impact, maintenance and ownership aspects associated with stormwater detention. Regional detention facilities are less maintenance intensive compared to onsite facilities simply because there would be fewer regional detention basins required. Regional detention basins have greater accessibility with respect to maintenance and can be designed to be

physically more open and broad in their design. Regional detention basins can also offer a resource to the area in regard to open space dedication and wetland mitigation areas if necessary. For the West Fork Jimmy Camp Creek basin, regional detention may be a more feasible solution to implement owing to the fact that there are a limited number of major developments within the basin which will develop at their own pace. Once a regional detention facility was established, a greater area of development can then proceed without being encumbered by the construction of small onsite facilities.

Floodplain Preservation

This concept involves the preservation of the natural floodplains in combination with the provision of open space buffer adjacent to the urbanized area. This concept works well wherever the floodplain and channel area is well defined and stable with respect to vegetative invert and bank linings. Within the West Fork Jimmy Camp Creek basin, channel segments 3030, 2090, 3000, 3010 and 3021 each have characteristics that make the implementation of a floodplain preservation concept feasible. These channels and floodplains are well defined and naturally stabilized with native vegetation. For channels 5010, 3110, 3020 and 2160 floodplain preservation is less feasible due to the poor channel definition that presently characterizes these segments. This situation is most evident in segments 5010, 3110 and 2160 where the 100-year floodplain is very wide and uncontained by the existing banks of the drainageway.

The implementation of a floodplain preservation plan can not be considered without the assumption that the channel invert will remain stable. To achieve this grade control structures need to be constructed at an interval that depends upon the existing stream gradient and the invert soils. Selective areas of bank lining may also be required to implement a floodplain preservation concept. Lining of the low flow area of the floodplain on one or both sides may be necessary at outside bends and at the inlet and outlet of culverts and bridges.

Channelization

This concept would involve the construction of lined channels generally trapezoidal in shape. Riprap lined channels are the most common lining material. Within the West Fork Jimmy Camp Creek basin, channel segments 5010, 3110, 3020 and 2160 have the greatest feasibility for channelization due to the reasons pointed out above. Grade control structures to maintain the channel invert at constant and stable gradient would be required.

Conclusions

Based upon the qualitative alternative evaluation process, the following findings were established:

1. Detention is a desirable and feasible alternative to addressing the future stormwater management needs of the basin. The primary advantages of the implementation of a regional detention concept are in the areas of floodplain hazard and damage reduction, reduction in channel and roadway crossing costs, habitat preservation, and in open space. Disadvantages with the concept are in the areas of implementation and detention basin right-of-way or land acquisition issues.
2. Feasible channel alternatives for the major drainageway range from the floodplain preservation, or "do nothing" alternate to riprap bank linings. Along the West Fork Jimmy Camp Creek drainageways, floodplain preservation is feasible in segments 3030, 2090, 3000, 3010 and 3021. The implementation of the floodplain preservation concept will maintain the existing floodplains and natural vegetation that is presently keeping the channel bank and invert stable. Proposing to channelize these segments may result in permitting or environmental concerns by the 404 review agencies. Grade control structures to stabilize the drainageways will be required to address the potential for stream invert degradation that can occur because of increased runoff volumes due to urbanization.
3. Channelization is feasible within segments 5010, 3110, 3020 and 2160. Grade control structures to stabilize the invert of the channel will be required. The channelization of segments 5010 and 3110 would result in significant reductions in the extent of the 100-year floodplain.

VI. SELECTED PLAN

The results of the drainage basin planning analysis are summarized in this section. The alternative drainage concepts have been quantitatively and qualitatively evaluated. Field visits have been conducted in order to refine the channel treatments suggested for use along drainageways of the West Fork Jimmy Camp Creek basin. The conceptual plan for the recommended alternatives is shown on Figure 6 contained in the map pocket at the rear of this report.

Criteria

The City of Colorado Springs, El Paso County Drainage Criteria Manual was used in the development of the typical sections and plans for the major drainageways within the Basin. The City/County manual was supplemented by various criteria manuals with more specific application. These were:

1. Urban Storm Drainage Criteria Manual, Volumes I, II, and III, prepared by the Urban Drainage and Flood Control District.

The design plans and report for the Powers Boulevard extension through the basin were reviewed in order to prepare the conceptual design plans. The master land development plans for the Cross Creek at Mesa Ridge, The Glen at Widefield, and the Crescent Heights developments were reviewed and taken into account in the selection of the channel sections and detention basin locations. Hydrologic data prepared for the Colorado Centre contained in the Jimmy Camp Creek Drainage Basin Planning Study prepared by Wilson & Company was reviewed and incorporated into this plan.

The general design criteria followed for the sizing of the facilities shown on Figure 6 were:

1. Average channelized velocity for riprap channels: 7 feet per second
2. Maximum 100-year channel depth: 5-feet
3. Degraded channel slope: One-half of existing slope
4. Maximum culvert headwater to depth ratio: 1.2
5. Bridge velocity: 10 feet per second
6. Maximum height of detention basin embankment: 10-feet

Hydrology

Presented on Table 6 is the selected detention basin plan hydrologic data to be used for the sizing of major drainageway improvements within the Basin. **Peak flow rates for the 5- and 100-year frequency incorporating and the regional detention alternative for the West Fork Jimmy Camp Creek Basin are summarized for key points along the major drainageways.** Contained within the appendices of this report are the HEC-1 input and output data for the baseline and detention basin hydrologic conditions.

Land development activities may alter the location of design points along the drainageways and therefore slight alteration in a sub-basin's characteristics such as length, slope and area may occur. The methods outlined in the City/County Drainage Criteria Manual should be applied during master development and final development drainage plan phases.

Channels

The recommended channel sections for each reach of drainageway has been presented on Sheets 1 through 7 at the rear of this report. In general, the banks of the West Fork of Jimmy Camp Creek within segments 5010, 2160, 3110 and 3020 are to be lined with riprap to 100-year flow depth. Within segments 3030, 2090, 3000, 3010, and 3021 the drainageway low flow areas should have selectively lined riprap bank protection such as at outside bends, at bridge or culvert outlets, and at the confluence with side tributaries. In conjunction with the selective improvement measures, the 100-year floodplain should be preserved and regulated.

Check Structures

Check structures have been sited along the drainageways in order to maintain the channel invert at a stable gradient. A degraded slope of no more than one-half of the existing slope was assumed when estimating the number of check structures needed along a given segment. The checks have been conceptually designed to allow for a maximum drop of three feet once the degraded slope has been reached. Check structures are needed along the floodplain preservation and channelized segments. In the segments to be selectively lined, check structures will protect the native vegetation from the detrimental effects of stream invert headcutting. A typical check structure detail has been presented on Sheet 7.

Detention

The recommended plan calls for the construction of regional detention basins within the West Fork Jimmy Camp Creek Basin. The locations of the regional detention basins are shown

on sheets 1 through 6. The purpose of the detention basins is to limit peak discharges at the basin's outfall to Jimmy Camp Creek to the existing hydrologic condition. The regional basins have also been sited within each of the major land developments in order to more locally control runoff to existing levels. Regional detention basins at design points 3030, 3020 and 2090 are onstream basins and the remainder will be off-stream basins. It is not anticipated that any of the regional detention basins will be subject to State Engineer's regulations. Each of the regional basins will have to be designed taking into account the geotechnical considerations at each site. Specific design criteria for detention basins can be found in the City/County Storm Drainage Criteria Manual. It may be possible to consolidate two or more of the smaller detention basins. This can be determined during the master development and final development planning phases. During the initial development stages of a sub-basin that is tributary to a regional detention facility, temporary detention basins may need to be constructed until such time that the regional facility shown in this plan has been constructed. A summary of the detention basin characteristics is presented on Table 7 and on sheets 1 through 6.

Stormwater quality measures should be designed into the regional stormwater detention basins. These measures would include the provision of a water quality and sediment pool area in addition to the volume required for stormwater detention. Forebays at the inlet to all of the regional detention facilities is recommended. The water quality capture volume for each of the detention basins should be calculated as part of the final design of these facilities. Criteria and methodology for the sizing and the design of the water quality measures for stormwater detention facilities features can be found within Volume III of the Urban Storm Drainage Criteria Manual.

Roadway Crossings

Summarized on Sheets 1 through 7 are the size, type and location of roadway crossings along the major drainageways. The location of future arterials and collector streets was obtained from the various development plans for the major land developments within the basin. A summary of the roadway crossings is provided on Table 8.

Trails

Trails for access to the detention basins and drainageways need to be incorporated into the design of the improvements. For this basin, multi-purpose trails that can be used for open space, channel maintenance and utility access is recommended. The siting of a trail along a drainageway should be carried out taking into account hydraulic considerations, utilities in the area, access to dedicated parks and roadway crossings. Maintenance access to the drainageway and to existing utilities within the drainageway corridor can offer a multiple use aspect to a trail

project. The design of the trails along the drainageways will be mostly dependent upon the type of development adjacent to the particular drainageway.

Maintenance and Revegetation

Maintenance of drainageway facilities is essential in preventing long term degradation of the drainageway and overbank areas. Along the drainageway, clearing of debris and dead vegetation should be considered within the low flow area of the creek and its tributaries. On the overbanks, limited maintenance of the existing vegetative cover is recommended. Yearly clearing of trash and debris at roadway crossings is also recommended to ensure the design capacity of the crossing, and to enhance the crossings for trail users if a trail exists. Caution should be taken when clearing culverts of sediment so as not to leave the dredged soil within the channel or overbank area. This disturbs the native vegetation and creates a potential water quality concern if the dredged material is subsequently washed into the drainageway by natural erosion. In those reaches designated to be selectively lined and the floodplain preserved, maintenance activities should be carried out while minimizing the disturbances to native vegetation.

Right-of-Way

For the most part the main channels within the basin which pass through undeveloped areas and the right-of-way can be dedicated as part of the land development process. For those segments of the drainageway where floodplain preservation is the recommended plan, a combination of open space dedication (such as park-land and greenbelts), in combination with a more narrow dedicated right-of-way along the low flow area of the drainageway should be obtained through the land development process. Land acquisition will be required for the regional detention basins. The dedication of easements and right-of-way for the drainageways and detention basins would be accomplished at the time of development planning and platting of the parcels that lie adjacent to or upstream of the stormwater facility.

Erosion and Sedimentation Control

Soils in the West Fork Jimmy Camp Creek basin vary widely and because of this, areas within the basin are subject to varying degrees of hazard resulting from sediment being transported to the drainageway(s). During the collection of field and drainage inventory data, some areas were noted which were being impacted by either erosion (of one form or another), or sediment deposition. The soil make up of the basin is generally highly erodible, and this is particularly the case in the upper portions of the drainageway where the channel has a sand bottom and the watersheds have poor to fair vegetative cover. The disturbance of the native

vegetation and failure to properly revegetate areas impacted by site development, utility, roadway and landscape construction has in some cases negatively affected downstream portions of the basin.

The City of Colorado Springs, City of Fountain and El Paso County have enacted erosion control ordinances and criteria to address these problems. In general, it is the responsibility of the entity conducting any land disturbance activity to properly control surface runoff, erosion and sedimentation during and after the activity. Technical criteria identifying measures which help mitigate the impacts of erosion and sedimentation is available and being used throughout the Front Range area.

**TABLE 6
SUMMARY OF DESIGN POINT DISCHARGES WITH REGIONAL DETENTION
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

DESIGN POINT NUMBER	DRAINAGEWAY	LOCATION	EXISTING 100-YEAR FLOW (cfs)	DETAINED CONDITION	
				5 YR (cfs)	100YR (cfs)
2020	DRAINAGEWAY A	AT NORTH PL OF THE GLEN	189	57	210
2090	DRAINAGEWAY A	INFLOW TO DET BASIN 2091	219	152	535
2091	DRAINAGEWAY A	OUTFLOW FROM DET BASIN 2091	219	147	473
2160	DRAINAGEWAY A	AT MESA RIDGE PARKWAY	624	188	640
3020	WEST FORK	AT FONTAINE BOULEVARD	1857	1059	2737
3021	WEST FORK	OUTFLOW FROM DET BASIN 3021	1857	348	1810
3030	WEST FORK	AT NORTH PL OF THE GLEN	2216	401	2007
3031	WEST FORK	OUTFLOW FORM DET BASIN 3031	2216	399	1970
3060	WEST FORK	INFLOW TO DET BASIN 3061	163	63	190
3061	WEST FORK	OUTFLOW FROM DET BASIN 3061	163	50	165
3110	WEST FORK	AT MESA RIDGE PARKWAY	2828	585	2500
4010	DIRECT FLOW AREA	INFLOW TO DET BASIN 4011	153	108	279
4011	DIRECT FLOW AREA	OUTFLOW FROM DET BASIN 4011	153	64	157
4020	DIRECT FLOW AREA	INFLOW TO DET BASIN 4021	238	100	265
4021	DIRECT FLOW AREA	OUTFLOW FROM DET BASIN 4021	238	77	210
5010	WEST FORK	AT MARKSHEFFEL ROAD	3550	866	3318

TABLE 7
SUMMARY OF DETENTION BASIN DATA
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

DETENTION BASIN NO.	STORAGE (AF)	JURISDICTION	OUTLET PIPE SIZE	Q100 IN (cfs)	Q100 OUT (cfs)
3021	80.0	CITY OF CS	2-8'Hx15'W CBC	2740	1810
4011	8.4	CITY OF FOUNTAIN	54" RCP	279	157
3061	2.0	CITY OF FOUNTAIN	60" RCP	190	165
3031	12.0	CITY OF FOUNTAIN	2-8'Hx15'W CBC	2010	1970
4021	8.4	EL PASO COUNTY	4'H x 8'W CBC	265	210
3091	4.0	EL PASO COUNTY	48" CMP	138	107
3101	6.1	EL PASO COUNTY	54" CMP	166	116
2091	4.1	EL PASO COUNTY	N/A	535	473
5011	9.0	EL PASO COUNTY	60" CMP	250	130
5021	10.5	EL PASO COUNTY	4'H x 8'W	360	190

TABLE 8
SUMMARY OF MAJOR ROADWAY CROSSINGS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

ROADWAY CROSSING #	TRIBUTARY DRAINAGEWAY	ROADWAY	FLOW RATE 100-year (cfs)	SIZE	TYPE
2160	DRAINAGEWAY A	MESA RIDGE PARKWAY	620	2-5'x8'	CBC
2160	DRAINAGEWAY A	PROPOSED SNEFFELS ROAD	620	2-5'x8'	CBC
2091	DRAINAGEWAY A	FUTURE ARTERIAL	470	1-5'x12'	CBC
2050	DRAINAGEWAY A	WAYFARER LANE	430	1-4'x12'	CBC
2110	TRIBUTARY TO DRAINAGEWAY A	FUTURE ARTERIAL	30	1-36"	CMP
5011	WEST FORK JIMMY CAMP CREEK	MARKSHEFFEL ROAD	3320	75'	BRIDGE
5010	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	3320	5-6'H x 15'W	CBC
3110	WEST FORK JIMMY CAMP CREEK	MESA RIDGE PARKWAY	2630	50'	BRIDGE
3092	WEST FORK JIMMY CAMP CREEK	FUTURE EAST ARTERIAL	2510	50'	BRIDGE
3081	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	105	54"	RCP
3080	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	72	48"	RCP
3070	TRIBUTARY DRAINAGEWAY	FUTURE EAST ARTERIAL	190	4'H x 8'W	CBC
3000-1	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	570	5'H x 18'W	CBC
3000-2	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	380	5'H x 12'W	CBC
3005-1	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	205	4'H x 9'W	CBC
3005-2	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	410	5'H x 12'W	CBC
3000	WEST FORK JIMMY CAMP CREEK	FUTURE ARTERIAL	935	2-6'H x 12' W	CBC
3010	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	380	5'H x 12'W	CBC
3020	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	420	5'H x 12'W	CBC
3025	TRIBUTARY DRAINAGEWAY	FUTURE ARTERIAL	910	2-6'H x 12'W	CBC
3030	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	1850	2-8'x15'	CBC
3040	TRIBUTARY DRAINAGEWAY	FUTURE EAST ARTERIAL	360	5'H x 10'W	CBC
3040	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	360	5'H x 10'W	CBC
3060	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	195	4'H x 8'W	CBC
4030	DFA 4030	MARKSHEFFEL ROAD	50	42"	CMP
4010	DFA 4010	FUTURE COLLECTOR	280	4'H x 10'W	CBC

VII. PLAN IMPLEMENTATION

General

Many of the channel sections shown on the plans will have to be modified to fit specific site conditions. This will be particularly true in the segments where selective channel treatments are proposed. Check locations are approximate and may be moved to minimize disturbances to existing vegetation, roads, trails, and utilities. Future easements and/or right-of-way for the stormwater facilities must be dedicated as part of the land development and platting process. Channel sizes, sections and alignments for minor drainage systems will have to be verified at the time the surrounding land is proposed for development. The final location of the proposed arterial and collector roadways shown in this plan are also subject to revision as development of the basin proceeds.

The detention basin locations shown on the preliminary design drawings are approximate, and will have to be verified during final design. The acquisition of property for the detention basins should be coordinated as the master development planning for the major parcels moves forward. The scheduling of the detention basin construction will depend upon the rate of development as well as the location. The regional detention basins will serve large areas, and therefore the need for the detention storage will not be critical until at least twenty-five percent of the tributary watershed is developed.

Improvements along the West Fork of Jimmy Camp Creek and Drainageway A should be refined when master development drainage plans are prepared for the major land parcels identified in this report. The channels are intended to be public drainageway systems that will be owned and maintained by the respective governing agency of Flood Conservancy District that it lies within. The outfall channel identified as segment 5012 will need to be constructed whenever the improvements to the Marksheffel Road and/or the development of the Crossings at Mesa Ridge parcel. There is currently no outfall to Jimmy Camp Creek that can handle the existing 100-year discharge. The right-of-way for channel 5012 will need to be acquired by the County. This is a critical segment of the drainageway system that will need to be installed in the very early

development stages of the basin. The design of improvements for Marksheffel Road should take into consideration the bridge structure recommended in this study during the design.

Cost Estimates

Presented on Tables 9 and 10 are the costs for the proposed bridge and roadway crossing improvements for the West Fork Jimmy Camp Creek basin. The division of the crossings between bridges and culverts was established based upon the requirements contained within the City/County Storm Drainage Criteria Manual. Presented on Table 11 is the summary of detention basin costs. The estimated construction cost has been based upon a unit cost of \$15,000 per acre-foot (with the exception of detention basin 3021). The cost of the outlet structure and outlet piping for each basin is included in the costs shown on Table 11. Presented on Table 12 is the summary of the major drainageway and grade control structure costs for the basin. No costs have been estimated for local or initial systems. Costs associated with utility relocations have not been estimated or included in the costs estimates. Presented on Tables 13 through 15 are breakdowns of the major drainageway improvement costs by jurisdiction. These estimates include an allowance for engineering and contingency of 10 percent and 5 percent respectively. Presented on Table 16 is a summary of the costs for bridge improvements within the County.

The costs for revegetation have been included within the drainageway improvement costs. No cost for habitat mitigation has been provided in the cost estimate. The cost of protection and/or replacement of habitat impacted by the construction of the facilities can be minimized by paying attention to siting, construction sequencing and access.

Jurisdictions and Platable Acreage

As mentioned previously, the West Fork Jimmy Camp Creek basin lies within portions of the City of Fountain, the City of Colorado Springs, and unincorporated El Paso County. Currently, the City of Fountain does not have a drainage or bridge fee collection system for new development. The portion of the basin in the City of Colorado Springs lies within the Colorado Centre property and the Banning-Lewis Ranch Flood Conservancy District (District). It is the intent of the City of Colorado Springs that the District will be responsible for all drainage, detention and bridge improvement construction and maintenance. Prior to any development within the City, specific

agreements will have to be finalized between the City and the District. A fee calculation for the areas within the City has been included within this report for information purposes only.

Using aerial photographs, El Paso County Tax Assessor maps and the USGS quadrangle maps, the amount of unplatted acreage was estimated. Presented on Table 17 are estimates of the area within the West Fork Jimmy Camp Creek basin that are unplatted and subject to fee calculation for the City of Colorado Springs and El Paso County. The percent impervious area value shown on Table 17 was obtained by calculating the weighted percent impervious value for the County sub-basins. A weighted percent imperviousness of 62.9 was estimated. The percent impervious values for major land use types as listed on Exhibit 3 of Board of County Commissioners Resolution No. 99-383 was used in the weighted percent impervious calculation. The weighted percent impervious value was then used to calculate the "impervious plattable acreage" noted on Table 17.

Drainage and Bridge Fee Calculations

Presented on Table 18 is the estimated bridge calculation for El Paso County. There are no bridges for the portion of the basin within the City of Colorado Springs. Presented on Table 19 are the estimated drainage fees for the City of Colorado Springs and El Paso County.

**TABLE 9
SUMMARY OF BRIDGE COSTS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

ROADWAY CROSSING #	TRIBUTARY DRAINAGEWAY	ROADWAY	SIZE	TYPE	LENGTH/ SQ. FOOT. (ft)/(sf)	UNIT COST		TOTAL COST		
						UNIT	COST	UNIT	COST	
5011	WEST FORK JIMMY CAMP CREEK	MARKSHEFFEL ROAD	75'	BRIDGE	7500	\$	140	\$	1,050,000	
5010	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	5'-8"x15'	CBC	80	\$	3,100	\$	248,000	
3110	WEST FORK JIMMY CAMP CREEK	MESA RIDGE PARKWAY	50'	BRIDGE	4000	\$	140	\$	560,000	
3092	WEST FORK JIMMY CAMP CREEK	FUTURE EAST ARTERIAL	50'	BRIDGE	3200	\$	140	\$	448,000	
3030	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	2'-8"x15'	CBC	100	\$	1,400	\$	140,000	
TOTAL COSTS OF BRIDGES										
ENGINEERING							\$		\$	2,446,000
CONTINGENCY							\$		\$	244,600
TOTAL COSTS OF BRIDGES							\$		\$	122,300
							\$		\$	2,812,900

**TABLE 10
SUMMARY OF MAJOR ROADWAY CROSSING COSTS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

ROADWAY CROSSING #	TRIBUTARY DRAINAGEWAY	ROADWAY	SIZE	TYPE	LENGTH (ft)	UNIT COST	TOTAL COST
2160	DRAINAGEWAY A	MESA RIDGE PARKWAY	2-5'x8'	CBC	100	\$ 550	\$ 55,000
2160	DRAINAGEWAY A	PROPOSED SNEFFELS ROAD	2-5'x8'	CBC	100	\$ 550	\$ 55,000
2091	DRAINAGEWAY A	FUTURE ARTERIAL	1-5'x12'	CBC	80	\$ 570	\$ 45,600
2050	DRAINAGEWAY A	WAYFARER LANE	1-4'x12'	CBC	60	\$ 530	\$ 31,800
2110	TRIBUTARY TO DRAINAGEWAY A	FUTURE ARTERIAL	1-36"	CMP	200	\$ 75	\$ 15,000
3081	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	54"	RCP	60	\$ 120	\$ 7,200
3080	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	48"	RCP	60	\$ 110	\$ 6,600
3070	TRIBUTARY DRAINAGEWAY	FUTURE EAST ARTERIAL	4H x 8'W	CBC	80	\$ 405	\$ 32,400
3000-1	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	5H x 18'W	CBC	100	\$ 770	\$ 77,000
3000-2	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	5H x 12'W	CBC	100	\$ 570	\$ 57,000
3005-1	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	4H x 9'W	CBC	100	\$ 430	\$ 43,000
3005-2	WEST FORK JIMMY CAMP CREEK	FUTURE COLLECTOR	5H x 12'W	CBC	100	\$ 570	\$ 57,000
3000	WEST FORK JIMMY CAMP CREEK	FUTURE ARTERIAL	2-6H x 12' W	CBC	120	\$ 1,100	\$ 132,000
3010	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	5H x 12'W	CBC	100	\$ 570	\$ 57,000
3020	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	5H x 12'W	CBC	120	\$ 570	\$ 68,400
3025	TRIBUTARY DRAINAGEWAY	FUTURE ARTERIAL	2-6H x 12'W	CBC	150	\$ 1,100	\$ 165,000
3040	TRIBUTARY DRAINAGEWAY	FUTURE EAST ARTERIAL	5H x 10'W	CBC	120	\$ 500	\$ 60,000
3040	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	5H x 10'W	CBC	120	\$ 500	\$ 60,000
3060	TRIBUTARY DRAINAGEWAY	FUTURE COLLECTOR	4H x 8'W	CBC	100	\$ 405	\$ 40,500
4030	DFA 4030	MARKSHEFFEL ROAD	42"	CMP	80	\$ 100	\$ 8,000
4010	DFA 4010	FUTURE COLLECTOR	4H x 10'W	CBC	120	\$ 440	\$ 52,800

TOTAL COST OF ROADWAY CROSSINGS

\$ 1,126,300

**TABLE 11
SUMMARY OF DETENTION BASIN DATA AND COSTS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

DETENTION BASIN NO.	DRAINAGEWAY	STORAGE (AF)	JURISDICTION	OUTLET PIPE SIZE	COST
3021	WEST FORK JIMMY CAMP CREEK	80.0	CITY OF CS	2-8'Hx15'W CBC	\$ 710,000
4011	DFA 4010	8.4	CITY OF FOUNTAIN	54" RCP	\$ 148,000
3061	TRIBUTARY DRAINAGEWAY	2.0	CITY OF FOUNTAIN	60" RCP	\$ 55,600
3031	WEST FORK JIMMY CAMP CREEK	12.0	CITY OF FOUNTAIN	2-8'Hx15'W CBC	\$ 363,000
4021	DFA 4020	8.4	EL PASO COUNTY	4'H x 8'W CBC	\$ 208,900
3091	TRIBUTARY DRAINAGEWAY	4.0	EL PASO COUNTY	48" CMP	\$ 84,300
3101	TRIBUTARY DRAINAGEWAY	6.1	EL PASO COUNTY	54" CMP	\$ 119,500
2091	DRAINAGEWAY A	4.1	EL PASO COUNTY	N/A	\$ 71,500
5011	TRIBUTARY DRAINAGEWAY	9.0	EL PASO COUNTY	60" CMP	\$ 165,800
5021	TRIBUTARY DRAINAGEWAY	10.5	EL PASO COUNTY	4'H x 8'W	\$ 181,500

**TABLE 12
SUMMARY OF MAJOR DRAINAGEWAY COSTS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

DRAINAGEWAY #	DRAINAGEWAY	TYPE	LENGTH (ft)	UNIT COST	TOTAL COST
5012	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	1400	\$ 209.50	\$ 293,300
5011	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	1270	\$ 275.60	\$ 350,012
5010	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	2050	\$ 239.80	\$ 491,590
3110	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	870	\$ 227.20	\$ 197,664
3040	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	2350	\$ 241.40	\$ 567,290
3030-1	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	1060	\$ 335.25	\$ 355,365
3030-2	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	900	\$ 458.30	\$ 412,470
3000	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	3230	\$ 218.50	\$ 705,755
3005	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	3000	\$ 218.00	\$ 654,000
3012	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	2000	\$ 194.80	\$ 389,600
3015	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	1550	\$ 226.90	\$ 351,695
3021	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	1750	\$ 219.65	\$ 384,388
3025	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	1380	\$ 249.70	\$ 344,586
3060	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	2000	\$ 152.40	\$ 304,800
3070	WEST FORK JIMMY CAMP CREEK	RIRPAP AND GC	800	\$ 201.25	\$ 161,000
4020	DFA 4020	GRASSLINED AND GC	2500	\$ 70.35	\$ 175,875
4010	DFA 4010	GRASSLINED AND GC	900	\$ 42.50	\$ 38,250
2160	DRAINAGEWAY A	RIRPAP AND GC	1030	\$ 377.90	\$ 389,237
	WFJCC AND DRWY A IN THE 'GLEN'	SEL. RIPRAP	5700	\$ 115.00	\$ 655,500
	WFJCC AND DRWY A IN THE 'GLEN'	GRADE CONTROLS	1830	\$ 300.00	\$ 549,000
	WFJCC AND DRWY A IN THE 'GLEN'	SPILLWAY MOD	2	\$ 30,000.00	\$ 60,000

TOTAL DRAINAGEWAY COSTS

\$ 7,831,377

**TABLE 13
SUMMARY OF COSTS FOR THE CITY OF FOUNTAIN
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

SEGMENT #	DRAINAGEWAY/ROADWAY	TYPE	LENGTH (ft)	UNIT COST	TOTAL COST
3040	WFJCC	RIRPAP AND GC	2350	\$ 241.40	\$ 567,290
3030-1	WFJCC	RIRPAP AND GC	1060	\$ 335.25	\$ 355,365
3030-2	WFJCC	RIRPAP AND GC	900	\$ 458.30	\$ 412,470
4010	DFA 4010	GRASSLINED AND GC	900	\$ 42.50	\$ 38,250
3040	FUTURE EAST ARTERIAL	5'H x 10'W	120	\$ 500.00	\$ 60,000
3040	FUTURE COLLECTOR	5'H x 10'W	120	\$ 500.00	\$ 60,000
3060	FUTURE COLLECTOR	4'H x 8'W	100	\$ 405.00	\$ 40,500
4010	FUTURE COLLECTOR	4'H x 10'W	120	\$ 440.00	\$ 52,800
4011		DETENTION BASIN	8.4 AF		\$ 148,000
3061			2.0		\$ 84,300
3031			12.0		\$ 119,500
TOTAL COSTS WITHIN FOUNTAIN					\$ 1,938,475
ENGINEERING					\$ 193,848
CONTINGENCY					\$ 96,924
TOTAL					\$ 2,229,246

TABLE 14
SUMMARY OF COSTS FOR THE CITY OF COLORADO SPRINGS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

SEGMENT #	DRAINAGEWAY/ROADWAY	TYPE	LENGTH (ft)	UNIT COST	TOTAL COST
3000	WFJCC	RIRPAP AND GC	3230	\$218.50	\$ 705,755
3005	WFJCC	RIRPAP AND GC	3000	\$218.00	\$ 654,000
3012	WFJCC	RIRPAP AND GC	2000	\$194.80	\$ 389,600
3015	WFJCC	RIRPAP AND GC	1550	\$226.90	\$ 351,695
3025	WFJCC	RIRPAP AND GC	1380	\$249.70	\$ 344,586
3000-1	FUTURE COLLECTOR	5'H x 18'W' CBC	100'	\$770	\$ 77,000
3000-2	FUTURE COLLECTOR	5'H x 12'W' CBC	100	\$570	\$ 57,000
3005-1	FUTURE COLLECTOR	4'H x 9'W' CBC	100	\$430	\$ 43,000
3005-2	FUTURE COLLECTOR	5'H x 12'W' CBC	100	\$570	\$ 57,000
3000	FUTURE ARTERIAL	2-6'H x 12' W CBC	120	\$1,100	\$ 132,000
3010	FUTURE COLLECTOR	5'H x 12'W' CBC	100	\$570	\$ 57,000
3020	FUTURE COLLECTOR	5'H x 12'W' CBC	60	\$570	\$ 68,400
3025	FUTURE ARTERIAL	2-6'H x 12'W' CBC	150	\$1,100	\$ 165,000
3021		DETENTION BASIN	80 AF		\$ 710,000
3025, 3015, 3012		IRRIGATION STRUCT.	3.0	\$5,000	\$ 15,000
TOTAL COSTS WITHIN COLORADO SPRINGS					\$ 3,827,036.00
ENGINEERING					\$ 382,703.60
CONTINGENCY					\$ 191,351.80
TOTAL					\$ 4,401,091.40

TABLE 15
SUMMARY OF COSTS WITHIN EL PASO COUNTY
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

SEGMENT #	DRAINAGEWAY/ROADWAY	TYPE	LENGTH (ft)	UNIT COST	TOTAL COST
5012	WFJCC	RIRPAP AND GC	1400	\$ 209.50	\$ 293,300
5011	WFJCC	RIRPAP AND GC	1270	\$ 275.60	\$ 350,012
5010	WFJCC	RIRPAP AND GC	2050	\$ 239.80	\$ 491,590
3021	WFJCC	RIRPAP AND GC	1750	\$ 219.65	\$ 384,388
3110	WFJCC	RIRPAP AND GC	870	\$ 227.20	\$ 197,664
3070	WFJCC	RIRPAP AND GC	800	\$ 201.25	\$ 161,000
4020	DFA 4020	GRASSLINED AND GC	2500	\$ 70.35	\$ 175,875
2160	DRWY A	RIRPAP AND GC	1030	\$ 377.90	\$ 389,237
	WFJCC/DRWY A IN GLEN	SEL. RIPRAP	5700	\$ 115.00	\$ 655,500
	WFJCC/DRWY A IN GLEN	GRADE CONTROLS	1830	\$ 300.00	\$ 549,000
2160	MESA RIDGE PARKWAY	2-5'x8' CBC	100	\$ 550.00	\$ 55,000
2160	FUTURE SNEFFELS ROAD	2-5'x8' CBC	100	\$ 550.00	\$ 55,000
2091	FUTURE ARTERIAL	1-5'x12' CBC	80	\$ 570.00	\$ 45,600
2050	WAYFARER LANE	1-4'x12' CBC	60	\$ 530.00	\$ 31,800
2110	FUTURE ARTERIAL	1-36" CMP	200	\$ 75.00	\$ 15,000
3020	FUTURE COLLECTOR	1-5'x12' CBC	60	\$ 570.00	\$ 34,200
3081	FUTURE COLLECTOR	54" RCP	60	\$ 120.00	\$ 7,200
3080	FUTURE COLLECTOR	48" RCP	60	\$ 110.00	\$ 6,600
3070	FUTURE EAST ARTERIAL	4'H x 8'WCBC	80	\$ 405.00	\$ 32,400
4030	MARKSHEFFEL ROAD	42" CMP	80	\$ 100.00	\$ 8,000
4020	PEACEFUL VALLEY ROAD	42" RCP	1200	\$ 100.00	\$ 120,000
4021		DETENTION BASIN	8.4 AF		\$ 208,900
3091			4 AF		\$ 84,300
3101			6.1 AF		\$ 119,500
2091			4.1 AF		\$ 71,500
5011			9 AF		\$ 165,800
5021			10.5 AF		\$ 181,500
TOTAL COSTS WITHIN EL PASO COUNTY					\$ 4,889,866
ENGINEERING					\$ 488,987
CONTINGENCY					\$ 244,493
TOTAL					\$ 5,623,345

TABLE 16
SUMMARY OF BRIDGE COSTS WITHIN EL PASO COUNTY
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

SEGMENT #	DRAINAGEWAY/ROADWAY	TYPE	LENGTH/ AREA (ft/ft)	UNIT COST	TOTAL COST
5011	WFJCC/MARKSHEFFEL ROAD	75' BRIDGE	7500	\$ 140.00	\$ 1,050,000
5010	WFJCC/FUTURE COLLECTOR	5-6'H x 15'W CBC	80	\$ 3,100.00	\$ 248,000
3110	WFJCC/MESA RIDGE PARKWAY	50' BRIDGE	5000	\$ 140.00	\$ 700,000
3092	WFJCC/FUTURE EAST ARTERIAL	2-8'H x 15'W CBC	3200	\$ 140.00	\$ 448,000
TOTAL BRIDGE COSTS WITHIN EL PASO COUNTY					\$ 2,446,000
ENGINEERING					\$ 244,600
CONTINGENCY					\$ 122,300
TOTAL					\$ 2,812,900

TABLE 17
SUMMARY OF PLATTABLE ACREAGE
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

JURISDICTION	ACREAGE (AC)
EL PASO COUNTY	TOTAL ACREAGE 1658.0
REDUCTIONS	THE GLEN FILINGS 1 AND 2 70.7
	PEACEFUL VALLEY ESTATES #1 135.0
	PEACEFUL VALLEY ESTATES #2 23.0
	SUNRISE RIDGE 72.2
	FOUNTAIN MUTUAL IRRIGATION PARCEL 40.0
	MAJOR ROADWAYS
	MESA RIDGE PARKWAY 1.8
	POWERS BOULEVARD 3.2
	FONTAINE BOULEVARD 0.6
	DETENTION BASINS 7.0
	TOTAL REDUCTIONS 353.5
	NET PLATTABLE ACREAGE 1304.5
	IMPERVIOUS PLATTABLE ACREAGE (1) 820.5
COLORADO SPRINGS	TOTAL ACREAGE 1392.0
REDUCTIONS	DETENTION BASIN 3021 10.3
	NET PLATTABLE ACREAGE 1381.7

(1) Based upon weighted percent imperviousness of 62.9 for County basins only.

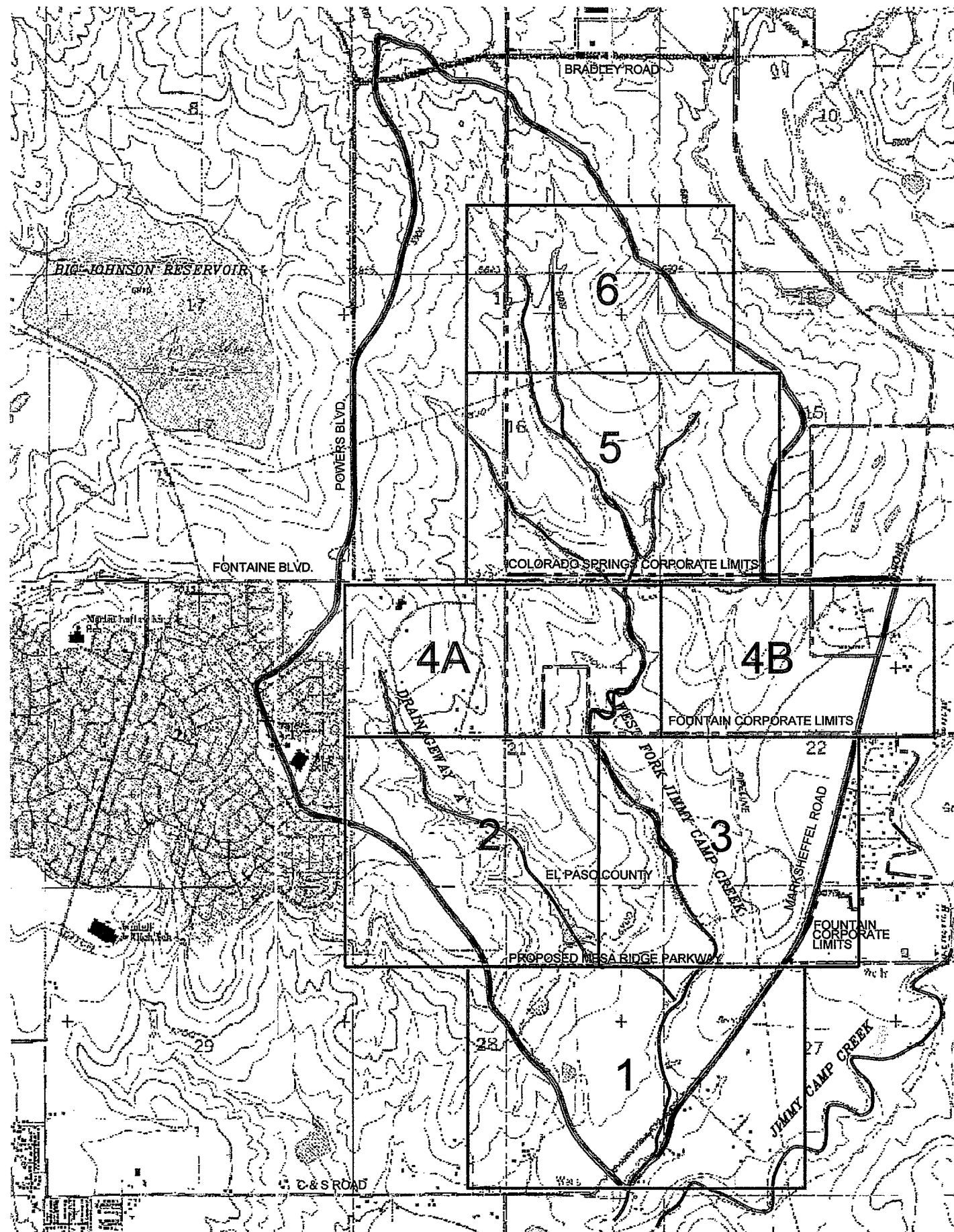
**TABLE 18
BRIDGE FEE CALCULATION
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

JURISDICTION		TOTAL COST (AC)	
EL PASO COUNTY	WFJCC FUTURE COLLECTOR	\$	248,000.00
	MESA RIDGE PARKWAY	\$	700,000.00
	WFJCC EAST ARTERIAL	\$	448,000.00
	TOTAL	\$	1,396,000.00
	ENGINEERING, 10%	\$	139,600.00
	CONTINGENCY, 5%	\$	69,800.00
	TOTAL	\$	1,605,400.00
	IMPERVIOUS PLATTABLE ACREAGE		820.5
	BRIDGE FEE (\$/AC)	\$	1,956.61

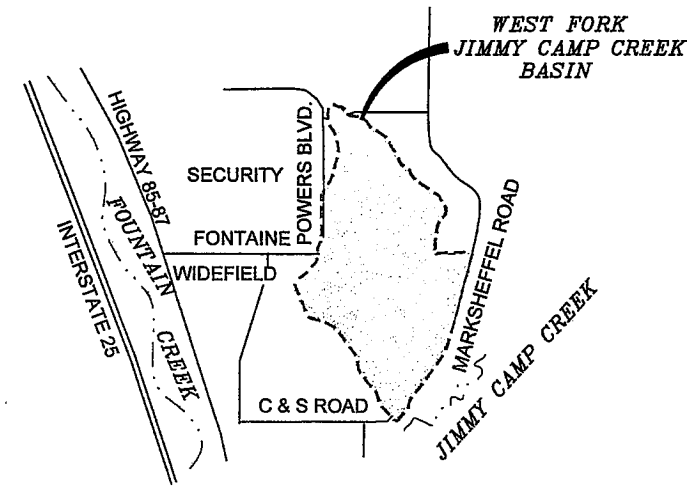
**TABLE 19
FEE CALCULATIONS
WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY**

JURISDICTION		TOTAL COST (AC)		
EL PASO COUNTY	ROADWAY CROSSING AND DRAINAGEWAYS AND DETENTION BASINS	\$	4,889,866.00	
	TOTAL	\$	4,889,866.00	
	ENGINEERING, 10%	\$	488,986.60	
	CONTINGENCY, 5%	\$	244,493.30	
	SUBTOTAL	\$	5,623,345.90	
	DETENTION BASIN LAND COST 7.0 ACRES @\$36,000 PER ACRE	\$	252,000.00	
	TOTAL	\$	5,875,345.90	
	IMPERVIOUS PLATTABLE ACREAGE		820.5	
	DRAINAGE FEE (\$/AC)	\$	7,160.69	
	COLORADO SPRINGS	ROADWAY CROSSING AND DRAINAGEWAYS AND DETENTION BASINS	\$	3,827,036.00
TOTAL		\$	3,827,036.00	
ENGINEERING, 10%		\$	382,703.60	
CONTINGENCY, 5%		\$	191,351.80	
TOTAL		\$	4,401,091.40	
PLATTABLE ACREAGE			1381.7	
DRAINAGE FEE (\$/AC)		\$	3,185.27	
COLORADO SPRINGS		DETENTION BASIN LAND ACQUISITION AND DETENTION BASINS		
		10.3 ACRES @\$35,280 PER ACRE	\$	363,384.00
		TOTAL	\$	363,384.00
	PLATTABLE ACREAGE		1381.7	
	DETENTION BASIN LAND FEE (\$/AC)	\$	263.00	

PRELIMINARY PLAN DRAWINGS


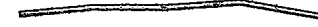


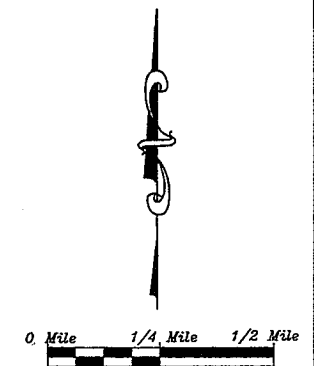
INDEX MAP
NTS



VICINITY MAP
NTS

LEGEND

-  STREAM INVERT
-  BASIN DIVIDE

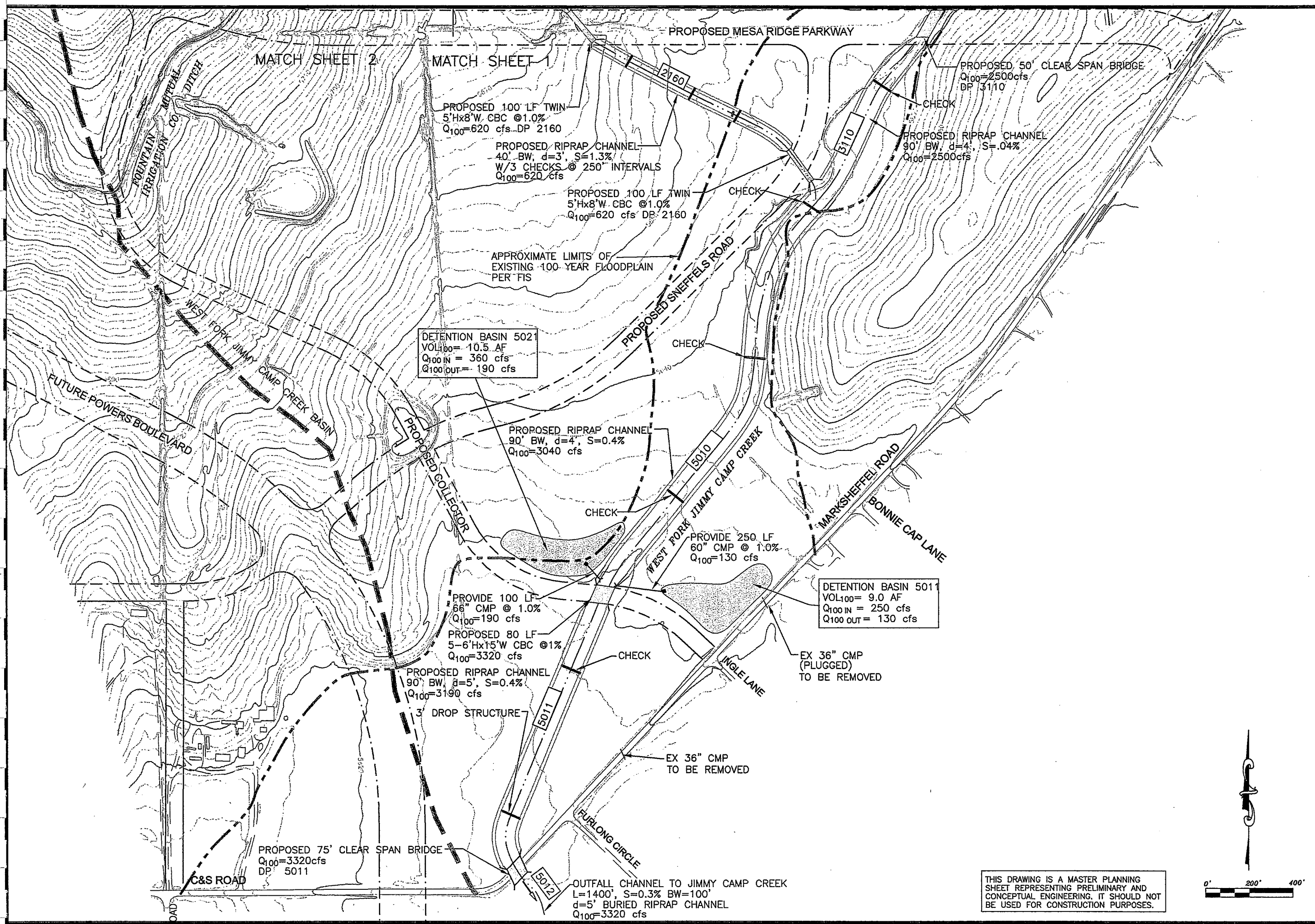


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 Colorado Springs, Colorado
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 (719) 630-7342

**WEST FORK JIMMY CAMP CREEK
 DRAINAGE BASIN PLANNING STUDY**
 PRELIMINARY PLAN
 EL PASO COUNTY, COLORADO

Project No.: 9893
Date: 2/00
Design: RNW
Drawn: CAD
Check: RNW
Revisions:

INDEX



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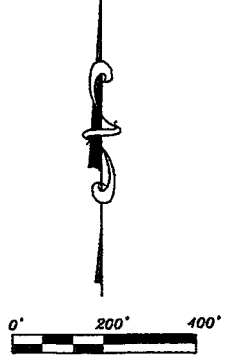
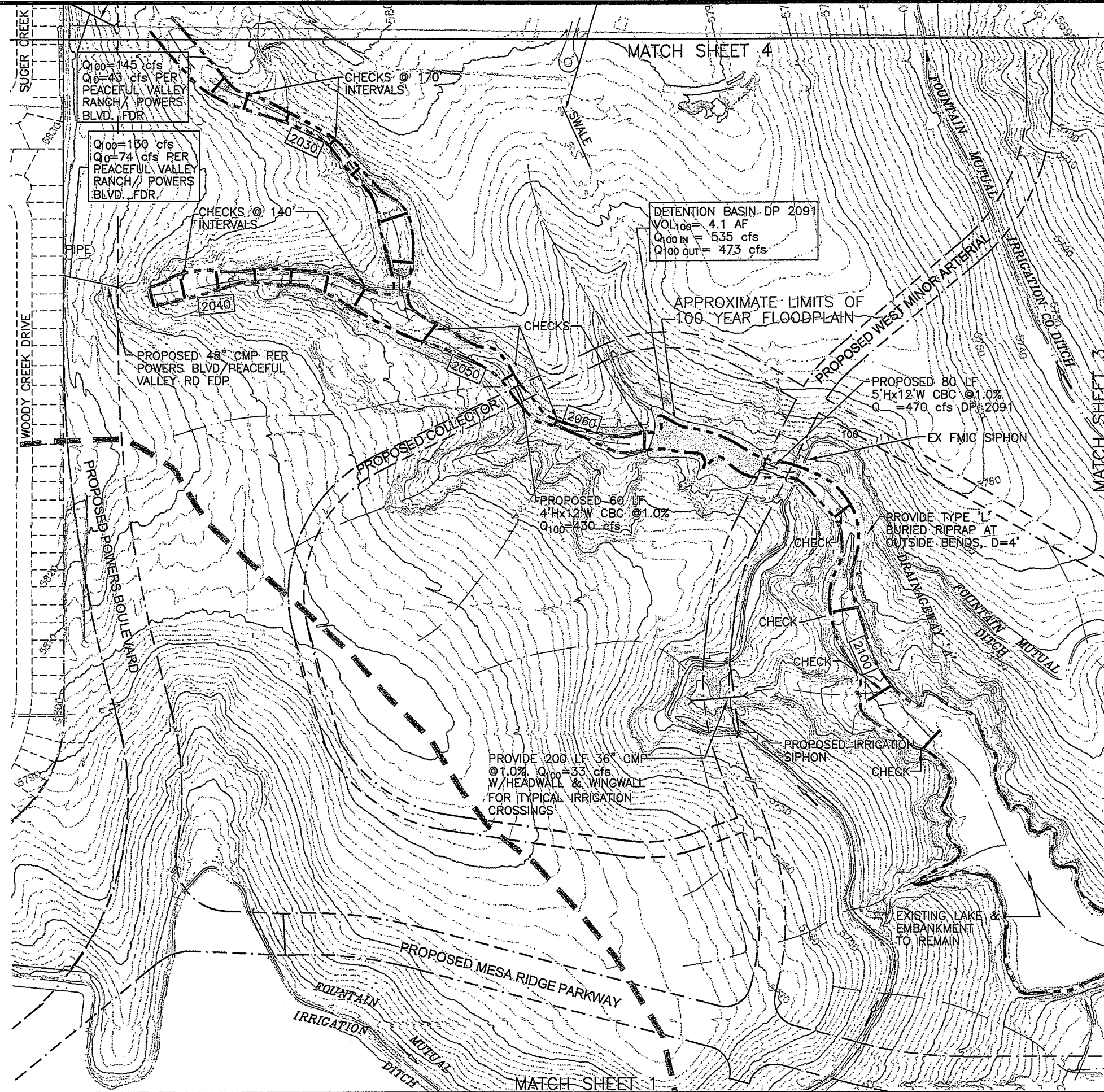
**WEST FORK JIMMY CAMP CREEK
 DRAINAGE BASIN PLANNING STUDY**
 PRELIMINARY PLAN
 EL PASO COUNTY, COLORADO

Project No.:	9893
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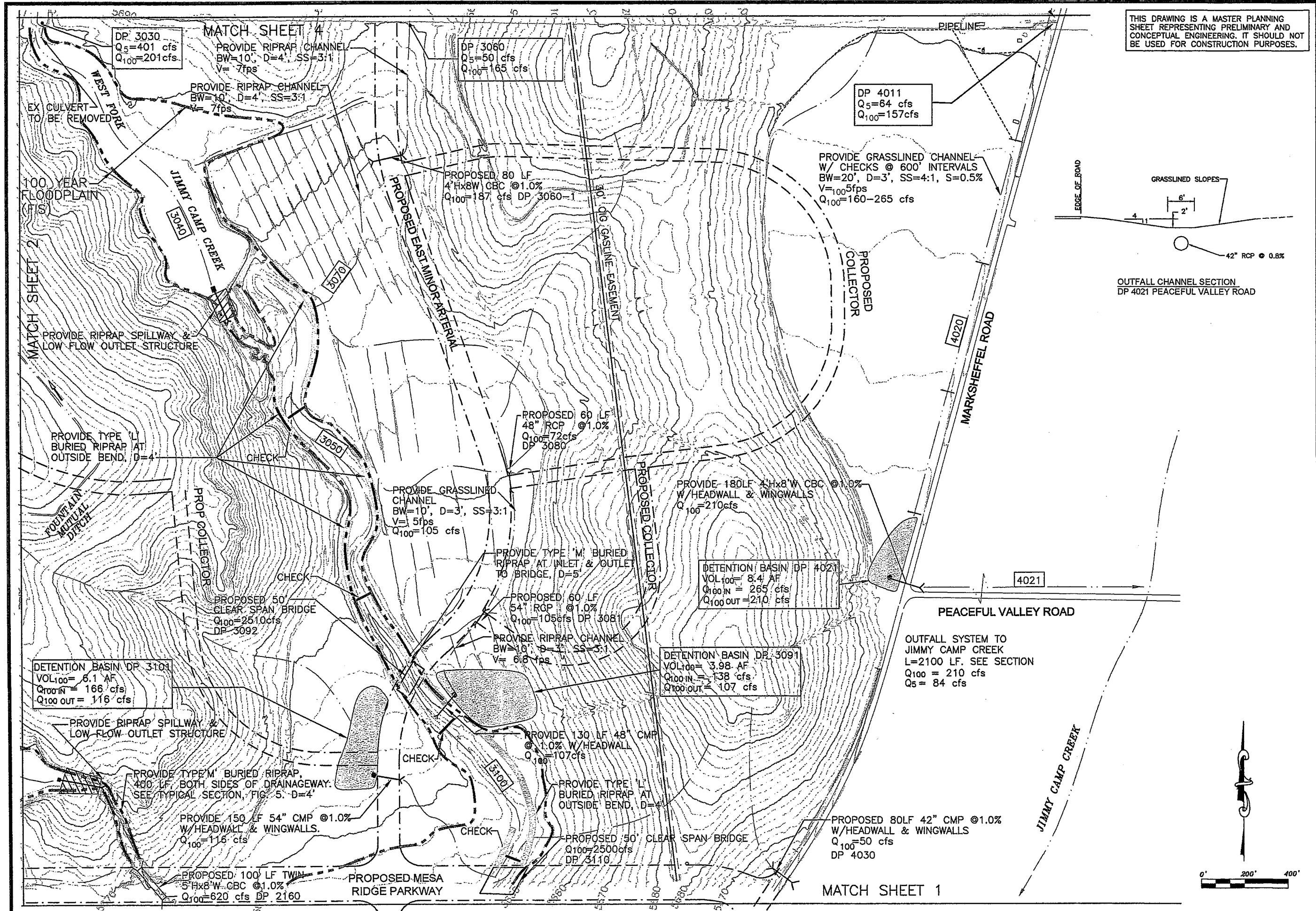
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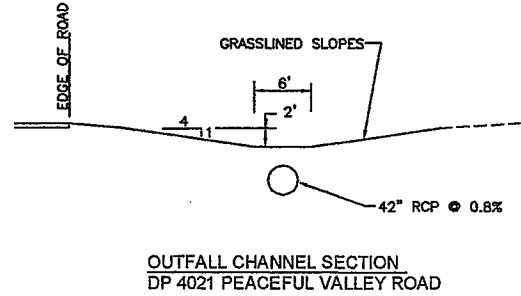
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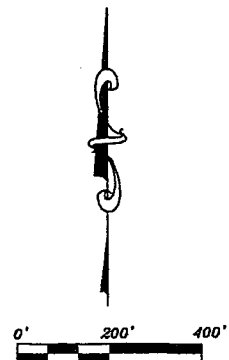
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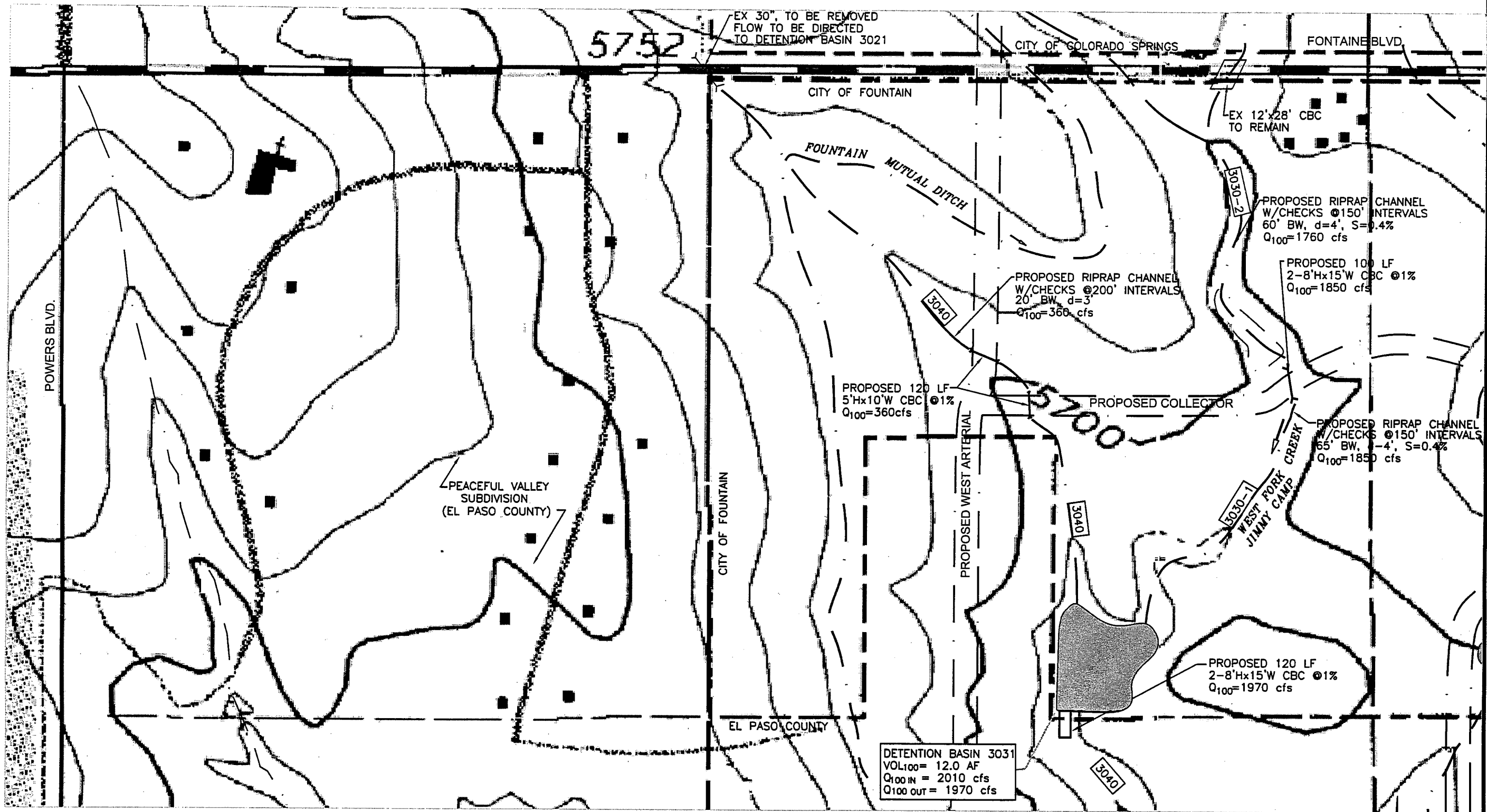
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Revisions:	



MATCH SHEET 1



DETENTION BASIN 3031
 VOL₁₀₀ = 12.0 AF
 Q_{100 IN} = 2010 cfs
 Q_{100 OUT} = 1970 cfs

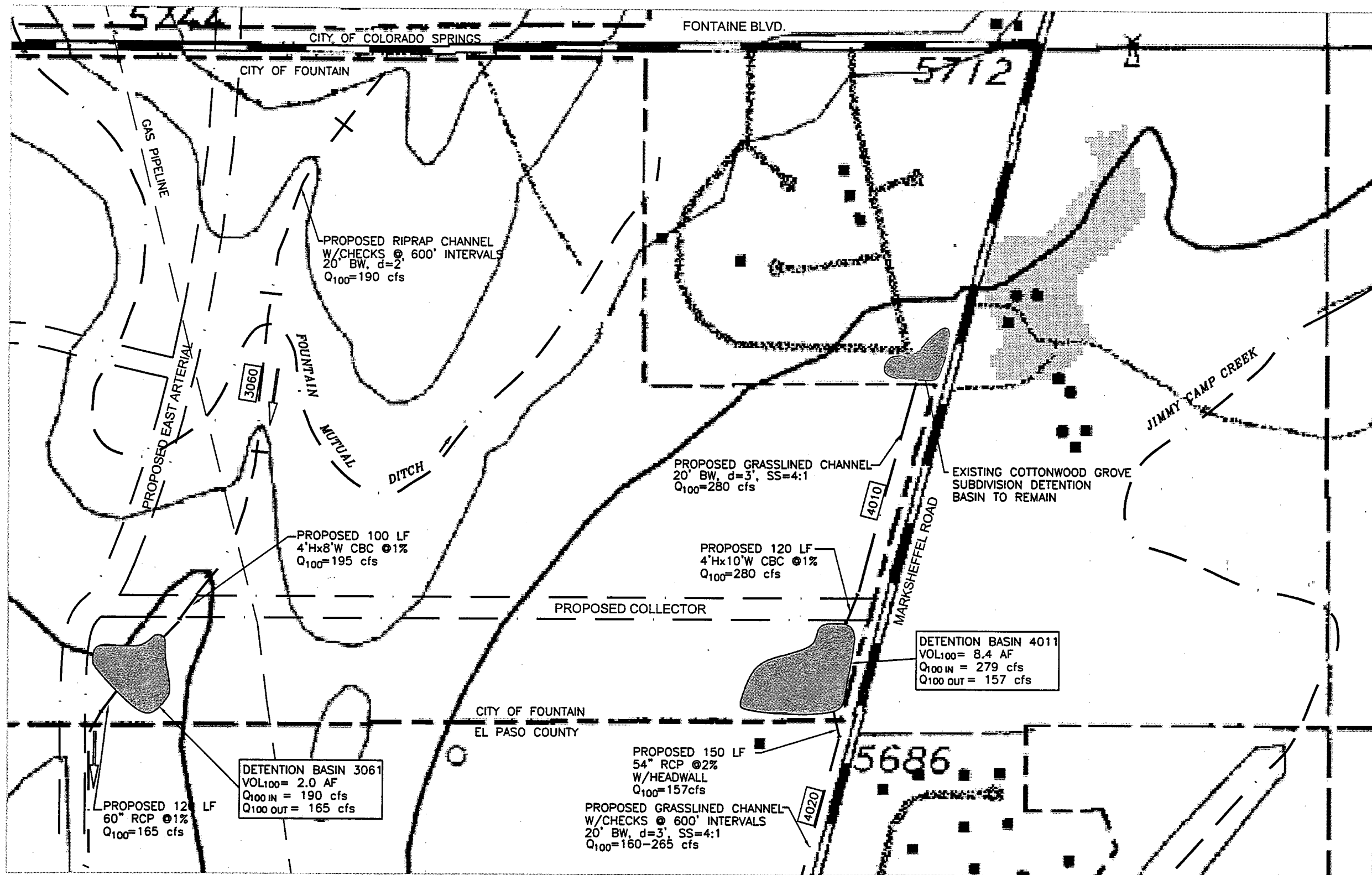
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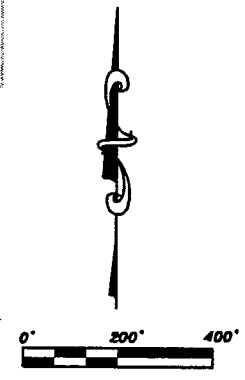


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PROPOSED CULVERT
100LF, 5'H x 18"W CBC
Q100 = 570 CFS
DP 3000-1

PROPOSED CULVERT
100LF, 5'H x 12"W CBC
Q100 = 410 CFS
DP 3005-2

PROPOSED CULVERT
100 LF, 5'H x 12"W CBC
Q100 = 380 CFS
DP 3010

PROPOSED CULVERT
120 LF, 2-6'H x 12"W CBC
Q100 = 935 CFS
DP 3000

PROPOSED CULVERT
120 LF, 5'H x 12"W CBC
Q100 = 420 CFS
DP 3020

PROPOSED CULVERT
150 LF 2-6'H x 12"W CBC
Q100=910 CFS
DP 3025

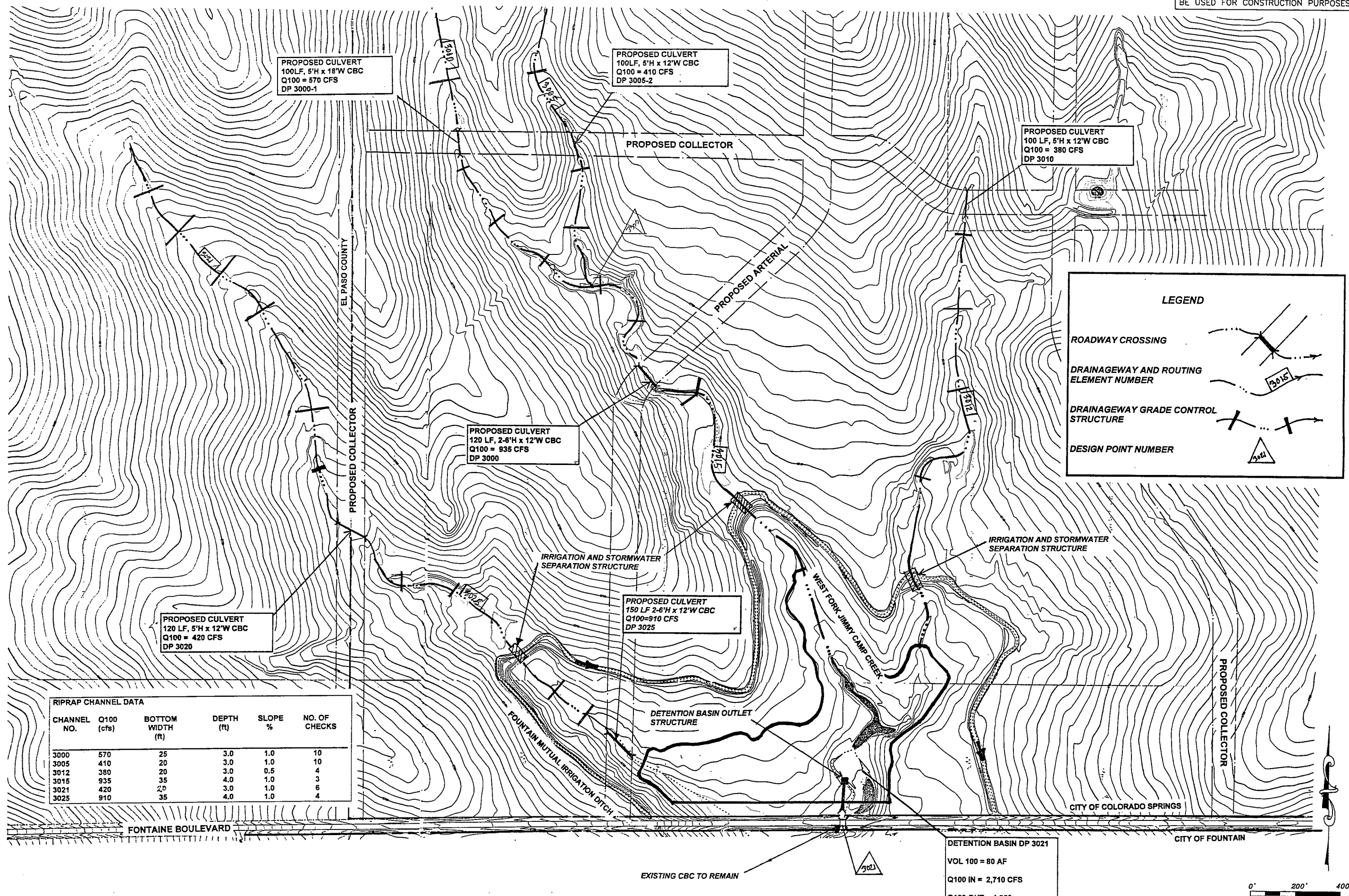
DETENTION BASIN DP 3021
VOL 100 = 80 AF
Q100 IN = 2,710 CFS
Q100 OUT = 1,850

LEGEND

- ROADWAY CROSSING
- DRAINAGEWAY AND ROUTING ELEMENT NUMBER
- DRAINAGEWAY GRADE CONTROL STRUCTURE
- DESIGN POINT NUMBER

RIPRAP CHANNEL DATA

CHANNEL NO.	Q100 (cfs)	BOTTOM WIDTH (R)	DEPTH (R)	SLOPE %	NO. OF CHECKS
3000	570	25	3.0	1.0	10
3005	410	20	3.0	1.0	10
3012	380	20	3.0	0.5	4
3015	935	35	4.0	1.0	3
3021	420	20	3.0	1.0	6
3025	910	35	4.0	1.0	4

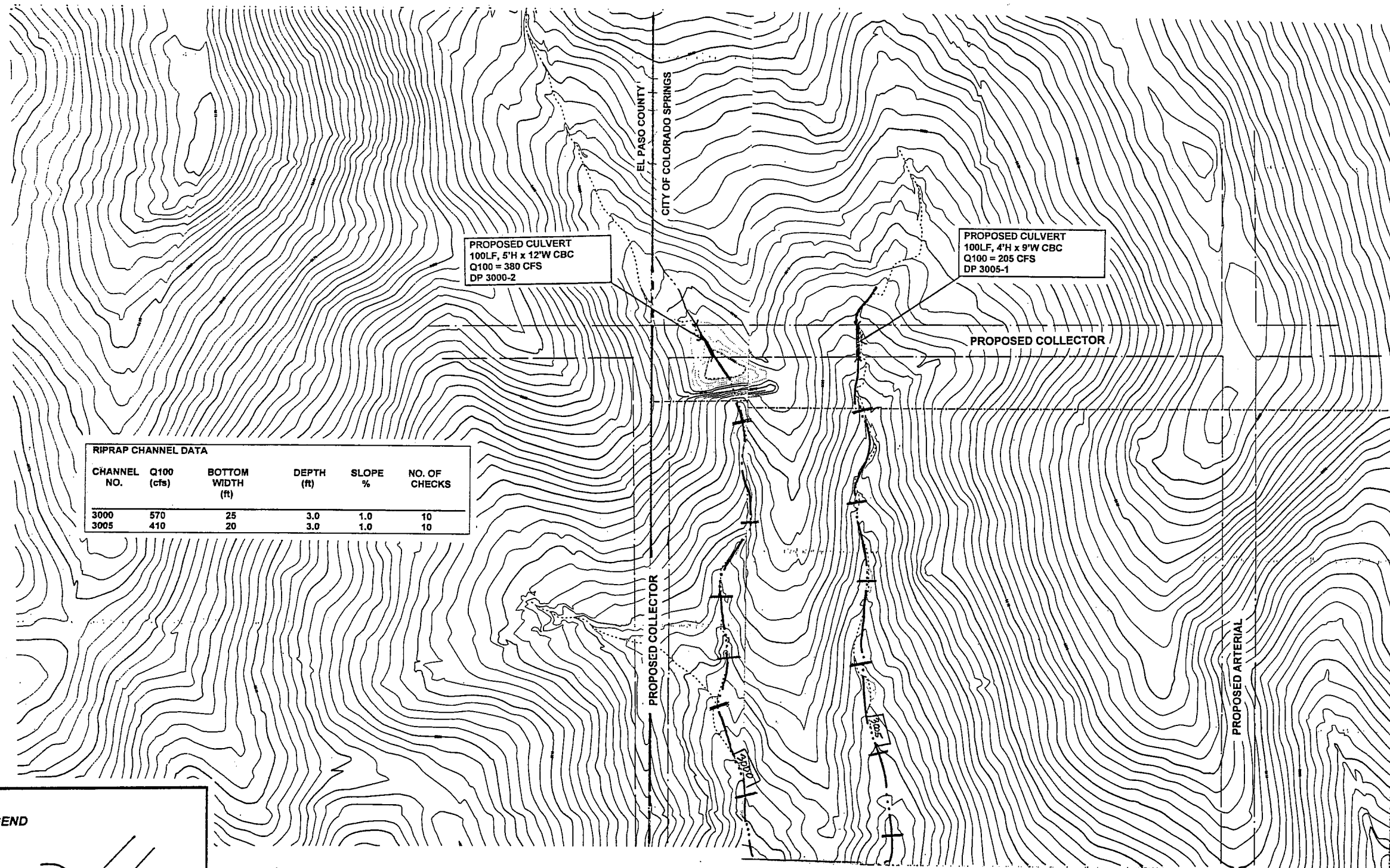


Kiowa Engineering Corporation
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Colorado Springs, Colorado
80904
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**WEST FORK JIMMY CAMP CREEK
DRAINAGE BASIN PLANNING STUDY
PRELIMINARY PLAN
EL PASO COUNTY, COLORADO**

Project No.: 9893
Date: 2/00
Design: RNW
Drawn: CAD
Check: RNW
Revisions:

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.



RIPRAP CHANNEL DATA

CHANNEL NO.	Q100 (cfs)	BOTTOM WIDTH (ft)	DEPTH (ft)	SLOPE %	NO. OF CHECKS
3000	570	25	3.0	1.0	10
3005	410	20	3.0	1.0	10

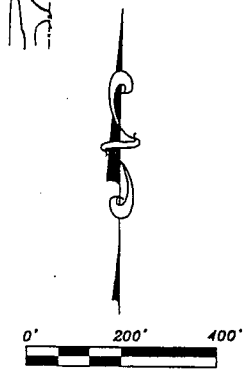
LEGEND

ROADWAY CROSSING

DRAINAGEWAY AND ROUTING ELEMENT NUMBER

DRAINAGEWAY GRADE CONTROL STRUCTURE

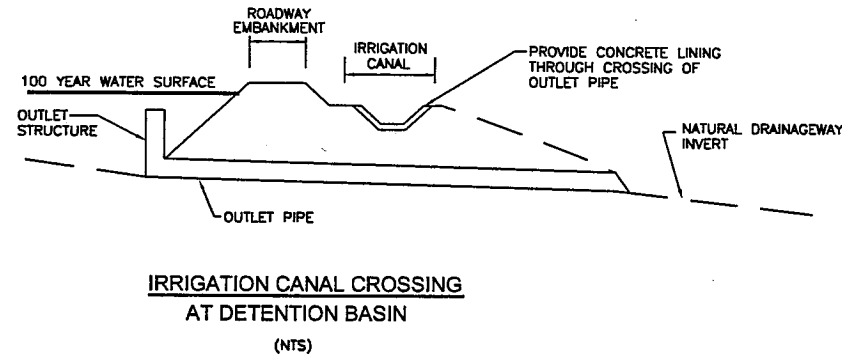
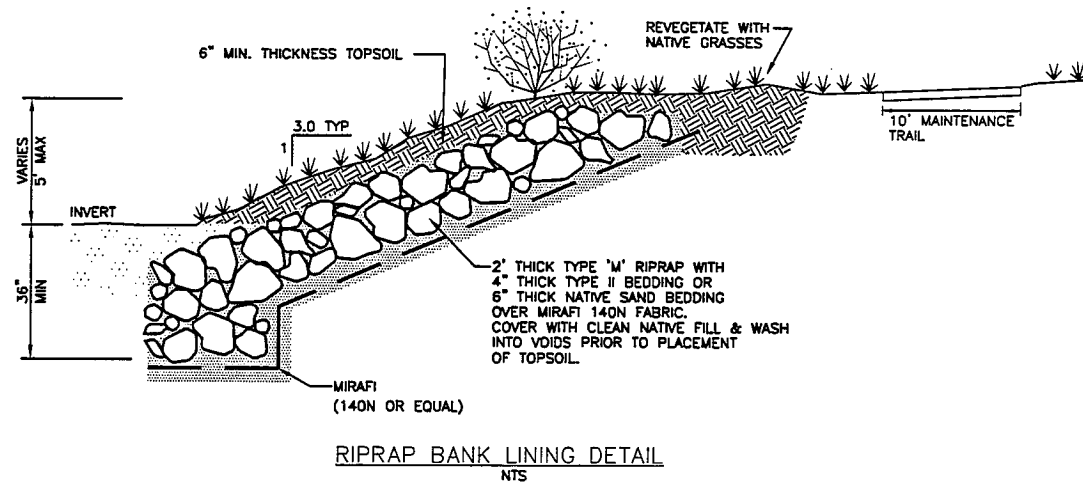
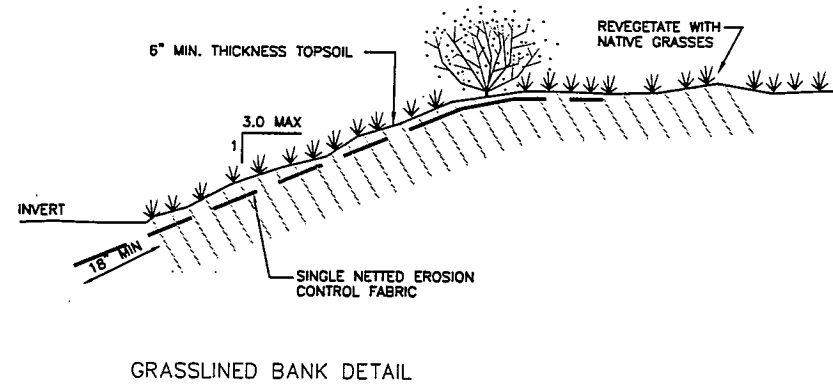
DESIGN POINT NUMBER



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 DRAINAGE BASIN PLANNING STUDY**
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RIPRAP GRADATIONS

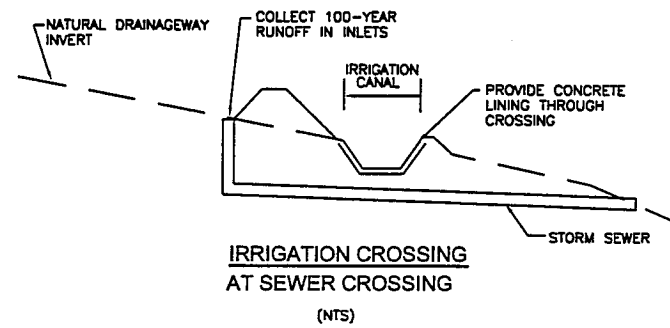
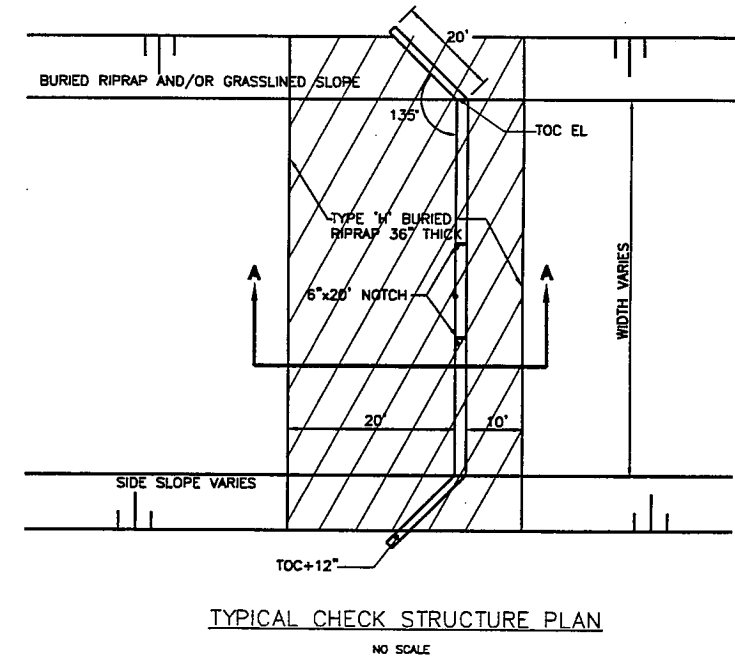
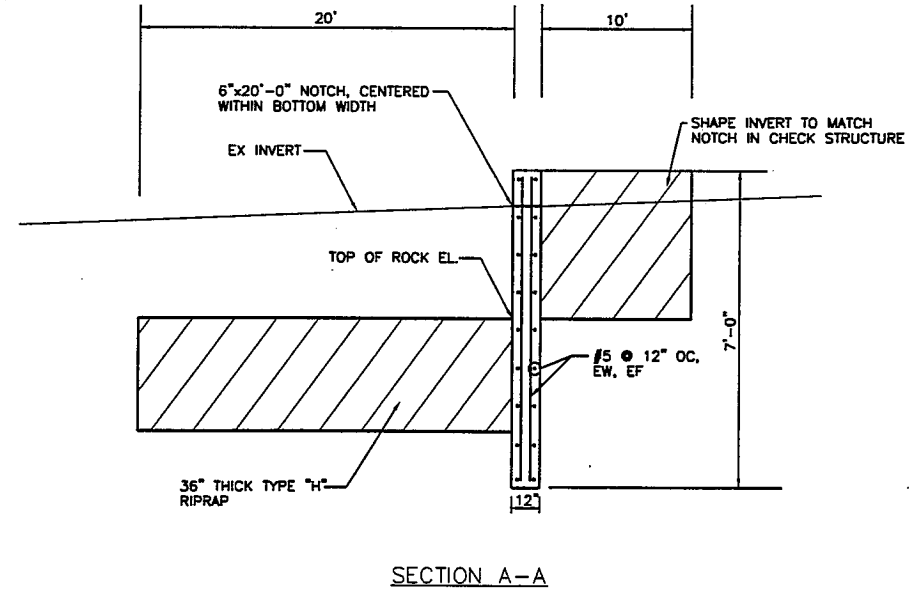
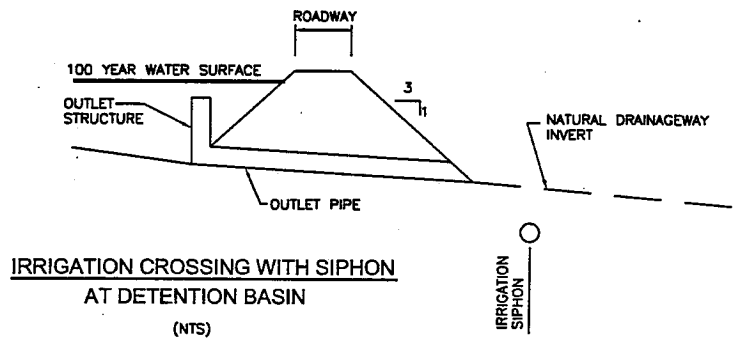
TYPE H RIPRAP INTERMEDIATE ROCK DIMENSION IN INCHES	% SMALLER THAN GIVEN SIZE BY WEIGHT	D 50 INCHES
30	100	18
24	50-70	
18	35-50	
6	2-10	

TYPE M RIPRAP INTERMEDIATE ROCK DIMENSION IN INCHES	% SMALLER THAN GIVEN SIZE BY WEIGHT	D 50 INCHES
21	100	12
18	50-70	
12	35-50	
4	2-10	

SEED MIX

AREAS DISTURBED BY THE EARTHWORK SHALL BE PERMANENTLY REVEGETATED WITH NATIVE GRASSES. NATIVE SEED MIX FOR THIS PROJECT SHALL BE AS FOLLOWS:

NATIVE SEED MIX		pls/acre
BLUE GRAMA	<i>Chondrosun hirsutum</i>	2.0
SIDEOATS GRAMA	<i>Bouteloua curtipendula</i>	3.0
SLENDER WHEATGRASS	<i>Agropyron trachyaulum trachyaulum</i>	2.0
WESTERN WHEATGRASS	<i>Agropyron smithii</i>	4.0
		11.0 lbs



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West Fork Jimmy Camp Creek
Drainage Basin Planning Study
TYPICAL DRAINAGEWAY DETAILS
EL PASO COUNTY, COLORADO

Project No.: 9893
Date: 7/00
Design: RNW
Drawn: CAD
Check: RNW
Revisions: