

The comprehensive plan and the workshop establishes a set of goals and values which one may use as guidelines for the development of drainageways within the City and County. These goals and values, to date, have not been integrated into the ordinances, thereby requiring development of these areas to respect these goals and values.

The City of Colorado Springs development approval process has the ability in planned zones to require a development plan which must address the preservation of natural features, such as healthy vegetation, drainage channels, etc., as an element of the review and approval process. The situation exists where numerous zones within the City do not require the submittal of a development plan as a requirement of approval, i.e., C2 or M6 zone. A potential no cost solution for the City would be to request at the time of zone change or conditional use application a submittal of a development plan and the addition of the planning zone to the particular parcel. This application works on a parcel by parcel basis, but for the overall protection of these natural drainage features, a more extensive environmentally sensitive overlay zone needs to be adopted which would address the drainages, their preservation and enhancement as well as other significant natural features. This solution would be a no cost alternative for the City as the burden of providing solutions and alternative treatments would be left up to the applicant.

The Inventory of Significant Natural Features, as accepted by the City of Colorado Springs, delineates Fountain Creek as a highest priority visual resources, yet there is at present no mechanism within the code to protect the resource, enhance it or preserve it. There are presently practices that occur along the Fountain Creek corridor that are inconsistent with the Midland Corridor Plan, Natural Features Inventory and the Comprehensive Plan. These practices of industrial waste and solid waste storage that is presently occurring along the corridor present a dual problem. The land uses are inconsistent with the approved plans, which recommend a higher and more aesthetically sensitive land use. Secondly, the temporary storage and uncompacted fill also present a potential hazard in a major flood even by providing significant amounts of material capable of creating a major blockage. With modifications to the existing codes, these uses could be modified over time to conform to the existing approved plans.

## Summary

The cost and non-cost criteria were combined together in the evaluation matrix, the development of which was described under Section 6.1. The eight completed Tables 6.3-27 thru 6.3-34 of Appendix C, Volume I present a numerical and visual description of the rating criteria and results for each alternative for each reach. At the bottom of each tabulation is a recommendation by the City/Consultant team of a selected alternative for each reach. This information was presented at a Study Group meeting which was held on October 28, 1992.

The Study Group, City and Consultants reached concurrence on the selected alternatives with the exception of Reach F5 and Reach F7 for which selections were not made at the time of the meeting. As a result of the review process which followed the Study Group meeting, there was a consensus decision to select alternative four for both Reaches F5 and F7 based upon their conformance more

closely with the City's stated preference for "natural drainageways" and to achieve a maximum level of consistency of treatment with adjacent reaches. Another result of the review process was the need to establish numerical values for operation and maintenance costs. In order to utilize operation and maintenance costs in an objective manner in the alternatives evaluation it was also decided to perform an economic analysis which combines one time capital costs with perpetual annual operation and maintenance costs creating a composite "present value (P.V.)" of each alternative. That "P.V." analysis is described in the following paragraphs.

For the P.V. analysis, the City requested that several different scenarios be reviewed which varied the period and the beginning year of capital cost expenditures. This analysis is summarized on Table 6.3-35, and is generally described as follows:

Scenario 1 - 10 Yr. Capital Cost Expenditures  
(Table 6.3-36, Appendix D, Volume III)

Scenario 2 - 20 Yr. Capital Cost Expenditures, Beginning in 1993  
(Table 6.3-37, Appendix D, Volume III)

Scenario 3 - 20 Yr. Capital Cost Expenditures, Beginning in 1998  
(Table 6.3-38, Appendix D, Volume III)

Scenario 4 - 50 Yr. Capital Cost Expenditures  
(Table 6.3-39, Appendix D, Volume III)

Scenario 5 - 2 Year Capital Cost Expenditure Consecutively per Reach  
(Table 6.3-40, Appendix D, Volume III)

Scenario 6<sup>1</sup> - \$1 Million in Total Expenditures, Beginning in 1993  
(Table 6.3-41, Appendix D, Volume III)

Scenario 7<sup>1</sup> - \$1 Million in Total Expenditures, Beginning in 1998  
(Table 6.3-42, Appendix D, Volume III)

<sup>1</sup>Calculated for selected alternatives only.

Two illustrations were also reviewed, showing a total expenditure of 1 million dollars per year, capital cost and O & M costs, for the selected alternatives. The first scenario beginning in 1993, and the second expenditures beginning in 1998.

The illustrations showed that a 50 year period of capital costs would be required to maintain a total yearly expenditure of one million dollars, Scenario 6 and Scenario 7. See Tables 6.3-41, and 6.3-42, Appendix D, Volume III for calculations. Scenarios 6 and 7 represent only selected alternatives analysis, therefore they are not summarized in Table 6.3-35, but are included in Table 6.3-41 and 42 in Appendix D, Volume III.

TABLE 6.3 - 35  
Summary of Present Value Analysis

Capital Cost Only	REACH NUMBER							
	Total Capital Cost per Reach							
	F1	F2	F3	F4	F5	F6	F7	F8
Alternative 1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Alternative 2	\$3,439,500	\$636,000	\$33,000	\$2,348,000	\$1,535,500	\$3,702,400	\$1,710,300	\$1,616,700
Alternative 3	\$896,500	\$9,037,850	\$2,380,200	\$1,559,000	\$6,495,600	\$6,820,000	\$6,292,700	N/A
Alternative 4	\$979,500	\$7,720,950	\$4,923,200	\$2,288,000	\$4,011,900	N/A	\$5,773,700	N/A
Alternative 5	N/A	\$12,987,850	\$11,286,200	N/A	N/A	N/A	N/A	N/A
O & M Cost Only	REACH NUMBER							
	Cost represents dollars per linear foot of reach							
	F1	F2	F3	F4	F5	F6	F7	F8
Alternative 1	\$24	\$20	\$15	\$13	\$39	\$32	\$23	\$24
Alternative 2	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
Alternative 3	\$1	\$4	\$4	\$1	\$4	\$4	\$4	N/A
Alternative 4	\$1	\$3	\$3	\$2	\$4	N/A	\$4	N/A
Alternative 5	N/A	\$1	\$1	N/A	N/A	N/A	N/A	N/A

Present Value of Capital Cost and Operation & Maintenance (O & M) Cost								
REACH NUMBER	F1	F2	F3	F4	F5	F6	F7	F8
Scenario 1 - 10 Year Capital Cost								
Alternative 1	\$2,161,300	\$5,969,305	\$1,698,164	\$1,204,153	\$3,712,805	\$4,075,595	\$3,876,189	\$988,023
Alternative 2	\$3,294,180	\$1,736,382	\$480,994	\$2,373,400	\$1,690,613	\$3,667,672	\$2,133,040	\$1,543,748
Alternative 3	\$584,787	\$8,903,330	\$2,483,203	\$1,422,486	\$5,921,679	\$6,327,048	\$6,041,921	N/A
Alternative 4	\$925,588	\$7,481,523	\$5,439,222	\$2,136,965	\$3,803,033	N/A	\$5,599,203	N/A
Alternative 5	N/A	\$11,377,365	\$9,740,568	N/A	N/A	N/A	N/A	N/A
Scenario 2 - 20 Year Capital Cost Beginning in 1993								
Alternative 1	\$2,161,300	\$5,969,305	\$1,698,164	\$1,204,153	\$3,712,805	\$4,075,595	\$3,876,189	\$988,023
Alternative 2	\$2,918,770	\$1,666,965	\$477,392	\$2,117,124	\$1,523,019	\$3,263,567	\$1,946,367	\$1,367,291
Alternative 3	\$756,937	\$7,916,880	\$2,223,412	\$1,252,326	\$5,212,707	\$5,582,688	\$5,355,094	N/A
Alternative 4	\$818,679	\$6,638,808	\$4,001,872	\$1,887,237	\$3,365,148	N/A	\$4,969,024	N/A
Alternative 5	N/A	\$9,959,786	\$8,508,719	N/A	N/A	N/A	N/A	N/A
Scenario 3 - 20 Year Capital Cost Beginning in 1998								
Alternative 1	\$2,161,300	\$5,969,305	\$1,698,164	\$1,204,153	\$3,712,805	\$4,075,595	\$3,876,189	\$988,023
Alternative 2	\$2,890,928	\$2,462,234	\$699,575	\$2,028,726	\$1,962,438	\$3,524,308	\$2,347,318	\$1,350,030
Alternative 3	\$1,033,980	\$7,843,190	\$2,201,809	\$1,290,837	\$5,141,400	\$5,520,400	\$5,281,914	N/A
Alternative 4	\$1,087,238	\$6,752,832	\$3,740,521	\$1,981,007	\$3,548,197	N/A	\$4,948,886	N/A
Alternative 5	N/A	\$9,959,786	\$8,508,719	N/A	N/A	N/A	N/A	N/A
Scenario 4 - 50 Year Capital Cost								
Alternative 1	\$2,161,300	\$5,969,305	\$1,698,164	\$1,204,153	\$3,712,805	\$4,075,595	\$3,876,189	\$988,023
Alternative 2	\$2,130,167	\$1,521,144	\$469,825	\$1,578,778	\$1,170,962	\$2,414,687	\$1,554,232	\$996,617
Alternative 3	\$551,389	\$5,844,696	\$1,677,684	\$894,881	\$3,723,406	\$4,018,989	\$3,912,314	N/A
Alternative 4	\$594,100	\$4,868,560	\$2,873,088	\$1,362,648	\$2,445,305	N/A	\$3,645,239	N/A
Alternative 5	N/A	\$6,981,952	\$5,921,036	N/A	N/A	N/A	N/A	N/A
Scenario 5 - 1/2 Capital Cost per Year per Consecutive Reach								
Alternative 1	\$2,161,300	\$5,969,305	\$1,698,164	\$1,204,153	\$3,712,805	\$4,075,595	\$3,876,189	\$988,023
Alternative 2	\$3,650,906	\$2,122,555	\$660,803	\$2,427,361	\$2,449,545	\$4,327,476	\$3,060,566	\$1,548,731
Alternative 3	\$947,767	\$9,699,464	\$2,656,032	\$1,575,799	\$6,195,687	\$6,376,622	\$6,135,515	N/A
Alternative 4	\$1,055,290	\$8,444,481	\$4,846,393	\$2,288,034	\$4,410,760	N/A	N/A	N/A
Alternative 5	N/A	\$12,724,394	\$10,291,268	N/A	N/A	N/A	N/A	N/A

-Previously Selected Alternative

The data required for the present value scenarios includes the existing O & M costs for the "No Action" alternative as well as the proposed O & M and capital costs of the alternatives. The following maintenance cost information accumulated by the Denver area Urban Drainage and Flood Control District, were felt to be applicable to Fountain Creek in Colorado Springs and were applied to the alternatives with specific physical improvements.

Natural Flood Plain Areas, primarily debris control:	1.00 \$/lf
Channelized Areas:	2.00 \$/lf
Utility Protection, and Debris Control:	4.00 \$/lf

The "No Action" and less intensive construction alternatives will generally have high O & M costs. These costs would be associated with remediation of erosion, utility crossings, and other features of an undeveloped channel. There will also be the cost of utility protection and debris control. In order to develop a cost of the O & M, the capital cost of the alternative using drop structures, was divided over a fifty year period. In addition a cost for the utility protection and debris control of 4 dollars per linear foot was added to the cost. The O&M values are summarized in Table 6.3-35.

The variables used to estimate the present value of the alternatives, are the discount rate and the period of capital expenditures. The discount rate is equal to the nominal interest adjusted for the inflation rate,

$$\text{Discount Rate} = \text{Nominal Interest} - \text{Inflation.}$$

An example of the discount rate would be if the inflation rate were 5 percent then \$100.00 today would be worth \$95.00 next year ( $100/1.05$ ). If the interest rate for that year was 8 percent then the \$100.00 would be worth \$108.00 next year ( $100 \times 1.08$ ). However due to the inflation of 5 percent that \$108.00 would only buy \$103.00 of goods ( $108/1.05$ ). Therefore the discount rate would be 3 percent,  $(1 - (103/100))$ . The present value analysis was computed using 1993 dollars and a discount rate of 3 percent.

In a situation where cost is the only selection criteria the lowest present value alternative would be selected. However since there are non cost considerations based upon the goals and objectives of the selection criteria, the P.V. analysis should be evaluated in the same manner as the capital costs. The P.V. analysis shows the effect of the O & M costs and the capital cost expenditure period on the alternatives.

The Alternatives 1 through 5 are the same as those presented in the Alternative Description Matrices, Appendix C, Table 6.2-1 through 6.2-8. These include no action, reactive strategies, and stabilization through the use of drop structures, riffle drops, and vegetation. The present value of Scenario 1 consists entirely of O&M costs, no capital costs are associated with it. Scenarios 2 through 5 have significant capital expenditures, and therefore are sensitive to the capital cost funding strategy.

Scenario 1 has the high present value costs due to the minimum period of capital cost expenditure. Scenarios 2 and 3 show the effect of delaying the alternatives construction for 5 years, primarily due to higher O&M costs for years 1993 to 1998.

Scenario 4, the 50-year capital cost expenditure, has low present value costs. Construction of each alternative item would need to be coordinated to insure that its life expectancy would be greater than the capital cost expenditure period.

Scenario 5, has the highest present value costs, due to the short expenditure period of 2 years. The benefit derived is that the channel improvements are completed and each specific improvement will have equal life expectancies, as well as decreasing original operation and maintenance costs.

The present value analysis illustrates that there would be differences in costs for the alternatives depending on the funding strategy implemented. The analysis also indicates, however, that the recommended alternatives would be consistent irrespective of the anticipated funding strategy.

#### **6.4 EVALUATION OF ALTERNATIVES AND ALTERNATIVES SELECTION**

##### **General**

The narrative of this Section is a description of the selection rationale for the preferred alternative for each Reach. In that regard it is important to keep in mind two characteristics of alternatives which have a significant impact on both cost (as described by line items on Tables 6.3-1 through 6.3-23, Appendix C, Volume I) and non-cost evaluation criteria.

The first concerns the allocation of costs among the potentially benefitted or responsible parties. As previously mentioned, the improvements and related costs described herein are those which have been allocated primarily to drainage and flood control improvements. Such things as trails, boating improvements, pedestrian bridges, etc. are not included. Even some of the improvements associated with drainage and flood control have other benefits as well (for instance the riffle drops protect utilities, enable navigation and enable fish passage) and costs which are included herein may eventually be partially covered by non-drainage/flood control funds. Also some of the drainage/flood control improvements may be built as a integral part of site development and therefore the costs covered by private funds. Certain other private improvements either will not be built as a conscious choice made by a landowner or will be paid for by the landowner (floodproofing activity is an example of this type of improvement).

The second has to do with property acquisitions and land costs. The costs presented herein represent municipal acquisition and ownership of needed right-of-way as a common way of comparing alternatives. The absolute, actual costs will be significantly lower as a reflection of limiting actual acquisitions to selected problem areas and access points where other options of access right are not available, lower or no cost easements, use of mutually agreeable negotiated settlements involving physical improvements to protect or enable development in

exchange for access right, and use of non-adversarial acquisition as parcels become available.

#### Reach F1 Preferred Alternative

The "Maximize Development" (Alternative 2) alternative is the most expensive option and is a poorer aesthetic/environment option than even no action (Alternative 1) for the reason that a valuable mature cottonwood riparian area would be lost. The current pattern of development in the area has been to elevate developed structures and to avoid floodprone areas and it is expected that this practice will continue. The no-action alternative accomplishes too few of the selection criteria and leaves a significant maintenance cost which makes it the first or second highest cost on a present value basis. The opportunity exists for both recreational and natural riparian enhancement of this reach as reflected in Alternative 4. For the small additional cost over Alternative 3 to achieve this enhancement of this part of the river corridor Alternative 4 is therefore selected as the preferred alternative.

#### Reach F2 Preferred Alternative

This light industrial reach has a significant potential for flooding. The opportunity exists for redevelopment of this area over time to a higher value level of use. Channel degradation, the extent of prospective flooding and the redevelopment opportunity effectively eliminate no-action (Alternative 1) as an alternative. New development is utilizing structural elevation, floodproofing and avoidance to reduce the prospect of flooding. A high cost channelization project (Alternative 3) or levee (Alternative 4) project to protect existing properties which will be likely converted to new uses in the future seems unwarranted. Alternative 2, rehabilitative maintenance, would be most effective as a short term or interim solution. Ecologically compatible rehabilitative maintenance along with a long term program of redevelopment which includes restricting floodplain development, removing floodprone structures and where no other options exist, acquisition and conversion of use is the most highly rated alternative (Alternative 5) as is illustrated by its evaluation criteria rating (Table 6.3-28, Appendix C, Volume I). The structural components of this alternative should be accomplished in the short term while the remaining non-structural actions should be pursued along with the expected natural economic redevelopment to avoid the need for adversarial land acquisition and to minimize the costs significantly, as outlined in the preceding "General" section narrative. Alternative 5 clearly has the best evaluation criteria rating (Table 6.3-28, Appendix C, Volume I) and is selected as the preferred alternative.

#### Reach F3 Preferred Alternative

This reach has the greatest potential for flooding in the area downstream of the confluence due to extensive south Colorado Springs floodplain development, some of which lies in an area of spatially varied flow. The need to reduce this flooding is sufficient justification to eliminate the no-action (Alternative 1) alternative. Both the levee alternative (Alternative 4) and the maximum development alternative (Alternative 3) involve an unacceptable amount of ecologic disturbance (disturbance of the Tejon Marsh) and are expensive options which do not completely solve the flooding problem. The levee option would also

involve modifications to the storm sewer network to handle local drainage which are not reflected herein.

Simply providing flood warning, (Alternative 2) while an excellent idea, is insufficient action to take in a flooding situation. This must be combined with a proactive program of restricting floodplain development, removing flood prone structures, floodproofing existing structures and where no other options exist, acquisition and conversion of use. This combination of actions is described in Alternative 5. This largely non-structural alternative should be implemented over the long term to avoid the need for adversarial land acquisition and to minimize the costs significantly as outlined in the preceding "General" section narrative. Alternative 5 has clearly the best evaluation criteria rating (Table 6.3-29, Appendix C, Volume I) and is selected as the preferred alternative.

#### Reach F4 Preferred Alternative

This reach has no serious flooding problems as development within the reach is minimal. The reach is actively degrading due in part to inadequate or failed grade control structures. Continued degradation is unacceptable due to potentially disastrous consequences of continued infrastructure (utilities and bridges) degradation and possible failure. Consequently, the no action (Alternative 1) alternative is unacceptable as indicated by its rating on the alternatives evaluation matrix (Table 6.3-30, Appendix C, Volume I). The rehabilitative maintenance (Alternative 2) alternative is the most expensive one from both capital cost and present value perspectives, and has an evaluation only slightly better than the no-action alternative. Alternative 4 is very similar to Alternative 3 except that it replaces a vegetated edge of bank with a rock toe for increased stability and contains enhanced woody plantings for ecologic and visual screening purposes. These additional benefits were felt desirable and Alternative 4 is therefore selected as the preferred alternative.

#### Reach F5 Preferred Alternative

This reach and that immediately downstream of 31st Street (Reach F7) both evidence significant flooding of a number of small size parcels and severe lateral encroachment problems. This effectively rules out no-action as an alternative (Alternative 1). Rehabilitative maintenance (Alternative 2) would correct some drainage control problems but would not improve the flooding situation. The stream through this reach bears little resemblance to its natural condition or location. Both Alternative 3 (structural channel) and Alternative 4 (natural channel) provide flooding relief through increased conveyance which necessitate property acquisition. This can be minimized through the techniques outlined in the preceding "General" section narrative. Alternative 3 provides more flood relief at a higher cost than Alternative 4 but it is not as desirable from the standpoint of compatibility with the City's "natural drainageways" preference. Alternative 4 (natural channel) has overall the best evaluation criteria rating (Table 6.3-31, Appendix C, Volume I) and is selected as the preferred alternative. Reaches F5 through F7 provide the continuity of appearance and function of a rehabilitated natural channel.

#### Reach F6 Preferred Alternative

This reach has no significant flooding problems except at its downstream end where a modular unit housing area exists, which is planned for eventual removal. It is dominated by the abandoned "Gold Hill" mining/milling operation and the Midland Expressway. Significant erosion of contaminated materials from the mining operation and horizontal/vertical channel instability of the no-action alternative (Alternative 1) are unacceptable as indicated by its rating on the alternatives evaluation matrix (Table 6.3-32, Appendix C, Volume I). Performance of rehabilitative maintenance (Alternative 2) has an unacceptably high present value cost as does the no-action alternative, neither of which have obvious direct economic benefit. Improvement of this reach is unavoidably tied to remediation of the contaminated materials, erosion and aesthetic improvement of the mining area. This can be done utilizing a natural concept of stream rehabilitation while simultaneously converting the "Gold Hill" area to a private and/or public asset through redevelopment. Alternative 3 is clearly the best choice as indicated by its rating on the alternative evaluation matrix and offers the best opportunity for realizing the redevelopment potential and is therefore selected as the preferred alternative.

#### Reach F7 Preferred Alternative

This reach and that above the confluence (Reach F5) both evidence significant flooding of a number of small size parcels and severe lateral encroachment problems. This effectively rules out no-action as an alternative (Alternative 1). Rehabilitative maintenance (Alternative 2) would correct some drainage control problems but would not improve the flooding situation. The stream through this reach bears little resemblance to its natural condition or location. Both Alternative 3 (structural channel) and Alternative 4 (natural channel) provide flooding relief through increased conveyance which necessitate property acquisition. This can be minimized through the techniques outlined in the preceding "General" section narrative. Alternative 3 provides more flood relief at a higher cost than Alternative 4 but it is not as desirable from the standpoint of compatibility with the City's "natural drainageways" preference. Alternative 4 (natural channel) has the overall best evaluation criteria rating (Table 6.3-33, Appendix C, Volume I) and is selected as the preferred alternative. Reaches F5 through F7 provide the continuity of appearance and function of a rehabilitated natural channel.

#### Reach F8 Preferred Alternative

The decision to implement a 10-year flood conveyance channel as a central element of the Safeway redevelopment project, which is now essentially complete, fixed the concept by which water will be handled upstream of 31st Street to the study limits. As redevelopment of the remainder of the shopping area occurs, the site owners should be required to continue this channel from its current terminus to 31st Street. The "no action" alternative (the only other alternative) of leaving the channel incomplete meets very few of the evaluation criteria (Table 6.3-34, Appendix C, Volume I) and provides no financial benefit at a high annual operation and maintenance cost. Most or all of the drainage improvement costs will actually be borne by private developers when renovation proceeds, thereby minimizing the City's contribution to the capital costs presented for this reach.



Alternative 2, the 10-year structural channel, is therefore selected as the preferred alternative.

TABLE 6.4-1 RECOMMENDED ALTERNATIVE PLANS	
REACH	RECOMMENDED PLAN
F1	Alternative 4
F2	Alternative 5
F3	Alternative 5
F4	Alternative 4
F5	Alternative 4
F6	Alternative 3
F7	Alternative 4
F8	Alternative 2

## 7.0 PRELIMINARY PLAN

### 7.1 GENERAL

The Interim Draft Report of the Fountain Creek Drainage Basin Planning Study, dated April 5, 1993, presented the results of the entire project through the presentation of the preferred alternative for each reach. The preferred alternative for each reach of this study and its companion Monument Creek DBPS were briefly described in the second project newsletter in April 1993. The newsletter was followed by a public meeting held on May 11, 1993 to review and receive comments on the respective preferred plans. The City reviewed and responded by June 8, 1993 to the public comment which was received. No comments were received which changed the basis for selection of the preferred alternatives or the actual configuration of the preferred alternatives themselves. The preferred alternatives which constitute the "Natural Creek" theme became the selected alternative. The reach-by-reach description of selected alternative remains as described in Section 6.4 of this report and is summarized from downstream to upstream as follows:

- F1 - stabilized "natural" channel with ecological enhancement
- F2 - stabilized "natural" channel and floodproofing
- F3 - stabilized "natural" channel and floodproofing
- F4 - stabilized "natural" channel with ecological enhancement
- F5 - stabilized "natural" channel
- F6 - stabilized "natural" channel
- F7 - stabilized "natural" channel
- F8 - structural sides with softlined channel bottom

The use of "riffle drops" and enhanced riparian vegetation was recommended for the stabilized "natural" reaches.

Applicable comments which were received from the public meeting and draft report review were consolidated into the final configuration/description of the preliminary plan and documented in this report. An in-progress presentation of the selected alternative preliminary plan was made at the final Study Group meeting which was held on August 19, 1993. No further significant modifications were made to the preliminary plan presentation as a result of that meeting. The preliminary plan was finalized with additional detail being provided.

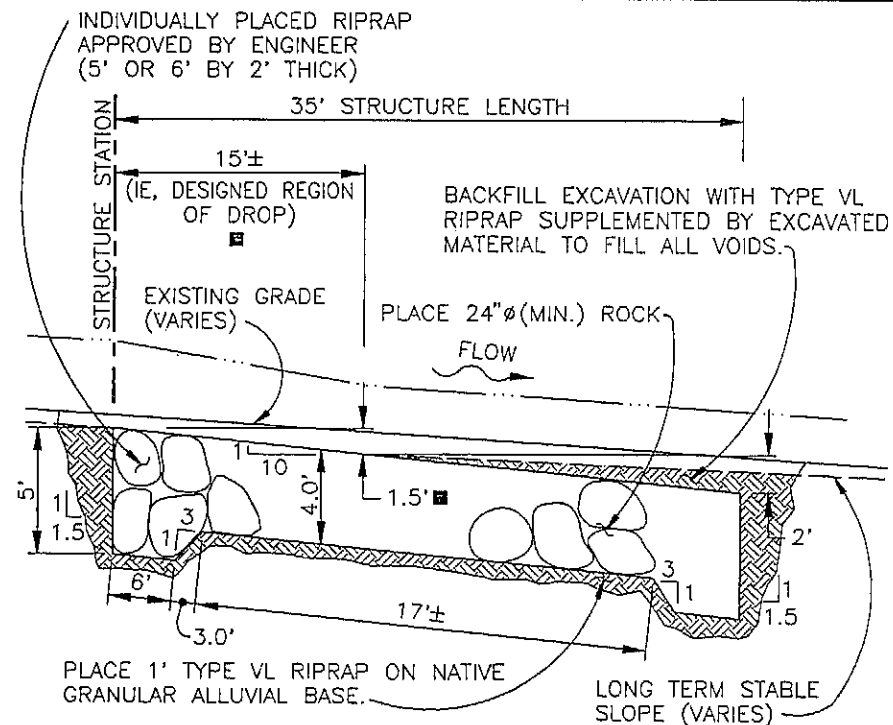
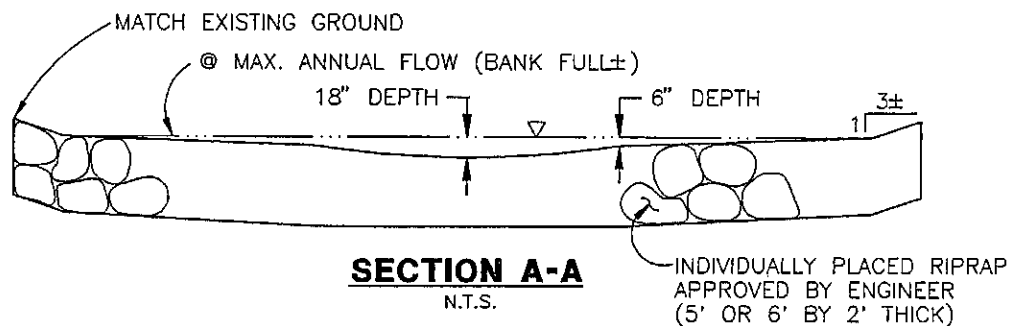
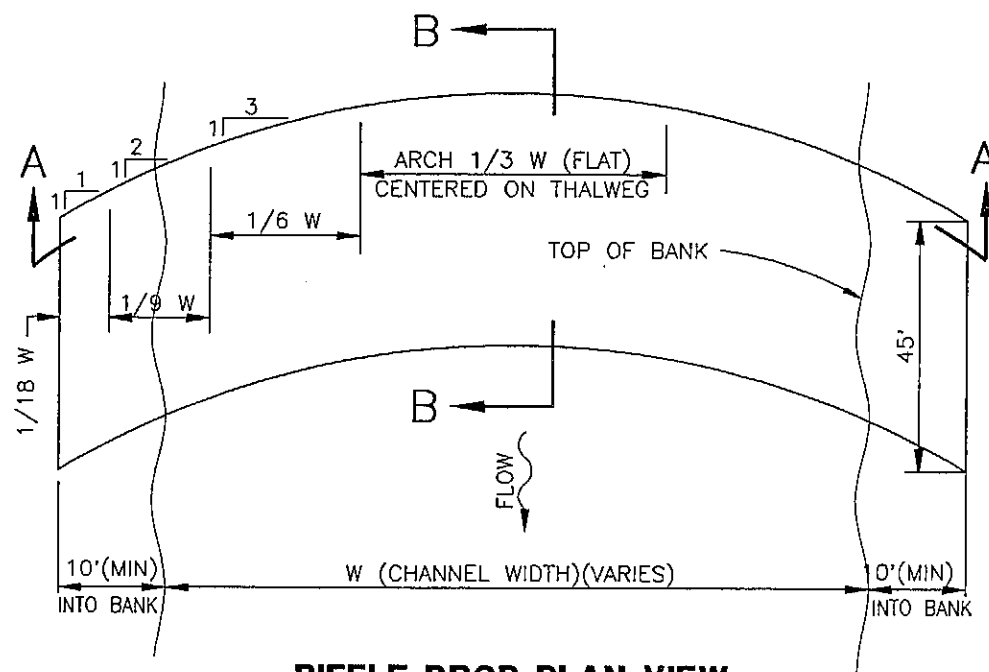
## 7.2 PLAN DESCRIPTION

### Common Components

While the Preliminary Plan varies from reach to reach due to the unique physiographic characteristics of each, the reaches are linked by common components which provide continuity. This continuity is reflected by common improvement elements terminology referenced to the Icon Sheets (Figure 6.2-10, Volume II), common quantity/cost descriptions, common improvement symbols on the drawings and a common narrative description pattern. Selected other modifications which are self explanatory are described by location on the "Preliminary Plan" sheets. Before describing individual reaches, these common elements are described as follows:

Riffle drop structures appear in all the reaches. Because of its importance and the large number of riffle drops, two detail schematics and an associated cost equation (Figure 7.2-1) were prepared for use in describing the preliminary plan. Also, because of the many stream and storm sewer confluences with Fountain Creek, a detail schematic (Figure 7.2-1) was prepared for the typical confluence reconstruction work as identified on the preliminary plan. The physical configuration and cost for all other individual structures is the same as described in narrative Section 6.3. The components of each reach are now described in more detail and the quantities to a greater level of detail but the costs are computed in the same manner as in Section 6.3 based on October, 1992 ENR Construction Cost Index 5052. Other common assumptions or elements are outlined as follows:

1. Quantities and costs for associated Creek corridor activity such as trail construction, historical preservation, pedestrian bridges, parks, roads, bridges, land development (including related drainage improvements), drainage improvements behind the top of bank, and connecting drainage system inadequacies are not included in the reach tabulations.
2. The right-of-way quantities and costs reflect the eventual desirability of having a continuous minimum width maintenance access for the full corridor length. This is to provide a reasonable level of control over channel activity, routing maintenance access, instream and across stream access, to avoid a "patchwork" of limited access easements, and to access existing as well as prospective construction/maintenance areas. Acquisition of or easements for this corridor will generally occur as development, redevelopment, or market availability control. In selected areas of channel relocation or widening there is an expected impact on the current land use/ownership in order to permit drainage improvements to be made. The costs reflect negotiated acquisition of these parcels, again in general as they become available and as such no costs are included for relocation of people and buildings. There are areas where acquisition of adjacent parcels for private redevelopment or to provide for public use (parks, trails, stream access, public works, etc.) is desirable and compatible with the plan but the associated costs are not included in this plan.

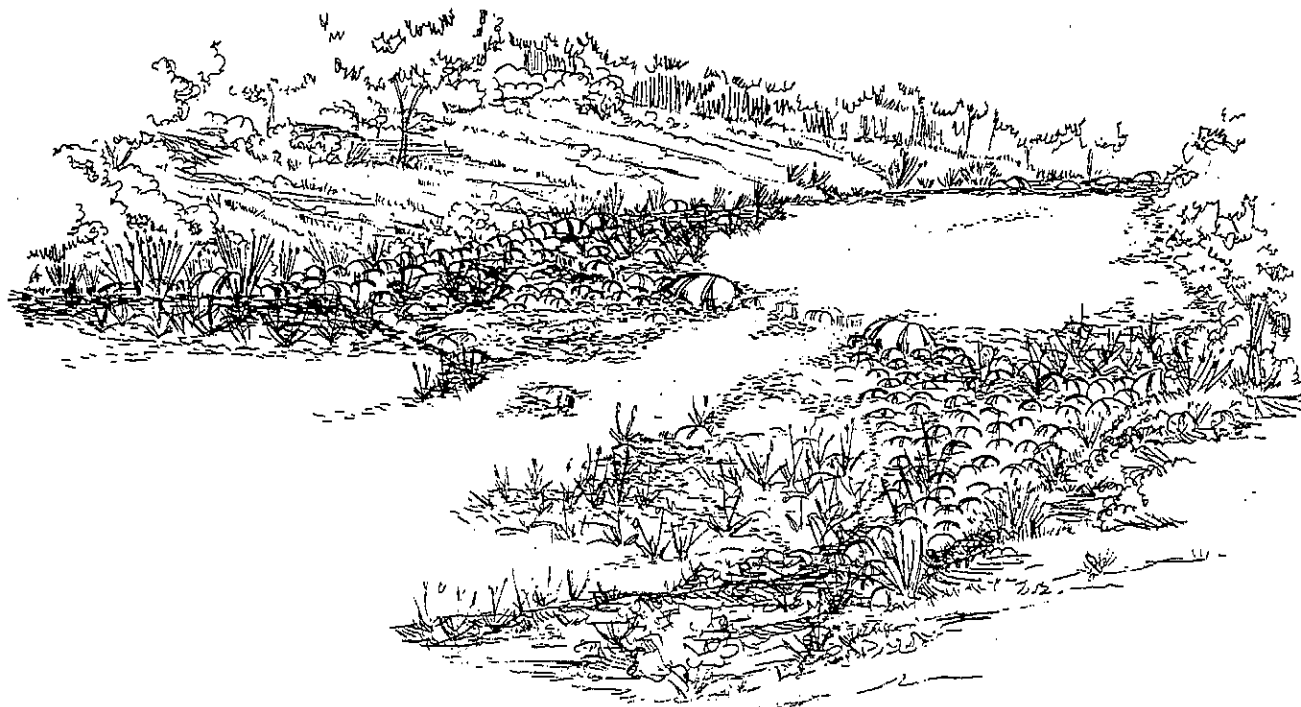


- IE, STANDARD DROP ON 10:1 SLOPE OF 1.5'  
OCCURS IN FIRST 15 FEET OF STRUCTURE

FOUNTAIN CREEK DRAINAGE BASIN  
PLANNING STUDY

DESIGNED:	DRL	DATE:	7/13/94	SHEET 1 OF 3 <b>MULLER ENGINEERING CO., INC.</b> CONSULTING ENGINEERS LEGNATE 2, SUITE 100 777 S. WADSWORTH BLVD. LAKEWOOD, COLORADO 80226 (303) 988-4939
CHECKED:	DRL	PROJ. NO.	9117	
DRAWN:	JHK	DWG. NO.	CS-DFT	

**CONSULTING ENGINEERS**  
IRONGATE 2, SUITE 100  
777 S. WADSWORTH BLVD.  
LAKEWOOD, COLORADO 80226  
(303) 988-4932



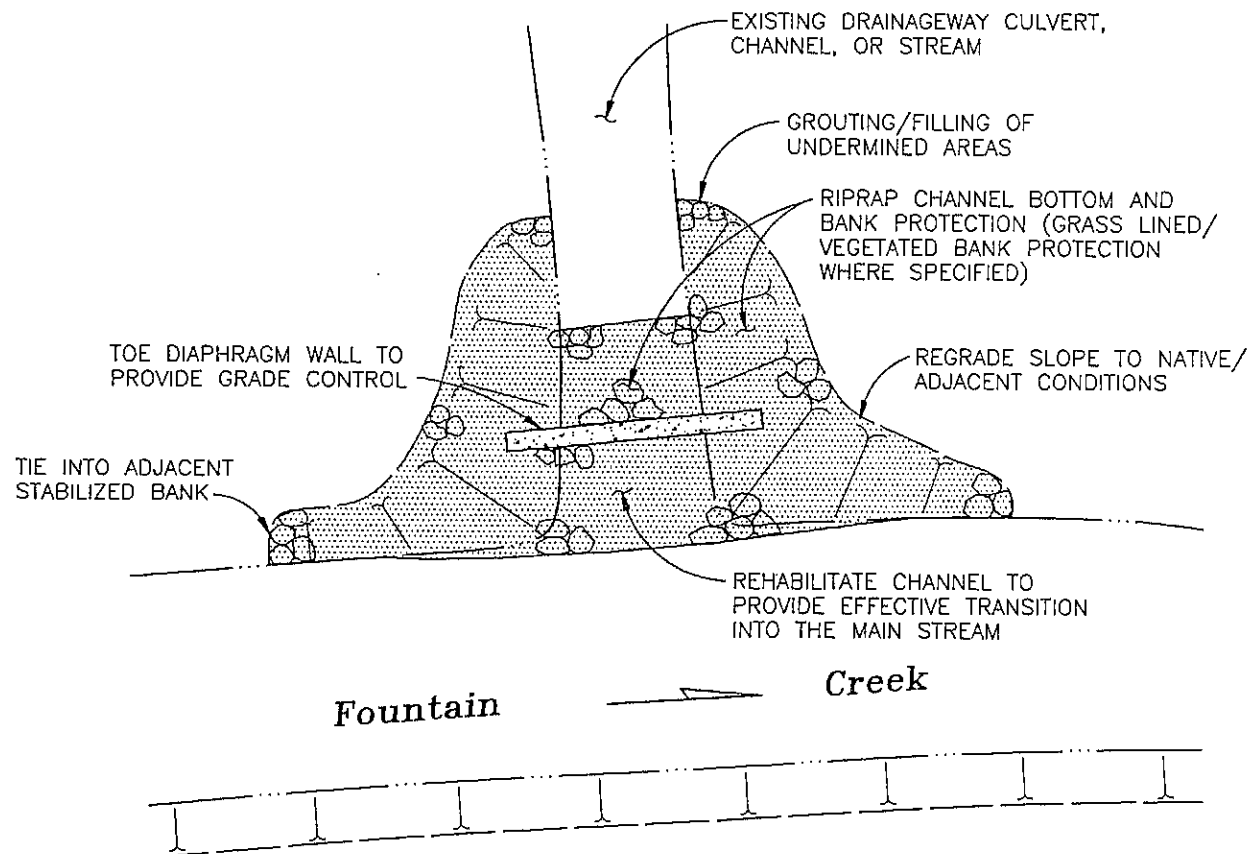
**TYPICAL RIFFLE DROP**

FOUNTAIN CREEK DRAINAGE BASIN  
PLANNING STUDY

**FIGURE 7.2-1  
DETAIL SCHEMATICS  
RIFFLE DROP**

SHEET 2 OF 3

DESIGNED:	DRL	DATE:	7/13/94	MULLER ENGINEERING CO., INC. CONSULTING ENGINEERS IRONGATE 2, SUITE 100 777 S. WADSWORTH BLVD. LAKEWOOD, COLORADO 80228 (303) 986-4939
CHECKED:	DRL	PROJ. NO.	9117	
DRAWN:	JHK	DWG. NO.	CS-DET1	



**TYPICAL CONFLUENCE RECONSTRUCTION DETAIL**

FOUNTAIN CREEK DRAINAGE BASIN  
PLANNING STUDY  
**FIGURE 7.2-1**  
**DETAIL SCHEMATICS**  
**CONFLUENCE RECONSTRUCTION**  
SHEET 3 OF 3

DESIGNED: DAH	DATE: 7/13/94	MULLER ENGINEERING CO., INC. CONSULTING ENGINEERS IRONGATE 2, SUITE 100 777 S. WALSWORTH BLVD. LAKWOOD, COLORADO 80226 (303) 986-4939
CHECKED: DRL	PROJ. NO. 9117	
DRAWN: JHK	DWG. NO. CS-DET2	

3. While certain drainage improvements are positioned to protect existing utilities or enable future utilities to be constructed, work specifically to rehabilitate, replace, or install utilities is not presented in the plan. Floodproofing and flood elevation while a part of the overall plan are viewed as a private responsibility and therefore not included as plan costs.
4. The line item listings describe the uniquely distinguishing items in each reach and those that involve a significant cost. The category "unlisted items" generally covers small cost items (<5% or \$5,000 each) which when grouped together constitute a cost which must be considered. Covered are such items as local erosion control at unidentified locations; miscellaneous transition grading, filling, excavation and ground surface restoration, connections to existing drainage systems, debris collection and disposal.

The quantity listings and cost estimates for the recommended improvements contained in this preliminary plan are tabulated in Tables 7.2-1 through 7.2-8.

### Riffle Drops

Riffle drops are gently sloping boulder and cobble structures designed to control the vertical grade of the Creek and limit downcutting of the channel bed. The riffle drops allow the creek to assume a gentle "stairstep" pattern, as the equilibrium slope of Fountain Creek develops. Each structure is assumed to allow for a drop in the channel bed elevation of 1.5 feet. The width of each riffle drop, varies on the basis of the width of the Fountain Creek channel.

Riffle drops are designed to create a physical stream character that emulates the natural riffle/pool sequence found in many undisturbed streams. The riffles are comprised of coarse, stable material (boulders and cobbles), which is beneficial to the aquatic ecosystem. The coarse substrate provides habitat for bacteria, algae, and macroinvertebrates, and assists in the establishment of riparian vegetation. The minor turbulence associated with riffle drop energy dissipation aerates the streamflow increasing its dissolved oxygen content.

In general, the riffle drops shown in the plan can be installed using a phased approach, based on the actual rate of degradation in Fountain Creek, but before degradation has had a chance to cause other rehabilitative activity. The timing for the need for each structure will vary depending on the rate of degradation in each reach and the relationship between the riffle drops and associated stream stabilization activity. If the equilibrium slope of Fountain Creek stabilizes at a grade steeper than anticipated, fewer drops would be required than the number shown in the plan. The following stations represent the highest priority riffle drop locations:

1. Stations 232+25 and 323+60, Reach F4 - These two riffle drops are to be located downstream of the Monument Creek confluence immediately downstream of the Cimarron Street bridge where the existing drop structure has failed. The riffle drops would be constructed to restore the grades of the Fountain Creek and Monument Creek channels to their former elevations prior to the failure of the drop, and protect the Cimarron Street bridge

from any further degradation to the streambed at the bridge abutments/foundations. These drops would be constructed above grade and would need to be constructed in coordination with the riffle drop proposed by the companion Monument Creek DBPS preliminary plan immediately upstream of the confluence on Monument Creek.

2. Stations 123+30, 123+65, and 124+00, Reach F2 - These three riffle drops are to be located approximately 350 feet downstream of the diversion structure near the City's wastewater treatment facility. The diversion structure diverts irrigation water into an agricultural ditch owned by the Fountain Mutual Irrigation Company. Construction of these riffle drops would provide grade control and protect the diversion structure from undermining.
3. Stations 218+65 and 219+00, Reach F4 - These two riffle drops are to be located immediately upstream of the confluence with Bear Creek where the existing drop structure is situated. Currently, upstream from the existing drop is the exposed concrete encasement of a sanitary sewer line that diagonally crosses Fountain Creek. Construction of these drops will raise the grade of the channel bottom to protect and conceal the exposed sanitary sewer crossing.
4. Station -1+70, Reach F1 - This riffle drop is to be located just outside of the project boundaries approximately 170 feet downstream of the "Downstream Project Boundary." The concrete encasement for an existing 48-inch sanitary sewer situated just upstream of the proposed drop location recently has become exposed due to the degradation of the Fountain Creek channel bottom. Construction of this drop will raise the grade of the channel bottom to protect and conceal the exposed utility.
5. Stations 313+80, 315+50, 316+50, 317+85, 319+20, and 320+20, Reach F6 - These six riffle drops are to be located immediately downstream of the U.S. Highway 24 bridge near 21st Street. As discussed for and shown on the preliminary plan for Reach F6, major drainageway improvements are proposed to rehabilitate this area downstream of the bridge. The riffle drops would be constructed to stabilize the channel and provide grade control.
6. Stations 327+00, and 328+00, Reach F7 - These two riffle drops are to be located immediately downstream of the 21st Street bridge. Construction of these drops will stabilize the channel and provide protection for the exposed sanitary sewer crossing upstream of the bridge.
7. Station 386+25, Reach F7 - This riffle drop is to be located immediately on the downstream side of the campground bridge approximately 200 feet downstream of 31st Street. The riffle would be constructed to protect the 18-inch sanitary sewer crossing just downstream of the 31st Street bridge.

#### Vegetated Benches

The selected alternatives provided for enhanced riparian vegetation along the creek channel. The vegetated benches are proposed to be similar in form and



function to existing benches along the creek. In many areas, dense, hardy vegetation is growing on shallow benches of sandy material bed material adjacent to the active baseflow channel. These existing benches, covered with grasses, herbaceous vegetation, and willows, function to slow velocities during moderate and high-flow events. The locally slower flow velocities promote sedimentation of fine sands and silts within the bench area, adding material and nutrients to the bench. This, in turn, provides water quality and habitat benefits and reduces the potential for erosion of the adjacent outer channel bank.

Erosion control fabrics, such as jute netting, would provide some stability to newly vegetated bench areas until vegetation could become established. In areas where the upstream channel alignment would provide an angle of attack against new bench areas, rock toe protection is called out at the interface between the bench and the baseflow channel.

### Regrading Steep Eroding Banks

A number of steep, eroding channel banks, are shown in the plan as requiring regrading and revegetating. This work is proposed to provide for improved public safety and reduce sediment contributions to the creek from bank sloughing. Wherever possible, steep slopes should be flattened at cut bank, rather than balancing cut and fill, to reverse the historic practice of filling in the channel. Final slopes should be 3 (horizontal) to 1 (vertical) or flatter.

### Reach F1 - Fountain Creek Preliminary Plan

The currently undeveloped nature of this reach allows for implementation of the natural drainageway concept, in accordance with the Section 6 description of the preferred and selected Alternative 4 drainage plan for this reach. The preliminary plan includes grade control using riffle drops, erosion repair through earthwork, vegetation and rock stabilization techniques, limited structural walls in areas of severe slope stability problems, and protection/enhancement of the existing riparian area. The specific features are illustrated on plan sheet 1 of Figure 7.2-2, Volume II, profile sheet 1 of Figure 7.2-3, Volume II and the cost estimate in Table 7.2-1. This activity is contained in a suggested 150 foot continuous right-of-way.

Special characteristics of this reach include the need to rehabilitate a 290 foot stream reach downstream of Reach F1 in order to provide an effective transition, structural four tier six-foot high retaining walls to restore the failing gabions at the Circle Drive bridge, construction of a riffle drop downstream of the "Downstream Project Boundary" to provide protection of a sanitary sewer main crossing behind the El Paso County Detention Center, structural high eroding bank protection with terrace retaining walls to transition an exposed rock outcrop around a bend midway in the reach, and removal of earth spoil piles in the right (west) floodplain.

Private development of like nature is expected to continue outside of riparian area utilizing fill and floodproofing techniques to meet floodplain development standards. The existing riparian area will be protected through private preservation or public acquisition. Local drainage facilities will need to be constructed as necessary to serve new development.

## Reach F2 - Fountain Creek Preliminary Plan

This reach serves as a transition from the more naturally functioning Creek in Reach F1 to the urbanized area of Reaches F3 through F5. Implementation of a combination of land use conversion and selective channel improvements is in accordance with the Section 6 description of the preferred and selected Alternative 5 drainage plan for this reach. The preliminary plan therefore includes grade control using riffle drops; erosion repair through earthwork, vegetation and rock stabilization techniques utilizing riprap and buried riprap bank protection, and rock toe protection in areas experiencing or subject to erosion; limited usage of structural terrace retaining walls in areas of steep slopes, limited access or severe erosion; and an emphasis on long term floodplain redevelopment through regulation and compatible redevelopment. This latter floodplain management approach includes removing floodprone structures, restricting new floodplain development, floodproofing, and acquisition and conversion to a higher land use. The specific features are illustrated on plan sheets 1, 2 and 3 of Figure 7.2-2, Volume II, profile sheets 1 and 2 of Figure 7.2-3, Volume II and the cost estimate in Table 7.2-2. This activity is contained in a suggested 200 foot continuous right-of-way of which 32%± is currently in public control.

Special characteristics of this reach include the Fountain Mutual Irrigation Company ditch diversion which will be rehabilitated but will remain as an obstruction to flooding, navigation and fish movement; stabilization of the very steep and eroding west bank of Fountain Creek upstream of the Spring Creek confluence; structural walls to restore the failing gabions at the Circle Drive bridge.

The presence of a modular housing unit development in the floodplain immediately upstream of Circle Drive is illustrative of the type of land use in this area which is incompatible with the natural floodplain function of conveying floodwater downstream. The presence of the wastewater treatment facility, salvage yard businesses and other similar land use in this reach is reflective of the lower land values here. Urban redevelopment involving an improvement in land use could increase land values with the Creek as an amenity, benefiting both. This redevelopment activity and development of the remaining undeveloped parcels should include implementation of the floodplain management techniques mentioned in the previous section. The costs associated with this activity and any local drainage improvement works are not included in the cost estimate for this reach.

## Reach F3 - Fountain Creek Preliminary Plan

The most distinctive features in this reach are the "Tejon Marsh" on the north side of the stream, and I-25 to the south. This reach is heavily occupied by business activity on each side of the stream. Creek characteristics include aggradation, low channel banks, and low overbank areas along Las Vegas and Arvada Streets which possible spatial varied floodwater can travel. Consequently, in these outlying low areas the potential exists for widespread flooding and extensive property damage of the businesses in the corridor. However, constructing structural improvements to reduce the flood hazards in these low areas would be extremely costly and is not a viable alternative. Therefore, the

preliminary plan proposes few structural improvements, with the implementation of a long-term proactive program of non-structural flood protective/drainage improvement measures. The plan is in accordance with the Section 6 description of the preferred, and selected Alternative 5 drainage plan. Costs were not included in the cost estimate for the acquisition of land; only costs were included for the structural improvements of providing grade control with the use of riffle drops downstream at Nevada Avenue where the stream slightly breaks in slope. The specific features of the preliminary plan are illustrated on plan sheets 3 and 4 of Figure 7.2-2, Volume II, profile sheet 2 of Figure 7.2-3, Volume II and the cost estimate in Table 7.2-3. Right-of-way along the corridor is desirable; however, since much of the corridor area immediately along the Creek is publicly owned and few structural improvements are proposed, it appears that the only right-of-way required is at the structural improvement locations.

The extensive infrastructure (roads and utilities) and private development along Las Vegas and Arvada Streets present a significant existing investment which could be damaged by flooding but also present a very large prospective investment in facilities to provide protection from infrequent flooding. Few reasonable options exist to minimize the impact of low frequency flooding along these offstream corridors. A long term program should be initiated as a part of otherwise planned municipal improvements and urban redevelopment to raise the ground surface in these areas. This would elevate areas which are currently flood prone above flood levels and would help to cut-off the route of spatially varied flow. This should be done in conjunction with providing more flood conveyance closer to the channel through a program of acquisition of land as it becomes available, modifying the land to carry overbank floodwater and converting it to a floodplain compatible use (parking, parks, outdoor recreation facilities, etc.). An equally involved option would be to convert these corridors to intentionally handle a specific quantity of the spatially varied flow safely through the overbank area. This effort will require a passive and a conscious proactive program consisting of selectively restricting further floodplain development in the reach, removing structures prone to flooding, using flood hazard warning signs, flood proofing existing structures, and/or acquiring land for conversion to other land uses.

#### Reach F4 - Fountain Creek Preliminary Plan

This reach is visibly dominated by the Drake Power Plant on the east and I-25 on the west. The streambed is experiencing continued degradation associated in part to inadequate and failed grade control structures which are affecting the structural integrity of the infrastructure (utilities and bridges) along the reach. The preliminary plan focuses on these problems in accordance with the Section 6 description of the preferred, and selected Alternative 4 drainage plan, with the exception of the continuous rock toe bank protection being replaced by selected biotechnical measures to protect existing vegetation. This includes grade control using riffle drops, erosion repair through earthwork, vegetation, and rock stabilization techniques, limited structural walls in areas of severe slope stability problems, and enhanced woody plantings for ecological and visual screening purposes of I-25 and the Drake Power Plant. The specific features are illustrated on plan sheets 4 and 5 of Figure 7.2-2, Volume II, profile sheets 2 and 3 of Figure 7.2-3, Volume II and the cost estimate in Table 7.2-4. No right-of-way acquisition is anticipated. The corridor is primarily public owned.

Special characteristics of this reach include the restoration of the failing rock-filled gabion wall just downstream of the Bear Creek confluence with structural two tier six-foot high retaining walls; re-construction of the Bear Creek, and Monument Creek confluences; re-establishment of vertical grade control using riffle drops and erosion repair of the exposed sanitary sewer lines just above the Monument Creek confluence (refer also to the Monument Creek DBPS) and just upstream of the Bear Creek confluence; and restoration of the eroded streambed and exposed piers under the Cimarron Street bridge using riffle drops to protect the sanitary sewer utility crossing upstream of the confluence on Monument Creek and riprap under the bridge.

It is anticipated that there will be no change in the associated floodplain development activity in this reach.

#### Reach F5 - Fountain Creek Preliminary Plan

The stream for this reach has been encroached upon by commercial land use on the north with commercial, some high density residential and roadways on the south. This has resulted in significant flooding of a number of small size parcels along the reach. The preliminary plan focuses on providing drainage improvements compatible with the City's "natural drainageways" preference which is in compliance with the preferred and selected Alternative 4 drainage plan as described in Section 6. This particular reach, while bearing little resemblance to a natural channel, will be improved in a manner compatible with the existing uses but emphasize "soft techniques" to restore the natural channel to the extent possible. This includes channel enlargement in the most encroached areas upstream of 8th Street; grade control using riffle drops; and erosion repair through earthwork, vegetation, and rock stabilization techniques utilizing riprap and buried riprap bank protection, and rock toe protection in areas experiencing or subject to erosion. The specific features are illustrated on plan sheet 5 of Figure 7.2-2, Volume II, profile sheet 3 of Figure 7.2-3, Volume II and the cost estimate in Table 7.2-5. This activity is contained in a suggested 120-foot continuous right-of-way. Because of the extensively constricted channel, some amount of private land acquisition adjacent to the channel is necessary.

Special characteristics of this reach include the removal of deposition and debris from under the 8th Street bridge to increase conveyance capacity, relaying of an exposed sanitary sewer line underneath the 8th Street bridge, confluence reconstruction of various storm sewer outlets, and the removal of an existing abandoned irrigation ditch structure/flume just downstream from the 8th Street bridge.

An integral component of the plan for this reach is the replacement of the U.S. 24 bridge at I-25 and the 8th Street bridge with larger bridge openings to provide adequate hydraulic conveyance capacities. Currently, these bridges are hydraulic restrictions to the flow, and can cause flooding of adjacent development. Rebuilding these bridges simply to provide flood relief is probably not justified. The timing and need for replacement of the bridges can be controlled by structural, traffic and other factors and the flooding related improvements considered a secondary benefit achieved by rebuilding them to current design standards (100-year flood in urban areas). Since this work is more clearly transportation related and is not physically tied to any other

specific flood improvement facilities, the associated cost is considered outside the financial scope of this plan. At the U.S.24 bridge, there is the possibility of spatially varied flow towards the borrow ditch on the south side of the south bound I-25 on-ramp, which eventually ends up flowing into Bear Creek. Replacing the U.S.24 bridge and associated grading should enable elimination of the spatially varied flow for flood frequencies up to the 100-year event. It is important to note that the degradation in this reach is primarily associated with the failed grade control structure in Reach F4 just downstream of the Cimarron Street bridge. From a priority standpoint, the construction of the proposed grade control structures in Reach F4 at that location needs to be completed before the grade control structures in this reach. It is important to note that Reach F6 will continue to transport sediment from Gold Hills Mesa into Reach F5 until off-channel sediment control improvements are made in that area.

The corridor is essentially fully developed, except for the area south of the stream between I-25 and 8th Street. Redevelopment is likely to occur with a similar land use. This area has some modular unit housing subject to flooding which is adjacent to the portion of the Creek which is proposed for enlargement and is immediately adjacent to Gold Hills Mesa which is described in the narrative for Reach F6. Local drainage facilities will be constructed by others as necessary to serve new development.

#### Reach F6 - Fountain Creek Preliminary Plan

This reach has as its most distinctive features Gold Hills Mesa on the south and the Midland Expressway on the north. At both ends of the reach the Creek transitions into essentially fully developed areas. The Creek in this reach lies within its historical floodplain but other than that bears little resemblance to its natural condition having been rerouted by the Gold Hills Mesa operation, private construction, and to accommodate extensive road and railroad development in the valley. This historical rerouting and encroachment which has obliterated parts of the floodplain fringe has led to the creation of steep bank headcutting in the channel. With the long standing nature of the changed channel, it has developed a "human modified" natural state which has some natural characteristics of significant enough value to be preserved. Implementation of channel modifications in this reach is directly tied to remediation activity of the Gold Hills Mesa because of its dominant physical presence and its integral connection to the Creek. Implementation of extensive channel modifications is the major component of activity in this reach in order to implement the natural drainageway concept in accordance with the Section 6 description of the preferred and selected Alternative 3 drainage plan for this reach. The Preliminary Plan outlines extensive channel modifications to restore the natural vegetated channel and banks, grade control using riffle drops, limited usage of structural terrace retaining walls to stabilize severe erosion and reroute a channel confluence, erosion source control, channel enlargement with rock toe protection at the downstream end of the reach adjacent to the modular housing units. Development guidelines should be established to provide the opportunity for adjacent redevelopment compatible with a natural stream environment. The specific features are illustrated on plan sheets 5 and 6 of Figure 7.2-2, Volume II, profile sheets 3 and 4 of Figure 7.2-3, Volume II, and the cost estimate in Table 7.2-6. This activity is contained in a suggested 150 foot continuous right-of-way. Because of the extensively constricted channel at the downstream end of the

reach, some amount of private land acquisition adjacent to the channel is necessary.

The correction of the severely eroding bank just downstream of the U.S. 24 bridge crossing over Fountain Creek requires relocation of Fountain Creek away from this 30'+ high bank. This is accomplished by rebuilding the U.S.24 bridge with a larger opening and straighter alignment permitting relocation of Fountain Creek to the north and the confluence of the South 21st Street drainage basin outfall to a point 350-feet downstream of its current location. Structural walls, terracing and backsloping will form the south edge of the South 21st Street drainageway upstream of the confluence as the primary elements of bank stabilization. The baffled drop structure on the channel for the South 21st Street Basin drainage is needed for grade control and energy dissipation. Other special characteristics include enlarging the channel and flattening channel banks through the short developed reach upstream of 8th Street in order to increase conveyance and reduce overbank flooding caused by this constricted channel, four sediment control ponds to control severe Gold Hills Mesa erosion and selective reconstruction and rerouting of approximately 50% of the existing channel while maintaining to the maximum extent possible the existing riparian area.

Channel enlargement at the downstream end of the reach necessarily involves relocation of a portion of the modular housing unit area to both remove buildings from flooding as well as to provide additional flood conveyance. In the long term it is expected that full redevelopment of this area west of 8th Street and south of Fountain Creek will occur either independently or as part of Gold Hills Mesa remediation/redevelopment. As previously referenced, all Creek rehabilitation in this area is directly tied to any Gold Hills Mesa activity. This major earthmoving undertaking activity is likely to include hazardous materials remediation and public or private redevelopment of the land area. Costs for Gold Hills Mesa activity with the exception of four transition sediment control ponds is not part of the cost estimate for this reach. Local drainage facilities will be constructed by others as necessary to serve any new development. The Midland Expressway roadway, except for the bridge at the upstream end of the reach (which will be reconstructed as a part of channel improvements) and existing development to the north will remain in the future in the same configuration and land use as it is today.

#### Reach F7 - Fountain Creek Preliminary Plan

The stream for the most part along this reach is characterized on the north side with steep banks with various areas of active erosion, evidence of wasted debris and rubble, and development encroaching near the banks; and on the south side with scattered development and inaccessible land in between the channel and the Midland Expressway. As described in Section 6, the preferred and selected Alternative 4 drainage plan is the preliminary plan for this reach. It conforms as much as possible to the "natural channel" concept. However, in minimizing right-of-way acquisition and conflicts with existing structures, there are segments along the stream that require "structural" type banks with riprap protection and high eroding bank stabilization. The "natural channel" improvements proposed for this reach include grade control using riffle drops, and erosion repair through earthwork, and grass lined/vegetated bank protection.

The specific features are illustrated on plan sheet 7 of Figure 7.2-2, Volume II, profile sheet 4 of Figure 7.2-3, Volume II, and the cost estimate in Table 7.2-7. This activity is contained for three-quarters of the reach in a suggested 150 foot wide right-of-way. It is suggested that the other quarter be contained in a 200 foot wide right-of-way for the areas where extended channel excavation is proposed.

Special characteristics of this reach include a built-up berm (levee) on the northerly bank to contain the more frequent floods in the channel where Fountain Creek crosses under the Midland Expressway. Currently, spatially varied flow may occur towards the east and across the highway due to the existing bridge being a hydraulic constriction to the flow and the ground around the easterly bank side being relatively low. The replacement of the bridge, as proposed in the Reach F6 work, is to be designed with a bridge large enough to pass the 100-year flooding event without spatially varied flow crossing the highway. Other special characteristics include a concrete wall along the Midland Expressway near the 27th Street (extension) to stabilize the stream from further erosion towards the highway; the realignment of the channel at the upstream end of the reach to resolve the severe erosion problem with flatter banks and grass lined/vegetated bank protection; and the removal of the 25th Street bridge, the two private bridges near 27th and 28th Street (extensions), and the campground bridge near 31st Street.

The riparian area on the north side of the channel is nearly fully developed and the remaining habitat should be protected through private/public preservation. For the unaccessible land on the south side of the channel between 27th and 31st in which the private bridges are recommended to be removed, the City may choose to consider joint cooperative replacement of the bridges with the associated landowners, alternate means of access, development of the parcels without access, or an alternate public/private acquisition and redevelopment of the land. Any new development/redevelopment will be done in a manner consistent with the existing land use. Local drainage facilities will be constructed as necessary to serve any such development.

#### Reach F8 - Fountain Creek Preliminary Plan

In this short reach, commercial businesses have developed in the floodplain and up to the banks of Fountain Creek, leaving few viable alternatives available for stream improvements. This development includes the recent reconstruction of the upper half of this reach as part of the redevelopment of a Safeway store and parking area. That redevelopment involved channel relocation and the construction of a vertical walled 10-year conveyance channel. As described in Section 6 of the preferred and selected Alternative 2, the preliminary plan for this reach is simply an extension of the same concept as implemented for the Safeway redevelopment project; that is, the construction of a 10-year flood conveyance channel. This involves extending the existing concrete vertical walled channel, similar to that constructed immediately upstream, and riffle drops for grade control, and the enlargement of the channel approach to the 31st Street bridge. The specific features are illustrated on plan sheets 7 and 8 of Figure 7.2-2, Volume II, profile sheets 4 and 5 of Figure 7.2-3, Volume II, and the cost estimate in Table 7.2-8. This activity is contained in a suggested 75-foot continuous right-of-way.

Private redevelopment and renovation of the commercial businesses and shopping center is expected to continue. Local drainage facilities will be constructed by private developers as redevelopment and renovation proceeds.

**TABLE 7.2-1**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F1**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$108,000
RIGHT-OF-WAY	ENTIRE REACH	ONE	\$170,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$9,700
WATER HANDLING	ENTIRE REACH	ONE	\$90,000
DEMOLITION/DISPOSAL	ENTIRE REACH	ONE	\$10,000
CUT/FILL AND GRADING	ENTIRE REACH	700 CY	\$3,500
ACCESS ROAD	ENTIRE REACH	3,500 LF	\$10,500
ROCK TOE PROTECTION	STA -2+90 - STA 0+00 (LT)	290 LF	\$6,500
RIFFLE DROP	STA -1+70	88 FT	\$57,000
RIFFLE DROP	STA 0+00	118 FT	\$72,000
RIFFLE DROP	STA 5+00	112 FT	\$69,000
RIFFLE DROP	STA 8+80	118 FT	\$72,000
BERMS REMOVAL	STA 10+00 +/- (RT)	330 CY	\$22,000
HIGH ERODING BANK STABILIZATION	STA 9+60 - STA 11+00 (LT)	140 LF	\$59,000
HIGH ERODING BANK STABILIZATION	STA 12+70 - STA 15+60 (LT)	290 LF	\$155,000
CUT SECTION	STA 20+70 - STA 22+70 (RT)	240 CY	\$2,400
ROCK TOE PROTECTION	STA 20+70 - STA 22+70 (RT)	200 LF	\$4,500
ROCK TOE PROTECTION	STA 22+70 - STA 26+20 (LT & RT)	350 LF	\$8,000
CUT SECTION	STA 26+20 - STA 28+20 (RT)	105 CY	\$10,500
ROCK TOE PROTECTION	STA 26+20 - STA 28+20 (RT)	200 LF	\$4,500
ROCK TOE PROTECTION	STA 22+80 - STA 25+80 (LT)	300 LF	\$6,800
RIFFLE DROP	STA 25+60	125 FT	\$76,000
RIFFLE DROP	STA 29+30	100 FT	\$63,000
RIFFLE DROP	STA 32+60	100 FT	\$63,000
HIGH ERODING BANK STABILIZATION	STA 32+30 - STA 32+80 (LT)	50 LF	\$27,000
HIGH ERODING BANK STABILIZATION	STA 33+50 - STA 35+00 (LT)	150 LF	\$140,000
TOPSOIL/VEGETATION RESTORATION	ENTIRE REACH	ONE	\$31,000
RIPARIAN VEGETATION ENHANCEMENT	VARIOUS LOCATIONS	ONE	\$52,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$216,000
CONTINGENCY	ENTIRE REACH	ONE	\$540,000
TOTAL ESTIMATED COST			<u>\$2,158,900</u>



**TABLE 7.2-2**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F2**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$287,000
RIGHT-OF-WAY	ENTIRE REACH	ONE	\$500,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$42,000
WATER HANDLING	ENTIRE REACH	ONE	\$210,000
DEMOLITION/DISPOSAL	ENTIRE REACH	ONE	\$30,000
CUT/FILL AND GRADING	ENTIRE REACH	400 CY	\$3,500
ACCESS ROAD	ENTIRE REACH	11,600 LF	\$34,800
HIGH GRADING BANK STABILIZATION	STA 35+00 - STA 41+20 (LT)	620 LF	\$480,000
HIGH ERODING BANK STABILIZATION	STA 42+30 - STA 43+40 (LT)	110 LF	\$59,000
CONFLUENCE RECONSTRUCTION	VARIOUS LOCATIONS	THREE	\$49,000
RIFFLE DROP	STA 40+00	150 FT	\$88,000
RIFFLE DROP	STA 49+00	220 FT	\$125,000
RIFFLE DROP	STA 54+00	230 FT	\$130,000
RIFFLE DROP	STA 65+00	165 FT	\$96,000
RIFFLE DROP	STA 73+80	95 FT	\$61,000
CUT SECTION	STA 72+80 - STA 75+00 (RT)	495 CY	\$5,000
BURIED RIPRAP BANK PROTECTION	STA 72+80 - STA 75+00 (RT)	220 LF	\$10,000
HIGH ERODING BANK STABILIZATION	STA 75+00 - STA 79+70 (RT)	470 LF	\$250,000
CUT SECTION	STA 79+70 - STA 85+60 (RT)	4,130 CY	\$41,000
BURIED RIPRAP BANK PROTECTION	STA 79+70 - STA 85+60 (RT)	590 LF	\$27,000
RIFFLE DROP	STA 92+20	130 FT	\$78,000
RIPPRAP BANK PROTECTION	STA 92+70 - 93+70 (RT)	100 LF	\$3,600
CUT SECTION	STA 95+20 - STA 101+00 (RT)	2,515 CY	\$25,000
ROCK TOE PROTECTION	STA 95+20 - STA 101+00 (RT)	580 LF	\$13,000
ROCK TOE PROTECTION	STA 99+60 - STA 105+00 (LT)	540 LF	\$12,000
RIFFLE DROP	STA 99+50	110 FT	\$68,000
RIFFLE DROP	STA 104+00	120 FT	\$73,000
HIGH ERODING BANK STABILIZATION	STA 106+50 - STA 110+50 (RT)	400 LF	\$200,000
RIFFLE DROP	STA 111+00	110 FT	\$68,000
RIFFLE DROP	STA 117+00	80 FT	\$53,000
BURIED RIPRAP BANK PROTECTION	STA 119+00 STA 123+00 (LT)	400 LF	\$13,000
RIFFLE DROP	STA 121+00	135 FT	\$81,000
RIFFLE DROP	STA 123+30	115 FT	\$71,000
RIFFLE DROP	STA 123+65	110 FT	\$68,000
RIFFLE DROP	STA 124+00	110 FT	\$68,000

TABLE 7.2-2  
PRELIMINARY PLAN  
QUANTITY LISTING / COST ESTIMATE  
REACH F2  
(CONTINUED)

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
RIPRAP BANK PROTECTION	STA 124+50 - STA 128+00 (LT)	350 LF	\$15,000
DIVERSION DAM REHABILITATION	STA 128+00	ONE	\$40,000
BURIED RIPRAP BANK PROTECTION	STA 134+70 - STA 145+70 (LT)	1,100 LF	\$40,000
RIPRAP BANK PROTECTION	STA 145+70 - STA 147+90 (LT)	220 LF	\$14,000
BURIED RIPRAP BANK PROTECTION	STA 147+90 - STA 151+00 (LT)	310 LF	\$13,500
RIFFLE DROP	STA 149+65	70 FT	\$48,000
RIFFLE DROP	STA 150+00	70 FT	\$48,000
TOPSOIL/VEGETATION RESTORATION	ENTIRE REACH	ONE	\$87,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$574,000
CONTINGENCY	ENTIRE REACH	ONE	<u>\$1,434,000</u>
TOTAL ESTIMATED COST			<u><u>\$5,736,400</u></u>

**TABLE 7.2-3**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F3**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$10,000
RIGHT-OF-WAY	STA 164+00	ONE	\$4,000
CLEARING AND GRUBBING	STRUCTURAL IMPROVMNT LOCATIONS	ONE	\$3,600
WATER HANDLING	ENTIRE REACH	ONE	\$20,000
RIFFLE DROP	STA 154+00	65 FT	\$46,000
RIFFLE DROP	STA 164+00	70 FT	\$48,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$20,000
CONTINGENCY	ENTIRE REACH	ONE	<u>\$51,000</u>
TOTAL ESTIMATED COST			<u><u>\$202,600</u></u>

**TABLE 7.2-4**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F4**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$94,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$8,500
WATER HANDLING	ENTIRE REACH	ONE	\$86,000
DEMOLITION/DISPOSAL	ENTIRE REACH	ONE	\$115,000
RIFFLE DROP	STA 203+30	90 ft	\$58,000
HIGH ERODING BANK STABILIZATION	STA 207+00 - 211+00 (RT)	400 LF	\$220,000
RIFFLE DROP	STA 213+00	90 FT	\$70,000
CONFLUENCE RECONSTRUCTION (BEAR CREEK)	STA 214+00 (RT)	ONE	\$58,000
CUT SECTION	STA 213+50 - 219+00 (LT)	1,350 CY	\$13,500
BURIED RIPRAP PROTECTION	STA 213+50 - 219+00 (LT)	450 LF	\$15,000
RIFFLE DROP	STA 218+65	100 FT	\$63,000
RIFFLE DROP	STA 219+00	100 FT	\$63,000
VARIOUS STORM SEWER CONFLUNCE RECONSTRUCTION	STA 223+00 - 232+50 (RT)	FOUR	\$13,500
RIFFLE DROP	STA 225+00	90 FT	\$58,000
RIFFLE DROP	STA 232+25	90 FT	\$58,000
RIFLE DROP	STA 232+60	90 LF	\$58,000
CONFLUENCE RECONSTRUCTION (MONUMENT CREEK) AND RIPRAP PROTECTION AT CIMARRON STREET BRIDGE	STA 232+60 - 234+00	ONE	\$88,000
TOP SOIL / REVEGETATION	VARIOUS LOCATIONS	ONE	\$18,500
WOODY PLANT ENHANCED SCREENING	ENTIRE REACH	ONE	\$65,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$188,000
CONTINGENCY	ENTIRE REACH	ONE	\$470,000
TOTAL ESTIMATED COST			<u>\$1,881,000</u>

**TABLE 7.2-5**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F5**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$52,000
RIGHT OF WAY	ENTIRE REACH	ONE	\$210,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$4,000
WATER HANDLING	ENTIRE REACH	ONE	\$14,000
DEMOLITION / DISPOSAL	ENTIRE REACH	ONE	\$34,000
RIFFLE DROP	STA 235+15	45 FT	\$36,000
RIPRAP BANK PROTECTION	STA 241+25 - 242+25 (RT)	100 LF	\$6,000
CUT SECTION	STA 244+00 - 244+75 (LT)	125 CY	\$1,250
ROCK TOE PROTECTION	STA 244+00 - 244+75 (LT)	75 LF	\$1,700
RIFFLE DROP	245+00	35 FT	\$31,000
RIPRAP BANK PROTECTION	STA 244+75 - 246+75 (LT)	200 FT	\$8,000
RIFFLE DROP	STA 253+00	60 LF	\$43,000
RIFFLE DROP	STA 256+00	50 FT	\$38,000
CHANNEL ENLARGEMENT	STA 257+00 - 266+75 (RT)	3,800 CY	\$38,000
BURIED RIPRAP BANK PROTECTION	STA 257+00 - 266+75 (RT)	975 LF	\$58,000
RIFFLE DROP	STA 266+30	35 FT	\$31,000
CHANNEL ENLARGEMENT	STA 266+75 - 271+00 (LT & RT)	1,600 CY	\$16,000
ROCK TOE PROTECTION	STA 266+75 - 271+00 (LT & RT)	425 LF	\$9,500
CONFLUENCE RECONSTRUCTION	VARIOUS LOCATIONS	FOUR	\$15,000
UTILITY RELOCATION	VARIOUS LOCATIONS	ONE	\$14,000
TOP SOIL / REVEGETATION	VARIOUS LOCATIONS	ONE	\$19,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$105,000
CONTINGENCY	ENTIRE REACH	ONE	\$261,000
TOTAL ESTIMATED COST			<u>\$1,045,450</u>

**TABLE 7.2-6**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F6**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$275,000
RIGHT OF WAY	ENTIRE REACH	ONE	\$250,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$25,000
WATER HANDLING	ENTIRE REACH	ONE	\$35,000
DEMOLITION / DISPOSAL	ENTIRE REACH	ONE	\$8,700
CUT / FILL GRADING	ENTIRE REACH	ONE	\$3,700
ACCESS ROAD	ENTIRE REACH	5,000 LF	\$15,000
CONFLUENCE RECONSTRUCTION	VARIOUS LOCATIONS	FIVE	\$19,000
CHANNEL ENLARGEMENT	STA 271+00 - 313+00	64,000 CY	\$530,000
ROCK TOE PROTECTION	STA 271+00 - 284+00 (LT&RT)	1,300 FT	\$56,000
RIFFLE DROP	STA 275+90	30 FT	\$28,000
RIFFLE DROP	STA 284+00	40 LF	\$33,000
GRASS LINED / VEGETATED BANK PROTECTION	STA 284+00 - 313+00 (LT&RT)	2,900 FT	\$180,000
SEDIMENTATION / DETENTION PONDS	VARIOUS LOCATIONS	FOUR	\$47,000
RIFFLE DROP	STA 290+00	40 LF	\$33,000
CUT SECTION	STA 296+60 - STA 297+50 (LT)	400 CY	\$4,000
ROCK TOE PROTECTION	STA 296+60 - STA 297+50 (LT)	90 FT	\$2,000
RIFFLE DROP	STA 307+50	40 FT	\$33,000
RIFFLE DROP	STA 313+80	40 FT	\$33,000
RIFFLE DROP	STA 315+15	40 FT	\$33,000
RIFFLE DROP	STA 316+50	40 FT	\$33,000
RIFFLE DROP	STA 317+85	40 FT	\$33,000
RIFFLE DROP	STA 319+20	40 FT	\$33,000
RIFFLE DROP	STA 320+20	40 FT	\$33,000
BRIDGE DEMOLITION	STA 321+00 + / -	TWO	\$40,000
BRIDGE REPLACEMENT	STA 321+00 + / -	TWO	\$910,000
RIPRAP BANK PROTECTION	STA 321+00 + / - (LT & RT)	140 FT	\$18,000
CONCRETE VERTICAL WALL CHANNEL	STA 315+00 + / -	370 FT	\$220,000
BAFFLED DROP	STA 315+00 + / -	10 FT	\$73,000
CUT / FILL SECTION	STA 313+00 - 320+20 (LT)	500 C Y	\$2,400
BURIED RIPRAP BANK PROTECTION	STA 313+00 - 320+20 (LT)	720 FT	\$17,000
CUT / FILL CHANNEL ENLARGEMENT AND RELOCATION	STA 313+00 - 320+20 (LT & RT)	8,700 CY	\$87,000
ROCK TOE BANK PROTECTION	STA 315+00 - 320+50 (RT)	550 FT	\$8,600

**TABLE 7.2-6**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F6**  
**(CONTINUED)**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
CUT / FILL SECTION	STA 315+00 - 318+00 (RT)	3,300 CY	\$17,000
HIGH ERODING BANK STABILIZATION	STA 315+00 - 318+00 (RT)	300 LF	\$76,000
CUT / FILL SECTION	STA 318+00 - 320+50 (RT)	1,300 CY	\$6,700
HIGH ERODING BANK STABILIZATION	STA 318+00 - 320+50 (RT)	250 LF	\$97,000
RIPARIAN VEGETATION ENHANCEMENT	VARIOUS LOCATIONS	ONE	\$79,000
TOPSOIL / VEGETATION RESTORATION	VARIOUS LOCATIONS	ONE	\$155,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$550,000
CONTINGENCY	ENTIRE REACH	ONE	<u>\$1,375,000</u>
TOTAL ESTIMATED COST			<u><u>\$5,507,100</u></u>

**TABLE 7.2-7**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F7**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$176,000
RIGHT OF WAY	ENTIRE REACH	ONE	\$470,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$22,000
WATER HANDLING	ENTIRE REACH	ONE	\$43,000
DEMOLITION / DISPOSAL	ENTIRE REACH	ONE	\$100,000
ACCESS ROAD	ENTIRE REACH	6,700 LF	\$20,000
CUT / FILL SECTION	STA 321+00 - 328+50 (RT)	7,500 CY	\$75,000
GRASS LINED / VEGETATED BANK PROTECT	STA 321+00 - 328+50 (RT)	750 LF	\$34,000
CUT / FILL SECTION WITH LEVEE	STA 321+00 - 323+00 (LT)	1,300 CY	\$13,000
CUT SECTION	STA 323+00 - 328+50 (LT)	1,000 CY	\$10,000
GRASS LINED / VEGETATED BANK PROTECT	STA 321+00 - 325+75 (LT)	475 LF	\$5,900
BURIED RIPRAP BANK PROTECTION	STA 325+75 - 326+30 (LT)	55 LF	\$2,500
RIPRAP BANK PROTECTION	STA 326+30 - 328+50 (LT)	220 LF	\$100,000
RIFFLE DROP	STA 327+00	35 FT	\$31,000
RIFFLE DROP	STA 328+00	35 FT	\$31,000
CUT SECTION	STA 337+35 - 338+00 (LT)	540 CY	\$5,400
RIPRAP BANK PROTECTION	STA 335+80 - 340+20 (LT)	440 LF	\$44,000
CUT / FILL SECTION (STRAIGHTEN CHANNEL BOTTOM)	STA 340+20 - 342+80	580 CY	\$5,800
BURIED RIPRAP BANK PROTECTION	STA 340+20 - 345+30 (RT)	510 LF	\$23,000
RIFFLE DROP	STA 344+00	35 FT	\$31,000
CUT SECTION	STA 345+30 - 351+30 (RT)	2,200 CY	\$22,000
GRASS LINED / VEGETATED BANK PROTECTION	STA 345+30 - 351+30 (RT)	600 LF	\$12,000
RIPRAP BANK PROTECTION	STA 345+40 - 349+90 (LT)	450 LF	\$33,000
RIFFLE DROP	STA 346+00	35 FT	\$31,000
RIFFLE DROP	STA 348+00	35 FT	\$31,000
RIFFLE DROP	STA 351+00	35 FT	\$31,000
BRIDGE REMOVAL (25TH STREET)	STA 351+40	ONE	\$5,000
CUT SECTION	STA 351+50 - 357+00 (RT)	1,650 CY	\$16,500
GRASS LINED / VEGETATED BANK PROTECTION	STA 351+50 - 357+00 (RT)	550 LF	\$11,000
RIPRAP BANK PROTECTION	STA 351+50 - 357+00 (LT)	550 LF	\$33,000
RIFFLE DROP	STA 354+00	35 FT	\$31,000
HIGH ERODING BANK STABILIZATION	361+50 - 363+25 (RT)	175 LF	\$95,000
RIFFLE DROP	STA 363+00	35 FT	\$31,000



**TABLE 7.2-7**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F7**  
**(CONTINUED)**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
CUT / FILL SECTION	STA 363+30 - 372+50 (LT & RT)	8,200 CY	\$82,000
GRASS LINED / VEGETATED BANK PROTECTION	STA 363+30 - 372+50 (LT & RT)	920 LF	\$59,000
RIFFLE DROP	STA 364+50	35 FT	\$31,000
RIFFLE DROP	STA 366+00	35 FT	\$31,000
RIFFLE DROP	STA 367+00	35 FT	\$31,000
PEDESTRIAN BRIDGE REMOVAL	STA 368+00 + / -	ONE	\$2,000
RIFFLE DROP	STA 368+75	35 FT	\$31,000
BRIDGE REMOVAL	STA 370+75	ONE	\$2,000
BURIED RIPRAP PROTECTION	STA 372+50 - 375+00 (RT)	250 LF	\$10,000
CUT / FILL SECTION	STA 375+00 - 387+70 (LT & RT)	12,000 CY	\$120,000
GRASS LINED / VEGETATED BANK PROTECTION	STA 375+00 - 387+70 (LT & RT)	1,270 LF	\$95,000
RIFFLE DROP	STA 376+80	35 FT	\$31,000
RIFFLE DROP	STA 379+15	35 FT	\$31,000
RIFFLE DROP	STA 383+00	35 FT	\$31,000
RIFFLE DROP	STA 386+25	35 FT	\$31,000
BRIDGE REMOVAL	STA 386+30	ONE	\$2,000
UTILITY RELOCATIONS	VARIOUS LOCATIONS	ONE	\$24,000
TOPSOIL / VEGETATION RESTORATION	VARIOUS LOCATIONS	ONE	\$22,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$353,000
CONTINGENCY	ENTIRE REACH	ONE	\$881,000
<b>TOTAL ESTIMATED COST</b>			<b><u>\$3,525,100</u></b>

**TABLE 7.2-8**  
**PRELIMINARY PLAN**  
**QUANTITY LISTING / COST ESTIMATE**  
**REACH F8**

<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>QUANTITY</u>	<u>COST</u>
MOBILIZATION	ENTIRE REACH	ONE	\$84,000
RIGHT OF WAY	ENTIRE REACH	ONE	\$47,000
CLEARING AND GRUBBING	ENTIRE REACH	ONE	\$6,000
WATER HANDLING	ENTIRE REACH	ONE	\$6,000
DEMOLITION / DISPOSAL	ENTIRE REACH	ONE	\$6,000
ACCESS ROAD	ENTIRE REACH	1,300 LF	\$3,900
CHANNEL ENLARGEMENT	STA 388+00 - 392+50 (LT & RT)	4,500 CY	\$45,000
CONCRETE VERTICAL WALLED CHANNEL	STA 388+00 - 401+00 (LT & RT)	1,300 LF	\$790,000
RIFFLE DROP	STA 391+00	35 FT	\$31,000
RIFFLE DROP	STA 394+50	35 FT	\$31,000
UTILITY RELOCATIONS	VARIOUS LOCATIONS	ONE	\$12,000
TOPSOIL / VEGETATION RESTORATION	ENTIRE REACH	ONE	\$28,000
UNLISTED ITEMS	ENTIRE REACH	ONE	\$168,000
CONTINGENCY	ENTIRE REACH	ONE	\$419,000
TOTAL ESTIMATED COST			<u>\$1,676,900</u>

## 8.0 FUNDING AND IMPLEMENTATION OF PLAN

It was the original intent that as part of this study, a funding strategy would be developed to implement the improvements outlined in the preliminary plan. The funding strategy was to be developed in accordance and in coordination with the "Colorado Springs Stormwater-Environmental Program Study," (CH2M-Hill, Inc., 1992).

The study referenced above outlines several alternative funding strategies which attempt to address the relative benefits to the population as a whole (economic, recreation, wildlife, flood protection, safety, open space), benefits related to potential land development and/or restoration which may result from the improvements, and benefits to the land in tributary drainage basins. The strategies also address the benefits and responsibilities of specific parties, including both private and public.

It was determined that, prior to developing a funding strategy for the Fountain Creek DBPS as well as the companion Monument Creek DBPS, the next phase of the City's overall stormwater funding study would need to be completed, or at least substantially complete, to assure that the recommended strategy is consistent with the overall stormwater funding program.

Therefore, this study does not outline a funding strategy or implementation plan for the improvements outlined in the preliminary plan. This study will be used to guide the improvements to be constructed along Monument Creek. Until such time as the stormwater funding study identifies a strategy to be followed, funding aspects of improvements will be addressed by the City Engineering division on an individual, or case-by-case basis in accordance with existing ordinances, regulations, policies and criteria.

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**APPENDIX C**  
**CITY'S "GOALS AND POLICIES"**  
**AND**  
**GOAL AND OBJECTIVE DEVELOPMENT**  
**FROM STUDY GROUP MEETINGS**

8.3.4 Promote and encourage bicycling as a mode of transportation not restricted to recreation.

8.3.5 Promote and encourage mutually supportive transportation modes which offer alternatives to the automobile.

### Goal

8.4 Implement the planned transportation system in a coordinated and cost-effective manner utilizing a fair and sufficient method of funding.

### Policies

8.4.1 Base funding for transportation system improvements as much as possible on a user pay system which recognizes both the local and City-wide benefits of major facilities. However, since public transportation is an essential public service it should be supported by general public funding as well as by user fees.

8.4.2 Require advance right-of-way reservation and dedication for transportation facilities as part of the land development process.

8.4.3 Utilize transportation strategies designed to improve the efficiency of a roadway prior to investing in roadway expansions or additions.

8.4.4 Adequately fund maintenance of the existing and future transportation systems and coordinate with utility construction and maintenance schedules.

8.4.5 Consider public-private financing for the construction of additional parking spaces in those areas where there are overall shortages of off-street parking.

8.4.6 Pursue strategies and funding mechanisms to address deficiencies in the transportation system which cannot be corrected through development-related construction or user pay principles.

## 9.0 NATURAL ENVIRONMENT

### Goal

9.1 Preserve and enhance drainageways as amenities to the City by incorporating a comprehensive system of detention ponds in conjunction with "soft linings" or natural drainageways as the preferred method of treatment whenever possible.

### Policies

9.1.1 Utilize the Master Drainage Basin Studies to establish the method of drainage treatment for each specific basin. All subsequent subdivision master development plans, zoning plans, and plats shall indicate conformance to the specified method of drainage treatment as shown in the Master Drainage Basin Study. Any proposed change to the specified form of drainage treatment shown in the Master Drainage Basin Study must be justified through a revision to the Master Drainage Basin Study and an amendment to the master plan for the development.

9.1.2 Plan drainageways when possible as part of urban trail corridors for multiple use including conveyance of runoff, utilities, access roads, trails, wetlands, wildlife, trees, vegetation and recreational uses.

9.1.3 Revise and update existing Master Drainage Basin plans in order to address all pertinent issues relating to the discharge of dredged or filled material into the water (Section 404 of the Clean Water Act) as well as City drainage criteria. The updated Master Basin Plans will include the fiscal impact of the Federally mandated regulations as they pertain to potential increases in maintenance costs, land acquisition costs, drainage fee increases, and/or other economic impacts.

9.1.4 Utilize erosion protection, as outlined in the City/County Drainage Criteria Manual, in conjunction with regulations concerning nonpoint source pollution and stormwater discharge (Sections 319 and 402 of the Clean Water Act) to minimize the adverse impacts of erosion/sedimentation to the drainageways.

9.1.5 Continue water quality testing relating to stormwater discharge (Section 402 of the Clean Water Act) and expand testing to encompass new development.

9.1.6 Consider channelization or similar modifications to water courses for reasons of public safety and to avoid possible excessive costs of maintaining streams and drainageways in their natural state. Drainage-



ways not left in a natural condition should consider the following features:

- A. Mitigation of damage to wetlands
  - B. Trails
  - C. Drop structures
  - D. Pilot channels with landscaped overflow banks
  - E. Groundwater recharge capability
  - F. Minimum structural protection with modified natural materials
  - G. Landscaping
- 9.1.7 Increase citizen education and awareness of the engineering and environmental issues involved in preservation of natural drainageways including wetland preservation, riparian habitat, erosion/sedimentation, recreational uses and any increased fiscal responsibilities such as drainage fees, maintenance costs, or land acquisition costs.

### Goal [REDACTED]

- 9.2 Preserve, enhance and promote the significant features of the City's natural environment.

#### Definition

- 9.2.D Significant natural features include those ridgelines, bluffs, rock outcroppings, view corridors, foothills, mountain backdrop, unique vegetation, floodplains, streams, surface water, air, natural drainageways and wildlife habitats which contribute to the attractiveness of the community.

#### Policies

- 9.2.1 In areas where both controlled development and preservation are possible, retain significant natural features in private ownership and protect them as part of a development plan review. Land suitability studies shall be required prior to the approval of development in these areas.

In areas where significant natural features can only be protected by prohibiting development, other methods for preservation may be utilized, such as outright purchase, open space credits, donations or preservation easements.

- 9.2.2 Formulate strategies to mitigate and/or eliminate the negative effects of mining activity on the City's

mountain backdrop and the region's recreational and tourism resources.

- 9.2.3 Recognize and avoid, whenever possible, significant natural features in the placement of public infrastructure. If this is not possible, siting of facilities should minimize their impact and maximize restoration of disturbed areas.

### Goal [REDACTED]

- 9.3 Maintain and improve air quality in the Colorado Springs area.

#### Assumption

Motor vehicles are recognized as the principal source of carbon monoxide pollution in Colorado Springs. Motor vehicles and wood burning devices are major sources of pollution involving small particulate matter, and also are integral components of conditions which impair visibility in the Pikes Peak region.

#### Policies

- 9.3.1 Continuously and sufficiently fund the City's air quality monitoring, analysis and control systems.
- 9.3.2 Cooperate with County, State and Federal agencies in efforts to develop and implement a regional air quality monitoring network.
- 9.3.3 Consider the effect of traffic movement on air quality in the City's transportation planning and traffic engineering, and encourage alternative transportation modes, including ride sharing, and private efforts designed to reduce the number of vehicle miles traveled in the community.
- 9.3.4 Give high priority to funding for capital projects which contribute to the improvement of regional air quality.
- 9.3.5 Continue to support proposed, effective State and Federal legislation designed to control emissions from motor vehicles.
- 9.3.6 Support, through intergovernmental cooperative efforts, the continuing analysis and monitoring of factors contributing to "brown cloud" conditions which impair visibility at various times throughout the year.
- 9.3.7 Continue to support efforts at community education and awareness of air quality issues through the Clean Air Campaign.

# Monument/Fountain Creek Corridor Planning Study

## **Goal and Objective Development: from Study Group Meetings**

### **I. Broad Goals Presented from both of the 1990 Stormwater Management Workshop and those that are specific to Monument/Fountain Corridor (not presented in order of importance) :**

- Provide Recreational and Social Benefits
- Assure Public Safety and Welfare
- Maintain and Enhance the Natural Beauty and the Quality of the Built Environment
- Aid in Control of Pollution/ Enhance Water Quality
- Maintain a High Level of Benefit to Cost
- Promote Community Development
- Protect and Enhance Aquatic Environment and Adjacent Riparian and Upland Ecosystems
- Goal 9.1 of the City Comprehensive Plan: "Preserve and enhance drainageways as amenities to the City by incorporating a comprehensive system of detention ponds in conjunction with soft linings or natural drainageways as the preferred method of treatment whenever possible."

### **II. How the Goals and Objectives should be used:**

The Goals and Objectives are designed to guide the planning and design of recreational amenities, flood control, in-stream hydrologic modifications, bank stabilization, natural feature/ecosystem alteration, development adjacent to the corridor and throughout the watershed, and other proposals being undertaken by this study and subsequent studies affecting the Monument/Fountain Creek corridor. Each alternative considered for the corridor should be checked against the goals and objectives to assess its impact and/or compliance.

### **III. Objectives Towards the Accomplishment of Broad Goals:**

#### **A) Provide Recreational and Social Benefits:**

##### **\_\_\_1. Develop multi-use trails in corridor which:**

- provide access to the creek corridors for the enjoyment and appreciation by the public, including persons with physical disabilities.
- provide access to and from connecting trails, parks, and other recreational amenities.
- are in harmony with aquatic, riparian, and upland ecosystems.
- are mutually supportive of flood control improvements, stream stabilization, utility crossings, and urban infrastructure.
- serve the regional and local transportation needs of bicyclists and pedestrians.

- \_\_\_2. Protect and enhance significant natural features of the corridor including stream, riparian zone, and upland ecosystems.
- \_\_\_3. Provide vehicular and non-vehicular access to the corridor (e.g. parking areas and trail heads)
- \_\_\_4. Educate the public about stream corridor environments, urban wildlife, natural geomorphologic processes, water quality, and their relationships to urban development.
- \_\_\_5. Provide areas for appropriate active recreational purposes.

**B) Maintain and Enhance the Natural Beauty and Quality of the Built Environment:**

- \_\_\_1. Implement physical improvements using quality design standards, durable materials, and construction techniques which promote visual attractiveness and compatibility with their surroundings.
- \_\_\_2. Provide landscaping and other physical improvements which enhance visual relationships and foster corridor-wide attractiveness.
- \_\_\_3. Provide amenities which promote a multi-sensory experience along the corridor.
- \_\_\_4. Establish buffer zones in and adjacent to the corridor through development setbacks, open space easements, private investment in corridor amenity enhancement, and other techniques.
- \_\_\_5. Prevent inappropriate actions in the corridor such as development in the floodplain, point source and non-point source pollution and bank dumping.
- \_\_\_6. Maximize visual compatibility between I-25 and the recreational amenities within the corridor.

**C) Assure Public Safety and Welfare:**

- \_\_\_1. Minimize private property damage that could result from flooding and stream erosion.
- \_\_\_2. Protect urban infrastructure components such as utility and road crossings.
- \_\_\_3. Decrease potential for loss of life or injury as a result of flooding and/or channel erosion.

#### **D) Maintain a High Level of Benefit to Cost:**

- \_\_\_ 1. Use planning, design, and management criteria and standards which maximize return from funding invested in the corridor.
- \_\_\_ 2. Protect public investment in infrastructure such as road overpasses, utilities, and recreational amenities.
- \_\_\_ 3. Include the value of protecting environmental and aesthetic quality of the corridor in the benefit-cost assessment.
- \_\_\_ 4. Include the short and long-term operations and maintenance costs in the benefit-cost assessment.

#### **E) Aid in Control of Pollution/ Enhance Water Quality:**

- \_\_\_ 1. Reduce sedimentation to acceptable levels consistent with flood control structures, adjacent riparian/vegetation zones, and a healthy aquatic environment.
- \_\_\_ 2. Manage water quality from a watershed perspective.
- \_\_\_ 3. Reduce point and non-point source chemical, biological, and sediment borne pollution and attempt to monitor impact of stormwater pollutants downstream so improvements can be evaluated (NPDES).

#### **F) Promote Community Development:**

- \_\_\_ 1. Promote the stream corridors as a community asset.
- \_\_\_ 2. Promote corridor improvements which are supportive of quality development in adjacent areas, including the downtown area.
- \_\_\_ 3. Promote adjacent land uses which are compatible with, and supportive of the stream corridor as a major social, economic, and environmental asset to the entire community.
- \_\_\_ 4. Promote development which is compatible with locations and structures which are of historical and cultural value.
- \_\_\_ 5. Accommodate the placement of needed utility improvements across and through the corridor.

### **G) Protect and Enhance Aquatic and Adjacent Ecosystems:**

- \_\_\_ 1. Improve aquatic habitat and water quality by promoting adequate streamflow, appropriate levels of nutrient input, and water quality.
- \_\_\_ 2. Promote diversity of vegetation along the corridor for wildlife cover, food, nesting, stream shading, and aesthetic/experiential values.
- \_\_\_ 3. Promote preservation and enhancement of riparian and upland ecosystems along the corridor.
- \_\_\_ 4. Protect groundwater recharge capability.
- \_\_\_ 5. Utilize construction and maintenance techniques which are sensitive to ecological impacts.

### **H) Promote Project Implementation:**

- \_\_\_ 1. Build a base of community support and develop private public joint solutions and incentives for private property owners.
- \_\_\_ 2. Identify the costs of phased implementation.
- \_\_\_ 3. Recommend funding mechanisms which are innovative and equitable.

## **APPENDIX C**

### **EXAMPLE LIST OF RATING CRITERIA FOR USE IN EVALUATING THE ALTERNATIVES ON A COMMON BASIS**

## REACH F1 — COUNTY JAIL TO CIRCLE DRIVE

	ALT 1	ALT 2	ALT 3	ALT 4
<b>PUBLIC SAFETY</b>				
Minimizes Flood Damage to Private Property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimizes Flood Damage to Public Property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimizes Bank Erosion & Bank Sloughing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimizes Loss of Life & Injury	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimizes Safety Hazard — Water Contact	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>RECREATION</b>				
Provides Multi-Use Trail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides Active Recreation Area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides Education/Interpretive Opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides Access to Corridor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>AESTHETICS</b>				
Utilizes Quality & Compatible Materials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides Beautification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides Passive Recreation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Establishes Buffer Zones	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cleans-Up/Deters Bank Dumping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances I-25/Creek Visual Compatibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>ENVIRONMENT</b>				
Stabilizes Channel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances Aquatic Habitat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances Riparian Habitat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances Upland Habitat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protects Groundwater Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimizes Construction & Maintenance Impacts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>COMMUNITY DEVELOPMENT</b>				
Promotes Development & Redevelopment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supports Desirable Adjacent Land Uses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances Historic/Cultural Features	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides Utility Improvements Opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promotes Community Pride & Stewardship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances Neighborhoods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PROPERTY</b>				
Minimizes Acquisition of Private Property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preserves/Enhances Property Value	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>COST</b>				
Minimizes Capital Cost				
Minimizes Operations & Maintenance Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## RECOMMENDATION

**APPENDIX C**

**TABLES 6.2-1 THROUGH 6.2-8  
ALTERNATIVE DESCRIPTION MATRICES**



**TABLE 6.2-1  
ALTERNATIVE DESCRIPTION MATRIX  
REACH: F1 - COUNTY JAIL TO CIRCLE DRIVE**

**SUMMARY:**

This reach of the creek is the only one within the study limits which remains largely an unchannelized natural (mature cottonwood) riparian area. The east side of the creek is characterized by a narrow floodplain bordered by a high bluff and is 100% undeveloped to Las Vegas Street with the exception of a powerline which runs generally north-south along the top of the bluff and a major developed drainage outfall. The creek has a degrading sand and gravel bed with relatively stable streambanks, a significant exposed rock outcrop on the east bank and several isolated eroded slopes. The west side of the creek is characterized by a wide floodplain, the fringe of which has been partially developed as a commercial area. There is no flooding of developed properties in this area. A sanitary sewer gravity main and a force main cross the creek at its bed level in this reach. There is casual use of the creek area but no developed recreation facilities exist within this privately owned area.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Histo- Aesthetics	Special Features
<b>Alternative 1 No Action</b>	No Action	No Action	No Action	No Action	No Action	No Action	No Action	No Change	No Change	No Action	No Action	None
<b>Alternative 2</b>	Provide maximum conveyance in channel and immediate over-bank by channelization, const. of berms, etc.	Provide structural drops as controlled by economics and protection of utilities.	Provide structural slopes for development protection as controlled by economics.	Provide structural edges for development protection as controlled by economics.	Partial or complete elimination of riparian area to provide for increased water conveyance.	Continuous trail in west floodplain. No crossings.	None specifically.	No change required. Public rights through easement or land dedication may be involved.	Additional commercial/industrial with riparian buffer.	Protect existing utility stream crossings.	No Action	None
<b>Alternative 3</b>	No Action	Provide aesthetic, environmentally compatible "riffle drops" as needed to protect utilities and provide channel stability.	Protect existing instability using bio-engineering techniques.	Protect existing instability using bio-engineering techniques.	Preserve existing.	Continuous trail in west riparian area fringe. No crossings.	Enhanced public access and passive recreational activity.	Corridor acquisition by the public.	Existing commercial/industrial with riparian buffer.	Protect existing utility stream crossings.	No Action	None
<b>Alternative 4</b>	No Action	Provide aesthetic, environmentally compatible "riffle drops" as needed to protect utilities and provide channel stability.	Protect existing instability using bio-engineering techniques.	Protect existing instability using bio-engineering techniques.	Enhance the floodplain fringe area to the west.	Continuous trail in west riparian area fringe. No crossings.	Enhanced public access and passive recreational activity.	Corridor acquisition by the public.	Existing commercial/industrial with riparian buffer.	Protect existing utility stream crossings.	No Action	None
<b>Alternative 5</b>	—	—	—	—	—	—	—	—	—	—	—	—

**TABLE 6.2-2  
ALTERNATIVE DESCRIPTION MATRIX  
REACH: F2 - CIRCLE DRIVE TO SHOOKS RUN**

**SUMMARY:**

This reach of the creek is dominated by the City wastewater treatment facility on the north bank and industrial/commercial property development as the creek flows from the City into the County. The land use in this area has encouraged the creek to become deteriorated/neglected by pollution and solid waste problems. Extensive ledge outcrops at the stream bed level, with some superficial gravel covering provides a relatively stable channel bed. Several high vertical actively eroding sand/gravel banks exist on the south and west streambank upstream of the Spring Creek confluence. Two dams and the WWTF outfall limit active use of the creek itself and adjacent riparian area. However, there is a casual path along an old irrigation ditch alignment which provides passive access. Valuable cottonwood groves exist across from the WWTF and just upstream of the Spring Creek confluence and the area provides a pleasant view from I-25. A modest flooding problem exists in this reach particularly at the trailer park near its downstream end. Land ownership is a mix of City, CDOT and privately held large parcels.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Histo Aesthetics	Special Features
<b>Alternative 1 No Action</b>	No Action	No Action	No Action	No Action	No Action	No Action	No Action	No Change	No Change	No Action	No Action	No Action
<b>Alternative 2</b>	No Action	Repair dams near WWTF. Struct. check structure needed at U.S. 24 Interchange. Repair check structure/utility crossing just downstream of Shooks Run.	No Action	Repair gabion walls upstream of Circle Drive. Repair toe of slope erosion at U.S. 24.	No Action	No Action	Modify dams and drop structures as hazards to navigation.	No Change	No Change	Repair check structure/utility crossing just downstream of Shooks Run.	No Action	No Action
<b>Alternative 3</b>	Enlarge channel to provide additional conveyance.	Structural drops as needed.	Rock, vertical walls or other structural treatment.	Rock, vertical walls or other structural treatment.	Partial or complete elimination of riparian area to provide for increased conveyance of water.	Provide trail along maintenance access outside of channel.	No Action	No Change	Increase in existing commercial/ industrial land use.	Repair check structure/utility crossing just downstream of Shooks Run.	No Action	No Action
<b>Alternative 4</b>	Minor channel modifications to increase conveyance and levees where needed to reduce flooding.	"Riffle" drops as needed.	Repair/stabilization of high eroding banks upstream of Spring Creek confluence using bio-engineering techniques.	Repair/stabilization of high eroding banks upstream of Spring Creek confluence using bio-engineering techniques.	Acquire and preserve cottonwood groves in Spring Creek area and across from WWTF and provide drops which permit fish movement.	Provide trail along levee and/or in riparian area.	Modify dams and drop structures as hazards to navigation and provide access to creek edge for passive creek use.	Moderate public acquisition or easements as are needed for levee.	Acquired land converted to floodplain compatible with public use.	Provide closures as necessary for levees and repair check structure/utility crossing just downstream of Shooks Run.	Enhance WW water quality and base flow when possible.	Provide street flooding warning and institute evacuation plan.
<b>Alternative 5</b>	Acquisition of properties and flood-proofing.	"Riffle" drops as needed.	Repair/stabilization of high eroding banks upstream of Spring Creek confluence using bio-engineering techniques.	Repair/stabilization of high eroding banks upstream of Spring Creek confluence using bio-engineering techniques.	Acquire and preserve cottonwood groves in Spring Creek area and across from WWTF and provide drops which permit fish movement.	Provide trail.	Modify dams and drop structures as hazards to navigation and provide access to creek edge for passive creek use.	Moderate public land acquisition.	Acquired land converted to floodplain compatible with public use.	Repair check structure/utility crossing just downstream of Shooks Run.	Enhance WW water quality and base flow when possible.	Provide street flooding warning and institute evacuation plan.

**TABLE 6.2-3**  
**ALTERNATIVE DESCRIPTION MATRIX**  
**REACH: F3 - SHOOKS RUN - CONEJOS STREET (EXTENSION)**

**SUMMARY:**

This reach of the creek is fully commercially developed. Arvada and Las Vegas Streets are low areas parallel to the creek which have extensive flooding problems. The primarily sand bed through this reach appears to be aggrading and as a result there are not problems with exposed utilities in this reach, but there is the potential for increased flooding as a result. This reach of the stream is channelized and floodplains have been encroached upon by adjacent development. A partial trail and a community park exist in this area but the stream itself is not actively used for recreation. The Tejon Marsh has evolved as a result of locally poor drainage and now exists as an ecologic asset.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater Flood/Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Historic/ Aesthetics	Special Features
<b>Alternative 1</b> No Action	No Action	No Action	No Action	No Action	Enhancement of Tejon Marsh area underway.	No Action	No Action	No Change	No Change	No Action	No Action	No Action
<b>Alternative 2</b>	No Action	No Action	No Action	No Action	Enhancement of Tejon Marsh area underway.	No Action	No Action	No Change	No Change	No Action	No Action	Provide street flooding warnings and institute evacuation plan.
<b>Alternative 3</b>	Enlarge channel to provide additional conveyance and eliminate spatially varied flow.	Structural drops as needed.	No Action	Rock, vertical walls or other structural treatment.	Partial or complete elimination of riparian area to provide for increased conveyance of water.	Provide trail along maintenance access outside of channel or along roads.	No Action	No Change	Increase in existing commercial land use.	No Action	No Action	No Action
<b>Alternative 4</b>	Minor channel modifications to increase conveyance and levees where needed to reduce flooding.	"Riffle" drops as needed.	No Action	Repair individual unstable areas by grading and revegetation or bio-engineering techniques.	Enhancement of Tejon Marsh area and preservation of riparian areas.	Provide trail along levee and/or in riparian area.	Provide access to creek edge for active creek use.	Moderate public acquisition or easements as are needed for levee.	Acquired land converted to floodplain-compatible for public use.	Provide closures as necessary for levees.	No Action	Provide street flooding warnings and institute evacuation plan.
<b>Alternative 5</b>	Acquisition of flood-prone properties and flood-proofing.	"Riffle" drops as needed.	No Action	Repair individual unstable areas by grading and revegetation or bio-engineering techniques.	Enhancement of Tejon Marsh area and preservation of riparian areas.	Provide trail.	Provide access to creek edge for active creek use.	Extensive public land acquisition.	Acquired land converted to floodplain-compatible for public use.	No Action	No Action	Provide street flooding warnings and institute evacuation plan.

**TABLE 6.2-4**  
**ALTERNATIVE DESCRIPTION MATRIX**  
**REACH: F4 - CONEJOS STREET (EXTENSION) TO CONFLUENCE**

**SUMMARY:**

This channelized reach is dominated by the Drake Power Plant (which, with its power lines, is a dominant visual feature) on the east, and I-25 on the west. There is no private development or flooding in this reach. The upstream end of this reach is characterized by a severely degraded (6-foot) streambed which has exposed bridge foundations and a major utility crossing above the confluence on Monument Creek. The downstream end of the north levee ends permitting spatially varied flow in the next downstream reach. This reach is entirely owned by CDOT or the City of Colorado Springs. The sand and gravel stream bed is degrading and possible additional severe degradation will continue with the probable failure of a remaining concrete check structure, further exposing the several utility crossings in this area. A high bank with partially failing retaining walls exists on the west side to protect the electric transmission towers. Otherwise, the streambanks themselves are relatively well protected with vegetation. The primary recreational feature is the continuing development of the trail through this reach.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Historic Aesthetics	Special Features
Alternative 1 No Action	No Action	No Action	No Action	No Action	No Action	Trail and a single crossing completion are underway.	No Action	No Change	No Change	No Action	No Action	No Action
Alternative 2	No Action	Rebuild protective check/drop structures with 4'-6' concrete structures.	Repair failing west side retaining walls as necessary with same features.	No Action	No Action	Trail and a single crossing completion are underway.	Remove hazards to navigation.	No Change	No Change	Provide structural drops to protect the several utility crossings and Cimarron Street Bridge.	No Action	No Action
Alternative 3	No Action	Construct multiple 1'-3' "riffle" drops.	Repair failing west side retaining walls as necessary with same features.	Grade banks and revegetate without realignment.	Bank grading and revegetation of eroded areas to protect current environment. Provide drops which permit fish movement.	Trail and a single crossing completion are underway.	Provide navigable drops for water crafts. Remove hazards to navigation. Provide access to stream edge for active stream use.	No Change	No Change	Provide structural drops to protect the several utility crossings and Cimarron Street Bridge.	No Action	No Action
Alternative 4	No Action	Construct multiple 1'-3' "riffle" drops.	Repair failing west side retaining walls as necessary with same features.	Construct rock toe to fix location of creek channel.	Provide enhanced riparian area including woody plants to screen for aesthetic purposes. Provide drops which permit fish movement.	Trail and a single crossing completion are underway.	Provide navigable drops for water crafts. Remove hazards to navigation. Provide access to stream edge for active stream use.	No Change	No Change	Provide structural drops to protect the several utility crossings and Cimarron Street Bridge.	Provide woody plant screening for aesthetics.	No Action
Alternative 5	—	—	—	—	—	—	—	—	—	—	—	—

**TABLE 6.2-5  
ALTERNATIVE DESCRIPTION MATRIX  
REACH: F5 - CONFLUENCE TO 10TH STREET (EXTENSION)**

**SUMMARY:**

This reach of the creek is largely influenced by conditions at the downstream confluence with Monument Creek. A failed grade control structure has allowed severe degradation of bridges at Cimarron, I-25 access ramp, and I-25. Revisions to I-25/U.S. 24 Interchange may impact creek improvement alternatives. The north side of the creek in this area is in heavy commercial use and the south side is occupied by roadways and commercial land use. The stream bed and banks are primarily sand and the creek is degrading, having been extensively channelized. The floodplain is broad, as is typical of stream confluences, and flooding of private properties is significant. Several creek utility crossings have been exposed by channel degradation. There is casual and transient use of the creek area and a partially developed trail exists at the confluence. There are no developed recreation facilities in this CDOT and privately owned area.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Historic/ Aesthetics	Special Features
<b>Alternative 1 No Action</b>	No Action	No Action	No Action	No Action	No Action	No Action	No Action	No Change	No Change	No Change	No Action	No Action
<b>Alternative 2</b>	No Action	Remove sediment from clogged south span of U.S. 24 bridge. Structural drops or checks as necessary to protect utility crossings.	No Action	Spot correction of erosion by grading and revegetation on or riprap (or wall construction) at two specific locations where private and public property are threatened.	No Action	No Action	No Action	Limited public acquisition or easements as are needed to facilitate repair.	No Change	Replace 8th Street bridge with larger structure when it would otherwise be replaced. Restore/protect existing utility stream crossings.	No Action	Remove abandoned irrigation diversion behind Holiday Inn. Drop structure replacement required below confluence (Reach 4).
<b>Alternative 3</b>	Provide increased conveyance in channel and immediate over-bank by channelization, const. of berms, etc.	Rock or structural drops as controlled by economics and protection of utilities.	No Action	Structural bank edges.	Partial or complete elimination of riparian area to provide for increased water conveyance.	Build trail and needed crossings along alignment yet to be determined. (Wherever they fit).	No Action	Limited public acquisition or easements as are needed to facilitate repair and to provide for maintenance/repair of channel.	Enhanced private land development opportunity.	Replace 8th Street bridge with larger structure when it would otherwise be replaced. Restore/protect existing utility stream crossings.	No Action	Remove abandoned irrigation diversion behind Holiday Inn. Drop structure replacement required below confluence (Reach 4).
<b>Alternative 4</b>	Provide increased conveyance in channel and floodplain fringe areas through regrading to achieve flatter slopes with lower banks.	Construct "riffle" drops or pool/ "riffle"-drops.	No Action	Lower banks, flatten backslopes and revegetate.	Enhance floodplain fringe area where additional flood conveyance is provided.	Build trail and needed crossings integral with channel in enhanced riparian area fringe.	Enhanced access for casual contact.	Extensive public land acquisition to access areas in need of repair and to enable channel enlargement.	Modest conversion of land to public usage along riparian corridor.	Replace 8th Street bridge with larger structure when it would otherwise be replaced. Restore/protect existing utility stream crossings.	No Action	Remove abandoned irrigation diversion behind Holiday Inn. Drop structure replacement required below confluence (Reach 4).
<b>Alternative 5</b>	—	—	—	—	—	—	—	—	—	—	—	—

**TABLE 6.2-6**  
**ALTERNATIVE DESCRIPTION MATRIX**  
**REACH: F6 - 10TH STREET (EXTENSION) TO MIDLAND EXPRESSWAY**

**SUMMARY:**

This reach of the creek is dominated by "Gold Hill Mesa", which is an abandoned gold tailings pile of modest historical significance, located along the south floodplain fringe. This feature is a known source of sediment and water quality degradation. A trailer park, junkyard, and shopping center exist at the downstream end of this now otherwise undeveloped reach. Just upstream of this feature is a severely eroded 30' high bank and stream confluence just downstream of the U.S. 24 bridge. U.S. 24 borders the creek continuously on the north. Flooding in this reach is primarily at its downstream end in the trailer park area. The slightly degrading sand and gravel bed characterizes this creek which has been almost completely channelized. A remnant riparian corridor exists along the channel in an area with no obvious recreational usage. A single exposed utility crossing exists just downstream of the rock outcrop at the U.S. 24 Bridge. This large parcel in a privately owned area is an opportunity for private/public development as a part of overcoming its environmental degradation/contamination problems.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Historic/ Aesthetics	Special Features
Alternative 1 No Action	No Action	No Action	No Action	No Action	No Action	No Action	No Action	No Change	No Change	No Action	No Action	No Action
Alternative 2	No Action	Structural baffled drop at tributary confluence. Structural drop or check structure to protect utility crossing.	Stabilize high bank by flattening slopes and/or structural retaining walls downstream of U.S. 24.	Realignment of U.S. 24 stream crossing as a part of high bank repair and spot grading/riprap protection as necessary.	No Action	No Action	No Action	Limited public acquisition or easements as are needed to facilitate repair.	No Change	Utility crossing restore/protect just downstream of U.S. 24 -- U.S. 24 bridge replacement with larger structure and realignment.	No Action	No Action
Alternative 3	Channel enlargement and floodplain fringe modifications to provide increased conveyance, especially near downstream end of reach.	Construct "riffle" drops or pool/"riffle" drops and structural baffle drop at tributary confluence.	Stabilize high bank using grading and bio-engineering techniques.	Realign at U.S. 24 and restore to condition of a natural channel to the maximum extent possible.	Enhance riparian floodplain fringe area.	Construct trail on south side of channel through reach.	Develop a linear park concept with adjacent recreation facility planned at downstream end.	Acquire selected properties and easements as necessary for recreational facilities and riparian enhancement.	Improvements will permit development of environmentally degraded area by public or private entities. Conversion of trailer park area to public use.	Utility crossing restore/protect just downstream of U.S. 24 -- U.S. 24 bridge replacement with larger structure and realignment.	Gold Hill remnant historical features restoration/interpretation.	Construction of detention/water quality ponds between channel and tailings pile and dam remnants removal.
Alternative 4	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Alternative 5	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

**TABLE 6.2-7**  
**ALTERNATIVE DESCRIPTION MATRIX**  
**REACH: F7 - MIDLAND EXPRESSWAY TO 31ST STREET**

**SUMMARY:**

This reach of the creek is essentially 100% developed in mixed use. The creek has been channelized and the floodplain encroached upon on both sides. The creek is bordered by, but generally not visible from U.S. 24 on the south and by Old Colorado City on the north. The creek has a degrading sand and gravel bed and generally steep/eroding channel edge banks with dumping activity apparent. Several at-grade and aerial utility crossings exist and several private bridges provide flood conveyance restrictions in the reach. The U.S. 24 bridge and related channel require realignment. There are several neighborhood parks mixed in this area of numerous small private land parcels. Flooding of floodplain fringe properties on both sides of the creek, including a campground, is characteristic of this reach. No public trails and creek-based recreation exist along this reach with the exception of a single trailhead adjacent to the planned "Arrival Park."

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood/Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossing	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Historic/ Aesthetics	Special Features
<b>Alternative 1</b> <b>No Action</b>	No Action	No Action	No Action	No Action	No Action	No Action	No Action	No Change	No Change	No Action	No Action	No Action
<b>Alternative 2</b>	No Action	Structural drops or checks as necessary to protect utility crossings and bridges.	Cut back and revegetate or retain eroding unstable banks at select locations as necessary.	Restore/replace bank edge retaining walls.	No Action	No Action	No Action	Limited public acquisition or easements as are needed to facilitate repair.	No Change	Restore/protect utility crossings, and enlarge the four major bridges in this reach as their replacement becomes otherwise necessary.	No Action	Get private bridge owners (3) in this reach to remove or enlarge hydraulic capacity of bridges.
<b>Alternative 3</b>	Enlarge and align channel to maximize conveyance.	Rock or structural drops as controlled by economics and protection of utilities.	Cut back and revegetate or retain eroding unstable banks at select locations as necessary.	Structural bank edges.	Partial or complete elimination of riparian area to provide for increased water conveyance.	Construct trail and crossings at 21st Street and 26th Street.	No Action	Extensive public acquisition or easements as are needed to facilitate repair and to provide for maintenance/repair of channel.	No Change	Restore/protect utility crossings, and enlarge the four major bridges in this reach as their replacement becomes otherwise necessary.	No Action	Get private bridge owners (3) in this reach to remove or enlarge hydraulic capacity of bridges.
<b>Alternative 4</b>	Provide increased conveyance in channel floodplain fringe areas through regrading to achieve flatter slopes with lower banks.	Construct "riffle" drops or pool/ "riffle"-drops.	Cut back and revegetate or retain eroding unstable banks at select locations as necessary.	Lower banks. Flatten back slopes and revegetate.	Restoration of stream bank area to more native riparian function where possible.	Construct trail and crossings at 21st Street and 28th Street.	Enhanced public access and passive recreational activity.	Extensive public land acquisition to access areas in need of repair and to enable channel enlargement.	Modest conversion of land to public usage along riparian corridor.	Restore/protect utility crossings, and enlarge the four major bridges in this reach as their replacement becomes otherwise necessary.	Enhance relationship with Old Colorado City through path connections.	Get private bridge owners (3) in this reach to remove or enlarge hydraulic capacity of bridges.
<b>Alternative 5</b>	—	—	—	—	—	—	—	—	—	—	—	—

Notes/Comments:

**TABLE 6.2-8  
ALTERNATIVE DESCRIPTION MATRIX  
REACH: F8 - 31ST STREET TO 33RD STREET**

**SUMMARY:**

This reach of the creek is essentially 100% commercially developed on the north and the south is undevelopable due to the presence of U.S. 24 and a steep rock outcrop. The area is undergoing redevelopment which maintains the current situation of flooding developed properties on the north. The redevelopment contains channel enhancements for floodwater conveyance and channel bottom environment. The creek has a degrading sand and gravel bed with a very narrow riparian fringe along rubble/debris covered banks. This reach is undergoing a transition to vertically walled structural banks with an internal rock-lined low-flow channel and rock drop structures. Downstream of 31st Street an enclosed concrete encased 18" diameter sanitary sewer main exercises grade control over the lower portion of this reach. There is essentially no ecological value to the area except to the channel bottom. A partial trail is under construction outside the channel and only minimal active/passive water-based recreation is available in this privately owned reach.

**ALTERNATIVE ACTIONS/POLICIES**

	Stormwater/ Flood/Plain	Grade Control	Outer (high) bank treatment	Channel (low) bank treatment	Environmental	Trails/Crossings	Recreation	Property Ownership	Land Use	Infrastructure	Cultural/Historic/ Aesthetics	Special Features
<b>Alternative 1 No Action</b>	Partial - 10-year channel under construction.	Partial - rock drops under construction.	None	Partial - Vertical structural channel walls under construction.	Partial - Channel bottom enhancement underway.	Partial - Construction underway on south side of channel wall.	No Action	No Change	No Change	Some utility relocations part of existing construction.	No Action	No Action
<b>Alternative 2</b>	10-year structural channel as is under construction upstream - maximize conveyance.	Rock drops are under construction upstream.	None Necessary	Vertical structural walls as are under construction upstream.	Rock/Vegetation channel bottom as is under construction upstream.	Continue trail to east as it is being built upstream.	No Action	No Change	No Change	Utility relocates as are required to accommodate channelized walls.	No Action	Transition out of "walled channel" proceeding downstream to normal channel/floodplain fringe configuration.
<b>Alternative 3</b>	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
<b>Alternative 4</b>	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
<b>Alternative 5</b>	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____



**TABLE 6.3-32**  
**ALTERNATIVE EVALUATION MATRIX**  
**REACH F6 — 10TH STREET (EXTENSION) TO MIDLAND EXPRESSWAY**

	ALT 1	ALT 2	ALT 3
<b>PUBLIC SAFETY</b>			
Minimizes Flood Damage to Private Property	○	◐	●
Minimizes Flood Damage to Public Property	●	●	●
Minimizes Bank Erosion & Bank Sloughing	○	◐	●
Minimizes Loss of Life & Injury	○	◐	●
Minimizes Safety Hazard — Water Contact	○	◐	●
<b>RECREATION</b>			
Provides Multi-Use Trail	○	○	●
Provides Active Recreation Area	○	○	●
Provides Education/Interpretive Opportunities	○	○	●
Provides Access to Corridor	○	◐	●
<b>AESTHETICS</b>			
Utilizes Quality & Compatible Materials	○	●	●
Provides Beautification	○	◐	●
Provides Passive Recreation	◐	◐	●
Establishes Buffer Zones	◐	◐	●
Cleans-Up/Deters Bank Dumping	○	◐	●
Preserves/Enhances I-25/Creek Visual Compatibility	○	◐	●
<b>ENVIRONMENT</b>			
Stabilizes Channel	○	◐	●
Preserves/Enhances Aquatic Habitat	◐	◐	●
Preserves/Enhances Riparian Habitat	◐	◐	●
Preserves/Enhances Upland Habitat	◐	●	●
Protects Groundwater Level	○	◐	●
Minimizes Construction & Maintenance Impacts	◐	○	◐
<b>COMMUNITY DEVELOPMENT</b>			
Promotes Development & Redevelopment	○	◐	●
Supports Desirable Adjacent Land Uses	○	◐	●
Preserves/Enhances Historic/Cultural Features	○	○	●
Provides Utility Improvements Opportunities	○	●	●
Promotes Community Pride & Stewardship	○	◐	●
Preserves/Enhances Neighborhoods	○	◐	●
<b>PROPERTY</b>			
Minimizes Acquisition of Private Property	●	◐	○
Preserves/Enhances Property Value	○	◐	●
<b>COST</b>			
Minimizes Capital Cost	Ø M	3.7M	6.8M
Minimizes Operations & Maintenance Cost	○	◐	●

**RECOMMENDATION**

Recommend implementation of Alternative 3 (enlarged natural channel). It is expected that Alternative 2 (limited channel realignment and maintenance of existing conditions) will be the near term activity in this reach as there are some critical drainage needs and future private or public development of "Gold Hill" will initiate the need for implementation of Alternative 3.

TABLE 6.3-33

## ALTERNATIVE EVALUATION MATRIX

## REACH F7 — MIDLAND EXPRESSWAY TO 31ST STREET

	ALT 1	ALT 2	ALT 3	ALT 4
<b>PUBLIC SAFETY</b>				
Minimizes Flood Damage to Private Property	○	◐	●	◐
Minimizes Flood Damage to Public Property	○	◐	●	◐
Minimizes Bank Erosion & Bank Sloughing	○	◐	●	●
Minimizes Loss of Life & Injury	◐	◐	●	◐
Minimizes Safety Hazard — Water Contact	◐	◐	◐	●
<b>RECREATION</b>				
Provides Multi-Use Trail	○	○	●	●
Provides Active Recreation Area	○	○	○	●
Provides Education/Interpretive Opportunities	○	○	○	◐
Provides Access to Corridor	○	○	●	●
<b>AESTHETICS</b>				
Utilizes Quality & Compatible Materials	○	○	○	●
Provides Beautification	○	○	○	●
Provides Passive Recreation	◐	◐	◐	●
Establishes Buffer Zones	◐	◐	○	●
Cleans-Up/Deters Bank Dumping	○	◐	◐	●
Preserves/Enhances I-25/Creek Visual Compatibility	○	◐	○	●
<b>ENVIRONMENT</b>				
Stabilizes Channel	○	◐	●	●
Preserves/Enhances Aquatic Habitat	◐	◐	○	●
Preserves/Enhances Riparian Habitat	◐	◐	○	●
Preserves/Enhances Upland Habitat	◐	◐	◐	●
Protects Groundwater Level	◐	◐	○	●
Minimizes Construction & Maintenance Impacts	◐	◐	○	◐
<b>COMMUNITY DEVELOPMENT</b>				
Promotes Development & Redevelopment	○	◐	○	○
Supports Desirable Adjacent Land Uses	○	◐	●	●
Preserves/Enhances Historic/Cultural Features	○	○	○	●
Provides Utility Improvements Opportunities	○	◐	●	●
Promotes Community Pride & Stewardship	○	◐	◐	●
Preserves/Enhances Neighborhoods	◐	◐	◐	◐
<b>PROPERTY</b>				
Minimizes Acquisition of Private Property	●	◐	○	○
Preserves/Enhances Property Value	◐	◐	◐	◐
<b>COST</b>				
Minimizes Capital Cost	Ø M	1.7M	6.3M	5.8M
Minimizes Operations & Maintenance Cost	○	◐	◐	◐

**RECOMMENDATION** Recommend implementation of either Alternative 3 (enlarged structural channel) or Alternative 4 (enlarged natural channel). Both require channel conveyance improvements which means that private property acquisition is involved. Alternative 3 provides a greater degree of flood relief at a higher cost than Alternative 4, but does not accomplish the City's stated goal of a preference for soft linings/natural drainageways.

(continued)

**TABLE 6.3-33**  
**ALTERNATIVE EVALUATION MATRIX**

REACH 7 - MIDLAND EXPRESSWAY TO 31ST STREET

RECOMMENDATION (Continued)

It may be appropriate to partially base the decision of which alternative to implement on maintaining consistency of channel treatment in the reach.

## ALTERNATIVE EVALUATION MATRIX

## REACH F8 — 31ST STREET TO 33RD STREET

	ALT 1	ALT 2
<b>PUBLIC SAFETY</b>		
Minimizes Flood Damage to Private Property	<input type="radio"/>	<input checked="" type="radio"/>
Minimizes Flood Damage to Public Property	<input type="radio"/>	<input checked="" type="radio"/>
Minimizes Bank Erosion & Bank Sloughing	<input type="radio"/>	<input checked="" type="radio"/>
Minimizes Loss of Life & Injury	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Minimizes Safety Hazard — Water Contact	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<b>RECREATION</b>		
Provides Multi-Use Trail	<input type="radio"/>	<input checked="" type="radio"/>
Provides Active Recreation Area	<input type="radio"/>	<input checked="" type="radio"/>
Provides Education/Interpretive Opportunities	<input type="radio"/>	<input type="radio"/>
Provides Access to Corridor	<input type="radio"/>	<input checked="" type="radio"/>
<b>AESTHETICS</b>		
Utilizes Quality & Compatible Materials	<input type="radio"/>	<input checked="" type="radio"/>
Provides Beautification	<input type="radio"/>	<input checked="" type="radio"/>
Provides Passive Recreation	<input type="radio"/>	<input checked="" type="radio"/>
Establishes Buffer Zones	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Cleans-Up/Deters Bank Dumping	<input type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances I-25/Creek Visual Compatibility	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<b>ENVIRONMENT</b>		
Stabilizes Channel	<input type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances Aquatic Habitat	<input type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances Riparian Habitat	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances Upland Habitat	<input checked="" type="radio"/>	<input type="radio"/>
Protects Groundwater Level	<input type="radio"/>	<input checked="" type="radio"/>
Minimizes Construction & Maintenance Impacts	<input checked="" type="radio"/>	<input type="radio"/>
<b>COMMUNITY DEVELOPMENT</b>		
Promotes Development & Redevelopment	<input type="radio"/>	<input checked="" type="radio"/>
Supports Desirable Adjacent Land Uses	<input type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances Historic/Cultural Features	<input type="radio"/>	<input type="radio"/>
Provides Utility Improvements Opportunities	<input type="radio"/>	<input checked="" type="radio"/>
Promotes Community Pride & Stewardship	<input type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances Neighborhoods	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<b>PROPERTY</b>		
Minimizes Acquisition of Private Property	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Preserves/Enhances Property Value	<input checked="" type="radio"/>	<input checked="" type="radio"/>
<b>COST</b>		
Minimizes Capital Cost	Ø M	1.6M
Minimizes Operations & Maintenance Cost	<input type="radio"/>	<input checked="" type="radio"/>

**RECOMMENDATION**

Recommend implementation of Alternative 2 (10-Year Structural Channel). It is expected that Alternative 1 (No Action) will be the near term activity in this reach as there are no critical drainage needs and future commercial redevelopment will initiate the need for implementation of Alternative 2.

**APPENDIX C**

**TABLES 6.3-1 THROUGH 6.3-23  
ALTERNATIVE CONSTRUCTION COST ESTIMATES**

TABLE 6.3 -1  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F1 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$172,000	L.S.	\$172,000
Clearing and Grubbing	1	L.S.	\$30,000	L.S.	\$30,000
Water Handling	1	L.S.	\$150,000	L.S.	\$150,000
Demolition	1	L.S.	\$5,000	L.S.	\$5,000
Utility Relocation	1	L.S.	\$10,000	L.S.	\$10,000
Drop Structure	5	L.S.	\$191,000	L.S.	\$955,000
Riffle Drop	0	L.S.	\$26,000	L.F.	\$0
Retaining Wall	300	L.F.	\$360	L.F.	\$108,000
Grading/Excavation	28,000	CUYD	\$5	CUYD	\$140,000
Riprap Bank Protection	3500	L.F.	\$180	L.F.	\$630,000
Restoration	1	L.S.	\$25,000	L.S.	\$25,000
Access Road/Bike Path	3500	L.F.	\$3	L.F.	\$10,500
Floodplain Fringe Enhancement	0	L.S.	\$0	L.S.	\$0
Land Acquisition	0	SQFT	\$1.5	SQFT	\$0
Unlisted Items	1	L.S.	\$344,000	L.S.	\$344,000
Contingency	1	L.S.	\$860,000	L.S.	\$860,000
Total					<u>\$3,439,500</u>

Miscellaneous Notes or Items Not Included

High bank on east side - Ledge outcrop - Stable w/o protection - Any development would be set back.

TABLE 6.3-2  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F1 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY	COST	TOTAL COST
Mobilization	1 L.S.	\$45,000 L.S.	\$45,000
Clearing and Grubbing	1 L.S.	\$10,000 L.S.	\$10,000
Water Handling	1 L.S.	\$100,000 L.S.	\$100,000
Demolition	1 L.S.	\$5,000 L.S.	\$5,000
Utility Relocation	1 L.S.	\$10,000 L.S.	\$10,000
Drop Structure	0 L.S.	\$191,000 L.S.	\$0
Riffle Drop	10 L.S.	\$26,000 L.F.	\$260,000
Retaining Wall	0 L.F.	\$360 L.F.	\$0
Grading/Excavation	4,000 CUYD	\$5 CUYD	\$20,000
Riprap Bank Protection	0 L.F.	\$90 L.F.	\$0
Restoration	1 L.S.	\$10,000 L.S.	\$10,000
Access Road/Bike Path	3500 L.F.	\$3 L.F.	\$10,500
Floodplain Fringe Enhancement	0 L.S.	\$0 L.S.	\$0
Land Acquisition	350000 SQFT	\$0.3 SQFT	\$112,000
Unlisted Items	1 L.S.	\$90,000 L.S.	\$90,000
Contingency	1 L.S.	\$224,000 L.S.	\$224,000
Total			<u>\$896,500</u>

Miscellaneous Notes or Items Not Included

High bank on east side - Ledge outcrop - Stable w/o protection - Any development would be set back.

TABLE 6.3 -3  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F1 - ALTERNATIVE 4

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$49,000	L.S.	\$49,000
Clearing and Grubbing	1	L.S.	\$10,000	L.S.	\$10,000
Water Handling	1	L.S.	\$100,000	L.S.	\$100,000
Demolition	1	L.S.	\$5,000	L.S.	\$5,000
Utility Relocation	1	L.S.	\$10,000	L.S.	\$10,000
Drop Structure	0	L.S.	\$191,000	L.S.	\$0
Riffle Drop	10	L.S.	\$26,000	L.F.	\$260,000
Retaining Wall	0	L.F.	\$360	L.F.	\$0
Grading/Excavation	4,000	CUYD	\$5	CUYD	\$20,000
Riprap Bank Protection	0	L.F.	\$90	L.F.	\$0
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Access Road/Bike Path	3500	L.F.	\$3	L.F.	\$10,500
Floodplain Fringe Enhancement	1	L.S.	\$50,000	L.S.	\$50,000
Land Acquisition	350000	SQFT	\$0.3	SQFT	\$112,000
Unlisted Items	1	L.S.	\$98,000	L.S.	\$98,000
Contingency	1	L.S.	\$245,000	L.S.	\$245,000
Total					<u>\$979,500</u> ✓

Miscellaneous Notes or Items Not Included

High bank on east side - Ledge outcrop - Stable w/o protection - Any development would be set back.



TABLE 6.3 -4  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F2 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$32,000	L.S.	\$32,000
Clearing and Grubbing	1	L.S.	\$5,000	L.S.	\$5,000
Water Handling	1	L.S.	\$40,000	L.S.	\$40,000
Demolition	1	L.S.	\$10,000	L.S.	\$10,000
Reconstruction/Repair of Check Structures	1	L.S.	\$10,000	L.S.	\$10,000
Reconstruction/Repair of WWTF Dams	2	L.S.	\$30,000	L.S.	\$60,000
Reconstruction/Repair of Gabion Wall	1	L.F.	\$15,000	L.F.	\$15,000
Utility Relocation	1	L.S.	\$10,000	L.S.	\$10,000
Drop Structure	1	L.S.	\$191,000	L.S.	\$191,000
Riffle Drop	0	L.S.	\$28,000	L.S.	\$0
Grading/Excavation	3,000	CUYD	\$5	CUYD	\$15,000
Riprap Protection	0	L.F.	\$180	L.F.	\$0
Levee (8' High)	0	L.F.	\$255	L.F.	\$0
Levee Closure(s)	0	L.S.	\$150,000	L.S.	\$0
Vertical Concrete Wall	0	L.F.	\$360	L.F.	\$0
Grass Lined Bank Protection	0	L.F.	\$20	L.F.	\$0
Rock Toe Stabilization	0	L.F.	\$75	L.F.	\$0
Repair Rock Toe/Gabion Structure	1	L.S.	\$10,000	L.S.	\$10,000
Restoration	1	L.S.	\$15,000	L.S.	\$15,000
Access Road/Bike Path	0	L.F.	\$3	L.F.	\$0
Street Flood Warning System	0	L.S.	\$10,000	L.S.	\$0
Interior Drainage	0	L.S.	\$150,000	L.S.	\$0
Structure Acquisition/Relocation	0	L.S.	\$15,000	L.S.	\$0
Flood Proofing	0	L.S.	\$30,000	L.S.	\$0
Land Acquisition	0	SQFT	\$1.5	SQFT	\$0
Unlisted Items	1	L.S.	\$64,000	L.S.	\$64,000
Contingency	1	L.S.	\$159,000	L.S.	\$159,000
				Total	<u>\$636,000</u>

Miscellaneous Notes or Items Not Included

TABLE 6.3 -5  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F2 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$452,000	L.S.	\$452,000
Clearing and Grubbing	1	L.S.	\$60,000	L.S.	\$60,000
Water Handling	1	L.S.	\$170,000	L.S.	\$170,000
Demolition	1	L.S.	\$30,000	L.S.	\$30,000
Reconstruction/Repair of Check Structures	0	L.S.	\$10,000	L.S.	\$0
Reconstruction/Repair of WWTF Dams	1	L.S.	\$30,000	L.S.	\$30,000
Reconstruction/Repair of Gabion Wall	0	L.F.	\$15,000	L.F.	\$0
Utility Relocation	1	L.S.	\$35,000	L.S.	\$35,000
Drop Structure	8	L.S.	\$191,000	L.S.	\$1,528,000
Riffle Drop	0	L.S.	\$28,000	L.S.	\$0
Grading/Excavation	136,500	CUYD	\$5	CUYD	\$682,500
Riprap Protection	11,600	L.F.	\$180	L.F.	\$2,088,000
Levee (8' High)	0	L.S.	\$255	L.F.	\$0
Levee Closure(s)	0	L.S.	\$150,000	L.S.	\$0
Vertical Concrete Wall	2,000	L.F.	\$360	L.F.	\$720,000
Grass Lined Bank Protection	0	L.F.	\$20	L.F.	\$0
Rock Toe Stabilization	0	L.F.	\$75	L.F.	\$0
Repair Rock Toe/Gabion Structure	0	L.S.	\$8,000	L.S.	\$0
Restoration	1	L.S.	\$45,000	L.S.	\$45,000
Access Road/Bike Path	11,450	L.F.	\$3	L.F.	\$34,350
Street Flood Warning System	0	L.S.	\$10,000	L.S.	\$0
Interior Drainage	0	L.S.	\$150,000	L.S.	\$0
Structure Acquisition/Relocation	0	L.S.	\$15,000	L.S.	\$0
Flood Proofing	0	L.S.	\$30,000	L.S.	\$0
Land Acquisition	0	SQFT	\$1.5	SQFT	\$0
Unlisted Items	1	L.S.	\$904,000	L.S.	\$904,000
Contingency	1	L.S.	\$2,259,000	L.S.	\$2,259,000
				Total	<u>\$9,037,850</u>

Miscellaneous Notes or Items Not Included

TABLE 6.3 -6  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F2 - ALTERNATIVE 4

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$386,000	L.S.	\$387,000
Clearing and Grubbing	1	L.S.	\$30,000	L.S.	\$30,000
Water Handling	1	L.S.	\$150,000	L.S.	\$150,000
Demolition	1	L.S.	\$20,000	L.S.	\$20,000
Reconstruction/Repair of Check Structures	0	L.S.	\$10,000	L.S.	\$0
Reconstruction/Repair of WWTF Dams	1	L.S.	\$30,000	L.S.	\$30,000
Reconstruction/Repair of Gabion Wall	0	L.F.	\$15,000	L.F.	\$0
Utility Relocation	1	L.S.	\$30,000	L.S.	\$30,000
Drop Structure	0	L.S.	\$191,000	L.S.	\$0
Riffle Drop	13	L.S.	\$28,000	L.S.	\$364,000
Grading/Excavation	100,000	CUYD	\$5	CUYD	\$500,000
Riprap Protection	1,000	L.F.	\$90	L.F.	\$90,000
Levee (8' High)	8,500	L.F.	\$255	L.F.	\$2,167,500
Levee Closure(s)	1	L.S.	\$150,000	L.S.	\$150,000
Vertical Concrete Wall	0	L.F.	\$360	L.F.	\$0
Grass Lined Bank Protection	2000	L.F.	\$20	L.F.	\$40,000
Rock Toe Stabilization	300	L.F.	\$75	L.F.	\$22,500
Repair Rock Toe/Gabion Structure	0	L.S.	\$8,000	L.S.	\$0
Restoration	1	L.S.	\$30,000	L.S.	\$30,000
Access Road/Bike Path	11,450	L.F.	\$3	L.F.	\$34,350
Street Flood Warning System	1	L.S.	\$10,000	L.S.	\$10,000
Interior Drainage	3	L.S.	\$150,000	L.S.	\$450,000
Structure Acquisition/Relocation	0	L.S.	\$15,000	L.S.	\$0
Flood Proofing	0	L.S.	\$30,000	L.S.	\$0
Land Acquisition	620,000	SQFT	\$0.8	SQFT	\$514,600
Unlisted Items	1	L.S.	\$774,000	L.S.	\$774,000
Contingency	1	L.S.	\$1,935,000	L.S.	\$1,935,000
Total					<u>\$7,728,950</u>

Miscellaneous Notes or Items Not Included

TABLE 6.3-7  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F2 - ALTERNATIVE 5

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$649,000	L.S.	\$649,000
Clearing and Grubbing	1	L.S.	\$25,000	L.S.	\$25,000
Water Handling	1	L.S.	\$150,000	L.S.	\$150,000
Demolition	1	L.S.	\$60,000	L.S.	\$60,000
Reconstruction/Repair of Check Structures	0	L.S.	\$10,000	L.S.	\$0
Reconstruction/Repair of WWTF Dams	1	L.S.	\$30,000	L.S.	\$30,000
Reconstruction/Repair of Gabion Wall	0	L.F.	\$15,000	L.F.	\$0
Utility Relocation	1	L.S.	\$25,000	L.S.	\$25,000
Drop Structure	0	L.S.	\$191,000	L.S.	\$0
Riffle Drop	13	L.S.	\$28,000	L.S.	\$364,000
Grading/Excavation	55,600	CUYD	\$5	CUYD	\$278,000
Riprap Protection	1,000	L.F.	\$90	L.F.	\$90,000
Levee (8' High)	0	L.F.	\$255	L.F.	\$0
Levee Closure(s)	0	L.S.	\$150,000	L.S.	\$0
Vertical Concrete Wall	0	L.F.	\$360	L.F.	\$0
Grass Lined Bank Protection	2000	L.F.	\$20	L.F.	\$40,000
Rock Toe Stabilization	300	L.F.	\$75	L.F.	\$22,500
Repair Rock Toe/Gabion Structure	0	L.S.	\$8,000	L.S.	\$0
Restoration	1	L.S.	\$25,000	L.S.	\$25,000
Access Road/Bike Path	11,450	L.F.	\$3	L.F.	\$34,350
Street Flood Warning System	1	L.S.	\$10,000	L.S.	\$10,000
Interior Drainage	0	L.S.	\$150,000	L.S.	\$0
Structure Acquisition/Relocation	260	L.S.	\$15,000	L.S.	\$3,900,000
Flood Proofing	22	L.S.	\$30,000	L.S.	\$660,000
Land Acquisition	1,260,000	SQFT	\$1.7	SQFT	\$2,079,000
Unlisted Items	1	L.S.	\$1,298,000	L.S.	\$1,298,000
Contingency	1	L.S.	\$3,245,000	L.S.	\$3,245,000
				Total	\$12,984,850 ✓

Miscellaneous Notes or Items Not Included

TABLE 6.3 - 8  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F3 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$2,000	L.S.	\$2,000
Clearing and Grubbing	0	L.S.	\$0	L.S.	\$0
Water Handling	0	L.S.	\$0	L.S.	\$0
Demolition	0	L.S.	\$5,000	L.S.	\$0
Utility Relocation	0	L.S.	\$5,000	L.S.	\$0
Drop Structure	0	L.S.	\$138,000	L.S.	\$0
Riffle Drop	0	L.S.	\$25,000	L.S.	\$0
Riprap Bank Protection	0	L.F.	\$180	L.F.	\$0
Grading/Excavation	0	CUYD	\$5	CUYD	\$0
Grass Lined/Vegetated Bank	0	L.F.	\$20	L.F.	\$0
Levee (8' High)	0	L.F.	\$255	L.F.	\$0
Levee Closures	0	L.S.	\$150,000	L.S.	\$0
Land Acquisition	0	SQFT	\$1.5	SQFT	\$0
Flood Proofing	0	L.S.	\$40,000	L.S.	\$0
Interior Drainage	0	L.S.	\$150,000	L.S.	\$0
Street Flood Warning Systems	1	L.S.	\$20,000	L.S.	\$20,000
Access Road/Bike Path	0	L.F.	\$0	L.F.	\$0
Tejon Marsh Enhancement	0	L.S.	\$200,000	L.S.	\$0
Restoration	0	L.S.	\$10,000	L.S.	\$0
Unlisted Items	1	L.S.	\$3,000	L.S.	\$3,000
Contingency	1	L.S.	\$8,000	L.S.	\$8,000
Total					<u>\$33,000</u>

Miscellaneous Notes or Items Not Included

TABLE 6.3 - 9  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F3 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$119,000	L.S.	\$119,000
Clearing and Grubbing	1	L.S.	\$60,000	L.S.	\$60,000
Water Handling	1	L.S.	\$40,000	L.S.	\$40,000
Demolition	1	L.S.	\$40,000	L.S.	\$40,000
Utility Relocation	1	L.S.	\$35,000	L.S.	\$35,000
Drop Structure	1	L.S.	\$138,000	L.S.	\$138,000
Riffle Drop	0	L.S.	\$25,000	L.S.	\$0
Riprap Bank Protection	4,400	L.F.	\$180	L.F.	\$792,000
Grading/Excavation	53,000	CUYD	\$5	CUYD	\$265,000
Grass Lined/Vegetated Bank	0	L.F.	\$20	L.F.	\$0
Levee (8' High)	0	L.F.	\$255	L.F.	\$0
Levee Closures	0	L.S.	\$150,000	L.S.	\$0
Land Acquisition	0	SQFT	\$1.5	SQFT	\$0
Flood Proofing	0	L.S.	\$40,000	L.S.	\$0
Interior Drainage	0	L.S.	\$150,000	L.S.	\$0
Street Flood Warning Systems	0	L.S.	\$20,000	L.S.	\$0
Access Road/Bike Path	4,400	L.F.	\$3	L.F.	\$13,200
Tejon Marsh Enhancement	0	L.S.	\$200,000	L.S.	\$0
Restoration	1	L.S.	\$45,000	L.S.	\$45,000
Unlisted Items	1	L.S.	\$238,000	L.S.	\$238,000
Contingency	1	L.S.	\$595,000	L.S.	\$595,000
Total					<u>\$2,380,200</u>

Miscellaneous Notes or Items Not Included

TABLE 6.3 - 10  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F3 - ALTERNATIVE 4

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$246,000	L.S.	\$246,000
Clearing and Grubbing	1	L.S.	\$40,000	L.S.	\$40,000
Water Handling	1	L.S.	\$20,000	L.S.	\$20,000
Demolition	1	L.S.	\$20,000	L.S.	\$20,000
Utility Relocation	1	L.S.	\$30,000	L.S.	\$30,000
Drop Structure	0	L.S.	\$138,000	L.S.	\$0
Riffle Drop	1	L.S.	\$25,000	L.S.	\$25,000
Riprap Bank Protection	0	L.F.	\$180	L.F.	\$0
Grading/Excavation	25,000	CUYD	\$5	CUYD	\$125,000
Grass Lined/Vegetated Bank	3,000	L.F.	\$20	L.F.	\$60,000
Levee (8' High)	5400	L.F.	\$255	L.F.	\$1,377,000
Levee Closures	2	L.S.	\$150,000	L.S.	\$300,000
Land Acquisition	610,000	SQFT	\$0.4	SQFT	\$244,000
Flood Proofing	0	L.S.	\$40,000	L.S.	\$0
Interior Drainage	3	L.S.	\$150,000	L.S.	\$450,000
Street Flood Warning Systems	1	L.S.	\$20,000	L.S.	\$20,000
Access Road/Bike Path	4,400	L.F.	\$3	L.F.	\$13,200
Tejon Marsh Enhancement	1	L.S.	\$200,000	L.S.	\$200,000
Restoration	1	L.S.	\$30,000	L.S.	\$30,000
Unlisted Items	1	L.S.	\$492,000	L.S.	\$492,000
Contingency	1	L.S.	\$1,231,000	L.S.	\$1,231,000
Total					<u>\$4,923,200</u>

Miscellaneous Notes or Items Not Included

TABLE 6.3 -11  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F3 - ALTERNATIVE 5

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$564,000	L.S.	\$564,000
Clearing and Grubbing	1	L.S.	\$25,000	L.S.	\$25,000
Water Handling	1	L.S.	\$10,000	L.S.	\$10,000
Demolition	1	L.S.	\$20,000	L.S.	\$20,000
Utility Relocation	1	L.S.	\$25,000	L.S.	\$25,000
Drop Structure	0	L.S.	\$138,000	L.S.	\$0
Riffle Drop	1	L.S.	\$25,000	L.S.	\$25,000
Riprap Bank Protection	0	L.F.	\$180	L.F.	\$0
Grading/Excavation	8,000	CUYD	\$5	CUYD	\$40,000
Grass Lined/Vegetated Bank	1,000	L.F.	\$20	L.F.	\$20,000
Levee (8' High)	0	L.F.	\$255	L.F.	\$0
Levee Closures	0	L.S.	\$150,000	L.S.	\$0
Land Acquisition	870,000	SQFT	\$0.4	SQFT	\$348,000
Flood Proofing	150	L.S.	\$40,000	L.S.	\$6,000,000
Interior Drainage	0	L.S.	\$150,000	L.S.	\$0
Street Flood Warning Systems	1	L.S.	\$20,000	L.S.	\$20,000
Access Road/Bike Path	4,400	L.F.	\$3	L.F.	\$13,200
Tejon Marsh Enhancement	1	L.S.	\$200,000	L.S.	\$200,000
Restoration	1	L.S.	\$25,000	L.S.	\$25,000
Unlisted Items	1	L.S.	\$1,129,000	L.S.	\$1,129,000
Contingency	1	L.S.	\$2,822,000	L.S.	\$2,822,000
Total					<u>\$11,286,200</u>

Miscellaneous Notes or Items Not Included



TABLE 6.3 -12  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F4 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$117,000	L.S.	\$117,000
Clearing and Grubbing	1	L.S.	\$5,000	L.S.	\$5,000
Water Handling	1	L.S.	\$50,000	L.S.	\$50,000
Demolition	1	L.S.	\$5,000	L.S.	\$5,000
Utility Relocation	1	L.S.	\$10,000	L.S.	\$10,000
Drop Structure	5	L.S.	\$236,000	L.S.	\$1,180,000
Repair/Replace Retaining	400	L.F.	\$360	L.F.	\$144,000
Riffle Drop	0	L.S.	\$28,000	L.S.	\$0
Grading/Excavation	1,000	CUYD	\$5	CUYD	\$5,000
Rock Toe Stabilization	0	L.F.	\$0	L.F.	\$0
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Grass Lined/Vegetated Ban	0	L.F.	\$20	L.F.	\$0
Enhanced vegetation Woody Plant Screening	0	SQFT	\$0	SQFT	\$0
Unlisted Items	1	L.S.	\$235,000	L.S.	\$235,000
Contingency	1	L.S.	\$587,000	L.S.	\$587,000
Total					<u>\$2,348,000</u>

Miscellaneous Notes or Items Not Included

Pedestrian bridge cost has not been included.

TABLE 6.3 -13  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F4 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$78,000	L.S.	\$78,000
Clearing and Grubbing	1	L.S.	\$20,000	L.S.	\$20,000
Water Handling	1	L.S.	\$200,000	L.S.	\$200,000
Demolition	1	L.S.	\$5,000	L.S.	\$5,000
Utility Relocation	100	L.F.	\$100	L.F.	\$10,000
Drop Structure	0	L.S.	\$236,000	L.S.	\$0
Repair/Replace Retaining	400	L.F.	\$360	L.F.	\$144,000
Riffle Drop	9	L.S.	\$28,000	L.S.	\$252,000
Grading/Excavation	30,000	CUYD	\$5	CUYD	\$150,000
Rock Toe Stabilization	0	L.F.	\$0	L.F.	\$0
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Grass Lined\Vegetated Ban	3600	L.F.	\$40	L.F.	\$144,000
Enhanced vegetation Woody Plant Screening	0	SQFT	\$0.5	SQFT	\$0
Unlisted Items	1	L.S.	\$156,000	L.S.	\$156,000
Contingency	1	L.S.	\$390,000	L.S.	\$390,000
Total					<u>\$1,559,000</u>

Miscellaneous Notes or Items Not Included

Pedestrian bridge cost has not been included.

TABLE 6.3 -14  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F4 - ALTERNATIVE 4

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$114,000	L.S.	\$114,000
Clearing and Grubbing	1	L.S.	\$20,000	L.S.	\$20,000
Water Handling	1	L.S.	\$200,000	L.S.	\$200,000
Demolition	1	L.S.	\$5,000	L.S.	\$5,000
Utility Relocation	100	L.F.	\$100	L.F.	\$10,000
Drop Structure	0	L.S.	\$236,000	L.S.	\$0
Repair/Replace Retaining	400	L.F.	\$360	L.F.	\$144,000
Riffle Drop	9	L.F.	\$28,000	L.F.	\$252,000
Grading/Excavation	6,000	CUYD	\$5	CUYD	\$30,000
Rock Toe Stabilization	3,600	L.F.	\$150	L.F.	\$540,000
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Grass Lined/Vegetated Ban	3600	L.F.	\$20	L.F.	\$72,000
Enhanced vegetation Woody Plant Screening	45,000	SQFT	\$2	SQFT	\$90,000
Unlisted Items	1	L.S.	\$229,000	L.S.	\$229,000
Contingency	1	L.S.	\$572,000	L.S.	\$572,000
Total					<u>\$2,288,000</u>

Miscellaneous Notes or Items Not Included

Pedestrian bridge has not been included.

TABLE 6.3 - 15  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F5 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$77,000	L.S.	\$77,000
Clearing and Grubbing	1	L.S.	\$20,000	L.S.	\$20,000
Water Handling	1	L.S.	\$20,000	L.S.	\$20,000
Demolition	1	L.S.	\$10,000	L.S.	\$10,000
Utility Relocation	1	L.S.	\$10,000	L.S.	\$10,000
Drop Structure	1	L.S.	\$107,000	L.S.	\$107,000
Riffle Drop	0	L.F.	\$15,000	L.F.	\$0
Riprap Bank Protection	450	L.F.	\$90	L.F.	\$40,500
Vertical Concrete Retainin	0	L.F.	\$360	L.F.	\$0
Bridge Replacement	1	L.S.	\$630,000	L.S.	\$630,000
Grading/Excavation	5,000	CUYD	\$5	CUYD	\$25,000
Grass Lined/Vegetated Bank	0	L.F.	\$40	L.F.	\$0
Bike Trail	0	L.F.	\$3	L.F.	\$0
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Land Acquisition	100000	SQFT	\$0.5	SQFT	\$48,000
Structure Acquisition/Relo	0	L.S.	\$0	L.S.	\$0
Enhanced Floodplain Fringe	0	L.S.	\$0	L.S.	\$0
Unlisted Items	1	L.S.	\$154,000	L.S.	\$154,000
Contingency	1	L.S.	\$384,000	L.S.	\$384,000
Total					<u>\$1,535,500</u>

Miscellaneous Notes or Items Not Included

Removal of sediment from clogged south span of U.S. 24 bridge was not

TABLE 6.3 - 16  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F5 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$325,000	L.S.	\$325,000
Clearing and Grubbing	1	L.S.	\$80,000	L.S.	\$80,000
Water Handling	1	L.S.	\$100,000	L.S.	\$100,000
Demolition	1	L.S.	\$40,000	L.S.	\$40,000
Utility Relocation	1	L.S.	\$20,000	L.S.	\$20,000
Drop Structure	1	L.S.	\$107,000	L.S.	\$107,000
Riffle Drop	0	L.F.	\$15,000	L.F.	\$0
Riprap Bank Protection	0	CUYD	\$45	CUYD	\$0
Vertical Concrete Wall Cha	3,700	L.F.	\$720	L.F.	\$2,664,000
Bridge Replacement	1	L.S.	\$630,000	L.S.	\$630,000
Grading/Excavation	31,500	CUYD	\$5	CUYD	\$157,500
Grass Lined/Vegetated Bank	0	L.F.	\$40	L.F.	\$0
Access Road/Bike Trail	3700	L.F.	\$3	L.F.	\$11,100
Restoration	1	L.S.	\$15,000	L.S.	\$15,000
Land Acquisition	150000	SQFT	\$0.5	SQFT	\$72,000
Structure Acquisition/Relo	0	L.S.	\$0	L.S.	\$0
Enhanced Floodplain Fringe	0	L.S.	\$0	L.S.	\$0
Unlisted Items	1	L.S.	\$650,000	L.S.	\$650,000
Contingency	1	L.S.	\$1,624,000	L.S.	\$1,624,000
Total					<u>\$6,495,600</u>

Miscellaneous Notes or Items Not Included

Cost for the pedestrian bridge was not included.

TABLE 6.3 - 17  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F5 - ALTERNATIVE 4

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$201,000	L.S.	\$201,000
Clearing and Grubbing	1	L.S.	\$40,000	L.S.	\$40,000
Water Handling	1	L.S.	\$70,000	L.S.	\$70,000
Demolition	1	L.S.	\$40,000	L.S.	\$40,000
Utility Relocation	1	L.S.	\$15,000	L.S.	\$15,000
Drop Structure	0	L.S.	\$107,000	L.S.	\$0
Riffle Drop	1	L.F.	\$15,000	L.F.	\$15,000
Riprap Bank Protection	0	CUYD	\$45	CUYD	\$0
Vertical Concrete Retainin	0	L.F.	\$720	L.F.	\$0
Bridge Replacement	1	L.S.	\$630,000	L.S.	\$630,000
Grading/Excavation	45,000	CUYD	\$5	CUYD	\$225,000
Grass Lined/Vegetated Bank	3,700	L.F.	\$40	L.F.	\$148,000
Access Road/Bike Trail	3,700	L.F.	\$3	L.F.	\$11,100
Restoration	1	L.S.	\$20,000	L.S.	\$20,000
Land Acquisition	360,000	SQFT	\$0.5	SQFT	\$172,800
Structure Acquisition/Relo	1	L.S.	\$1,000,000	L.S.	\$1,000,000
Enhanced Floodplain Fringe	1	L.S.	\$20,000	L.S.	\$20,000
Unlisted Items	1	L.S.	\$401,000	L.S.	\$401,000
Contingency	1	L.S.	\$1,003,000	L.S.	\$1,003,000
Total					<u>\$4,011,900</u>

Miscellaneous Notes or Items Not Included

Cost for the pedestrian bridge was not included.

Based on only a sufficient amount of private properties/structures acquisition for the channel construction.

TABLE 5.3 - 18  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F6 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$185,000	L.S.	\$185,000
Clearing and Grubbing	1	L.S.	\$20,000	L.S.	\$20,000
Water Handling	1	L.S.	\$30,000	L.S.	\$30,000
Demolition	1	L.S.	\$95,000	L.S.	\$95,000
Utility Relocation	1	L.S.	\$20,000	L.S.	\$20,000
Drop Structure	3	L.S.	\$155,000	L.S.	\$465,000
Riffle Drop	0	L.S.	\$17,000	L.S.	\$0
Baffled Drop	1	L.S.	\$226,000	L.S.	\$226,000
Riprap Bank Protection	1,250	L.F.	\$180	L.F.	\$225,000
Vertical Concrete Retaining Wall	750	L.F.	\$360	L.F.	\$270,000
Detention Pond	0	L.S.	\$31,000	L.S.	\$0
Grading/Excavation	40,000	CUYD	\$5	CUYD	\$200,000
Access Road/Bike Trail	0	L.F.	\$3	L.F.	\$0
Grass Lined/Vegetated Bank	0	L.F.	\$40	L.F.	\$0
Restoration	1	L.S.	\$20,000	L.S.	\$20,000
Land Acquisition	105,000	SQFT	\$0.5	SQFT	\$50,400
Structure Acquisition/Relocation	30	L.S.	\$20,000	L.S.	\$600,000
Enhanced Floodplain Fringe	0	SQFT	\$1	SQFT	\$0
Unlisted Items	1	L.S.	\$370,000	L.S.	\$370,000
Contingency	1	L.S.	\$926,000	L.S.	\$926,000
Total					<u>\$3,702,400</u>

Miscellaneous Notes or Items Not Included

Cost estimate includes the removal and reconstruction of 8th street bridge.  
Cost estimate does not include pedestrian bridge(s), linear park facility,  
Gold Hill Mesa historical restoration and hazardous material remediation.

TABLE 6.3 - 19  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F6 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$341,000	L.S.	\$341,000
Clearing and Grubbing	1	L.S.	42,000	L.S.	42,000
Water Handling	1	L.S.	50,000	L.S.	50,000
Demolition	1	L.S.	120,000	L.S.	120,000
Utility Relocation	1	L.S.	60,000	L.S.	60,000
Drop Structure	0	L.S.	155,000	L.S.	0
Riffle Drop	5	L.S.	17,000	L.S.	85,000
Baffled Drop	1	L.S.	226,000	L.S.	226,000
Riprap Bank Protection	0	L.F.	180	L.F.	0
Vertical Concrete Retaining Wall	0	L.F.	360	L.F.	0
Detention Pond	5	L.S.	31,000	L.S.	155,000
Grading/Excavation	65,000	CUYD	5	CUYD	325,000
Access Road/Bike Trail	5,000	L.F.	3	L.F.	15,000
Grass Lined/Vegetated Bank	4950	L.F.	40	L.F.	198,000
Restoration	1	L.S.	20,000	L.S.	20,000
Land Acquisition	700,000	SQFT	0.78	SQFT	546,000
Structure Acquisition/Relocation	100	L.S.	20,000	L.S.	2,000,000
Enhanced Floodplain Fringe	500,000	SQFT	0.5	SQFT	250,000
Unlisted Items	1	L.S.	682,000	L.S.	682,000
Contingency	1	L.S.	1,705,000	L.S.	1,705,000
				Total	<u>\$6,820,000</u>

Miscellaneous Notes or Items Not Included

Cost estimate includes the removal and reconstruction of 8th street bridge.  
Cost estimate does not include pedestrian bridge(s), linear park facility,  
Gold Hill Mesa historical restoration and hazardous materials remediation.



TABLE 6.3 - 20  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F7 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY	COST	TOTAL COST
Mobilization	1 L.S.	\$86,000 L.S.	\$86,000
Clearing and Grubbing	1 L.S.	\$20,000 L.S.	\$20,000
Water Handling	1 L.S.	\$30,000 L.S.	\$30,000
Demolition	1 L.S.	\$60,000 L.S.	\$60,000
Utility Relocation	1 L.S.	\$20,000 L.S.	\$20,000
Repair Retaining Wall	1000 L.F.	\$270 L.F.	\$270,000
Drop Structure	3 L.S.	\$97,500 L.S.	\$292,500
Riffle Drop	0 L.S.	\$13,500 L.S.	\$0
Riprap Bank Protection	0 L.F.	\$180 L.F.	\$0
Vertical Concrete Retaining Wall	600 L.F.	\$360 L.F.	\$216,000
Grading/Excavation	15,000 CU YD	\$5 CU YD	\$75,000
Grass Lined/Vegetated Bank	0 L.F.	\$40 L.F.	\$0
Levee	0 L.F.	\$255 L.F.	\$0
Access Road/Bike Trail	4200 L.F.	\$3 L.F.	\$12,600
Restoration	1 L.S.	\$10,000 L.S.	\$10,000
Solid Waste Removal/Disposal	0 L.S.	\$25,000 L.S.	\$0
Structure Acquisition/Relocation	0 L.S.	\$75,000 L.S.	\$0
Land Acquisition	40,000 SQ FT	\$0.5 SQ FT	\$19,200
Unlisted Items	1 L.S.	\$171,000 L.S.	\$171,000
Contingency	1 L.S.	\$428,000 L.S.	\$428,000
Total			<u>\$1,710,300</u>

Miscellaneous Notes or Items Not Included

Cost includes removal of three private bridges.

Cost does not include hazardous materials remediation.

Bridge replacements of U.S. 24, 21st St., 26th St., and 31th St. were not included, and were assumed to be part of future transportation capital improvements related work.

TABLE 6.3 - 21  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F7 - ALTERNATIVE 3

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$315,000	L.S.	\$315,000
Clearing and Grubbing	1	L.S.	\$70,000	L.S.	\$70,000
Water Handling	1	L.S.	\$30,000	L.S.	\$30,000
Demolition	1	L.S.	\$60,000	L.S.	\$60,000
Utility Relocation	1	L.S.	\$100,000	L.S.	\$100,000
Repair Retaining Wall	0	L.F.	\$270	L.F.	\$0
Drop Structure	3	L.S.	\$97,500	L.S.	\$292,500
Riffle Drop	0	L.S.	\$13,500	L.S.	\$0
Riprap Bank Protection	6,550	L.F.	\$180	L.F.	\$1,179,000
Vertical Concrete Retaining Wall	600	L.F.	\$360	L.F.	\$216,000
Grading/Excavation	110,000	CUYD	\$5	CUYD	\$550,000
Grass Lined/Vegetated Bank	0	L.F.	\$40	L.F.	\$0
Levee	800	L.F.	\$255	L.F.	\$204,000
Access Road/Bike Trail	4200	L.F.	\$3	L.F.	\$12,600
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Solid Waste Removal/Disposal	1	L.S.	\$25,000	L.S.	\$25,000
Structure Acquisition/Relocation	11	L.S.	\$75,000	L.S.	\$825,000
Land Acquisition	420,000	SQFT	\$0.5	SQFT	\$201,600
Unlisted Items	1	L.S.	\$629,000	L.S.	\$629,000
Contingency	1	L.S.	\$1,573,000	L.S.	\$1,573,000
				Total	<u>\$6,292,700</u>

Miscellaneous Notes or Items Not Included

Cost includes removal of three private bridges.  
 Cost does not include hazardous materials remediation.  
 Two pedestrian bridges not included in estimate  
 Bridge replacements of U.S. 24, 21st St., 26th St., and 31st St. were not included, and  
 were assumed to be part of future transportation capital improvements related work.

TABLE 6.3 - 22  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F7 - ALTERNATIVE 4

CONSTRUCTION ITEMS	QUANTITY		COST		TOTAL COST
Mobilization	1	L.S.	\$289,000	L.S.	\$289,000
Clearing and Grubbing	1	L.S.	\$40,000	L.S.	\$40,000
Water Handling	1	L.S.	\$30,000	L.S.	\$30,000
Demolition	1	L.S.	\$60,000	L.S.	\$60,000
Utility Relocation	1	L.S.	\$20,000	L.S.	\$20,000
Repair Retaining Wall	0	L.F.	\$270	L.F.	\$0
Drop Structure	0	L.S.	\$97,500	L.S.	\$0
Riffle Drop	3	L.S.	\$13,500	L.S.	\$40,500
Riprap Bank Protection	0	CUYD	\$45	CUYD	\$0
Vertical Concrete Retaining Wall	600	L.F.	\$360	L.F.	\$216,000
Grading/Excavation	42,000	CUYD	\$5	CUYD	\$210,000
Grass Lined/Vegetated Bank	6550	L.F.	\$40	L.F.	\$262,000
Levee	0	L.F.	\$255	L.F.	\$0
Access Road/Bike Trail	4200	L.F.	\$3	L.F.	\$12,600
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Solid Waste Removal/Disposal	1	L.S.	\$25,000	L.S.	\$25,000
Structure Acquisition/Relocation	11	L.S.	\$75,000	L.S.	\$825,000
Land Acquisition	960,000	SQFT	\$1.8	SQFT	\$1,713,600
Unlisted Items	1	L.S.	\$577,000	L.S.	\$577,000
Contingency	1	L.S.	\$1,443,000	L.S.	\$1,443,000
Total					<u>\$5,773,700</u>

Miscellaneous Notes or Items Not Included

Cost includes removal of three private bridges.  
 Cost does not include hazardous materials remediation.  
 Two pedestrian bridges not included in estimate.  
 Bridge replacements of U.S. 24, 21st St., 26th St., and 31th St. were not included, and  
 were assumed to be part of future transportation capital improvements related work.

TABLE 6.3 - 23  
ALTERNATIVE CONSTRUCTION COST ESTIMATE  
REACH F8 - ALTERNATIVE 2

CONSTRUCTION ITEMS	QUANTITY		UNIT COST		TOTAL COST
Mobilization	1	L.S.	\$81,000	L.S.	\$81,000
Clearing and Grubbing	1	L.S.	\$10,000	L.S.	\$10,000
Water Handling	1	L.S.	\$80,000	L.S.	\$80,000
Demolition	1	L.S.	\$8,000	L.S.	\$8,000
Utility Relocation	1	L.S.	\$10,000	L.S.	\$10,000
Riffle Drop	3	L.S.	\$17,000	L.S.	\$51,000
Concrete Vertical Wall Channel	900	L.F.	\$720	L.F.	\$648,000
Transition	1	L.S.	\$120,000	L.S.	\$120,000
Grading/Excavation	6,000	CUYD	\$5	CUYD	\$30,000
Access Road/Bike Trail	900	L.F.	\$3	L.F.	\$2,700
Restoration	1	L.S.	\$10,000	L.S.	\$10,000
Unlisted Items	1	L.S.	\$162,000	L.S.	\$162,000
Contingency	1	L.S.	\$404,000	L.S.	\$404,000
Total					<u>\$1,616,700</u>

Miscellaneous Notes or Items Not Included

Conceptual configuration is compatible with and an extension downstream of construction being completed immediately upstream.

**APPENDIX C**

**TABLES 6.3-27 THROUGH 6.3-34  
ALTERNATIVE EVALUATION MATRICES**

**TABLE 6.3-27**  
**ALTERNATIVE EVALUATION MATRIX**  
**REACH F1 — COUNTY JAIL TO CIRCLE DRIVE**

	ALT 1	ALT 2	ALT 3	ALT 4
<b>PUBLIC SAFETY</b>				
Minimizes Flood Damage to Private Property	◐	●	●	●
Minimizes Flood Damage to Public Property	◐	●	●	●
Minimizes Bank Erosion & Bank Sloughing	○	●	●	●
Minimizes Loss of Life & Injury	◐	●	●	●
Minimizes Safety Hazard — Water Contact	◐	●	●	●
<b>RECREATION</b>				
Provides Multi-Use Trail	○	●	●	●
Provides Active Recreation Area	○	○	●	●
Provides Education/Interpretive Opportunities	○	○	◐	●
Provides Access to Corridor	○	●	●	●
<b>AESTHETICS</b>				
Utilizes Quality & Compatible Materials	◐	◐	●	●
Provides Beautification	○	○	●	●
Provides Passive Recreation	◐	◐	●	●
Establishes Buffer Zones	◐	○	●	●
Cleans-Up/Deters Bank Dumping	○	◐	●	●
Preserves/Enhances I-25/Creek Visual Compatibility	◐	○	●	●
<b>ENVIRONMENT</b>				
Stabilizes Channel	○	●	◐	●
Preserves/Enhances Aquatic Habitat	◐	◐	◐	●
Preserves/Enhances Riparian Habitat	◐	○	◐	●
Preserves/Enhances Upland Habitat	○	○	◐	●
Protects Groundwater Level	◐	◐	◐	●
Minimizes Construction & Maintenance Impacts	●	◐	◐	●
<b>COMMUNITY DEVELOPMENT</b>				
Promotes Development & Redevelopment	◐	●	◐	○
Supports Desirable Adjacent Land Uses	◐	◐	●	●
Preserves/Enhances Historic/Cultural Features	⊙	⊙	⊙	⊙
Provides Utility Improvements Opportunities	○	◐	●	●
Promotes Community Pride & Stewardship	◐	◐	●	●
Preserves/Enhances Neighborhoods	◐	◐	◐	●
<b>PROPERTY</b>				
Minimizes Acquisition of Private Property	●	●	◐	○
Preserves/Enhances Property Value	◐	●	◐	●
<b>COST</b>				
Minimizes Capital Cost	Ø M	3.4M	0.9M	1.0M
Minimizes Operations & Maintenance Cost	○	◐	◐	◐

**RECOMMENDATION**

Recommend implementation of Alternative 4 (stabilization with riparian enhancement). This is a reasonable cost alternative which preserves a valuable ecological resource while allowing a balanced level of adjacent private development and riparian area enhancement.

## ALTERNATIVE EVALUATION MATRIX

## REACH F2 — CIRCLE DRIVE TO SHOOKS RUN

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
<b>PUBLIC SAFETY</b>					
Minimizes Flood Damage to Private Property	○	◐	●	●	◐
Minimizes Flood Damage to Public Property	○	◐	●	●	◐
Minimizes Bank Erosion & Bank Sloughing	◐	◐	●	◐	●
Minimizes Loss of Life & Injury	○	◐	●	●	●
Minimizes Safety Hazard — Water Contact	○	○	○	◐	◐
<b>RECREATION</b>					
Provides Multi-Use Trail	○	○	●	●	●
Provides Active Recreation Area	○	○	○	●	●
Provides Education/Interpretive Opportunities	◐	◐	◐	◐	●
Provides Access to Corridor	◐	◐	●	●	●
<b>AESTHETICS</b>					
Utilizes Quality & Compatible Materials	○	○	○	◐	●
Provides Beautification	○	◐	○	◐	●
Provides Passive Recreation	○	○	◐	◐	●
Establishes Buffer Zones	○	○	○	◐	●
Cleans-Up/Deters Bank Dumping	○	◐	◐	◐	●
Preserves/Enhances I-25/Creek Visual Compatibility	○	◐	○	◐	●
<b>ENVIRONMENT</b>					
Stabilizes Channel	○	◐	●	●	●
Preserves/Enhances Aquatic Habitat	○	◐	○	◐	●
Preserves/Enhances Riparian Habitat	○	◐	○	◐	●
Preserves/Enhances Upland Habitat	○	◐	○	○	●
Protects Groundwater Level	○	◐	○	◐	●
Minimizes Construction & Maintenance Impacts	●	●	○	◐	●
<b>COMMUNITY DEVELOPMENT</b>					
Promotes Development & Redevelopment	◐	◐	●	◐	○
Supports Desirable Adjacent Land Uses	○	◐	●	◐	●
Preserves/Enhances Historic/Cultural Features	⊖	⊖	⊖	⊖	⊖
Provides Utility Improvements Opportunities	○	◐	◐	◐	●
Promotes Community Pride & Stewardship	○	◐	◐	◐	●
Preserves/Enhances Neighborhoods	○	◐	◐	◐	●
<b>PROPERTY</b>					
Minimizes Acquisition of Private Property	●	◐	●	◐	○
Preserves/Enhances Property Value	◐	◐	●	◐	●
<b>COST</b>					
Minimizes Capital Cost	Ø M	0.6M	9.0M	7.8M	13.0M
Minimizes Operations & Maintenance Cost	○	◐	◐	◐	◐

**RECOMMENDATION**

Recommend implementation of either Alternative 4 (levee) or Alternative 5 (flood proofing). With an emphasis on acquisition (trailer parks) and control through regulation. Channel stabilization is a significant cost in this reach. Floodproofing should be largely through private party expense. Acquisition and related activities should be through non-adversarial means as the opportunity occurs in order to minimize cost.

**TABLE 6.3-29**  
**ALTERNATIVE EVALUATION MATRIX**  
**REACH F3 — SHOOKS RUN TO CONEJOS STREET (EXTENSION)**

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
<b>PUBLIC SAFETY</b>					
Minimizes Flood Damage to Private Property	○	○	●	●	◐
Minimizes Flood Damage to Public Property	○	○	●	●	◐
Minimizes Bank Erosion & Bank Sloughing	◐	◐	●	◐	●
Minimizes Loss of Life & Injury	○	◐	●	●	●
Minimizes Safety Hazard — Water Contact	○	○	○	●	●
<b>RECREATION</b>					
Provides Multi-Use Trail	○	○	●	●	●
Provides Active Recreation Area	○	○	○	●	●
Provides Education/Interpretive Opportunities	◐	◐	○	◐	●
Provides Access to Corridor	◐	◐	●	●	●
<b>AESTHETICS</b>					
Utilizes Quality & Compatible Materials	○	○	○	◐	●
Provides Beautification	○	○	○	◐	●
Provides Passive Recreation	○	○	◐	◐	●
Establishes Buffer Zones	○	○	○	◐	●
Cleans-Up/Deters Bank Dumping	○	○	◐	◐	●
Preserves/Enhances I-25/Creek Visual Compatibility	○	○	○	◐	●
<b>ENVIRONMENT</b>					
Stabilizes Channel	○	○	●	●	●
Preserves/Enhances Aquatic Habitat	○	○	○	◐	●
Preserves/Enhances Riparian Habitat	○	○	○	◐	●
Preserves/Enhances Upland Habitat	○	○	○	○	●
Protects Groundwater Level	○	○	○	◐	●
Minimizes Construction & Maintenance Impacts	●	●	○	◐	●
<b>COMMUNITY DEVELOPMENT</b>					
Promotes Development & Redevelopment	◐	◐	●	◐	○
Supports Desirable Adjacent Land Uses	○	○	●	◐	●
Preserves/Enhances Historic/Cultural Features	◐	◐	◐	◐	◐
Provides Utility Improvements Opportunities	○	○	◐	◐	●
Promotes Community Pride & Stewardship	○	○	◐	◐	●
Preserves/Enhances Neighborhoods	○	○	◐	◐	●
<b>PROPERTY</b>					
Minimizes Acquisition of Private Property	●	●	●	◐	○
Preserves/Enhances Property Value	◐	◐	●	◐	●
<b>COST</b>					
Minimizes Capital Cost	Ø M	<.1M	2.4M	4.9M	11.3M
Minimizes Operations & Maintenance Cost	○	○	◐	◐	◐

**RECOMMENDATION**

Recommend implementation of either Alternative 4 (levee) or Alternative (flood proofing) with an emphasis on regulation and flood proofing versus acquisition. The environmental impact of channelization is unacceptable and levee protection is excessively expensive. Floodproofing should be largely through private party expense. Acquisition and related activities should be through non-adversarial means as the opportunity occurs in order to minimize cost.



TABLE 6.3-30

## ALTERNATIVE EVALUATION MATRIX

## REACH F4 — CONEJOS STREET (EXTENSION) TO CONFLUENCE

	ALT 1	ALT 2	ALT 3	ALT 4
<b>PUBLIC SAFETY</b>				
Minimizes Flood Damage to Private Property	●	●	●	●
Minimizes Flood Damage to Public Property	●	●	●	●
Minimizes Bank Erosion & Bank Sloughing	○	◐	●	●
Minimizes Loss of Life & Injury	◐	◐	●	●
Minimizes Safety Hazard — Water Contact	◐	◐	●	●
<b>RECREATION</b>				
Provides Multi-Use Trail	●	●	●	●
Provides Active Recreation Area	◐	◐	◐	◐
Provides Education/Interpretive Opportunities	○	○	◐	◐
Provides Access to Corridor	◐	●	●	●
<b>AESTHETICS</b>				
Utilizes Quality & Compatible Materials	○	○	●	●
Provides Beautification	○	◐	●	●
Provides Passive Recreation	◐	◐	●	●
Establishes Buffer Zones	◐	◐	●	●
Cleans-Up/Deters Bank Dumping	◐	◐	◐	◐
Preserves/Enhances I-25/Creek Visual Compatibility	◐	◐	◐	●
<b>ENVIRONMENT</b>				
Stabilizes Channel	○	◐	●	●
Preserves/Enhances Aquatic Habitat	○	◐	●	●
Preserves/Enhances Riparian Habitat	◐	◐	●	●
Preserves/Enhances Upland Habitat	◐	◐	●	●
Protects Groundwater Level	○	◐	●	●
Minimizes Construction & Maintenance Impacts	◐	○	◐	◐
<b>COMMUNITY DEVELOPMENT</b>				
Promotes Development & Redevelopment	○	○	○	○
Supports Desirable Adjacent Land Uses	◐	◐	◐	◐
Preserves/Enhances Historic/Cultural Features	◐	◐	◐	◐
Provides Utility Improvements Opportunities	◐	○	●	●
Promotes Community Pride & Stewardship	○	◐	◐	◐
Preserves/Enhances Neighborhoods	○	○	◐	◐
<b>PROPERTY</b>				
Minimizes Acquisition of Private Property	●	●	●	●
Preserves/Enhances Property Value	◐	◐	◐	◐
<b>COST</b>				
Minimizes Capital Cost	Ø M	2.3M	1.6M	2.3M
Minimizes Operations & Maintenance Cost	○	○	◐	◐

**RECOMMENDATION**

Recommend implementation of Alternative 4 (rehabilitation through grading, construction of rock channel edges, revegetation and use of riffle drops with vegetation screening). Alternative 2 is most expensive and not as effective as Alternatives 3 and 4 which are about equal in cost. Alternative 3 saves on bank protection and vegetation costs.

**TABLE 6.3-31**  
**ALTERNATIVE EVALUATION MATRIX**  
**REACH F5 — CONFLUENCE TO 10TH STREET (EXTENSION)**

	ALT 1	ALT 2	ALT 3	ALT 4
<b>PUBLIC SAFETY</b>				
Minimizes Flood Damage to Private Property	○	◐	●	◐
Minimizes Flood Damage to Public Property	○	◐	●	◐
Minimizes Bank Erosion & Bank Sloughing	○	◐	●	●
Minimizes Loss of Life & Injury	○	◐	●	◐
Minimizes Safety Hazard — Water Contact	◐	◐	◐	●
<b>RECREATION</b>				
Provides Multi-Use Trail	○	○	●	●
Provides Active Recreation Area	○	○	○	●
Provides Education/Interpretive Opportunities	○	○	○	◐
Provides Access to Corridor	○	○	●	●
<b>AESTHETICS</b>				
Utilizes Quality & Compatible Materials	○	○	○	●
Provides Beautification	○	○	○	●
Provides Passive Recreation	◐	◐	◐	●
Establishes Buffer Zones	◐	◐	○	●
Cleans-Up/Deters Bank Dumping	○	◐	◐	●
Preserves/Enhances I-25/Creek Visual Compatibility	○	◐	○	●
<b>ENVIRONMENT</b>				
Stabilizes Channel	○	◐	●	●
Preserves/Enhances Aquatic Habitat	◐	◐	○	●
Preserves/Enhances Riparian Habitat	◐	◐	○	●
Preserves/Enhances Upland Habitat	◐	◐	◐	●
Protects Groundwater Level	◐	◐	○	●
Minimizes Construction & Maintenance Impacts	○	○	○	○
<b>COMMUNITY DEVELOPMENT</b>				
Promotes Development & Redevelopment	○	◐	○	○
Supports Desirable Adjacent Land Uses	○	◐	●	●
Preserves/Enhances Historic/Cultural Features	◐	◐	◐	◐
Provides Utility Improvements Opportunities	○	◐	●	●
Promotes Community Pride & Stewardship	○	◐	◐	●
Preserves/Enhances Neighborhoods	◐	◐	◐	◐
<b>PROPERTY</b>				
Minimizes Acquisition of Private Property	●	◐	○	○
Preserves/Enhances Property Value	◐	◐	◐	◐
<b>COST</b>				
Minimizes Capital Cost	Ø M	1.5M	6.5M	4.0M
Minimizes Operations & Maintenance Cost	○	◐	◐	◐

**RECOMMENDATION** Recommend implementation of either Alternative 3 (enlarged structural channel) or Alternative 4 (enlarged natural channel). Both require channel conveyance improvements which means that private property acquisition is involved. Alternative 3 provides a greater degree of flood relief at a higher cost than Alternative 4, but does not accomplish the City's stated goal of a preference for soft linings/natural drainageways.

(continued)

**TABLE 6.3-31**  
**ALTERNATIVE EVALUATION MATRIX**

REACH F5 - CONFLUENCE TO 10TH STREET (EXTENSION)

RECOMMENDATION (Continued)

It may be appropriate to partially base the decision of which alternative to implement on maintaining consistency of channel treatment in the reach.