SPRINGS RANCH
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE

COLORADO SPRINGS, COLORADO

Kiowa Engineering Corporation

SPRINGS RANCH
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE

COLORADO SPRINGS, COLORADO

Prepared for:

Springs Ranch LLC
2 North Cascade #1100
Colorado Springs, CO 80903

Prepared by:

Kiowa Engineering Corporation
2814 International Circle
Colorado Springs, CO 80910

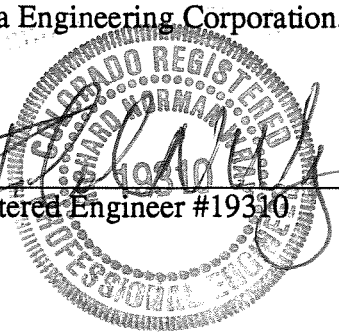
KIOWA Project No. 94.02.11
D/R282

April, 1994
July, 1994
Revised November 1996
Revised April 1998

ENGINEER'S STATEMENT:

The attached drainage plan and report was prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors and omissions on my part in preparing this report.

Kiowa Engineering Corporation, 1011 North Weber St., Suite 200, Colorado Springs, CO 80903



Registered Engineer #19310 Date 6/22/98

OWNER'S STATEMENT:

The Owner and/or his representative has read and will comply with all of the requirements specified in this drainage report and plan.

BY: Donald S Magoff Date 5/20/98

ADDRESS:

2 No Cascade Suite 1100
Colorado Springs CO 80903

CITY OF COLORADO SPRINGS

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

City Engineer Dated 7/6/98

Conditions:

I. INTRODUCTION

Authorization

This Master Development Drainage Plan Update (MDDP), for the stormwater facilities within the Springs Ranch Development was authorized under the terms of the agreement between the The Springs Ranch LLC and Kiowa Engineering Corporation. The agreement was approved by the Springs Ranch LLC, February, 1994.

Purpose and Scope

The purpose of the study is to identify feasible stormwater management plans to satisfy the existing and future needs within the Springs Ranch. The need for this update is primarily based upon the changes in development planning within the Ranch and changes in the City/County Drainage Criteria since the original MDDP was completed in 1985. The specific scope of work for this study included the following tasks:

1. Meet with the City and Owner to: insure compliance with the services required by this agreement, obtain existing data and general information from participating entities, solicit desires of participating entities and other interested agencies or groups in order to develop, procure current information relative to development plans within the Springs Ranch, procure information relative to right-of-way limitations, proposed stormwater projects, potential hazards due to flooding, and avoid duplication of effort whenever possible by utilizing existing information available from other agencies and past studies.

2. Contact the City, County, individuals, and other agencies who have knowledge and/or interest in the study area.

3. Utilize City/County policies and criteria and applicable information wherever possible.

4. Perform hydraulic and hydrologic analyses within the study area.

5. Identify environmental setting within the Ranch.

6. Identify existing and potential drainage and/or flooding problems.

7. Evaluate the capacity of existing drainage systems within the Ranch and along Sand Creek with respect to the current City/County Drainage Criteria and the ongoing Sand Creek Drainage Basin Planning Study (DBPS).

8. Conduct an economic analysis for the proposed stormwater collection systems and major drainageway improvements within the Springs Ranch.

9. Recommend and prepare a preliminary design for major drainageway improvements along Sand Creek for the interim and long-term system needs.

10. Prepare a written report discussing all items examined in the study which is in conformance with the City/County Drainage Criteria Manual.

Summary of Data Obtained

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

1. Soil Survey for El Paso County, Colorado, dated June 1981.

2. "City of Colorado Springs/El Paso County Drainage Criteria Manual", prepared by City of Colorado Springs, El Paso County, and HDR Infrastructure, Inc., dated May 1987.

3. "Flood Insurance Studies for Colorado Springs, and El Paso County, Colorado", prepared by the Federal Emergency Management Agency (FEMA), revised 1989.

4. Flood Insurance Restudy, Hydrology Report and Hydrologic Analyses, prepared by RCI, Inc., 1989.

5. Sand Creek Drainage Basin Planning Study prepared by Simons, Li & Associates, Inc., dated July, 1985.

6. Flood Hazard Analysis, Sand Creek, City of Colorado Springs and El Paso County, Colorado, prepared by the Soil Conservation Service, dated December, 1973.

7. Colorado Springs Ranch Filing Nos. 1, 2, 3, 4, 5, and 6 Drainage Plans, prepared by Simons Li and Associates, Inc., dated 1985 through 1987.

8. Colorado Springs Ranch Filing No. 7, Final Drainage Plan, prepared by Rockwell/Minchow, Inc., dated 1995.

9. Highlands and Springs Ranch Filing Nos. 1, Final Drainage Plan, prepared by Rockwell/Minchow, Inc., dated 1996.

10. Springs Ranch Golf Course Preliminary Grading and Development Plan.

11. Colorado Springs Ranch Master Development Plan Update, prepared by NES, Inc., dated 1993.

12. Drainage Basin Inventory, Sand Creek Drainage Basin Planning Study, prepared by Kiowa Engineering Corporation, dated June, 1992.

13. Sand Creek Drainage Basin Planning Study, prepared by Kiowa Engineering Corporation, March, 1996.

14. Sand Creek Grade Control Project Final Design Plans, prepared by Kiowa Engineering Corporation, April, 1996.

15. Sand Creek Detention Basin No. 1 Final Design Plans, prepared by Kiowa Engineering Corporation, July, 1996.

Mapping and Surveying

Mapping used in the planning effort consisted of USGS 7-1/2 minute quadrangles, and 2-foot contour interval, 1-inch to 200-foot scale planimetric topographic maps. The 2-foot contour mapping within the Ranch used in this study were obtained through the City FIMS program. This mapping was compiled using the National Geodetic and Vertical Datum of 1929.

Stream cross-section data for Sand Creek was obtained from the aerial mapping described above. These sections were verified against the cross-sections compiled in the 1986 City of Colorado Springs Flood Insurance Study (FIS), whenever possible.

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

Project Background

The need for this update has been necessitated by several factors. With regard to the City/County Drainage Criteria, this manual was adopted in 1987 by the City for use by developers and engineers when planning, designing and installing major and minor drainage systems within Colorado Springs and El Paso County. The current criteria varies significantly in the areas of hydrology and subdivision planning requirements. The 1985 master drainage plan for the Ranch was developed using the Drainage criteria in force previous to the 1987 criteria. For this reason, it is anticipated that the sizes of proposed facilities may not be sufficient to convey peak discharges estimated using the current criteria manual. Additionally, some of the drainage improvements planned, designed and constructed within Filing Nos. 1, 2, 3, and 4 since 1985 have to be checked against peak discharges produced using the drainage criteria in force at the time this work was completed.

In 1990, the City of Colorado Springs began the process of updating the 1985 Sand Creek Master Drainage Plan. The Drainage Basin Planning Study (DBPS), for Sand Creek approved in March of 1996 has identified major drainageway improvements along Sand Creek within the Ranch which vary significantly in their form compared to the 1985 Master Drainage Plan for Sand Creek. This is primarily the result of the changes in the criteria discussed above which effects the overall basin, and changes in the planning process. The City has generally decided to evaluate any major drainageway improvement for Sand Creek with respect to environmental impact, so that the selected improvements summarized in the DBPS can better meet with the 404 reviewing agencies requirements. Avoidance of loss of riparian and wetland habitat is a primary feature in the development of major drainageway improvements within the Sand Creek basin. Accordingly, the concepts put forth in the 1985 Master Drainage Plan may not meet with agency approval today. Therefore, the concepts for Sand Creek through the Colorado Springs Ranch as identified in the

original Colorado Springs Ranch Master Drainage Plan need to be reviewed in light of the concepts currently being recommended in the DBPS for Sand Creek.

The development plan for the Ranch has also changed since the original Master Development Plan was approved by the City in 1985. The most significant change is a golf course which has been constructed alongside Sand Creek and within the 100-year floodplain. In the original development plan, the area now developed as the golf course was proposed for use as a drainage right-of-way, commercial/industrial development, school site and park land properties. The drainage right-of-way along Sand Creek extended from Constitution Avenue to the north property line of the Ranch. The right-of-way was platted as Filing No. 2, and deeded over to the City. Filing No. 2 has now been vacated in the updated Master Development Plan. In place of the drainage right-of-way a drainage easement has been created. The operator of the Golf Course has agreed to taking over the responsibility for the construction and maintenance of the drainageway improvements for Sand Creek within the golf course property. A maintenance agreement has been negotiated with the City for the segment of Sand Creek within the Golf Course. All improvements to Sand Creek through the Course must conform to the recommended improvements shown in the Sand Creek DBPS. A portion of the improvements to Sand Creek within the Course have been constructed. The balance of the improvements will be built in 1998. Maintenance access along the channel must be provided by the Golf Course operators. The easement created is similar in area and width as Filing No. 2, which was vacated into private ownership. In return, drainage fees were not be collected within the course except for the area to be platted for the golf course club house. The loss of this acreage has been accounted for within the DBPS and the Ranch MDDP update.

In addition to the Golf Course, the updated Master Development Plan also proposed some areas of different land use and densities as compared to the original Master development plan. These changes need to be accounted for in the hydrologic and hydraulic modeling for the drainage systems within the Ranch.

II. STUDY AREA DESCRIPTION

The Springs Ranch development is located in eastern Colorado Springs. The development is bounded on the east by the Banning Lewis Ranch property, on the west by Powers Boulevard, on the south by Constitution Avenue and on the north by the Stetson Hills development. The Springs Ranch property covers approximately 1330 acres of which approximately 280 acres is currently platted. The property is shown on Figure 1.

The major drainage feature within the Ranch is Sand Creek. The Sand Creek drainage basin is a left-bank tributary to the Fountain Creek. The total drainage area at the south property line is approximately 24 square miles. A portion of the Ranch drains to the East Fork Sand Creek basin. There are three offsite areas which enter the property. These areas are located west of Powers Boulevard and cover approximately 1.5 square miles.

Development Description

The Springs Ranch property is proposed as a mixed use development consisting of single-family residential, business, office and commercial land uses. A significant land use within the Ranch is the Springs Ranch Golf Course. The Golf Course covers approximately 200 acres, and lies primarily along the historic Sand Creek floodplain. At the current time, there are 14 recorded filings within the Ranch, namely Filings 1 through 4, 8 through 11, Highlands No. 1, Cascade Numbers 1 through 3, and the Spring Ranch Golf Club No. 1. Filings 1 and 4 are single family residential subdivisions. Filing 3 is the Peterson Road and North Carefree Circle road right-of-ways. A portion Filing No. 2 is the Sand Creek drainageway right-of-way. This portion of Filing No. 2 is proposed for vacation and for the eventual development of the Springs Ranch Golf Course. A land use map for the development is shown on Figure 2. The City has approved plats and subdivision drainage plans for filings 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, The Cascades filings 1 through 3, the Highlands at Springs Ranch Filing No. 1, Colorado Springs Fire Station No. 17, Tutt Boulevard, and the Springs Ranch Golf Club. Some of the above filings have been replatted.

Climate

This area of El Paso County can be described, in general as high plains, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry. Precipitation ranges from 14 to 16 inches per year, with the majority of this precipitation occurring in spring and summer in the form of rainfall. Thunderstorms are common during the summer months, and are typified by quick-moving low pressure cells which draw moisture from the Gulf of Mexico into the region. Average temperatures range from about 30^{o}F in the winter to

75° in the summer. The relative humidity ranges from about 25 percent in the summer to 45 percent in the winter.

Soils and Geology

Soils within the Springs Ranch Development vary between soil types A and B, as identified by the U. S. Department of Agriculture, Soil Conservation Service. The predominant soil groupings are in the Truckton and Bresser soil associations. The soils consist of deep, well drained soils that formed in alluvium and residium, derived from sedimentary rock. The soils have high to moderate infiltration rates, and are extremely susceptible to wind and water erosion where poor vegetation cover exists. In undeveloped areas, the predominance of Type A and B soils give this basin a lower runoff per unit area as compared to basins with soil dominated by Types C and D. Presented on Figure 3 is the Hydrologic Soil distribution map for the Sand Creek basin. For the developed condition, per the City/County Drainage Criteria, Type A soils have been assumed to be B soils for the purposes of preparing the hydrology model for the Ranch.

Impervious Land Densities

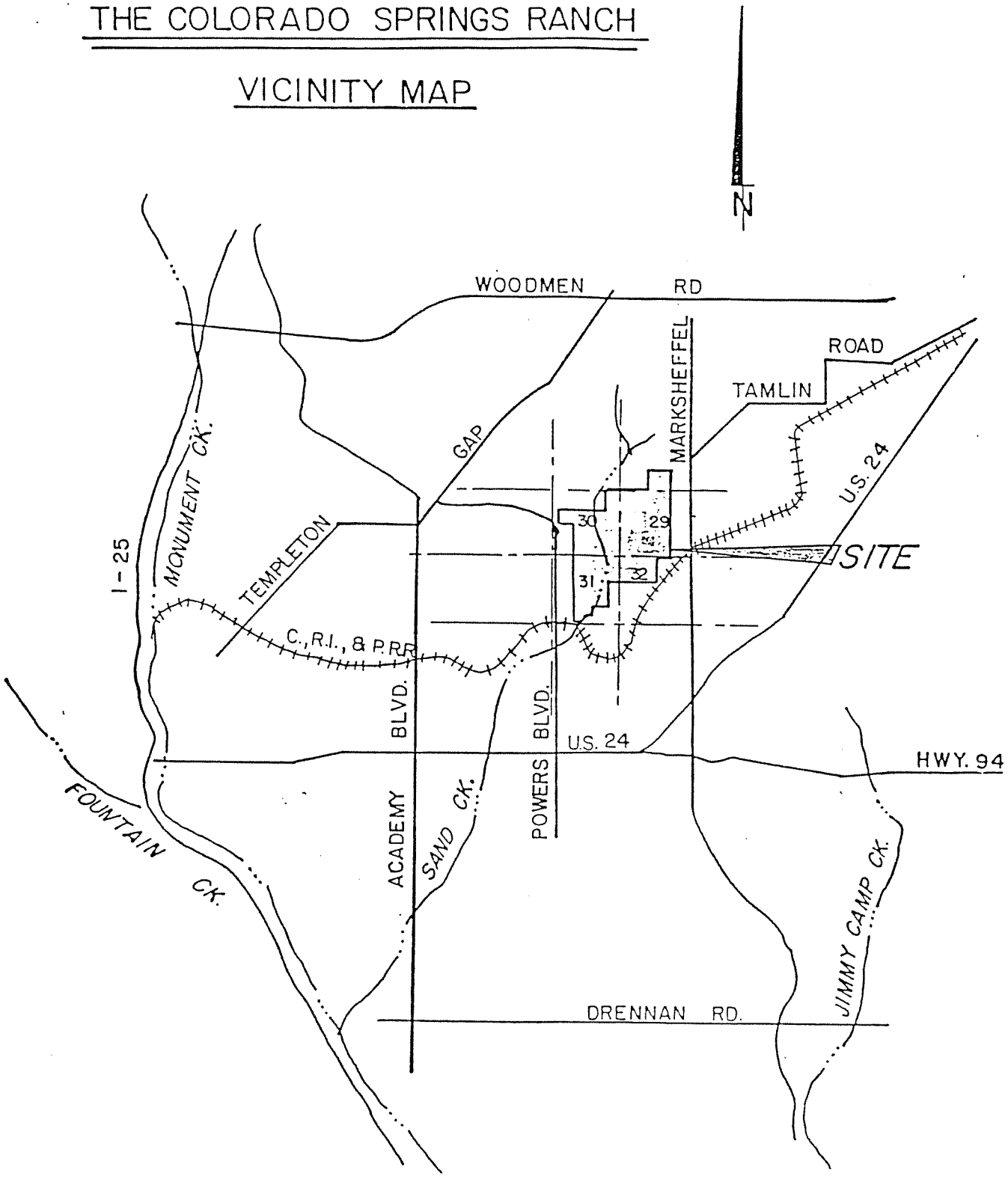
Land use information for the existing and future conditions were reviewed as part of the planning effort. This information is used in the hydrologic analysis to predict runoff rates and volumes for the purposes of stormwater facility evaluation. The identification of land uses abutting the drainageways is also useful in the identification of feasible plans for stabilization and aesthetic treatment of the Creek. The land uses shown on Figure 2 were used to estimate impervious area percentages for the sub-basins within the Ranch. The impervious percentages were then used to estimate the curve numbers, or "CN" values per the City/County Drainage Criteria manual.

There are several locations shown on the revised master Development Plan for the Ranch where the proposed land uses vary from the land uses as proposed in the 1985 Plan. The golf course represents a significant change in the master plan. The proposed golf course replaces areas previously proposed as schools, single -family residential and parkland. Another area where the updated land used varies from the original master plan is in the area of North Carefree Circle and Peterson Road. Land uses as proposed in this area would result in significantly higher impervious values as compared to the original master plan. Because of this, and increase in runoff is anticipated for the sub-basins in this area of the Ranch. The properties currently being developed by the Falcon School District have been reflected in the land use assumptions.

FIGURE I

THE COLORADO SPRINGS RANCH

VICINITY MAP



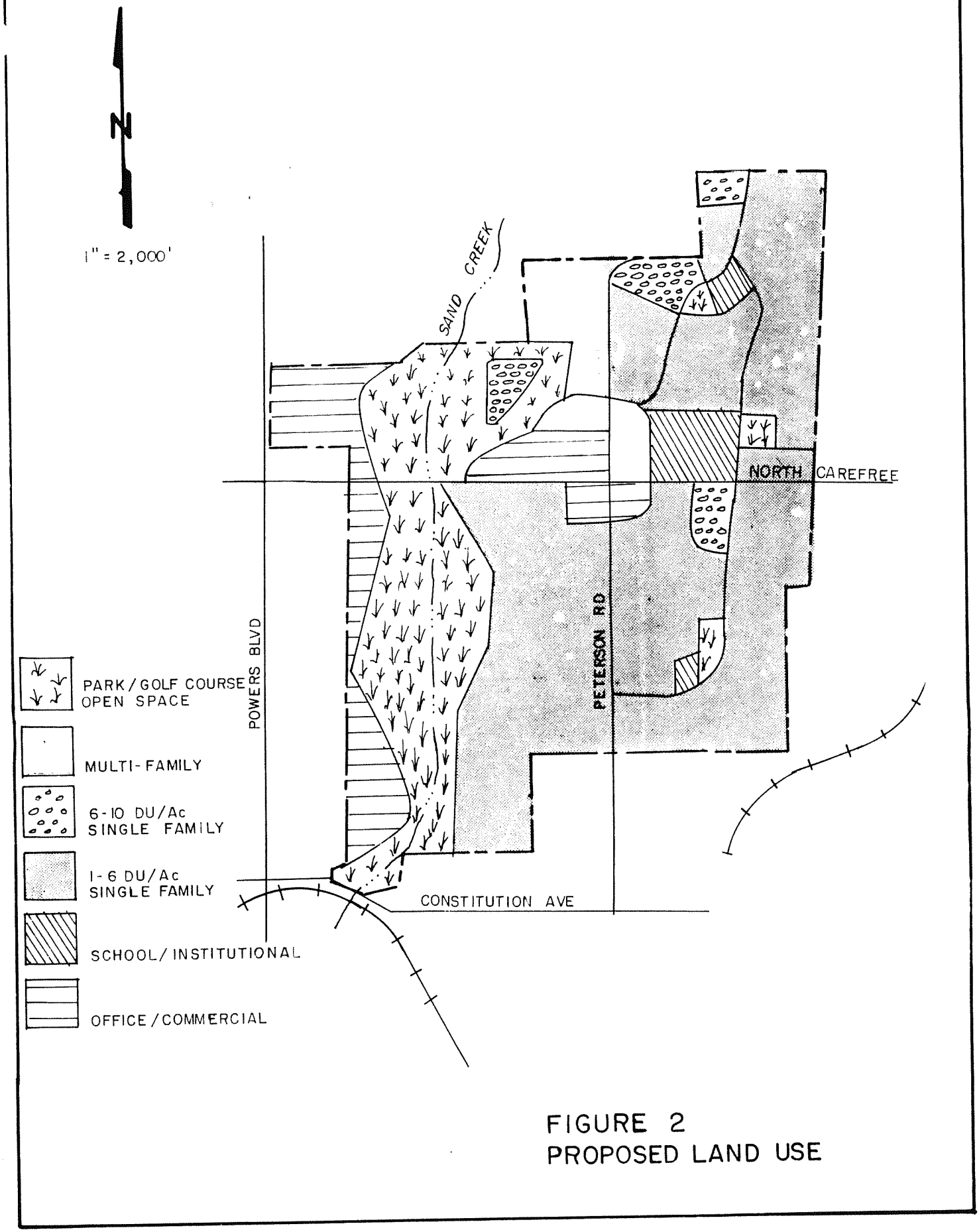
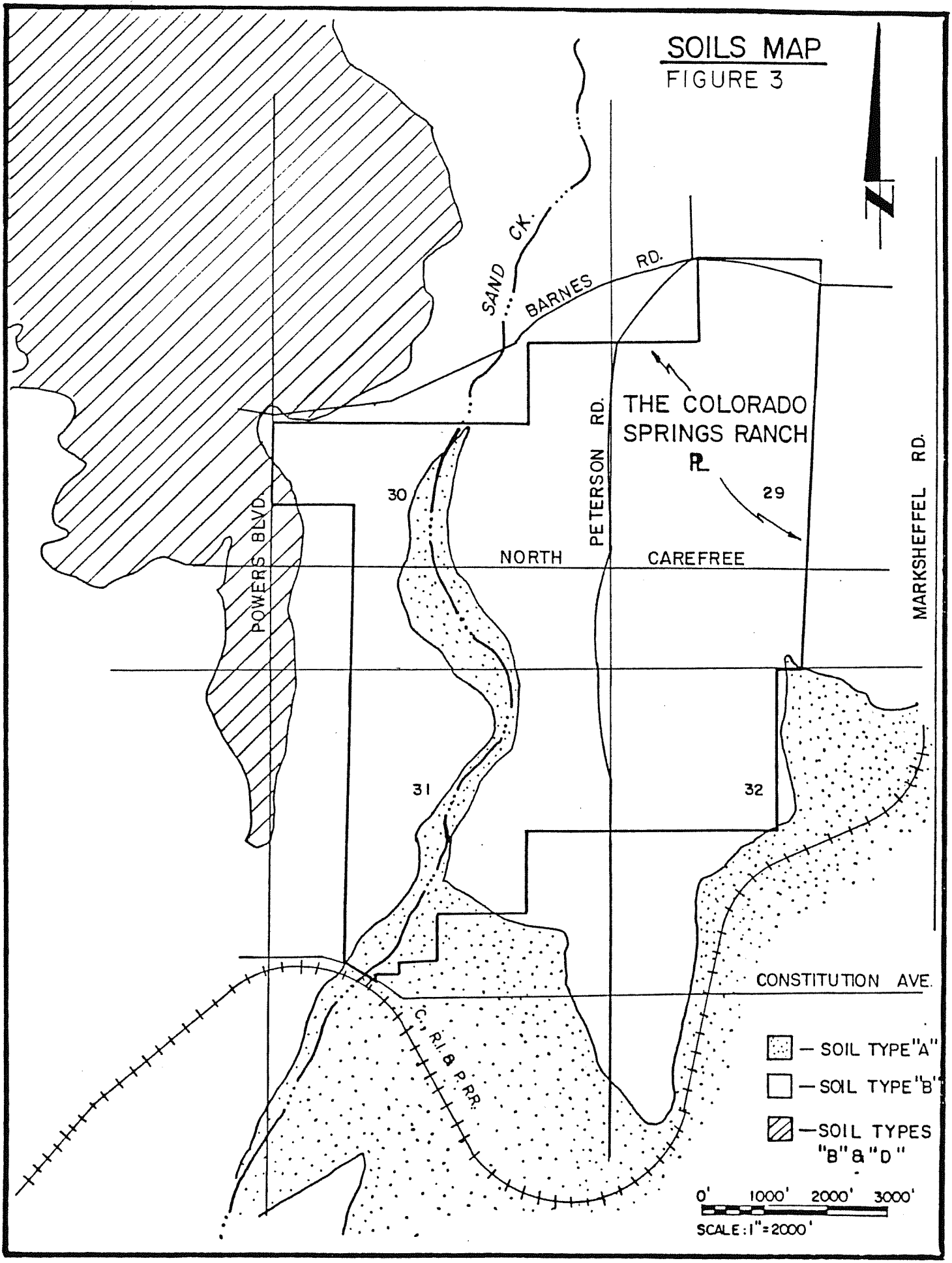


FIGURE 2
PROPOSED LAND USE


SOILS MAP
FIGURE 3
SAND CK.
BARNES RD.
THE COLORADO SPRINGS RANCH PL.
PETERSON RD.
MARKSHEFFEL RD.
POWERS BLVD.
30
29
31
32
NORTH CAREFREE
CONSTITUTION AVE.
C. R. I. & P. R.R.
— SOIL TYPE "A"
— SOIL TYPE "B"
— SOIL TYPES "B" & "D"
0' 1000' 2000' 3000'
SCALE: 1" = 2000'

III. HYDROLOGIC ANALYSIS

A hydrologic analysis was conducted in order to determine peak discharges and runoff volumes for various storm types, and basin development conditions. This data was used in the evaluation of existing flood problems, and in the evaluation of existing and proposed stormwater facilities within the Springs Ranch development.

For Sand Creek, the peak discharges developed in the Sand Creek Drainage Basin Planning Study were used for the design of facilities along Sand Creek itself. The peak discharges for the segment of Sand Creek through the Ranch were developed using basin wide land use assumptions for both the existing and future development conditions. No attempt was made as part of this study to incorporate the sub-basin delineation shown in this plan to the greater Sand Creek hydrologic model.

Runoff Model

The runoff model used to determine the peak flows and volumes within the study area is the Soil Conservation Service (SCS) Computer Program for the Project Formulation Hydrology (TR20). The version is available for the IBM personal computer (PC) "XT" and "AT" or a compatible PC. The use of this hydrological model is in compliance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The TR 20 model was also used in the Sand Creek DBPS to estimate peak flows along the main Sand Creek channel.

Basin Characteristics

The study area subject to the hydrologic evaluation is the area encompassed by the Springs Ranch Development as well as areas which drain onto the property. Presented on Exhibit 1 is the Hydrologic Sub-basin map, which shows the individual drainage basin within the property. This Exhibit shows the major design points, channel routing elements and sub-basins. Also summarized are the peak flows for each sub-basin and design point for the existing and developed condition. Finally, peak discharges for Sand Creek as obtained from the Sand Creek DBPS are summarized on Exhibit 1.

Basin characteristics such as size, curve numbers (CN-values), basin slope, soils flow path, time of concentration (Tc), channel type, slope and size, channel routing coefficient "X" and "M" values, and velocity were estimated within each sub-basin. These parameters were determined from available topographic, land use and soils maps, and field investigation. Presented on Table 1 are the CN-values used in the modelling. Presented on Table 2 are the time of concentration calculations. Presented on Table 3 is the "X" and "M" values used in the modelling of the routing reaches which link the individual sub-basins.

Design Rainfall

In accordance with the 1994 revision of the City/County Drainage Criteria Manual the 24-hour Type II-A storm with an antecedent moisture condition (AMC) of II was applied in the hydrologic modeling. The 24-hour duration storm events for the 10-year and 100-year recurrence intervals were evaluated. Rainfall depths are 4.4 inches and 3.0 inches for the 100-year and 10-year frequencies, respectively.

Hydrologic Modeling

The hydrologic model is a series of sub-basins, ranging in size from 80 to 200 acres, linked by drainageways or "reaches." Presented on Exhibit 1 (in map pocket) is the Hydrologic Basin Map. Hydrographs are accumulated at design points along the major drainages. Channel improvements have been assumed for the future condition hydrologic model when developing the "X" and "M" values as well as for the time of concentration calculations. Presented on Figure 4 is the flow routing schematic used in the development of the TR20 model.

Results

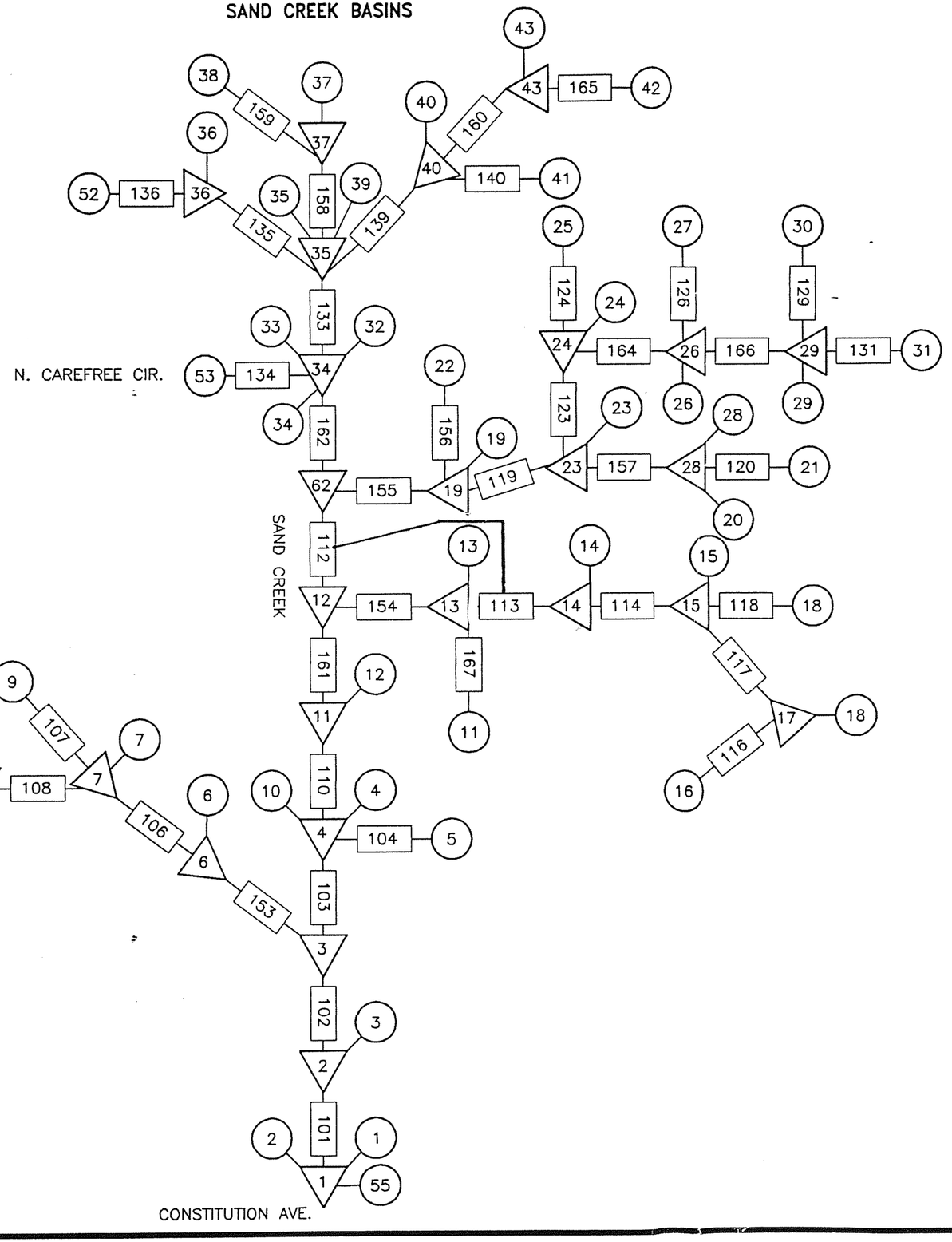
The results of the hydrologic analysis have been presented in several formats. Exhibit 1 shows sub-basin boundary, channel routing scheme, sub-basin locations, and design points. A summary of flow rates for key design points is presented on Table 4. Sub-basin flows are presented on Table 5. The TR20 input and output has been included in appendices A, B and C.

As mentioned earlier in the report, there are areas within the Ranch where land uses have changed as compared to the original Ranch MDDP. The two areas where the greastest change in peak discharges occur are in the areas outfalling to Peterson Road and North Carefree, and sub-basins within the proposed golf course. An increase in estimated 100-year peak discharges occurs at design point 24, which is located at Pony Tracks Drive. This design point eventually contributes to an existing storm sewer system which passes through Filing No. 4. The increase is due to the increase in imperviousness associated with the land uses in this area, especially the commercial and multi-family areas located in the vicinity of Peterson Road and North Carefree Circle.

In general, the 10-year discharges for the updated master drainage plan are higher than the 5-year discharges presented in the 1985 master drainage plan. The 100-year discharges are in general agreement with the 1985 study, except in those areas where land uses have been altered. Because the changes in land use assumptions, the construction of storm sewer facilities, and in the location of roadways within the Ranch, no direct comparison of peak discharges can be easily made to discharges presented in the 1985 master drainage plan. For these reasons it is

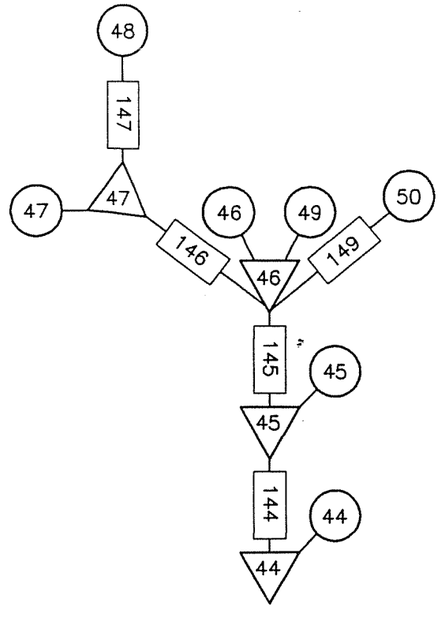
recommended that the review of existing facilities and the sizing of proposed facilities be completed using the discharges listed in Tables 4 and 5.

SAND CREEK BASINS



LEGEND

- 42 — BASIN NUMBER
- 165 — REACH NUMBER
- 43 — DESIGN POINT



EAST FORK SAND CREEK BASINS

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COLORADO SPRINGS RANCH
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE

FIGURE 4: FLOW SCHEMATIC

Project No.:	94.02.11
Date:	4/94
Design:	
Drawn:	
Check:	
Revisions:	

FIGURE 4

TABLE 1: SUMMARY OF CN-VALUES

SPRINGS RANCH MASTER DRAINAGE PLAN UPDATE
FILE NAMI CSRMDPCN.WQ1
NOTE: SOIL GROUP A = 1 SOIL GROUP B/D=3
SOIL GROUP B = 2

TR-20 SOIL CURVE CALCULATION SPREADSHEET

<---------- S-O-I-L G-R-O-U-P I-N-F-O-R-M-A-T-I-O-N ---------->

** ANTECEDENT MOISTURE CONDITION = 2 **

BASIN ID NUMBEI	** FIRST GROUP ** GROUP NUMBEI	PERCENT GROUP	** SECOND GROUP ** GROUP NUMBEI	PERCENT GROUP	** THIRD GROUP ** GROUP NUMBEI	PERCENT GROUP	% IMP. EXISTING	% IMP. FUTURE	EXISTING CONDITIONS 1ST GROUF CURVE #	2ND GROUI CURVE #	3RD GROU CURVE #	WEIGHTE CURVE	FUTURE CONDITIONS 1ST GROUF CURVE #	2ND GROUI CURVE #	3RD GROU CURVE #	WEIGHTED CURVE
1	1	100					10.0	65.0	44.8	0.0	0.0	45	84.5	0.0	0.0	84
2	1	40	2	60			10.0	53.0	17.9	38.8	0.0	57	32.1	48.1	0.0	80
3	1	80	2	20			11.5	42.8	36.5	13.0	0.0	50	61.2	15.3	0.0	76
4	1	10	2	90			38.5	38.3	6.2	67.4	0.0	74	7.5	67.4	0.0	75
5	2	100					40.0	40.0	75.5	0.0	0.0	75	75.5	0.0	0.0	75
6	2	100					10.0	29.0	64.7	0.0	0.0	65	71.5	0.0	0.0	72
7	2	100					10.0	61.0	64.7	0.0	0.0	65	83.0	0.0	0.0	83
8	2	75	3	25			13.8	85.0	49.5	19.4	0.0	69	68.8	23.5	0.0	92
9	2	85	3	15			10.0	85.0	55.0	11.5	0.0	67	77.9	14.1	0.0	92
10	1	45	2	55			14.5	13.8	21.3	36.5	0.0	58	29.7	36.3	0.0	66
11	1	10	2	90	4	13	29.5	38.3	5.6	64.5	11.1	81	7.5	67.4	11.3	86
12	1	60	2	40			10.0	6.8	26.9	25.9	0.0	53	38.1	25.4	0.0	64
13	1	85	2	15			10.0	40.0	38.0	9.7	0.0	48	64.2	11.3	0.0	75
14	2	100					17.5	40.0	67.4	0.0	0.0	67	75.5	0.0	0.0	75
15	2	100					13.8	40.1	66.0	0.0	0.0	66	75.5	0.0	0.0	76
16	2	100					16.8	40.0	67.1	0.0	0.0	67	75.5	0.0	0.0	75
17	2	100					10.0	40.0	64.7	0.0	0.0	65	75.5	0.0	0.0	75
18	1	3	2	97			10.0	40.0	1.3	62.7	0.0	64	2.3	73.2	0.0	75
19	1	25	2	75			11.5	40.0	11.4	48.9	0.0	60	18.9	56.6	0.0	75
20	1	100					12.3	45.0	46.1	0.0	0.0	46	77.3	0.0	0.0	77
21	1	100					10.0	40.0	44.8	0.0	0.0	45	75.5	0.0	0.0	75
22	1	35	2	65			17.5	36.5	17.2	43.8	0.0	61	26.0	48.2	0.0	74
23	2	100					21.3	85.0	68.7	0.0	0.0	69	91.7	0.0	0.0	92
24	2	100					12.3	80.0	65.5	0.0	0.0	65	89.9	0.0	0.0	90
25	2	100					10.0	45.5	64.7	0.0	0.0	65	77.5	0.0	0.0	77
26	2	100					11.5	75.0	65.2	0.0	0.0	65	88.1	0.0	0.0	88
27	2	100					10.0	41.5	64.7	0.0	0.0	65	76.0	0.0	0.0	76
28	2	100					11.5	57.3	65.2	0.0	0.0	65	81.7	0.0	0.0	82
29	2	100					10.0	50.0	64.7	0.0	0.0	65	79.1	0.0	0.0	79
30	2	100					10.0	37.8	64.7	0.0	0.0	65	74.7	0.0	0.0	75
31	2	100					10.0	47.0	64.7	0.0	0.0	65	78.0	0.0	0.0	78
32	1	25	2	75			13.8	39.0	11.7	49.5	0.0	61	18.8	56.3	0.0	75
33	1	45	2	55			10.0	33.0	20.1	35.6	0.0	56	32.8	40.1	0.0	73
34	2	85	3	15			13.8	85.0	56.1	11.7	0.0	68	77.9	14.1	0.0	92
35	1	15	2	85			10.0	21.0	6.7	55.0	0.0	62	10.3	58.3	0.0	69
36	2	90	2	10			10.0	85.0	58.2	6.5	0.0	65	82.5	9.2	0.0	92
37	1	20	2	80			17.5	13.0	9.8	53.9	0.0	64	13.2	52.6	0.0	66
38	2	25	3	75			21.3	85.0	17.2	59.6	0.0	77	22.9	70.6	0.0	93
39	1	30	2	70			10.0	16.0	13.4	45.3	0.0	59	20.1	46.8	0.0	67
40	2	100					10.0	63.8	64.7	0.0	0.0	65	84.0	0.0	0.0	84
41	2	100					10.0	40.0	64.7	0.0	0.0	65	75.5	0.0	0.0	75
42	2	100					10.0	54.5	64.7	0.0	0.0	65	80.7	0.0	0.0	81
43	2	100					10.0	52.0	64.7	0.0	0.0	65	79.8	0.0	0.0	80
44	1	1	2	99			10.0	40.0	0.4	64.0	0.0	64	0.8	74.7	0.0	75
45	2	100					10.0	45.3	64.7	0.0	0.0	65	77.4	0.0	0.0	77
46	2	100					10.0	40.0	64.7	0.0	0.0	65	75.5	0.0	0.0	75
47	2	100					10.0	55.0	64.7	0.0	0.0	65	80.9	0.0	0.0	81
48	2	100					10.0	40.0	64.7	0.0	0.0	65	75.5	0.0	0.0	75
49	2	100					10.0	40.0	64.7	0.0	0.0	65	75.5	0.0	0.0	75
50	2	100					10.0	44.0	64.7	0.0	0.0	65	76.9	0.0	0.0	77
51	2	100					10.0	40.0	64.7	0.0	0.0	65	75.5	0.0	0.0	75
52	3	100					11.5	42.8	77.2	0.0	0.0	77	84.4	0.0	0.0	84
53	2	15	3	85			31.8	47.3	10.9	69.6	0.0	80	11.7	72.6	0.0	84
54	2	67	3	33			36.0	44.5	49.6	27.3	0.0	77	51.7	28.0	0.0	80

TABLE 2: TIME OF CONCENTRATION CALCULATIONS
SPRINGS RANCH MDDP UPDATE

CURVE	DESCRIPTION	EQUATION	CONVEYANCE TYPE
E	GRASSED WATERWAY	VELOCITY = 16 ^ (0.5 * LOG(SLOPE%)) + 0.18)	1
F	PAVED AREA (SHEET FLOW) & SHALLOW GUT. FLOW	VELOCITY = 16 ^ (0.5 * LOG(SLOPE%)) + 0.30)	2
C	SHORT GRASS PASTURE & LAWNS	VELOCITY = 16 ^ (0.5 * LOG(SLOPE%)) - 0.18)	3
A	FOREST WITH HEAVY GROUND LITTER & MEADOW	VELOCITY = 16 ^ (0.5 * LOG(SLOPE%)) - 0.61)	4
B	FALLOW OR MINIMUM TILLAGE CULTIVATION	VELOCITY = 16 ^ (0.5 * LOG(SLOPE%)) - 0.30)	5
D	NEARLY BARE GROUND	VELOCITY = 16 ^ (0.5 * LOG(SLOPE%))	6
N/A	DRAINAGEWAY	VELOCITY = 1.49 / n * R^(2/3) * S^(1/2)	7
* N/A	PIPE	VELOCITY = 1.49 / n * (D/4)^(2/3) * S^(1/2)	8

BASIN ID	CONDITON	** SLOPE (FT./FT.) **			** LENGTH (FT.) **			** CONVEYANCE TYPE **			** VELOCITY (FT/SEC) **			** TIME OF CONCENTRATION (HR) **			Tc (HR)	AREA
NUMBER	FUT./EXIST.	SEGMENT-1	SEGMENT-2	SEGMENT-3	SEGMENT-1	SEGMENT-2	SEGMENT-3	SEGMENT-1	SEGMENT-2	SEGMENT-3	SEGMENT-1	SEGMENT-2	SEGMENT-3	SEGMENT-1	SEGMENT-2	SEGMENT-3	TOTAL	(MI)^2
1	EXISTING	0.0154	0.1094		650	320		1	3		1.88	2.34		0.10	0.04		0.35	
	FUTURE	0.0100	0.1094		650	320		7	2		4.36	6.80		0.04	0.01		0.25	
2	EXISTING	0.0091	0.0333	0.0075 *	880	600	400 *	1	3	3	1.44	1.29	0.61	0.17	0.13	0.18	0.68	
	FUTURE	0.0091	0.0100	0.0075 *	880	600	400 *	7	7	2	5.44	5.71	1.75	0.04	0.03	0.06	0.34	
3	EXISTING	0.0057	0.0021	0.1174	950	320	230	7	6	3	5.44	0.46	2.43	0.05	0.19	0.03	0.47	
	FUTURE	0.0057	0.0021	0.0600	950	320	230	7	7	1	4.66	1.57	5.71	0.06	0.06	0.02	0.34	
4	EXISTING	0.0182	0.0215	0.0511	260	860	900	6	6	2	1.39	13.67	4.61	0.05	0.02	0.06	0.32	
	FUTURE	0.0100	0.0215	0.0511	260	860	900	7	6	2	5.71	13.67	4.61	0.01	0.02	0.06	0.29	
5	EXISTING	0.0159	0.0507	0.0100	1200	750	200	6	2	3	11.93	4.49	0.71	0.03	0.05	0.08	0.35	
	FUTURE	0.0159	0.0507	0.0100	1200	750	200	6	2	3	11.93	4.49	0.71	0.03	0.05	0.08	0.35	
6	EXISTING	0.0125	0.0190		650	1050		7	3		8.27	0.98		0.02	0.30		0.32	
	FUTURE	0.0050	0.0190		650	1050		7	2		6.64	2.76		0.03	0.11		0.35	
7	EXISTING	0.0125	0.0200	0.0183	240	1500	550	7	1	3	8.27	2.14	0.98	0.01	0.19	0.16	0.56	
	FUTURE	0.0050	0.0200	0.0183	240	1500	550	7	1	3	6.64	2.14	0.98	0.01	0.19	0.16	0.56	
8	EXISTING	0.0100	0.0295	0.0667	600	880	150	2	1	3	2.00	2.80	1.85	0.08	0.09	0.02	0.40	
	FUTURE	0.0100	0.0295	0.0667	600	880	150	2	2	3	2.00	3.45	1.85	0.08	0.07	0.02	0.38	
9	EXISTING	0.0147	0.0429	0.0444	950	700	450	1	6	3	1.84	2.07	1.49	0.14	0.09	0.05	0.52	
	FUTURE	0.0100	0.0429		950	700		7	2		4.83	4.13		0.06	0.05		0.30	
10	EXISTING	0.0129	0.0143		850	700		6	6		1.14	1.20		0.21	0.16		0.57	
	FUTURE	0.0050	0.0100		850	300		7	7		7.00	3.00		0.03	0.03		0.26	
11	EXISTING	0.0215	0.0143	0.0267	850	1050	300	7	6	3	7.49	11.31	1.16	0.02	0.03	0.07	0.32	
	FUTURE	0.0215	0.0143	0.0267	850	1050	300	7	6	3	7.49	11.31	1.16	0.02	0.03	0.07	0.32	
12	EXISTING	0.0109	0.0605		2380	430		7	3		10.33	1.74		0.06	0.07		0.35	
	FUTURE	0.0050	0.0605		2380	460		7	3		7.00	1.74		0.09	0.07		0.37	
13	EXISTING	0.0100	0.0075	0.1260	800	550	250	7	2	3	7.05	1.73	2.53	0.03	0.09	0.03	0.35	
	FUTURE	0.0100	0.0075	0.1260	800	550	250	7	2	3	4.83	1.73	2.53	0.05	0.09	0.03	0.36	
14	EXISTING	0.0100	0.0100	0.0114	400	650	700	7	6	2	6.82	10.49	2.13	0.02	0.02	0.09	0.32	
	FUTURE	0.0100	0.0100	0.0114	400	650	700	7	6	2	6.82	10.49	2.13	0.02	0.02	0.09	0.32	
15	EXISTING	0.0334	0.0533		1200	300		2	3		3.85	1.85		0.09	0.05		0.34	
	FUTURE	0.0100	0.0533		1500	600		7	2		4.07	4.61		0.10	0.04		0.34	
16	EXISTING	0.0225	0.0314	0.0200	400	700	200	2	1	3	2.99	2.85	1.00	0.04	0.07	0.06	0.37	
	FUTURE	0.0100	0.0314		900	700		7	2		4.07	3.54		0.06	0.05		0.32	
17	EXISTING	0.0240	0.0400	0.0400	250	600	150	2	6	3	3.09	2.00	1.42	0.02	0.08	0.03	0.34	
	FUTURE	0.0100	0.0400	0.0250	400	500	400	7	2	1	4.76	3.99	2.58	0.02	0.03	0.05	0.33	
18	EXISTING	0.0300	0.0300		1000	200		1	3		2.82	1.23		0.11	0.05		0.35	
	FUTURE	0.0100	0.0300	0.0167	700	600	300	7	2	1 *	4.07	3.46	1.96	0.05	0.05	0.04	0.34	
19	EXISTING	0.0123	0.0366	0.0933 *	1220	570	150	7	2	3	15.17	3.92	2.16	0.02	0.04	0.02	0.38	
	FUTURE	0.0123	0.0366	0.0933 *	1220	570	150	7	2	3	15.17	3.92	2.16	0.02	0.04	0.02	0.38	
20	EXISTING	0.0050	0.2350	0.0300 *	400	1800	300	6	1	2	9.40	7.31	3.46	0.01	0.07	0.02	0.30	
	FUTURE	0.0050	0.0300	0.0300	400	1200	500	6	2	1	9.40	3.46	2.82	0.01	0.10	0.05	0.38	
21	EXISTING	0.0300	0.0360		800	250		5	1		1.23	2.87		0.18	0.02		0.41	
	FUTURE	0.0250	0.0360		1200	300		2	1		3.05	2.87		0.11	0.03		0.34	
22	EXISTING	0.0200	0.0480		900	250		2	1		2.82	3.32		0.09	0.02		0.31	
	FUTURE	0.0200	0.0480		900	250		2	1		2.82	3.32		0.09	0.02		0.31	
23	EXISTING	0.0250	0.0300		400	200		1	3		2.39	1.23		0.05	0.05		0.29	
	FUTURE	0.0250			500			2			3.15			0.04			0.24	
24	EXISTING	0.0174	0.0400		1150	300		1	3		2.00	1.42		0.16	0.06		0.42	
	FUTURE	0.0100	0.0400		1450	300		7	2		4.76	3.99		0.08	0.02		0.31	
25	EXISTING	0.0327	0.0320		520	250		1	3		2.74	1.27		0.05	0.05		0.31	
	FUTURE	0.0320	0.0300		700	600		2	1		3.57	2.82		0.05	0.06		0.32	
26	EXISTING	0.0180	0.0600		1050	300		1	3		2.09	1.75		0.14	0.05		0.39	
	FUTURE	0.0100	0.0600	0.0150	700	500	400	7	2	1	4.76	4.89	1.85	0.04	0.03	0.06	0.33	
27	EXISTING	0.0636	0.0400		550	250		1	3		3.82	1.42		0.04	0.05		0.29	
	FUTURE	0.0100	0.0400		250	650		7	2		3.73	3.99		0.02	0.05		0.28	
28	EXISTING	0.0206	0.0333		1550	300		1	3		2.17	1.29		0.20	0.06		0.46	
	FUTURE	0.0240	0.0333		1800	300		2	1		3.09	2.76		0.16	0.03		0.39	
29	EXISTING	0.0125	0.0333	0.0467	800	600	300	1	1	3	1.69	2.76	1.53	0.13	0.06	0.05	0.45	
	FUTURE	0.0100	0.0333	0.0500	1200	600	400	7	2	1	4.76	3.64	3.39	0.07	0.05	0.03	0.35	
30	EXISTING	0.0360	0.0666	0.0952	1000	450	275	1	1	3	2.95	4.51	2.22	0.09	0.03	0.03	0.36	
	FUTURE	0.0100	0.0666	0.0930	1100	450	600	7	2	1	4.76	5.95	4.38	0.06	0.02	0.04	0.32	
31	EXISTING	0.0333	0.0350		900	400		1	2		2.76	3.73		0.09	0.03		0.32	
	FUTURE	0.0100	0.0350		1200	500		7	2		4.76	3.73		0.07	0.04		0.31	
32	EXISTING	0.0146	0.0540	0.0733	2050	370	300	7	1	3	7.76	3.52	1.92	0.07	0.03	0.04	0.35	
	FUTURE	0.0100	0.0540		2050	370		7	2		5.50	4.64		0.10	0.02		0.33	
33	EXISTING	0.0256	0.0600		1250	250		7	3		10.56	1.75		0.03	0.04		0.27	
	FUTURE	0.0100	0.0600		1250	250		7	2		3.73	4.89		0.09	0.01		0.31	
34	EXISTING	0.0050	0.0318	0.0668	1150	2200	300	6	1	3	8.77	2.70	1.85	0.04	0.23	0.05	0.51	
	FUTURE	0.0050	0.0100	0.0668	1150	1500	300	6	7	2	8.77	5.93	5.15	0.04	0.07	0.02	0.32	
35	EXISTING	0.0105	0.0333	0.0800	950	600	250	1	1	3	1.55	2.76	2.00	0.17	0.06	0.03	0.47	
	FUTURE	0.0100	0.0333		950	600		7	2		4.76	3.64		0.06	0.05		0.30	
36	EXISTING	0.0190	0.0570	0.0720	1050	350	250	7	1	3	10.63	3.61	1.90	0.03	0.03	0.04	0.29	
	FUTURE	0.0100	0.0570		1050	350		7	2		7.71	4.78		0.04	0.02		0.28	
37	EXISTING	0.0114	0.0200	0.0500	1050	250	300	7	7	3	10.57	8.65	1.55	0.03	0.01	0.05	0.29	
	FUTURE	0.0080	0.0200		1050	300		7	2		5.79	2.82		0.05	0.03		0.38	
38	EXISTING *	0.0200	0.0529	0.1333	1850	1700	300	6	1	3	27.13	3.46	2.58	0.02	0.14	0.03	0.39	
	FUTURE	0.0200	0.0100	0.0500	1850	1200	500	6	7	2	18.81	8.46	4.46	0.03	0.05	0.03	0.31	
39	EXISTING	0.0180	0.0714		2100	260		7	3		8.69	1.69		0.07	0.04		0.31	
	FUTURE	0.0100	0.0714		2100	260		7	2		7.08	5.33		0.08	0.01		0.30	
40	EXISTING	0.0311	0.0266		1800	300		1	3		2.67	1.15		0.19	0.07		0.46	
	FUTURE	0.0100	0.0266		1800	300		7	2		5.50	3.25		0.09	0.03		0.32	
41	EXISTING	0.0300	0.0750		1000	400		1	3		2.82	1.94		0.11	0.06		0.38	
	FUTURE	0.0100	0.0750		1000	400		7	2		5.44	5.46		0.05	0.02		0.27	
42	EXISTING	0.0400	0.0800		1250	300		1	3		3.05	1.75		0.11	0.05		0.38	
	FUTURE	0.0100	0.0800		1250	300		7	2		5.44	4.89		0.06	0.02		0.28	
43	EXISTING	0.0350	0.2143	0.0476	2000	140	420	6	6	3	1.87	4.83	1.54	0.30	0.01	0.08	0.58	
	FUTURE	0.0100	0.0476		2000	300		7	2		5.44	4.35		0.10	0.02		0.32	
44	EXISTING	0.0167	0.0800		1920	300		7	3		8.39	2.00		0.06	0.04		0.31	
	FUTURE	0.0100	0.0800		1920	300		7	2		5.88	5.84		0.09	0.01		0.31	
45	EXISTING	0.0160	0.0545	0.0933	1500	330	300	7	1	3	8.21	3.53	2.16	0.05	0.03	0.04	0.32	
	FUTURE	0.0100	0.0545		1250	700		7	2		5.88	4.66		0.06	0.04		0.30	
46	EXISTING	0.0162	0.0212		680	330		1	3		1.93	1.05		0.10	0.09		0.39	
	FUTURE	0.0100	0.0212		600	330		7	2		4.66	2.91		0.03	0.03		0.27	
47	EXISTING	0.0471	0.0600		850	300		1	3		3.26	2.00		0.07	0.04		0.31	
	FUTURE	0.0100	0.0600		850	300		7	2		4.66	5.64		0.05	0.01		0.28	
48	EXISTING	0.0577	0.0500		520	200		1	3		3.64	1.58		0.04	0.04		0.27	
	FUTURE	0.0100	0.0500		200	300		7	2		3.43	4.46		0.02	0.02		0.23	
49	EXISTING	0.0180	0.0350	0.0533	1375	1000	300	1	1	3	1.91	2.95	1.63	0.20	0.09	0.05	0.54	
	FUTURE	0.0100	0.0350		1375	1000		7	2		4.66	3.89		0.08	0.07		0.35	
50	EXISTING	0.0506	0.0667		850	300		1	3		3.40	1.63		0.07	0.05		0.31	
	FUTURE	0.0100	0.0667		850	300		7	2		3.43	5.15		0.07	0.02		0.28	
51	EXISTING	0.0250	0.0490	0.0667	440	1020	300	1	1	3	2.39	3.35	1.83	0.05	0.08	0.05	0.38	
	FUTURE										0.00	0.00	0.00					
52	EXISTING	0.0150	0.0750		2400	800		7	1		10.09	4.15		0.07	0.05		0.32	
	FUTURE	0.0150	0.0750		2400	800		7	1		10.09	4.15		0.07	0.05		0.32	
53	EXISTING	0.0163	0.0327	0.0667	1600	1100	300	6	2	3	10.70	3.61	1.83	0.04	0.08	0.05	0.37	
	FUTURE	0.0163	0.0327	0.0667	1600	1100	300	6	2	3	10.70	3.61	1.83	0.04	0.08	0.05	0.37	
54	EXISTING	0.0150	0.0300	0.0667	2500	1200	300	6	2	3	11.58	3.46	1.85	0.06	0.10	0.05	0.48	

TABLE 3: SUMMARY OF CHANNEL ROUTING COEFFICIENT CALCULATIONS
COLORADO SPRINGS RANCH MDDP UPDATE

REACH CARDS

REACH ID	CONDITION	SLOPE	MANNING'S N VALUE	BOTTOM WIDTH FT	SIDE SLOP Z	DEPTH (FT)	LENGTH (FT)	AREA FT^2	X VALUE	M VALUE
101	FUTURE	0.005	0.035	75.0	2.5	4.0	400.0	340.0	0.2	1.64
102	FUTURE	0.005	0.035	75.0	2.5	4.0	600.0	340.0	0.2	1.64
103	FUTURE	0.005	0.035	75.0	2.5	4.0	500.0	340.0	0.2	1.64
104	EXISTING	0.044	0.016	36.0	10.0	0.7	1500.0	28.6	1.8	1.60
106	EXISTING	0.010	0.035	30.0	1.0	10.0	900.0	400.0	0.4	1.59
	FUTURE	0.009	0.035	25.0	2.5	4.0	900.0	140.0	0.5	1.58
107	EXISTING	0.016	0.035	40.0	1.0	5.0	1000.0	225.0	0.5	1.63
	FUTURE	0.008	0.035	15.0	3.0	4.0	1000.0	108.0	0.6	1.53
108	EXISTING	0.010	0.035	30.0	1.0	10.0	250.0	400.0	0.4	1.59
	FUTURE	0.009	0.035	25.0	2.5	4.0	250.0	140.0	0.5	1.58
110	FUTURE	0.008	0.035	80.0	2.5	4.0	1200.0	360.0	0.2	1.64
112	FUTURE	0.010	0.035	80.0	2.5	4.0	1700.0	360.0	0.2	1.64
113	EXISTING	0.025	0.035	30.0	2.5	4.0	1000.0	160.0	0.7	1.60
	FUTURE	0.025	0.035	15.0	2.5	4.0	1000.0	100.0	1.1	1.54
114	EXISTING	0.014	0.016	40.0	10.0	0.7	1500.0	31.3	1.0	1.61
116	EXISTING	0.031	0.035	20.0	4.0	3.0	450.0	96.0	1.0	1.55
	FUTURE	0.010	0.035	10.0	2.5	2.0	450.0	30.0	0.9	1.52
117	EXISTING	0.025	0.035	20.0	4.0	3.0	1000.0	96.0	0.9	1.55
	FUTURE	0.010	0.035	10.0	2.5	2.0	1000.0	30.0	0.9	1.52
118	EXISTING	0.031	0.035	20.0	4.0	3.0	1500.0	96.0	1.0	1.55
	FUTURE	0.010	0.035	10.0	2.5	3.0	1500.0	52.5	0.9	1.50
119	EXISTING	0.015	0.016	40.0	10.0	0.7	1450.0	31.3	1.0	1.61
120	EXISTING	0.023	0.035	20.0	4.0	3.0	2200.0	96.0	0.9	1.55
	FUTURE	0.011	0.035	10.0	2.5	2.0	2200.0	30.0	1.0	1.52
123	EXISTING	0.032	0.035	30.0	4.0	3.0	500.0	126.0	0.8	1.58
	FUTURE	0.009	0.035	15.0	2.5	3.0	500.0	67.5	0.7	1.55
124	EXISTING	0.027	0.035	30.0	4.0	3.0	1500.0	126.0	0.7	1.58
	FUTURE	0.009	0.035	15.0	2.5	3.0	1500.0	67.5	0.7	1.55
126	EXISTING	0.031	0.035	30.0	4.0	3.0	1300.0	126.0	0.8	1.58
	FUTURE	0.015	0.035	10.0	2.5	2.0	1300.0	30.0	1.1	1.52
129	EXISTING	0.020	0.035	20.0	4.0	3.0	1600.0	96.0	0.8	1.55
	FUTURE	0.010	0.035	15.0	2.5	3.0	1600.0	67.5	0.7	1.55
131	EXISTING	0.018	0.035	20.0	4.0	2.0	1450.0	56.0	0.8	1.57
	FUTURE	0.015	0.016	100.0	10.0	1.0	1450.0	110.0	0.5	1.64
133	FUTURE	0.015	0.035	80.0	2.5	4.0	1100.0	360.0	0.3	1.64
134	EXISTING	0.016	0.016	100.0	10.0	1.0	2500.0	110.0	0.5	1.64
135	FUTURE	0.010	0.035	30.0	2.5	3.0	1250.0	112.5	0.4	1.61
136	FUTURE	0.010	0.035	30.0	2.5	3.0	1400.0	112.5	0.4	1.61
137	FUTURE	0.008	0.035	80.0	2.5	4.0	1000.0	360.0	0.2	1.64
139	EXISTING	0.021	0.035	20.0	4.0	3.0	2450.0	96.0	0.8	1.55
	FUTURE	0.010	0.035	15.0	2.5	3.0	2450.0	67.5	0.7	1.55
140	EXISTING	0.033	0.035	20.0	4.0	3.0	800.0	96.0	1.0	1.55
	FUTURE	0.017	0.035	10.0	2.5	2.0	800.0	30.0	1.2	1.52
144	EXISTING	0.015	0.035	20.0	4.0	3.0	2000.0	96.0	0.7	1.55
	FUTURE	0.010	0.035	20.0	2.5	2.0	2000.0	50.0	0.6	1.59
145	EXISTING	0.019	0.035	20.0	4.0	3.0	1600.0	96.0	0.8	1.55
	FUTURE	0.010	0.035	15.0	2.5	2.0	1600.0	40.0	0.7	1.57
146	EXISTING	0.015	0.035	20.0	4.0	3.0	800.0	96.0	0.7	1.55
	FUTURE	0.008	0.035	10.0	2.5	2.0	800.0	30.0	0.8	1.52
147	EXISTING	0.042	0.035	20.0	4.0	3.0	1200.0	96.0	1.2	1.55
	FUTURE	0.021	0.035	10.0	2.5	2.0	1200.0	30.0	1.3	1.52
149	EXISTING	0.025	0.035	20.0	4.0	3.0	2400.0	96.0	0.9	1.55
	FUTURE	0.013	0.035	10.0	2.5	2.0	2400.0	30.0	1.0	1.52
153	EXISTING	0.013	0.035	30.0	1.0	10.0	900.0	400.0	0.5	1.59
	FUTURE	0.009	0.035	25.0	2.5	4.0	900.0	140.0	0.5	1.58
154	EXISTING	0.015	0.035	20.0	4.0	3.0	400.0	96.0	0.7	1.55
	FUTURE	0.008	0.035	20.0	2.5	5.0	400.0	162.5	0.5	1.55
155	EXISTING	0.005	0.035	20.0	4.0	3.0	400.0	96.0	0.4	1.55
	FUTURE	0.005	0.016	7.0	1.0	1.0	400.0	8.0	1.8	1.56
156	EXISTING	0.020	0.035	20.0	4.0	3.0	400.0	96.0	0.8	1.55
	FUTURE	0.015	0.016	40.0	10.0	0.7	400.0	31.3	1.0	1.61
157	EXISTING	0.015	0.035	20.0	4.0	3.0	400.0	96.0	0.7	1.55
	FUTURE	0.015	0.016	40.0	10.0	3.0	400.0	210.0	1.0	1.55
158	FUTURE	0.015	0.035	80.0	2.5	4.0	900.0	360.0	0.3	1.64
159	FUTURE	0.015	0.035	30.0	2.5	3.0	800.0	112.5	0.5	1.61
160	EXISTING	0.029	0.035	20.0	4.0	3.0	2000.0	96.0	1.0	1.55
	FUTURE	0.015	0.035	15.0	2.5	3.0	2000.0	67.5	0.9	1.55
161	FUTURE	0.010	0.035	80.0	2.5	4.0	600.0	360.0	0.2	1.64
162	FUTURE	0.015	0.035	80.0	2.5	4.0	1400.0	360.0	0.3	1.64
163	EXISTING	0.007	0.016	100.0	10.0	1.0	950.0	110.0	0.4	1.64
164	EXISTING	0.017	0.016	100.0	10.0	1.0	600.0	110.0	0.6	1.64
165	EXISTING	0.010	0.016	100.0	10.0	1.0	100.0	110.0	0.4	1.64
166	EXISTING	0.015	0.016	100.0	10.0	1.0	650.0	110.0	0.5	1.64
167	FUTURE	0.040	0.016	40.0	10.0	0.7	400.0	32.9	1.6	1.61

TABLE 4
DESIGN POINT DISCHARGES
SPRINGS RANCH DEVELOPMENT MDDP UPDATE

DESIGN POINT #	DISCHARGE/FREQUENCY (CFS) (1) 10YR Existing	10YR Future	100YR Existing	100YR Future	Comments
5	62	62	135	135	
6	250	490	520	930	
7	234	450	540	850	
8	200	280	440	540	
13	60	250	130	470	
14	75	140	230	240	
15	54	200	170	390	u/s Detention pond 15
15	54	115	170	165	d/s Detention pond 15
17	25	65	75	115	
19	79	370	290	840	
20	-	72	-	173	
23	75	340	260	740	
24	63	220	210	460	
26	47	55	160	100	
28	11	110	41	250	
29	36	150	115	330	
31	13	37	39	75	
36	280	500	610	900	
37	83	200	185	330	
40	40	140	130	290	
43	17	60	51	115	
44	73	282	272	647	
45	63	225	215	494	
46	52	166	166	390	
47	13	43	41	85	
SAND CREEK @ N. PROPERTY LINE	1100	4160	3670	9260	(2)
SAND CREEK D/S N. CAREFREE CIR.	1650	4890	4470	10500	(2)
SAND CREEK D/S CONSTITUTION	1930	5900	5040	12100	(2)

NOTES:

1. ALL DISCHARGES ARE FOR THE 24-HOUR DURATION RAINFALL
2. DISHARGES FOR SAND CREEK WERE OBTAINED FROM THE SAND CREEK DRAINAGE BASIN PLANNING STUDY, OCTOBER, 1996. WITHOUT REGIONAL DETENTION BASINS IN PLACE.

TABLE 5
SUB-BASIN DISCHARGES
SPRINGS RANCH DEVELOPMENT MDDP UDATE

SUB-BASIN #	DRAINAGE AREA (SM)	DISCHARGE/FREQUENCY (CFS) (1) 10YR EX	10YR FUT	100YR EX	100YR FUT
1	0.02	0	5	1	15
3	0.04	0.5	10	7	33
4	0.05	33	38	75	81
5	0.09	63	63	140	140
6	0.07	15	40	48	93
7	0.09	18	41	56	94
8	0.04	15	61	39	99
9	0.08	23	140	64	231
10	0.04	3	16	16	44
11	0.08	78	101	150	179
12	0.09	3	24	31	75
13	0.04	0.5	29	6	62
14	0.08	29	54	79	116
15	0.08	26	75	75	145
16	0.03	11	35	29	64
17	0.05	16	63	48	116
18	0.04	10	43	32	79
19	0.05	10	40	38	86
20	0.07	0.1	18	8	59
21	0.05	0	32	3	68
22	0.03	5	18	19	39
23	0.01	7	26	17	42
24	0.04	11	65	33	110
25	0.03	9	23	27	47
26	0.03	9	40	28	70
27	0.02	7	17	20	36
28	0.04	5	29	18	54
29	0.06	15	42	47	92
30	0.05	13	33	40	70
31	0.04	13	37	39	75
32	0.09	16	63	60	140
33	0.04	3	21	19	53
34	0.11	34	190	92	310
35	0.04	7	21	27	53
36	0.07	25	32	72	85
37	0.03	10	13	31	35
38	0.1	76	190	160	300
39	0.04	6	10	25	34
40	0.06	15	61	45	113
41	0.05	14	32	42	70
42	0.03	8	27	24	51
43	0.05	10	34	32	71
44	0.13	36	92	112	200
45	0.09	29	78	86	160
46	0.02	6	17	18	37
47	0.03	9	32	27	60
48	0.02	6	14	16	28
49	0.13	27	87	84	56
50	0.04	12	31	34	63
52	0.33	267	390	550	720
53	0.16	144	180	280	330
54	0.26	190	230	400	450
55	0.01	5	12	12	28
56	0.04	-	21	-	48

(1) ALL DISCHARGES ARE FOR THE 24-HOUR DURATION RAINFALL

IV. HYDRAULIC ANALYSIS AND FLOOD PLAIN DESCRIPTION

A hydraulic analysis was conducted to ascertain the conveyance capacity of existing hydraulic structures within the Springs Ranch development and along the major drainageways including Sand Creek. Field verifications of major roadway crossings and channel improvements were conducted and the general physical condition of the structure(s) noted. A hydraulic analysis was conducted using the U. S. Army Corps of Engineers (COE) HEC-2 water surface profile program. Cross section data for the analysis was obtained by using the two-foot contour interval planimetric topographic mapping referenced earlier in this report. The capacity of the North Carefree Circle and Constitution Avenue box culverts over Sand Creek were verified using the HEC-2 model. Capacities for existing storm drainage structures constructed since 1985 were verified using the methods outlined in the City/County Drainage Criteria manual.

Hydrology

The hydrology used in the hydraulic capacity verification of existing storm drainage facilities is the same as summarized in Section III of this report. The verification was carried out in order to determine if the systems built prior to the adoption of the 1987 drainage criteria manual are adequate to pass the updated flow.

Hydrology used in the estimation of the 100-year floodplain for Sand Creek through the Ranch property was obtained from the Sand Creek Drainage Basin Planning Study and the City of Colorado Springs Flood Insurance Study. Discharges for the 100-year existing and future conditions were analyzed.

Hydraulic Structure Inventory

As part of the field investigation, the existing drainage facilities were verified and inventoried. The size, type, and condition was recorded for all the bridges, culverts, channels, inlets, pipes, and miscellaneous drainage features within the Ranch property. Hydraulic capacities were estimated for the culverts and bridges over the major drainageways. The existing drainage facilities are presented on Exhibit 2, contained within the map pocket of this report. The hydraulic capacity of a roadway crossing was assumed to be reached when the design discharge (i.e., the 10- or 100-year recurrence intervals), hydraulic grade line equaled the adjacent road grade. Channel capacity adequacy was assumed to be reached when the design flow for the future condition discharge reached the channel depth minus the required freeboard per the City/County Drainage Criteria Manual.

Presented on Table 6 is a summary of the hydraulic capacities of the existing major drainageway, storm sewer systems and roadway culverts within the Springs Ranch property. The as-built drawings for storm sewer facilities within Filings 1, 2, 3, and 4 were used to estimated the design capacity of the system(s). In general, the existing roadway culverts within the Ranch were designed to convey the 100-year flow without overtopping the roadway. The storm sewer systems within Filings 1, 4, and Constitution Hills North (County area, not within the Ranch), were designed to collect and convey the 5-year discharge within a pipe and the street was to carry the overflow. Culverts under Powers Boulevard which convey offsite flows onto the Ranch property were designed to convey the 100-year discharge. At Tutt Boulevard, a temporary culvert was constructed under the rough graded roadway embankment. This culvert has less than a 5-year capacity.

None of the existing storm sewer systems within Filings 1 and 4, the South Carefree Circle outfall system, the Sky Sox Stadium outfall, the Tutt Boulevard culvert, and the Constitution Hills North system have outfall facilities which reach the Sand Creek drainageway. Most of these systems daylight to a rough graded natural channel. Outfall facilities for these systems need to be considered with the design of the Sand Creek channel improvements. Outfall channel systems for Filings 1 and 4 have been constructed as part of the Sand Creek Grade Control project improvements.

The storm sewer outfall system within Filing 4 does not have sufficient capacity to convey the updated 100-year discharge. The changes in land use has resulted in a higher 100-year discharge. This is also the case for the outfall system within Filing 1 (i.e., design point 15), which begins at the 60-inch RCP under Peterson Road. In order to maintain the design flows for these two systems, detention may have to be implemented in the undeveloped areas tributary to these systems. There appears to be adequate area to install a detention basin upstream of these two outfall systems, at design points 15 and 29.

The multiple-bay box culverts at North Carefree Circle and Constitution Avenue have sufficient capacity to pass the 100-year discharge per the FIS and estimated existing condition discharge presented in the Sand Creek DBPS. The North Carefree culvert has adequate capacity to convey the 100-year future condition flows (with or without regional detention), per the DBPS. The Constitution Avenue culverts would be overtopped in the future condition discharge scenario. Once the proposed regional detention basins (i.e., Sand Creek detention basins No. 1 and 2), were in-place, the Constitution Avenue culvert would have 100-year capacity.

The storm sewer systems and detention basin at design point 15 (i.e., the Highlands Filing No. 1 detention basin), have been constructed. These facilities were

built as part of the development of Highlands at Springs Ranch Filing No. 1, Sand Creek Elementary School and Cascade Filing No. 1. These facilities have been accepted by the City. The Highlands Detention basin is maintained by the City of Colorado Springs as a public storm drainage facility.

Floodplains

The floodplains for the 100-year future condition (without regional detention), discharge has been delineated for Sand Creek through the Ranch. The future condition discharge applied does not take into account any of the future regional detention facilities as proposed in the DBPS. That is, the detention basins proposed in the DBPS are considered to not be in place. This yields a conservative result for the location of the 100-year floodplain. The 100-year future condition floodplain presented on the drawings is synonymous with the "no-build" line shown in the Sand Creek DBPS. The "no-build" zone was adopted the time City Council in 1992 in response to request by builders within Filings 1 and 4. Platted lots within Filings 1 and 4 were released from previous restrictions upon the adoption of the "no-build" zone. A fee was established for lots the platted lots within Filings No. 1 and 4 to be collected at the time of building permit issuance. The fees collected are to be used for the construction of channel and grade control structures along the Sand Creek through the Springs Ranch property as depicted in this MDDP and the Sand Creek DBPS. A portion of these facilities are currently under construction as part of the development of the Springs Ranch Golf Course.

In 1990, FEMA began a restudy of the segment of Sand Creek through the Ranch. The restudy was needed in order to reflect the Constitution Avenue and North Carefree Circle box culverts over Sand Creek. Also, the construction of 100-year channel improvements immediately downstream of North Carefree are not currently reflected in the effective FIS. The hydraulic information resulting from the restudy was to be included in the Colorado Springs FIS upon completion. To date, the floodplain and floodway information produced in the restudy has not been included into the most current revision of the FIS. As part of the development planning for the Ranch, a Letter of Map Revision (LOMR), was prepared and submitted to FEMA. The LOMR request was approved by FEMA in 1994, and the revision incorporated into the Colorado Springs FIS.

The 100-year floodplain was estimated in order to assess where hydraulic inadequacies may exist along Sand Creek. This analysis assumed rigid boundary conditions to exist along the channel cross sections. The field inventory supplied roughness and bridge opening data for use in the HEC-2 modeling.

Basis of Design

As stated above, all proposed facilities shown on Exhibit 2 were evaluated in accordance with the City/County Drainage Criteria manual in effect at the time this MDDP update was initiated. Channel and pipe sizes were further defined using the following criteria:

1. Velocity for the sizing of riprap channel varies from 7 to 9 feet per second.
2. Maximum velocity for grasslined or natural channels is five to seven feet per second.
3. Long-term stream invert gradient (i.e., at full basin development) for sand Creek assumed to be 0.7 percent.
4. maximum drop height 4-feet.
5. Maximum side slopes for channels: Riprap, 2.5 to 1; Grasslined, 3 to 1; soil cement, 1 to 1.

Table 6:
SUMMARY OF EXISTING DRAINAGE FACILITIES
SPRINGS RANCH MDDP UPDATE

FACILITY	SIZE	TYPE	Design Frequency	DESIGN CAPACITY (cfs)	AS-BUILT MAXIMUM CAPACITY (cfs)	UPDATED DESIGN FLOW (cfs)	Comments	ADEQUATE CAPACITY? Y/N
Constitution Ave. crossing over Sand Creek	2-10' X 16'; 4-10' X 11'	CBC	100yr				Regional detention will limit 100-year flow to existing conditions	Y (exisitng flows)
North Carefree Cr. crossing over Sand Creek	5-12' X 12'; 1-9' X 9'	CBC	100yr					Y
Sand Creek drainageway	80' BW, 5' depth Channel 5, 80' wide	Riprap & Grasslined Checks	10-year	2,330-2,430	N/A	2,330-2,430	10-year with regional detention per Sand Creek DBPS	
Peterson Road at design point 15	60"	RCP	100yr	203	245	310	Upstream detention needed to limit discharge to 165 cfs	N
Highlands detention basin	7.6 AF		100yr	165	165	165	Discharge to 60-inch RCP under Peterson Road	Y
Cascade No. 1 outfall number 1	42"	RCP	100yr				Discharges to Highlands detention basin	Y
Cascade No. 1 outfall number 2	24"-30"	RCP	100yr				Discharges to Highlands detention basin	Y
Highlands No. 1 outfall number 1	30"	RCP	100yr				Discharges to Highlands detention basin	Y
Highlands No. 1 outfall number 2	42"	RCP	100yr				Discharges to Highlands detention basin	Y
Quarter Circle Drive outfall	42"	RCP	5-yr pipe 100yr street	75 133	93 133	200	Discharge limited to 165 cfs by detention at design point 15	Y (w/detention)
Quarter Circle Drive outfall Segment 152	66"	RCP	100-yr	470	470	470	Discharge limited to 165 cfs by detention at design point 15	
Tutt Blvd. at design point 36	24"	CMP	n/a		30	900	Outfall to creek needed. Temporary culvert installed presently.	N
Pony Tracks Drive north outfall, Segment 155	7' X 6' 60" 8' X 6' 9' X 6' Channel	CBC RCP CBC CBC Riprap	100yr 100yr 100yr 100yr	588 850 850	588 850 850	 850	Detention at design point 29 needed to limit discharge to meet design capacity	Y (w/detention)

Table 6:
SUMMARY OF EXISTING DRAINAGE FACILITIES
SPRINGS RANCH MDDP UPDATE

FACILITY	SIZE	TYPE	Design Frequency	DESIGN CAPACITY (cfs)	AS-BUILT MAXIMUM CAPACITY (cfs)	UPDATED DESIGN FLOW (cfs)	Comments	ADEQUATE CAPACITY? Y/N
North Carefree outfall system, west	10' X 6'; 36"-60"	CBC RCP	100-yr pipe	630	800	636		Y
South Carefree outfall system	6' X 14'	CBC	100-yr	805	1000	900	Outfall to creek needed.	Y
Constitution Hills North outfall system	36"	RCP	5yr pipe 100-yr street	60 91	83 91	 135	Outfall to creek needed.	5-year only
Pony Tracks Drive outfall Filing no. 1			5-year pipe 100-year street				Upstream detention required.	Y
Barnes Road outfall	60"	RCP	100yr	Unknown	410	300	Outfall to creek needed.	Y

V. RECOMMENDED STORM DRAINAGE IMPROVEMENTS

As a result of the hydrologic and hydraulic evaluations, proposed stormwater and drainageway improvements have been identified for the Springs Ranch Development. The improvements are presented on Exhibit 2 and on the plan and profile drawings for Sand Creek contained at the rear of the report.

Storm Sewer Systems

Size, type and location of storm sewers and channels to serve the existing and proposed filings within the Ranch are shown on Exhibit 2. In some areas, due to increases in runoff, the storm sewer systems proposed in past drainage plans approved by the City will need to be upgraded. The 10-year design capacity per the criteria in effect at the time this MDDP was initiated was applied in the sizing of new and upgraded storm sewers. In some cases the existing systems are sufficient to carry the design capacity as estimated in this report. In general, the systems within existing filings or as identified in drainage plans and report as approved by the City will remain in the same location.

At two locations within Filings 1 and 4, the existing storm sewer facilities were found to be inadequate to convey the 10-year and/or 100-year design discharge. The upstream termini of these systems occur at design points 15 and 29. The existing system downstream of design point 15 consists of a 100-year culvert under Peterson Road, a 5-year storm sewer within Quarter Circle Drive, and a 100-year outfall storm sewer to Sand Creek. The existing system downstream of design point 29 consists of a 100-year capacity storm sewer in North Carefree Circle, 100-year culverts under North Carefree Circle and Pony Tracks Drive, and a 100-year box culvert/storm sewer system in Cowhand Drive to its outfall point at Sand Creek. Hydraulic calculations for the existing systems at these locations show that the storm sewers do not have sufficient capacity to convey the required 10- and/or 100-year discharges presented on Exhibit 1. The primary causes for these systems to be considered under capacity is because of the changes in criteria form as 5-year system to a 10-year system, and localized changes in the overall Springs Ranch development plan. Because of this, alternatives to conveying the discharges presented on Exhibit 1 have been considered.

Several alternatives exist for conveying the 10-year or 100-year discharges at design points 15 and 29 to Sand Creek. These alternatives are:

(1) Upgrading the existing storm sewers to meet the 10-year and/or the 100-year discharges by means of parallel pipes;
(2) Allowing for overflows to be conveyed via the street systems;
(3) Installation of onsite detention basins to limit the discharge to the existing storm sewers to the capacity of the as-built system; and,

(1) Parallel systems: A parallel system has been sized to convey the 10-year and 100-year discharges shown on Exhibit 1 through the existing areas downstream of design points 15 and 29. For the Quarter Circle Drive System, meeting the required design capacity as specified in the Drainage Criteria Manual would require the following additional systems;

A 42-inch culvert parallel to the existing 60-inch culvert under Peterson Road (100-year capacity);
A 30-inch storm sewer paralleling the existing 42-inch storm sewer in Quarter Circle Drive, (10-year capacity);
An additional 40-feet of curb opening inlets. (10-year capacity)

For the systems below design point 29, the following upgraded systems would be required;

A 48-inch storm sewer from Pony Tracks to Peterson Road within North Carefree Circle, paralleling the existing 48-inch storm sewer, (100-year capacity);
A 66-inch culvert paralleling the existing 72-inch culvert under North Carefree Circle, (100-year capacity);
An additional 3-foot by 6-foot box culvert paralleling the existing 6-foot by 7-foot box culvert in Cowhand Drive, (100-year capacity);
A 6-foot by 11-foot box culvert in-place of the proposed 6-foot by 8-foot box culvert from Cowhand Drive to the outfall at Sand Creek, (100-year capacity).

Provided on Table 5-1 is a summary of additional costs for these systems compared to the costs of providing onsite detention at design points 15 and 29. As can be seen, to upgrade the existing systems would cost an additional $200,000. These costs would have to shared by the Developer(s) and the City since the changes are in part because of the change in criteria. The upgrading of the existing systems would also cause extensive utility relocation and street repaving, costs which have not been reflected in Table 5-1.

(2) Additional flow in streets; This concept would allow for greater flow to be carried within the existing street section of Quarter Circle Drive, North Carefree Circle, and Cowhand Drive. In the case of Quarter Circle Drive, in the Final Drainage Plan for Filing No. 1, the flow in excess if the storm sewer capacity, (i.e., the 100-year flow minus the 5-year flow), was to be conveyed through the street section. Accordingly, the lots abutting this segment of Quarter Circle Drive had finish floor elevations specified. Many of these houses have already been constructed, and the associated grading completed. It does not seem feasible to elevate these structures to any height greater than specified on the plat. This alternative cannot be recommended to the Developer by its Engineer(s), primarily because of the increased liability this concept presents with respect to the potential for damages to private property.

(3) Onsite detention; This concept would entail the installation of detention basins located at design points 15 and 29. Installation of these basins would limit the discharge to the downstream systems to their as-built capacity. These basins would require that long-term maintenance be conducted in order to assure their proper functioning. The City has expressed concern regarding the onsite detention alternative because of the long-term maintenance question. The detention basin at design point 15 has been constructed as part of the Highlands at Springs Ranch Filing No. 1 subdivision. This detention basin discharges at a maximum rate of 165 cfs. This discharge rate was determined during the final design of the Highlands Filing No.1 storm sewer facilities.

With regard to the analysis associated with these alternatives, it is recommended that detention basins be used to limit future runoff to meet the design capacity of existing systems. The storage and discharge requirements for these detention basins have been summarized of Exhibit 2. This recommendation has been made based primarily upon the cost to upgrade the existing storm sewers, collector channels and inlets which pass through developed residential areas to their outfall points at Sand Creek.

Major Drainageways

Presented on the preliminary design plans included with this report are the proposed improvements for Sand Creek within the Ranch property. Two significant changes have occurred with respect to drainageway planning since the original master drainage plan for the Ranch was approved in 1985. Firstly, the Sand Creek DBPS has proposed that a selective 10-year channel system in combination with floodplain preservation be used for the segments of Sand Creek upstream of Constitution Avenue. This is in contrast to the 100-year capacity soil cement channel proposed in the 1985 master drainage plan for the Ranch. This change in concept is primarily associated with the comments received by the 404 reviewing agencies and the City of Colorado Springs as the DBPS was being prepared.

The second fundamental change in drainage planning for Sand Creek is in the proposal to introduce regional detention within the Sand Creek basin. Five regional detention basins have been proposed in the Sand Creek DBPS. Sand Creek Regional Detention Basins No. 1 and No. 2 are sited on property within the Springs Ranch. The purpose of these detention basins is to control runoff from the portions of the Sand Creek upstream of Powers Boulevard to pre-development levels. This in turn will reduce the need to expand the capacity of bridges and channel sections for Sand Creek below Powers Boulevard in the future. Though the actual length of channel improvements is greatly reduced within the Ranch property if the detention basins are implemented, low flow linings (i.e., for flows less than or equal to the 10-year discharge), and grade control of the channel through the Ranch is needed.

The construction of the regional detention basins within the Ranch property will be dependent upon the rate of development within the areas tributary to the detention basins. A funding plan with financial assurances has been developed between the City and the developers of the Springs Ranch and Stetson Hills for the Sand Creek Detention Basin No. 1 which is located upstream of Constitution Avenue. The time frame for construction of this detention facility ranges has been estimated from five to seven years from the present time assuming that development of the Ranch and Stetson Hills continue at their present pace. The final design for Sand Creek Detention Basin No. 1 was initiated in January of 1996, and has been reviewed by the State Engineer's office. Agreements for the transfer of the land required to construct Sand Creek No. 1 to the City of Colorado are currently being considered. The cost for the land and construction of Sand Creek No. 1 are reimbursable through the Sand Creek Drainage Basin fee system. A copy of the funding agreement has been included within the appendix of this report.

Design and construction timing for Sand Creek Detention Basin No. 2 located near Sky Sox Stadium has not been addressed at this time. Sand Creek No. 2 should be constructed when the area north of the Stetson Hills begins development. There is an opportunity at this time to construct a portion of the embankment of SC-2 as part of the development of the Springs Ranch Golf Course. This has been recommended as a way of avoiding future disturbances within the Course by the construction of this detention basin once the need for the basin is warranted based upon the level of development in the Sand Creek basin as a whole.

Presented on the preliminary design plans is the layout of the proposed drainage improvements for Sand Creek through the Ranch. The location for the Sand Creek No. 2 embankment is approximate and subject to further refinement as the area develops. The localized improvements along Sand Creek which were needed prior to the construction of the Sand Creek Nos. 1 and 2 detention basins have been built. The drops and checks were constructed as part of the golf course development. Side drainage channels across the golf course have been constructed as the golf course was built.

Typical sections of the channel linings and grade control/drop structures have been presented on the preliminary plans. The spacing of the drops and checks have been based upon the assumption that the main channel of Sand Creek will ultimately reach a gradient of 0.7 percent. Wherever checks which were constructed show long-term degradation of three feet, additional checks located immediately downstream should be constructed. The rate of degradation should be monitored by the operator of the golf course so that the appropriate drop/check construction can commence prior to any substantial lose of channel bank linings or check structures.

A preliminary layout of the proposed regional detention basins within the Ranch has been presented on the plans. The layout of the basins is similar to the layout proposed in the Sand

Creek DBPS. The location of the detention basins have been chosen based upon their hydrologic location within the Sand Creek basin and the physical attributes of the topography in vicinity of the proposed detention site. The detention basins have been sized to store and release future development condition runoff from the 10- and 100-year storms to the discharges defined in the DBPS. The basins have also been designed to accommodate a water quality storage pool. The size of the water quality pool is based upon the type of development projected for the Sand Creek basin and upon a 40 hour release rate. The water quality pool of the detention basin is the area where the most intensive maintenance will have to take place. The areas outside of the water quality storage pool can be used as open space and possibly park uses.

Also presented on Exhibit 2 and the preliminary design plans is the location of the future condition 100-year floodplain. The discharges used to estimate this floodplain consider no regional detention in place. This floodplain represents an area where encroachment with habitable structures is not to take place as per prior agreement with the City of Colorado Springs. (Refer to Section VI for a discussion of this agreement). At this time, the revised master development plan for the Ranch shows no encroachment into this floodplain with habitable structures.

Descriptions of Recommended Improvements

1. **Constitution Hills North at Haystack Drive**: The existing storm sewer system within Haystack Drive is in need of an outfall channel to Sand Creek. A riprap lined channel with drops is proposed. The existing storm sewer collection system within the Constitution Hills North subdivision (County) and the Colorado Springs Ranch Filing No. 1 is to remain as is.

2. **Constitution Hills North at Constitution Avenue**: The existing subdivision collects stormwater by means of street flows to a point where the flow would move west, out of the subdivision and into the historic Sand Creek floodplain. An outfall conveyance Sand Creek is needed. A riprap lined channel with drops is proposed. The connection of this side drainageway to the Sand Creek Detention Basin # 1 is shown of the final design plans for the detention basin.

3. **South Carefree Circle Outfall Channel**: This outfall channel would connect the existing box culvert within South Carefree to the Sand Creek channel. A riprap lined channel is proposed with drop structures. The existing storm sewer system within South Carefree collects stormwater from areas west of Powers Boulevard and for the areas east of Powers known as the Carefree Commerce Park. Upon construction of the Sand Creek Detention Basin # 1, the outfall channel should be terminated in a channel outfall structure. The location for this outfall is shown on the final design plans for the Sand Creek Detention Basin No. 1. The type of outfall for this location should be decided upon when final drainage plans for the parcels tributary to this system are prepared.

4. **Design Point 15 Outfall System**: This system consists of grasslined channels and drop structures to collect stormwater runoff from future single family residential areas and an elementary school site. The channel will outfall to the design point 15 detention basin, located east of Peterson Road. The detention basin is needed in order to reduce peak discharges from the basins east of Peterson to meet the design capacity of the existing storm sewer system in Quarter Circle Drive, Filing No. 4. The storm sewer system in Quarter Circle drive has a five-year flow capacity. The 66-inch RCP outfall storm sewer to Sand Creek has been constructed (Segment 152). This system was been substantially constructed as part of the Highlands at Springs Ranch Filing No. 1, the Cascades Filing No. 1 and the elementary school.

5. **Pony Tracks Drive North Outfall** (Segment 155): The outfall for this system is proposed to be an extension to the existing 6-foot by 7-foot CBC to Sand Creek. The 100-year design capacity storm sewer within Pony Tracks should remain (refer to Design point 28 outfall system description). North of Pony Tracks, riprap and grasslined channels are proposed for the collection of runoff from the proposed multi-family and commercial area in the vicinity of Peterson Road and North Carefree Circle. The 100-year capacity 72-inch culvert under North Carefree is to remain (refer to design point 29 description).

6. **Design Point 28 Outfall System**: This system is proposed as a 48-inch outfall storm sewer and a series of grasslined channels with drops at specified intervals. This storm drainage system outfalls to the existing storm sewer under Peterson Road, approximately 500 feet south of Pony Tracks Drive. The planning and site design plans for the new Falcon District high school has been considered in the hydrologic design of the system to Peterson Road. The design capacity of the Pony Tracks Drive Storm Sewer is adequate to handle runoff from the areas tributary to design point 28. Portions of this system have been built as part of the High School and the Highland North Filing No. 1 projects.

7. **Quarter Circle/Pony Tracks Drive Outfall System** (Segment 154): This system consists of a 18-inch through 48-inch storm sewers, outfall to a riprap channels on Pony Tracks Drive. The existing Quarter Circle storm sewer daylights in a concrete channel which conveys flow from Filing 4 through Filing 1 via an existing drainage easement. Riprap channels are proposed as the outfall facility into Sand Creek. These outfalls have been constructed.

8. **Design Point 46 Outfall System:** This system conveys flow to a proposed detention basin located at design point 46. The collection system consists of 100-year capacity grasslined channels with drops at specified intervals. The detention basin is needed in order to reduce developed runoff to historic levels at the east Ranch property line. This system lies within the East Fork Sand Creek basin.

9. **Design Point 29 Outfall System**: This system consists of a series of 100-year capacity grasslined channels with drops at specified intervals which outfall to a detention basin

proposed north of North Carefree and east of future Pony Tracks Drive (Design point 29). This detention basin is needed in order to limit the discharge from developing area to the design capacity of the existing storm sewer within North Carefree Circle. The storm sewer within North Carefree eventually outfalls to the Pony Tracks Drive north CBC described above.

10. **Sub-basin 39 Outfall System:** This system consists of riprap and grasslined channels which will collect runoff from proposed residential areas. The system discharges to Sand Creek and eventually into the proposed Sand Creek Detention Basin # 2. The lower segment of this system will pass through the Springs Ranch Golf Course.

11. **Design Point 35 Outfall System:** The main conveyance in this system is a riprap channel which is aligned within a natural drainageway which begins at the culvert under Powers Boulevard. This system will convey mostly developed offsite runoff from areas west of Powers Boulevard. The temporary culvert under Tutt Boulevard will need to be replaced in the future with a twin, 6-foot by 8-foot concrete box culvert. This system will outfall to the Sand Creek Detention Basin # 2. Prior to the detention basin being constructed, the channel will have to be constructed to the Sand Creek channel.

12. **Design Point 32 Outfall:** This system will enter Sand Creek at the northeast corner of the North Carefree box culvert. A grasslined channel is proposed. The channel will be aligned for the most part within the Springs Ranch Golf Course.

13. **Miscellaneous Systems:** The following improvements have also been identified within the MDDP. An extension of the existing 60-inch outfall line from Barnes Road will be required at the time the Sand Creek No. 2 detention basin is built. Approximately 800 lineal feet of 42-inch storm sewer will be required within Tutt Boulevard. This storm sewer was identified in the Filing No. 3 (North Carefree Circle), drainage report and the final drainage report for the City of Colorado Springs Fire Station No. 17. Finally, as part of the Filing No. 7 project, a 24-inch storm sewer with grasslined overflow swale was constructed across the Springs Ranch Golf Course. The storm sewer outfalls to the Sand Creek channel.

Drop Structures and Check Structures

Drop and check structures have been sited along Sand Creek and the collector channels in order to slow the channel velocity to the recommended nine-feet per second for riprap lined channels and seven-feet per second for grasslined channels. The seven foot per second criteria for the grasslined channels assumes that an erosion netting will be used in the establishment of vegetation. The drops and checks are designed to prevent localized and long-term invert degradation from affecting channel linings and overbanks. In the reaches to be selectively lined, drops and check structures will protect the native vegetation from the detrimental effects of stream invert headcutting. Several types of structures could be considered for the Sand Creek

Basin. For the collector channels, reinforced concrete structures are recommended. **A maximum drop height of four feet is recommended.**

Detention

The recommended plan calls for the construction of three onsite or local detention basins. These detention basins occur at design points 15, 29 and 46. The purpose of detention basins 15 and 29 is to limit peak discharges to the design capacity of the existing storm sewer systems to which the detention basins outfall. The detention basin at design point 46 is needed to reduce the developed flow to historic levels prior to leaving the Springs Ranch property. Detention basin 15 is already in place and functioning. These basins can serve as temporary sedimentation basins during the development of the Ranch. These basins should be designed to control both 10-year and 100-year flows. Maintenance access and associated easements will need to be provided as the subdivisions outfalling to the detention basins are developed. Detention basins 15 and 29 are to be publicly owned and maintained by the City of Colorado Springs. Since the need for detention basins 15 and 29 is based upon a receiving storm sewer system which was under capacity as a result of drainage criteria, the cost for these basins need to be included into the drainage basin fee for Sand Creek. The cost for detention basin 15 was incorporated into the basin fee as a result of the City/ County Drainage Board action in 1996.

Water Quality

Improvement of urban stormwater quality has become and important issue in drainage basin planning. Many pollutants are naturally associated with sediments that enter sensitive receiving waters. The pollutants are naturally occurring compounds that are carried to the drainageways in storm runoff. Other pollutants are the result of urbanization such as lawn chemicals, oil and grease, pet feces, lawn clippings and other items. Many pollutants can be limited by programs such as erosion control at construction sites, educational programs to inform the public as to the proper use of lawn chemicals, oil recycling and street sweeping.

The collector channels and bank linings along Sand Creek have been designed to limit bank sloughing and invert degradation. Provision of adequate erosion control during the grading of roadways and within developing subdivisions offers the single best way to mitigate potential water quality degradation along Sand Creek downstream of the Ranch. The construction of the golf course will act to stabilize the floodplain with excellent vegetative cover and thereby reducing the potential for erosion of surficial soils.

The proposed regional detention basins have been designed to allow for a water quality storage area. The water quality storage volume is adequate to store approximately 3/4 inch of developed runoff and release this runoff over a 40-hour period. The timing of the construction of the regional detention basins depends upon the rate of development. From the water quality standpoint, the regional basins should be constructed when the tributary area is approximately 50

percent developed. Prior to this, the measures discussed above are the best means of managing water quality as areas such as the Springs Ranch develop.

The water quality measures for each regional detention basin includes an inlet forebay, a water quality storage area, a water quality outlet control structure and the introduction of water tolerant vegetation in the basin bottom. Permanent water quality pools may eventually form, however it is likely that the detention basins will remain dry.

Right-of-Way

For the most part the grasslined channels and storm sewers within the Ranch will pass through developed subdivisions. At the time of platting, adequately wide drainage easements and right-of-ways must be dedicated. For the channel sections presented on the plans, a minimum right-of-way width should be 60-feet. This width will provide to the room needed to maintain the channels. If the right-of-way is to contain other utilities such as sanitary sewer or water lines, the widths should be increased approximately 20-feet for each utility planned to share the easement or right-of-way. All weather maintenance roads should be contained within the easements and constructed at the time the collector channels are built.

Along Sand Creek, the operator of the Springs Ranch Golf Course has proposed to construct and maintain the recommended drainageway improvements privately. Accordingly, Filing No. 2 within the course has been vacated and a drainage easement with the same dimensions created. Maintenance access to the drainageway should be limited to specific areas along the creek. The existing ramps at North Carefree offer access to the channel bottom both upstream and downstream of the roadway. A maintenance agreement is currently under review by the City and property owners.

TABLE 5-1: SPRINGS RANCH MASTER DEVELOPMENT DRAINAGE PLAN UPDATE
PARALLEL SYSTEM COST INCREASE COMPARED TO ONSITE DETENTION BASIN

OUTFALL/ BASIN DP	IMPROVEMENT TYPE	Quantity/ Length (FT)	Unit Cost ($/LF)	NUMBER OF DROP STRUCTURES	LENGTH OF DROPS (FT)	TOTAL COST
Pony Tracks Drive North Outfall	3' x 6' CBC	1020	90	0	0	$91,800
	6' x 11' CBC	550	130	0	0	$71,500
	66-inch RCP	120	135	0	34	$22,320
	48-inch RCP	820	80	0	0	$65,600
Ouarter Circle/Pony Tracks Dr outfall system	42-inch RCP	120	72	0	0	$8,640
	30-inch RCP	1050	50	0	0	$52,500
	10' CO Inlets	6	4000	0	0	$24,000
	5' manholes	5	2000	0	0	$10,000
Elimination of Detention basin at DP 15 (2)						($63,200)
Elimination of Detention basin at DP 29 (2)						($69,500)
TOTAL CONSTRUCTION COSTS						$213,660
5% CONTINGENCY						$10,683
10% ENGINEERING						$21,366
TOTAL COSTS (1)						$245,709

(1) Increase over costs summarized in Table 10. Costs for utility and repaving not included.
(2) Costs for detention basins presented on Table 11.

VI. COST OF CONSTRUCTION AND ESTIMATED DRAINAGE FEES

A summary of costs for the proposed drainage facilities presented on Exhibit 2 are contained in this section of the report. The cost for the facilities have been separated into major drainageways, storm sewer outfall and collection systems, roadway crossing and detention basins. Cost estimates have been based upon the unit prices shown on Table 7.

Costs for the stabilization of Sand Creek within proposed Springs Ranch Golf Course have been shown as "non-reimbursable." This is because the golf course owners have proposed to construct and maintain drainageway improvements within the course privately in return for the waiving of drainage fees associated with the golf course property. The area needed for the club house will be platted and will be subject to drainage fees assessment. Accordingly, the drainageway improvements for Sand Creek within the golf course property have been deducted from the reimbursable drainage improvements. The cost estimates are summarized on Tables 8 through 11.

Drainage Fees

Drainage fees are assessed on a property at the time of platting. The drainage fees are to be collected by the City for use in reimbursing other developers who construct public drainage facilities within the Sand Creek basin. The 1998 bridge and drainage fees are $356 and $5,552 per acre, respectively. The capital construction cost fee for the regional detention basin is $1,331, and the detention basin land fee is $335.

Drainage fees are assessed according to the acreage within a given subdivision plat. Summarized on Table 12 is an estimate (current as of July 1994), of the acreage within the Springs Ranch still subject to fee assessment. The total "plattable" acreage remaining in the Ranch is approximately 790 acres.

Based upon the acreage presented in Table 12, the total estimated fees to be assessed are:

Bridge Fee:	789.6 acres @ $356 per acre=$281,098
Drainage Fees:	789.6 acres @ $5552 per acre=$4,383,859
Detention Basin Fees:	789.6 acres @ $1331 per acre=$1,050,958
Detention Basin Land Fees:	789.6 acres @ $335 per acre=$265,306

Building Permit Fees

During the original master drainage planning for the Ranch, certain areas within Filings 1 and 4 were platted with building restrictions for each platted lot which was sited within the 100-year floodplain as depicted in the effective Flood Insurance Study. The 1985 master drainage

plan proposed that the Sand Creek channel be realigned from North Carefree Circle to Constitution Avenue. This realignment would cause the 100-year floodplain to be confined to the channel right-of-way (i.e., Filing no. 2), and the building restrictions lifted upon completion of the channel improvements. As well as constructing the channel improvements, the historic floodplain would have to be filled to render portions of the land within Filings 1 and 4 buildable and therefore subject the lifting of the building restrictions.

The construction of the North Carefree Circle box culvert and the associated permanent and temporary channel construction downstream of North Carefree in 1986 and 1987, have effectively realigned the 100-year floodplain to the limits shown on Exhibit 2 and the preliminary design plans. Therefore, in response to developers and builders within the Ranch, the City agreed to establish a "no-build" zone for Filings 1 and 4. The no-build zone established is essentially the 100-year floodplain as currently depicted on the plans, in combination with a buffer zone in areas where no channel improvements had been built and none were anticipated to be built in the immediate future. The buffer zone was large enough to restrict encroachment into the proposed regional detention basin areas within the Ranch and the physiographic floodplain. The no-build zone did however contain 28 lots within Filing 4 which were restricted from any building.

In April of 1992, the City of Colorado Springs City Council adopted a fee of $.0875 per square foot per lot for un-built lots within Filings 1 and Phase 1, Filing 4. This fee was established in order to replace the funds which were to be covered by letters of credit posted by the original developers of the Ranch. The letters of credits were posted to cover the public drainage improvements for the Sand Creek drainageway. In 1990, the original letters of credit could not be renewed by the developers. To cover the cost of the future improvements for Sand Creek, the per lot fee was proposed by the City Engineering Division. This fee was set to cover the cost of Filing No. 1 and Phase 1, Filing No. 4 share of the proposed channel improvements depicted in the DBPS. The fees collected to date have been earmarked for the construction of major drainageway facilities for Sand Creek within the Ranch, namely the drops, checks and low flow linings shown on the preliminary design plans. The construction associated with the Sand Creek Grade Control Project was paid for using the funds generated by the collection of the building permit fee.

Several items presented on Tables 9, 10 and 11 have been identified as being eligible for reimbursement through the Sand Creek drainage basin fee system. These facilities were identified in the Sand Creek DBPS as major drainageways, and as such were included in the estimate of the drainage and bridge fees. These facilities include the South Carefree Outfall, the Pony Tracks Drive North Outfall (Segment 155), the Quarter Circle/Pony Tracks Drive Outfall (Segment 152), and the Design Point 35 outfall. These segments correspond to segments 107, 115, 114 and 183 in the Sand Creek DBPS. Because the need for the detention basins at design points 15 and 29

are based in part upon a change on drainage criteria, the cost of the construction for these detention basins is subject to reimbursement.

TABLE 7
Unit Construction Costs
Springs Ranch Master Development Drainage Plan Update

Item	Unit	Unit Cost	Comments
CHANNEL AND HYDRAULIC STRUCTURES			
Channel earthwork	CY	$8	
Filter material	Ton	$25	
Structural concrete	CY	$250	
Seeding and mulching	SF	$0.15	
Riprap Type H	CY	$30	
Riprap Type M	CY	$24	
12 foot wide gravel trail	LF	$15	Maintenance trail
Erosion netting	SY	$1.75	
Topsoil	CY	$12	
CULVERTS RCP/CMP			
18-inch	LF	$20	
24-inch	LF	$25	
30-inch	LF	$42	
36-inch	LF	$58	
42-inch	LF	$72	
48-inch	LF	$80	
54-inch	LF	$100	
53"X 34" Ell	LF	$110	
60-inch	LF	$120	
6' X 9' CBC	LF	$480	
2-6' X 8' CBC	LF	$800	
MISCELLANEOUS STRUCTURES			
Wingwalls/headwalls	EA	$5,000	
Riprap outlet protection	EA	$1,500	
Storm Sewer Outlet Structure	EA	$2,500	
Channel outlet structure	EA	$2,000	

Table 8:
Summary of Major Drainageway Costs
Springs Ranch Master Development Drainage Plan Update

	Unit Cost	Unit	Quantity	Total
Drop Structures	350	LF	300	$105,000
Riprap channel linings (2)	800	LF	130	$104,000
Total Construction Cost				$209,000
10% Engineering				$20,900
5% Contingency				$10,450
Total Estimated Drainageway Costs				$240,350
Current channel construction, sta 31+00 to 75+00 (1)				$585,255
Total Sand Creek channel constuction				$825,605

(1) Improvements from station 31+00 to 75+00 completed or currently under construction.
(2) Riprap linings required out of future Sand Creek Detention Basin No. 2.

Table 9:
Summary of Roadway Crossing Costs
Springs Ranch Master Development Drainage Plan Update

	Size/Type	Unit Cost	Unit	Quantity	Total Cost	Comment
Road SB 50	36" RCP	$58	LF	60	$3,480	
Peterson Road at SB 42	60" RCP	$120	LF	300	$36,000	
Peterson Road at SB 41	42" RCP	$72	LF	125	$9,000	
Road SB 25	36" RCP	$58	LF	80	$4,640	
Road SB 46	48" RCP	$80	LF	80	$6,400	
Road SB 31	42" RCP	$72	LF	80	$5,760	
Road SB 28	42" RCP	$72	LF	80	$5,760	
Road SB 21	42" RCP	$72	LF	80	$5,760	
Road SB 18	42" RCP	$72	LF	80	$5,760	
Road SB 17	54" RCP	$106	LF	80	$8,480	
Tutt Boulevard	2-6' x 8'	$800	LF	100	$80,000	(1)
Headwalls and Wingwalls		$4,000	EA	11	$44,000	(1)
Riprap Outlet Protection		$1,500	EA	11	$16,500	(1)
Total Construction Cost					$231,540	
10% Engineering					$23,154	
5% Contingency					$11,577	
Total Estimated Roadway Crossing Costs					$266,271	

(1) These items are reimbursable through the Sand Creek Drainage Basin Fee system

TABLE 10: SPRINGS RANCH MASTER DEVELOPMENT DRAINAGE PLAN UPDATE

SUMMARY OF STORM SEWER OUTFALL AND COLLECTION CHANNEL COSTS

OUTFALL/ BASIN DP	IMPROVEMENT TYPE	Quantity/ Length (FT)	Unit Cost ($/LF)	NUMBER OF DROP STRUCTURES	Total Drop Length (FT)	TOTAL COST	Comments COST
Quarter Circle/Pony Tracks Drive	66" RCP	895				$115,100	(1), (2)
Segment 152	5' CO Inlet	4	2200			$8,800	
	18" RCP	80	20			$1,600	
Sub-basin 22 outfall	24" RCP	420	25			$10,500	
	Grasslined overflow swale	320	50			$16,000	
Design point 46 Outfall System	100yr grasslined, 10' BW	2600	72	8	240	$230,400	
	18" RCP	40	20	4	140	$26,000	
	24" RCP	600	25			$15,000	
	10' CO Inlets	3	4000			$12,000	
	5' Manhole	1	2000			$2,000	
	Outlet Structures	2	3000			$6,000	
Design point 29 Outfall System	100yr grasslined, 10' BW	2700	72	12	360	$259,200	
	42" RCP	350	72			$25,200	
	18" RCP	40	20			$800	
	10' CO Inlets	2	4000			$8,000	
	Outlet Structures	2	3000			$6,000	
Sub-basin 39 Outfall System	100yr riprap, 15' BW	800	100	3	120	$101,600	
	100yr grasslined, 10' BW	4150	72	33	1122	$500,760	
	10' CO Inlets	4	4000			$16,000	
	18" RCP	80	20			$1,600	
	Outlet Structures	1	3000			$3,000	
Design point 35 outfall	100yr riprap, 35' BW	2200	165	8	472	$433,800	(1)
	Outlet Structures	1	3000			$3,000	(1)
Design point 32 Outfall	100yr grasslined, 10' BW	1500	72	4	136	$132,480	
Tutt Boulevard Storm Sewer	42" RCP	800	72			$57,600	
	18" RCP	20	20			$400	
	6' CO Inlets	1	2500			$2,500	
	Manholes	2	2000			$4,000	
TOTAL CONSTRUCTION COSTS						$3,542,259	
5% CONTINGENCY						$177,113	
10% ENGINEERING						$354,226	
TOTAL COSTS						$4,073,598	

(1) These items are reimbursable through the Sand Creek Drainage fee system

(2) Actual construction costs.

SPRINGS RANCH MASTER DEVELOPMENT DRAINAGE PLAN UPDATE

SUMMARY OF STORM SEWER OUTFALL AND COLLECTION CHANNEL COSTS

OUTFALL/ BASIN DP	IMPROVEMENT TYPE	Quantity/ Length (FT)	Unit Cost ($/LF)	NUMBER OF DROP STRUCTURES	Total Drop Length (FT)	TOTAL COST	Comments COST
Constitution Hills North	100-year riprap	250	150	3	75	$51,000	
@ Haystack Drive	Outlet structure	1	3000			$3,000	
Constitution Hills North	100yr riprap	400	150	2	60	$70,800	
@ Constitution Avenue	Outlet structure	1	3000			$3,000	
South Carefree Circle outfall	100yr Riprap, 35' BW	1800	142	4	200	$285,600	(1)
channel (Segment 106, 153)	100yr Riprap, 15' BW	900	100	0	0	$90,000	(1)
	Outlet structures	1	3000	0	0	$3,000	(1)
Design point 15 outfall system	100yr Grasslined, 12' BW	600	75	3	108	$64,440	
	100-yr grasslined, 10' BW	400	72	0	0	$28,800	
	Outlet structures	2	3000			$6,000	
	48" RCP	150	80			$12,000	
	42" RCP	900	72			$64,800	
	30" RCP	800	42			$33,600	
	24" RCP	500	25			$12,500	
	36" RCP	750	58			$43.500	
	12' CO Inlet	2	4200			$8,400	
	10' CO Inlet	1	4000			$4,000	
	8' CO Inlet	2	3500			$7,000	
	Manholes	7	2000			$14,000	
Pony Tracks Drive North Outfall	100yr riprap, 15' BW	200	100			$20,000	
Segment 155	100yr grasslined, 15' BW	1400	90	3	102	$144,360	
	6' X 8' CBC	100	150			$15,000	
	6' X 9' CBC	1045				$153,589	(1), (2)
Design point 20 outfall system	100yr grasslined, 10' BW	2350	72	10	240	$212,400	
	Junction structures	1	4000			$4,000	
	48" RCP	800	80			$64,000	
	18" RCP	80	20			$1,600	
	Manhole	2	2000			$4,000	
Quarter Circle/Pony Tracks Drive	100yr riprap channel, 8' BW	330	95			$31,350	
Segment 154	36" RCP	420	58			$24,360	
	30" RCP	60	42			$2,520	
	24" RCP	380	25			$9,500	
	18"-RCP	40	20			$800	
	4' CO Inlets	1	2000			$2,000	
	10' CO Inlets	1	4000			$4,000	
	20' CO Inlets	5	6000			$30,000	
	Grasslined overflow swale	200	50			$10,000	
	5' Manholes	2	2000			$4,000	

Table 11:
Summary of Detention Basin Costs (1)
Springs Ranch Master Development Drainage Plan Update

	Size	Type	Unit Cost	Unit	Quantity	Total Cost	Comments
Sand Creek Basin # 1 (3)	350 AF	Regional				$1,900,000	(2)
Sand Creek Basin #2 (3)	230 AF	Regional					
Earthwork and revegetatio			$10,000	AF	230	$2,300,000	
Outlet structure			$30,000	EA	1	$30,000	
Drop at flow spreader			$350	LF	200	$70,000	
Forebay			$15,000	EA	1	$15,000	
Total Construction Cost						$4,315,000	
10% Engineering						$431,500	
5% Contingency						$215,750	
Total Estimated Regional Detention Basin Costs						$4,962,250	
Basin at DP 15 (3)	7.6 AF	Local					
Earthwork and revegetation			7000	AF	7.6	$55,000	
Outlet Structure			10000	EA	1	$10,000	
Basin at DP 46	8.2 AF	Local					
Earthwork and revegetation			7000	AF	8.2	$57,400	
Outlet Structure			10000	EA	1	$10,000	
Basin at DP 29 (3)	8.5 AF	Local					
Earthwork and revegetation			7000	AF	8.5	$59,500	
Outlet Structure			10000	EA	1	$10,000	
Total Construction Cost						$201,900	
10% Engineering						$20,190	
5% Contingency						$10,095	
Total Estimated Local Detention Basin Costs						$232,185	

(1) No allowance made for property acquisition costs
(2) Cost shown is from a construction cost estimate prepared for the Springs Ranch Development, based upon the the "Sand Creek Detention Basin No. 1 Final Design Plans" prepared by Kiowa Engineering, June 1996.
(3) Facility costs eligible for reimbursement through the Sand Creek drainage basin fee system.

Table 12:
Summary of Plattable Acreage (2)
Springs Ranch Master Development Drainage Plan Update

Total Acreage within Ranch Development	1328.8
Recorded plat acreages since 1985	
Filing no. 1	101.0
Filing no. 2 (1)	49.1
Filing no. 3	15.0
Filing no. 4	96.5
Filing no. 5	37.0
Filing no. 7	Replat
Filing no. 8	Replat
Filing no. 9	3.7
Filing no. 10	0.8
Filing no. 11	Replat
Springs Ranch Golf Club	5.3
Highlands at Springs Ranch No. 1	24.2
Fire Station No. 1	2.4
Tutt Boulevard	2.1
Cascades Filing no. 1	4.9
Cascades Filing no. 2	8.2
Cascades Filing no. 3	4.0
Total	354.2
Proposed Golf Course Acreage	185.0
Net Plattable Acreage	789.6

(1) Area vacated subtracted from total Filing 2 acreage.
(2) Estimate as of April 1998

APPENDIX A

TR20 Hydrology Model
Existing Condition, 10- and 100-year Frequencies

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C:\QPRO>type b:exsc
1


*******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*******************

JOB TR-20                                         SUMMARY   NOPLOTS
TITLE 001 COLD SPGS RANCH - EXISTING CONDITION
TITLE     24 HR TYPE IIA STORM (100 AND 10-YR, AMC=2)
 5 RAINFL 1               .50
 8              0.000       .0015       0.005       .0080       0.012
 8              0.017       0.021       0.026       0.032       0.046
 8              0.060       0.100       0.700       0.750       0.780
 8              0.800       0.820       0.830       0.840       0.850
 8              0.860       0.870       0.875       0.883       0.890
 8              0.898       0.905       0.912       0.918       0.924
 8              0.930       0.935       0.940       0.945       0.950
 8              0.955       0.960       0.965       0.970       0.975
 8              0.980       0.983       0.985       0.988       0.990
 8              0.993       0.995       0.998       1.000       1.000
 9 ENDTBL
 6 RUNOFF 1  42        1      0.027       65.0        0.36
 6 REACH  3 165    1   2      170.0        0.4        1.64
 6 RUNOFF 1  43        1       0.05       65.0        0.58
 6 ADDHYD 4    43 1 2 3
 6 REACH  3 160    3   1    [illegible]    1.0        1.55
 6 RUNOFF 1  40        2       0.06       65.0        0.46
 6 ADDHYD 4    40 1 2 3
 6 RUNOFF 1  41        1      0.047       65.0        0.36
 6 REACH  3 140    1   2      500.0        1.0        1.55
 6 ADDHYD 4    40 2 3 1
 6 REACH  3 139    1   5     2450.0        0.8        1.55
 6 RUNOFF 1  38        1      0.100       77.0        0.39
 6 REACH  3 159    1   2      500.0        0.5        1.61
 6 RUNOFF 1  37        1      0.030       64.0        0.29
 6 ADDHYD 4    37 1 2 3
 6 REACH  3 158    3   4      500.0        0.3        1.64
 6 RUNOFF 1  52        1      0.326       77.0        0.32
 6 REACH  3 136    1   2     1400.0        0.4        1.61
 6 RUNOFF 1  36        1      0.073       65.0        0.29
 6 ADDHYD 4    36 1 2 3
 6 REACH  3 135    3   1     1250.0        0.4        1.61
 6 RUNOFF 1  35        2      0.044       62.0        0.47
 6 ADDHYD 4    35 1 2 3
 6 ADDHYD 4    35 3 4 1
 6 RUNOFF 1  39        2       0.04       59.0        0.31
 6 ADDHYD 4    35 2 5 3
 6 ADDHYD 4    35 1 3 2
 6 REACH  3 133    2   4     1100.0        0.3        1.64
 6 RUNOFF 1  53        1      0.158       80.0        0.37
 6 REACH  3 134    1   2     2500.0        0.5        1.64
 6 RUNOFF 1  32        1      0.088       61.0        0.35
1


************************80-80 LIST OF INPUT DATA (CONTINUED)**********************

 6 ADDHYD 4    34 1 4 3
 6 RUNOFF 1  33        1      0.036       56.0        0.27
 6 ADDHYD 4    34 1 3 4
```

```
 6 ADDHYD 4     24 1 2 3
 6 REACH  3 152   3   5        1400.0          0.3          1.64
 6 RUNOFF 1  21       1         0.045         45.0          0.41
 6 REACH  3 120   1   2        2200.0          0.9          1.55
 6 RUNOFF 1  20       1         0.073         46.0          0.30
 6 ADDHYD 4     28 1 2 3
 6 RUNOFF 1  28       1         0.044         65.0          0.46
 6 ADDHYD 4     28 1 3 2
 6 REACH  3 157   2   5         400.0          0.7          1.55
 6 RUNOFF 1  31       1         0.042         65.0          0.72
 6 REACH  3 131   1   2        1450.0          0.8          1.57
 6 RUNOFF 1  29       1         0.061         65.0          0.45
 6 ADDHYD 4     29 1 2 3
 6 RUNOFF 1  30       1         0.045         65.0          0.36
 6 REACH  3 129   1   2        1600.0          0.8          1.55
 6 ADDHYD 4     29 2 3 4
 6 REACH  3 166   4   7         650.0          0.5          1.64
 6 RUNOFF 1  26       1         0.033         65.0          0.39
 6 RUNOFF 1  27       2         0.020         65.0          0.29
 6 REACH  3 126   2   3        1300.0          0.8          1.58
 6 ADDHYD 4     26 1 3 2
 6 ADDHYD 4     26 2 7 1
 6 REACH  3 164   1   3         610.0          0.5          1.64
 6 RUNOFF 1  25       1         0.028         65.0          0.31
 6 REACH  3 124   1   2        1500.0          0.7          1.58
 6 ADDHYD 4     24 2 3 1
 6 RUNOFF 1  24       2         0.042         65.0          0.42
 6 ADDHYD 4     24 1 2 3
 6 REACH  3 123   3   1         900.0          0.8          1.58
 6 RUNOFF 1  23       3         0.024         65.0          0.29
 6 ADDHYD 4     23 1 3 2
 6 ADDHYD 4     23 2 5 1
 6 REACH  3 119   1   4        1450.0          1.0          1.61
 6 RUNOFF 1  22       1         0.026         61.0          0.31
 6 REACH  3 156   1   2         400.0          0.8          1.55
 6 RUNOFF 1  19       1         0.052         63.0          0.28
 6 ADDHYD 4     19 1 2 3
 6 ADDHYD 4     19 3 4 1
 6 REACH  3 155   1   2         400.0          0.4          1.55
 6 ADDHYD 4     62 2 6 1
 6 REACH  3 112   1   6        1700.0          0.2          1.64
1

***********************80-80 LIST OF INPUT DATA (CONTINUED)***********************

 6 RUNOFF 1  16       1          0.03         67.0          0.27
 6 REACH  3 116   1   2         700.0          1.0          1.55
 6 RUNOFF 1  17       1         0.053         65.0          0.34
 6 ADDHYD 4     17 1 2 3
 6 REACH  3 117   3   4        1000.           0.9          1.55
 6 RUNOFF 1  18       1         0.078         64.0          0.35
 6 REACH  3 118   1   2        1500.0          1.0          1.55
 6 ADDHYD 4     15 4 2 3
 6 RUNOFF 1  15       1         0.078         66.0          0.34
 6 ADDHYD 4     15 1 3 2
 6 REACH  3 114   2   1        1500.0          1.0          1.61
 6 RUNOFF 1  14       2         0.075         67.0          0.32
 6 ADDHYD 4     14 2 1 3
 6 REACH  3 113   3   2        1000.0          0.7          1.60
 6 RUNOFF 1  13       1         0.042         48.0          0.35
 6 ADDHYD 4     13 1 2 3
 6 RUNOFF 1  11       1         0.076         81.0          0.32
```

```
 6 REACH  3 154   4   1       400.0        0.7        1.55
 6 ADDHYD 4    12 1 6 2
 6 REACH  3 161   2   1       600.0        0.2        1.64
 6 RUNOFF 1  12       2       0.092       53.0        0.33
 6 ADDHYD 4    11 1 2 3
 6 REACH  3 110   3   1      1200.0        0.2        1.64
 6 RUNOFF 1   4       2        0.05       74.0        0.32
 6 ADDHYD 4     4 1 2 3
 6 RUNOFF 1  10       1       0.042       58.0        0.57
 6 ADDHYD 4     4 1 3 2
 6 RUNOFF 1   5       1        0.09       75.0        1.05
 6 REACH  3 104   1   3      1500.0        1.8        1.60
 6 ADDHYD 4     4 2 3 1
 6 REACH  3 103   1   2       500.0        0.2        1.64
 6 RUNOFF 1  54       1        1.25       77.0        0.40
 6 REACH  3 163   1   3       550.0        0.4        1.64
 6 RUNOFF 1   8       1       0.037       69.0        0.40
 6 ADDHYD 4     8 1 3 4
 6 REACH  3 108   4   1       250.0        0.4        1.59
 6 RUNOFF 1   7       3       0.081       67.0        0.52
 6 REACH  3 107   3   4      1000.0        0.5        1.63
 6 ADDHYD 4     7 1 4 3
 6 RUNOFF 1   7       1       0.086       65.0        0.36
 6 ADDHYD 4     7 1 3 4
 6 REACH  3 106   4   1       500.0        0.4        1.59
 6 RUNOFF 1   6       3       0.069       65.0        0.52
 6 ADDHYD 4     6 1 3 4
```

```
********************************80-80 LIST OF INPUT DATA (CONTINUED)********************************

 6 REACH  3 105   4   1       500.0        0.5        1.59
 6 ADDHYD 4     3 1 2 3
 6 REACH  3 102   3   1       800.0        0.2        1.64
 6 RUNOFF 1   3       2       0.041       50.0        0.47
 6 ADDHYD 4     2 1 2 3
 6 REACH  3 101   3   1       400.0        0.2        1.64
 6 RUNOFF 1   1       2       0.016       45.0        0.33
 6 ADDHYD 4     1 1 2 3
 6 RUNOFF 1   2       1       0.065       57.0        0.68
 6 ADDHYD 4     1 3 1 2                                     1 1   1  1 TO SC
   ENDATA
 7 LIST
 7 INCREM 6              .033                                          2-MIN.
 7 COMPUT 7  42      1        0.0         4.4          1.01 2  01  01 100-YR
   ENDCMP 1
 7 COMPUT 7  42      1        0.0         3.0          1.01 2  01  02 10-YR
   ENDCMP 1
   ENDJOB 2
**********************************END OF 80-80 LIST**************************************
1
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 TR20 XEQ  4/19/94    8:21      COLD SPGS RANCH -- EXISTING CONDITION                        7, CONSIDER REDUCING MAIN TIME INCREME
T  ***

      ***  WARNING  REACH 155 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

 *** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE =          .11 CFS.
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*** WARNING REACH 161 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 102 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

1

TR20 XEQ 4/19/94 8:21 COLO SPGS RANCH -- EXISTING CONDITION ICB 1 PAGE 2
REV PC/09/83 (50 MI) (HR) (HR) (IN) (HR) (IN) FT) (HR) (CF
S) (CBM)

ALTERNATE 1 STORM 1

XSECTION 42	RUNOFF	.03	1	2	.07	.0	4.40	24.00	.89	---	6.10	13.86	887.6
XSECTION 166	REACH	.03	1	2	.08	.0	4.40	24.00	.87	---	6.10	13.86	887.6
XSECTION 43	RUNOFF	.05	1	2	.12	.0	4.40	24.00	.88	---	6.27	21.91	678.1
STRUCTURE 43	ADDHYD	.08	1	2	.10	.0	4.40	24.00	.88	---	6.19	34.89	670.1
XSECTION 160	REACH	.08	1	2	.10	.0	4.40	24.00	.87	---	6.20	47.70	619.5
XSECTION 40	RUNOFF	.06	1	2	.07	.0	4.40	24.00	.88	---	6.19	45.29	754.8
STRUCTURE 40	ADDHYD	.14	1	2	.10	.0	4.40	24.00	.88	---	6.24	89.78	655.3
XSECTION 41	RUNOFF	.09	1	2	.07	.0	4.40	24.00	.89	---	6.13	41.83	883.6
XSECTION 140	REACH	.09	1	2	.10	.0	4.40	24.00	.88	---	6.18	40.53	862.3
STRUCTURE 41	ADDHYD	.18	1	2	.10	.0	4.40	24.00	.88	---	6.21	128.83	700.2
XSECTION 159	REACH	.18	1	2	.10	.0	4.40	24.00	.87	---	6.32	117.39	640.7
XSECTION 58	RUNOFF	.21	1	2	.10	.0	4.40	24.00	1.61	---	6.12	159.87	1552.1
XSECTION 139	REACH	.21	1	2	.10	.0	4.40	24.00	1.61	---	6.17	158.22	1536.1
XSECTION 57	RUNOFF	.10	1	2	.10	.0	4.40	24.00	.84	---	6.39	30.82	925.3
STRUCTURE 57	ADDHYD	.24	1	2	.10	.0	4.40	24.00	1.42	---	6.15	184.92	1339.7
XSECTION 138	REACH	.24	1	2	.10	.0	4.40	24.00	1.42	---	6.21	181.15	1312.4
XSECTION 51	RUNOFF	.27	1	2	.10	.0	4.40	24.00	1.62	---	6.08	182.89	1678.0
XSECTION 136	REACH	.27	1	2	.10	.0	4.41	24.00	1.61	---	6.17	181.78	1661.8
XSECTION 56	RUNOFF	.07	1	2	.10	.0	4.40	24.00	.89	---	6.09	21.79	887.4
STRUCTURE 56	ADDHYD	.46	1	2	.10	.0	4.40	24.00	1.48	---	6.17	613.38	1529.0
XSECTION 135	REACH	.43	1	2	.10	.0	4.40	24.00	1.48	---	6.17	601.39	1517.3
XSECTION 55	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.73	---	6.21	28.55	603.4
STRUCTURE 55	ADDHYD	.44	1	2	.03	.0	4.40	24.00	1.40	---	6.18	627.87	1416.6
STRUCTURE 35	ADDHYD	.38	1	2	.03	.0	4.40	24.00	1.41	---	6.18	806.56	1293.0
XSECTION 34	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.60	---	6.11	25.12	628.0
STRUCTURE 33	ADDHYD	.22	1	2	.07	.0	4.40	24.00	.82	---	6.29	129.72	579.1
STRUCTURE 35	ADDHYD	.80	1	2	.03	.0	4.40	24.00	1.24	---	6.19	922.73	1149.1
XSECTION 133	REACH	.80	1	2	.03	.0	4.40	24.00	1.24	---	6.23	916.22	1141.0
XSECTION 32	RUNOFF	.16	1	2	.03	.0	4.40	24.00	1.63	---	6.11	283.89	1776.8
XSECTION 134	REACH	.16	1	2	.07	.0	4.40	24.00	1.63	---	6.18	268.29	1678.0
XSECTION 52	RUNOFF	.09	1	2	.03	.0	4.40	24.00	.89	---	6.13	60.25	884.6
STRUCTURE 34	ADDHYD	.39	1	2	.10	.0	4.40	24.00	1.19	---	6.23	968.00	1083.1

1

TR20 XEQ 4/19/94 8:21 COLO SPGS RANCH -- EXISTING CONDITION ICB 1 SUMMARY
REV PC/09/83 24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2) PAGE 13

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND DATE (SEC) VALUES INDICATES A FLAT TOP HYDROGRAPH

SECTION, STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN HR	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 33	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.47	---	6.09	18.78	521.8
STRUCTURE 34	ADDHYD	.93	1	2	.03	.0	4.40	24.00	1.16	---	6.23	976.32	1053.2
STRUCTURE 34	ADDHYD	1.09	1	2	.03	.0	4.40	24.00	1.26	---	6.22	1238.67	1141.6
XSECTION 34	RUNOFF	.11	1	2	.03	.0	4.40	24.00	1.04	---	6.21	91.99	844.9
STRUCTURE 34	ADDHYD	1.19	1	2	.03	.0	4.40	24.00	1.24	---	6.22	1330.65	1114.4
XSECTION 162	REACH	1.19	1	2	.03	.0	4.40	24.00	1.23	---	6.18	1319.88	1104.8
XSECTION 21	RUNOFF	.05	1	2	.03	.0	4.40	24.00	.12	---	6.25	2.84	87.9
XSECTION 163	REACH	.05	1	2	.03	.0	4.40	24.00	.12	---	6.41	1.81	40.2
XSECTION 20	RUNOFF	.07	1	2	.03	.0	4.40	24.00	.15	---	6.15	7.80	106.9
STRUCTURE 28	ADDHYD	.12	1	2	.03	.0	4.40	24.00	.14	---	6.16	7.96	67.5
XSECTION 28	RUNOFF	.04	1	2	.03	.0	4.4.	24.00	.08	---	6.17	33.21	734.8
STRUCTURE 28	ADDHYD	.16	1	2	.03	.0	4.40	24.00	.24	---	6.13	41.69	253.6
XSECTION 157	REACH	.16	1	2	.03	.0	4.40	24.00	.24	---	6.22	40.81	251.9
XSECTION 31	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.09	---	6.10	39.26	934.7
XSECTION 161	REACH	.04	1	2	.03	.0	4.40	24.00	.08	---	6.19	38.85	846.4
XSECTION 29	RUNOFF	.06	1	2	.03	.0	4.40	24.00	.08	---	6.18	46.79	767.1
STRUCTURE 29	ADDHYD	.10	1	2	.03	.0	4.40	24.00	.08	---	6.18	82.33	799.4
XSECTION 30	RUNOFF	.05	1	2	.03	.0	4.40	24.00	.09	---	6.17	39.76	883.6
XSECTION 159	REACH	.10	1	2	.03	.0	4.40	24.00	.08	---	6.25	35.39	786.5
STRUCTURE 29	ADDHYD	.15	1	2	.03	.0	4.40	24.00	.08	---	6.21	116.71	781.8
XSECTION 160	REACH	.15	1	2	.03	.0	4.40	24.00	.08	---	6.25	114.92	776.8
XSECTION 26	RUNOFF	.12	1	2	.03	.0	4.40	24.00	.08	---	6.15	27.64	837.5
XSECTION 27	RUNOFF	.12	1	2	.03	.0	4.40	24.00	.09	---	6.09	15.67	581.4
XSECTION 164	REACH	.02	1	2	.03	.0	4.40	24.00	.08	---	6.21	17.31	865.5
STRUCTURE 16	ADDHYD	.03	1	2	.03	.0	4.40	24.00	.08	---	6.17	44.14	802.8
STRUCTURE 16	ADDHYD	.30	1	2	.03	.0	4.40	24.00	.08	---	6.27	155.85	779.4
XSECTION 154	REACH	.30	1	2	.03	.0	4.40	24.00	.08	---	6.26	155.61	774.2
XSECTION 25	RUNOFF	.03	1	2	.03	.0	4.40	24.00	.09	---	6.10	26.86	952.1
XSECTION 124	REACH	.33	1	2	.03	.0	4.40	24.00	.08	---	6.19	27.37	822.4
STRUCTURE 24	ADDHYD	.23	1	2	.03	.0	4.40	24.00	.08	---	6.25	176.98	772.8
XSECTION 24	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.08	---	6.17	33.46	796.6
STRUCTURE 24	ADDHYD	.27	1	2	.03	.0	4.40	24.00	.08	---	6.24	207.06	764.1
XSECTION 123	REACH	.27	1	2	.03	.0	4.40	24.00	.08	---	6.24	207.06	764.1
XSECTION 23	RUNOFF	.01	1	2	.03	.0	4.40	24.00	1.11	---	6.08	17.17	1226.8
STRUCTURE 23	ADDHYD	.28	1	2	.03	.0	4.40	24.00	.09	---	6.23	216.82	760.3
STRUCTURE 23	ADDHYD	.49	1	2	.03	.0	4.40	24.00	.09	---	6.23	357.58	576.2

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

ID	OPERATION	AREA (SQ MI)	#	SCNS	INCREMENT (HR)	RECESSION (HR)	AMOUNT (IN)	DURATION (HR)	AMOUNT (IN)	ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 119	REACH	.45	1	2	.03	.0	4.40	24.00	.69	---	6.28	283.16	570.8
XSECTION 22	RUNOFF	.03	1	2	.03	.0	4.40	24.00	.69	---	6.11	19.31	731.3
XSECTION 15a	REACH	.03	1	2	.03	.0	4.40	24.00	.69	---	6.15	18.72	719.9
XSECTION 13	RUNOFF	.08	1	2	.03	.0	4.40	24.00	.64	---	6.09	37.50	721.2
STRUCTURE 19	ADDHYD	.38	1	2	.03	.0	4.40	24.00	.66	---	6.11	54.97	704.7
STRUCTURE 19	ADDHYD	.82	1	2	.03	.0	4.40	24.00	.68	---	6.25	287.14	546.9
XSECTION 183	REACH	.82	1	2	.03	.0	4.40	24.00	.68	---	6.29	286.34	546.6
STRUCTURE 62	ADDHYD	4.72	1	2	.03	.0	4.40	24.00	.97	---	6.27	1604.22	970.3
XSECTION 11I	REACH	1.72	1	2	.03	.0	4.40	24.00	1.06	---	6.32	1571.87	914.3
XSECTION 16	RUNOFF	.07	1	2	.03	.0	4.40	24.00	.99	---	6.13	29.17	972.4
XSECTION 16a	REACH	.32	1	2	.03	.0	4.40	24.00	.99	---	6.18	28.95	981.6
XSECTION 17	RUNOFF	.15	1	2	.03	.0	4.40	24.00	.88	---	6.12	47.64	904.8
STRUCTURE 17	ADDHYD	.38	1	2	.03	.0	4.40	24.00	.92	---	6.14	74.90	902.4
XSECTION 17	REACH	.08	1	2	.03	.0	4.40	24.00	.92	---	6.20	72.90	878.3
XSECTION 18	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.82	---	6.12	31.97	841.3
XSECTION 118	REACH	.4	1	2	.03	.0	4.40	24.00	.82	---	6.21	28.98	762.7
STRUCTURE 18	ADDHYD	.42	1	2	.03	.0	4.40	24.00	.89	---	6.20	101.81	841.4
XSECTION 18	RUNOFF	.08	1	2	.03	.0	4.40	24.00	.94	---	6.11	74.93	960.7
STRUCTURE 18	ADDHYD	.50	1	2	.03	.0	4.40	24.00	.91	---	6.16	170.40	856.3
XSECTION 114	REACH	.20	1	2	.03	.0	4.40	24.00	.91	---	6.21	167.23	840.4
XSECTION 14	RUNOFF	.08	1	2	.03	.0	4.40	24.00	.99	---	6.10	78.60	1050.7
STRUCTURE 14	ADDHYD	.27	1	2	.03	.0	4.40	24.00	.93	---	6.18	231.71	845.7
XSECTION 113	REACH	.27	1	2	.03	.0	4.40	24.00	.93	---	6.22	229.78	838.6
XSECTION 17	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.20	---	6.18	8.27	149.2
STRUCTURE 17	ADDHYD	.32	1	2	.03	.0	4.40	24.00	.83	---	6.22	205.80	746.2
XSECTION 11	RUNOFF	.13	1	2	.03	.0	4.40	24.00	1.91	---	6.07	150.61	1981.7
XSECTION 167	REACH	.13	1	2	.03	.0	4.40	24.00	1.91	---	6.07	150.61	1981.7
STRUCTURE 17	ADDHYD	.39	1	2	.03	.0	4.40	24.00	1.04	---	6.16	353.04	900.6
XSECTION 191	REACH	.39	1	2	.03	.0	4.40	24.00	1.04	---	6.16	353.04	900.6
STRUCTURE 12	ADDHYD	2.11	1	2	.03	.0	4.40	24.00	1.06	---	6.30	1838.95	871.1
XSECTION 161	REACH	2.11	1	2	.03	.0	4.40	24.00	1.06	---	6.30	1838.95	871.1
XSECTION 12	RUNOFF	.09	1	2	.03	.0	4.40	24.00	.76	---	6.14	30.91	336.9
STRUCTURE 11	ADDHYD	2.20	1	2	.03	.0	4.40	24.00	1.03	---	6.30	1857.35	847.1
XSECTION 110	REACH	2.20	1	2	.03	.0	4.40	24.00	1.03	---	6.35	1845.97	837.9
XSECTION 4	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.41	---	6.09	74.52	1490.4
STRUCTURE 4	ADDHYD	2.25	1	2	.03	.0	4.40	24.00	1.04	---	6.34	1872.25	831.0

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE	STANDARD CONTROL	DRAINAGE AREA	RAIN TABLE	ANTEC MOIST	MAIN TIME INCR	PRECIPITATION AMOUNT	PRECIPITATION DURATION	RUNOFF AMOUNT	PEAK DISCHARGE TIME	PEAK DISCHARGE RATE	PEAK DISCHARGE RATE

ALTERNATE 1 STORM 1

ASECTION 10	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.56	---	6.29	15.85	777.4
STRUCTURE 4	ADDHYD	2.30	1	2	.03	.0	4.40	24.00	1.07	---	6.34	1887.66	822.5
ASECTION 5	RUNOFF	.09	1	2	.03	.0	4.40	24.00	1.45	---	6.10	125.89	1503.5
ASECTION 104	REACH	.09	1	2	.03	.0	4.40	24.00	1.48	---	6.18	124.05	1490.6
STRUCTURE 4	ADDHYD	2.38	1	2	.03	.0	4.40	24.00	1.04	---	6.33	1962.55	822.9
ASECTION 105	REACH	2.38	1	2	.03	.0	4.41	24.00	1.04	---	6.33	1962.55	822.9
ASECTION 84	RUNOFF	.26	1	2	.03	.0	4.40	24.00	1.61	---	6.13	359.70	1387.7
ASECTION 163	REACH	.26	1	2	.03	.0	4.40	24.00	1.61	---	6.17	356.86	1526.4
ASECTION 8	RUNOFF	.14	1	2	.03	.0	4.40	24.00	1.16	---	6.14	78.67	1045.6
STRUCTURE 8	ADDHYD	.39	1	2	.03	.0	4.40	24.00	1.55	---	6.17	436.05	1464.8
ASECTION 106	REACH	.39	1	2	.03	.0	4.40	24.00	1.55	---	6.17	436.05	1464.8
ASECTION 9	RUNOFF	.18	1	2	.03	.0	4.40	24.00	.99	---	6.22	67.88	784.9
ASECTION 107	REACH	.08	1	2	.03	.0	4.40	24.00	.98	---	6.29	61.74	762.2
STRUCTURE 7	ADDHYD	.78	1	2	.03	.0	4.41	24.00	1.43	---	6.18	486.47	1297.0
ASECTION 7	RUNOFF	.19	1	2	.03	.0	4.40	24.00	.88	---	6.25	86.07	638.8
STRUCTURE 7	ADDHYD	.46	1	2	.03	.0	4.40	24.00	1.32	---	6.19	539.36	1162.4
ASECTION 106	REACH	.46	1	2	.03	.0	4.40	24.00	1.32	---	6.23	535.66	1154.4
ASECTION 6	RUNOFF	.07	1	2	.03	.0	4.40	24.00	.68	---	6.23	47.76	692.2
STRUCTURE 6	ADDHYD	.53	1	2	.03	.0	4.40	24.00	1.26	---	6.23	583.42	1094.6
ASECTION 108	REACH	.53	1	2	.03	.0	4.40	24.00	1.26	---	6.27	581.40	1090.8
STRUCTURE 3	ADDHYD	2.92	1	2	.03	.0	4.40	24.00	1.08	---	6.32	2520.43	863.8
ASECTION 102	REACH	2.92	1	2	.03	.0	4.40	24.00	1.08	---	6.32	2520.43	863.8
ASECTION 3	RUNOFF	.14	1	2	.03	.0	4.40	24.00	.26	---	6.26	6.92	166.8
STRUCTURE 2	ADDHYD	3.06	1	2	.03	.0	4.40	24.00	1.07	---	6.32	2527.05	854.0
ASECTION 101	REACH	3.06	1	2	.03	.0	4.40	24.00	1.07	---	6.32	2527.05	854.0
ASECTION 1	RUNOFF	.12	1	2	.03	.0	4.40	24.00	.18	---	6.17	1.18	73.9
STRUCTURE 1	ADDHYD	3.17	1	2	.03	.0	4.40	24.00	1.07	---	6.32	2527.93	849.7

ALTERNATE 1 STORM 2

ASECTION 42	RUNOFF	.17	1	2	.03	.0	3.00	24.00	.32	---	6.18	3.12	297.1
ASECTION 165	REACH	.17	1	2	.03	.0	3.00	24.00	.32	---	6.18	8.02	297.1
ASECTION 41	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.31	---	6.31	10.32	206.3
STRUCTURE 43	ADDHYD	.25	1	2	.03	.0	3.00	24.00	.32	---	6.22	14.68	216.6
ASECTION 160	REACH	.25	1	2	.03	.0	3.00	24.00	.31	---	6.27	14.31	185.9
ASECTION 40	RUNOFF	.06	1	2	.03	.0	3.00	24.00	.32	---	6.22	14.87	247.8
STRUCTURE 40	ADDHYD	.14	1	2	.03	.0	3.00	24.00	.31	---	6.26	27.43	200.2
ASECTION 41	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.32	---	6.15	12.96	297.1

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE	STANDARD CONTROL	DRAINAGE	RAIN TABLE	ANTEC MOIST	MAIN TIME	PRECIPITATION		RUNOFF	PEAK DISCHARGE			
						AMOUNT	DURATION	AMOUNT	ELEVATION	TIME	RATE	RATE

ALTERNATE 1 STORM 2

XSECTION 140	REACH	.05	1	2	.03	.0	3.00	24.00	.31	---	6.22	13.07	278.1
STRUCTURE 40	ADDHYD	.18	1	2	.03	.0	3.00	24.00	.31	---	6.25	49.06	217.7
XSECTION 139	REACH	.18	1	2	.03	.0	3.00	24.00	.31	---	6.40	33.84	183.9
XSECTION 36	RUNOFF	.10	1	2	.03	.0	3.00	24.00	.77	---	6.14	72.40	74.7
XSECTION 159	REACH	.10	1	2	.03	.0	3.00	24.00	.77	---	6.19	74.80	704.7
XSECTION 37	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.29	---	6.11	10.02	363.7
STRUCTURE 37	ADDHYD	.14	1	2	.03	.0	3.00	24.00	.65	---	6.18	87.16	620.7
XSECTION 158	REACH	.14	1	2	.03	.0	3.00	24.00	.65	---	6.23	79.81	884.7
XSECTION 32	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.78	---	6.14	267.66	321.6
XSECTION 178	REACH	.03	1	2	.03	.0	3.00	24.00	.77	---	6.16	256.29	736.2
XSECTION 38	RUNOFF	.27	1	2	.03	.0	3.00	24.00	.32	---	6.11	24.67	338.2
STRUCTURE 78	ADDHYD	.49	1	2	.03	.0	3.00	24.00	.69	---	6.18	279.37	700.2
XSECTION 179	REACH	.00	1	2	.03	.0	3.00	24.00	.69	---	6.21	271.66	673.4
XSECTION 35	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.27	---	6.24	7.42	146.3
STRUCTURE 33	ADDHYD	.44	1	2	.03	.0	3.00	24.00	.64	---	6.21	177.78	827.3
STRUCTURE 33	ADDHYD	.88	1	2	.03	.0	3.00	24.00	.64	---	6.22	388.35	814.6
XSECTION 39	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.17	---	6.14	3.65	146.7
STRUCTURE 79	ADDHYD	.22	1	2	.03	.0	3.00	24.00	.29	---	6.39	36.23	161.7
STRUCTURE 34	ADDHYD	.50	1	2	.03	.0	3.00	24.00	.54	---	6.23	384.46	478.8
XSECTION 180	REACH	.81	1	2	.03	.0	3.00	24.00	.54	---	6.28	377.40	470.3
XSECTION 31	RUNOFF	.15	1	2	.03	.0	3.00	24.00	.93	---	6.12	144.36	913.7
XSECTION 174	REACH	.15	1	2	.03	.0	3.00	24.00	.72	---	6.21	130.47	825.8
XSECTION 30	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.22	---	6.16	16.18	163.9
STRUCTURE 76	ADDHYD	.19	1	2	.03	.0	3.00	24.00	.51	---	6.28	389.52	407.2
XSECTION 29	RUNOFF	.13	1	2	.03	.0	3.00	24.00	.11	---	6.13	3.15	87.4
STRUCTURE 31	ADDHYD	.32	1	2	.03	.0	3.00	24.00	.49	---	6.26	394.24	422.5
STRUCTURE 74	ADDHYD	1.13	1	2	.03	.0	3.00	24.00	.36	---	6.26	815.90	478.5
XSECTION 28	RUNOFF	.11	1	2	.03	.0	3.00	24.00	.41	---	6.24	72.82	716.4
STRUCTURE 24	ADDHYD	1.24	1	2	.03	.0	3.00	24.00	.54	---	6.26	849.61	469.2
XSECTION 182	REACH	1.35	1	2	.03	.0	3.00	24.00	.54	---	6.32	838.32	459.9
XSECTION 21	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.03	---	5.333	.000	.0
XSECTION 120	REACH	.05	1	2	.03	.0	3.00	24.00	.00	---	.000	.000	.0
XSECTION 22	RUNOFF	.07	1	2	.03	.0	3.00	24.00	.00	---	5.833	.100	1.0
STRUCTURE 23	ADDHYD	.12	1	2	.03	.0	3.00	24.00	.00	---	5.833	.100	.5
XSECTION 23	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.32	---	6.22	10.91	247.5
STRUCTURE 26	ADDHYD	.16	1	2	.03	.0	3.00	24.00	.09	---	6.22	13.91	67.0

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTED MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

XSECTION 187	REACH	.16	1	2	.03	.0	3.00	24.00	.29	---	6.28	12.68	65.9
XSECTION 31	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.32	---	6.13	13.32	317.2
XSECTION 171	REACH	.04	1	2	.03	.0	3.00	24.00	.31	---	6.27	10.89	257.1
XSECTION 29	RUNOFF	.06	1	2	.03	.0	3.00	24.00	.32	---	6.21	16.38	252.1
STRUCTURE 28	ADDHYD	.10	1	2	.03	.0	3.00	24.00	.32	---	6.24	28.81	280.6
XSECTION 30	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.32	---	6.18	12.37	297.1
XSECTION 129	REACH	.05	1	2	.03	.0	3.00	24.00	.31	---	6.27	10.61	238.6
STRUCTURE 29	ADDHYD	.15	1	2	.03	.0	3.00	24.00	.32	---	6.23	38.21	245.9
XSECTION 166	REACH	.18	1	2	.03	.0	3.00	24.0	.31	---	6.31	35.47	279.3
XSECTION 26	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.32	---	6.17	9.21	276.9
XSECTION 27	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.32	---	6.11	6.76	306.2
XSECTION 128	REACH	.02	1	2	.03	.0	3.00	24.00	.32	---	6.22	5.19	233.7
STRUCTURE 28	ADDHYD	.05	1	2	.03	.0	3.00	24.00	.32	---	6.19	14.22	268.2
STRUCTURE 26	ADDHYD	.21	1	2	.03	.0	3.00	24.00	.31	---	6.28	47.48	276.1
XSECTION 164	REACH	.20	1	2	.03	.0	3.00	24.00	.31	---	6.33	46.96	233.7
XSECTION 25	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.32	---	6.12	9.19	329.1
XSECTION 124	REACH	.03	1	2	.03	.0	3.00	24.00	.31	---	6.26	6.80	242.8
STRUCTURE 24	ADDHYD	.07	1	2	.03	.0	3.00	24.00	.31	---	6.32	53.58	234.0
XSECTION 24	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.32	---	6.19	11.06	263.7
STRUCTURE 24	ADDHYD	.27	1	2	.03	.0	3.00	24.00	.31	---	6.30	62.85	230.8
XSECTION 163	REACH	.27	1	2	.03	.0	3.00	24.00	.31	---	6.34	62.36	230.1
XSECTION 23	RUNOFF	.01	1	2	.03	.0	3.00	24.00	.45	---	6.10	6.86	490.1
STRUCTURE 23	ADDHYD	.28	1	2	.03	.0	3.00	24.00	.32	---	6.33	64.75	227.2
STRUCTURE 27	ADDHYD	.48	1	2	.03	.0	3.00	24.00	.24	---	6.33	75.00	167.3
XSECTION 119	REACH	.49	1	2	.03	.0	3.00	24.00	.27	---	6.39	73.13	163.6
XSECTION 22	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.21	---	6.13	5.19	199.6
XSECTION 156	REACH	.02	1	2	.03	.0	3.00	24.00	.21	---	6.20	4.93	188.7
XSECTION 19	RUNOFF	.06	1	2	.03	.0	3.00	24.00	.19	---	6.12	9.66	185.9
STRUCTURE 19	ADDHYD	.08	1	2	.03	.0	3.00	24.00	.21	---	6.14	13.92	173.8
STRUCTURE 19	ADDHYD	.52	1	2	.03	.0	3.00	24.00	.22	---	6.33	79.07	150.6
XSECTION 155	REACH	.51	1	2	.03	.0	3.00	24.00	.22	---	6.42	78.65	149.9
STRUCTURE 52	ADDHYD	1.72	1	2	.03	.0	3.00	24.00	.45	---	6.33	609.89	554.6
XSECTION 112	REACH	1.72	1	2	.03	.0	3.00	24.00	.44	---	6.41	584.47	540.1
XSECTION 18	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.28	---	6.15	10.62	384.1
XSECTION 116	REACH	.37	1	2	.03	.0	3.00	24.00	.38	---	6.22	11.06	308.7
XSECTION 17	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.32	---	6.14	16.18	505.3

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 1 STORM 2

XSECTION 117	REACH	.08	1	2	.03	.0	3.00	24.00	.34	---	6.24	12.73	188.1
XSECTION 18	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.29	---	6.15	10.28	276.4
XSECTION 118	REACH	.04	1	2	.03	.0	3.00	24.00	.25	---	6.26	8.35	219.7
STRUCTURE 15	ADDHYD	.12	1	2	.03	.0	3.00	24.00	.32	---	6.25	11.06	265.0
XSECTION 15	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.35	---	6.14	26.41	378.5
STRUCTURE 15	ADDHYD	.20	1	2	.03	.0	3.00	24.00	.33	---	6.20	54.63	274.3
XSECTION 114	REACH	.20	1	2	.03	.0	3.00	24.00	.33	---	6.27	52.14	261.5
XSECTION 14	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.32	---	6.12	29.07	387.6
STRUCTURE 14	ADDHYD	.27	1	2	.03	.0	3.00	24.00	.34	---	6.21	72.87	265.3
XSECTION 113	REACH	.27	1	2	.03	.0	3.00	24.00	.34	---	6.28	71.15	259.7
XSECTION 13	RUNOFF	.34	1	2	.03	.0	3.00	24.00	.01	---	6.05	.15	3.6
STRUCTURE 13	ADDHYD	.61	1	2	.03	.0	3.00	24.00	.20	---	6.28	71.15	225.2
XSECTION 11	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.98	---	6.09	78.62	1004.5
XSECTION 167	REACH	.08	1	2	.03	.0	3.00	24.00	.96	---	6.09	78.62	1004.5
STRUCTURE 17	ADDHYD	.37	1	2	.03	.0	3.00	24.00	.43	---	6.17	127.58	325.5
XSECTION 184	REACH	.37	1	2	.03	.0	3.00	24.00	.43	---	6.17	127.56	325.5
STRUCTURE 12	ADDHYD	2.11	1	2	.03	.0	3.00	24.00	.44	---	6.39	666.97	315.9
XSECTION 161	REACH	2.11	1	2	.03	.0	3.00	24.00	.44	---	6.43	665.69	315.3
XSECTION 12	RUNOFF	.07	1	2	.03	.0	3.00	24.00	.06	---	6.21	2.71	29.4
STRUCTURE 11	ADDHYD	2.20	1	2	.03	.0	3.00	24.00	.42	---	6.43	667.49	303.0
XSECTION 110	REACH	2.20	1	2	.03	.0	3.00	24.00	.42	---	6.49	657.60	298.5
XSECTION 1	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.24	---	6.10	33.81	676.2
STRUCTURE 4	ADDHYD	2.25	1	2	.03	.0	3.00	24.00	.43	---	6.48	665.32	295.7
XSECTION 10	RUNOFF	.04	1	1	.03	.0	3.00	24.00	.14	---	6.35	3.21	76.4
STRUCTURE 4	ADDHYD	2.30	1	2	.03	.0	3.00	24.00	.42	---	6.48	668.14	291.1
XSECTION 8	RUNOFF	.09	1	2	.03	.0	3.00	24.00	.68	---	6.12	62.50	674.5
XSECTION 104	REACH	.09	1	2	.03	.0	3.00	24.00	.68	---	6.17	61.03	678.1
STRUCTURE 1	ADDHYD	2.39	1	2	.03	.0	3.00	24.00	.43	---	6.48	688.23	288.6
XSECTION 107	REACH	2.39	1	2	.03	.0	3.00	24.00	.43	---	6.51	668.00	288.5
XSECTION 34	RUNOFF	.06	1	2	.03	.0	3.00	24.00	.77	---	6.14	190.80	773.8
XSECTION 103	REACH	.06	1	2	.03	.0	3.00	24.00	.77	---	6.19	187.34	720.5
XSECTION 9	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.44	---	6.16	14.99	405.2
STRUCTURE 3	ADDHYD	.71	1	2	.03	.0	3.00	24.00	.73	---	6.19	202.07	680.4
XSECTION 115	REACH	.71	1	2	.03	.0	3.00	24.00	.73	---	6.19	202.07	680.4
XSECTION 9	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.38	---	6.25	22.51	278.3

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 107	REACH	.08	1	2	.03	.0	3.00	24.00	.37	---	6.35	21.06	260.0

STRUCTURE 7	ADDHYD	.46	1	2	.03	.0	3.00	24.00	.59	---	6.21	234.36	305.1
XSECTION 106	REACH	.46	1	2	.03	.0	3.00	24.00	.59	---	6.26	230.45	456.6
XSECTION 6	RUNOFF	.07	1	2	.03	.0	3.00	24.00	.22	---	6.26	15.54	225.2
STRUCTURE 6	ADDHYD	.53	1	2	.03	.0	3.00	24.00	.55	---	6.26	245.98	461.5
XSECTION 103	REACH	.53	1	2	.03	.0	3.00	24.00	.55	---	6.31	243.47	456.8
STRUCTURE 3	ADDHYD	2.92	1	2	.03	.0	3.00	24.00	.45	---	6.46	859.84	294.7
XSECTION 102	REACH	2.92	1	2	.03	.0	3.00	24.00	.45	---	6.50	857.26	294.5
XSECTION 3	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.33	---	6.76	.28	5.8
STRUCTURE 2	ADDHYD	2.96	1	2	.03	.0	3.00	24.00	.45	---	6.50	856.48	290.3
XSECTION 101	REACH	2.96	1	2	.03	.0	3.00	24.00	.45	---	6.50	859.43	290.3
XSECTION 1	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.00	---	9.977	.017	.7
STRUCTURE 1	ADDHYD	2.97	1	2	.03	.0	3.00	24.00	.44	---	6.50	859.46	288.9

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SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(X) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

	HYDROGRAPH INFORMATION							ROUTING PARAMETERS								PEAK TRAVEL TIME	
			OUTFLOW+					VOLUME	MAIN	ITER-	Q AND A			PEAK	S/S	ATT-	
REC	REACH	INFLOW	OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	BTCR- KINE-
#	LENGTH FT	PEAK CFS	TIME HR	PEAK CFS	TIME (HR)	PEAK CFS	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	Q/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 1																	
												.400					
+138	100	24	6.1	24	6.1			0	.57	.03	0	1.64	.002	1.000	31	1.007	.00 .00
+					---	---											
												1.00					
+141	2400	82	6.2	48	6.3			0	.88	.03	1	1.65	.059	.926	319	.71	.10 .09
+					---	---											
												1.00					
+140	800	41	6.1	40	6.2			0	.89	.03	1	1.65	.025	.976	138	.60	.03 .04
+					---	---											
												.800					
+139	2450	129	6.2	118	6.3			0	.88	.03	1	1.65	.066	.914	328	.71	.10 .09
+					---	---											
												.500					
+159	860	159	6.1	158	6.2			0	1.61	.03	1	1.61	.015	.994	112	.697	.03 .03
+					---	---											
												.300					
+158	900	184	6.1	181	6.2			0	1.42	.03	1	1.64	.023	.982	149	.57	.07 .04
+					---	---											
												.400					
+136	1400	552	6.1	542	6.1			0	1.62	.03	1	1.61	.025	.982	141	.39	.07 .04
+					---	---											
												.400					
+135	1250	608	6.1	601	6.2			0	1.48	.03	1	1.61	.019	.988	121	.66	.03 .03

+						---	---											
												.500						
+134	2500	284	6.1	268	6.2			0	1.83	.03	1	1.64	.059	.944	257	.28	.07	.07
+						---	---											
												.300						
+162	1400	1328	6.2	1318	6.3			0	1.24	.03	1	1.64	.012	.993	107	.717	.07	.03
+						---	---											
												.900						
+120	2200	3	6.3	2	6.6			0	.12*	.03	1	1.55	.199	.640	1081	.11	.26	.31
+						---	---											
												.700						
+157	400	41	6.2	41	6.2			0	.24	.03	1	1.55	.008	.992	87	.817	.07	.02
+						---	---											
												.500						
+171	1450	39	6.1	35	6.2			0	.89	.03	1	1.57	.080	.902	281	.35	.07	.08
+						---	---											
												.800						
+129	1e00	40	6.1	35	6.2			0	.89	.03	1	1.55	.092	.888	323	.31	.07	.09
+						---	---											
												.500						
+186	650	116	6.2	115	6.2			0	.88	.03	1	1.64	.010	.991	95	.777	.03	.03
+						---	---											
												.800						
+126	1700	20	6.1	17	6.2			0	.89	.03	1	1.58	.104	.886	318	.31	.07	.09
+						---	---											
												.600						
+164	600	156	6.2	155	6.3			0	.88	.03	1	1.64	.006	.997	70	.922	.03	.02
+						---	---											
												.700						
+124	1500	27	6.1	23	6.2			0	.89	.03	1	1.58	.119	.863	357	.29	.10	.10
+						---	---											
												.800						
+123	500	207	6.2	207	6.2			0	.88	.03	0	1.58	.004	1.000	51	1.007	.00	.00
-						---	---											
												1.00						
+119	1450	257	6.2	255	6.3			0	.69	.03	1	1.61	.012	.990	110	.707	.03	.03
-						---	---											
												.600						
+156	400	19	6.1	19	6.1			0	.69	.03	1	1.55	.018	.979	105	.727	.03	.03
+						---	---											
												.400						
+155	400	286	6.2	286	6.3			0	.68	.03	1	1.55	.005	.999	63	.979	.07	.02
+						---	---											
												.200						
+112	1700	1604	6.3	1569	6.3			0	1.07	.03	1	1.64	.021	.978	155	.55	.07	.04
+						---	---											
												1.00						
+118	700	29	6.1	28	6.2			0	.99	.03	1	1.55	.024	.977	137	.61	.03	.04
+						---	---											
												.500						
+117	1000	75	6.1	73	6.2			0	.92	.03	1	1.55	.027	.972	149	.57	.07	.04
+						---	---											
												1.00						
+115	1500	32	6.1	29	6.2			0	.83	.03	1	1.55	.076	.910	283	.35	.07	.08
+						---	---											
												1.00						
+114	1500	170	6.2	167	6.2			0	.91	.03	1	1.61	.020	.981	133	.62	.03	.04
+						---	---											
												.700						
+147	1000	270	6.2	270	6.2			0	.87	.03	1	1.60	.012	.988	101	.742	.03	.03

+167	400	151	6.1	151	6.1	---	---		0	1.41	.03	0		1.61	.002	1.000	28	1.007	.00	.00
+154	400	353	6.2	353	6.2	---	---		0	1.04	.03	0	.700	1.55	.003	1.000	41	1.007	.00	.00
+161	600	1839	6.3	1839	6.3	---	---		0	1.06	.03	0	.200	1.64	.003	1.000	52	1.007	.00	.00

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SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK (?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS. SEE PREVIOUS WARNINGS

XSEC ID	REACH LENGTH (FT)	INFLOW PEAK (CFS)	INFLOW TIME (HR)	OUTFLOW PEAK (CFS)	OUTFLOW TIME (HR)	INTERM. AREA OUTFLOW PEAK (CFS)	INTERM. AREA OUTFLOW TIME (HR)	BASE-FLOW (CFS)	VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	Q AND A EQUATION COEFF (X)	Q AND A EQUATION POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO Q/I (Q*)	B/G SPEAK (K) (SEC)	ATT-KIN COEFF (C)	PEAK TRAVEL TIME STOR-AGE (HR)	PEAK TRAVEL TIME KINE-MATIC (HR)
ALTERNATE 1 STORM 1																			
+110	1000	1557	6.3	1544	6.3	---	---	0	1.00	.03	1	.200	1.64	.010	.997	130	.727	.03	.03
+104	1500	135	6.1	134	6.1	---	---	0	1.48	.03	1	1.80	1.50	.015	.989	103	.737	.03	.03
+103	500	1962	6.3	1962	6.3	---	---	0	1.04	.03	0	.200	1.64	.002	1.000	42	1.007	.00	.00
+157	950	399	6.1	397	6.2	---	---	0	1.61	.03	1	.400	1.64	.012	.995	58	.757	.03	.03
+108	250	435	6.2	435	6.2	---	---	0	1.55	.03	0	.400	1.59	.002	1.000	29	1.007	.00	.00
+107	1000	63	6.2	62	6.3	---	---	0	.99	.03	1	.500	1.63	.025	.972	185	.48	.07	.05
+106	900	538	6.2	535	6.3	---	---	0	1.32	.03	1	.400	1.59	.011	.995	58	.759	.07	.03
+153	900	583	6.2	581	6.3	---	---	0	1.26	.03	1	.500	1.59	.008	.997	82	.849	.03	.02
+102	600	2516	6.3	2516	6.3	---	---	0	1.08	.03	0	.200	1.64	.002	1.000	46	1.007	.00	.00
+101	600	2537	6.3	2537	6.3			0	1.07	.03	0	.200	1.64	.001	1.000	31	1.007	.00	.00

ALTERNATE 1 STORM 2

+165	100	8	6.1	8	6.1	---	---	0	.32	.03	0	.400	1.64	.002	1.000	47	1.00?	.00	.00
+160	2000	17	6.2	14	6.4	---	---	0	.32	.03	1	1.00	1.55	.094	.861	476	.22	.16	.14
+140	300	14	6.1	13	6.2	---	---	0	.32	.03	1	1.00	1.55	.040	.935	207	.45	.10	.06
+129	2450	40	6.2	34	6.4	---	---	0	.31	.03	1	.800	1.55	.101	.848	493	.21	.16	.14
+159	800	76	6.1	74	6.2	---	---	0	.77	.03	1	.500	1.61	.024	.974	148	.57	.07	.04
+158	900	63	6.2	59	6.2	---	---	0	.65	.03	1	.300	1.64	.037	.956	204	.45	.07	.06
+135	1400	267	6.1	265	6.2	---	---	0	.78	.03	1	.400	1.61	.040	.956	185	.49	.07	.05
+136	1250	278	6.1	276	6.2	---	---	0	.69	.03	1	.400	1.61	.030	.972	163	.54	.07	.05
+170	1100	384	6.2	377	6.3	---	---	0	.64	.03	1	.300	1.64	.018	.982	137	.60	.03	.04
+174	2500	144	6.1	136	6.2	---	---	0	.60	.03	1	.500	1.64	.091	.906	334	.30	.10	.09
+161	1400	549	6.3	532	6.3	---	---	0	.84	.03	1	.300	1.64	.019	.977	152	.56	.03	.04
+120	2200	0	.0	0	.0	---	---	0	.00	.03	0	.000	.00	.000	.000	0	.00	.00	.00
+167	400	11	6.2	11	6.3	---	---	0	.09	.03	1	.700	1.55	.017	.983	139	.63	.07	.04
+121	1450	12	6.1	11	6.3	---	---	0	.32	.03	1	.800	1.57	.133	.814	416	.25	.10	.12
+129	1600	13	6.1	11	6.3	---	---	0	.32	.03	1	.800	1.55	.151	.796	476	.22	.13	.14
+166	650	36	6.2	35	6.3	---	---	0	.32	.03	1	.500	1.64	.016	.979	149	.57	.07	.04
+126	1300	7	6.1	5	6.2	---	---	0	.32	.03	1	.800	1.58	.181	.764	470	.22	.13	.14
+164	600	47	6.3	47	6.3	---	---	0	.31	.03	1	.600	1.64	.010	.989	111	.70?	.07	.03
+124	1800	9	6.1	7	6.3	---	---	0	.32	.03	1	.700	1.58	.203	.751	530	.20	.13	.15
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.800	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

+119	1450	75	6.3	73	6.4			0	.24	.03	1	1.61	.019	.975	176	.51	.07	.05
+						---	---											
1																		

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS. SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS								PEAK TRAVEL TIME	
				OUTFLOW+					VOLUME	MAIN	ITER-	X AND A			PEAK	S/S	ATT-	STOR- KINE-
+SEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	SPEAK	KIN	AGE MATIC
	ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (S*)	Q/I (Q*)	(K) (SEC)	COEFF (C)	(HR) (HR)
	ALTERNATE	1	STORM	2														
+182	400	8	6.1	8	6.2			0	.21	.03	1	.800 1.55	.030	.944	166	.53	.07	.05
+						---	---											
+188	400	79	6.4	79	6.4			0	.23	.03	1	.400 1.55	.002	.994	99	.759	.07	.05
+						---	---											
+122	1700	609	6.3	584	6.4			0	.45	.02	1	.200 1.64	.034	.959	227	.42	.07	.06
+						---	---											
+116	700	11	6.1	10	6.2			0	.36	.03	1	1.00 1.55	.033	.946	196	.47	.07	.05
+						---	---											
+117	1000	25	6.2	24	6.2			0	.34	.03	1	.500 1.55	.043	.937	219	.42	.07	.06
+						---	---											
+118	1600	10	6.1	8	6.3			0	.29	.03	1	1.00 1.55	.126	.814	424	.25	.13	.12
+						---	---											
+114	1500	55	6.2	52	6.3			0	.33	.03	1	1.00 1.61	.032	.984	205	.45	.07	.06
+						---	---											
+113	1000	73	6.2	71	6.3			0	.34	.03	1	.700 1.60	.019	.978	157	.55	.07	.04
+						---	---											
+157	400	73	6.1	78	6.1			0	.98	.03	0	1.80 1.61	.003	1.000	36	1.007	.00	.00
+						---	---											
+154	400	128	6.2	128	6.2			0	.43	.03	0	.700 1.55	.004	1.000	58	1.007	.00	.00
+						---	---											
+161	600	666	6.4	665	6.4			0	.44	.03	1	.200 1.64	.005	.999	77	.872	.03	.02
+						---	---											

```
                                                                                    1.30
 +104   1500    62   6.1     61   6.2                       0     .68    .03    1          1.60   .024   .980    138  .60     .07    .04
 +                                         ---   ---
                                                                                    .200
 +103    500   688   6.5    687   6.5                       0     .43    .03    1          1.64   .003   .999     64  .977    .03    .02
 +                                         ---   ---
                                                                                    .400
 +163    950   191   6.1    187   6.2                       0     .77    .03    1          1.64   .018   .981    130  .63     .07    .04
 +                                         ---   ---

                                                                                    .400
 +108    250   202   6.2    202   6.2                       0     .73    .03    0          1.59   .003  1.000     39 1.007    .00    .00
 +                                         ---   ---
                                                                                    .500
 +107   1000    22   6.2     21   6.3                       0     .38    .03    1          1.63   .043   .937    282  .35     .10    .08
 +                                         ---   ---
                                                                                    .400
 +106    900   234   6.2    230   6.3                       0     .59    .03    1          1.59   .017   .982    133  .62     .07    .04
 +                                         ---   ---
                                                                                    .500
 +153    900   246   6.3    243   6.3                       0     .55    .03    1          1.59   .013   .991    114  .697    .03    .03
 +                                         ---   ---
                                                                                    .200
 +102    600   560   6.5    557   6.5                       0     .45    .03    1          1.64   .004   .999     70  .927    .03    .02
 +                                         ---   ---

                                                                                    .200
 +101    400   359   6.5    359   6.5                       0     .45    .03    0          1.64   .002  1.000     47 1.007    .00    .00
 +                                         ---   ---
 1
```

```
  TR20 XEQ  4/19/94    9:21      COLD SPGS RANCH -- EXISTING CONDITION                                JOB  1   SUMMARY
      REV PC/09/83               24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                                  PAGE  23


  SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

  XSECTION/           DRAINAGE
  STRUCTURE             AREA       STORM NUMBERS..........
    ID                 (SQ MI)           1         2

 0 STRUCTURE  62          1.72
 +____________________________
     ALTERNATE    1                1604.32    609.59
 0 STRUCTURE  43           .08
 +____________________________
     ALTERNATE    1                  51.59     16.68
 0 STRUCTURE  40           .19
 +____________________________
     ALTERNATE    1                 128.83     40.06
 0 STRUCTURE  37           .14
 +____________________________
     ALTERNATE    1                 184.92     83.06
 0 STRUCTURE  36           .40
 +____________________________
     ALTERNATE    1                 610.08    279.37
 0 STRUCTURE  35           .80
 +____________________________
     ALTERNATE    1                 922.75    384.46
 0 STRUCTURE  34          1.19
 1
```

	ALTERNATE	1	115.71	36.26
0	STRUCTURE 28	.16		
	ALTERNATE	1	41.09	10.91
0	STRUCTURE 26	.20		
	ALTERNATE	1	155.85	47.46
0	STRUCTURE 24	.27		
	ALTERNATE	1	207.06	62.55
0	STRUCTURE 23	.45		
	ALTERNATE	1	257.58	75.00
0	STRUCTURE 19	.52		
	ALTERNATE	1	287.14	79.07
0	STRUCTURE 17	.08		
	ALTERNATE	1	74.90	25.32
1				

SUMMARY TABLE 1 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 STRUCTURE 16	.20		
ALTERNATE 1		171.40	54.63
0 STRUCTURE 14	.27		
ALTERNATE 1		231.71	72.83
0 STRUCTURE 13	.39		
ALTERNATE 1		353.04	127.58
0 STRUCTURE 12	2.11		
ALTERNATE 1		1838.95	666.93
0 STRUCTURE 11	2.20		
ALTERNATE 1		1857.35	667.49
0 STRUCTURE 8	.30		
ALTERNATE 1		435.05	202.07
0 STRUCTURE 7	.46		
ALTERNATE 1		539.36	234.38
0 STRUCTURE 6	.53		
ALTERNATE 1		583.42	245.98
0 STRUCTURE 4	2.38		
ALTERNATE 1		1962.55	688.23
0 STRUCTURE 3	2.92		

	ALTERNATE	1	2527.05	859.48
0	STRUCTURE	1	2.97	
	ALTERNATE	1	2527.93	859.48
0	XSECTION	1	.02	
	ALTERNATE	1	1.18	.01
0	XSECTION	3	.04	
	ALTERNATE	1	6.92	.28
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID			DRAINAGE AREA SQ MI	STORM NUMBERS,..... 1	2
0	XSECTION	4	.05		
	ALTERNATE	1		74.52	32.81
0	XSECTION	5	.09		
	ALTERNATE	1		135.50	62.51
0	XSECTION	6	.37		
	ALTERNATE	1		47.76	16.54
0	XSECTION	7	.09		
	ALTERNATE	1		36.37	18.25
0	XSECTION	8	.04		
	ALTERNATE	1		38.69	14.99
0	XSECTION	9	.08		
	ALTERNATE	1		63.58	22.51
0	XSECTION	10	.04		
	ALTERNATE	1		15.85	3.21
0	XSECTION	11	.08		
	ALTERNATE	1		150.61	78.62
0	XSECTION	12	.09		
	ALTERNATE	1		30.91	2.71
0	XSECTION	13	.04		
	ALTERNATE	1		6.27	.15
0	XSECTION	14	.08		
	ALTERNATE	1		78.80	29.07
0	XSECTION	15	.08		
	ALTERNATE	1		74.93	26.41
0	XSECTION	16	.03		

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 18	.04		
ALTERNATE 1		31.97	10.28
0 XSECTION 19	.05		
ALTERNATE 1		37.50	9.66
0 XSECTION 20	.07		
ALTERNATE 1		7.30	.10
0 XSECTION 21	.05		
ALTERNATE 1		2.84	.03
0 XSECTION 22	.03		
ALTERNATE 1		19.01	6.19
0 XSECTION 23	.01		
ALTERNATE 1		17.17	6.86
0 XSECTION 24	.04		
ALTERNATE 1		33.46	11.06
0 XSECTION 25	.03		
ALTERNATE 1		26.66	9.10
0 XSECTION 26	.03		
ALTERNATE 1		27.64	9.20
0 XSECTION 27	.02		
ALTERNATE 1		19.67	6.76
0 XSECTION 28	.04		
ALTERNATE 1		33.21	10.91
0 XSECTION 29	.06		
ALTERNATE 1		46.79	15.38
0 XSECTION 30	.05		
ALTERNATE 1		39.76	13.37
0 XSECTION 31	.04		
ALTERNATE 1		39.26	13.32

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 32	.09		
+ ALTERNATE 1		60.25	16.18
0 XSECTION 33	.04		
+ ALTERNATE 1		18.78	3.15
0 XSECTION 34	.11		
+ ALTERNATE 1		91.99	33.82
0 XSECTION 35	.04		
+ ALTERNATE 1		26.55	7.42
0 XSECTION 36	.07		
+ ALTERNATE 1		71.79	24.69
0 XSECTION 37	.03		
+ ALTERNATE 1		30.53	10.02
0 XSECTION 38	.10		
+ ALTERNATE 1		159.87	76.42
0 XSECTION 39	.04		
+ ALTERNATE 1		25.12	5.89
0 XSECTION 40	.06		
+ ALTERNATE 1		45.29	14.87
0 XSECTION 41	.05		
+ ALTERNATE 1		41.53	13.96
0 XSECTION 42	.03		
+ ALTERNATE 1		23.86	8.02
0 XSECTION 43	.06		
+ ALTERNATE 1		31.91	10.32
0 XSECTION 52	.33		
+ ALTERNATE 1		552.59	267.66
0 XSECTION 53	.16		
+ ALTERNATE 1		283.89	144.36

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE	DRAINAGE AREA	STORM NUMBERS.....

	ALTERNATE	1	399.70	190.80
0 XSECTION	101	2.96		
	ALTERNATE	1	2527.05	859.48
0 XSECTION	102	2.92		
	ALTERNATE	1	2520.43	859.26
0 XSECTION	103	2.38		
	ALTERNATE	1	1962.55	688.00
0 XSECTION	104	.09		
	ALTERNATE	1	134.15	61.03
0 XSECTION	106	.46		
	ALTERNATE	1	539.66	230.45
0 XSECTION	107	.08		
	ALTERNATE	1	61.74	21.06
0 XSECTION	108	.30		
	ALTERNATE	1	435.05	202.07
0 XSECTION	110	2.20		
	ALTERNATE	1	1845.97	657.60
0 XSECTION	112	1.72		
	ALTERNATE	1	1571.63	584.43
0 XSECTION	113	.27		
	ALTERNATE	1	225.78	71.15
0 XSECTION	114	.20		
	ALTERNATE	1	167.23	52.04
0 XSECTION	116	.03		
	ALTERNATE	1	15.55	10.06
0 XSECTION	117	.08		
	ALTERNATE	1	72.90	23.75
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION	118	.04		
	ALTERNATE	1	28.98	8.35
0 XSECTION	119	.45		
	ALTERNATE	1	255.16	73.13
0 XSECTION	120	.05		

	ALTERNATE	1	207.06	62.36
0 XSECTION 124		.03		
	ALTERNATE	1	23.03	6.80
0 XSECTION 126		.02		
	ALTERNATE	1	17.31	5.19
0 XSECTION 129		.05		
	ALTERNATE	1	35.39	10.60
0 XSECTION 131		.04		
	ALTERNATE	1	35.55	10.80
0 XSECTION 133		.30		
	ALTERNATE	1	916.22	377.40
0 XSECTION 134		.16		
	ALTERNATE	1	268.29	130.47
0 XSECTION 135		.40		
	ALTERNATE	1	801.39	270.86
0 XSECTION 136		.33		
	ALTERNATE	1	541.75	256.29
0 XSECTION 139		.18		
	ALTERNATE	1	117.39	33.84
0 XSECTION 140		.05		
	ALTERNATE	1	40.53	13.07
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 153		.53		
	ALTERNATE	1	581.40	243.47
0 XSECTION 154		.39		
	ALTERNATE	1	353.04	127.58
0 XSECTION 155		.52		
	ALTERNATE	1	286.94	78.68
0 XSECTION 156		.03		
	ALTERNATE	1	18.72	4.90
0 XSECTION 157		.16		
	ALTERNATE	1	40.81	10.68
0 XSECTION 158		.14		

```
+_____________________________
   ALTERNATE   1              158.22    74.60
0 XSECTION  160         .08
+_____________________________
   ALTERNATE   1               47.70    14.31
0 XSECTION  161        2.11
+_____________________________
   ALTERNATE   1             1838.95   665.69
0 XSECTION  162        1.19
+_____________________________
   ALTERNATE   1             1319.08   538.32
0 XSECTION  163         .26
+_____________________________
   ALTERNATE   1              396.86   187.34
0 XSECTION  164         .20
+_____________________________
   ALTERNATE   1              155.61    46.96
0 XSECTION  165         .03
+_____________________________
   ALTERNATE   1               23.86     8.02
0 XSECTION  166         .15
+_____________________________
   ALTERNATE   1              114.92    35.43
1
```


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 167	.08		
+_____ ALTERNATE 1		150.61	78.62

```
1END OF  1 JOBS IN THIS RUN
```

APPENDIX B

TR20 Hydrology Model
Future Condition, 10- and 100-year Frequencies

A

type wray
1

```
********************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY********************

JOB TR-20                                          SUMMARY   NOPLOTS
TITLE 001 SPGS RANCH MDDP - FUTURE CONDITION-CSFUREV3.DAT
TITLE     24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)
 5 RAINFL 1                .50
 8                0.000      .0015      0.005      .0080      0.012
 8                0.017      0.021      0.026      0.032      0.046
 8                0.060      0.100      0.700      0.750      0.780
 8                0.800      0.820      0.830      0.840      0.850
 8                0.860      0.870      0.875      0.883      0.890
 8                0.898      0.905      0.912      0.918      0.924
 8                0.930      0.935      0.940      0.945      0.950
 8                0.955      0.960      0.965      0.970      0.975
 8                0.980      0.983      0.985      0.988      0.990
 8                0.993      0.995      0.998      1.000      1.000
 9 ENDTBL
 3 STRUCT      99
 8                          0.          0.         0.
 8                          2.         80.       1.48
 8                          4.        125.       3.77
 8                          6.        150.       6.50
 8                          8.        180.       9.70
 8                         10.        210.       13.8
 9 ENDTBL
 6 RUNOFF 1  42        1        0.027        81.0        0.36
 6 REACH  3 165   1    2        100.0         0.4        1.64
 6 RUNOFF 1  43        1         0.05        80.0        0.58
 6 ADDHYD 4    43 1 2 3
 6 REACH  3 160   3    1       2000.0         0.9        1.55
 6 RUNOFF 1  40        2         0.06        84.0        0.46
 6 ADDHYD 4    40 1 2 3
 6 RUNOFF 1  41        1        0.047        75.0        0.36
 6 REACH  3 140   1    2        800.0         1.2        1.52
 6 ADDHYD 4    40 2 3 1
 6 REACH  3 139   1    5       2450.0         0.7        1.55
 6 RUNOFF 1  38        1        0.103        93.0        0.31
 6 REACH  3 159   1    2        800.0         0.5        1.61
 6 RUNOFF 1  37        1        0.033        66.0        0.28
 6 ADDHYD 4    37 1 2 3
 6 REACH  3 158   3    4        900.0         0.3        1.64
 6 RUNOFF 1  52        1        0.326        84.0        0.32
 6 REACH  3 136   1    2       1400.0         0.4        1.61
 6 RUNOFF 1  36        1        0.073        67.0        0.26
 6 ADDHYD 4    36 1 2 3
 6 REACH  3 135   3    1       1250.0         0.4        1.61
 6 RUNOFF 1  35        2        0.044        69.0        0.30
 6 ADDHYD 4    35 1 2 3
1

********************80-80 LIST OF INPUT DATA (CONTINUED)********************
```

ENDJOB 1
ENDJOB 2
0**********END OF 80-80 LIST**********
1

FILE NO. 1
0 COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

```
 6 ADDHYD 4    35 2 5 3
 6 ADDHYD 4    35 1 3 2
 6 REACH  3 133   2   4       1100.0         0.3        1.64
 6 RUNOFF 1  53         1        0.158        84.0        0.37
 6 REACH  3 134   1   2       2500.0         0.5        1.64
 6 RUNOFF 1  32         1        0.088        75.0        0.33
 6 ADDHYD 4    34 1 4 3
 6 RUNOFF 1  33         1        0.036        75.0        0.31
 6 ADDHYD 4    34 1 3 4
 6 ADDHYD 4    34 2 4 1
 6 RUNOFF 1  34         2        0.109        92.0        0.32
 6 ADDHYD 4    34 1 2 3
 6 REACH  3 162   3   6       1400.0         0.3        1.64
 6 RUNOFF 1  21         1        0.045        75.0        0.34
 6 REACH  3 120   1   2       2200.0         1.0        1.52
 6 RUNOFF 1  20         1        0.076        63.0        0.36
 6 ADDHYD 4    20 1 2 3
 6 RUNOFF 1  28         1        0.030        84.0        0.50
 6 ADDHYD 4    20 1 3 2
 6 REACH  3 128   2   1        550.0         1.0        1.64
 6 RUNOFF 1  56         2        0.039        75.0        0.50
 6 ADDHYD 4    28 1 2 3
 6 RUNOFF 1  55         1        0.012        92.0        0.50
 6 ADDHYD 4    28 3 1 2
 6 REACH  3 157   2   5        400.0         1.0        1.55
 6 RUNOFF 1  31         1        0.042        78.0        0.31
 6 REACH  3 131   1   2       1450.0         0.5        1.64
 6 RUNOFF 1  29         1        0.061        75.0        0.35
 6 ADDHYD 4    29 1 2 3
 6 RUNOFF 1  30         1        0.045        75.0        0.32
 6 REACH  3 129   1   2       1600.0         0.7        1.55
 6 ADDHYD 4    29 2 3 4
 6 REACH  3 166   4   7        650.0         0.5        1.64
 6 RUNOFF 1  26         1        0.033        87.0        0.45
 6 RUNOFF 1  27         2        0.020        76.0        0.26
 6 REACH  3 126   2   3       1300.0         1.1        1.52
 6 ADDHYD 4    26 1 3 2
 6 ADDHYD 4    29 2 7 1
 6 REACH  3 164   1   3        600.0         0.6        1.64
 6 RUNOFF 1  25         1        0.028        77.0        0.32
 6 REACH  3 124   1   2       1500.0         0.7        1.55
 6 ADDHYD 4    24 2 3 1
 6 RUNOFF 1  24         2        0.042        89.0        0.31
 6 ADDHYD 4    24 1 2 3
1


**********80-80 LIST OF INPUT DATA (CONTINUED)**********

 6 REACH  3 123   3   1        500.0         0.7        1.55
 6 RUNOFF 1  23         3        0.014        92.0        0.24
 6 ADDHYD 4    23 1 3 2
 6 ADDHYD 4    23 2 5 1
 6 REACH  3 119   1   4       1450.0         1.0        1.61
 6 RUNOFF 1  22         1        0.026        74.0        0.31
 6 REACH  3 156   1   2        400.0         1.0        1.61
 6 RUNOFF 1  19         1        0.052        75.0        0.28
 6 ADDHYD 4    19 1 2 3
 6 ADDHYD 4    19 3 4 1
 6 REACH  3 155   1   2        400.0         1.8        1.56
 6 ADDHYD 4    62 2 6 1
 6 REACH  3 112   1   6       1700.0         0.2        1.64
```

EXECUTIVE CONTROL OPERATION LIST RECORD ID

LISTING OF CURRENT DATA

	STRUCT NO.	ELEVATION	DISCHARGE	STORAGE
3 STRUCT	99			
8		.00	.00	.00
8		2.00	80.00	1.48
8		4.00	125.00	3.77
8		6.00	150.00	6.50
8		8.00	180.00	9.70
8		10.00	210.00	13.80
9 ENDTBL				

	TIME INCREMENT				
4 DIMHYD	.0200				
8	.0000	.0300	.1000	.1900	.3100
8	.4700	.6600	.8200	.9300	.9900
8	1.0000	.9900	.9300	.8600	.7800
8	.6800	.5600	.4600	.3900	.3300
8	.2800	.2410	.2070	.1740	.1470
8	.1260	.1070	.0910	.0770	.0660
8	.0550	.0470	.0400	.0340	.0290
8	.0250	.0210	.0180	.0150	.0130
8	.0110	.0090	.0080	.0070	.0060
8	.0050	.0040	.0030	.0020	.0010
8	.0000	.0000	.0000	.0000	.0000
9 ENDTBL					

COMPUTED PEAK RATE FACTOR = 484.00

	TABLE NO.	TIME INCREMENT			
5 RAINFL 1	.5000				
8	.0000	.0015	.0050	.0080	.0120
8	.0170	.0210	.0260	.0320	.0460
8	.0600	.1000	.7000	.7500	.7800
8	.8000	.8200	.8300	.8400	.8500
8	.8600	.8700	.8750	.8830	.8900

1

8	.8980	.9050	.9120	.9180	.9240
8	.9300	.9350	.9400	.9450	.9500
8	.9550	.9600	.9650	.9700	.9750

```
6 REACH  3 117   1   3        1000.0          0.9          1.52
6 RUNOFF 1  18        1         0.038         83.0          0.34
6 REACH  3 118   1   4        1500.0          0.9          1.50
6 ADDHYD 4    15 2 3 5
6 ADDHYD 4    15 5 4 3
6 RUNOFF 1  15        1         0.078         80.0          0.34
6 ADDHYD 4    15 1 3 2
6 RESVOR 2    99 2   3
6 REACH  3 114   3   1        1500.0          1.0          1.61
6 RUNOFF 1  14        2         0.075         75.0          0.32
6 ADDHYD 4    14 2 1 3
6 RESVOR 2 113   3   2        10004Q          75.0          0.36
6 ADDHYD 4    13 1 2 3
6 RUNOFF 1  11        1         0.076         86.0          0.32
6 REACH  3 167   1   2         400.0          1.6          1.61
6 ADDHYD 4    13 2 3 4
6 REACH  3 154   4   1         400.0          0.5          1.55
6 ADDHYD 4    12 1 6 2
6 REACH  3 161   2   1         600.0          0.2          1.64
6 RUNOFF 1  12        2         0.092         64.0          0.37
6 ADDHYD 4    11 1 2 3
6 REACH  3 110   3   1        1200.0          0.2          1.64
6 RUNOFF 1   4        2         0.050         75.0          0.29
6 ADDHYD 4     4 1 2 3
6 RUNOFF 1  10        1         0.042         65.0          0.26
6 ADDHYD 4     4 1 3 2
6 RUNOFF 1   5        1         0.090         75.0          0.35
6 REACH  3 104   1   3        1500.0          1.8          1.60
6 ADDHYD 4     4 2 3 1
1
```

**********80-80 LIST OF INPUT DATA (CONTINUED)**********

```
6 REACH  3 103   1   2         500.0          0.2          1.64
6 RUNOFF 1  54        1         0.260         80.0          0.40
6 REACH  3 163   1   3         950.0          0.4          1.64
6 RUNOFF 1   8        1         0.037         92.0          0.38
6 ADDHYD 4     8 1 3 4
6 REACH  3 108   4   1         250.0          0.5          1.58
6 RUNOFF 1   9        3         0.081         92.0          0.30
6 REACH  3 107   3   4        1000.0          0.6          1.53
6 ADDHYD 4     7 1 4 3
6 RUNOFF 1   7        1         0.086         74.0          0.56
6 ADDHYD 4     7 1 3 4
6 REACH  3 106   4   1         900.0          0.5          1.58
6 RUNOFF 1   6        3         0.069         72.0          0.33
6 ADDHYD 4     6 1 3 4
6 REACH  3 153   4   1         900.0          0.5          1.58
6 ADDHYD 4     3 1 2 3
6 REACH  3 102   3   1         600.0          0.2          1.64
6 RUNOFF 1   3        2         0.041         63.0          0.34
6 ADDHYD 4     2 1 2 3
6 REACH  3 101   3   1         400.0          0.2          1.64
6 RUNOFF 1   1        2         0.016         63.0          0.25
6 ADDHYD 4     1 1 2 3
6 RUNOFF 1   2        1         0.068         74.0          0.34
6 ADDHYD 4     1 3 1 2                                        1 1   1   1 TO SC
  ENDATA
7 LIST
7 INCREM 6                .033                                          2-MIN
7 COMPUT 7  42        1          0.0          4.4          1.01 2  01  01 100-YR
  ENDCMP 1
```

```
     TABLE NO.       TIME INCREMENT
5 RAINFL 2                   .2500

8                .0000       .0020       .0050       .0080       .0110
8                .0140       .0170       .0200       .0230       .0260
8                .0290       .0320       .0350       .0380       .0410
8                .0440       .0480       .0520       .0560       .0600
8                .0640       .0680       .0720       .0760       .0800
8                .0850       .0900       .0950       .1000       .1050
8                .1100       .1150       .1200       .1260       .1330
8                .1400       .1470       .1550       .1630       .1720
8                .1810       .1910       .2030       .2180       .2360
8                .2570       .2830       .3870       .6630       .7070
8                .7350       .7580       .7760       .7910       .8040
8                .8150       .8250       .8340       .8420       .8490
8                .8560       .8630       .8690       .8750       .8810
8                .8870       .8930       .8980       .9030       .9080
8                .9130       .9180       .9220       .9260       .9300
8                .9340       .9380       .9420       .9460       .9500
8                .9530       .9560       .9590       .9620       .9650
8                .9680       .9710       .9740       .9770       .9800
8                .9830       .9860       .9890       .9920       .9950
8                .9980      1.0000      1.0000      1.0000      1.0000
9 ENDTBL

     TABLE NO.       TIME INCREMENT
5 RAINFL 3                   .5000

8                .0000       .0100       .0220       .0360       .0510
8                .0670       .0830       .0990       .1160       .1350
8                .1560       .1790       .2040       .2330       .2680
8                .3100       .4250       .4800       .5200       .5500
8                .5770       .6010       .6230       .6440       .6640
8                .6830       .7010       .7190       .7360       .7530
8                .7690       .7850       .8000       .8150       .8300
8                .8440       .8580       .8710       .8840       .8960
8                .9080       .9200       .9320       .9440       .9560
8                .9670       .9780       .9890      1.0000      1.0000
9 ENDTBL
1
```



```
     TABLE NO.       TIME INCREMENT
5 RAINFL 4                   .5000

8                .0000       .0040       .0080       .0120       .0160
8                .0200       .0250       .0300       .0350       .0400
8                .0450       .0500       .0550       .0600       .0650
8                .0700       .0750       .0810       .0870       .0930
8                .0990       .1050       .1110       .1180       .1250
8                .1320       .1400       .1480       .1560       .1650
8                .1740       .1840       .1950       .2070       .2200
8                .2360       .2550       .2770       .3030       .4090
8                .5150       .5490       .5830       .6050       .6240
8                .6400       .6550       .6690       .6820       .6940
8                .7050       .7160       .7270       .7380       .7480
```

```
8              .8700      .8760      .8820      .8880      .8940
8              .9000      .9060      .9110      .9160      .9210
8              .9260      .9310      .9360      .9410      .9460
8              .9510      .9560      .9610      .9660      .9710
8              .9760      .9800      .9840      .9880      .9920
8              .9960     1.0000     1.0000     1.0000     1.0000
9 ENDTBL

     TABLE NO.      TIME INCREMENT
5 RAINFL 5                  .5000

8              .0000      .0020      .0050      .0080      .0110
8              .0140      .0170      .0200      .0230      .0260
8              .0290      .0320      .0350      .0380      .0410
8              .0440      .0470      .0510      .0550      .0590
8              .0630      .0670      .0710      .0750      .0790
8              .0840      .0890      .0940      .0990      .1040
8              .1090      .1140      .1200      .1260      .1330
8              .1400      .1470      .1540      .1620      .1710
8              .1810      .1920      .2040      .2170      .2330
8              .2520      .2770      .3180      .6380      .6980
8              .7290      .7520      .7700      .7850      .7980
8              .8090      .8190      .8290      .8380      .8460
8              .8540      .8610      .8680      .8740      .8800
8              .8860      .8920      .8970      .9020      .9070
8              .9120      .9170      .9210      .9250      .9290
8              .9330      .9370      .9410      .9450      .9490
8              .9530      .9570      .9600      .9630      .9660
8              .9690      .9720      .9750      .9780      .9810
1
```



```
8              .9840      .9870      .9900      .9930      .9960
8              .9980     1.0000     1.0000     1.0000     1.0000
9 ENDTBL

     TABLE NO.      TIME INCREMENT
5 RAINFL 6                  .0200

8              .0000      .0080      .0162      .0246      .0333
8              .0425      .0524      .0630      .0743      .0863
8              .0990      .1124      .1265      .1420      .1595
8              .1800      .2050      .2550      .3450      .4370
8              .5300      .6030      .6330      .6600      .6840
8              .7050      .7240      .7420      .7590      .7750
8              .7900      .8043      .8180      .8312      .8439
8              .8561      .8678      .8790      .8898      .9002
8              .9103      .9201      .9297      .9391      .9483
8              .9573      .9661      .9747      .9832      .9916
8             1.0000     1.0000     1.0000     1.0000     1.0000
9 ENDTBL
1
```

```
 6 RUNOFF 1  42       1        .0270     81.0000       .36000 0 0 0 0 1
 6 REACH  3 165   1   2     100.0000       .4000      1.64000 0 0 0 0 1
 6 RUNOFF 1  43       1        .0500     80.0000       .58000 0 0 0 0 1
 6 ADDHYD 4    43 1 2 3                                    0 0 0 0 0 1
 6 REACH  3 160   3   1    2000.0000       .9000      1.55000 0 0 0 0 1
 6 RUNOFF 1  40       2        .0600     84.0000       .46000 0 0 0 0 1
 6 ADDHYD 4    40 1 2 3                                    0 0 0 0 0 1
 6 RUNOFF 1  41       1        .0470     75.0000       .36000 0 0 0 0 1
 6 REACH  3 140   1   2     800.0000      1.2000      1.52000 0 0 0 0 1
 6 ADDHYD 4    40 2 3 1                                    0 0 0 0 0 1
 6 REACH  3 139   1   5    2450.0000       .7000      1.55000 0 0 0 0 1
 6 RUNOFF 1  38       1        .1030     93.0000       .31000 0 0 0 0 1
 6 REACH  3 159   1   2     800.0000       .5000      1.61000 0 0 0 0 1
 6 RUNOFF 1  37       1        .0330     66.0000       .28000 0 0 0 0 1
 6 ADDHYD 4    37 1 2 3                                    0 0 0 0 0 1
 6 REACH  3 158   3   4     900.0000       .3000      1.64000 0 0 0 0 1
 6 RUNOFF 1  52       1        .3260     84.0000       .32000 0 0 0 0 1
 6 REACH  3 136   1   2    1400.0000       .4000      1.61000 0 0 0 0 1
 6 RUNOFF 1  36       1        .0730     67.0000       .26000 0 0 0 0 1
 6 ADDHYD 4    36 1 2 3                                    0 0 0 0 0 1
 6 REACH  3 135   3   1    1250.0000       .4000      1.61000 0 0 0 0 1
 6 RUNOFF 1  35       2        .0440     69.0000       .30000 0 0 0 0 1
 6 ADDHYD 4    35 1 2 3                                    0 0 0 0 0 1
 6 ADDHYD 4    35 3 4 1                                    0 0 0 0 0 1
 6 RUNOFF 1  39       2        .0400     63.0000       .30000 0 0 0 0 1
 6 ADDHYD 4    35 2 5 3                                    0 0 0 0 0 1
 6 ADDHYD 4    35 1 3 2                                    0 0 0 0 0 1
 6 REACH  3 133   2   4    1100.0000       .3000      1.64000 0 0 0 0 1
 6 RUNOFF 1  53       1        .1580     84.0000       .37000 0 0 0 0 1
 6 REACH  3 134   1   2    2500.0000       .5000      1.64000 0 0 0 0 1
 6 RUNOFF 1  32       1        .0880     75.0000       .33000 0 0 0 0 1
 6 ADDHYD 4    34 1 4 3                                    0 0 0 0 0 1
 6 RUNOFF 1  33       1        .0360     75.0000       .31000 0 0 0 0 1
 6 ADDHYD 4    34 1 3 4                                    0 0 0 0 0 1
 6 ADDHYD 4    34 2 4 1                                    0 0 0 0 0 1
 6 RUNOFF 1  34       2        .1090     92.0000       .32000 0 0 0 0 1
 6 ADDHYD 4    34 1 2 3                                    0 0 0 0 0 1
 6 REACH  3 162   3   6    1400.0000       .3000      1.64000 0 0 0 0 1
 6 RUNOFF 1  21       1        .0450     75.0000       .34000 0 0 0 0 1
 6 REACH  3 120   1   2    2200.0000      1.0000      1.52000 0 0 0 0 1
 6 RUNOFF 1  20       1        .0760     63.0000       .36000 0 0 0 0 1
 6 ADDHYD 4    20 1 2 3                                    0 0 0 0 0 1
 6 RUNOFF 1  28       1        .0300     84.0000       .50000 0 0 0 0 1
 6 ADDHYD 4    20 1 3 2                                    0 0 0 0 0 1
 6 REACH  3 128   2   1     550.0000      1.0000      1.64000 0 0 0 0 1
1
```



```
 6 RUNOFF 1  56       2        .0390     75.0000       .50000 0 0 0 0 1
 6 ADDHYD 4    28 1 2 3                                    0 0 0 0 0 1
 6 RUNOFF 1  55       1        .0120     92.0000       .50000 0 0 0 0 1
 6 ADDHYD 4    28 3 1 2                                    0 0 0 0 0 1
 6 REACH  3 157   2   5     400.0000      1.0000      1.55000 0 0 0 0 1
 6 RUNOFF 1  31       1        .0420     78.0000       .31000 0 0 0 0 1
 6 REACH  3 131   1   2    1450.0000       .5000      1.64000 0 0 0 0 1
 6 RUNOFF 1  29       1        .0610     75.0000       .35000 0 0 0 0 1
```

```
6 ADDHYD 4    29 2 3 4                                    0 0 0 0 0 1
6 REACH  3 166   4   7    650.0000      .5000     1.64000 0 0 0 0 1
6 RUNOFF 1  26        1      .0330    87.0000      .45000 0 0 0 0 1
6 RUNOFF 1  27        2      .0200    76.0000      .26000 0 0 0 0 1
6 REACH  3 126   2   3   1300.0000     1.1000     1.52000 0 0 0 0 1
6 ADDHYD 4    26 1 3 2                                    0 0 0 0 0 1
6 ADDHYD 4    29 2 7 1                                    0 0 0 0 0 1
6 REACH  3 164   1   3    600.0000      .6000     1.64000 0 0 0 0 1
6 RUNOFF 1  25        1      .0280    77.0000      .32000 0 0 0 0 1
6 REACH  3 124   1   2   1500.0000      .7000     1.55000 0 0 0 0 1
6 ADDHYD 4    24 2 3 1                                    0 0 0 0 0 1
6 RUNOFF 1  24        2      .0420    89.0000      .31000 0 0 0 0 1
6 ADDHYD 4    24 1 2 3                                    0 0 0 0 0 1
6 REACH  3 123   3   1    500.0000      .7000     1.55000 0 0 0 0 1
6 RUNOFF 1  23        3      .0140    92.0000      .24000 0 0 0 0 1
6 ADDHYD 4    23 1 3 2                                    0 0 0 0 0 1
6 ADDHYD 4    23 2 5 1                                    0 0 0 0 0 1
6 REACH  3 119   1   4   1450.0000     1.0000     1.61000 0 0 0 0 1
6 RUNOFF 1  22        1      .0260    74.0000      .31000 0 0 0 0 1
6 REACH  3 156   1   2    400.0000     1.0000     1.61000 0 0 0 0 1
6 RUNOFF 1  19        1      .0520    75.0000      .28000 0 0 0 0 1
6 ADDHYD 4    19 1 2 3                                    0 0 0 0 0 1
6 ADDHYD 4    19 3 4 1                                    0 0 0 0 0 1
6 REACH  3 155   1   2    400.0000     1.8000     1.56000 0 0 0 0 1
6 ADDHYD 4    62 2 6 1                                    0 0 0 0 0 1
6 REACH  3 112   1   6   1700.0000      .2000     1.64000 0 0 0 0 1
6 RUNOFF 1  16        1      .0300    83.0000      .32000 0 0 0 0 1
6 REACH  3 116   1   2    650.0000      .9000     1.52000 0 0 0 0 1
6 RUNOFF 1  17        1      .0530    83.0000      .30000 0 0 0 0 1
6 REACH  3 117   1   3   1000.0000      .9000     1.52000 0 0 0 0 1
6 RUNOFF 1  18        1      .0380    83.0000      .34000 0 0 0 0 1
6 REACH  3 118   1   4   1500.0000      .9000     1.50000 0 0 0 0 1
6 ADDHYD 4    15 2 3 5                                    0 0 0 0 0 1
6 ADDHYD 4    15 5 4 3                                    0 0 0 0 0 1
6 RUNOFF 1  15        1      .0780    80.0000      .34000 0 0 0 0 1
6 ADDHYD 4    15 1 3 2                                    0 0 0 0 0 1
6 RESVOR 2    99 2   3      .0000                        0 0 0 0 0 1
6 REACH  3 114   3   1   1500.0000     1.0000     1.61000 0 0 0 0 1
1
```



```
6 RUNOFF 1  14        2      .0750    75.0000      .32000 0 0 0 0 1
6 ADDHYD 4    14 2 1 3                                    0 0 0 0 0 1
6 REACH  3 113   3   2   1000.0000     1.1000     1.54000 0 0 0 0 1
6 RUNOFF 1  13        1      .0420    75.0000      .36000 0 0 0 0 1
6 ADDHYD 4    13 1 2 3                                    0 0 0 0 0 1
6 RUNOFF 1  11        1      .0760    86.0000      .32000 0 0 0 0 1
6 REACH  3 167   1   2    400.0000     1.6000     1.61000 0 0 0 0 1
6 ADDHYD 4    13 2 3 4                                    0 0 0 0 0 1
6 REACH  3 154   4   1    400.0000      .5000     1.55000 0 0 0 0 1
6 ADDHYD 4    12 1 6 2                                    0 0 0 0 0 1
6 REACH  3 161   2   1    600.0000      .2000     1.64000 0 0 0 0 1
6 RUNOFF 1  12        2      .0920    64.0000      .37000 0 0 0 0 1
6 ADDHYD 4    11 1 2 3                                    0 0 0 0 0 1
6 REACH  3 110   3   1   1200.0000      .2000     1.64000 0 0 0 0 1
6 RUNOFF 1   4        2      .0500    75.0000      .29000 0 0 0 0 1
6 ADDHYD 4     4 1 2 3                                    0 0 0 0 0 1
6 RUNOFF 1  10        1      .0420    65.0000      .26000 0 0 0 0 1
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 6 ADDHYD 4     4 2 3 1                                    0 0 0 0 0 1
 6 REACH  3 103   1   2     500.0000      .2000     1.64000 0 0 0 0 1
 6 RUNOFF 1  54         1      .2600    80.0000      .40000 0 0 0 0 1
 6 REACH  3 163   1   3     950.0000      .4000     1.64000 0 0 0 0 1
 6 RUNOFF 1   8         1      .0370    92.0000      .38000 0 0 0 0 1
 6 ADDHYD 4     8 1 3 4                                    0 0 0 0 0 1
 6 REACH  3 108   4   1     250.0000      .5000     1.58000 0 0 0 0 1
 6 RUNOFF 1   9         3      .0810    92.0000      .30000 0 0 0 0 1
 6 REACH  3 107   3   4    1000.0000      .6000     1.53000 0 0 0 0 1
 6 ADDHYD 4     7 1 4 3                                    0 0 0 0 0 1
 6 RUNOFF 1   7         1      .0860    74.0000      .56000 0 0 0 0 1
 6 ADDHYD 4     7 1 3 4                                    0 0 0 0 0 1
 6 REACH  3 106   4   1     900.0000      .5000     1.58000 0 0 0 0 1
 6 RUNOFF 1   6         3      .0690    72.0000      .33000 0 0 0 0 1
 6 ADDHYD 4     6 1 3 4                                    0 0 0 0 0 1
 6 REACH  3 153   4   1     900.0000      .5000     1.58000 0 0 0 0 1
 6 ADDHYD 4     3 1 2 3                                    0 0 0 0 0 1
 6 REACH  3 102   3   1     600.0000      .2000     1.64000 0 0 0 0 1
 6 RUNOFF 1   3         2      .0410    63.0000      .34000 0 0 0 0 1
 6 ADDHYD 4     2 1 2 3                                    0 0 0 0 0 1
 6 REACH  3 101   3   1     400.0000      .2000     1.64000 0 0 0 0 1
 6 RUNOFF 1   1         2      .0160    63.0000      .25000 0 0 0 0 1
 6 ADDHYD 4     1 1 2 3                                    0 0 0 0 0 1
 6 RUNOFF 1   2         1      .0680    74.0000      .34000 0 0 0 0 1
 6 ADDHYD 4     1 3 1 2                                    1 1 0 1 0 1
   ENDATA


 END OF LISTING
1



 TR20 XEQ 11/15/96   15: 0      SPGS RANCH MDDP - FUTURE CONDITION-CSFUREV3.DAT                          JOB  1   PASS
      REV PC/09/83              24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                                PAGE



 EXECUTIVE CONTROL OPERATION INCREM                                                                  RECORD ID MIN
+                                  MAIN TIME INCREMENT =   .03 HOURS


 EXECUTIVE CONTROL OPERATION COMPUT                                                                  RECORD ID 100-YR
+                                  FROM XSECTION  42
+                                                 TO STRUCTURE  1
        STARTING TIME =   .00    RAIN DEPTH =  4.40    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
        ALTERNATE NO.= 1         STORM NO.= 1    MAIN TIME INCREMENT =   .03 HOURS

     ***  WARNING  REACH 165 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 140 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 159 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 158 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 135 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 133 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 162 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 139 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***
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*** WARNING REACH 166 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 164 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 123 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 119 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 156 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 155 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 116 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 113 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 167 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 154 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 161 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

1

*** WARNING REACH 110 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 104 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 103 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 163 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 108 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 106 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 153 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 102 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 101 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID 10-YR
+ FROM XSECTION 42
+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .03 HOURS

*** WARNING REACH 165 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 133 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 162 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 128 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 157 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 166 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 164 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 123 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 119 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

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*** WARNING REACH 156 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 155 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 113 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 167 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 154 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 161 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 110 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 103 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 108 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 106 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 153 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 102 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 101 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
+													
XSECTION 42	RUNOFF	.03	1	2	.03	.0	4.40	24.00	1.91	---	6.10	51.35	1901.8
XSECTION 165	REACH	.03	1	2	.03	.0	4.40	24.00	1.91	---	6.10	51.35	1901.8
XSECTION 43	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.82	---	6.23	70.19	1403.7
STRUCTURE 43	ADDHYD	.08	1	2	.03	.0	4.40	24.00	1.85	---	6.15	115.04	1494.0
XSECTION 160	REACH	.08	1	2	.03	.0	4.40	24.00	1.85	---	6.24	109.73	1425.1
XSECTION 40	RUNOFF	.06	1	2	.03	.0	4.40	24.00	2.14	---	6.14	113.53	1892.2
STRUCTURE 40	ADDHYD	.14	1	2	.03	.0	4.40	24.00	1.98	---	6.19	217.80	1589.8
XSECTION 41	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.11	69.91	1487.4
XSECTION 140	REACH	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.15	69.11	1470.4
STRUCTURE 40	ADDHYD	.18	1	2	.03	.0	4.40	24.00	1.85	---	6.18	286.02	1554.5
XSECTION 139	REACH	.18	1	2	.03	.0	4.40	24.00	1.84	---	6.26	271.21	1473.9
XSECTION 38	RUNOFF	.10	1	2	.03	.0	4.40	24.00	2.97	---	6.04	298.61	2899.1
XSECTION 159	REACH	.10	1	2	.03	.0	4.40	24.00	2.97	---	6.08	297.60	2889.3
XSECTION 37	RUNOFF	.03	1	2	.03	.0	4.40	24.00	.94	---	6.08	35.13	1064.7
STRUCTURE 37	ADDHYD	.14	1	2	.03	.0	4.40	24.00	2.48	---	6.08	332.73	2446.6
XSECTION 158	REACH	.14	1	2	.03	.0	4.40	24.00	2.47	---	6.13	330.08	2427.0
XSECTION 52	RUNOFF	.33	1	2	.03	.0	4.40	24.00	2.15	---	6.07	718.94	2205.3
XSECTION 136	REACH	.33	1	2	.03	.0	4.40	24.00	2.15	---	6.12	709.25	2175.6
XSECTION 36	RUNOFF	.07	1	2	.03	.0	4.40	24.00	1.00	---	6.07	85.22	1167.4
STRUCTURE 36	ADDHYD	.40	1	2	.03	.0	4.40	24.00	1.94	---	6.11	789.49	1978.7
XSECTION 135	REACH	.40	1	2	.03	.0	4.40	24.00	1.93	---	6.15	781.87	1959.6
XSECTION 35	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.11	---	6.09	53.49	1215.6
STRUCTURE 35	ADDHYD	.44	1	2	.03	.0	r						
4.40	24.00	1.85	---		6.15	830.30	1874.3						
STRUCTURE 35	ADDHYD	.58	1	2	.03	.0	4.40	24.00	2.00	---	6.14	1159.21	2002.1
XSECTION 39	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.78	---	6.10	34.41	860.2
STRUCTURE 35	ADDHYD	.22	1	2	.03	.0	4.40	24.00	1.65	---	6.24	291.12	1299.7
STRUCTURE 35	ADDHYD	.80	1	2	.03	.0	4.40	24.00	1.90	---	6.15	1426.79	1776.8
XSECTION 133	REACH	.80	1	2	.03	.0	4.40	24.00	1.90	---	6.19	1422.32	1771.3
XSECTION 53	RUNOFF	.16	1	2	.03	.0	4.40	24.00	2.15	---	6.09	329.66	2086.5
XSECTION 134	REACH	.16	1	2	.03	.0	4.40	24.00	2.14	---	6.17	314.81	1992.4
XSECTION 32	RUNOFF	.09	1	2	.03	.0	4.40	24.00	1.48	---	6.09	135.86	1543.9
STRUCTURE 34	ADDHYD	.89	1	2	.03	.0	4.40	24.00	1.86	---	6.18	1534.80	1722.6

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH

STRUCTURE ID	CONTROL OPERATION	DRAINAGE AREA (SQ MI)	TABLE #	MOIST COND	TIME INCREM (HR)	RUNOFF BEGIN (HR)	RUNOFF AMOUNT (IN)	RUNOFF DURATION (HR)	RUNOFF AMOUNT (IN)	ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 33	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.48	---	6.08	56.88	1580.0
STRUCTURE 34	ADDHYD	.93	1	2	.03	.0	4.40	24.00	1.84	---	6.18	1580.62	1705.1
STRUCTURE 34	ADDHYD	1.09	1	2	.03	.0	4.40	24.00	1.89	---	6.18	1895.04	1746.6
XSECTION 34	RUNOFF	.11	1	2	.03	.0	4.40	24.00	2.87	---	6.05	305.84	2805.9
STRUCTURE 34	ADDHYD	1.19	1	2	.03	.0	4.40	24.00	1.98	---	6.16	2140.01	1792.3
XSECTION 162	REACH	1.19	1	2	.03	.0	4.40	24.00	1.97	---	6.20	2131.33	1785.0
XSECTION 21	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.10	68.27	1517.0
XSECTION 120	REACH	.05	1	2	.03	.0	4.40	24.00	1.47	---	6.19	61.39	1364.2
XSECTION 20	RUNOFF	.08	1	2	.03	.0	4.40	24.00	.78	---	6.13	59.03	776.7
STRUCTURE 20	ADDHYD	.12	1	2	.03	.0	4.40	24.00	1.04	---	6.15	118.54	979.7
XSECTION 28	RUNOFF	.03	1	2	.03	.0	4.40	24.00	2.14	---	6.17	54.44	1814.7
STRUCTURE 20	ADDHYD	.15	1	2	.03	.0	4.40	24.00	1.26	---	6.16	172.90	1145.1
XSECTION 128	REACH	.15	1	2	.03	.0	4.40	24.00	1.26	---	6.16	172.90	1145.1
XSECTION 56	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.47	---	6.19	48.32	1239.1
STRUCTURE 28	ADDHYD	.19	1	2	.03	.0	4.40	24.00	1.30	---	6.16	220.76	1161.9
XSECTION 55	RUNOFF	.01	1	2	.03	.0	4.40	24.00	2.86	---	6.14	28.63	2385.8
STRUCTURE 28	ADDHYD	.20	1	2	.03	.0	4.40	24.00	1.39	---	6.16	249.30	1234.2
XSECTION 157	REACH	.20	1	2	.03	.0	4.40	24.00	1.39	---	6.16	249.30	1234.2
XSECTION 31	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.69	---	6.08	75.13	1788.7
XSECTION 131	REACH	.04	1	2	.03	.0	4.40	24.00	1.68	---	6.15	70.69	1683.1
XSECTION 29	RUNOFF	.06	1	2	.03	.0	4.40	24.00	1.48	---	6.10	91.84	1505.5
STRUCTURE 29	ADDHYD	.10	1	2	.03	.0	4.40	24.00	1.56	---	6.12	161.03	1563.4
XSECTION 30	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.09	70.09	1557.6
XSECTION 129	REACH	.05	1	2	.03	.0	4.40	24.00	1.47	---	6.17	64.56	1434.6
STRUCTURE 29	ADDHYD	.15	1	2	.03	.0	4.40	24.00	1.53	---	6.13	224.05	1513.8
XSECTION 166	REACH	.15	1	2	.03	.0	4.40	24.00	1.53	---	6.17	223.51	1510.2
XSECTION 26	RUNOFF	.03	1	2	.03	.0	4.40	24.00	2.40	---	6.13	70.37	2132.6
XSECTION 27	RUNOFF	.02	1	2	.03	.0	4.40	24.00	1.55	---	6.06	35.42	1771.0
XSECTION 126	REACH	.02	1	2	.03	.0	4.40	24.00	1.54	---	6.15	33.21	1660.3
STRUCTURE 26	ADDHYD	.05	1	2	.03	.0	4.40	24.00	2.08	---	6.14	103.40	1950.9
STRUCTURE 29	ADDHYD	.20	1	2	.03	.0	4.40	24.00	1.68	---	6.16	326.08	1622.3
XSECTION 164	REACH	.20	1	2	.03	.0	4.40	24.00	1.68	---	6.16	326.08	1622.3
XSECTION 25	RUNOFF	.03	1	2	.03	.0	4.40	24.00	1.62	---	6.08	47.46	1695.0
XSECTION 124	REACH	.03	1	2	.03	.0	4.40	24.00	1.61	---	6.17	43.44	1551.4
STRUCTURE 24	ADDHYD	.23	1	2	.03	.0	4.40	24.00	1.67	---	6.16	369.51	1613.6
XSECTION 24	RUNOFF	.04	1	2	.03	.0	4.40	24.00	2.59	---	6.05	109.45	2606.0

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/	STANDARD	RAIN	ANTEC	MAIN	PRECIPITATION			PEAK DISCHARGE		

		(SQ MI)			(HR)	(HR)	(IN)	(HR)	(IN)	(FT)	(HR)	(CFS)	(CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 24	ADDHYD	.27	1	2	.03	.0	4.40	24.00	1.81	---	6.14	462.82	1707.8
XSECTION 123	REACH	.27	1	2	.03	.0	4.40	24.00	1.81	---	6.14	462.82	1707.8
XSECTION 23	RUNOFF	.01	1	2	.03	.0	4.40	24.00	2.88	---	6.01	41.69	2977.7
STRUCTURE 23	ADDHYD	.28	1	2	.03	.0	4.40	24.00	1.86	---	6.12	493.82	1732.7
STRUCTURE 23	ADDHYD	.49	1	2	.03	.0	4.40	24.00	1.67	---	6.14	739.72	1518.9
XSECTION 119	REACH	.49	1	2	.03	.0	4.40	24.00	1.67	---	6.17	738.17	1515.8
XSECTION 22	RUNOFF	.03	1	2	.03	.0	4.40	24.00	1.41	---	6.08	39.32	1512.3
XSECTION 156	REACH	.03	1	2	.03	.0	4.40	24.00	1.41	---	6.12	39.30	1511.6
XSECTION 19	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.07	85.89	1651.7
STRUCTURE 19	ADDHYD	.08	1	2	.03	.0	4.40	24.00	1.46	---	6.08	123.72	1586.2
STRUCTURE 19	ADDHYD	.56	1	2	.03	.0	4.40	24.00	1.64	---	6.16	842.63	1491.4
XSECTION 155	REACH	.56	1	2	.03	.0	4.40	24.00	1.64	---	6.16	842.63	1491.4
STRUCTURE 62	ADDHYD	1.76	1	2	.03	.0	4.40	24.00	1.87	---	6.19	2958.76	1682.1
XSECTION 112	REACH	1.76	1	2	.03	.0	4.40	24.00	1.86	---	6.24	2928.68	1665.0
XSECTION 16	RUNOFF	.03	1	2	.03	.0	4.40	24.00	2.07	---	6.07	63.90	2130.1
XSECTION 116	REACH	.03	1	2	.03	.0	4.40	24.00	2.06	---	6.11	63.27	2109.0
XSECTION 17	RUNOFF	.05	1	2	.03	.0	4.40	24.00	2.07	---	6.06	115.96	2187.9
XSECTION 117	REACH	.05	1	2	.03	.0	4.40	24.00	2.07	---	6.11	113.93	2149.6
XSECTION 18	RUNOFF	.04	1	2	.03	.0	4.40	24.00	2.07	---	6.08	79.10	2081.5
XSECTION 118	REACH	.04	1	2	.03	.0	4.40	24.00	2.06	---	6.16	75.13	1977.1
STRUCTURE 15	ADDHYD	.08	1	2	.03	.0	4.40	24.00	2.07	---	6.11	177.19	2134.9
STRUCTURE 15	ADDHYD	.12	1	2	.03	.0	4.40	24.00	2.06	---	6.12	251.13	2075.5
XSECTION 15	RUNOFF	.08	1	2	.03	.0	4.40	24.00	1.83	---	6.09	145.35	1863.5
STRUCTURE 15	ADDHYD	.20	1	2	.03	.0	4.40	24.00	1.97	---	6.11	394.29	1981.4
STRUCTURE 99	RESVOR	.20	1	2	.03	.0	4.40	24.00	1.96	7.07	6.36	166.10	834.7
XSECTION 114	REACH	.20	1	2	.03	.0	4.40	24.00	1.95	---	6.42	165.70	832.7
XSECTION 14	RUNOFF	.08	1	2	.03	.0	4.40	24.00	1.48	---	6.09	116.82	1557.6
STRUCTURE 14	ADDHYD	.27	1	2	.03	.0	4.40	24.00	1.82	---	6.13	244.46	892.2
XSECTION 113	REACH	.27	1	2	.03	.0	4.40	24.00	1.82	---	6.17	243.63	889.2
XSECTION 13	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.48	---	6.11	62.47	1487.4
STRUCTURE 13	ADDHYD	.32	1	2	.03	.0	4.40	24.00	1.78	---	6.15	303.05	959.0
XSECTION 11	RUNOFF	.08	1	2	.03	.0	4.40	24.00	2.32	---	6.06	179.14	2357.1
XSECTION 167	REACH	.08	1	2	.03	.0	4.40	24.00	2.32	---	6.06	179.14	2357.1
STRUCTURE 13	ADDHYD	.39	1	2	.03	.0	4.40	24.00	1.88	---	6.12	468.75	1195.8
XSECTION 154	REACH	.39	1	2	.03	.0	4.40	24.00	1.88	---	6.12	468.75	1195.8
STRUCTURE 12	ADDHYD	2.15	1	2	.03	.0	4.40	24.00	1.86	---	6.22	3326.02	1546.3

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM	PRECIPITATION BEGIN	PRECIPITATION AMOUNT	PRECIPITATION DURATION	RUNOFF AMOUNT	PEAK DISCHARGE ELEVATION	PEAK DISCHARGE TIME	PEAK DISCHARGE RATE	PEAK DISCHARGE RATE
		(SQ MI)			(HR)	(HR)	(IN)	(HR)	(IN)	(FT)	(HR)	(CFS)	(CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 24	ADDHYD	.27	1	2	.03	.0	4.40	24.00	1.81	---	6.14	462.82	1707.8
XSECTION 123	REACH	.27	1	2	.03	.0	4.40	24.00	1.81	---	6.14	462.82	1707.8
XSECTION 23	RUNOFF	.01	1	2	.03	.0	4.40	24.00	2.88	---	6.01	41.69	2977.7
STRUCTURE 23	ADDHYD	.28	1	2	.03	.0	4.40	24.00	1.86	---	6.12	493.82	1732.7
STRUCTURE 23	ADDHYD	.49	1	2	.03	.0	4.40	24.00	1.67	---	6.14	739.72	1518.9
XSECTION 119	REACH	.49	1	2	.03	.0	4.40	24.00	1.67	---	6.17	738.17	1515.8
XSECTION 22	RUNOFF	.03	1	2	.03	.0	4.40	24.00	1.41	---	6.08	39.32	1512.3
XSECTION 156	REACH	.03	1	2	.03	.0	4.40	24.00	1.41	---	6.12	39.30	1511.6
XSECTION 19	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.07	85.89	1651.7
STRUCTURE 19	ADDHYD	.08	1	2	.03	.0	4.40	24.00	1.46	---	6.08	123.72	1586.2
STRUCTURE 19	ADDHYD	.56	1	2	.03	.0	4.40	24.00	1.64	---	6.16	842.63	1491.4
XSECTION 155	REACH	.56	1	2	.03	.0	4.40	24.00	1.64	---	6.16	842.63	1491.4
STRUCTURE 62	ADDHYD	1.76	1	2	.03	.0	4.40	24.00	1.87	---	6.19	2958.76	1682.1
XSECTION 112	REACH	1.76	1	2	.03	.0	4.40	24.00	1.86	---	6.24	2928.68	1665.0
XSECTION 16	RUNOFF	.03	1	2	.03	.0	4.40	24.00	2.07	---	6.07	63.90	2130.1
XSECTION 116	REACH	.03	1	2	.03	.0	4.40	24.00	2.06	---	6.11	63.27	2109.0
XSECTION 17	RUNOFF	.05	1	2	.03	.0	4.40	24.00	2.07	---	6.06	115.96	2187.9
XSECTION 117	REACH	.05	1	2	.03	.0	4.40	24.00	2.07	---	6.11	113.93	2149.6
XSECTION 18	RUNOFF	.04	1	2	.03	.0	4.40	24.00	2.07	---	6.08	79.10	2081.5
XSECTION 118	REACH	.04	1	2	.03	.0	4.40	24.00	2.06	---	6.16	75.13	1977.1
STRUCTURE 15	ADDHYD	.08	1	2	.03	.0	4.40	24.00	2.07	---	6.11	177.19	2134.9
STRUCTURE 15	ADDHYD	.12	1	2	.03	.0	4.40	24.00	2.06	---	6.12	251.13	2075.5
XSECTION 15	RUNOFF	.08	1	2	.03	.0	4.40	24.00	1.83	---	6.09	145.35	1863.5
STRUCTURE 15	ADDHYD	.20	1	2	.03	.0	4.40	24.00	1.97	---	6.11	394.29	1981.4
STRUCTURE 99	RESVOR	.20	1	2	.03	.0	4.40	24.00	1.96	7.07	6.36	166.10	834.7
XSECTION 114	REACH	.20	1	2	.03	.0	4.40	24.00	1.95	---	6.42	165.70	832.7
XSECTION 14	RUNOFF	.08	1	2	.03	.0	4.40	24.00	1.48	---	6.09	116.82	1557.6
STRUCTURE 14	ADDHYD	.27	1	2	.03	.0	4.40	24.00	1.82	---	6.13	244.46	892.2
XSECTION 113	REACH	.27	1	2	.03	.0	4.40	24.00	1.82	---	6.17	243.63	889.2
XSECTION 13	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.48	---	6.11	62.47	1487.4
STRUCTURE 13	ADDHYD	.32	1	2	.03	.0	4.40	24.00	1.78	---	6.15	303.05	959.0
XSECTION 11	RUNOFF	.08	1	2	.03	.0	4.40	24.00	2.32	---	6.06	179.14	2357.1
XSECTION 167	REACH	.08	1	2	.03	.0	4.40	24.00	2.32	---	6.06	179.14	2357.1
STRUCTURE 13	ADDHYD	.39	1	2	.03	.0	4.40	24.00	1.88	---	6.12	468.75	1195.8
XSECTION 154	REACH	.39	1	2	.03	.0	4.40	24.00	1.88	---	6.12	468.75	1195.8
STRUCTURE 12	ADDHYD	2.15	1	2	.03	.0	4.40	24.00	1.86	---	6.22	3326.02	1546.3

ALTERNATE 1 STORM 1

XSECTION 161	REACH	2.15	1	2	.03	.0	4.40	24.00	1.86	---	6.22	3326.02	1546.3
XSECTION 12	RUNOFF	.09	1	2	.03	.0	4.40	24.00	.83	---	6.14	74.49	809.7
STRUCTURE 11	ADDHYD	2.24	1	2	.03	.0	4.40	24.00	1.82	---	6.22	3390.92	1511.8
XSECTION 110	REACH	2.24	1	2	.03	.0	4.40	24.00	1.82	---	6.26	3382.07	1507.8
XSECTION 4	RUNOFF	.05	1	2	.03	.0	4.40	24.00	1.48	---	6.07	81.18	1623.5
STRUCTURE 4	ADDHYD	2.29	1	2	.03	.0	4.40	24.00	1.81	---	6.26	3421.31	1492.1
XSECTION 10	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.89	---	6.07	43.83	1043.6
STRUCTURE 4	ADDHYD	2.34	1	2	.03	.0	4.40	24.00	1.80	---	6.25	3439.57	1473.1
XSECTION 5	RUNOFF	.09	1	2	.03	.0	4.40	24.00	1.48	---	6.10	135.50	1505.5
XSECTION 104	REACH	.09	1	2	.03	.0	4.40	24.00	1.48	---	6.15	134.15	1490.6
STRUCTURE 4	ADDHYD	2.42	1	2	.03	.0	4.40	24.00	1.78	---	6.25	3550.07	1463.9
XSECTION 103	REACH	2.42	1	2	.03	.0	4.40	24.00	1.78	---	6.25	3550.07	1463.9
XSECTION 54	RUNOFF	.26	1	2	.03	.0	4.40	24.00	1.83	---	6.12	452.47	1740.3
XSECTION 163	REACH	.26	1	2	.03	.0	4.40	24.00	1.83	---	6.16	449.91	1730.4
XSECTION 8	RUNOFF	.04	1	2	.03	.0	4.40	24.00	2.87	---	6.08	98.49	2661.9
STRUCTURE 8	ADDHYD	.30	1	2	.03	.0	4.40	24.00	1.96	---	6.15	541.35	1822.7
XSECTION 108	REACH	.30	1	2	.03	.0	4.40	24.00	1.96	---	6.15	541.35	1822.7
XSECTION 9	RUNOFF	.08	1	2	.03	.0	4.40	24.00	2.87	---	6.04	231.66	2860.0
XSECTION 107	REACH	.08	1	2	.03	.0	4.40	24.00	2.87	---	6.09	229.23	2830.0
STRUCTURE 7	ADDHYD	.38	1	2	.03	.0	4.40	24.00	2.15	---	6.13	763.01	2018.5
XSECTION 7	RUNOFF	.09	1	2	.03	.0	4.40	24.00	1.40	---	6.23	93.91	1092.0
STRUCTURE 7	ADDHYD	.46	1	2	.03	.0	4.40	24.00	2.01	---	6.14	848.07	1827.7
XSECTION 106	REACH	.46	1	2	.03	.0	4.40	24.00	2.01	---	6.18	846.27	1823.9
XSECTION 6	RUNOFF	.07	1	2	.03	.0	4.40	24.00	1.29	---	6.10	92.91	1346.5
STRUCTURE 6	ADDHYD	.53	1	2	.03	.0	4.40	24.00	1.92	---	6.17	928.95	1742.9
XSECTION 153	REACH	.53	1	2	.03	.0	4.40	24.00	1.91	---	6.20	927.40	1740.0
STRUCTURE 3	ADDHYD	2.96	1	2	.03	.0	4.40	24.00	1.81	---	6.24	4458.73	1507.3
XSECTION 102	REACH	2.96	1	2	.03	.0	4.40	24.00	1.81	---	6.24	4458.73	1507.3
XSECTION 3	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.78	---	6.12	32.62	795.6
STRUCTURE 2	ADDHYD	3.00	1	2	.03	.0	4.40	24.00	1.79	---	6.24	4483.60	1495.0
XSECTION 101	REACH	3.00	1	2	.03	.0	4.40	24.00	1.79	---	6.24	4483.60	1495.0
XSECTION 1	RUNOFF	.02	1	2	.03	.0	4.40	24.00	.79	---	6.07	15.10	943.9
STRUCTURE 1	ADDHYD	3.01	1	2	.03	.0	4.40	24.00	1.79	---	6.23	4490.32	1489.3

ALTERNATE 1 STORM 2

XSECTION 42	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.98	---	6.11	26.66	987.4
XSECTION 165	REACH	.03	1	2	.03	.0	3.00	24.00	.98	---	6.11	26.66	987.4

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM	PRECIPITATION BEGIN	PRECIPITATION AMOUNT	PRECIPITATION DURATION	RUNOFF AMOUNT	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 1 STORM 2

XSECTION 43	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.92	---	6.25	34.83	696.7
STRUCTURE 43	ADDHYD	.08	1	2	.03	.0	3.00	24.00	.94	---	6.17	57.58	747.8
XSECTION 160	REACH	.08	1	2	.03	.0	3.00	24.00	.94	---	6.27	53.32	692.4
XSECTION 40	RUNOFF	.06	1	2	.03	.0	3.00	24.00	1.15	---	6.16	61.26	1021.0
STRUCTURE 40	ADDHYD	.14	1	2	.03	.0	3.00	24.00	1.03	---	6.21	110.46	806.2
XSECTION 41	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.68	---	6.12	32.19	684.9
XSECTION 140	REACH	.05	1	2	.03	.0	3.00	24.00	.68	---	6.18	31.39	668.0
STRUCTURE 40	ADDHYD	.18	1	2	.03	.0	3.00	24.00	.94	---	6.20	141.50	769.0
XSECTION 139	REACH	.18	1	2	.03	.0	3.00	24.00	.94	---	6.30	129.91	706.0
XSECTION 38	RUNOFF	.10	1	2	.03	.0	3.00	24.00	1.83	---	6.05	188.59	1831.0
XSECTION 159	REACH	.10	1	2	.03	.0	3.00	24.00	1.83	---	6.09	187.58	1821.1
XSECTION 37	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.35	---	6.10	12.67	384.0
STRUCTURE 37	ADDHYD	.14	1	2	.03	.0	3.00	24.00	1.47	---	6.09	200.23	1472.3
XSECTION 158	REACH	.14	1	2	.03	.0	3.00	24.00	1.47	---	6.15	197.04	1448.8
XSECTION 52	RUNOFF	.33	1	2	.03	.0	3.00	24.00	1.16	---	6.08	394.95	1211.5
XSECTION 136	REACH	.33	1	2	.03	.0	3.00	24.00	1.16	---	6.13	385.07	1181.2
XSECTION 36	RUNOFF	.07	1	2	.03	.0	3.00	24.00	.38	---	6.08	32.21	441.3
STRUCTURE 36	ADDHYD	.40	1	2	.03	.0	3.00	24.00	1.01	---	6.13	414.53	1038.9
XSECTION 135	REACH	.40	1	2	.03	.0	3.00	24.00	1.01	---	6.18	406.46	1018.7
XSECTION 35	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.45	---	6.10	21.35	485.3
STRUCTURE 35	ADDHYD	.44	1	2	.03	.0	3.00	24.00	.96	---	6.18	424.62	958.5
STRUCTURE 35	ADDHYD	.58	1	2	.03	.0	3.00	24.00	1.08	---	6.17	619.96	1070.7
XSECTION 39	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.26	---	6.12	10.69	267.4
STRUCTURE 35	ADDHYD	.22	1	2	.03	.0	3.00	24.00	.82	---	6.29	135.26	603.8
STRUCTURE 35	ADDHYD	.80	1	2	.03	.0	3.00	24.00	1.00	---	6.18	738.60	919.8
XSECTION 133	REACH	.80	1	2	.03	.0	3.00	24.00	1.00	---	6.23	732.27	911.9
XSECTION 53	RUNOFF	.16	1	2	.03	.0	3.00	24.00	1.16	---	6.11	179.80	1138.0
XSECTION 134	REACH	.16	1	2	.03	.0	3.00	24.00	1.15	---	6.19	166.00	1050.6
XSECTION 32	RUNOFF	.09	1	2	.03	.0	3.00	24.00	.68	---	6.11	62.93	715.1
STRUCTURE 34	ADDHYD	.89	1	2	.03	.0	3.00	24.00	.97	---	6.22	779.99	875.4
XSECTION 33	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.68	---	6.10	26.49	735.8
STRUCTURE 34	ADDHYD	.93	1	2	.03	.0	3.00	24.00	.96	---	6.21	799.12	862.0
STRUCTURE 34	ADDHYD	1.09	1	2	.03	.0	3.00	24.00	.99	---	6.21	964.51	888.9
XSECTION 34	RUNOFF	.11	1	2	.03	.0	3.00	24.00	1.74	---	6.06	190.39	1746.7
STRUCTURE 34	ADDHYD	1.19	1	2	.03	.0	3.00	24.00	1.06	---	6.19	1101.43	922.5
XSECTION 162	REACH	1.19	1	2	.03	.0	3.00	24.00	1.05	---	6.23	1091.78	914.4

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

XSECTION 21	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.68	---	6.11	31.33	700.6
XSECTION 120	REACH	.05	1	2	.03	.0	3.00	24.00	.68	---	6.22	26.31	584.7
XSECTION 20	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.26	---	6.16	17.91	235.7
STRUCTURE 20	ADDHYD	.12	1	2	.03	.0	3.00	24.00	.42	---	6.19	43.31	357.9
XSECTION 28	RUNOFF	.03	1	2	.03	.0	3.00	24.00	1.15	---	6.18	29.26	975.5
STRUCTURE 20	ADDHYD	.15	1	2	.03	.0	3.00	24.00	.56	---	6.19	72.59	480.7
XSECTION 128	REACH	.15	1	2	.03	.0	3.00	24.00	.56	---	6.22	72.50	480.1
XSECTION 56	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.68	---	6.21	21.76	557.9
STRUCTURE 28	ADDHYD	.19	1	2	.03	.0	3.00	24.00	.59	---	6.22	94.27	496.1
XSECTION 55	RUNOFF	.01	1	2	.03	.0	3.00	24.00	1.74	---	6.16	17.57	1464.0
STRUCTURE 28	ADDHYD	.20	1	2	.03	.0	3.00	24.00	.65	---	6.21	111.18	550.4
XSECTION 157	REACH	.20	1	2	.03	.0	3.00	24.00	.65	---	6.21	111.18	550.4
XSECTION 31	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.82	---	6.09	37.23	886.3
XSECTION 131	REACH	.04	1	2	.03	.0	3.00	24.00	.82	---	6.21	33.19	790.3
XSECTION 29	RUNOFF	.06	1	2	.03	.0	3.00	24.00	.68	---	6.12	42.36	694.5
STRUCTURE 29	ADDHYD	.10	1	2	.03	.0	3.00	24.00	.74	---	6.15	72.54	704.2
XSECTION 30	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.68	---	6.10	32.54	723.0
XSECTION 129	REACH	.05	1	2	.03	.0	3.00	24.00	.68	---	6.20	28.04	623.0
STRUCTURE 29	ADDHYD	.15	1	2	.03	.0	3.00	24.00	.72	---	6.17	99.86	674.7
XSECTION 166	REACH	.15	1	2	.03	.0	3.00	24.00	.72	---	6.21	99.03	669.1
XSECTION 26	RUNOFF	.03	1	2	.03	.0	3.00	24.00	1.35	---	6.14	39.97	1211.1
XSECTION 27	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.73	---	6.07	17.08	854.2
XSECTION 126	REACH	.02	1	2	.03	.0	3.00	24.00	.73	---	6.18	15.18	759.1
STRUCTURE 26	ADDHYD	.05	1	2	.03	.0	3.00	24.00	1.12	---	6.16	54.91	1036.0
STRUCTURE 29	ADDHYD	.20	1	2	.03	.0	3.00	24.00	.82	---	6.19	152.36	758.0
XSECTION 164	REACH	.20	1	2	.03	.0	3.00	24.00	.82	---	6.23	152.10	756.7
XSECTION 25	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.78	---	6.10	22.99	821.0
XSECTION 124	REACH	.03	1	2	.03	.0	3.00	24.00	.77	---	6.20	19.70	703.4
STRUCTURE 24	ADDHYD	.23	1	2	.03	.0	3.00	24.00	.82	---	6.23	171.49	748.9
XSECTION 24	RUNOFF	.04	1	2	.03	.0	3.00	24.00	1.50	---	6.06	65.27	1554.0
STRUCTURE 24	ADDHYD	.27	1	2	.03	.0	3.00	24.00	.92	---	6.18	216.27	798.0
XSECTION 123	REACH	.27	1	2	.03	.0	3.00	24.00	.92	---	6.22	216.24	797.9
XSECTION 23	RUNOFF	.01	1	2	.03	.0	3.00	24.00	1.75	---	6.02	26.24	1874.4
STRUCTURE 23	ADDHYD	.28	1	2	.03	.0	3.00	24.00	.96	---	6.20	227.64	798.7
STRUCTURE 23	ADDHYD	.49	1	2	.03	.0	3.00	24.00	.83	---	6.20	338.69	695.5
XSECTION 119	REACH	.49	1	2	.03	.0	3.00	24.00	.83	---	6.25	336.72	691.4

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 1 STORM 2

XSECTION 19	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.68	---	6.08	40.27	774.5
STRUCTURE 19	ADDHYD	.08	1	2	.03	.0	3.00	24.00	.67	---	6.10	57.06	731.5
STRUCTURE 19	ADDHYD	.56	1	2	.03	.0	3.00	24.00	.81	---	6.22	372.74	659.7
XSECTION 155	REACH	.56	1	2	.03	.0	3.00	24.00	.81	---	6.22	372.74	659.7
STRUCTURE 62	ADDHYD	1.76	1	2	.03	.0	3.00	24.00	.98	---	6.23	1464.24	832.4
XSECTION 112	REACH	1.76	1	2	.03	.0	3.00	24.00	.97	---	6.29	1437.20	817.1
XSECTION 16	RUNOFF	.03	1	2	.03	.0	3.00	24.00	1.10	---	6.08	34.53	1150.9
XSECTION 116	REACH	.03	1	2	.03	.0	3.00	24.00	1.10	---	6.13	33.89	1129.7
XSECTION 17	RUNOFF	.05	1	2	.03	.0	3.00	24.00	1.10	---	6.07	62.96	1187.9
XSECTION 117	REACH	.05	1	2	.03	.0	3.00	24.00	1.10	---	6.13	61.01	1151.2
XSECTION 18	RUNOFF	.04	1	2	.03	.0	3.00	24.00	1.10	---	6.09	42.64	1122.1
XSECTION 118	REACH	.04	1	2	.03	.0	3.00	24.00	1.09	---	6.21	39.12	1029.5
STRUCTURE 15	ADDHYD	.08	1	2	.03	.0	3.00	24.00	1.10	---	6.13	94.90	1143.4
STRUCTURE 15	ADDHYD	.12	1	2	.03	.0	3.00	24.00	1.09	---	6.15	131.14	1083.8
XSECTION 15	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.93	---	6.10	74.28	952.3
STRUCTURE 15	ADDHYD	.20	1	2	.03	.0	3.00	24.00	1.03	---	6.13	203.25	1021.4
STRUCTURE 99	RESVOR	.20	1	2	.03	.0	3.00	24.00	1.02	3.55	6.33	114.82	577.0
XSECTION 114	REACH	.20	1	2	.03	.0	3.00	24.00	1.02	---	6.39	114.08	573.3
XSECTION 14	RUNOFF	.08	1	2	.03	.0	3.00	24.00	.68	---	6.10	54.23	723.0
STRUCTURE 14	ADDHYD	.27	1	2	.03	.0	3.00	24.00	.92	---	6.19	140.46	512.6
XSECTION 113	REACH	.27	1	2	.03	.0	3.00	24.00	.92	---	6.25	139.99	510.9
XSECTION 13	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.68	---	6.12	28.77	684.9
STRUCTURE 13	ADDHYD	.32	1	2	.03	.0	3.00	24.00	.89	---	6.20	163.87	518.6
XSECTION 11	RUNOFF	.08	1	2	.03	.0	3.00	24.00	1.29	---	6.07	101.64	1337.4
XSECTION 167	REACH	.08	1	2	.03	.0	3.00	24.00	1.29	---	6.07	101.64	1337.4
STRUCTURE 13	ADDHYD	.39	1	2	.03	.0	3.00	24.00	.97	---	6.14	250.83	639.9
XSECTION 154	REACH	.39	1	2	.03	.0	3.00	24.00	.97	---	6.14	250.83	639.9
STRUCTURE 12	ADDHYD	2.15	1	2	.03	.0	3.00	24.00	.97	---	6.28	1642.83	763.8
XSECTION 161	REACH	2.15	1	2	.03	.0	3.00	24.00	.97	---	6.28	1642.83	763.8
XSECTION 12	RUNOFF	.09	1	2	.03	.0	3.00	24.00	.29	---	6.16	23.77	258.3
STRUCTURE 11	ADDHYD	2.24	1	2	.03	.0	3.00	24.00	.94	---	6.28	1661.34	740.7
XSECTION 110	REACH	2.24	1	2	.03	.0	3.00	24.00	.94	---	6.32	1651.54	736.3
XSECTION 4	RUNOFF	.05	1	2	.03	.0	3.00	24.00	.68	---	6.08	37.94	758.7
STRUCTURE 4	ADDHYD	2.29	1	2	.03	.0	3.00	24.00	.94	---	6.32	1664.84	726.1

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 10	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.32	---	6.09	15.28	363.8

STRUCTURE 4	ADDHYD	2.42	1	2	.03	.0	3.00	24.00	.92	---	6.31	1712.22	706.1
XSECTION 103	REACH	2.42	1	2	.03	.0	3.00	24.00	.92	---	6.31	1712.22	706.1
XSECTION 54	RUNOFF	.26	1	2	.03	.0	3.00	24.00	.92	---	6.14	229.18	881.5
XSECTION 163	REACH	.26	1	2	.03	.0	3.00	24.00	.92	---	6.18	225.97	869.1
XSECTION 8	RUNOFF	.04	1	2	.03	.0	3.00	24.00	1.74	---	6.09	60.96	1647.6
STRUCTURE 8	ADDHYD	.30	1	2	.03	.0	3.00	24.00	1.02	---	6.17	281.10	946.5
XSECTION 108	REACH	.30	1	2	.03	.0	3.00	24.00	1.02	---	6.17	281.10	946.5
XSECTION 9	RUNOFF	.08	1	2	.03	.0	3.00	24.00	1.74	---	6.05	144.44	1783.3
XSECTION 107	REACH	.08	1	2	.03	.0	3.00	24.00	1.74	---	6.10	141.82	1750.9
STRUCTURE 7	ADDHYD	.38	1	2	.03	.0	3.00	24.00	1.18	---	6.15	417.16	1103.6
XSECTION 7	RUNOFF	.09	1	2	.03	.0	3.00	24.00	.63	---	6.25	41.00	476.8
STRUCTURE 7	ADDHYD	.46	1	2	.03	.0	3.00	24.00	1.08	---	6.15	453.15	976.6
XSECTION 106	REACH	.46	1	2	.03	.0	3.00	24.00	1.08	---	6.20	450.60	971.1
XSECTION 6	RUNOFF	.07	1	2	.03	.0	3.00	24.00	.56	---	6.11	40.01	579.9
STRUCTURE 6	ADDHYD	.53	1	2	.03	.0	3.00	24.00	1.01	---	6.19	485.34	910.6
XSECTION 153	REACH	.53	1	2	.03	.0	3.00	24.00	1.01	---	6.23	482.91	906.0
STRUCTURE 3	ADDHYD	2.96	1	2	.03	.0	3.00	24.00	.93	---	6.29	2161.48	730.7
XSECTION 102	REACH	2.96	1	2	.03	.0	3.00	24.00	.93	---	6.29	2161.48	730.7
XSECTION 3	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.26	---	6.15	9.97	243.1
STRUCTURE 2	ADDHYD	3.00	1	2	.03	.0	3.00	24.00	.92	---	6.29	2168.17	723.0
XSECTION 101	REACH	3.00	1	2	.03	.0	3.00	24.00	.92	---	6.29	2168.17	723.0
XSECTION 1	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.26	---	6.09	4.81	300.6
STRUCTURE 1	ADDHYD	3.01	1	2	.03	.0	3.00	24.00	.92	---	6.29	2170.29	719.8

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SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS										PEAK TRAVEL TIME	
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-	STOR-	KINE-
XSEC ID	REACH LENGTH (FT)	INFLOW PEAK (CFS)	INFLOW TIME (HR)	OUTFLOW PEAK (CFS)	OUTFLOW TIME (HR)	INTERV.AREA PEAK (CFS)	INTERV.AREA TIME (HR)	BASE-FLOW (CFS)	ABOVE BASE (IN)	TIME INCR (HR)	ATION #	EQUATION COEFF (X)	EQUATION POWER (M)	LENGTH FACTOR (K%)	RATIO O/I (Q%)	@PEAK (K) (SEC)	KIN COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 1																			
												.400							
+165	100	51	6.1	51	6.1			0	1.91	.03	0		1.64	.001	1.000	23	1.00?	.00	.00
+						---	---												
												.900							
+160	2000	115	6.1	110	6.2			0	1.85	.03	1		1.55	.046	.957	257	.38	.10	.07
+						---	---												
												1.20							
+140	800	70	6.1	69	6.1			0	1.48	.03	1		1.52	.018	.984	109	.70?	.03	.03
+						---	---												
												.700							

+159	800	299	6.0	297	6.1			0	2.97	.03	1		1.61	.011	.996	88	.80?	.03	.02
+						---	---												
												.300							
+158	900	332	6.1	330	6.1			0	2.48	.03	1		1.64	.017	.991	119	.67?	.07	.03
+						---	---												
												.400							
+136	1400	719	6.1	708	6.1			0	2.15	.03	1		1.61	.021	.985	127	.64	.03	.04
+						---	---												
												.400							
+135	1250	789	6.1	780	6.1			0	1.94	.03	1		1.61	.016	.988	110	.70?	.03	.03
+						---	---												
												.300							
+133	1100	1422	6.1	1420	6.2			0	1.90	.03	1		1.64	.008	.999	82	.84?	.07	.02
+						---	---												
												.500							
+134	2500	329	6.1	315	6.2			0	2.15	.03	1		1.64	.053	.956	242	.39	.07	.07
+						---	---												
												.300							
+162	1400	2136	6.2	2131	6.2			0	1.98	.03	1		1.64	.009	.998	89	.80?	.03	.02
+						---	---												
												1.00							
+120	2200	68	6.1	61	6.2			0	1.48	.03	1		1.52	.106	.897	341	.30	.10	.10
+						---	---												
												1.00							
+128	550	172	6.2	172	6.2			0	1.26	.03	0		1.64	.003	1.000	45	1.00?	.00	.00
+						---	---												
												1.00							
+157	400	249	6.2	249	6.2			0	1.39	.03	0		1.55	.003	1.000	36	1.00?	.00	.00
+						---	---												
												.500							
+131	1450	75	6.1	71	6.1			0	1.69	.03	1		1.64	.064	.940	250	.38	.07	.07
+						---	---												
												.700							
+129	1600	70	6.1	65	6.2			0	1.48	.03	1		1.55	.083	.924	288	.34	.10	.08
+						---	---												
												.500							
+166	650	224	6.1	224	6.2			0	1.53	.03	1		1.64	.008	.998	73	.90?	.03	.02
+						---	---												
												1.10							
+126	1300	35	6.1	33	6.1			0	1.55	.03	1		1.52	.071	.939	238	.40	.03	.07
+						---	---												
												.600							
+164	600	326	6.2	326	6.2			0	1.68	.03	0		1.64	.004	1.000	52	1.00?	.00	.00
+						---	---												
												.700							
+124	1500	47	6.1	43	6.2			0	1.62	.03	1		1.55	.093	.916	310	.32	.10	.09
+						---	---												
												.700							
+123	500	463	6.1	463	6.1			0	1.81	.03	0		1.55	.004	1.000	46	1.00?	.00	.00
+						---	---												
												1.00							
+119	1450	740	6.1	738	6.2			0	1.67	.03	1		1.61	.007	.998	74	.89?	.03	.02
+						---	---												
												1.00							
+156	400	39	6.1	39	6.1			0	1.41	.03	1		1.61	.007	.999	62	.98?	.03	.02
+						---	---												
												1.80							
+155	400	840	6.2	840	6.2			0	1.64	.03	0		1.56	.001	1.000	16	1.00?	.00	.00
+						---	---												

												.900							
+116	650	64	6.1	63	6.1			0	2.07	.03	1		1.52	.019	.989	111	.70?	.03	.03
+						---	---												
												.900							
+117	1000	116	6.1	114	6.1			0	2.07	.03	1		1.52	.028	.983	139	.60	.03	.04
+						---	---												
												.900							
+118	1500	79	6.1	75	6.2			0	2.07	.03	1		1.50	.065	.948	250	.38	.10	.07
+						---	---												
												1.00							
+114	1500	166	6.4	166	6.4			0	1.96	.03	1		1.61	.006	.997	134	.61	.03	.04
+						---	---												
												1.10							
+113	1000	244	6.1	244	6.2			0	1.82	.03	1		1.54	.004	.997	89	.80?	.03	.07
+						---	---												
												1.60							
+167	400	179	6.1	179	6.1			0	2.32	.03	0		1.61	.002	1.000	26	1.00?	.00	.00
+						---	---												
												.500							
+154	400	468	6.1	468	6.1			0	1.88	.03	0		1.55	.002	1.000	46	1.00?	.00	.00
+						---	---												
1																			

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS										PEAK
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-	TRAVEL TIM	
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	STOR-	KINE
ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATI (HR
ALTERNATE 1 STORM 1																			
+161	600	3318	6.2	3318	6.2			0	1.86	.03	0	.200	1.64	.002	1.000	41	1.00?	.00	.0
+						---	---												
+110	1200	3382	6.2	3378	6.3			0	1.82	.03	1	.200	1.64	.007	.999	82	.84?	.07	.0
+						---	---												
+104	1500	135	6.1	134	6.1			0	1.48	.03	1	1.80	1.60	.015	.989	103	.73?	.03	.0
+						---	---												
+103	500	3546	6.2	3546	6.2			0	1.78	.03	0	.200	1.64	.002	1.000	34	1.00?	.00	.0
+						---	---												
+163	950	451	6.1	449	6.2			0	1.83	.03	1	.400	1.64	.011	.998	93	.78?	.03	.0
+						---	---												

+						---	---												
+107	1000	232	6.0	229	6.1			0	2.87	.03	1	.600	1.53	.025	.987	138	.60	.07	.04
+						---	---												
+106	900	848	6.1	846	6.2			0	2.01	.03	1	.500	1.58	.008	.997	74	.89?	.03	.02
+						---	---												
+153	900	929	6.2	927	6.2			0	1.92	.03	1	.500	1.58	.007	.999	72	.90?	.03	.02
+						---	---												
+102	600	4459	6.2	4459	6.2			0	1.81	.03	0	.200	1.64	.002	1.000	37	1.00?	.00	.00
+						---	---												
+101	400	4483	6.2	4483	6.2			0	1.79	.03	0	.200	1.64	.001	1.000	24	1.00?	.00	.00
+						---	---												

ALTERNATE 1 STORM 2

+						---	---												
+165	100	27	6.1	27	6.1			0	.98	.03	0	.400	1.64	.002	1.000	30	1.00?	.00	.00
+						---	---												
+160	2000	58	6.2	53	6.3			0	.94	.03	1	.900	1.55	.066	.926	328	.31	.10	.09
+						---	---												
+140	800	32	6.1	31	6.2			0	.68	.03	1	1.20	1.52	.027	.979	143	.59	.03	.04
+						---	---												
+139	2450	141	6.2	130	6.3			0	.94	.03	1	.700	1.55	.074	.919	343	.29	.10	.10
+						---	---												
+159	800	188	6.0	187	6.1			0	1.83	.03	1	.500	1.61	.015	.994	105	.72?	.07	.03
+						---	---												
+158	900	200	6.1	197	6.1			0	1.47	.03	1	.300	1.64	.024	.985	145	.58	.03	.04
+						---	---												
+136	1400	395	6.1	385	6.1			0	1.16	.03	1	.400	1.61	.031	.976	160	.54	.07	.04
+						---	---												
+135	1250	414	6.1	406	6.2			0	1.01	.03	1	.400	1.61	.024	.981	140	.60	.03	.04
+						---	---												
+133	1100	738	6.2	731	6.2			0	1.00	.03	1	.300	1.64	.012	.991	106	.72?	.07	.03
+						---	---												
+134	2500	180	6.1	166	6.2			0	1.16	.03	1	.500	1.64	.079	.922	307	.32	.10	.09
+						---	---												
+162	1400	1099	6.2	1092	6.2			0	1.06	.03	1	.300	1.64	.013	.993	116	.68?	.07	.03
+						---	---												
+120	2200	31	6.1	26	6.2			0	.68	.03	1	1.00	1.52	.159	.834	445	.24	.13	.13
+						---	---												
+128	550	72	6.2	72	6.2			0	.56	.03	1	1.00	1.64	.005	.999	63	.97?	.07	.02
+						---	---												
+157	400	111	6.2	111	6.2			0	.65	.03	0	1.00	1.55	.004	1.000	49	1.00?	.00	.00

+						---	---											
											.700							
+129	1600	33	6.1	28	6.2			0	.68	.03	1	1.55	.129	.862	378	.27	.10	.11
+						---	---											
											.500							
+166	650	100	6.2	99	6.2			0	.72	.03	1	1.64	.012	.992	100	.74?	.03	.03
+						---	---											
											1.10							
+126	1300	17	6.1	15	6.2			0	.73	.03	1	1.52	.109	.889	304	.33	.07	.09
+						---	---											
											.600							
+164	600	152	6.2	152	6.2			0	.82	.03	1	1.64	.006	.999	70	.92?	.03	.02
+						---	---											
											.700							
+124	1500	23	6.1	20	6.2			0	.78	.03	1	1.55	.141	.858	401	.26	.10	.11
+						---	---											
1																		

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS										
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA		BASE-	VOLUME ABOVE	MAIN TIME	ITER- ATION	Q AND A EQUATION			PEAK	S/Q	ATT-	TRAVEL TIME	
XSEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	RATIO O/I (Q*)	@PEAK (K) (SEC)	KIN COEFF (C)	STOR- AGE (HR)	KINE- MATIC (HR)
ALTERNATE 1 STORM 2																			
+123	500	216	6.2	216	6.2			0	.92	.03	1	.700	1.55	.005	1.000	60	.99?	.03	.02
+						---	---												
+119	1450	339	6.2	336	6.2			0	.83	.03	1	1.00	1.61	.010	.993	99	.75?	.03	.03
+						---	---												
+156	400	18	6.1	18	6.1			0	.64	.03	1	1.00	1.61	.011	.995	83	.83?	.03	.02
+						---	---												
+155	400	372	6.2	372	6.2			0	.81	.03	0	1.80	1.56	.001	1.000	21	1.00?	.00	.00
+						---	---												
+112	1700	1464	6.2	1435	6.3			0	.98	.03	1	.200	1.64	.022	.980	161	.54	.07	.04
+						---	---												
+116	650	34	6.1	34	6.1			0	1.10	.03	1	.900	1.52	.027	.983	137	.61	.07	.04
+						---	---												
+117	1000	63	6.1	61	6.1			0	1.10	.03	1	.900	1.52	.040	.968	171	.52	.07	.05

+						---	---												
											1.00								
+114	1500	115	6.3	114	6.4			0	1.02	.03	1	1.61	.011	.993	154	.56	.07	.04	
+						---	---												
											1.10								
+113	1000	140	6.2	140	6.2			0	.92	.03	1	1.54	.007	.996	108	.71?	.03	.03	
+						---	---												
											1.60								
+167	400	102	6.1	102	6.1			0	1.29	.03	0	1.61	.002	1.000	32	1.00?	.00	.00	
+						---	---												
											.500								
+154	400	251	6.1	251	6.1			0	.97	.03	0	1.55	.003	1.000	57	1.00?	.00	.00	
+						---	---												
											.200								
+161	600	1642	6.3	1642	6.3			0	.97	.03	0	1.64	.003	1.000	54	1.00?	.00	.00	
+						---	---												
											.200								
+110	1200	1661	6.3	1649	6.3			0	.94	.03	1	1.64	.010	.993	108	.71?	.07	.03	
+						---	---												
											1.80								
+104	1500	62	6.1	61	6.2			0	.68	.03	1	1.60	.024	.980	138	.60	.07	.04	
+						---	---												
											.200								
+103	500	1711	6.3	1711	6.3			0	.92	.03	0	1.64	.002	1.000	45	1.00?	.00	.00	
+						---	---												
											.400								
+163	950	229	6.1	225	6.2			0	.92	.03	1	1.64	.016	.983	121	.66	.03	.03	
+						---	---												
											.500								
+108	250	281	6.2	281	6.2			0	1.02	.03	0	1.58	.002	1.000	31	1.00?	.00	.00	
+						---	---												
											.600								
+107	1000	144	6.0	142	6.1			0	1.74	.03	1	1.53	.034	.984	163	.53	.07	.05	
+						---	---												
											.500								
+106	900	452	6.1	450	6.2			0	1.08	.03	1	1.58	.011	.997	94	.78?	.07	.03	
+						---	---												
											.500								
+153	900	484	6.2	482	6.2			0	1.01	.03	1	1.58	.010	.997	91	.79?	.07	.03	
+						---	---												
											.200								
+102	600	2157	6.3	2157	6.3			0	.93	.03	0	1.64	.003	1.000	49	1.00?	.00	.00	
+						---	---												
											.200								
+101	400	2163	6.3	2163	6.3			0	.92	.03	0	1.64	.001	1.000	33	1.00?	.00	.00	
+						---	---												
1																			

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2

	ALTERNATE	1	166.10	114.82
0	STRUCTURE 62	1.76		
	ALTERNATE	1	2958.76	1464.24
0	STRUCTURE 43	.08		
	ALTERNATE	1	115.04	57.58
0	STRUCTURE 40	.18		
	ALTERNATE	1	286.02	141.50
0	STRUCTURE 37	.14		
	ALTERNATE	1	332.73	200.23
0	STRUCTURE 36	.40		
	ALTERNATE	1	789.49	414.53
0	STRUCTURE 35	.80		
	ALTERNATE	1	1426.79	738.60
0	STRUCTURE 34	1.19		
	ALTERNATE	1	2140.01	1101.43
0	STRUCTURE 29	.20		
	ALTERNATE	1	326.08	152.36
0	STRUCTURE 28	.20		
	ALTERNATE	1	249.30	111.18
0	STRUCTURE 26	.05		
	ALTERNATE	1	103.40	54.91
0	STRUCTURE 24	.27		
	ALTERNATE	1	462.82	216.27
0	STRUCTURE 23	.49		
	ALTERNATE	1	739.72	338.69
0	STRUCTURE 20	.15		
	ALTERNATE	1	172.90	72.59
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0	STRUCTURE 19	.56		
	ALTERNATE	1	842.63	372.74
0	STRUCTURE 15	.20		
	ALTERNATE	1	394.29	203.25
0	STRUCTURE 14	.27		

	ALTERNATE	1	468.75	250.83
0	STRUCTURE	12	2.15	
	ALTERNATE	1	3326.02	1642.83
0	STRUCTURE	11	2.24	
	ALTERNATE	1	3390.92	1661.34
0	STRUCTURE	8	.30	
	ALTERNATE	1	541.35	281.10
0	STRUCTURE	7	.46	
	ALTERNATE	1	848.07	453.15
0	STRUCTURE	6	.53	
	ALTERNATE	1	928.95	485.34
0	STRUCTURE	4	2.42	
	ALTERNATE	1	3550.07	1712.22
0	STRUCTURE	3	2.96	
	ALTERNATE	1	4458.73	2161.48
0	STRUCTURE	2	3.00	
	ALTERNATE	1	4483.60	2168.17
0	STRUCTURE	1	3.01	
	ALTERNATE	1	4490.32	2170.29
0	XSECTION	1	.02	
	ALTERNATE	1	15.10	4.81
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID			DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0	XSECTION	3	.04		
	ALTERNATE	1		32.62	9.97
0	XSECTION	4	.05		
	ALTERNATE	1		81.18	37.94
0	XSECTION	5	.09		
	ALTERNATE	1		135.50	62.50
0	XSECTION	6	.07		
	ALTERNATE	1		92.91	40.01
0	XSECTION	7	.09		
	ALTERNATE	1		93.91	41.00
0	XSECTION	8	.04		

	ALTERNATE	1	231.66	144.44
0	XSECTION 10	.04		
+				
	ALTERNATE	1	43.83	15.28
0	XSECTION 11	.08		
+				
	ALTERNATE	1	179.14	101.64
0	XSECTION 12	.09		
+				
	ALTERNATE	1	74.49	23.77
0	XSECTION 13	.04		
+				
	ALTERNATE	1	62.47	28.77
0	XSECTION 14	.08		
+				
	ALTERNATE	1	116.82	54.23
0	XSECTION 15	.08		
+				
	ALTERNATE	1	145.35	74.28
0	XSECTION 16	.03		
+				
	ALTERNATE	1	63.90	34.53
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0	XSECTION 17	.05		
+				
	ALTERNATE	1	115.96	62.96
0	XSECTION 18	.04		
+				
	ALTERNATE	1	79.10	42.64
0	XSECTION 19	.05		
+				
	ALTERNATE	1	85.89	40.27
0	XSECTION 20	.08		
+				
	ALTERNATE	1	59.03	17.91
0	XSECTION 21	.05		
+				
	ALTERNATE	1	68.27	31.53
0	XSECTION 22	.03		
+				
	ALTERNATE	1	39.32	17.90
0	XSECTION 23	.01		
+				
	ALTERNATE	1	41.69	26.24
0	XSECTION 24	.04		
+				
	ALTERNATE	1	109.45	65.27
0	XSECTION 25	.03		
+				
	ALTERNATE	1	47.44	22.88

	ALTERNATE	1	70.37	39.97
0	XSECTION 27	.02		
+				
	ALTERNATE	1	35.42	17.08
0	XSECTION 28	.03		
+				
	ALTERNATE	1	54.44	29.26
0	XSECTION 29	.06		
+				
	ALTERNATE	1	91.84	42.36
0	XSECTION 30	.05		
+				
	ALTERNATE	1	70.09	32.54
1				

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 31	.04		
+			
ALTERNATE	1	75.13	37.23
0 XSECTION 32	.09		
+			
ALTERNATE	1	135.86	62.93
0 XSECTION 33	.04		
+			
ALTERNATE	1	56.88	26.49
0 XSECTION 34	.11		
+			
ALTERNATE	1	305.84	190.39
0 XSECTION 35	.04		
+			
ALTERNATE	1	53.49	21.35
0 XSECTION 36	.07		
+			
ALTERNATE	1	85.22	32.21
0 XSECTION 37	.03		
+			
ALTERNATE	1	35.13	12.67
0 XSECTION 38	.10		
+			
ALTERNATE	1	298.61	188.59
0 XSECTION 39	.04		
+			
ALTERNATE	1	34.41	10.69
0 XSECTION 40	.06		
+			
ALTERNATE	1	113.53	61.26
0 XSECTION 41	.05		
+			
ALTERNATE	1	69.91	32.19
0 XSECTION 42	.03		
+			

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 52		.33		
	ALTERNATE 1		70.19	34.83
0 XSECTION 53		.16		
	ALTERNATE 1		718.94	394.95
0 XSECTION 54		.26		
	ALTERNATE 1		329.66	179.80
0 XSECTION 55		.01		
	ALTERNATE 1		452.47	229.18
0 XSECTION 56		.04		
	ALTERNATE 1		28.63	17.57
0 XSECTION 101		3.00		
	ALTERNATE 1		48.32	21.76
0 XSECTION 102		2.96		
	ALTERNATE 1		4483.60	2168.17
0 XSECTION 103		2.42		
	ALTERNATE 1		4458.73	2161.48
0 XSECTION 104		.09		
	ALTERNATE 1		3550.07	1712.22
0 XSECTION 106		.46		
	ALTERNATE 1		134.15	61.03
0 XSECTION 107		.08		
	ALTERNATE 1		846.27	450.60
0 XSECTION 108		.30		
	ALTERNATE 1		229.23	141.82
0 XSECTION 110		2.24		
	ALTERNATE 1		541.35	281.10
0 XSECTION 112		1.76		
	ALTERNATE 1		3382.07	1651.54
0 XSECTION 113		.27		
	ALTERNATE 1		2928.68	1437.20
			243.63	139.99

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION 114	.20		
+ ALTERNATE 1		165.70	114.08
0 XSECTION 116	.03		
+ ALTERNATE 1		63.27	33.89
0 XSECTION 117	.05		
+ ALTERNATE 1		113.93	61.01
0 XSECTION 118	.04		
+ ALTERNATE 1		75.13	39.12
0 XSECTION 119	.49		
+ ALTERNATE 1		738.17	336.72
0 XSECTION 120	.05		
+ ALTERNATE 1		61.39	26.31
0 XSECTION 123	.27		
+ ALTERNATE 1		462.82	216.24
0 XSECTION 124	.03		
+ ALTERNATE 1		43.44	19.70
0 XSECTION 126	.02		
+ ALTERNATE 1		33.21	15.18
0 XSECTION 128	.15		
+ ALTERNATE 1		172.90	72.50
0 XSECTION 129	.05		
+ ALTERNATE 1		64.56	28.04
0 XSECTION 131	.04		
+ ALTERNATE 1		70.69	33.19
0 XSECTION 133	.80		
+ ALTERNATE 1		1422.32	732.27
0 XSECTION 134	.16		
+ ALTERNATE 1		314.81	166.00

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

0 XSECTION	135	.40		
+				
	ALTERNATE	1	781.87	406.46
0 XSECTION	136	.33		
+				
	ALTERNATE	1	709.25	385.07
0 XSECTION	139	.18		
+				
	ALTERNATE	1	271.21	129.91
0 XSECTION	140	.05		
+				
	ALTERNATE	1	69.11	31.39
0 XSECTION	153	.53		
+				
	ALTERNATE	1	927.40	482.91
0 XSECTION	154	.39		
+				
	ALTERNATE	1	468.75	250.83
0 XSECTION	155	.56		
+				
	ALTERNATE	1	842.63	372.74
0 XSECTION	156	.03		
+				
	ALTERNATE	1	39.30	17.78
0 XSECTION	157	.20		
+				
	ALTERNATE	1	249.30	111.18
0 XSECTION	158	.14		
+				
	ALTERNATE	1	330.08	197.04
0 XSECTION	159	.10		
+				
	ALTERNATE	1	297.60	187.58
0 XSECTION	160	.08		
+				
	ALTERNATE	1	109.73	53.32
0 XSECTION	161	2.15		
+				
	ALTERNATE	1	3326.02	1642.83
0 XSECTION	162	1.19		
+				
	ALTERNATE	1	2131.33	1091.78

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 XSECTION	163	.26		
+				
	ALTERNATE	1	449.91	225.97
0 XSECTION	164	.20		
+				

```
     ALTERNATE    1                     51.35     26.66
0 XSECTION  166          .15
+________________________________
     ALTERNATE    1                    223.51     99.03
0 XSECTION  167          .08
+________________________________
     ALTERNATE    1                    179.14    101.64
1END OF  1 JOBS IN THIS RUN

C:\TR20>
```

APPENDIX C

TR20 Hydrology Model
Existing and Future Condition, 10- and 100-year Frequencies
East Fork Sand Creek Basins

C:\RREF.LST

```
C: TR20>type wrav2
1


 ********************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY********************

 JOB TR-20                                          SUMMARY   NOPLOTS
 TITLE 001 SPRINGS RANCH EAST FORK BASINS -EXISTING CONDITION
 TITLE     24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)
  5 RAINFL 1                  .50
  8                  0.000       .0015       0.005       .0080       0.012
  8                  0.017       0.021       0.026       0.032       0.046
  8                  0.060       0.100       0.700       0.750       0.780
  8                  0.800       0.820       0.830       0.840       0.850
  8                  0.860       0.870       0.875       0.883       0.890
  8                  0.898       0.905       0.912       0.918       0.924
  8                  0.930       0.935       0.940       0.945       0.950
  8                  0.955       0.960       0.965       0.970       0.975
  8                  0.980       0.983       0.985       0.988       0.990
  8                  0.993       0.995       0.998       1.000       1.000
  9 ENDTBL
  6 RUNOFF 1  48        1        0.016        65.0        0.23
  6 REACH  3 147   1    2       1200.0         1.3        1.52
  6 RUNOFF 1  47        1        0.028        65.0        0.31
  6 ADDHYD 4    47 1 2 3
  6 REACH  3 146   3    1        800.0         0.7        1.55
  6 RUNOFF 1  46        2        0.022        65.0        0.39
  6 ADDHYD 4    46 1 2 3
  6 RUNOFF 1  49        1        0.125        65.0        0.54
  6 ADDHYD 4    46 1 3 2
  6 RUNOFF 1  50        1        0.036        65.0        0.31
  6 REACH  3 149   1    3       2400.0         0.9        1.55
  6 ADDHYD 4    46 3 2 1
  6 REACH  3 145   1    2       1600.0         0.8        1.55
  6 RUNOFF 1  45        1        0.092        65.0        0.32
  6 ADDHYD 4    45 1 2 3
  6 REACH  3 144   3    1       2000.0         0.7        1.55
  6 RUNOFF 1  44        2        0.125        64.0        0.31
  6 ADDHYD 4    44 1 2 3                                    1 1   1   1 TO SC
    ENDATA
  7 LIST
  7 INCREM 6                .033                                    2-MIN
  7 COMPUT 7  48      44        0.0         4.4          1.01 2  01  01 100-YR
    ENDCMP 1
  7 COMPUT 7  48      44        0.0         3.0          1.01 2  01  02 10-YR
    ENDCMP 1
    ENDJOB 2
0********************************END OF 80-80 LIST*********************************
1


 TR20 XEQ 12/ 4/96   10:48      SPRINGS RANCH EAST FORK BASINS -EXISTING CONDITION                JOB  1   PASS   1
      REV PC/09/83               24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                      PAGE   1


 FILE NO.  1
0                          COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY   USER NOTES

          THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

          REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
            PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.
```

THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-1933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5313 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
04/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STO-AGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

1

EXECUTIVE CONTROL OPERATION LIST RECORD ID

LISTING OF CURRENT DATA

	TIME INCREMENT
4 DIMHYD	.0200

```
8                .6800       .5600       .4600       .3900       .3300
8                .2800       .2410       .2070       .1740       .1470
8                .1260       .1070       .0910       .0770       .0660
8                .0550       .0470       .0400       .0340       .0290
8                .0250       .0210       .0180       .0150       .0130
8                .0110       .0090       .0080       .0070       .0060
8                .0050       .0040       .0030       .0020       .0010
8                .0000       .0000       .0000       .0000       .0000
9 ENDTBL

  COMPUTED PEAK RATE FACTOR =  484.00


     TABLE NO.       TIME INCREMENT
5 RAINFL 1                   .5000

8                .0000       .0015       .0050       .0080       .0120
8                .0170       .0210       .0260       .0320       .0460
8                .0600       .1000       .7000       .7500       .7800
8                .8000       .8200       .8300       .8400       .8500
8                .8600       .8700       .8750       .8830       .8900
8                .8980       .9050       .9120       .9180       .9240
8                .9300       .9350       .9400       .9450       .9500
8                .9550       .9600       .9650       .9700       .9750
8                .9800       .9830       .9850       .9880       .9900
8                .9930       .9950       .9980      1.0000      1.0000
9 ENDTBL

     TABLE NO.       TIME INCREMENT
5 RAINFL 2                   .2500

1


TR20 (EG 12/ 4/96   10:48      SPRINGS RANCH EAST FORK BASINS -EXISTING CONDITION                    JOB  1   PASS   1
     REV PC/09/83               24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                                PAGE   3


8                .0000       .0020       .0050       .0080       .0110
8                .0140       .0170       .0200       .0230       .0260
8                .0290       .0320       .0350       .0380       .0410
8                .0440       .0480       .0520       .0560       .0600
8                .0640       .0680       .0720       .0760       .0800
8                .0850       .0900       .0950       .1000       .1050
8                .1100       .1150       .1200       .1260       .1330
8                .1400       .1470       .1550       .1630       .1720
8                .1810       .1910       .2030       .2180       .2360
8                .2570       .2830       .3870       .6630       .7070
8                .7350       .7580       .7760       .7910       .8040
8                .8150       .8250       .8340       .8420       .8490
8                .8560       .8630       .8690       .8750       .8810
8                .8870       .8930       .8980       .9030       .9080
8                .9130       .9180       .9220       .9260       .9300
8                .9340       .9380       .9420       .9460       .9500
8                .9530       .9560       .9590       .9620       .9650
8                .9680       .9710       .9740       .9770       .9800
8                .9830       .9860       .9890       .9920       .9950
8                .9980      1.0000      1.0000      1.0000      1.0000
9 ENDTBL

     TABLE NO.       TIME INCREMENT
5 RAINFL 3                   .5000
```

3	.0670	.0830	.0990	.1160	.1350
3	.1560	.1790	.2040	.2330	.2680
3	.3100	.4250	.4800	.5200	.5500
3	.5770	.6010	.6230	.6440	.6640
8	.6830	.7010	.7190	.7360	.7530
8	.7690	.7850	.8000	.8150	.8300
9	.8440	.8580	.8710	.8840	.8960
9	.9080	.9200	.9320	.9440	.9560
3	.9670	.9780	.9890	1.0000	1.0000

9 ENDTBL

TABLE NO.	TIME INCREMENT
5 RAINFL 4	.5000

8	.0000	.0040	.0080	.0120	.0160
9	.0200	.0250	.0300	.0350	.0400
9	.0450	.0500	.0550	.0600	.0650
9	.0700	.0750	.0810	.0870	.0930
8	.0990	.1050	.1110	.1180	.1250
8	.1320	.1400	.1480	.1560	.1650
8	.1740	.1840	.1950	.2070	.2200

8	.2360	.2550	.2770	.3030	.4090
6	.5150	.5490	.5830	.6050	.6240
3	.6400	.6550	.6690	.6820	.6940
6	.7050	.7160	.7270	.7380	.7480
8	.7580	.7670	.7760	.7840	.7920
8	.8000	.8080	.8160	.8230	.8300
8	.8370	.8440	.8510	.8580	.8640
8	.8700	.8760	.8820	.8880	.8940
9	.9000	.9060	.9110	.9160	.9210
3	.9260	.9310	.9360	.9410	.9460
3	.9510	.9560	.9610	.9660	.9710
3	.9760	.9800	.9840	.9880	.9920
8	.9960	1.0000	1.0000	1.0000	1.0000

9 ENDTBL

TABLE NO.	TIME INCREMENT
5 RAINFL 5	.5000

8	.0000	.0020	.0050	.0080	.0110
8	.0140	.0170	.0200	.0230	.0260
8	.0290	.0320	.0350	.0380	.0410
3	.0440	.0470	.0510	.0550	.0590
8	.0630	.0670	.0710	.0750	.0790
3	.0840	.0890	.0940	.0990	.1040
3	.1090	.1140	.1200	.1260	.1330
8	.1400	.1470	.1540	.1620	.1710
8	.1810	.1920	.2040	.2170	.2330
8	.2520	.2770	.3180	.6380	.6980
3	.7290	.7520	.7700	.7850	.7980
3	.8090	.8190	.8290	.8380	.8460
3	.8540	.8610	.8680	.8740	.8800
8	.8860	.8920	.8970	.9020	.9070
8	.9120	.9170	.9210	.9250	.9290
8	.9330	.9370	.9410	.9450	.9490
8	.9530	.9570	.9600	.9630	.9660

```
8                .9840       .9870       .9900       .9930       .9960
8                .9980      1.0000      1.0000      1.0000      1.0000
9 ENDTBL

     TABLE NO.       TIME INCREMENT
5 RAINFL 6                   .0200

8                .0000       .0080       .0162       .0246       .0333
8                .0425       .0524       .0630       .0743       .0863
8                .0990       .1124       .1265       .1420       .1595
8                .1800       .2050       .2550       .3450       .4370
1
```



```
8                .5300       .6030       .6330       .6600       .6840
8                .7050       .7240       .7420       .7590       .7750
8                .7900       .8043       .8180       .8312       .8439
8                .8561       .8678       .8790       .8898       .9002
8                .9103       .9201       .9297       .9391       .9483
8                .9573       .9661       .9747       .9832       .9916
8               1.0000      1.0000      1.0000      1.0000      1.0000
9 ENDTBL
1
```


```
TR20 XEQ 12/ 4/96   10:48      SPRINGS RANCH EAST FORK BASINS -EXISTING CONDITION                JOB  1   PASS
     REV PC/09/83              24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                            PAGE
```


```
)                  STANDARD CONTROL INSTRUCTIONS


6 RUNOFF 1  48       1        .0160     65.0000      .23000 0 0 0 0 1
6 REACH  3 147   1   2    1200.0000      1.3000     1.52000 0 0 0 0 1
6 RUNOFF 1  47       1        .0280     65.0000      .31000 0 0 0 0 1
6 ADDHYD 4    47 1 2 3                                   0 0 0 0 0 1
6 REACH  3 146   3   1     800.0000       .7000     1.55000 0 0 0 0 1
6 RUNOFF 1  46       2        .0220     65.0000      .39000 0 0 0 0 1
6 ADDHYD 4    46 1 2 3                                   0 0 0 0 0 1
6 RUNOFF 1  49       1        .1250     65.0000      .54000 0 0 0 0 1
6 ADDHYD 4    46 1 3 2                                   0 0 0 0 0 1
6 RUNOFF 1  50       1        .0360     65.0000      .31000 0 0 0 0 1
6 REACH  3 149   1   3    2400.0000       .9000     1.55000 0 0 0 0 1
6 ADDHYD 4    46 3 2 1                                   0 0 0 0 0 1
6 REACH  3 145   1   2    1600.0000       .8000     1.55000 0 0 0 0 1
6 RUNOFF 1  45       1        .0920     65.0000      .32000 0 0 0 0 1
6 ADDHYD 4    45 1 2 3                                   0 0 0 0 0 1
6 REACH  3 144   3   1    2000.0000       .7000     1.55000 0 0 0 0 1
6 RUNOFF 1  44       2        .1250     64.0000      .31000 0 0 0 0 1
6 ADDHYD 4    44 1 2 3                                   1 1 0 1 0 1
  ENDATA


END OF LISTING
1
```

EXECUTIVE CONTROL OPERATION INCREM RECORD ID MIN
+ MAIN TIME INCREMENT = .03 HOURS

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID 100-YR
+ FROM XSECTION 48
+ TO STRUCTURE 44
STARTING TIME = .00 RAIN DEPTH = 4.40 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .03 HOURS

OPERATION ADDHYD STRUCTURE 44

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.21	274.43	(NULL)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS			TIME INCREMENT = .03 HOURS				DRAINAGE AREA =	.44 SQ.MI.
5.61	DISCHG	.00	.03	.33	1.40	4.03	9.21	17.83	30.47	47.38	68.57
5.94	DISCHG	93.82	122.76	154.39	186.78	217.25	242.73	260.67	270.85	274.36	272.52
6.27	DISCHG	266.52	257.44	246.73	234.44	220.91	206.48	191.72	177.09	162.94	149.49
6.60	DISCHG	136.87	125.15	114.42	104.74	96.10	88.45	81.72	75.81	70.63	66.09
6.93	DISCHG	62.12	58.66	55.66	53.05	50.74	48.62	46.63	44.74	42.94	41.25
7.26	DISCHG	39.66	38.19	36.83	35.59	34.45	33.41	32.47	31.62	30.86	30.18
7.59	DISCHG	29.59	29.07	28.62	28.24	27.91	27.64	27.41	27.23	27.08	26.96
7.92	DISCHG	26.88	26.81	26.76	26.71	26.61	26.41	26.08	25.58	24.95	24.23
8.25	DISCHG	23.44	22.62	21.80	21.00	20.23	19.49	18.79	18.13	17.52	16.97
8.58	DISCHG	16.48	16.04	15.66	15.33	15.05	14.81	14.61	14.44	14.30	14.19
8.91	DISCHG	14.09	14.01	13.94	13.89	13.84	13.81	13.78	13.75	13.74	13.72
9.24	DISCHG	13.71	13.70	13.70	13.70	13.69	13.70	13.70	13.70	13.70	13.71
9.57	DISCHG	13.71	13.72	13.72	13.73	13.73	13.74	13.75	13.75	13.76	13.77

RUNOFF VOLUME ABOVE BASEFLOW = .86 WATERSHED INCHES, 247.32 CFS-HRS, 20.44 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID 10-YR
+ FROM XSECTION 48
+ TO STRUCTURE 44
STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .03 HOURS

OPERATION ADDHYD STRUCTURE 44

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.26	74.06	(NULL)

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS	TIME INCREMENT = .03 HOURS	DRAINAGE AREA = .44 SQ.MI.
1			

5.94	DISCHG	13.81	21.42	30.72	41.02	51.23	60.11	66.65	70.80	73.07	73.98
6.27	DISCHG	74.01	73.52	72.98	72.17	71.00	69.37	67.34	64.94	62.25	59.31
6.60	DISCHG	56.19	52.97	49.73	46.56	43.53	40.70	38.09	35.71	33.55	31.61
6.93	DISCHG	29.85	28.28	26.88	25.63	24.49	23.43	22.42	21.46	20.56	19.71
7.26	DISCHG	18.93	18.21	17.56	16.97	16.44	15.95	15.50	15.09	14.72	14.39
7.59	DISCHG	14.08	13.81	13.57	13.35	13.16	13.00	12.86	12.74	12.64	12.56
7.92	DISCHG	12.49	12.44	12.40	12.36	12.30	12.20	12.05	11.84	11.57	11.27
8.25	DISCHG	10.96	10.64	10.32	10.01	9.72	9.43	9.14	8.87	8.61	8.36
8.58	DISCHG	8.13	7.91	7.71	7.54	7.37	7.23	7.11	7.00	6.90	6.82
8.91	DISCHG	6.75	6.69	6.63	6.59	6.56	6.52	6.50	6.48	6.46	6.45
9.24	DISCHG	6.44	6.43	6.43	6.42	6.42	6.42	6.42	6.42	6.42	6.42
9.57	DISCHG	6.42	6.43	6.43	6.43	6.44	6.44	6.45	6.45	6.46	6.46

RUNOFF VOLUME ABOVE BASEFLOW = .31 WATERSHED INCHES, 87.56 CFS-HRS, 7.24 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 48	RUNOFF	.02	1	2	.03	.0	4.40	24.00	.89	---	6.06	17.61	1100.6
XSECTION 147	REACH	.02	1	2	.03	.0	4.40	24.00	.89	---	6.13	15.91	994.6
XSECTION 47	RUNOFF	.03	1	2	.03	.0	4.40	24.00	.89	---	6.10	26.66	952.1
STRUCTURE 47	ADDHYD	.04	1	2	.03	.0	4.40	24.00	.89	---	6.11	42.38	963.2
XSECTION 146	REACH	.04	1	2	.03	.0	4.40	24.00	.88	---	6.17	40.57	922.0
XSECTION 46	RUNOFF	.02	1	2	.03	.0	4.40	24.00	.88	---	6.15	18.43	837.5
STRUCTURE 46	ADDHYD	.07	1	2	.03	.0	4.40	24.00	.88	---	6.16	58.85	891.6
XSECTION 49	RUNOFF	.13	1	2	.03	.0	4.40	24.00	.88	---	6.24	84.07	672.5
STRUCTURE 46	ADDHYD	.19	1	2	.03	.0	4.40	24.00	.88	---	6.20	139.35	729.6
XSECTION 50	RUNOFF	.04	1	2	.03	.0	4.40	24.00	.89	---	6.10	34.28	952.1
XSECTION 149	REACH	.04	1	2	.03	.0	4.40	24.00	.88	---	6.24	27.65	768.0
STRUCTURE 46	ADDHYD	.23	1	2	.03	.0	4.40	24.00	.88	---	6.21	166.32	732.7
XSECTION 145	REACH	.23	1	2	.03	.0	4.40	24.00	.88	---	6.28	160.28	706.1
XSECTION 45	RUNOFF	.09	1	2	.03	.0	4.40	24.00	.89	---	6.10	85.99	934.7
STRUCTURE 45	ADDHYD	.32	1	2	.03	.0	4.40	24.00	.88	---	6.21	216.51	678.7
XSECTION 144	REACH	.32	1	2	.03	.0	4.40	24.00	.87	---	6.30	207.14	649.3

ALTERNATE . STORM 2

XSECTION 48	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.32	---	6.07	6.25	390.6
XSECTION 147	REACH	.02	1	2	.03	.0	3.00	24.00	.32	---	6.16	5.01	312.8
XSECTION 47	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.32	---	6.12	9.10	325.1
STRUCTURE 47	ADDHYD	.04	1	2	.03	.0	3.00	24.00	.32	---	6.14	13.94	316.8
XSECTION 146	REACH	.04	1	2	.03	.0	3.00	24.00	.32	---	6.22	12.56	285.5
XSECTION 46	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.32	---	6.17	6.13	278.9
STRUCTURE 46	ADDHYD	.07	1	2	.03	.0	3.00	24.00	.32	---	6.20	18.53	280.7
XSECTION 49	RUNOFF	.13	1	2	.03	.0	3.00	24.00	.31	---	6.28	27.28	218.2
STRUCTURE 46	ADDHYD	.19	1	2	.03	.0	3.00	24.00	.32	---	6.24	44.86	234.9
XSECTION 50	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.32	---	6.12	11.70	325.1
XSECTION 149	REACH	.04	1	2	.03	.0	3.00	24.00	.31	---	6.30	7.90	219.5
STRUCTURE 46	ADDHYD	.23	1	2	.03	.0	3.00	24.00	.31	---	6.25	52.44	231.0
XSECTION 145	REACH	.23	1	2	.03	.0	3.00	24.00	.31	---	6.35	48.45	213.4

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 45	RUNOFF	.09	1	2	.03	.0	3.00	24.00	.32	---	6.13	29.18	317.2
STRUCTURE 45	ADDHYD	.32	1	2	.03	.0	3.00	24.00	.31	---	6.27	63.44	198.9
XSECTION 144	REACH	.32	1	2	.03	.0	3.00	24.00	.31	---	6.40	58.76	184.2
XSECTION 44	RUNOFF	.13	1	2	.03	.0	3.00	24.00	.29	---	6.12	36.39	291.1
STRUCTURE 44	ADDHYD	.44	1	2	.03	.0	3.00	24.00	.31	---	6.26	74.06	166.8

1

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION								ROUTING PARAMETERS									PEAK
				OUTFLOW+						VOLUME	MAIN	ITER-	Q AND A		PEAK	S/Q	ATT-	TRAVEL TIM	
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-		ABOVE	TIME	ATION	EQUATION	LENGTH	RATIO	@PEAK	KIN	STOR-	KINE
ID	LENGTH	PEAK	TIME	PEAK	TIME	PEAK	TIME	FLOW		BASE	INCR	#	COEFF POWER	FACTOR	O/I		(K)	COEFF	AGE MATI

ALTERNATE 1 STORM 1

											1.30							
+147	1200	17	6.1	16	6.1			0	.89	.03	1	1.52	.087	.907	250	.38	.07	.07
						---	---											
											.700							
+146	800	42	6.1	41	6.2			0	.89	.03	1	1.55	.040	.958	172	.51	.07	.05
											.900							
+149	2400	34	6.1	28	6.2			0	.89	.03	1	1.55	.187	.807	473	.22	.10	.14
						---	---											
											.800							
+145	1600	166	6.2	160	6.3			0	.88	.03	1	1.55	.032	.963	194	.47	.07	.05
						---	---											
											.700							
+144	2000	216	6.2	207	6.3			0	.88	.03	1	1.55	.039	.958	241	.40	.10	.07
						---	---											

ALTERNATE 1 STORM 2

											1.30							
+147	1200	6	6.1	5	6.2			0	.32	.03	1	1.52	.146	.799	355	.29	.10	.10
						---	---											
											.700							
+146	800	14	6.1	13	6.2			0	.32	.03	1	1.55	.064	.899	255	.38	.07	.07
						---	---											
											.900							
+149	2400	12	6.1	8	6.3			0	.32	.03	1	1.55	.309	.680	694	.16	.16	.23
						---	---											
											.800							
+145	1600	52	6.2	48	6.3			0	.31	.03	1	1.55	.049	.924	293	.34	.10	.08
						---	---											
											.700							
+144	2000	63	6.3	59	6.4			0	.31	.03	1	1.55	.057	.926	372	.28	.13	.13
						---	---											

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 STRUCTURE 47	.04		
ALTERNATE 1		42.38	13.94
0 STRUCTURE 46	.23		
ALTERNATE 1		166.32	52.44
0 STRUCTURE 45	.32		
ALTERNATE 1		216.51	63.44
0 STRUCTURE 44	.44		
ALTERNATE 1		274.43	74.06
0 XSECTION 44	.13		

```
+_____________________________
   ALTERNATE    1              85.99     29.18
0 XSECTION   46         .02
+_____________________________
   ALTERNATE    1              18.43      6.13
0 XSECTION   47         .03
+_____________________________
   ALTERNATE    1              26.66      9.10
0 XSECTION   48         .02
+_____________________________
   ALTERNATE    1              17.61      6.25
0 XSECTION   49         .13
+_____________________________
   ALTERNATE    1              84.07     27.28
0 XSECTION   50         .04
+_____________________________
   ALTERNATE    1              34.28     11.70
0 XSECTION  144         .32
+_____________________________
   ALTERNATE    1             207.14     58.76
0 XSECTION  145         .23
+_____________________________
   ALTERNATE    1             160.28     48.45
0 XSECTION  146         .04
+_____________________________
   ALTERNATE    1              40.57     12.56
1
```


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

```
 XSECTION/          DRAINAGE
 STRUCTURE            AREA      STORM NUMBERS.....
   ID               (SQ MI)          1         2

0 XSECTION  147         .02
+_____________________________
   ALTERNATE    1              15.91      5.01
0 XSECTION  149         .04
+_____________________________
   ALTERNATE    1              27.65      7.90
1END OF  1 JOBS IN THIS RUN.
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USFUTEF.DAT

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**********80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY**********

JOB TR-20                                          SUMMARY   NOPLOTS
TITLE 001 SPRINGS RANCH EAST FORK BASINS -FUTURE CONDITION
TITLE     24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)
 5 RAINFL 1                .50
 8                0.000      .0015      0.005      .0080      0.012
 8                0.017      0.021      0.026      0.032      0.046
 8                0.060      0.100      0.700      0.750      0.780
 8                0.800      0.820      0.830      0.840      0.850
 8                0.860      0.870      0.875      0.883      0.890
 8                0.898      0.905      0.912      0.918      0.924
 8                0.930      0.935      0.940      0.945      0.950
 8                0.955      0.960      0.965      0.970      0.975
 8                0.980      0.983      0.985      0.988      0.990
 8                0.993      0.995      0.998      1.000      1.000
 9 ENDTBL
 6 RUNOFF 1  48       1        0.016       75.0        0.23
 6 REACH  3 147   1   2       1200.0        1.3        1.52
 6 RUNOFF 1  47       1        0.028       81.0        0.26
 6 ADDHYD 4    47 1 2 3
 6 REACH  3 146   3   1        800.0        0.8        1.52
 6 RUNOFF 1  46       2        0.022       75.0        0.27
 6 ADDHYD 4    46 1 2 3
 6 RUNOFF 1  49       1        0.125       75.0        0.35
 6 ADDHYD 4    46 1 3 2
 6 RUNOFF 1  50       1        0.036       77.0        0.29
 6 REACH  3 149   1   3       2400.0        1.0        1.52
 6 ADDHYD 4    46 3 2 1
 6 REACH  3 145   1   2       1600.0        0.7        1.57
 6 RUNOFF 1  45       1        0.092       77.0        0.30
 6 ADDHYD 4    45 1 2 3
 6 REACH  3 144   3   1       2000.0        0.6        1.59
 6 RUNOFF 1  44       2        0.125       75.0        0.31
 6 ADDHYD 4    44 1 2 3                                  1 1   1   1 TO SC
   ENDATA
 7 LIST
 7 INCREM 6               .033                                    2-MIN
 7 COMPUT 7  48      44        0.0         4.4         1.01 2  01  01 100-YR
   ENDCMP 1
 7 COMPUT 7  48      44        0.0         3.0         1.01 2  01  02 10-YR
   ENDCMP 1
   ENDJOB 2
0**********END OF 80-80 LIST**********
1


TR20 XEQ 12/ 4/96   10:43      SPRINGS RANCH EAST FORK BASINS -FUTURE CONDITION          JOB  1   PASS
     REV PC/09/83              24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                    PAGE


 FILE NO.  1
0                          COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY   USER NOTES

          THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

          REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
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THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

1

EXECUTIVE CONTROL OPERATION LIST RECORD ID

LISTING OF CURRENT DATA

TIME INCREMENT
4 DIMHYD .0200

```
8                .4700       .6600       .8200       .9300       .9900
8               1.0000       .9900       .9300       .8600       .7800
8                .6800       .5600       .4600       .3900       .3300
8                .2800       .2410       .2070       .1740       .1470
8                .1260       .1070       .0910       .0770       .0660
8                .0550       .0470       .0400       .0340       .0290
8                .0250       .0210       .0180       .0150       .0130
8                .0110       .0090       .0080       .0070       .0060
8                .0050       .0040       .0030       .0020       .0010
8                .0000       .0000       .0000       .0000       .0000
9 ENDTBL

  COMPUTED PEAK RATE FACTOR =  484.00


     TABLE NO.       TIME INCREMENT
5 RAINFL 1                   .5000

[illegible]

     TABLE NO.       TIME INCREMENT
5 RAINFL 3                   .5000

8                .0000       .0100       .0220       .0360       .0510
8                .0670       .0830       .0990       .1160       .1350
8                .1560       .1790       .2040       .2330       .2680
8                .3100       .4250       .4800       .5200       .5500
8                .5770       .6010       .6230       .6440       .6640
8                .6830       .7010       .7190       .7360       .7530
8                .7690       .7850       .8000       .9150       .8300
8                .8440       .8580       .8710       .8840       .8960
8                .9080       .9200       .9320       .9440       .9560
8                .9670       .9780       .9890      1.0000      1.0000
9 ENDTBL

     TABLE NO.       TIME INCREMENT
5 RAINFL 4                   .5000

8                .0000       .0040       .0080       .0120       .0160
8                .0200       .0250       .0300       .0350       .0400
8                .0450       .0500       .0550       .0600       .0650
8                .0700       .0750       .0810       .0870       .0930
8                .0990       .1050       .1110       .1180       .1250
8                .1320       .1400       .1480       .1560       .1650
8                .1740       .1840       .1950       .2070       .2200
1
```



```
8                .2360       .2550       .2770       .3030       .4090
8                .5150       .5490       .5830       .6050       .6240
8                .6400       .6550       .6690       .6820       .6940
8                .7050       .7160       .7270       .7380       .7480
8                .7580       .7670       .7760       .7840       .7920
8                .8000       .8080       .8160       .8230       .8300
8                .8370       .8440       .8510       .8580       .8640
```

```
 8              .9510      .9560      .9610      .9660      .9710
 8              .9760      .9800      .9840      .9880      .9920
 8              .9960     1.0000     1.0000     1.0000     1.0000
 9 ENDTBL

     TABLE NO.      TIME INCREMENT
 5 RAINFL 5                 .5000

 8              .0000      .0020      .0050      .0080      .0110
 8              .0140      .0170      .0200      .0230      .0260
 8              .0290      .0320      .0350      .0380      .0410
 8              .0440      .0470      .0510      .0550      .0590
 8              .0630      .0670      .0710      .0750      .0790
 8              .0840      .0890      .0940      .0990      .1040
 8              .1090      .1140      .1200      .1260      .1330
 8              .1400      .1470      .1540      .1620      .1710
 8              .1810      .1920      .2040      .2170      .2330
 8              .2520      .2770      .3180      .6380      .6980
 8              .7290      .7520      .7700      .7850      .7980
 8              .8090      .8190      .8290      .8380      .8460
 8              .8540      .8610      .8680      .8740      .8800
 8              .8860      .8920      .8970      .9020      .9070
 8              .9120      .9170      .9210      .9250      .9290
 8              .9330      .9370      .9410      .9450      .9490
 8              .9530      .9570      .9600      .9630      .9660
 8              .9690      .9720      .9750      .9780      .9810
 8              .9840      .9870      .9900      .9930      .9960
 8              .9980     1.0000     1.0000     1.0000     1.0000
 9 ENDTBL

     TABLE NO.      TIME INCREMENT
 5 RAINFL 6                 .0200

 8              .0000      .0080      .0162      .0246      .0333
 8              .0425      .0524      .0630      .0743      .0863
 8              .0990      .1124      .1265      .1420      .1595
 8              .1800      .2050      .2550      .3450      .4370
 1
```



```
 8              .5300      .6030      .6330      .6600      .6840
 8              .7050      .7240      .7420      .7590      .7750
 8              .7900      .8043      .8180      .8312      .8439
 8              .8561      .8678      .8790      .8898      .9002
 8              .9103      .9201      .9297      .9391      .9483
 8              .9573      .9661      .9747      .9832      .9916
 8             1.0000     1.0000     1.0000     1.0000     1.0000
 9 ENDTBL
 1
```



```
 0                STANDARD CONTROL INSTRUCTIONS
```

```
 6 REACH  3 147   1   2    1200.0000      1.3000      1.52000 0 0 0 0 1
 6 RUNOFF 1  47       1       .0280     81.0000       .26000 0 0 0 0 1
 6 ADDHYD 4    47 1 2 3                                  0 0 0 0 0 1
 6 REACH  3 146   3   1     800.0000       .8000      1.52000 0 0 0 0 1
 6 RUNOFF 1  46       2       .0220     75.0000       .27000 0 0 0 0 1
 6 ADDHYD 4    46 1 2 3                                  0 0 0 0 0 1
 6 RUNOFF 1  49       1       .1250     75.0000       .35000 0 0 0 0 1
 6 ADDHYD 4    46 1 3 2                                  0 0 0 0 0 1
 6 RUNOFF 1  50       1       .0360     77.0000       .29000 0 0 0 0 1
 6 REACH  3 149   1   3    2400.0000      1.0000      1.52000 0 0 0 0 1
 6 ADDHYD 4    46 3 2 1                                  0 0 0 0 0 1
 6 REACH  3 145   1   2    1600.0000       .7000      1.57000 0 0 0 0 1
 6 RUNOFF 1  45       1       .0920     77.0000       .30000 0 0 0 0 1
 6 ADDHYD 4    45 1 2 3                                  0 0 0 0 0 1
 6 REACH  3 144   3   1    2000.0000       .6000      1.59000 0 0 0 0 1
 6 RUNOFF 1  44       2       .1250     75.0000       .31000 0 0 0 0 1
 6 ADDHYD 4    44 1 2 3                                  1 1 0 1 0 1
   ENDATA


 END OF LISTING
1



 TR20 XEQ 12/ 4/96   10:43      SPRINGS RANCH EAST FORK BASINS -FUTURE CONDITION                    JOB  1   PASS
      REV PC/09/83              24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2)                                PAGE



 EXECUTIVE CONTROL OPERATION INCREM                                                                RECORD ID MIN
+                                  MAIN TIME INCREMENT =   .03 HOURS


 EXECUTIVE CONTROL OPERATION COMPUT                                                                RECORD ID 100-YR
+                                  FROM XSECTION  48
+                                                TO STRUCTURE 44
         STARTING TIME =   .00    RAIN DEPTH =  4.40    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
         ALTERNATE NO.= 1         STORM NO.= 1    MAIN TIME INCREMENT =   .03 HOURS


 OPERATION ADDHYD   STRUCTURE 44

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              6.15                          646.87                       (NULL)
              7.98                           36.76                       (NULL)

 TIME(HRS)        FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .03 HOURS      DRAINAGE AREA =    .44 SQ.MI.
    5.28    DISCHG       .00      .00      .00      .00      .00      .00      .00      .00      .00      .26
    5.61    DISCHG      1.48     4.95    12.60    26.50    48.32    79.04   118.82   167.01   222.24   282.67
    5.94    DISCHG    346.41   411.72   476.32   536.81   588.64   626.40   645.15   643.24   621.98   584.39
    6.27    DISCHG    534.95   478.94   422.28   368.28   318.89   275.42   238.50   207.95   182.99   162.66
    6.60    DISCHG    145.98   132.10   120.27   110.01   101.00    93.06    86.10    80.07    74.93    70.59
    6.93    DISCHG     67.00    64.09    61.78    59.97    58.46    57.06    55.63    54.09    52.43    50.66
    7.26    DISCHG     48.85    47.05    45.35    43.81    42.44    41.27    40.28    39.48    38.84    38.33
    7.59    DISCHG     37.92    37.61    37.37    37.19    37.05    36.95    36.87    36.82    36.79    36.77
    7.92    DISCHG     36.75    36.75    36.76    36.74    36.64    36.39    35.88    35.08    33.98    32.63
    8.25    DISCHG     31.09    29.47    27.85    26.33    24.96    23.76    22.74    21.88    21.19    20.63
    8.58    DISCHG     20.19    19.83    19.56    19.34    19.17    19.04    18.93    18.86    18.80    18.75
    8.91    DISCHG     18.71    18.69    18.67    18.66    18.65    18.65    18.65    18.65    18.65    18.65
    9.24    DISCHG     18.66    18.66    18.67    18.67    18.68    18.68    18.69    18.70    18.70    18.71
    9.57    DISCHG     18.71    18.72    18.73    18.73    18.74    18.74    18.75    18.75    18.76    18.77
```

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID 10-YR
+ FROM XSECTION 48
+ TO STRUCTURE 44
STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .03 HOURS

OPERATION ADDHYD STRUCTURE 44
1

TR20 XEQ 12/ 4/96 10:43 SPRINGS RANCH EAST FORK BASINS -FUTURE CONDITION JOB 1 PASS
REV PC/09/83 24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2) PAGE

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.18	282.57	(NULL)
7.98	20.35	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .03 HOURS DRAINAGE AREA = .44 SQ.MI.

5.61	DISCHG	.01	.21	.98	3.00	7.21	14.53	25.66	41.01	60.67	84.39
5.94	DISCHG	111.66	141.82	173.75	205.66	235.11	259.17	275.18	282.16	280.50	271.25
6.27	DISCHG	255.97	236.60	215.56	194.10	173.15	153.51	135.79	120.28	106.97	95.64
6.60	DISCHG	86.02	77.81	70.71	64.54	59.13	54.41	50.28	46.70	43.63	41.00
6.93	DISCHG	38.78	36.93	35.42	34.19	33.15	32.21	31.29	30.35	29.39	28.41
7.26	DISCHG	27.43	26.47	25.57	24.73	23.98	23.31	22.72	22.23	21.82	21.48
7.59	DISCHG	21.21	20.99	20.82	20.68	20.58	20.50	20.44	20.40	20.37	20.35
7.92	DISCHG	20.35	20.34	20.35	20.34	20.29	20.16	19.90	19.50	18.95	18.29
8.25	DISCHG	17.54	16.73	15.93	15.15	14.42	13.76	13.17	12.66	12.23	11.87
8.58	DISCHG	11.57	11.32	11.12	10.96	10.83	10.73	10.65	10.59	10.54	10.50
8.91	DISCHG	10.47	10.45	10.43	10.42	10.42	10.41	10.41	10.41	10.41	10.41
9.24	DISCHG	10.41	10.42	10.42	10.43	10.43	10.44	10.44	10.44	10.45	10.45
9.57	DISCHG	10.46	10.46	10.47	10.48	10.48	10.49	10.49	10.50	10.50	10.51

RUNOFF VOLUME ABOVE BASEFLOW = .72 WATERSHED INCHES, 207.60 CFS-HRS, 17.16 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID
1

TR20 XEQ 12/ 4/96 10:43 SPRINGS RANCH EAST FORK BASINS -FUTURE CONDITION JOB 1 SUMMARY
REV PC/09/83 24 HR TYPE IIA STORM (100- AND 10-YR, AMC=2) PAGE

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 48	RUNOFF	.02	1	2	.03	.0	4.40	24.00	1.49	---	6.04	28.26	1766.1
XSECTION 147	REACH	.02	1	2	.03	.0	4.40	24.00	1.48	---	6.10	26.78	1674.0
XSECTION 47	RUNOFF	.03	1	2	.03	.0	4.40	24.00	1.91	---	6.05	59.66	2130.7
STRUCTURE 47	ADDHYD	.04	1	2	.03	.0	4.40	24.00	1.76	---	6.06	85.20	1936.5
XSECTION 146	REACH	.04	1	2	.03	.0	4.40	24.00	1.75	---	6.11	83.57	1899.3
XSECTION 46	RUNOFF	.02	1	2	.03	.0	4.40	24.00	1.48	---	6.06	36.66	1666.1
STRUCTURE 46	ADDHYD	.07	1	2	.03	.0	4.40	24.00	1.66	---	6.09	118.57	1796.6
XSECTION 49	RUNOFF	.13	1	2	.03	.0	4.40	24.00	1.48	---	6.10	188.19	1505.5
STRUCTURE 46	ADDHYD	.19	1	2	.03	.0	4.40	24.00	1.54	---	6.10	306.58	1605.1
XSECTION 50	RUNOFF	.04	1	2	.03	.0	4.40	24.00	1.62	---	6.07	63.49	1763.6
XSECTION 149	REACH	.04	1	2	.03	.0	4.40	24.00	1.61	---	6.16	55.88	1552.2
STRUCTURE 46	ADDHYD	.23	1	2	.03	.0	4.40	24.00	1.55	---	6.11	359.58	1584.1
XSECTION 145	REACH	.23	1	2	.03	.0	4.40	24.00	1.55	---	6.16	351.16	1547.0
XSECTION 45	RUNOFF	.09	1	2	.03	.0	4.40	24.00	1.62	---	6.07	160.94	1749.4
STRUCTURE 45	ADDHYD	.32	1	2	.03	.0	4.40	24.00	1.57	---	6.13	494.79	1551.1
XSECTION 144	REACH	.32	1	2	.03	.0	4.40	24.00	1.56	---	6.19	480.46	1506.1
XSECTION 44	RUNOFF	.13	1	2	.03	.0	4.40	24.00	1.48	---	6.08	197.49	1580.0
STRUCTURE 44	ADDHYD	.44	1	2	.03	.0	4.40	24.00	1.54	---	6.15	646.87	1456.9
ALTERNATE 1 STORM 2													
XSECTION 48	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.69	---	6.06	13.50	844.0
XSECTION 147	REACH	.02	1	2	.03	.0	3.00	24.00	.68	---	6.13	12.11	756.6
XSECTION 47	RUNOFF	.03	1	2	.03	.0	3.00	24.00	.98	---	6.06	31.67	1130.9
STRUCTURE 47	ADDHYD	.04	1	2	.03	.0	3.00	24.00	.87	---	6.07	42.69	970.2
XSECTION 146	REACH	.04	1	2	.03	.0	3.00	24.00	.87	---	6.13	41.14	934.9
XSECTION 46	RUNOFF	.02	1	2	.03	.0	3.00	24.00	.68	---	6.07	17.22	782.7
STRUCTURE 46	ADDHYD	.07	1	2	.03	.0	3.00	24.00	.81	---	6.11	57.19	866.5
XSECTION 49	RUNOFF	.13	1	2	.03	.0	3.00	24.00	.68	---	6.12	86.81	694.5
STRUCTURE 46	ADDHYD	.19	1	2	.03	.0	3.00	24.00	.73	---	6.11	143.95	753.7
XSECTION 50	RUNOFF	.04	1	2	.03	.0	3.00	24.00	.78	---	6.08	30.95	859.6
XSECTION 149	REACH	.04	1	2	.03	.0	3.00	24.00	.77	---	6.19	25.04	695.5
STRUCTURE 46	ADDHYD	.23	1	2	.03	.0	3.00	24.00	.73	---	6.12	166.93	735.4
XSECTION 145	REACH	.23	1	2	.03	.0	3.00	24.00	.73	---	6.19	159.06	700.7

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 1 STORM 2

XSECTION 45	RUNOFF	.09	1	2	.03	.0	3.00	24.00	.78	---	6.09	78.37	851.8
STRUCTURE 45	ADDHYD	.32	1	2	.03	.0	3.00	24.00	.74	---	6.15	224.90	705.0
XSECTION 144	REACH	.32	1	2	.03	.0	3.00	24.00	.74	---	6.23	212.60	666.5
XSECTION 44	RUNOFF	.13	1	2	.03	.0	3.00	24.00	.68	---	6.10	91.97	735.8
STRUCTURE 44	ADDHYD	.44	1	2	.03	.0	3.00	24.00	.72	---	6.18	282.57	636.4

1

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK TRAVEL TIME	
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-		
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	@PEAK	KIN	STOR-	KINE-
ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 1																			
												1.30							
+147	1200	28	6.0	27	6.1	---	---	0	1.49	.03	1		1.52	.064	.948	212	.44	.07	.06
												.800							
+146	800	85	6.1	84	6.1	---	---	0	1.76	.03	1		1.52	.028	.982	133	.62	.03	.04
												1.00							
+149	2400	63	6.1	56	6.2	---	---	0	1.62	.03	1		1.52	.138	.879	382	.27	.10	.11
												.700							
+145	1600	360	6.1	351	6.2	---	---	0	1.55	.03	1		1.57	.029	.975	151	.56	.07	.04
												.600							
+144	2000	494	6.1	479	6.2	---	---	0	1.57	.03	1		1.59	.033	.969	174	.51	.07	.05
ALTERNATE 1 STORM 2																			
												1.30							
+147	1200	13	6.1	12	6.1	---	---	0	.69	.03	1		1.52	.099	.902	274	.36	.07	.08
												.800							
+146	800	43	6.1	41	6.1	---	---	0	.87	.03	1		1.52	.041	.962	169	.52	.07	.05
												1.00							
+149	2400	31	6.1	25	6.2	---	---	0	.78	.03	1		1.52	.206	.808	488	.22	.13	.14
												.700							
+145	1600	166	6.1	159	6.2	---	---	0	.73	.03	1		1.57	.043	.954	200	.46	.07	.06
												.600							
+144	2000	224	6.1	212	6.2			0	.74	.03	1		1.59	.049	.947	233	.41	.10	.07

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2
0 STRUCTURE 47	.04		
+ ALTERNATE 1		85.20	42.69
0 STRUCTURE 46	.23		
+ ALTERNATE 1		359.58	166.93
0 STRUCTURE 45	.32		
+ ALTERNATE 1		494.79	224.90
0 STRUCTURE 44	.44		
+ ALTERNATE 1		646.87	282.57
0 XSECTION 44	.13		
+ ALTERNATE 1		197.49	91.97
0 XSECTION 45	.09		
+ ALTERNATE 1		160.94	78.37
0 XSECTION 46	.02		
+ ALTERNATE 1		36.66	17.22
0 XSECTION 47	.03		
+ ALTERNATE 1		59.66	31.67
0 XSECTION 48	.02		
+ ALTERNATE 1		28.26	13.50
0 XSECTION 49	.13		
+ ALTERNATE 1		188.19	86.81
0 XSECTION 50	.04		
+ ALTERNATE 1		63.49	30.95
0 XSECTION 144	.32		
+ ALTERNATE 1		480.46	212.60
0 XSECTION 145	.23		
+ ALTERNATE 1		351.16	159.06
0 XSECTION 146	.04		
+ ALTERNATE 1		83.57	41.14

1

```
 XSECTION/          DRAINAGE
 STRUCTURE            AREA       STORM NUMBERS.....
   ID               (SQ MI)          1         2

0 XSECTION  147          .02
+_____________________________
    ALTERNATE    1                 26.78     12.11
0 XSECTION  149          .04
+_____________________________
    ALTERNATE    1                 55.88     25.04
1END OF  1 JOBS IN THIS RUN
```

APPENDIX D

Private Maintenance Agreement for Drainageway

ASSIGNMENT OF AGREEMENT FOR MAINTENANCE OF DRAINAGE FACILITIES

THIS ASSIGNMENT OF AGREEMENT FOR MAINTENANCE OF DRAINAGE FACILITIES (the "Assignment") is entered into as of the 7th day of October, 1996, by and between **SPRINGS RANCH LIMITED LIABILITY CO.**, a Colorado limited liability company ("Developer"), whose address is Two North Cascade, Suite 1100, Colorado Springs, Colorado 80903, and **TOM TAUCHE, INC.**, a Colorado corporation ("Tauche"), whose address is 1055 Allegheny Drive, Colorado Springs, Colorado 80919. (Developer and Tauche are sometimes hereinafter collectively referred to as the "Parties" and individually as a "Party").

RECITALS:

A. Developer and The City of Colorado Springs, a Colorado home rule city and municipal corporation (the "City") entered into an Agreement for Maintenance of Drainage Facilities effective October 24, 1996, a copy of which is attached hereto as Exhibit "A" (the "Maintenance Agreement").

B. Pursuant to paragraph 5 of the Maintenance Agreement, Developer may transfer the maintenance obligations described in the Maintenance Agreement (the "Maintenance Obligations") to a third-party golf course developer pursuant to the terms set forth therein.

C. Developer desires to transfer the Maintenance Obligations to Tauche, and Tauche desires to assume the Maintenance Obligations and be bound by the Maintenance Agreement.

NOW, THEREFORE, for good and valuable consideration, the Parties hereby agree as follows:

1. Effective upon the completion by Developer of the drainage facilities described in the Maintenance Agreement, Developer assigns to Tauche the Maintenance Obligations set forth in the Maintenance Agreement. Tauche hereby assumes all of the Developer's Maintenance Obligations set forth in the Maintenance Agreement, and agrees to be bound by all of the terms of the Maintenance Agreement, upon completion by Developer of the drainage facilities described therein.

2. Upon execution of this Assignment by both Parties, Developer shall deliver a copy of this Assignment to the City, and upon Developer's completion of the drainage facilities described in the Maintenance Agreement, Developer shall thereupon be released of all liability under the Maintenance Agreement.

3. Upon satisfaction of the conditions set forth in paragraph 2 above, Tauche shall thereafter indemnify, defend and hold harmless Developer, its heirs, successors and assigns, from all liability, costs, expenses, and obligations whatsoever arising under the Maintenance Agreement or as a result of Tauche's maintenance of, or failure to maintain, the drainage facilities.

4. This Agreement shall be binding upon the Parties, their successors and assigns, and shall be governed by and interpreted in accordance with the laws of the State of Colorado.

This Agreement shall be recorded in El Paso County, Colorado. The benefits and burdens of this Agreement shall run with the land.

5. In the event that either Party hereto institutes any action, suit, litigation or other proceedings against the other Party to remedy, enforce, or obtain relief from a breach of this Assignment by such other Party, the prevailing Party shall recover all of such Party's attorneys' fees, costs and expenses incurred in each and every such action, suit, litigation or other proceedings, including any and all appeals or petitions therefrom.

SPRINGS RANCH LIMITED LIABILITY CO.
a Colorado Limited Liability Company

By: James M. Ratkovic
Its: MANAGER

TOM TAUCHE, INC.
a Colorado Corporation

By: Tom Tauche
Its: PRESIDENT

STATE OF Colorado)
) ss.
COUNTY OF El Paso)

The foregoing instrument was acknowledged to before me this 29th day of October 1996, by James M. Ratkovic as Manager of SPRINGS RANCH LIMITED LIABILITY CO., a Colorado limited liability company.

WITNESS my hand and official seal.

SEAL

KAREN M. BIGGS NOTARY PUBLIC STATE OF COLORADO

Notary Public
My Commission Expires: 6/17/97

STATE OF COLORADO)
) ss.
COUNTY OF EL PASO)

The foregoing instrument was acknowledged to before me this 29th day of October, 1996, by Tom Tauche as President of Tom Tauche, Inc., a Colorado corporation.

WITNESS my hand and official seal.

SEAL

KAREN M. BIGGS NOTARY PUBLIC STATE OF COLORADO

Notary Public
My Commission Expires: 6/17/97

EXHIBIT "A"

AGREEMENT FOR MAINTENANCE OF DRAINAGE FACILITIES

This Agreement for Maintenance of Drainage Facilities is made effective the 24th day of October, 1996, by and between SPRINGS RANCH LIMITED LIABILITY CO., a Colorado limited liability company ("Developer") and THE CITY OF COLORADO SPRINGS, a Colorado home rule city and municipal corporation (the "City").

RECITALS:

A. Developer is the owner of certain property to be improved as an eighteen (18) hole golf course with related improvements thereon located within the development known as The Springs Ranch in the City of Colorado Springs, County of El Paso, State of Colorado (the "Property"). The Property is described on Exhibit "A" attached hereto and incorporated herein by this reference.

B. The main channel of Sand Creek runs through the Property from north to south as depicted on the drawing attached hereto as Exhibit "B" (the "Channel"). Developer is obligated to install special drainage improvements to the Channel within the boundary of the Property (the "Drainage Facilities") in accordance with the approved construction plans prepared by Kiowa Engineering, Inc. dated September 30, 1996, project no. 95-70 said plans being hereby incorporated into this Agreement by reference and which are on file for public viewing in the City Engineering records of the City (the "Construction Plans").

C. The parties desire to provide for maintenance of the Channel and for the Drainage Facilities constructed therein, as hereinafter set forth.

NOW, THEREFORE, for good and valuable consideration, the receipt and adequacy of which is acknowledged, the parties agree as follows:

1. The Channel and the Drainage Facilities constructed therein are and shall remain the property of the Developer, its successors or assigns.

2. The City shall have the right in an emergency to enter the Property and make any necessary immediate repairs to damaged Drainage Facilities where such damaged sections immediately threaten the strength and stability of existing adjacent Drainage Facilities which are maintained by the City, the costs of which are the responsibility of Developer as set forth in paragraph 4.

3. Developer shall maintain the Drainage Facilities in good working condition and in conformity with the approved Construction Plans. The City shall have no responsibility for such maintenance. Such maintenance shall include, by way of example and not by way of limitation, replacing construction materials as needed from time to time, removing lodged materials and debris in the Channel from time to time; repairing or replacing the Channel's banks in the event of unusual erosion or bank sloughing; repairing and maintaining the drop structures

constructed within the Channel; maintaining the widths and slope of the channel; and generally rendering the Channel unencumbered by obstacles or blockages in order to maintain the normal flow of water and to operate as designed.

4. The City may enter onto the Property for inspection of the Channel and the Drainage Facilities. In the event Developer shall fail to properly maintain the Channel and the Drainage Facilities therein in a timely manner, the City shall give Developer thirty (30) days written notice of such failure, during which time Developer may cure the failure. If Developer does not cure or commence to cure as provided in this paragraph, or fails thereafter to complete curing the default within a reasonable period of time once a cure is commenced, the City may make all necessary repairs and initiate a special assessment against the Property pursuant to Article 1 of Chapter 7 of the Code of the City of Colorado Springs as the same may be amended from time to time. As provided for in Article 1 of Chapter 7, such special assessments shall become a lien upon the Property and shall cover all costs and expenses the City incurs (which shall include costs to repair the Channel and Drainage Facilities as well as to repair the downstream detention pond described in paragraph 6 below) attributable to the Developer's failure to maintain the Channel and the Drainage Facilities.

5. Developer may transfer the maintenance obligations set forth herein to a third party golf course developer if the Drainage Facilities are completed by the Developer in accordance with the approved Construction Plans, and provided such third party assumes and agrees to be bound by the maintenance obligations set forth herein pursuant to a separate written agreement executed by the third party. The City shall be furnished an executed copy of the written document transferring the maintenance obligations. The transfer of the maintenance obligations under the provisions of this Agreement shall not be effective until the Drainage Facilities are completed by the Developer in accordance with the approved construction plans and the City has received the executed agreement as provided herein. Upon compliance with these conditions, the Developer shall be released of all maintenance liability hereunder.

6. The City shall own and maintain a proposed regional detention pond currently planned but not at this time constructed pursuant to the approved Sand Creek Drainage Basin Planning study at the southern boundary of the Property (north of Constitution Avenue). Upon final inspection and acceptance, the City shall maintain the detention pond. The City acknowledges siltation of the detention pond is a normal occurrence as a result of natural erosion upstream of the detention pond, and the City shall accept such normal siltation and Developer shall have no responsibility therefore provided Developer is properly maintaining the Channel pursuant to this Agreement. If significant erosion of the Channel within the Property occurs, causing excessive sedimentation/siltation in the detention pond, Developer shall be responsible for all removal and costs associated with removal and disposal of excess material from the detention pond. The City may take appropriate action if the Developer fails to cure the excessive sedimentation/siltation in the detention pond. Any City action shall be in accordance with the notice and cure provisions and the City assessment rights set forth in paragraph 4 above.

7. This Agreement shall be binding upon the parties, their successors and assigns, and shall be governed by and interpreted in accordance with the laws of the State of Colorado. This Agreement shall be recorded in El Paso County, Colorado. The benefits and burdens of this Agreement shall run with the land.

SPRINGS RANCH LIMITED LIABILITY CO.
a Colorado Limited liability company

By: [signature]
Its: MANAGER

CITY OF COLORADO SPRINGS,
a Colorado home rule city
and municipal corporation

By: [signature]
Its: ~~Acting Deputy City Manager~~

ATTEST:

[signature]
Deputy CITY CLERK

APPROVED AS TO FORM:

[signature]
CITY ATTORNEY OF COLORADO SPRINGS

STATE OF COLORADO)
) SS.
COUNTY OF EL PASO)

The foregoing instrument was acknowledged to before me this 24th day of October, 1996, by James M. Kotkovic as Manager of SPRINGS RANCH LIMITED LIABILITY CO., a Colorado limited liability company.

WITNESS my hand and official seal.

SEAL

KAREN M. BIGGS NOTARY PUBLIC STATE OF COLORADO

Notary Public
My Commission Expires: 6/17/97

STATE OF COLORADO)
) SS.
COUNTY OF EL PASO)

The foregoing was acknowledged to before me this 25th day of October, 1996, by David D. Nickerson as Acting Deputy City Manager of the City of Colorado Springs.

WITNESS my hand and official seal.

SEAL

Frances C. St. Germain
Notary Public
My Commission Expires: 9-23-98

Exhibit "A"
(Sheet 1 of 4)

Description

A portion of the Southeast 1/4, the East 1/2 of the Southwest 1/4, and the South 1/2 of the northeast 1/4 all in Section 30, Township 13 South, Range 65 West of the 6th P.M., El Paso County, Colorado more particularly described as follows:

All bearings in this description are relative to the Annexation Plat of The Colorado Springs Ranch Addition.

Beginning at the southwest corner of the northeast 1/4 of the northeast 1/4 of said Section 30; thence N00°23'54"E on the west line of said northeast 1/4 of the northeast 1/4, a distance of 135.00 feet; thence N88°37'56"E a distance of 85.00 feet; thence N57°10'14"E a distance of 320.00 feet; thence N65°06'25"E a distance of 380.00 feet; thence S62°30'13"E a distance of 390.00 feet to the west Right-of-Way line of Peterson Road as shown on the plat of The Colorado Springs Ranch Filing No. 2; thence south on said west Right-of-Way along a curve to the left having a central angle of 02°26'39", a radius of 1055.00 feet for a distance of 45.00 feet, the chord of said curve bears S01°49'56"W; thence S00°36'37"W on said west Right-of-Way a distance of 210.00 feet; thence S68°36'30"W a distance of 310.00 feet; thence S53°47'00"W a distance of 405.00 feet; thence S21°13'45"W a distance of 30.00 feet; thence N82°11'09"W a distance of 190.17 feet; thence N54°10'54"W a distance of 126.42 feet; thence S77°05'29"W a distance of 500.00 feet; thence S52°56'59"W a distance of 415.00 feet; thence S10°27'00"W a distance of 455.00 feet; thence S31°28'26"E a distance of 295.00 feet; thence S43°51'52"E a distance of 450.00 feet; thence N89°56'12"E a distance of 90.00 feet; thence S00°03'48"E a distance of 42.35 feet to a point of curve; thence on said curve to the right having a central angle of 29°38'58", a radius of 480.00 feet for a distance of 248.39 feet, whose chord bears S14°45'41"W; thence N79°15'30"W a distance of 576.78 feet; thence S17°32'00"W a distance of 178.04 feet; thence S26°22'00"W a distance of 427.37 feet; thence S05°29'33"E a distance of 120.03 feet to the north Right-of-Way line of North Carefree Circle; thence westerly on said north line along a curve to the left having a central angle of 10°50'47", a radius of 3860.00 feet for a distance of 730.71 feet, the chord of said curve bears S79°05'09"W; thence N10°32'24"W a distance of 80.00 feet; thence N23°02'27"E a distance of 524.31 feet to the west line of the Sand Creek Drainage Tract; thence N10°32'24"W on said west line a distance of 315.00 feet to a point of curve; thence on west line along a curve to the right having a central angle of 45°41'56", a radius of 1600.00 feet for a distance of 1276.16 feet; thence N35°09'32"E on the west line of said Drainage Tract, a distance of 638.31 feet to the north line of the south 1/2 of the northeast 1/4 of said Section 30; thence N89°39'32"E on said north line a distance of 1032.84 feet to the Point of Beginning containing 67.39 acres of land more or less.

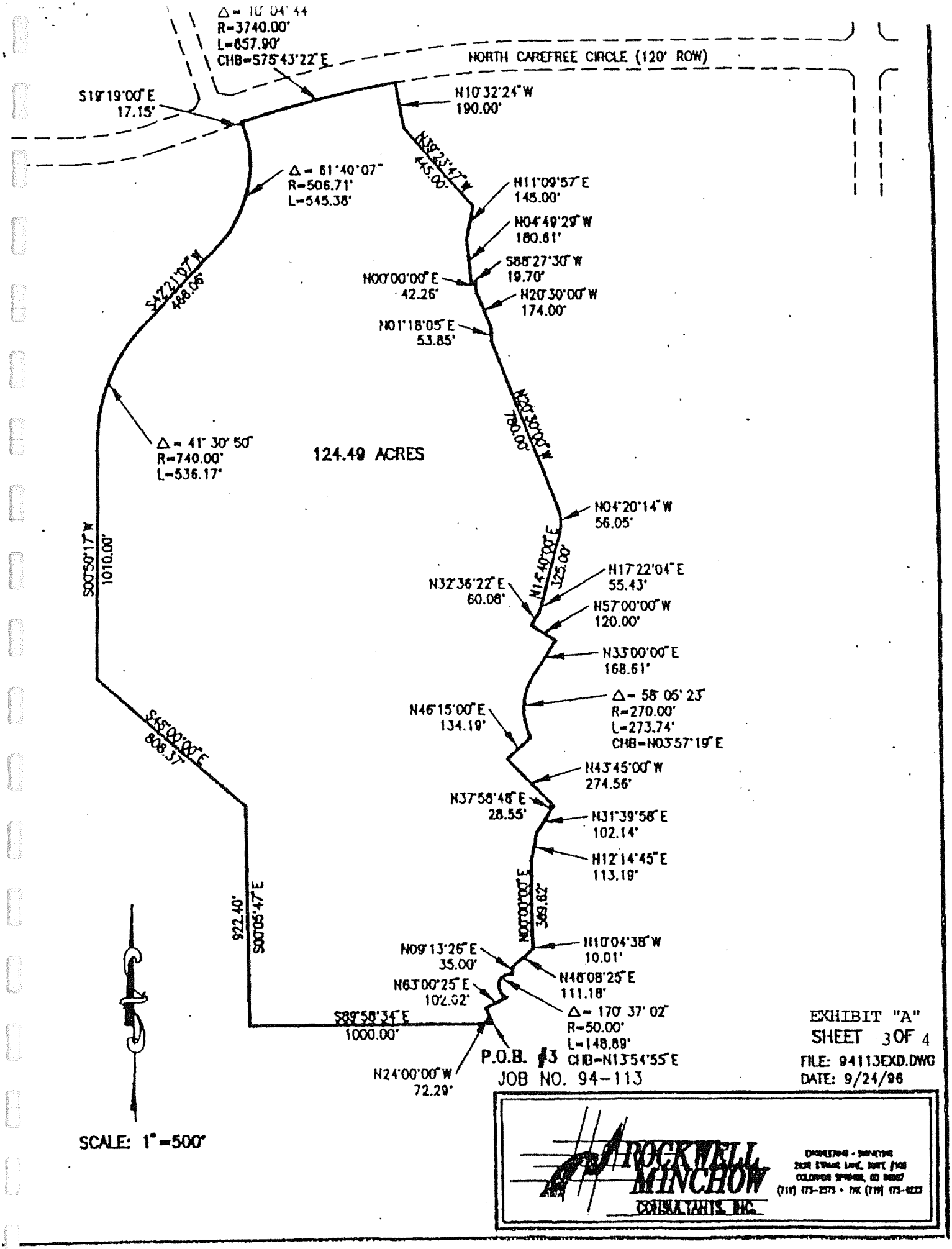
Together with a portion of the east 1/2 of Section 30, Township 13 South, Range 65 West of the 6th P.M., El Paso County, Colorado, more particularly described as follows:

Commencing at the end of course number 18 in the tract of land described above, thence N89°56'12"E on the easterly extension of said course number 17, a distance of 60.00 feet to the Point of Beginning, thence continuing N89°56'12"E a distance of 105.00 feet; thence N23°08'09"E a distance of 500.00 feet; thence N08°31'50"E a distance of 795.07 feet; thence S82°11'09"E a distance of 148.92 feet; thence S12°35'03"E a distance of 957.60 feet; thence S36°15'04"W a distance of 740.56 feet; thence S76°42'47"W a distance of 200.68 feet; thence N84°32'29"W a distance of

226.25 feet to a point of curve; thence of said curve to the left having a central angle of 32°14'08", a radius of 540.00 feet for a distance of 303.81 feet whose chord bears N16°03'16"E; thence N00°03'48"W a distance of 42.35 feet to the Point of Beginning containing 14.03 acres of land more or less.

Together with the following tract located in the south 1/2 of the south 1/2 of Section 30 and the north 1/2 of Section 31, Township 13 South, Range 65 West of the 6th P.M., El Paso County, Colorado more particularly described as follows:

Beginning at a point on the south line of the northeast 1/4 of Section 31 being on the west line of Lot 32, Block 1, The Colorado Springs Ranch Filing No. 1, thence N24°00'00"W, on said west line a distance of 72.29 feet to the northwest corner of Lot 33, said Block 1; thence N63°00'25"E a distance of 102.62 feet; thence northerly along a curve to the right having a central angle of 170°37'02", a radius of 50.00 feet for a distance of 148.89 feet, the chord of said curve bears N13°54'55"E; thence N09°13'26"E a distance of 35.00 feet; thence N48°08'25"E a distance of 111.18 feet to the southwest corner of Lot 35, Block 7, said Filing No. 1, thence N10°04'38"W on the west line of said Lot 35 a distance of 10.01 feet; thence N00°00'00"E on said west line and its northerly extension a distance of 369.62 feet to the southwest corner of Lot 29, said Block 7; thence N12°14'45"E on said west line a distance of 113.19 feet to the southeast corner of Lot 21, said Block 7; thence N31°39'58"E on the east line of said Lot 21, a distance of 102.14 feet to the southwest corner of Lot 26, said Block 7; thence N37°58'48"E on the west line of said Lot 26 a distance of 28.55 feet; thence N43°45'00"W a distance of 274.56 feet; thence N46°15'00"E a distance of 134.19 feet to the west Right-of-Way line of Pony Tracks Drive; thence northerly on said west line along a curve to the right having a central angle of 58°05'23", a radius of 270.00 feet for a distance of 273.74 feet, the chord of said curve bears N03°57'19"E; thence N33°00'00"E on said west line a distance of 168.61 feet; thence N57°00'00"W a distance of 120.00 feet; thence N32°36'22"E a distance of 60.08 feet; thence N17°22'04"E a distance of 55.43 feet; thence N14°40'00"E a distance of 325.00 feet; thence N04°20'14"W a distance of 56.05 feet; thence N20°30'00"W a distance of 780.00 feet; thence N01°18'05"E a distance of 53.85 feet to the southwest corner of Lot 1, Block 13, said Filing No. 1; thence N20°30'00"W on the west line of said Block 13 a distance of 174.00 feet; thence N00°00'00"E on said west line a distance of 42.26 feet to the northwest corner of Lot 3, said Block 13; thence S88°27'30"W on the south line of Lot 55, Springs Ranch Subdivision Filing No. 7, a distance of 19.70 feet to the southwest corner thereof; thence N04°49'29"W on the west line of said Filing No. 7 a distance of 180.61 feet; thence N11°09'57"E on said west line a distance of 145.00 feet; thence N39°23'47"W on said west line a distance of 445.00 feet; thence N10°32'24"W on said west line a distance of 190.00 feet to the northwest corner of Lot 43, said Filing No. 7, said point is on the south Right-of-Way line of North Carefree Circle; thence westerly on said south line along a curve to the left having a central angle of 10°04'44", a radius of 3740.00 feet for a distance of 657.90 feet, the chord of said curve bears S75°43'22"W; thence S19°19'00"E a distance of 17.15 feet to a point of curve; thence on a curve to the right having a central angle of 61°40'07", a radius of 506.71 feet for a distance of 545.38 feet; thence S42°21'07"W a distance of 466.06 feet to a point of curve; thence on a curve to the left having a central angle of 41°30'50", a radius of 740.00 feet for a distance of 536.17 feet; thence S00°50'17"W a distance of 1010.00 feet; thence S48°00'00"E a distance of 808.37 feet; thence S00°05'47"E a distance of 922.40 feet to the south line of the northeast 1/4 of said Section 31; thence S89°58'34"E on said south line a distance of 1000.00 feet to the Point of Beginning containing 124.49 acres of land more or less.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17.15'
N10°32'24"W
190.00'
N39°23'47"W
445.00'
Δ = 61°40'07"
R=506.71'
L=545.38'
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N04°49'29"W
180.61'
S85°27'30"W
19.70'
N00°00'00"E
42.26'
N20°30'00"W
174.00'
N01°18'05"E
53.85'
S42°21'07"W
488.06'
N20°30'00"W
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L=536.17'
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N09°13'26"E
35.00'
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111.18'
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CHB=N13°54'55"E
S89°58'34"E
1000.00'
P.O.B. #3
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SCALE: 1"=500'
EXHIBIT "A"
SHEET 3 OF 4
FILE: 94113EXD.DWG
DATE: 9/24/96
ROCKWELL MINCHOW
CONSULTANTS, INC.

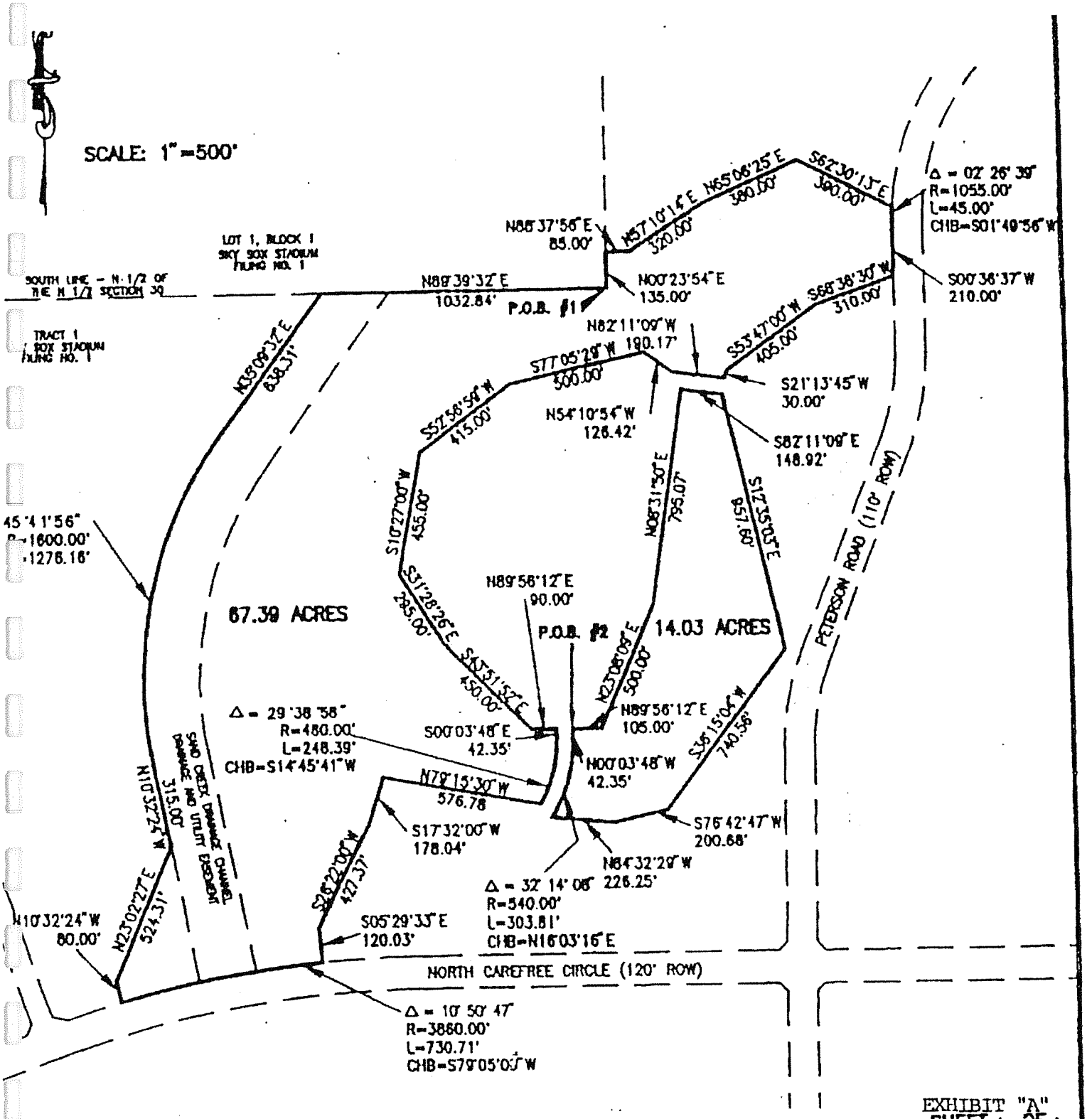
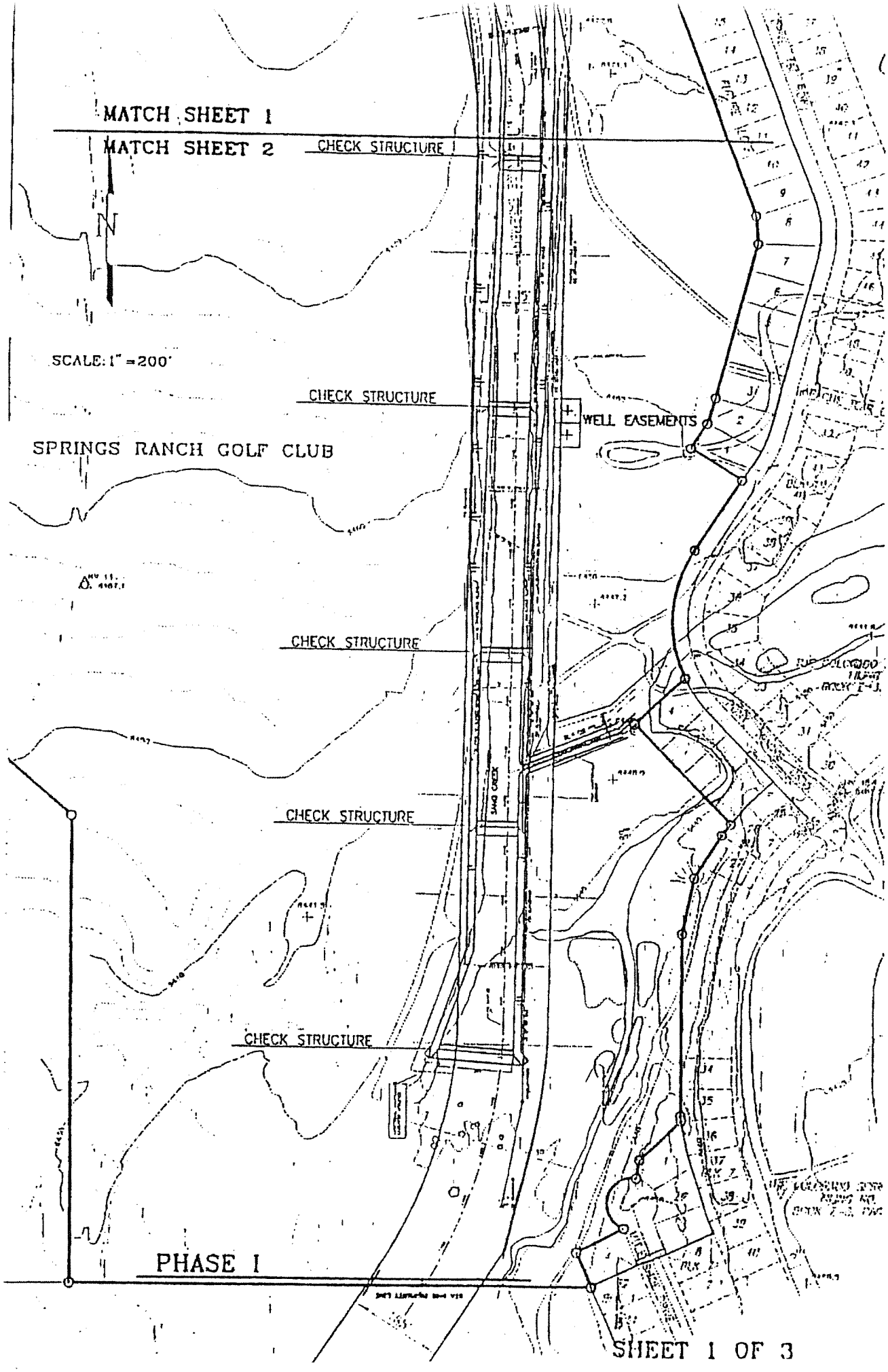


EXHIBIT "A"
SHEET 4 OF 4

FILE: 94113EXC.DWG
DATE: 9/24/96

JOB NO. 94-113

ROCKWELL MINCHOW CONSULTANTS, INC.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MATCH SHEET 2
CHECK STRUCTURE
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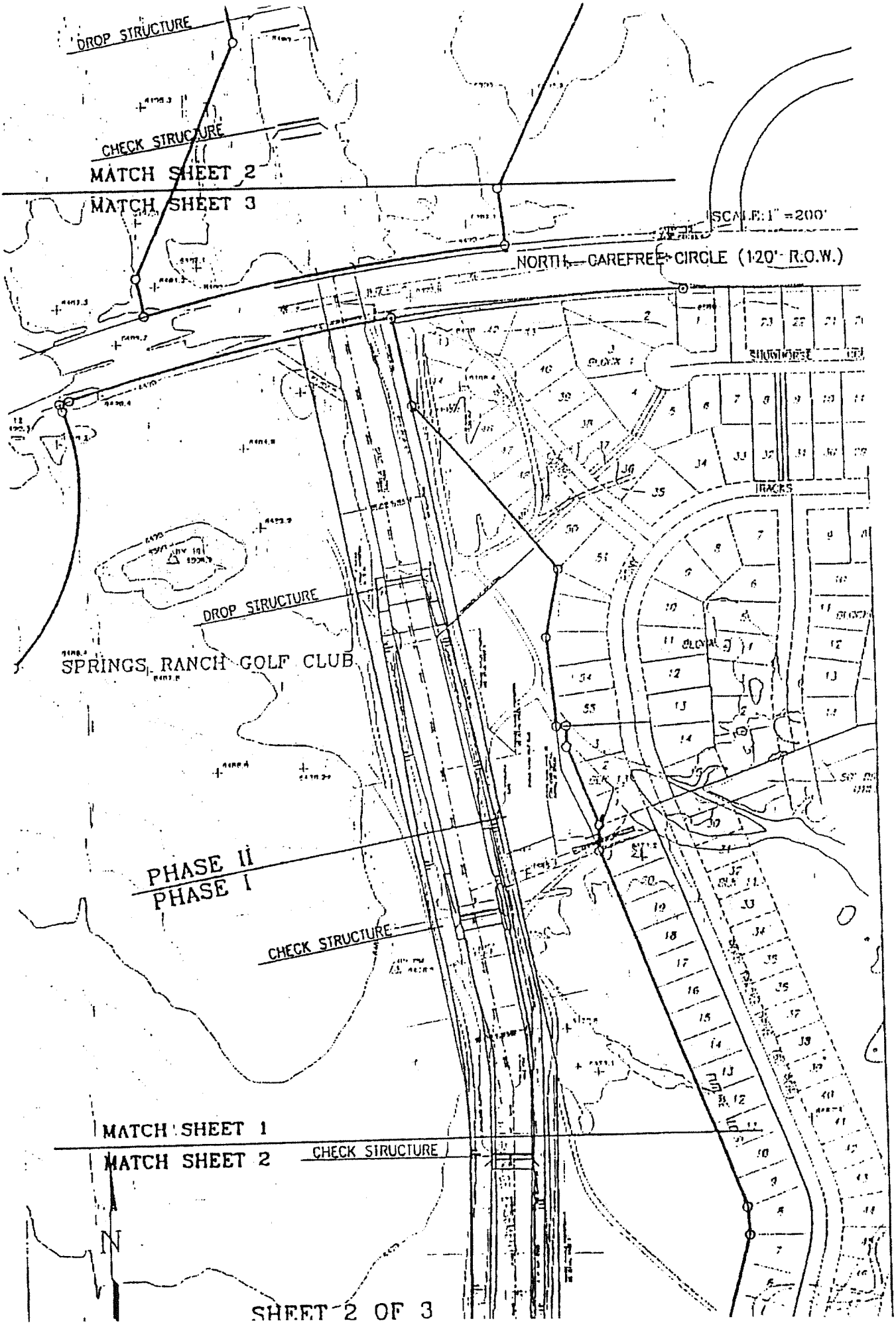
CHECK STRUCTURE
WELL EASEMENTS
SPRINGS RANCH GOLF CLUB
CHECK STRUCTURE
CHECK STRUCTURE
CHECK STRUCTURE
SAND CREEK
PHASE I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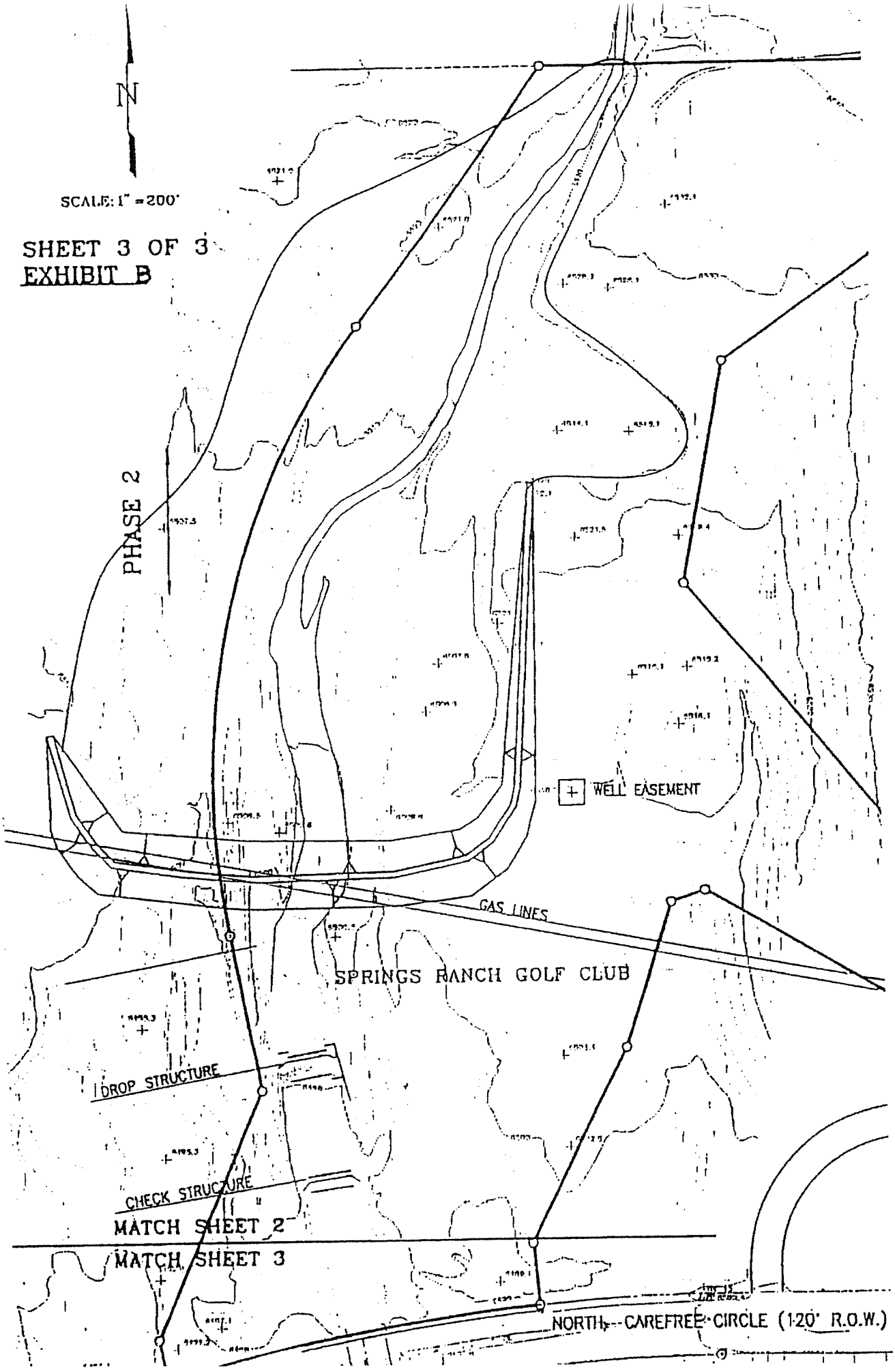
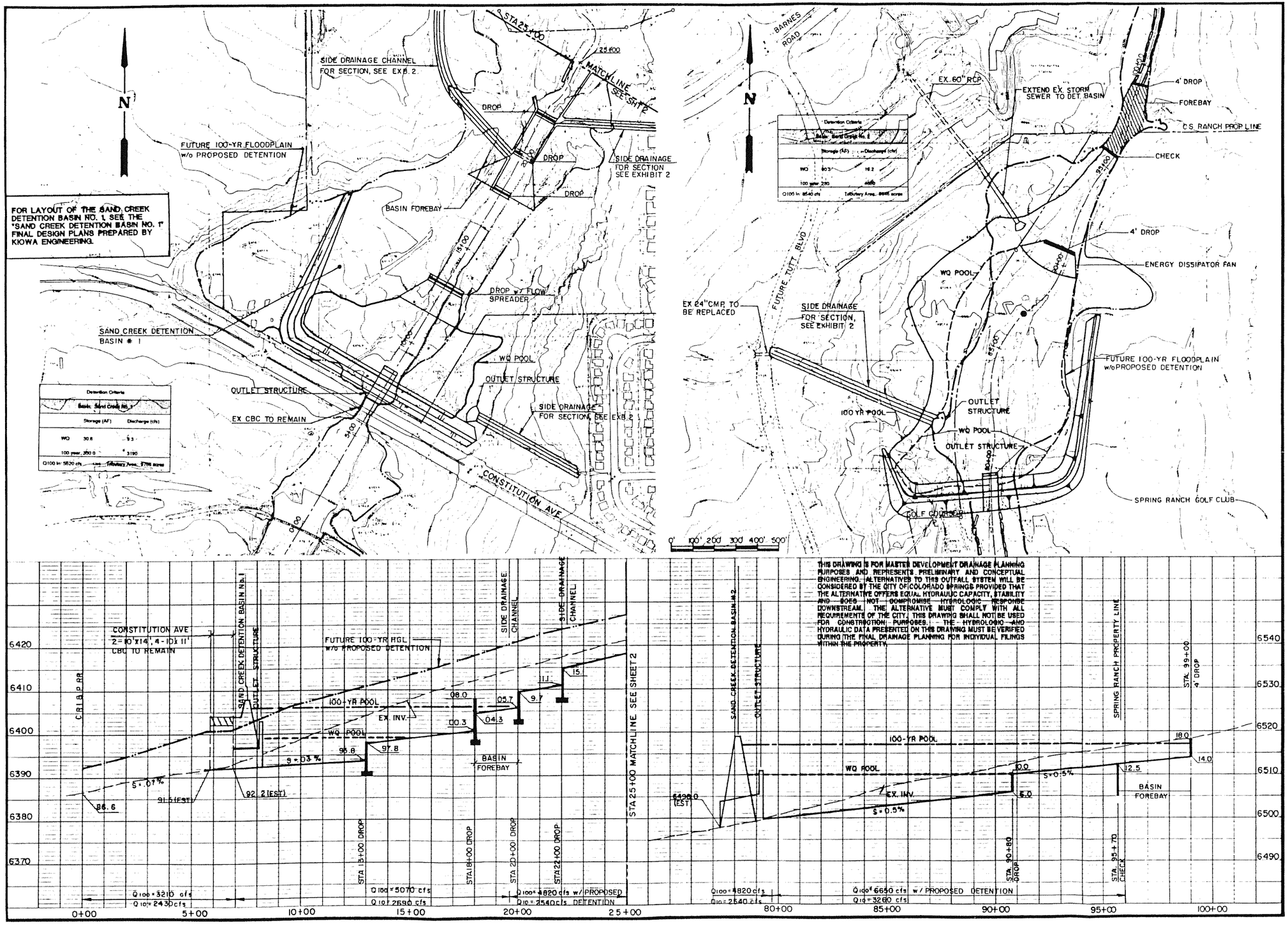
MATCH SHEET 3
SCALE: 1" =200'
NORTH CAREFREE CIRCLE (120' R.O.W.)
TRACKS
DROP STRUCTURE
SPRINGS RANCH GOLF CLUB
PHASE II
PHASE I
CHECK STRUCTURE
MATCH SHEET 1
MATCH SHEET 2
CHECK STRUCTURE
N


N
SCALE: 1" = 200'
SHEET 3 OF 3
EXHIBIT B
PHASE 2
WELL EASEMENT
GAS LINES
SPRINGS RANCH GOLF CLUB
DROP STRUCTURE
CHECK STRUCTURE
MATCH SHEET 2
MATCH SHEET 3
NORTH--CAREFREE CIRCLE (120' R.O.W.)

APPENDIX E

Preliminary Design Drawings



Kiowa Engineering Corporation
419 West Bijou Street
Colorado Springs, Colorado
80905-1308

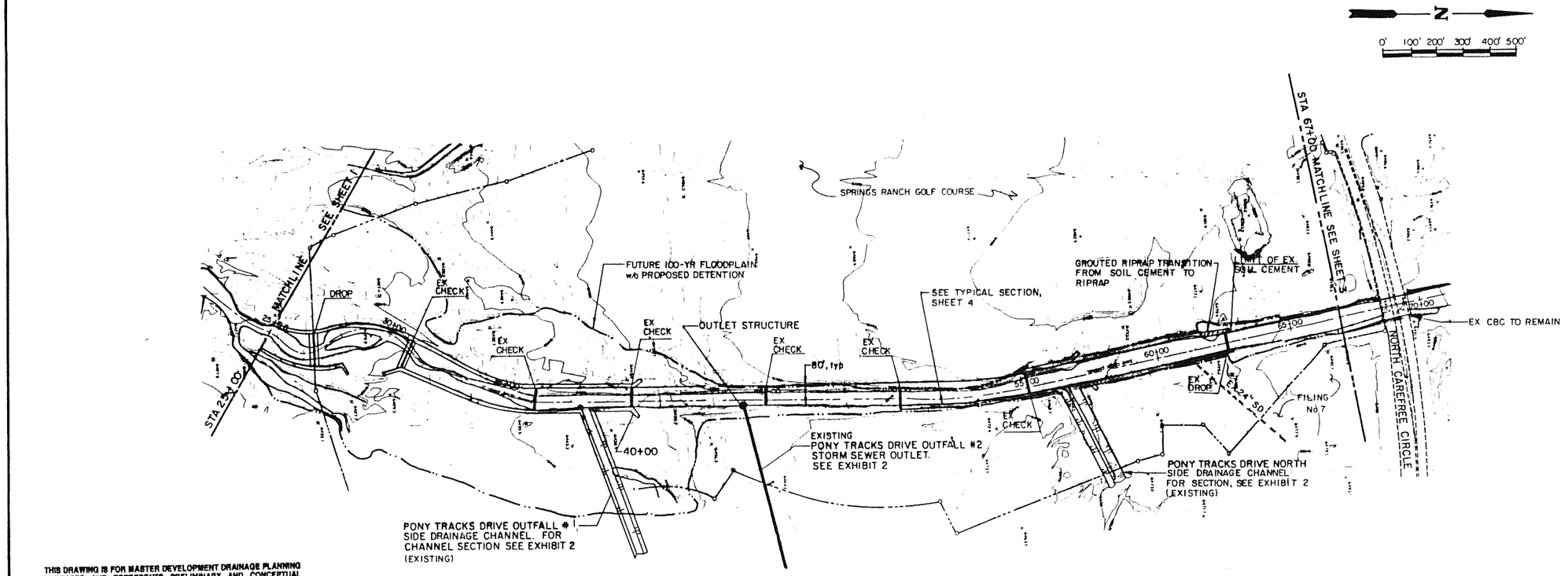
COLORADO SPRINGS RANCH MASTER DRAINAGE PLAN

SAND CREEK CHANNEL

PRELIMINARY DESIGN DRAWINGS

Project No.	94-02 11
Date:	4/94
Design:	RNW
Drawn:	EAK
Check:	RNW
Revisions:	10/95/ 4/98
	SC #2

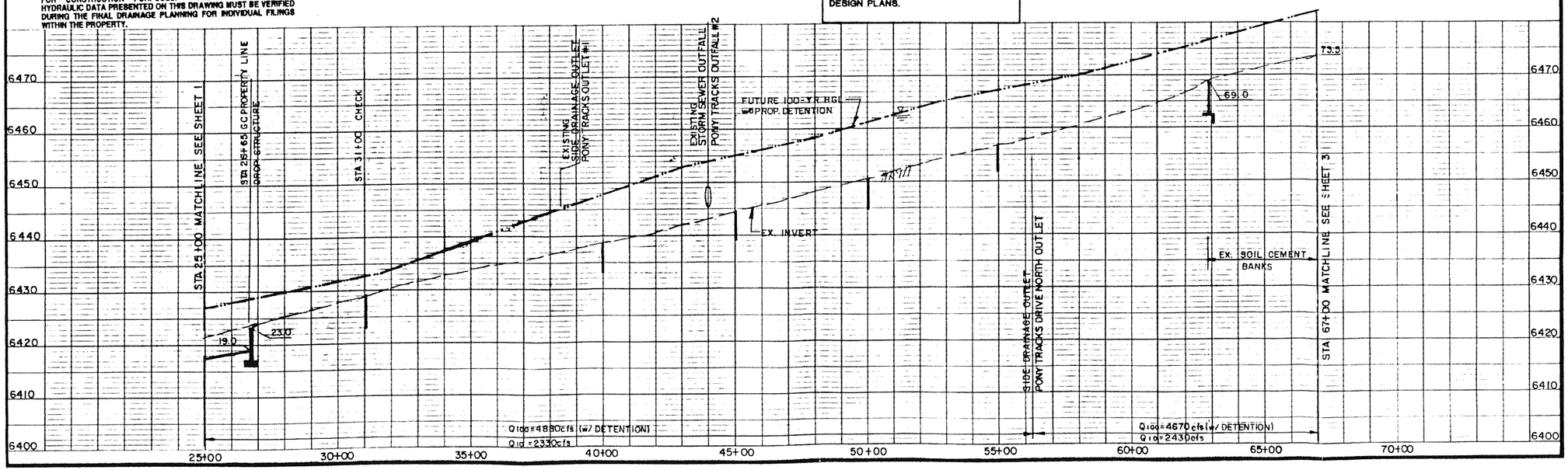
SHEET 1 of 4



THIS DRAWING IS FOR MASTER DEVELOPMENT DRAINAGE PLANNING PURPOSES AND REPRESENTS PRELIMINARY AND CONCEPTUAL ENGINEERING. ALTERNATIVES TO THIS OUTFALL SYSTEM WILL BE CONSIDERED BY THE CITY OF COLORADO SPRINGS PROVIDED THAT THE ALTERNATIVE OFFERS EQUAL HYDRAULIC CAPACITY, STABILITY AND DOES NOT COMPROMISE HYDROLOGIC RESPONSE DOWNSTREAM. THE ALTERNATIVE MUST COMPLY WITH ALL REQUIREMENTS OF THE CITY. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES. THE HYDROLOGIC AND HYDRAULIC DATA PRESENTED ON THIS DRAWING MUST BE VERIFIED DURING THE FINAL DRAINAGE PLANNING FOR INDIVIDUAL FILINGS WITHIN THE PROPERTY.

CHANNEL LININGS FROM STA 31+00 to 62+50 ARE CONSTRUCTED.

FOR DESIGN OF BANK AND CHECK STRUCTURES FOR STATIONS 31+00 TO STATION 63+00 SEE SAND CREEK GRADE CONTROL PROJECT FINAL DESIGN PLANS.



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COLORADO SPRINGS RANCH MASTER DRAINAGE PLAN

SAND CREEK CHANNEL

PRELIMINARY DESIGN DRAWINGS

Project No.	94.02.11
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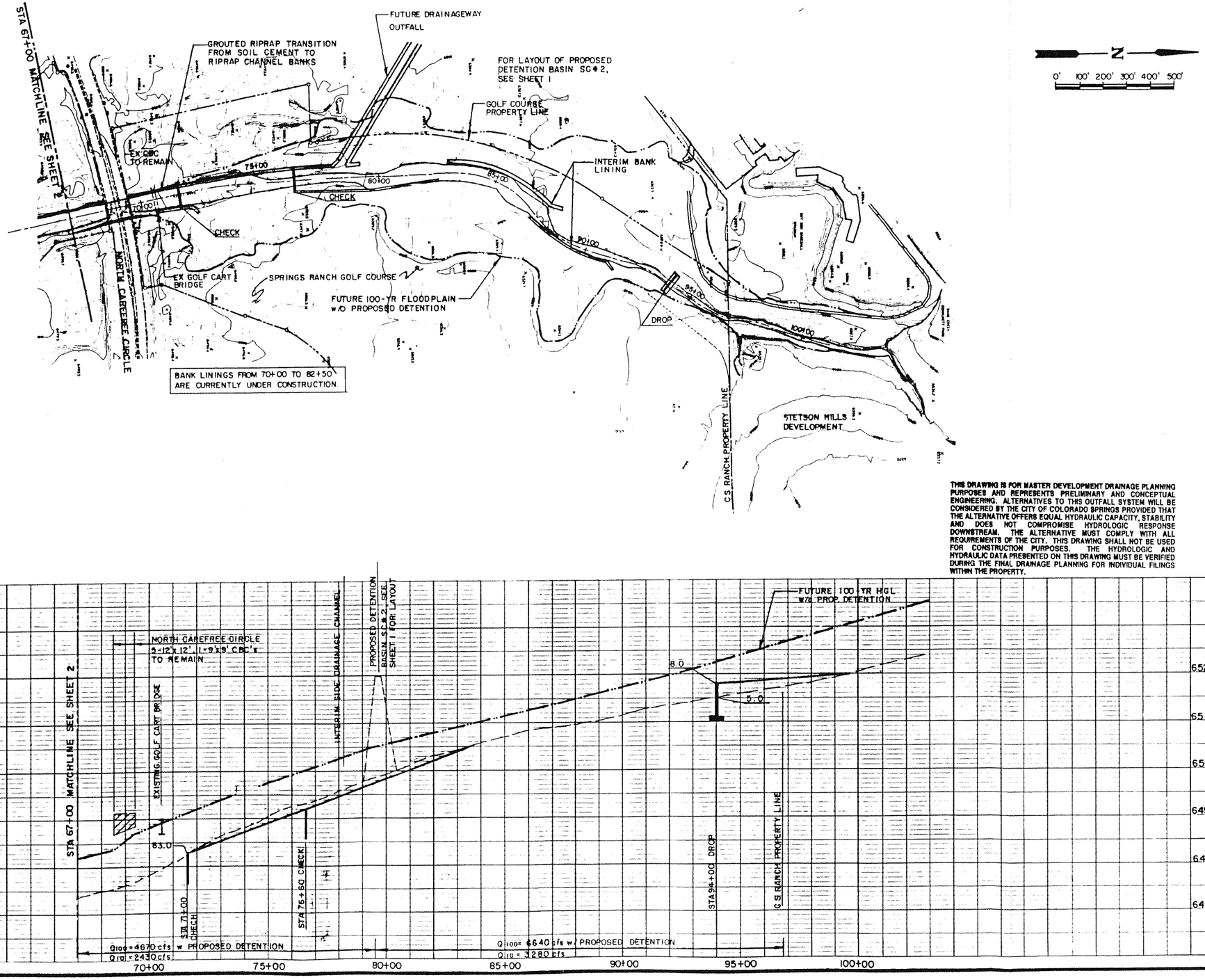

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COLORADO SPRINGS RANCH MASTER DRAINAGE PLAN

SAND CREEK CHANNEL

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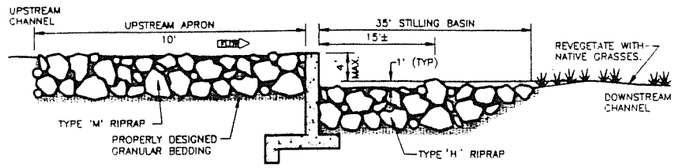
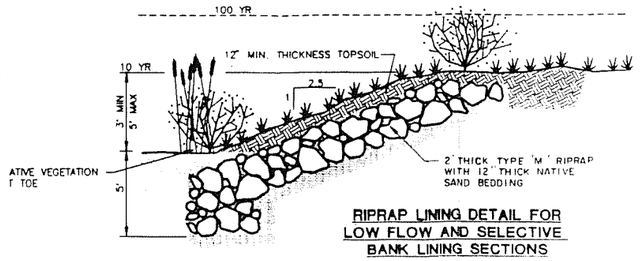
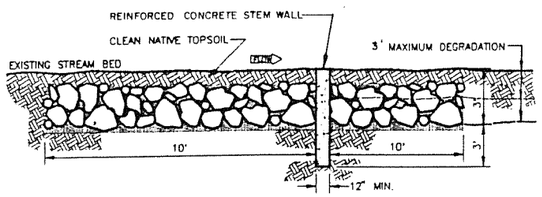


TYPICAL DROP STRUCTURE
GENERALIZED PROFILE
NTS

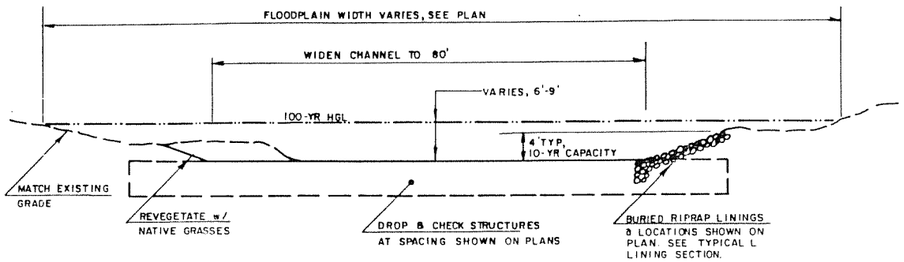
NOTE. DIMENSIONS OF APRON, STILLING BASIN, RIPRAP, AND CHECK STRUCTURE IS TO BE DETERMINED DURING FINAL DESIGN.



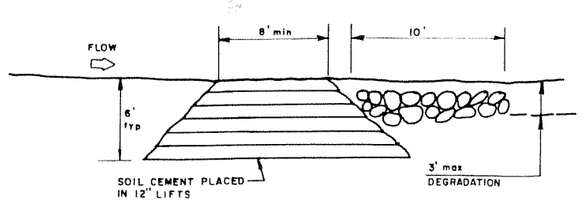
RIPRAP LINING DETAIL FOR
LOW FLOW AND SELECTIVE
BANK LINING SECTIONS
NTS



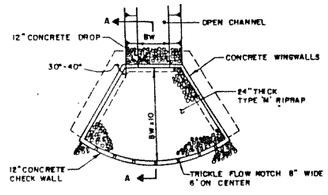
TYPICAL EROSION CONTROL
CHECK PROFILE
NTS



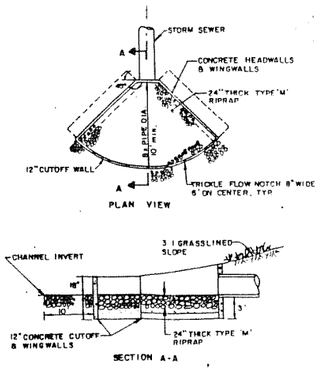
TYPICAL CHANNEL SECTION
NTS



TYPICAL SOIL CEMENT
CHECK STRUCTURE
NTS



TYPICAL OPEN CHANNEL OUTLET STRUCTURE



TYPICAL STORM SEWER OUTLET STRUCTURE
nts

Kiowa Engineering Corporation
419 West Bijou Street
Colorado Springs, Colorado
80905-1308

COLORADO SPRINGS RANCH MASTER DRAINAGE PLAN

SAND CREEK CHANNEL

Project No.	94.02.11
Date:	4/94
Design:	RNW
Drawn:	EAK
Check:	RNW
Revisions:	

APPENDIX F

Detention Basin (SC-1) Agreement

DETENTION POND (SC-1) AGREEMENT

THIS DETENTION POND (SC-1) AGREEMENT is made effective the 10th day of MARCH, 1998, by and between **BRE/SPRINGS RANCH L.L.C.,** a Delaware Limited Liability Company ("Springs Ranch"), **US HOME CORPORATION**, a Delaware Corporation ("US Home"), and the **CITY OF COLORADO SPRINGS**, a Colorado Home Rule City and Municipal Corporation (the "City"). Springs Ranch, US Home and the City are hereinafter sometimes referred to individually as a "Party" or collectively as the "Parties".

RECITALS:

A. Springs Ranch is the owner of certain property located within the development also known as Springs Ranch in the City of Colorado Springs, County of El Paso, State of Colorado (the "Springs Ranch Property"). The Springs Ranch Property is described on Exhibit "A" attached hereto and incorporated herein by this reference.

B. US Home is the owner of certain property located within the development known as Stetson Hills in the City of Colorado Springs, County of El Paso, State of Colorado (the "Stetson Property"). The Stetson Property is described on Exhibit "B" attached hereto and incorporated herein by this reference. The Stetson Property is located north of the Springs Ranch Property. The Stetson Property and the Springs Ranch Property are hereinafter collectively referred to as the "Properties".

C. The main channel of Sand Creek runs through the Properties, or portions thereof, from north to south as depicted on the drawing attached hereto as Exhibit "C" (the "Sand Creek Channel").

D. Springs Ranch and US Home have agreed to install a detention pond into which the Sand Creek Channel shall flow upon the southern portion of the Springs Ranch Property (the "Detention Pond"). The Detention Pond is depicted on the drawing attached hereto as Exhibit "D" and is depicted as "Detention Pond SC-1" in the Sand Creek Drainage Basin Planning Study of Kiowa Engineering adopted by the Colorado Springs City Council pursuant to Resolution No. 189-95 on November 28, 1995 (the "DBPS"). The full study is on file in office of the City Engineer for the City of Colorado Springs, Colorado.

E. After construction of the Detention Pond in accordance with the approved design thereof by Springs Ranch and US Home, the Detention Pond shall be accepted by the City and the City shall thereafter own and maintain the Detention Pond and the land surrounding it.

F. The parties desire to set forth their agreement regarding the timing of the Detention Pond construction, the method of financing and receiving credits for land dedication and Detention Pond construction, and the subsequent acceptance of the Detention Pond by the City.

NOW, THEREFORE, for good and valuable consideration, the receipt and adequacy of which is acknowledged, the Parties agree as follows:

1. The Detention Pond shall be constructed as a joint effort between Springs Ranch and US Home upon approximately 50.9 acres of land depicted on Exhibit "E" attached hereto (the "Detention Pond Property"). Springs Ranch currently owns approximately 42.499 acres of the Detention Pond Property as depicted on Exhibit "F". The Parties agree that both US Home and Springs Ranch shall receive equal credit at the time of the dedication of the Detention Pond Property to the City by Springs Ranch. Subject to the terms of Paragraph 2, regardless of the amount of land owned by Springs Ranch actually deeded to the City for the Detention Pond, the Parties acknowledge that the City shall give Springs Ranch and US Home credit for only 34.1 acres at the rate of $25,000.00 per acre if the land is dedicated in calendar year 1997 (or the then-current fee in lieu of land dedication provided for in the Subdivision Code, Article 3 of Chapter 15 of the Code of the City of Colorado Springs 1980, as amended if the land is dedicated after calendar year 1997).

2. The Parties further acknowledge that approximately 8.4 acres of the Detention Pond Property are currently owned by a third party (the "Outside 8.4 Acres"). Springs Ranch and US Home shall use diligent good faith efforts to purchase the Outside 8.4 Acres from the current owner thereof within two (2) years from the effective date of this Agreement at a price not to exceed the then-current rate for land dedication as determined by the City, in the amount of $25,000.00 per acre in calendar year 1997. In the event Springs Ranch and US Home have not purchased the Outside 8.4 Acres by the expiration of such two (2) year period, the City may acquire the Outside 8.4 Acres if the City Council authorizes its acquisition. In either case, whether acquired first by Springs Ranch and US Home or directly by the City, the costs and expenses of the acquisition of the Outside 8.4 Acres shall be paid out of the Escrow Account described in Paragraph 7 below. Springs Ranch and US Home have no obligation to commence construction of the Detention Pond facilities until the City acquires ownership of the Outside 8.4 Acres.

3. That portion of the Detention Pond Property currently owned by Springs Ranch shall be transferred to the City via Special Warranty Deed within forty (40) days of the date of this Agreement by all Parties. The City shall accept title free and clear of liens, but subject to conditions, easements, restrictions, reservations and rights of way of record, and subject to a reservation of mineral rights, if any, and a reservation of all rights to remove sand and fill dirt from the Detention Pond Property until completion of the Detention Pond and the City's acceptance of the Detention Pond improvements. Title shall be merchantable in the City. Springs Ranch shall furnish a title insurance commitment to the City within ten (10) days of the execution of this Agreement by all Parties. The City shall have ten (10) days within which to examine the title insurance commitment. If the City determines the title is not merchantable or exceptions set forth in the title insurance commitment are unacceptable to the City, the City shall notify Springs Ranch in which case this Agreement shall terminate. The deed shall also be subject to the further restriction that the City hold the Detention Pond Property for use only as a Detention Pond and open space and that the City may not sell or otherwise transfer the Detention Pond Property. The restriction set forth herein shall be reflected in the deed and shall run with the land. Notwithstanding the foregoing, the restrictions on

the use and restrictions on the transfer of the Detention Pond Property set forth in this Paragraph 3 shall terminate and become null and void and of no force upon January 1, 2017, or upon an agreement entered into by all three Parties or their successors or assigns. Springs Ranch and US Home shall pay the cost of any title insurance for the Detention Pond Property from funds currently held by the City.

4. Upon dedication of the Detention Pond Property to the City, Springs Ranch and US Home are granted licenses to enter upon the Detention Pond Property to construct the Detention Pond facilities and, in connection therewith, to remove and sell to third parties excess sand and fill-dirt material, and Springs Ranch and US Home shall obtain all pertinent governmental and regulatory permits and approvals necessary to remove, sell or otherwise dispose of the excess material. Such regulatory permits and approvals shall include appropriate land use approvals by the City of Colorado Springs. All net funds generated from the sale of excess material, less payment of costs, expenses and regulatory deposits, including a reasonable management fee, shall be placed in the Escrow Account described in Paragraph 7 below. Such funds generated from the disposal of the excess material shall be credited to Springs Ranch and US Home equally and used by Springs Ranch and US Home for payment of the Detention Pond construction obligations as hereinafter set forth.

5. The parties currently estimate the Detention Pond will cost in excess of $1,841,000.00 (excluding the cost to acquire the Outside 8.4 Acres), and that the Detention Pond facilities will not be necessary, given the current rate of land absorption within the Sand Creek Basin, for approximately 6 years. Springs Ranch and US Home agree to commence the construction of the Detention Pond facilities at such time as 600 acres of land within the immediate S-1 detention pond drainage area (as defined in the DBPS) is platted. The City, Springs Ranch and US Home each agree to independently keep track of the platting of the 600 acres as defined herein and to notify in writing the other parties when such acreage is platted. The detention pond facility shall be ~~completed~~ STARTED within one (1) year of the platting of the 600 acres as defined herein. The failure of any party to notify another party that the 600 acres have been platted shall not relieve Springs Ranch and US Home of their obligation to commence construction within such one (1) year period.

DM 2/5/98

6. The Parties further acknowledge that pursuant to the DBPS, the City established a new fee to meet the costs of construction of detention ponds supporting the Sand Creek Channel required by the DBPS (hereinafter the "Sand Creek Detention Pond Fee"). Such fee, payable at the time of platting for all property within the Sand Creek Basin as described in DBPS, is currently $1524.00 per acre, subject to annual adjustments by the City's Drainage Board and approval by the City Council. Owners of property within the Sand Creek Basin other than the Springs Ranch Property and the Stetson Property shall pay their Sand Creek Detention Pond Fee at the time of platting to the City to be administered by the City as part of the Sand Creek Detention Pond Fee fund. The Sand Creek Detention Pond Fees paid by the owners of the Springs Ranch Property and the Stetson Property shall be deposited in the Escrow Account described in Paragraph 7 below. All costs and expenses of construction of the Detention Pond incurred by Springs Ranch and US Home in excess of their respective $1,524.00 per acre Sand Creek Detention Ponds Fee obligation payable at the time of platting of their respective Properties shall be credited to Springs Ranch and US Home based upon the respective amounts paid by the owners of the Springs Ranch Property and Stetson

Property. Springs Ranch and US Home shall be entitled to standard drainage credits and reimbursements that exceed their $1524.00 (or the amount of the Sand Creek Detention Pond Fee applicable at the time construction of the Detention Pond is completed) per acre platting fees and land dedication requirements.

7. Additionally, the City has imposed only upon the Springs Ranch Property and the Stetson Property a Detention Pond additional assurance (the "Detention Pond Additional Assurance"), again payable at the time of platting, to help meet the anticipated costs of construction of the Detention Pond. Such Detention Pond Additional Assurance is set at $879.00 per acre, subject to annual adjustments by the City's Drainage Board which increases, if any, shall be commensurate with and shall not exceed the annual percentage increase to the Sand Creek Detention Pond Fee. All fees described in Paragraphs 6 and 7 paid by Springs Ranch, US Home, or the successor owners of the Springs Ranch Property and Stetson Property, shall be deposited in a separate interest-bearing escrow account with Land Title Guaranty Company or some other third party acceptable to all Parties (the "Escrow Account"). The Parties shall within thirty (30) days of approval of this Agreement by the Colorado Springs City Council enter into a separate tri-party Escrow Agreement. The City shall hold title to funds in the Escrow Account, subject to the rights and obligations set forth herein and in the Escrow Agreement.

8. The Parties acknowledge Springs Ranch has to date in 1997 already paid to the City or is obligated to pay to the City the Sand Creek Detention Pond Fees in the amount of $1,524.00 per platted acre and the Detention Pond Additional Assurance in the amount of $879.00 per platted acre in connection with its platting of Springs Ranch Property in contemplation of the consummation of this Agreement. In the event that any of such fees have not been paid to the City, such fees shall be paid to the City by Springs Ranch within ten (10) days after such notification by the City. The City shall transfer the total of such sums to the Escrow Account immediately upon its establishment. Upon execution of this Agreement by all Parties, the City shall return to US Home the Detention Pond assurance money it currently holds under a prior separate arrangement in the approximate amount of $100,000.00 less the Detention Pond Additional Assurance in the amount of $879.00 per platted acre multiplied by the number of acres of the Stetson Property platted by US Home in 1997. The amount of Detention Pond Additional Assurance funds retained by the City pursuant to this paragraph, as well as the total of all Sand Creek Detention Pond fees paid by US Home in connection with its platting of Stetson Property in 1997, shall be transferred to the Escrow Account established pursuant to Paragraph 7 hereof immediately upon its establishment.

9. As portions of the Detention Pond facilities are completed by Springs Ranch and US Home, Springs Ranch and US Home may jointly draw upon (i) first the funds in the Escrow Account pursuant to the terms of the Escrow Agreement, and (ii) then funds accumulated in the Sand Creek Detention Pond Fee fund administered by the City pursuant to the normal Sand Creek Basin recovery procedures already in place, for payment of, or reimbursement to them of, construction costs.

10. After the Detention Pond facilities are completed and accepted by the City, the City shall thereafter maintain the Detention Pond and the land surrounding its owned by the City, subject

to the terms of the Agreement for Maintenance of Drainage Facilities between Springs Ranch and the City dated effective October 24, 1996, which is recorded in the records of the El Paso County Clerk and Recorder under Reception No. 097148693 on December 18, 1997.

11. The obligations and rights of Springs Ranch and US Home shall be binding upon the current owners of the Properties and their respective heirs, successors and assigns and shall run with the land of the unplatted portion of the Springs Ranch Property and the Stetson Property. Notwithstanding the foregoing, upon platting and payment of appropriate fees of any portion of the Springs Ranch Property and the Stetson Property, and upon the subsequent sale of such Properties to third-party homeowners, the obligations of US Home, Springs Ranch ~~and Land Holding Co.~~ shall be released as to the third-party owners of the platted and sold Properties.

12. In the event either Springs Ranch or US Home defaults in the terms of this Agreement, and such default is not cured within thirty (30) days of receipt of written notice from the other, or in the event either Springs Ranch or US Home dissolves, ceases to operate, or files a petition for protection under the US Bankruptcy Code (the "Defaulting Party"), and no successor or assign either (i) specifically assumes the obligations hereof or, (ii) by virtue of the ownership of the remaining unplatted Springs Ranch Property or US Home Property, automatically becomes obligated hereunder, then the non-Defaulting Party may use all funds collected pursuant to Paragraphs 6 and 7 above for construction of the Detention Pond, and the Defaulting Party shall automatically forfeit to the non-Defaulting Party all credits for land dedication and construction costs earned pursuant to Paragraphs 6 and 7 above.

13. As between Springs Ranch and US Home only, the prevailing party in any legal proceeding brought to enforce rights hereunder shall recover from the other party its reasonable attorneys' fees and costs. As used herein the term "prevailing party" means the party entitled to recover the costs in any suite, whether or not brought to judgment, and whether or not incurred before or after the filing of suit.

14. This Agreement, including the conveyance of the Detention Pond Property to the City, is specifically contingent upon the approval of this Agreement by the Colorado Springs City Council.

15. All representations, obligations, covenants and agreements between the City and Springs Ranch and US Home shall survive the transfer of the Detention Pond Property to the City.

16. Notwithstanding the foregoing, in the event the City hereafter adopts a new mechanism for the funding or construction of public drainage facilities such as the Detention Pond in which Springs Ranch and US Home would have been qualified to participate, but for the entering into this Agreement, the City agrees to renegotiate this Agreement so that Springs Ranch and US Home are treated in an equitable manner. The parties agree that any modification of the Agreement shall be subject to approval by the City Council and the City Council shall determine whether Springs Ranch and US Home are treated in an equitable manner.

17. This Agreement may be executed in counterparts all of which shall be construed as one agreement.

IT WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date set forth above.

BRE/SPRINGS RANCH L.L.C
A Delaware Limited Liability Company

BY: _____
James Ratkovic, Manager

US HOME CORPORATION
A Delaware Corporation

BY: _____

Its: Land Development Mgr.

CITY OF COLORADO SPRINGS,
a Colorado home rule city
and municipal corporation

By: _____

Its: City Engineer DRL

ATTEST:

_____
CITY CLERK

APPROVED AS TO FORM:

_____
CITY ATTORNEY FOR COLORADO SPRINGS

STATE OF COLORADO)
) ss.
COUNTY OF Denver)

The foregoing instrument was acknowledged to before me this 18 day of February, 1998, by James M. Patkovic as Vice President of BRE/SPRINGS RANCH L.L.C., a Delaware limited liability company.

WITNESS my and hand and official seal.

SEAL

Judy K. Soucie
Notary Public

My Commission Expires: 4/5/1999

STATE OF COLORADO)
) ss.
COUNTY OF EL PASO)

The foregoing instrument was acknowledged to before me this 3rd day of FEBRUARY, 1998, by DEAN MARSON as LAND DEVELOPMENT MANAGER of US HOME CORPORATION, a Delaware Corporation.

WITNESS my and hand and official seal.

SEAL

ROBERT H. COLEMAN NOTARY PUBLIC STATE OF COLORADO

Notary Public

My Commission Expires: DECEMBER 2, 2000

STATE OF COLORADO)
) ss.
COUNTY OF EL PASO)

The foregoing instrument was acknowledged to before me this _____ day of _____, 1998, by _____ as _____ and _____ as City Clerk of the City of Colorado Springs.

SEAL

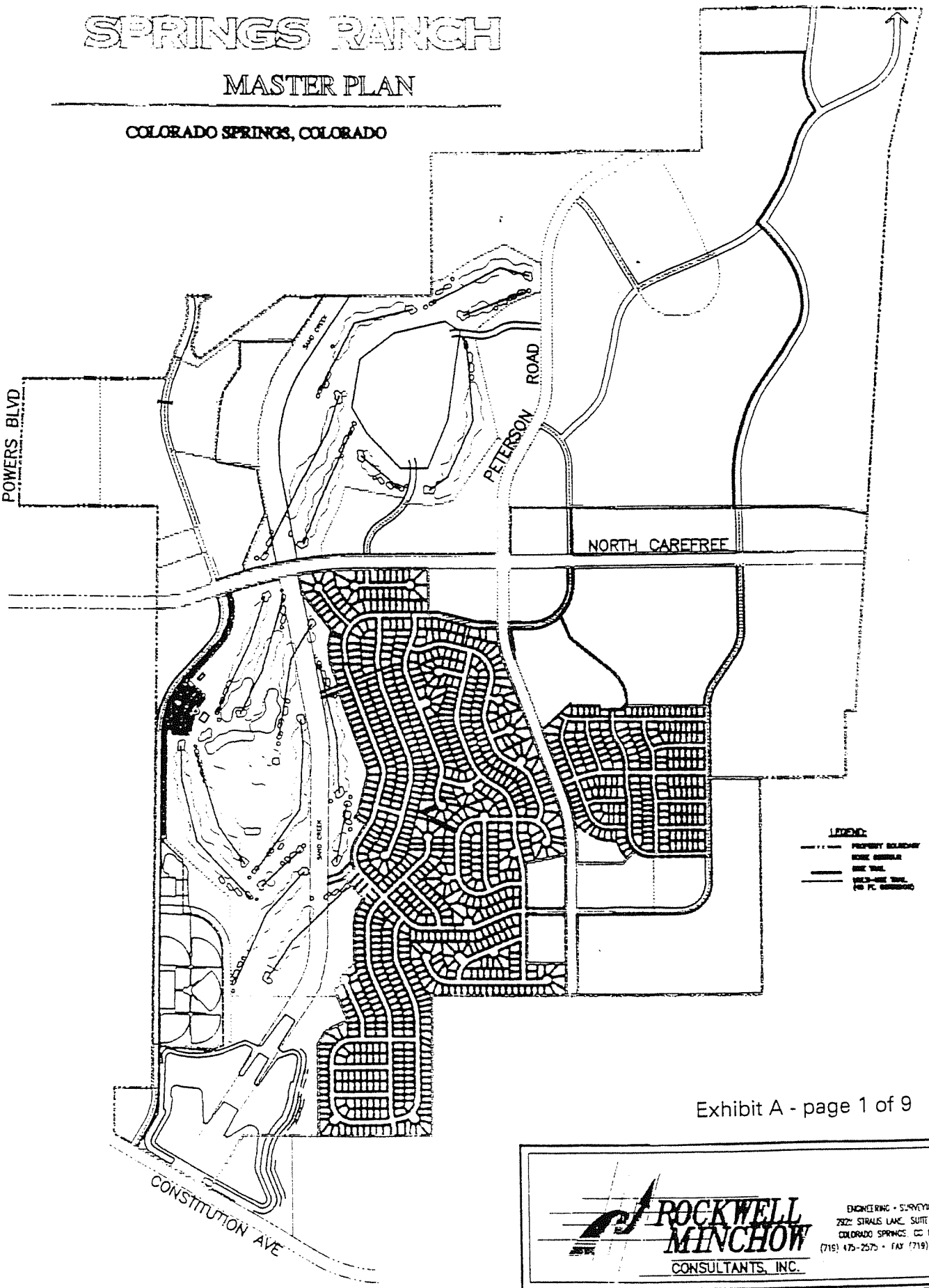
_____
Notary Public

My Commission Expires: _____

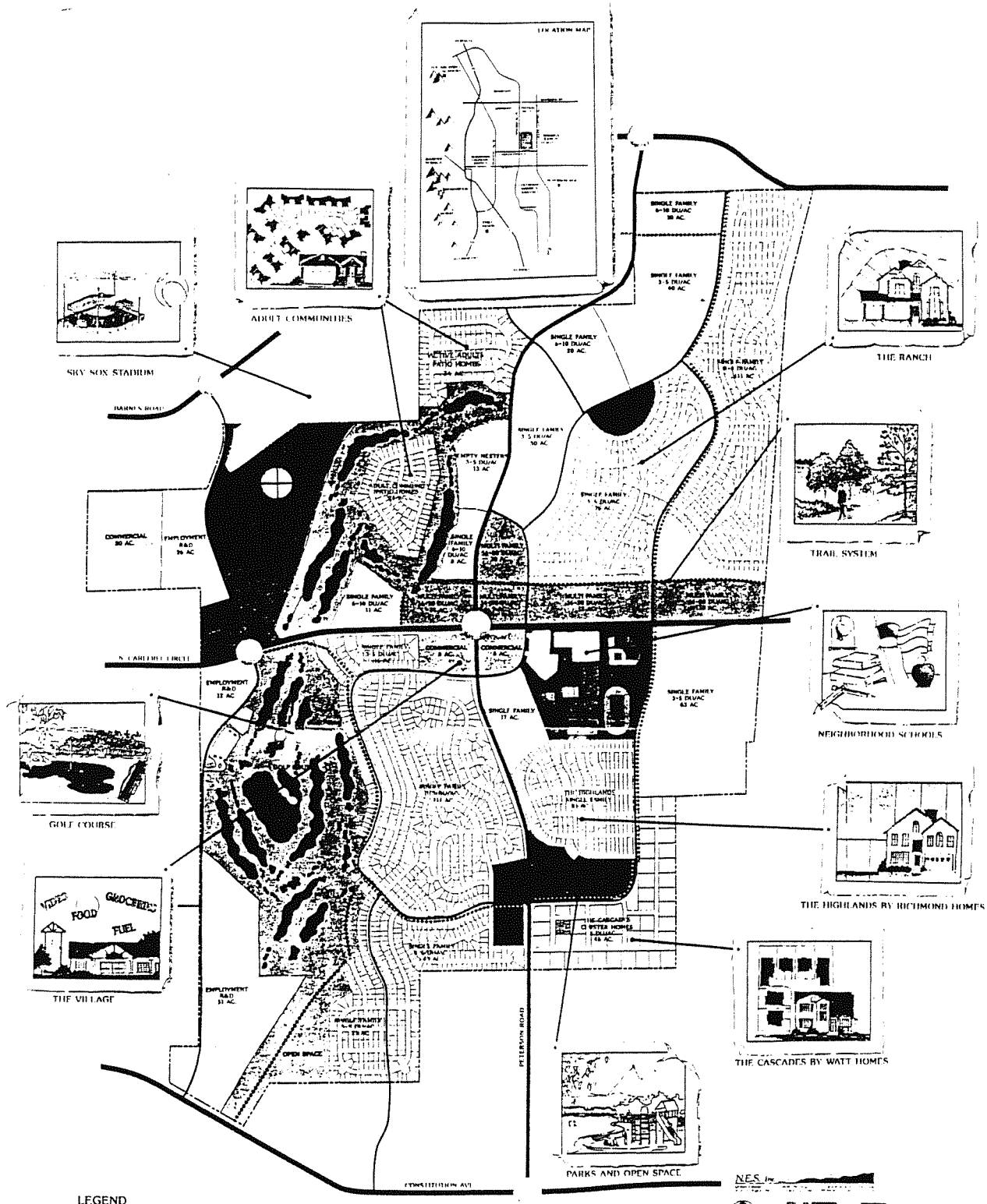
SPRINGS RANCH

MASTER PLAN

COLORADO SPRINGS, COLORADO



ROCKWELL MINCHOW
CONSULTANTS, INC.
ENGINEERING • SURVEYING
2502 STRALIS LANE, SUITE #100
COLORADO SPRINGS, CO 80907
(719) 475-2575 • FAX (719) 475-9223



SPRINGS RANCH
MASTER PLAN