CEDAR HEIGHTS
MASTER DEVELOPMENT DRAINAGE PLAN (MDDP)
January, 1995

Prepared for:

Schuck Communities, Inc.
2 N Cascade Avenue, Suite 1280
Colorado Springs, CO 80903

Prepared by:

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Project# 94-009

CEDAR HEIGHTS (MDDP)
DRAINAGE PLAN STATEMENTS

ENGINEER'S STATEMENT

The attached drainage plan and report were 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/County for drainage reports, and said drainage report is in conformity with the Master Plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Kent D. Rockwell, P.E. 1/30/95

COLORADO REGISTERED KENT D. ROCKWELL 25086 PROFESSIONAL ENGINEER

DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all the requirements specified in this drainage report and plan.

SCHUCK COMMUNITIES, INC.

BY: _____ DATE 1/20/95

Frederick A. Veitch

TITLE: Project Manager

ADDRESS: 2 N Cascade Avenue, Suite 1280
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.

_____ 1/31/95

CITY ENGINEER DATE

CEDAR HEIGHTS
MASTER DEVELOPMENT DRAINAGE PLAN (MDDP)
January, 1995

Purpose

The purpose of this MDDP is to identify major drainageways, ponding/detention areas, locations of culverts and drainage areas which are tributary to the Cedar Heights Development and to recommend drainage facilities and improvements required to facilitate the future development. This plan should serve only as a guide for future planning and design. Site specific design should be completed with individual drainage plans and reports at the time of platting.

General Location and Description

The Cedar Heights Development is located within El Paso County, Colorado north of State Highway 24 and west of Garden of the Gods Park (see Exhibit 1). The development contains approximately 944 acres, of which approximately one third has been developed to date.

Cedar Heights is a residential development containing lots ranging in size from 1/4 acre to 6+ acres. A majority of the existing and proposed lots contain "no build" areas, preventing disturbance of the existing natural vegetation. The development also contains several open space tracts (parks) ranging in size from 1 acre to 80 acres. The site is bounded by National Forest on the north, National Forest and the Castle Concrete Quarry to the west, Manitou Springs and Highway 24 to the south, and Garden of the Gods Park to the east.

The development lies within the closed Black Canyon Drainage Basin. Drainage fees are not required for this drainage basin. The developer is required to install non-reimbursable drainage facilities per individual drainage reports. All streets and drainage improvements are private, and are owned and maintained by the Cedar Heights Property Owners Association.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the soils in the Cedar Heights Development fall under two classifications (see Exhibit 2).

The soils in the northern portion of the site are classified as Paunsaugunt and Paunsaugunt Rock Outcrop series (soil 63), falling in Hydrologic Group D. The southern portion of the site is underlain by Fortwingate and Fortwingate Rock Outcrop series (soil 32), falling in Hydrologic Groups C and D, respectively.

Existing ground cover consists of well established native grasses and scrub oak with numerous pine, cedar and juniper trees over the entire development. Rock outcrops are prevalent on many of the ridges and steeper slopes. Several roads have been cut into the site in the past. Vegetation has re-established itself on these roads for the most part.

Drainage Criteria

The current City of Colorado Springs/El Paso County Drainage Criteria was utilized in this report. The Black Canyon Drainage Basin was modelled using the U.S. Army Corps of Engineers HEC-1 computer program with the SCS Unit Hydrograph method to determine runoff quantities during the 10 year and 100 year frequency 24 hour Type IIA storms for developed conditions. Based upon isopluvials for the area, a rainfall depth of 3.0 inches and 4.4 inches was used for the 10 year and 100 year 24 hour Type IIA storms, respectively. Runoff curve numbers for each basin were determined from the projected and/or existing development, and the soil types underlying the basin for AMC-2. A five minute time interval was used for the hydrographs in the HEC-1 computer program.

Drainage Characteristics

The majority of the development lies within the Black Canyon Drainage Basin (see enclosed drainage plan). A minor portion of the proposed development in the northwest corner of the site will drain to Williams Canyon to the west. The Black Canyon Drainage Basin contains approximately 1400 acres, or $\pm$2.2 mi^2.

The site generally slopes to the south and southeast with alternating ridges and drainageways trending in the same direction. All drainageways feed into the Black Canyon Drainageway which trends north-south and northeast-southwest along the eastern boundary of the development. The drainageways consist of deep natural rocky channels which are eroded to bedrock in many places. Well established trees and vegetation line the banks of most of the channels.

Most of the southern portion of Cedar Heights has already been developed. No new drainage facilities are proposed for the areas which have already been developed. It is recommended that all existing facilities in these areas be cleaned and repaired as is deemed necessary by field inspection. Entrance conditions to several of the existing CSP culverts should be improved to increase culvert capacity, as it has been determined from the drainage analysis that several road embankments will be overtopped during the 100 year storm in the existing condition.

Developed Drainage Basin Descriptions

A brief description of each drainage basin and temporary ponding/detention area is provided in this section of the report. Existing and proposed drainage conditions are described, including any temporary ponding/detention areas. A summary of peak developed runoff for the basins depicted on the drainage plan is provided in the appendix, as well as a summary of all ponds/detention areas. The summary includes depth of ponding, freeboard, peak volume and peak outflow, is also provided in the appendix. Any mention to a ponding/detention area in this report refers to the temporary ponding that occurs behind roadway embankments providing headwater for existing culverts. There are no permanent ponds/detention areas in Cedar Heights.

Basin 1.1

Basin 1.1 encompasses approximately 75.1 acres of undeveloped land at the northeast corner of the development, the majority of which is owned by the United States Forest Service (USFS) and the City of Colorado Springs. Rampart Range Road meanders through the basin. The only proposed development in this basin will be approximately 7 acres along Placer Ridge. The effect of developing these few lots will be negligible as far as developed runoff in this basin is concerned.

Developed runoff quantities of 97cfs/200cfs (10yr/100yr) from this basin overland and channel flows to Design Point #1.1 (DP #1.1). DP #1.1 is created by the existing embankment of a dirt access road to the former Black Canyon Picnic Grounds. An existing 36" CMP with a stone headwall crosses under the road embankment. The 10 year storm will pass through the CMP while ponding to a depth of 8' behind the embankment, and having a peak outflow of 84cfs. A portion of the 100 year storm will overtop the embankment and re-enter the channel with a peak outflow of 200cfs. Erosion control measures will be installed at the time of development upstream.

Basin 2.1

Basin 2.1 encompasses approximately 130 acres of undeveloped land at the north end of the site. Rampart Range Road meanders through the basin on USFS land. Runoff overland and channel flows to Design Point 2.2 (DP 2.2) where the runoff from Basins 2.1 and 2.2 converge. There is no proposed development within this basin, and no drainage improvements are required.

Basin 2.2

Developed Basin 2.2 also lies at the north end of the site, containing approximately 70.2 acres. A portion of the basin will be developed into single home lots larger than one acre. Runoff from this basin combines with runoff from Basin 2.1 at DP2.2. Total developed flows of 269cfs/544cfs (10yr/100yr) will pass through DP2.2. No drainage improvements are proposed within this basin, as the developed runoff patterns will remain the same as the historic condition.

Basin 2.3

Just south of Basin 2.2 lies developed Basin 2.3. Basin 2.3 contains approximately 16.3 acres along Cedar Heights Drive that will be developed as single family homes on $\pm$1 acre lots. At this time, it is proposed that the runoff developed from this basin will travel east down Cedar Heights Drive to DP #2.3. The runoff will be discharged from the street to the pond by means of superelevating the street and constructing curb cuts, or using guard rail with no curb and gutter.

DP #2.3 outfalls from an existing 24" CSP that crosses the Cedar Heights Drive embankment and discharges to the east. The pipe will carry the developed 10 year peak outflow of 22; however, a portion of the 100 year developed runoff will overtop the embankment in the current condition. It is proposed that the entrance condition of the 24" CSP be improved so the pipe will carry the 100 year flows without overtopping the embankment. These improvements will be completed when Cedar Heights Drive and the surrounding area is developed.

Basin 2.4

Developed Basin 2.4, at the northeast corner of the site, contains approximately 24.7 acres. The basin will be partially developed along the ridges on each side of the drainage channel. Runoff will overland flow to the channel in the middle of the basin. Design Point 2.4 (DP2.4), at the outfall of the basin, was created to analyze the total developed flows reaching the possible future Tourmaline Way crossing. The total developed flows at DP2.4 will be 315cfs/655cfs (10yr/100yr). A culvert will be installed at this crossing to discharge to Basin 2.5 if Tourmaline Way is constructed. The size of the pipe will be determined at the time of the road design, as available headwater and ponding volume is not know at this time.

Basin 3.1

This basin lies adjacent to Basin 2.4 and contains approximately 31.4 acres of future 1/4 acre to $\pm$1 acre residential lots. Runoff from this basin will be discharged to the Black Canyon Drainageway in Basin 2.5 through an existing 36" RCP crossing Black Canyon Road. In the event that the pipe should become plugged, runoff will overtop the embankment and re-enter the natural channel. The extreme southern end of this basin, along Cedar Heights Drive, has recently been developed as Juniper Ridge at Cedar Heights Filing No. 1, a replat of Cedar Heights Filing No. 5.

Basin 2.5

Encompassing approximately 24.8 acres in the northeast portion of the site is Basin 2.5. The western portion of this basin will be developed as a part of the Cedar Heights Development, while the eastern portion of the basin will remain as undeveloped City Park land. A new culvert will be required where Black Canyon Road crosses the outfall of Basin 2.4. The existing pair of 42" CSP's crossing the road do not provide sufficient capacity, as one is crushed and there is little available headwater. The size of the culvert will be determined when this area is developed. This basin outfalls into Basin 2.6.

Basin 4.1

Developed Basin 4.1 lies to the south of Basin 3.1. The basin is proposed to be developed as $\pm$ 1/2 acre residential lots, and is a replat of a portion of Cedar Heights Filing No. 5. Runoff will overland and street flow to the proposed low point in Twisted Oak Drive at the southeast corner of the Basin. The runoff will be collected by future inlets at the low point, and be piped to the Black Canyon Drainageway in Basin 2.6 to the east. The inlets and outfall pipe are the only drainage facilities proposed for this basin. A preliminary design for these drainage facilities was completed with the Juniper Ridge Filing No. 1 Drainage Report. Final design will be completed when that area is developed. A portion of this basin has recently been developed as Juniper Ridge at Cedar Heights Filing No. 1. This basin outfalls to Basin 2.6.

Basin 2.6

This small basin along the Black Canyon Drainageway contains 8.4 acres that has recently been partially developed along the west side as Rampart Canyon at Cedar Heights Filing No. 1, a replat of a portion of Cedar Heights Filing No. 5. The eastern portion of the basin is City Park land. Runoff will overland flow to the existing natural channel and outfall to Basin 2.8.

Basin 2.7

Basin 2.7 is on City Park land to the east of the site. The 20.5 acre basin outfalls to the Black Canyon Drainageway in Basin 2.8 after crossing Rampart Range Road. No drainage improvements are proposed for this basin.

Basin 2.8

Basin 2.8 also lies along the Black Canyon Drainageway, and has recently been partially developed along the west side as Rampart Canyon at Cedar Heights Filing No. 1. The eastern portion of this basin is City Park land. Two small areas west of Black Canyon Road will drain to the main channel to the east by way of existing culverts crossing the road. All 27.5 acres in the basin will drain to the Black Canyon Drainageway. The basin outfalls to Basin 2.9 at Design Point 2.8 (DP2.8), where the outflow from DP #5.4 combines with Basin 2.8. Total developed flows at this point will be 843cfs/1641cfs (10yr/100yr). No new facilities are proposed for this basin.

Basin 5.1

Basin 5.1 lies in the north central portion of the Cedar Heights Development, containing $\pm$ 97.7 acres. The basin will remain largely undeveloped; however, several +1 acre lots will be developed at various points around the basin. A small area north of Cedar Heights Drive drains to this basin by way of an existing culvert. Runoff from Cavern Ridge Drive will be collected at the proposed low point in the street along the eastern edge of the basin, and be discharged to the existing natural channel at that point by way of curb-cuts or inlets. Runoff from Echo Bend Lane will be discharged to the main channel to the west by way of superelevating the street and constructing curb cuts, or guard rail with no curb and gutter. Runoff from this basin will travel to Pond #5.3, where it combines with runoff from Basins 5.2 and 5.3.

Basin 5.2

Developed Basin 5.2 lies to the west of Basin 5.1 and contains approximately 105.8 acres. The basin will have much the same development pattern as that of Basin 5.1, with scattered +1 acre lots and large undeveloped areas. Runoff collected in Cedar Heights Drive along the western end of the basin will be discharged into natural drainageways along the street by superelevating the street at certain locations and constructing curb cuts or installing guard rail with no curb and gutter. Runoff from this basin travels to Pond #5.3.

Basin 5.3

This basin lies to the south of Basin 5.2 and contains approximately 26.1 acres. The basin will consist of $\pm$1 acre size lots for the most part, and runoff will travel from west to east via existing culverts for the most part. An inlet and outfall pipe will have to be constructed in the cul-de-sac on Solitude Point to discharge street flow collected there to the natural channel to the south.

DP #5.3.1 and DP #5.3.2, at the eastern end of the basin both outfall to the east by way of existing 30" CSP's. The outfall pipes for DP #5.3.1 and DP #5.3.2 will carry the 10 year storm flows of 39cfs without overtopping either roadway embankment. During the 100 year storm (76cfs); however, DP # 5.3.1 will overtop and flow into Cathedral Spires Drive. DP #5.3.2 will not overtop during the 100 year storm. It is proposed that the entrance conditions be improved on both 30" CMP's when the tributary area is developed to allow passage of the 100 year storm without overtopping either of the embankments. Runoff from this basin also travels to Pond #5.3.

Pond #5.3 is created by the existing Echo Bend Lane embankment crossing the natural drainageway near the center of the development. An existing 48" RCP crosses under the embankment and outfalls to the south. The combined developed runoff from Basins 5.1, 5.2 and 5.3 of 323cfs/619cfs (10yr/100yr) will reach Pond #5.3. Both the 10 year and 100 year storms will be contained behind the roadway embankment with adequate freeboard (see pond summary in appendix). In the event that the pipe would become plugged, the water would overtop the road and travel through the park to the existing natural drainageway. Peak outflows of 260cfs/339cfs will be produced. A rip-rap energy dissipator exists at the outfall into Basin 5.4, and no improvements are recommended for this pond. This pond will act as one of the major detention areas in the development.

Basin 5.4

Developed Basin 5.4 encompasses approximately 60.7 acres near the center of the development. Developed runoff collected in Cathedral Spires Drive will be discharged to the main drainage channel in the center of the basin by way of either inlets or curb-cuts. Runoff collected in Black Canyon Road along the east side of the basin is discharged to DP #5.4 by way of an existing curb-cut and rip-rap swale on the west side of the road with Rampart Canyon Filing No. 1. The remainder of the basin will overland flow to the main channel running south through the basin.

DP #5.4 lies at the south end of Basin 5.4 and is created by the existing Black Canyon Road embankment crossing the natural channel. An existing 96" CSP crosses the embankment and outfalls into the Black Canyon Drainageway to the east at DP2.8. The 96" CSP easily passes both the 10 year and 100 year developed peak flows of 301cfs/468cfs with minimal ponding. No improvements are recommended at this pond. In the event that the pipe should become plugged, the runoff will overtop the roadway embankment and re-enter the existing drainage channel.

Basin 2.9

Basin 2.9, near the east-central part of the development, contains approximately 47.8 acres. The Cedar Heights portion of this basin has already been developed, and the eastern portion of the basin is City Park land. Runoff from the basin will travel to the main channel (Black Canyon Drainageway), which travels to Pond #2.9.

Pond #2.9 lies at the outfall of Basin 2.9 in the Black Canyon Drainageway, and will act as the major detention area for the development. The pond is created by the existing embankment for the emergency access road into Cedar Heights from Rampart Range Road. An existing 96" CSP crosses under the embankment. The 96" CSP will pass both the 10 year and 100 year developed storm flows with adequate freeboard (see detention pond summary in appendix). Peak flows of 884cfs/1757cfs will reach the pond while peak outflows of 777cfs/1119cfs will be produced. No improvements are proposed for this pond. In the event that the pipe should become plugged, the runoff will overtop the roadway embankment and re-enter the existing drainage channel. The pond outfalls into Basin 2.10.

The Black Canyon Channel, emergency access road and ponding area are on City Park Property. The City of Colorado Springs Park and Recreation Department has agreed to continue to allow the roadway embankment to be used as a temporary ponding/detention area as it has been doing for the past 10 years. A letter regarding this subject dated 13 December, 1994 is provided in the appendix.

Basin 6.1

Basin 6.1 contains approximately 50.3 acres of already developed land in the south central portion of the site. The majority of the developed runoff travels from north to south in a pair of existing natural drainage channels. These channels combine just upstream from DP #6.1. The existing 36" CSP outfall from this pond will pass the peak 10 year storm flows under Mineral Drive without overtopping the street. A portion of the 100 year storm; however, will overtop the street in the existing condition. It is proposed that the entrance condition to the 36" CSP be improved to allow passage of the 100 year storm without overtopping. This basin outfalls to Basin 2.10.

Basin 2.10

Encompassing approximately 39.5 acres at the southeast portion of the site is Basin 2.10. The Cedar Heights portion of the basin is already developed, the remainder of the basin is City Park land. Runoff from the basin travels to the Black Canyon Drainageway running through the basin, and outfalls to Basin 2.11.

Basin 2.11

Basin 2.11 lies just south of Basin 2.10 and contains 24.2 acres. The Cedar Heights portion of the basin has already been developed to its full extent, and no new drainage facilities are proposed. Runoff from this basin travels to the Black Canyon Drainageway and outfalls to Basin 2.12 at DP2.11.

Basin 7.1

Basin 7.1 is an 84.3 acre basin on the west side of the development which has already been developed. Runoff travels to several smaller channels which combine upstream from DP #7.1. The pond is created by the existing Cedar Heights Drive embankment. An existing 42" CSP outfalls from DP #7.1, and allows passage of both the 10 year and 100 year storm flows without overtopping the road (see detention pond summary). This basin outfalls to Basin 7.2.

Basin 7.2

Basin 7.2 lies directly downstream from Basin 7.1 and contains 25.0 acres of already developed land. Runoff from this basin travels to the natural channel running through the basin. Basin 7.2 outfalls into Basin 8.2.

Basin 8.1

Containing approximately 87.1 acres on the west side of the development is Basin 8.1. The extreme northern portion of the basin may be developed if a future land trade, etc. is approved. The basin also contains a portion of the Castle Concrete Quarry, some of which drains to the existing natural channel in the middle of the basin, while most of the runoff remains within the quarry itself. The majority of the basin will remain as undeveloped land. The basin outfalls into Basin 8.2.

Basin 8.2

This basin encompasses approximately 136.6 acres to the southwest of the development. The majority of the basin is, and will remain undeveloped. Existing drainage facilities along the quarry access road discharge collected street flow to the natural drainage channel to the east. DP #8.2 lies at the outfall of this basin.

DP #8.2 is created by the existing Black Canyon Road embankment crossing the natural drainageway. An existing 72" and 84" CMP cross under Black Canyon Road at this point. Both the 10 year and 100 year storms pass through the culverts with minimal ponding (see appendix). The peak flows through this pond will be 275cfs/614cfs (10yr/100yr). The pond outfalls to Basin 2.12 at DP2.11 where the peak developed flows will be 1140cfs/1928cfs.

Basin 8.3

Basin 8.3 is a small basin near the south end of the development containing 42.2 acres of undeveloped land. The runoff travels to, and is collected by culverts at the beginning of the quarry access road. The flow is discharged to the Black Canyon Drainageway to the east in Basin 2.12.

Basin 2.12

Basin 2.12 encompasses 41.3 acres of undeveloped land on both sides of the Black Canyon Drainageway at the south end of the site. Runoff from the basin overland flows to the drainageway. An existing 7' x 15' split box culvert crosses Black Canyon Road near the south end of the basin. The culvert is adequate to pass both the 10 year and 100 year storm flows. A description of the channel downstream from the box culvert is provided in the next section of the report. The basin outfalls to Basin 2.14 at DP2.13.

Basin 2.13

Basin 2.13 lies at the extreme south east end of the site and contains approximately 27.4 acres of undeveloped City Park land that outfalls to Basin 2.14 at DP2.13. Peak developed flows at DP2.13 will be 1212cfs/2110cfs (10yr/100yr). Rampart Range Road meanders through the basin.

Basin 2.14

This basin encompasses 22.3 acres at the extreme south end of the development. There is no developed land within the basin other than Black Canyon Road itself. The total developed flows at the outfall of the Black Canyon Drainage Basin will be 1219cfs/2125cfs (10yr/100yr). A description of the drainage characteristics of the Black Canyon Drainageway running through the basin is provided next.

Main Channel Description

This portion of the report discusses the Black Canyon Drainageway Channel downstream from the existing 7' X 15' split box culvert crossing Black Canyon Road. Channel capacity was analyzed by taking several cross-sections along this reach, as the channel is relatively narrow and in close proximity to the road at several points. A total of five cross-sections were taken at various locations along the channel. Sketches of the cross-sections are provided in the appendix. A description of each cross-section is provided below. Exhibit 3 shows the location of each cross-section and the location of proposed improvements listed below. The improvements will be phased according to the letter of agreement by Schuck Communities, Inc., dated 16 December, 1994 (see attached letter at front of appendix).

Section 1 was taken approximately 40' downstream from the above mentioned box culvert, and was found to have a capacity of approximately 4190cfs in the existing condition. A peak runoff of approximately 2100cfs will be flowing in the channel during the 100 year storm. The channel has more than sufficient capacity at this point; however, some grouted rip-rap will be installed on the outside of the existing bend in the channel just downstream of the section to check future erosion. These improvements will be completed as a portion of Phase 2.

Section 2 was taken at a bottleneck in the channel approximately 210' downstream from Section 1. The channel is sandwiched between Black Canyon Road and the hillside to the south at this point. The channel itself only has a capacity of approximately 640cfs in the existing condition. A portion of the runoff will overtop the curb and enter Black Canyon Road during both the 10 year and 100 year storms. The water would flow at a depth of approximately 0.9' and 1.5' above flowline in Black Canyon Road at this section during the 10 year and 100 year storms, respectively. It is proposed that the channel be improved through this bottleneck to the cross-section shown on Exhibit 4 to allow for the passage of the 100 year peak runoff, and to help check erosion. These improvements will be completed as a portion of Phase 1.

Section 3 was taken at the bend in the channel across the street from the Cedar Heights Marketing Center. The existing channel was found to be insufficient to carry the 100 year developed flow of approximately 2100cfs (1200cfs capacity). With overtopping the street; however, the 100 year flows would be carried with an approximate depth of 1.1' above flowline in Black Canyon Road. The 10 year storm flows would remain in the channel. This portion of the channel along the bend should be improved to the cross-section shown on Exhibit 4 in order to contain the peak 100 year flows. These improvements will be completed as a portion of Phase 1.

Section 4 was taken at the head of another bottleneck in the channel along Black Canyon Road. The channel is sandwiched between Black Canyon Road and a vertical rock wall at this section. The existing channel is currently just shy of having sufficient capacity (1990cfs) to carry the peak 100 year storm runoff. It is recommended that the channel be cleaned in this area to improve capacity, and grouted rip-rap be installed along the Black Canyon Road side of the channel to check erosion. The existing channel has sufficient capacity to carry the peak 100 year flows a short distance downstream from this section. These improvements will be completed as a portion of Phase 1.

A typical cross-section of the proposed channel improvements near Sections 2 and 3 is provided on Exhibit 4.

Section 5 was taken at a bend in the channel near the Highway 24 embankment. The existing channel was found to be sufficient to carry the 100 year developed flow, having a capacity of approximately 4090cfs. The channel section remains relatively unchanged downstream to it's outfall into Fountain Creek. It is recommended that some grouted rip-rap lining of the channel be completed on the outside of the bend to check erosion. These improvements will be completed as a portion of Phase 2.

Grouted rip-rap will also be installed in the main channel at the outfall of an existing 36" CMP which collects runoff at the northwest corner of the intersection of Garden Drive and Black Canyon Road (see Exhibit 3). These improvements will be completed as a portion of Phase 2.

The entrance conditions to the existing 6'X12' concrete box culvert (CBC) under El Paso Drive will be improved with the construction of a 50' concrete transition from the existing natural channel to the CBC. An additional 42" of headwall will also be added to the CBC. These improvements will be completed as a portion of Phase 2.

Summary of Improvements

Main Channel:

All improvements to the Black Canyon Drainageway Channel mentioned above are Private Improvements and will be completed by Schuck Communities. The Phase 1 improvements will be completed during 1995. The Phase 2 improvements will be completed as platting of lots is required per the 16 December, 1994 agreement. Maintenance of this reach of the channel will be ongoing, and will be maintained by the Cedar Heights Property Homeowners Association and Castle Concrete Company. See next page for Fees and Construction Cost Estimate.

Minor Systems:

The improvement of the entrance conditions on several existing culverts in the Cedar Heights Development will be required. These improvements are all private. The improvement of the entrance condition of the culvert at DP #6.1 will be completed in 1995, as this area is already developed. The remainder of the culvert improvements are to be made in areas that are not developed at this time. The improvements to these culverts will be made at the time of development of that particular area.

Drainage Fees

The Cedar Heights Development lies within the closed Black Canyon Drainage Basin. Drainage fees are not required for this drainage basin. The developer is required to install non-reimbursable drainage facilities per individual drainage reports. All streets and drainage improvements are private, and are owned and maintained by the Cedar Heights Property Owners Association.

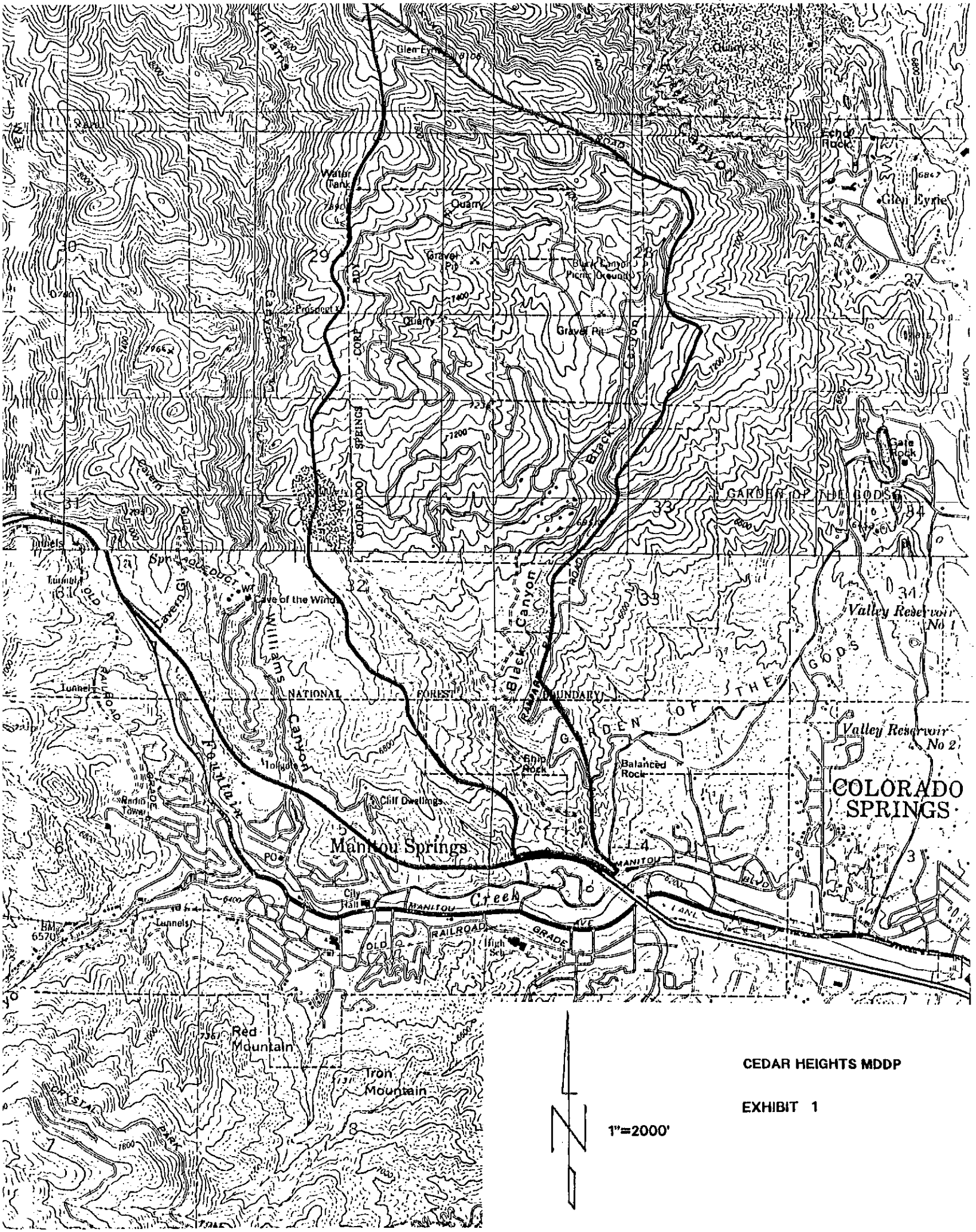
Main Channel Construction Improvements Cost Estimate:

Phase 1

	UNITS	UNIT COST	EXTENDED COST
Earthwork	1040 CY	@ $15.00/CY	$ 15,600
Grouted rip-rap (9"-12" diameter)	1000 CY	@ $50.00/CY	$ 50,000
		TOTAL:	**$ 65,600**

Phase 2

	UNITS	UNIT COST	EXTENDED COST
Earthwork	960 CY	@ $15.00/CY	$ 14,400
Grouted rip-rap (9"-12" diameter)	500 CY	@ $50.00/CY	$ 25,000
50' concrete transition to CBC	2400 SF	@ $4.00/SF	$ 9,600
Concrete headwall on CBC	5 CY	@ $200.00/CY	$ 1,000
		TOTAL:	**$ 50,000**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Quarry
Echo Rock
Water Tank
Gravel Pit
Black Canyon Picnic Grounds
Prospect Lk
Cave of the Winds
Williams Canyon
Fountain
Manitou Springs
Cliff Dwellings
Balanced Rock
Ship Rock
Valley Reservoir No 1
Valley Reservoir No 2
GARDEN OF THE GODS
COLORADO SPRINGS
NATIONAL FOREST BOUNDARY
Manitou Creek
RAILROAD GRADE
Red Mountain
Iron Mountain
CEDAR HEIGHTS MDDP
EXHIBIT 1
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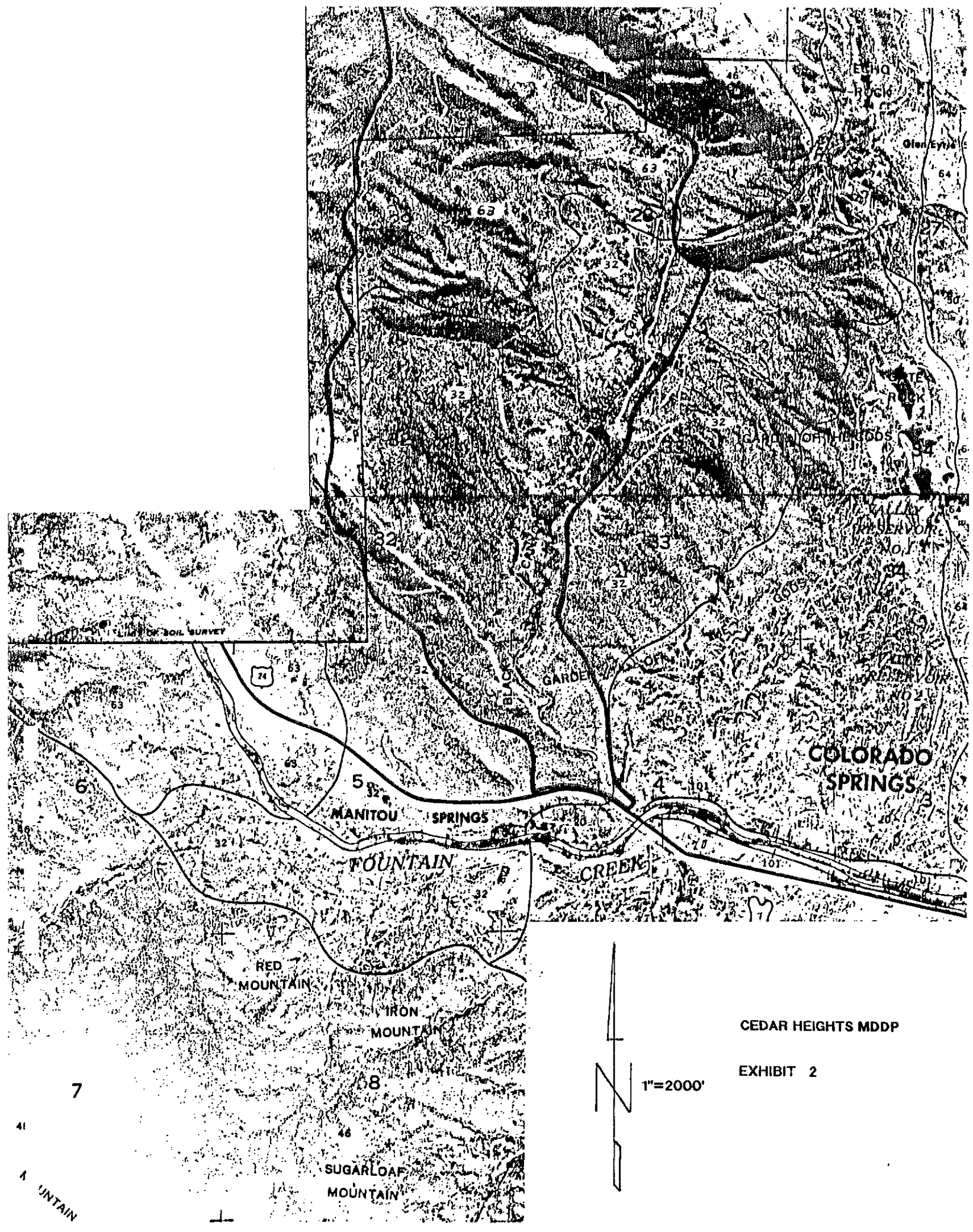
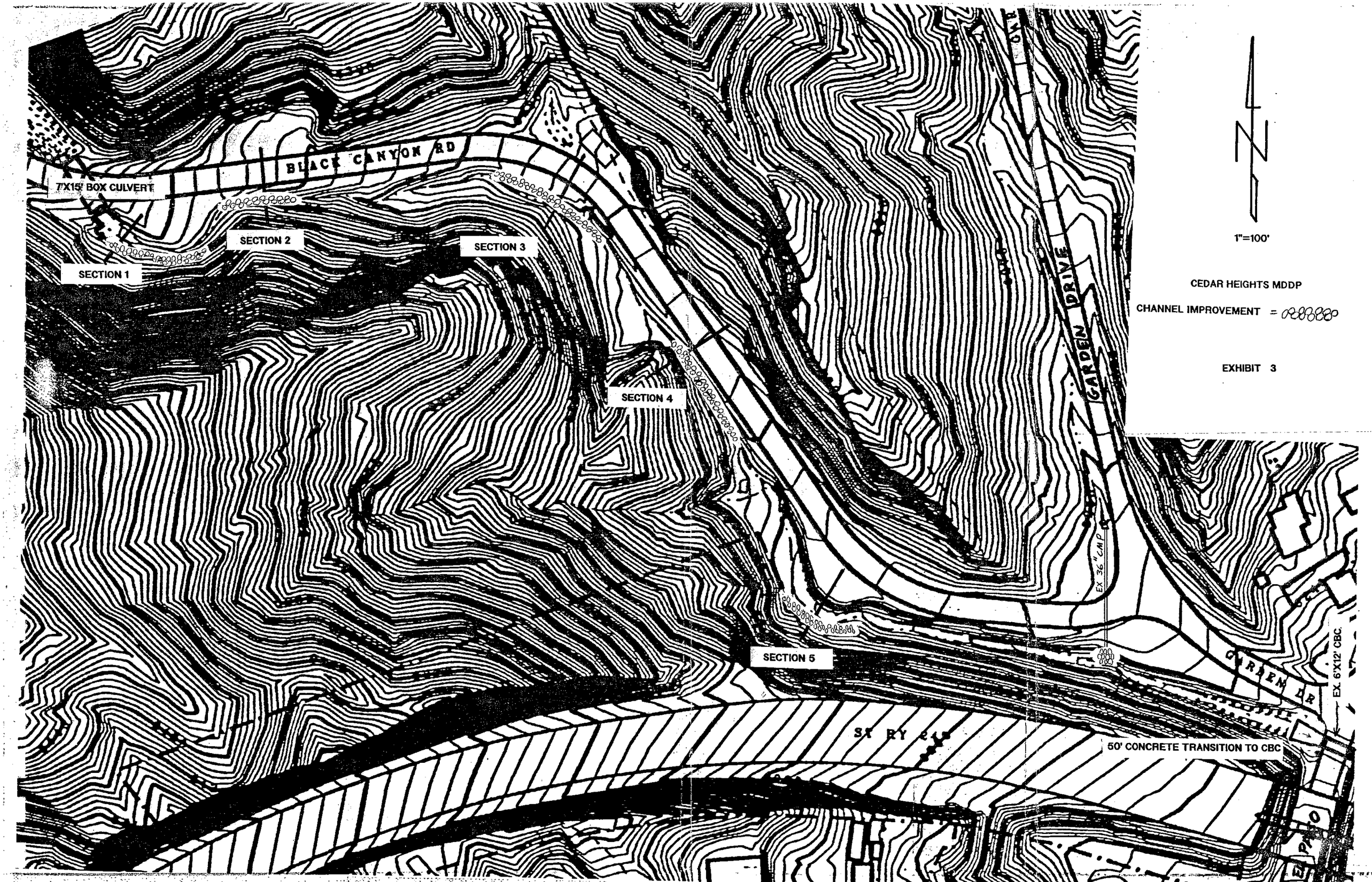
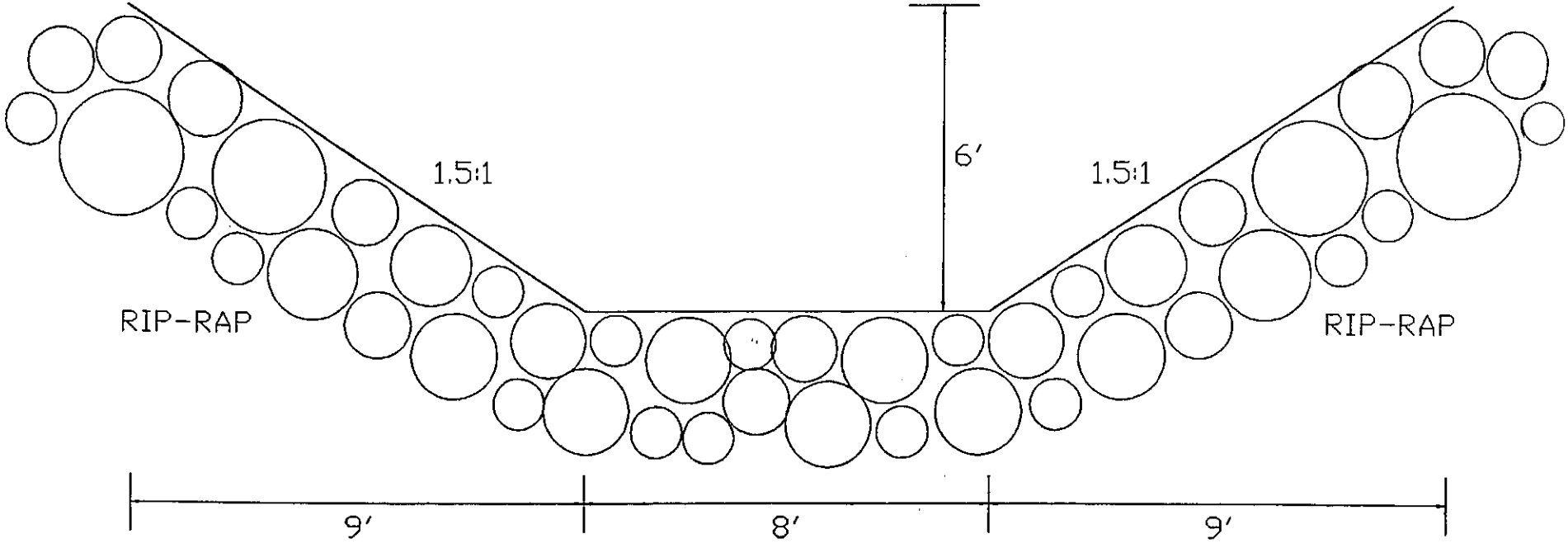

LIMIT OF SOIL SURVEY
MANITOU SPRINGS
FOUNTAIN CREEK
COLORADO SPRINGS
RED MOUNTAIN
IRON MOUNTAIN
SUGARLOAF MOUNTAIN
GARDEN OF THE GODS
CEDAR HEIGHTS MDDP
EXHIBIT 2
1"=2000'


BLACK CANYON RD
7'X15' BOX CULVERT
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
GARDEN DRIVE
50' CONCRETE TRANSITION TO CBC
EX. 6'X12' CBC.
EX 36" CMP
1"=100'
CEDAR HEIGHTS MDDP
CHANNEL IMPROVEMENT
EXHIBIT 3



RIP-RAP WILL BE 9"-12" IN DIAMETER, GROUTED, MIN. 30" THICK.

PROPOSED TYPICAL CHANNEL CROSS-SECTION

BLACK CANYON DRAINAGEWAY IMPROVEMENTS

NO SCALE

CEDAR HEIGHTS MDDP

EXHIBIT 4

APPENDIX

ROCKWELL MINCHOW
CONSULTANTS, INC.

December 13, 1994
Project #94-009

Mr. Terry Putman
City of Colorado Springs
Park & Recreation Department
1401 Recreation Way
Colorado Springs, CO 80907

RE: Cedar Heights Development
Garden of the Gods Park Detention Pond

Dear Mr. Putman:

Per our previous conversation, Rockwell-Minchow Consultants is requesting on behalf of Schuck Interests, Inc. the owner of Cedar Heights Development, that the existing roadway embankment for the emergency access from Rampart Range Road to Black Canyon Road continue to be used for detention of storm water. The roadway embankment and the area that would be temporarily ponded with water is part of the Garden of the Gods Park, owned by the City of Colorado Springs. This area is entirely with in the channel area of the Black Canyon drainage way. The Cedar Heights Property Owners Association will maintain the 96" CSP under the access road as well as the ponding area. This is the same as the maintenance of the on site drainage facilities.

If you have any questions about this request, please contact me at 475-2575. If this meets with your approval, please sign on the space provided below.

Respectfully,

Rockwell-Minchow Consultants, Inc.

Dennis A. Minchow

Schuck Interests, Inc.
Terry Schooler, V.P.

City of Colorado Springs
Park & Recreation Dept.

SCHUCK COMMUNITIES, INC.

December 16, 1994

Mr. Bruce Thorson, Subdivision manager
CITY ENGINEERING
101 West Costilla
Colorado Springs, CO 80903

RE: Cedar Heights Development
Black Canyon Channel Improvements
Project #94-009

Dear Bruce:

Per our meeting on December 15, 1994, the following is a summary about the installation of the Channel Improvements from the El Paso Street crossing north to the Black Canyon Road crossing described in the MDDP.

Schuck Communities, Inc. will install the improvements necessary to remediate the bottle necking of the channel during fiscal year 1995. The estimate for this portion of the improvement is approximately $65,000. The installation of these requirements will allow the additional platting or replatting of 20 additional lots in the Cedar Heights Development. The remaining $50,000 in channel improvements are tied to an additional 20 lots or replatted in Cedar Heights.

This agreement by Schuck Communities allows the construction and replatting of the 30 lots in Stonebridge at Cedar Heights to occur and not be bound to the channel improvements mentioned above. If you have any questions about this letter, please contact me at 633-4500.

Sincerely,
SCHUCK COMMUNITIES, INC.

Terry E. Schooler
Vice President

cc: Fred Veitch
Dennis Minchow

Cedar Heights MDDP Peak Flow Summary

	10 Year	100 Year
D1.1	97	198
D2.1	172	350
D2.2	97	194
DP2.2(D2.1 & D2.2 combine)	269	544
D2.3	32	59
D2.4	37	75
DP2.4(outfall of D2.4)	315	655
D3.1	60	111
D2.5	32	67
D4.1	55	105
D2.6	9	21
DP2.6(outfall of D2.6)	519	1090
D2.7	18	42
D2.8	26	59
D5.1	146	285
D5.2	154	303
D5.3	39	76
DP5.3(D5.1, D5.2 & D5.3 combine)	323	619
D5.4	77	165
DP5.4(outfall of D5.4)	298	469
DP2.8(outfall of D2.8 & D5.4)	843	1651
D2.9	57	120
DP2.9(outfall of D2.9)	884	1757

Peak Flow Summary Continued

	10 Year	100 Year
D2.10	72	160
D6.1	58	124
DP2.10(outfall of D2.10)	866	1317
D7.1	98	208
D7.2	34	71
DP7.2(outfall of D7.2)	94	168
D8.1	83	190
D8.2	110	268
DP2.8(outfall of D2.8)	277	614
D2.11	30	65
DP2.11(combine DP8.2 & outfall D2.11)	1140	1928
D8.3	35	85
D2.12	44	99
D2.13	29	64
DP2.13(outfall of D2.12 &D2.13)	1203	2081
D2.14	24	54
DP2.14(outfall of D2.14)	1219	2125

Cedar Heights MDDP Design Point and Detention Pond Summary

DP # 1.1 (36" CSP Outfall)

	10 Year	100 Year
Depth (ft)	8	8.5
Volume (ac-ft)	0.31	0.31
Freeboard (ft)	0	0
Peak Outflow (cfs)	84	200

DP # 2.3 (24" CSP Outfall)

	10 Year	100 Year
Depth (ft)	8	10
Volume (ac-ft)	0.4	0.57
Freeboard (ft)	2	0
Peak Outflow (cfs)	22	68

DP # 5.3.1 (30" CSP Outfall)

	10 Year	100 Year
Depth (ft)	6.5	10
Volume (ac-ft)	0.3	0.84
Freeboard (ft)	3.5	0
Peak Outflow (cfs)	30	51

DP # 5.3.2 (30" CSP Outfall)

	10 Year	100 Year
Depth (ft)	6	9
Volume (ac-ft)	0.3	0.60
Freeboard (ft)	4	1
Peak Outflow (cfs)	27	39

Pond # 5.3 (48" RCP Outfall)

	10 Year	100 Year
Depth (ft)	8	21
Volume (ac-ft)	.73	7
Freeboard (ft)	22	9
Peak Outflow (cfs)	260	339

DP # 5.4 (96" CSP Outfall)

	10 Year	100 Year
Depth (ft)	5.5	8.5
Volume (ac-ft)	0.2	0.4
Freeboard (ft)	20.5	17.5
Peak Outflow (cfs)	301	468

Detention Pond Summary Continued

Pond # 2.9 (96" CSP Outfall)

	10 Year	100 Year
Depth (ft)	17	35
Volume (ac-ft)	4	18
Freeboard (ft)	29	11
Peak Outflow (cfs)	777	1119

DP # 6.1 (36" CSP Outfall)

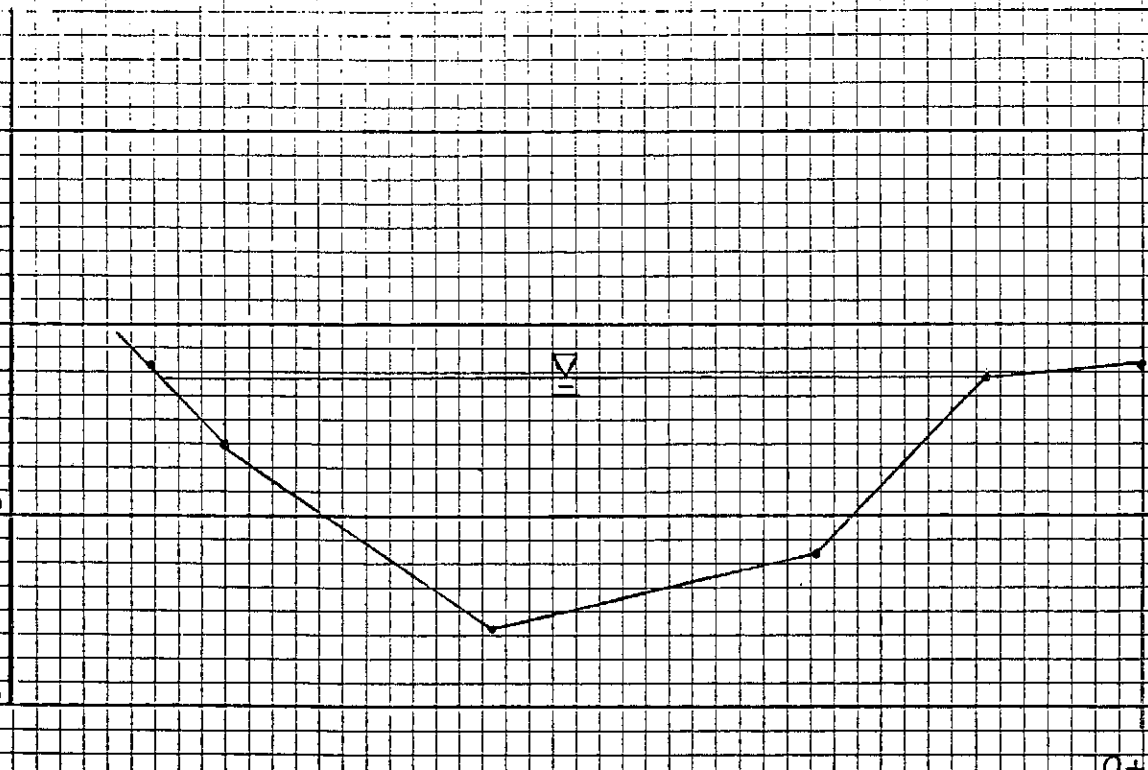
	10 Year	100 Year
Depth (ft)	7	10
Volume (ac-ft)	.5	.84
Freeboard (ft)	3	0
Peak Outflow (cfs)	47	119

DP # 7.1 (42" CSP Outfall)

	10 Year	100 Year
Depth (ft)	7	17
Volume (ac-ft)	0.2	2
Freeboard (ft)	19	9
Peak Outflow (cfs)	73	118

DP # 8.2 (72" & 84" CSP Outfall)

	10 Year	100 Year
Depth (ft)	4	9
Volume (ac-ft)	0.1	.2
Freeboard (ft)	18	13
Peak Outflow (cfs)	275	614



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$n = 0.0135$

$A = 192.5 \text{ ft}^2$

$P_w = 47 \text{ ft}$

$R = 4.1 \text{ ft}$

$S = 4\%$

$Q = 4190 \text{ cfs}$

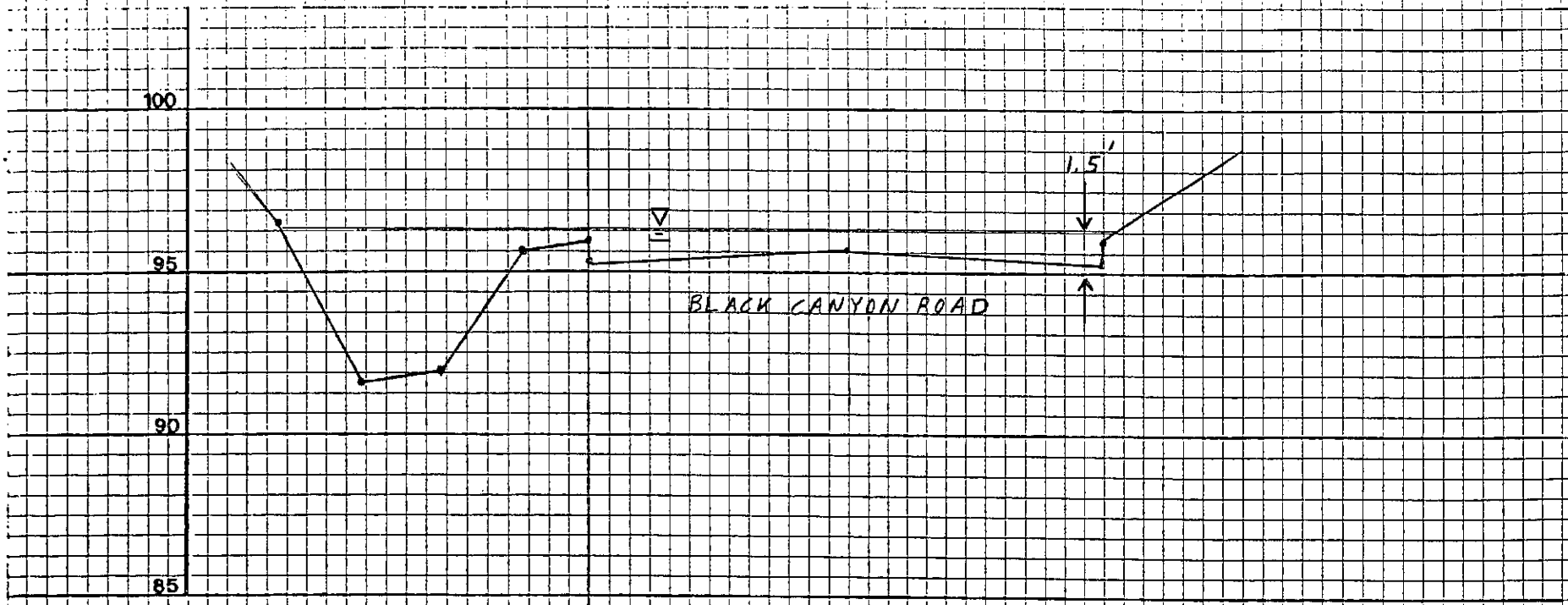
CEDAR HEIGHTS MDDP

BLACK CANYON DRAINAGEWAY

CROSS-SECTION 1

1"=10' HORIZ.

1"=5' VERT.



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$n = 0.024$

$A = 82.5 \text{ ft}^2$

$P_w = 55 \text{ ft}$

$R = 1.5 \text{ ft}$

$Q = 2160$

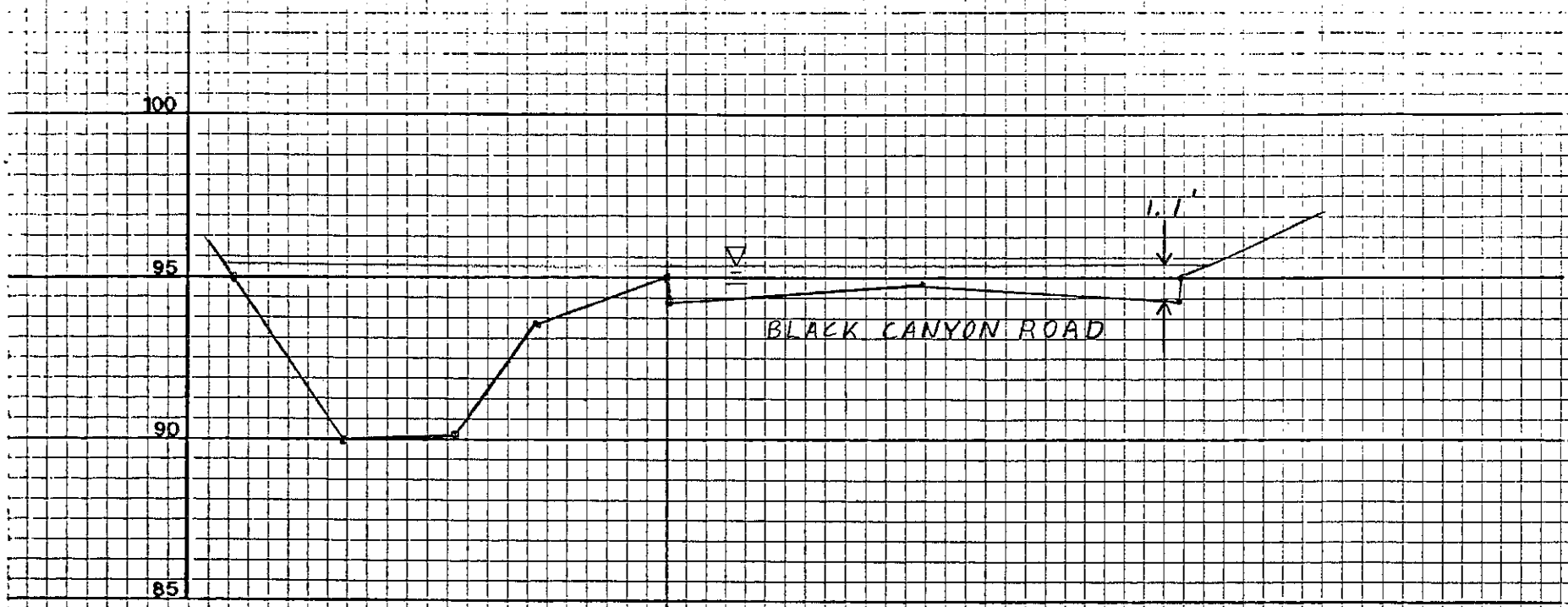
CEDAR HEIGHTS MDDP

BLACK CANYON DRAINAGEWAY

CROSS-SECTION 2

1"=10' HORIZ.

1"=5' VERT.



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$n = 0.025$

$A = 113.5 \text{ ft}^2$

$P_w = 60 \text{ ft}$

$R = 1.9$

$S = 4\%$

$Q = 2070 \text{ cfs}$

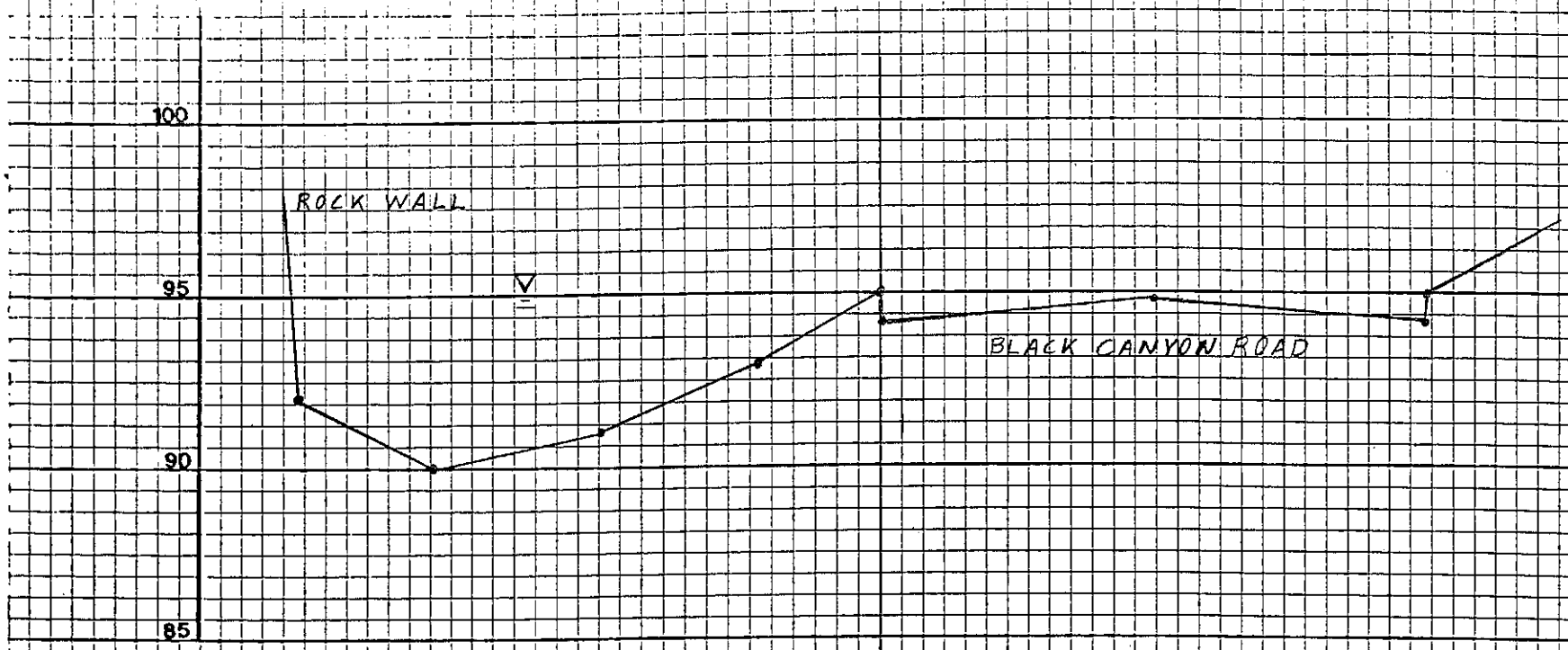
CEDAR HEIGHTS MDDP

BLACK CANYON DRAINAGEWAY

CROSS-SECTION B

1"=10' HORIZ.

1"=5' VERT.



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$n = 0.025$

$A = 112.5 \text{ ft}^2$

$P_w = 37.5 \text{ ft}$

$R = 3.0$

$S = 4\%$

$Q = 1990 \text{ cfs}$

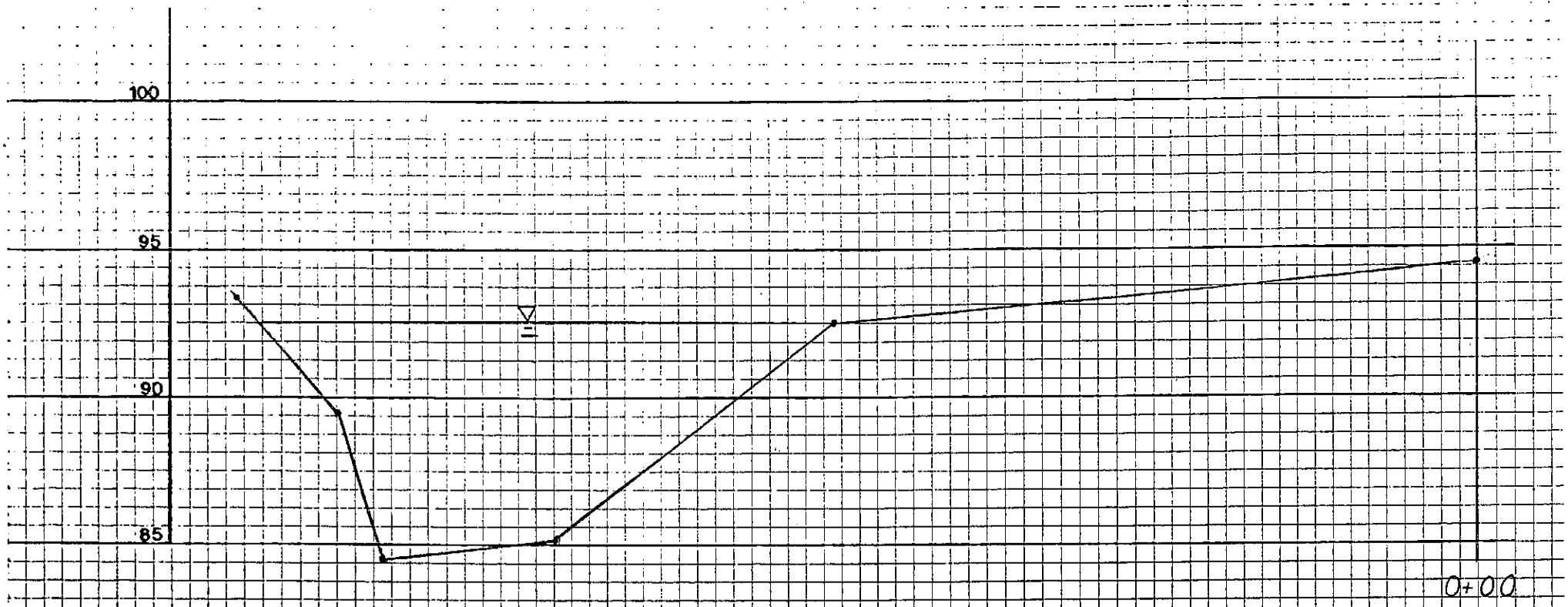
CEDAR HEIGHTS MDDP

BLACK CANYON DRAINAGEWAY

CROSS-SECTION 4

1"=10' HORIZ.

1"=5' VERT.



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$n = 0.025$

$A = 185.0 \ ft^2$

$P_w = 44 \ ft$

$R = 4.2 \ ft$

$S = 4\%$

$Q = 4090 \ cfs$

CEDAR HEIGHTS MDDP

BLACK CANYON DRAINAGEWAY

CROSS-SECTION 5

1"=10' HORIZ.

1"=5' VERT.

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
*  RUN DATE  06/24/1994  TIME  08:04:59 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X       XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
         LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

           1           ID   CEDAR HEIGHTS MDDP
           2           ID   ROCKWELL-MINCHOW CONSULTANTS - 94009 - TDH 6-24-94
           3           ID   24 HR - 10 & 100 YEAR TYPE IIA STORMS
           4           ID   DEVELOPED CONDITION, CEDAR HEIGHTS
           5           ID   FILE: H1DEV1.DAT
*** FREE ***
                       *DIAGRAM
           6           IT      5       0       0     300
           7           IO      5
           8           JR    PREC    .682     1.0

           9           KK    D1.1
          10           KM    RUNOFF FROM BASIN D1.1
          11           IN      30
          12           PB     4.4
          13           PC     0.0   .0015   .0045   .0080   .0120   .0165   .0210   .0255   .0320     .04
          14           PC   .0600   .1000   .7000   .7500   .7800   .8000   .8200   .8300   .8400     .85
          15           PC   .8600   .8675   .8750   .8825   .8900   .8975   .9050   .9115   .9180     .92
          16           PC   .9300   .9350   .9400   .9450   .9500   .9550   .9600   .9650   .9700     .97
          17           PC   .9800   .9825   .9850   .9875   .9900   .9925   .9950   .9975   1.000
          18           BA   .1173
          19           LS      0      77
          20           UD    0.18
```

```
22          KM   ROUTE FLOWS THRU POND #1.1(36"CSP, ROCK HEADWALL)
23          KO       3
24          RS       1    ELEV    7138
25          SQ       0      85
26          SA       0    .115
27          SE    7138    7146
28          SS    7146      50       3     1.5
29          ST    7146     100       3     1.5

30          KK  RTD1.1
31          KM   ROUTE D1.1 THRU D2.5
32          RK    1200     .08    .035       0    TRAP       3       5

33          KK    D2.1
34          KM   RUNOFF FROM D2.1
35          BA   .2027
36          LS       0      77
37          UD   0.164

38          KK    D2.2
39          KM   RUNOFF FROM D2.2
40          BA   .1097
41          LS       0      78
42          UD   0.174
```



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LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10


43          KK   DP2.2
44          KM   COMBINE RUNOFF FROM D2.1 AND D2.2
45          HC       2

46          KK RTDP2.2
47          KM   ROUTE DP2.2 THRU D2.4
48          RK    2000     .09    .035       0    TRAP       3       4

49          KK    D2.3
50          KM   RUNOFF FROM D2.3
51          BA   .0255
52          LS       0      84
53          UD   0.143

54          KK POND2.3
55          KM   ROUTE FLOWS THRU POND #2.3(24"CSP, PROJECTING)
56          KO       3
57          RS       1    ELEV    7352
58          SQ       0      28
59          SA       0     .17
60          SE    7352    7362
61          SS    7362      50       3     1.5
62          ST    7362     100       3     1.5

63          KK  RTD2.3
64          KM   ROUTE D2.3 THRU D2.4
65          RK    2000     .09    .035       0    TRAP       3       4

66          KK    D2.4
67          KM   RUNOFF FROM D2.4
68          BA   .0386
69          LS       0      77
70          UD   0.108

71          KK   DP2.4
```

```
 73          HC       3

 74          KK RTDP2.4
 75          KM   ROUTE DP2.4 THRU D2.5
 76          RK    1200     .08    .035       0    TRAP       3       5

 77          KK    D3.1
 78          KM   RUNOFF FROM D3.1
 79          BA   .0486
 80          LS      0      81
 81          UD    0.10

 82          KK    D2.5
 83          KM   RUNOFF FROM D2.5
 84          BA   .0387
 85          LS      0      76
 86          UD   0.136
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 87          KK   DP2.5
 88          KM   COMBINE RUNOFF FROM D2.5, RTDP2.4, RTD1.1 AND D3.1
 89          HC      4

 90          KK  RTD2.5
 91          KM   ROUTE DP2.5 THRU D2.6
 92          RK     700     .08    .035       0    TRAP       3       5

 93          KK    D4.1
 94          KM   RUNOFF FROM D4.1
 95          BA   .0492
 96          LS      0      80
 97          UD   0.114

 98          KK    D2.6
 99          KM   RUNOFF FROM D2.6
100          BA   .0132
101          LS      0      72
102          UD   0.101

103          KK   DP2.6
104          KM   COMBINE RUNOFF FROM D4.1, RTDP2.5 AND D2.6
105          HC      3

106          KK RTDP2.6
107          KM   ROUTE DP2.6 THRU D2.8
108          RK    1800     .08    .035       0    TRAP       3       4

109          KK    D2.7
110          KM   RUNOFF FROM D2.7
111          BA    .032
112          LS      0      70
113          UD   0.145

114          KK  RTD2.7
115          KM   ROUTE D2.7 THRU D2.8
116          RK    1800     .08    .035       0    TRAP       3       4

117          KK    D2.8
118          KM   RUNOFF FROM D2.8
119          BA    .043
120          LS      0      71
121          UD   0.140
```

```
122          KK    D5.1
123          KM   RUNOFF FROM D5.1
124          BA   .1527
125          LS      0      79
126          UD   0.159
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10


127          KK    D5.2
128          KM   RUNOFF FROM D5.2
129          BA   .1653
130          LS      0      79
131          UD   0.177

132          KK    D5.3
133          KM   RUNOFF FROM D5.3
134          BA   .0407
135          LS      0      79
136          UD   0.162

137          KKPOND5.3.1
138          KM   ROUTE FLOWS THRU POND #5.3.1(30"CSP, PROJECTING)
139          KO      3
140          RS      1    ELEV    7108
141          SQ      0      45
142          SA      0    .253
143          SE   7108    7118
144          SS   7118      50       3     1.5
145          ST   7118     100       3     1.5

146          KKPOND5.3.2
147          KM   ROUTE FLOWS THRU POND #5.3.2(30"CSP, PROJECTING)
148          KO      3
149          RS      1    ELEV    7094
150          SQ      0      45
151          SA      0    .207
152          SE   7094    7104
153          SS   7104      50       3     1.5
154          ST   7104     100       3     1.5

155          KK   DP5.3
156          KM   COMBINE D5.1, D5.2 AND D5.3
157          HC      3

158          KK POND5.3
159          KM   ROUTE FLOWS THRU POND #5.3(48"RCP, HEADWALL)
160          KO      3
161          RS      1    ELEV    7042
162          SQ    190     260     325     375
163          SA      0    .275    .528    .941
164          SE   7042    7050    7060    7070

165          KK RTDP5.3
166          KM   ROUTE DP5.3 THRU D5.4
167          RK   1500     .08    .035       0    TRAP       3       4

168          KK    D5.4
169          KM   RUNOFF FROM D5.4
170          BA   .0948
171          LS      0      75
172          UD   0.119
```

```
173          KK   DP5.4
174          KM   COMBINE RTDP5.3 AND D5.4
175          HC       2

176          KK POND5.4
177          KM   ROUTE FLOWS THRU POND #5.4(96"CSP, PROJECTING)
178          KO       3
179          RS       1    ELEV    6920
180          SQ       0     550     900    1000
181          SA       0    .161    .413    .636
182          SE    6920    6930    6940    6946

183          KK   DP2.8
184          KM   COMBINE RTDP5.4, RTDP2.6, RTD2.7 AND D2.8
185          HC       4

186          KK RTDP2.8
187          KM   ROUTE DP2.8 THRU D2.9
188          RK    1500     .07    .035       0    TRAP       5       4

189          KK    D2.9
190          KM   RUNOFF FROM D2.9
191          BA   .0746
192          LS       0      75
193          UD   0.151

194          KK   DP2.9
195          KM   COMBINE RTDP2.8 AND D2.9
196          HC       2

197          KK POND2.9
198          KM   ROUTE FLOWS THRU POND #2.9(96"CSP, PROJECTING)
199          KO       3
200          RS       1    ELEV    6766
201          SQ       0     190     700     980    1100    1250
202          SA       0    .092    .367    .666   1.102   1.630
203          SE    6766    6770    6780    6790    6800    6810

204          KK RTDP2.9
205          KM   ROUTE DP2.9 THRU D2.10
206          RK    2000     .07    .035       0    TRAP       5       4

207          KK   D2.10
208          KM   RUNOFF FROM D2.10
209          BA   .1090
210          LS       0      73
211          UD   0.163

212          KK    D6.1
213          KM   RUNOFF FROM D6.1
214          BA   .0786
215          LS       0      75
216          UD   0.171
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

217          KK POND6.1
218          KM   ROUTE FLOWS THRU POND #6.1(36"CSP, PROJECTING)
219          KO       3
220          RS       1    ELEV    6780
221          SQ       0      70
```

```
223          SE    6780    6790
224          SS    6790      50       3     1.5
225          ST    6790     100       3     1.5

226          KK  RTD6.1
227          KM   ROUTE D6.1 THRU D2.10
228          RK    1700     .07    .035       0    TRAP       3       5

229          KK  DP2.10
230          KM   COMBINE RTDP2.9, RTDP6.1, AND D2.10
231          HC       3

232          KK  RTDP2.10
233          KM   ROUTE RTDP2.10 THRU D2.11
234          RK    1300     .10    .035       0    TRAP       5       4

235          KK    D7.1
236          KM   RUNOFF FROM D7.1
237          BA   .1317
238          LS       0      75
239          UD   0.170

240          KK POND7.1
241          KM   ROUTE FLOWS THRU POND #7.1(42"CSP, PROJECTING)
242          KO       3
243          RS       1    ELEV    6856
244          SQ       0      55     110     140
245          SA       0    .046    .230    .505
246          SE    6856    6860    6870    6880

247          KK  RTD7.1
248          KM   ROUTE D7.1 THRU D7.2
249          RK    2000     .15    .035       0    TRAP       0       5

250          KK    D7.2
251          KM   RUNOFF FROM D7.2
252          BA    .039
253          LS       0      75
254          UD   0.102

255          KK   DP7.2
256          KM   COMBINE RTD7.1 AND D7.2
257          HC       2
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10


258          KK RTDP7.2
259          KM   ROUTE DP7.2 THRU D8.2
260          RK    1200     .10    .035       0    TRAP       3       4

261          KK    D8.1
262          KM   RUNOFF FROM D8.1
263          BA   .1362
264          LS       0      73
265          UD   0.191

266          KK  RTD8.1
267          KM   ROUTE D8.1 THRU D8.2
268          RK    4000     .14    .035       0    TRAP       3       4

269          KK    D8.2
270          KM   RUNOFF FROM D8.2
271          BA   .2135
```

```
273          UD   0.175

274          KK   DP8.2
275          KM   COMBINE RTD8.1, D8.2 AND RTDP7.2
276          HC       3

277          KK POND8.2
278          KM   ROUTE FLOWS THRU POND #8.2(72" & 84"CSP'S, PROJECTING)
279          KO       3
280          RS       1    ELEV    6410
281          SQ       0     675    1050
282          SA       0    .069    .298
283          SE    6410    6420    6430

284          KK   D2.11
285          KM   RUNOFF FROM D2.11
286          BA   .0377
287          LS       0      73
288          UD   0.095

289          KK  DP2.11
290          KM   COMBINE RTDP2.10, D2.11 AND RTDP8.2
291          HC       3

292          KK  RTDP2.11
293          KM   ROUTE DP2.11 THRU D2.12
294          RK    2800    .045    .035       0    TRAP       5       5

295          KK    D8.3
296          KM   RUNOFF FROM D8.3
297          BA    .066
298          LS       0      70
299          UD   0.160
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

300          KK  RTD8.3
301          KM   ROUTE D8.3 THRU D2.12
302          RK    1400    .045    .035       0    TRAP       5       5

303          KK   D2.12
304          KM   RUNOFF FROM D2.12
305          BA   .0646
306          LS       0      73
307          UD   0.131

308          KK   D2.13
309          KM   RUNOFF FROM D2.13
310          BA    .043
311          LS       0      73
312          UD   0.146

313          KK  DP2.13
314          KM   COMBINE RTDP2.11, D2.12, D2.13 AND RTD8.3
315          HC       4

316          KK  RTDP2.13
317          KM   ROUTE DP2.13 THRU D2.14
318          RK    1200    .035    .035       0    TRAP       5       5

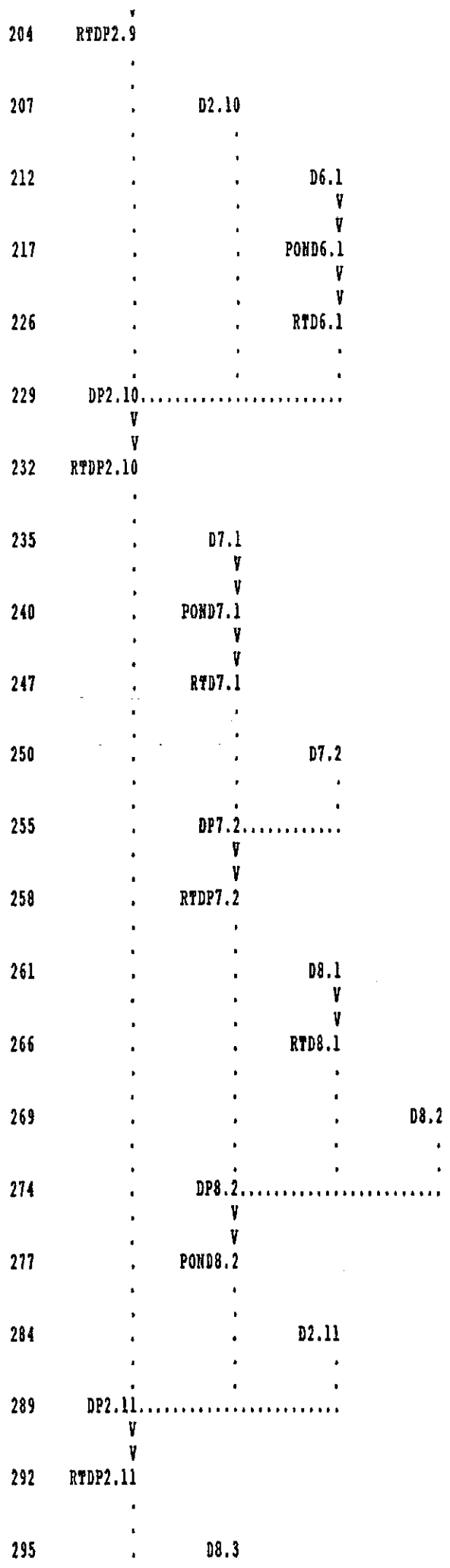
319          KK   D2.14
320          KM   RUNOFF FROM D2.14
321          BA   .0349
```

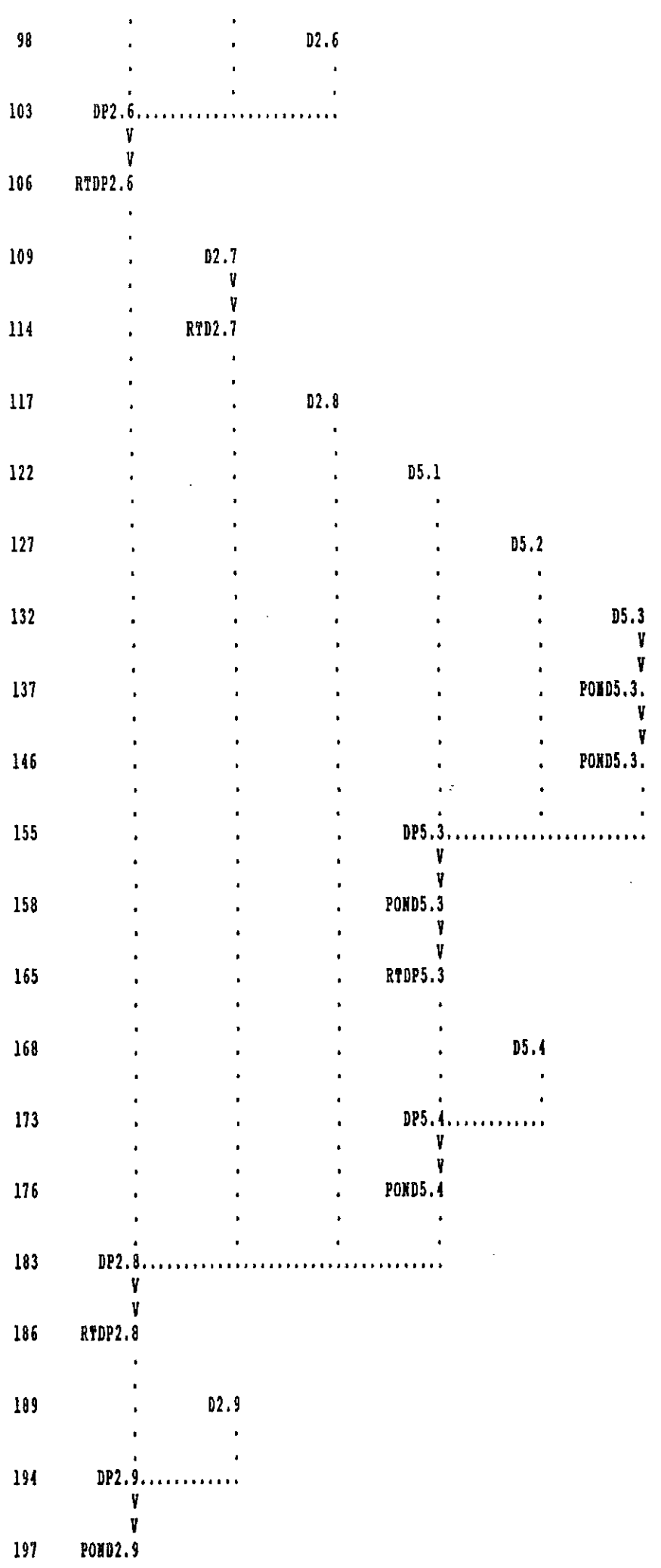
```
          323          UB   0.150

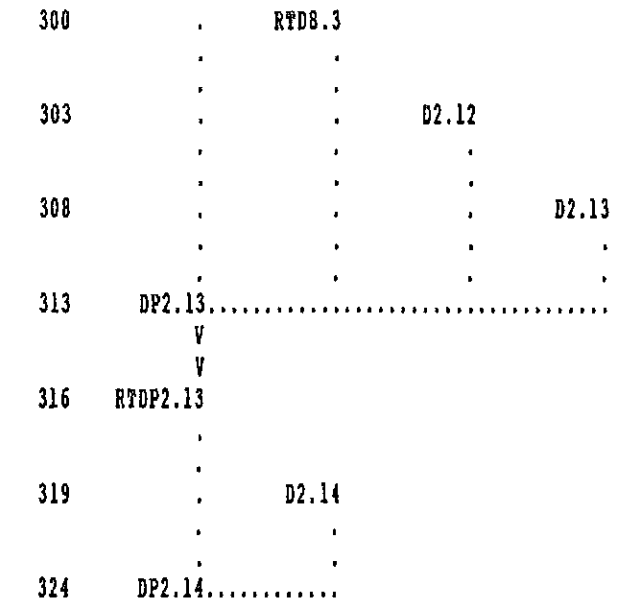
          324          KK  DP2.14
          325          KM   COMBINE RTDP2.13, D2.14
          326          HC       2
          327          ZZ
1
                  SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     9        D1.1
              V
              V
    21      POND1.1
              V
              V
    30      RTD1.1
              .
              .
    33          .        D2.1
                .          .
                .          .
    38          .          .        D2.2
                .          .          .
                .          .          .
    43          .       DP2.2.........
                .          V
                .          V
    46          .     RTDP2.2
                .          .
                .          .
    49          .          .        D2.3
                .          .          V
                .          .          V
    54          .          .     POND2.3
                .          .          V
                .          .          V
    63          .          .      RTD2.3
                .          .          .
                .          .          .
    66          .          .          .        D2.4
                .          .          .          .
                .          .          .          .
    71          .       DP2.4........................
                .          V
                .          V
    74          .     RTDP2.4
                .          .
                .          .
    77          .          .        D3.1
                .          .          .
                .          .          .
    82          .          .          .        D2.5
                .          .          .          .
                .          .          .          .
    87        DP2.5.................................
              V
              V
    90      RTD2.5
              .
              .
    93          .        D4.1
```


204 RTDP2.9
207 D2.10
212 D6.1
217 POND6.1
226 RTD6.1
229 DP2.10
232 RTDP2.10
235 D7.1
240 POND7.1
247 RTD7.1
250 D7.2
255 DP7.2
258 RTDP7.2
261 D8.1
266 RTD8.1
269 D8.2
274 DP8.2
277 POND8.2
284 D2.11
289 DP2.11
292 RTDP2.11
295 D8.3


98
D2.6
103
DP2.6
106
RTDP2.6
109
D2.7
114
RTD2.7
117
D2.8
122
D5.1
127
D5.2
132
D5.3
137
POND5.3.
146
POND5.3.
155
DP5.3
158
POND5.3
165
RTDP5.3
168
D5.4
173
DP5.4
176
POND5.4
183
DP2.8
186
RTDP2.8
189
D2.9
194
DP2.9
197
POND2.9



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990              *
*            VERSION 4.0                *
*                                       *
*  RUN DATE  06/24/1994  TIME  08:04:59 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                    CEDAR HEIGHTS HDDP
                    ROCKWELL-HINCHOW CONSULTANTS - 94009 - TDH 6-24-94
                    24 HR - 10 & 100 YEAR TYPE IIA STORMS
                    DEVELOPED CONDITION, CEDAR HEIGHTS
                    FILE: HIDEV1.DAT

  7 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                    NMIN          5  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1    0  STARTING DATE
                   ITIME        0000  STARTING TIME
                      NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      2    0  ENDING DATE
                  NDTIME        0055  ENDING TIME
                  ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL     .08 HOURS
                  TOTAL TIME BASE   24.92 HOURS

       ENGLISH UNITS
            DRAINAGE AREA        SQUARE MILES
            PRECIPITATION DEPTH  INCHES
            LENGTH, ELEVATION    FEET
            FLOW                 CUBIC FEET PER SECOND
            STORAGE VOLUME       ACRE-FEET
```

```
           TEMPERATURE          DEGREES FAHRENHEIT

   JP         MULTI-PLAN OPTION
                   NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                  .68      1.00



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


         ***************
         *             *
21 KK    *   POND1.1   *
         *             *
         ***************

23 KO         OUTPUT CONTROL VARIABLES
                   IPRNT          3  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

           HYDROGRAPH ROUTING DATA

24 RS         STORAGE ROUTING
                   NSTPS          1  NUMBER OF SUBREACHES
                    ITYP       ELEV  TYPE OF INITIAL CONDITION
                   RSVRIC    7138.00  INITIAL CONDITION
                       X         .00 WORKING R AND D COEFFICIENT

26 SA              AREA         .0       .1

27 SE         ELEVATION    7138.00   7146.00

25 SQ         DISCHARGE         0.      85.

28 SS         SPILLWAY
                    CREL    7146.00  SPILLWAY CREST ELEVATION
                   SPWID      50.00  SPILLWAY WIDTH
                    COQW       3.00  WEIR COEFFICIENT
                    EXPW       1.50  EXPONENT OF HEAD

29 ST         TOP OF DAM
                   TOPEL    7146.00  ELEVATION AT TOP OF DAM
                  DAMWID     100.00  DAM WIDTH
                    COQD       3.00  WEIR COEFFICIENT
                    EXPD       1.50  EXPONENT OF HEAD

                                                    ***

                                        COMPUTED STORAGE-ELEVATION DATA

        STORAGE       .00      .31
      ELEVATION    7138.00  7146.00

                                    COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

                                        (INCLUDING FLOW OVER DAM)

        STORAGE       .00      .31
        OUTFLOW       .00    85.00
      ELEVATION    7138.00  7146.00
```

*** *** *** *** ***

HYDROGRAPH AT STATION POND1.1
FOR PLAN 1, RATIO = .68

PEAK OUTFLOW IS 84. AT TIME 6.17 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 84.	6.17		10.	3.	3.	3.
		(INCHES)	.831	1.071	1.071	1.071
		(AC-FT)	5.	7.	7.	7.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
0.	6.17	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
7145.94	6.17	7138.99	7138.32	7138.31	7138.31

CUMULATIVE AREA = .12 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND1.1
FOR PLAN 1, RATIO = 1.00

PEAK OUTFLOW IS 200. AT TIME 6.00 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 200.	6.00		22.	7.	6.	6.
		(INCHES)	1.714	2.132	2.132	2.132
		(AC-FT)	11.	13.	13.	13.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
0.	6.00	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
7146.51	6.00	7139.60	7138.53	7138.51	7138.51

CUMULATIVE AREA = .12 SQ MI

*** ***

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* *

****

56 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

57 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	7352.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

59 SA AREA .0 .2

60 SE ELEVATION 7352.00 7362.00

58 SQ DISCHARGE 0. 28.

61 SS SPILLWAY

CREL	7362.00	SPILLWAY CREST ELEVATION
SPWID	50.00	SPILLWAY WIDTH
COQW	3.00	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

62 ST TOP OF DAM

TOPEL	7362.00	ELEVATION AT TOP OF DAM
DAMWID	100.00	DAM WIDTH
COQD	3.00	WEIR COEFFICIENT
EXPD	1.50	EXPONENT OF HEAD

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.57
ELEVATION	7352.00	7362.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	.57
OUTFLOW	.00	28.00
ELEVATION	7352.00	7362.00

*** *** *** *** ***

HYDROGRAPH AT STATION POND2.3
FOR PLAN 1, RATIO = .68

PEAK OUTFLOW IS 22. AT TIME 6.17 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 22.	6.17		3.	1.	1.	1.
		(INCHES)	1.232	1.523	1.523	1.523
		(AC-FT)	2.	2.	2.	2.

```
+ (AC-FT)      (HR)
      0.       6.17                  0.           0.           0.            0.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                  6-HR        24-HR        72-HR      24.92-HR
+   (FEET)     (HR)
   7360.00     6.17             7353.20      7352.37      7352.36      7352.36

                       CUMULATIVE AREA =     .03 SQ MI


      ***           ***           ***           ***           ***

                        HYDROGRAPH AT STATION  POND2.3
                          FOR PLAN 1, RATIO = 1.00

 PEAK OUTFLOW IS       68. AT TIME   6.08 HOURS


  PEAK FLOW     TIME                         MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR      24.92-HR
+   (CFS)      (HR)
                         (CFS)
+       68.    6.08                  6.           2.           2.            2.
                        (INCHES)  2.268        2.738        2.738         2.738
                         (AC-FT)     3.           4.           4.            4.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                  6-HR        24-HR        72-HR      24.92-HR
+ (AC-FT)      (HR)
      1.       6.08                  0.           0.           0.            0.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                  6-HR        24-HR        72-HR      24.92-HR
+   (FEET)     (HR)
   7362.26     6.08             7353.98      7352.61      7352.59      7352.59

                       CUMULATIVE AREA =     .03 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
 137 KK       *  POND5.3.  *     1
              *            *
              **************

 139 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

 140 RS          STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC    7108.00  INITIAL CONDITION
                           X        .00  WORKING R AND D COEFFICIENT
```

```
 143 SE          ELEVATION     7108.00   7118.00

 141 SQ          DISCHARGE          0.        45.

 144 SS          SPILLWAY
                       CREL     7118.00  SPILLWAY CREST ELEVATION
                      SPWID       50.00  SPILLWAY WIDTH
                       COQW        3.00  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD

 145 ST          TOP OF DAM
                      TOPEL     7118.00  ELEVATION AT TOP OF DAM
                     DAMWID      100.00  DAM WIDTH
                       COQD        3.00  WEIR COEFFICIENT
                       EXPD        1.50  EXPONENT OF HEAD

                                                                  ***

                                        COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .84
        ELEVATION    7108.00   7118.00

                                        COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

                                        (INCLUDING FLOW OVER DAM)

          STORAGE        .00       .84
          OUTFLOW        .00     45.00
        ELEVATION    7108.00   7118.00

     ***             ***             ***             ***             ***

                     HYDROGRAPH AT STATION POND5.3.
                       FOR PLAN 1, RATIO =  .68

PEAK OUTFLOW IS       30. AT TIME   6.17 HOURS


 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+      30.      6.17                  4.          1.          1.          1.
                         (INCHES)    .934       1.189       1.189       1.189
                          (AC-FT)       2.          3.          3.          3.

 PEAK STORAGE  TIME                        MAXIMUM AVERAGE STORAGE
                                    6-HR       24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
        0.      6.17                  0.          0.          0.          0.

  PEAK STAGE   TIME                        MAXIMUM AVERAGE STAGE
                                    6-HR       24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
    7114.57     6.17               7108.91    7108.30     7108.29     7108.29

                     CUMULATIVE AREA =     .04 SQ MI

     ***             ***             ***             ***             ***

                     HYDROGRAPH AT STATION POND5.3.
                       FOR PLAN 1, RATIO = 1.00
```

PEAK OUTFLOW IS 51. AT TIME 6.17 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 51.	6.17		8.	3.	2.	2.
		(INCHES)	1.864	2.298	2.298	2.298
		(AC-FT)	4.	5.	5.	5.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
1.	6.17	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
7118.07	6.17	7109.79	7108.56	7108.54	7108.54

CUMULATIVE AREA = .04 SQ MI

*** ***

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          ***************
          *             *
146 KK    *  POND5.3.   *     2
          *             *
          ***************
```

```
148 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

149 RS         STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       ELEV  TYPE OF INITIAL CONDITION
                    RSVRIC    7094.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

151 SA              AREA         .0       .2

152 SE         ELEVATION    7094.00   7104.00

150 SQ         DISCHARGE         0.       45.

153 SS         SPILLWAY
                     CREL    7104.00  SPILLWAY CREST ELEVATION
                    SPWID      50.00  SPILLWAY WIDTH
                     COQW       3.00  WEIR COEFFICIENT
                     EXPW       1.50  EXPONENT OF HEAD

154 ST         TOP OF DAM
                    TOPEL    7104.00  ELEVATION AT TOP OF DAM
                    DAMWID    100.00  DAM WIDTH
                     COQD       3.00  WEIR COEFFICIENT
                     EXPD       1.50  EXPONENT OF HEAD
```

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.69
ELEVATION	7094.00	7104.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	.69
OUTFLOW	.00	45.00
ELEVATION	7094.00	7104.00

*** *** *** *** ***

HYDROGRAPH AT STATION POND5.3.
FOR PLAN 1, RATIO = .68

PEAK OUTFLOW IS 27. AT TIME 6.25 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 27.	6.25		4.	1.	1.	1.
		(INCHES)	.943	1.198	1.198	1.198
		(AC-FT)	2.	3.	3.	3.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
0.	6.25		0.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
7099.90	6.25		7094.92	7094.30	7094.29	7094.29

CUMULATIVE AREA = .04 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND5.3.
FOR PLAN 1, RATIO = 1.00

PEAK OUTFLOW IS 39. AT TIME 6.42 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 39.	6.42		8.	3.	2.	2.
		(INCHES)	1.868	2.301	2.301	2.301
		(AC-FT)	4.	5.	5.	5.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
0.	6.42		0.	0.	0.	0.

			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
7102.75	6.42		7095.82	7094.56	7094.54	7094.54

CUMULATIVE AREA = .04 SQ MI

*** ***

```
          ***************
          *             *
158 KK    *   POND5.3   *
          *             *
          ***************

160 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

161 RS         STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       ELEV  TYPE OF INITIAL CONDITION
                   RSVRIC    7042.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

163 SA             AREA         .0       .3       .5       .9

164 SE         ELEVATION    7042.00  7050.00  7060.00  7070.00

162 SQ         DISCHARGE        190.     260.     325.     375.
                                                          ***

                                        COMPUTED STORAGE-ELEVATION DATA

          STORAGE       .00      .73     4.68    11.93
        ELEVATION   7042.00  7050.00  7060.00  7070.00

     ***           ***           ***           ***           ***

                    HYDROGRAPH AT STATION  POND5.3
                      FOR PLAN 1, RATIO =  .68
```

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 260.	6.17		192.	191.	191.	191.
		(INCHES)	4.986	19.761	20.513	20.513
		(AC-FT)	95.	378.	392.	392.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
1.	6.17	0.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				

```
                  CUMULATIVE AREA =     .36 SQ MI


      ***           ***           ***           ***           ***


                   HYDROGRAPH AT STATION  POND5.3
                     FOR PLAN 1, RATIO = 1.00

  PEAK FLOW .   TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR      72-HR    24.92-HR
+   (CFS)       (HR)
                           (CFS)
+     339.      6.25                208.        194.       194.        194.
                         (INCHES)  5.381      20.156     20.908      20.908
                         (AC-FT)    103.        386.       400.        400.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                    6-HR       24-HR      72-HR    24.92-HR
+  (AC-FT)      (HR)
        7.      6.25                  0.          0.         0.          0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                    6-HR       24-HR      72-HR    24.92-HR
+   (FEET)      (HR)
   7062.87      6.25             7044.32     7042.58    7042.56     7042.56

                   CUMULATIVE AREA =     .36 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  176 KK    *   POND5.4  *
            *            *
            **************

  178 KO        OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

  179 RS        STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC    6920.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

  181 SA               AREA         .0        .2        .4        .6

  182 SE          ELEVATION    6920.00   6930.00   6940.00   6946.00

  180 SQ          DISCHARGE         0.      550.      900.     1000.

                                                                ***

                                                   COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00       .54      3.31      6.43
```

*** *** *** *** ***

HYDROGRAPH AT STATION POND5.4
FOR PLAN 1, RATIO = .68

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	301.	6.17		200.	193.	193.	193.
			(INCHES)	4.098	15.835	16.419	16.419
			(AC-FT)	99.	383.	397.	397.

	PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+	(AC-FT)	(HR)				
	0.	6.17	0.	0.	0.	0.

	PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+	(FEET)	(HR)				
	6925.47	6.17	6923.63	6923.53	6923.52	6923.52

CUMULATIVE AREA = .45 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND5.4
FOR PLAN 1, RATIO = 1.00

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
			(CFS)				
+	468.	6.08		224.	199.	199.	199.
			(INCHES)	4.586	16.359	16.943	16.943
			(AC-FT)	111.	396.	410.	410.

	PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+	(AC-FT)	(HR)				
	0.	6.08	0.	0.	0.	0.

	PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+	(FEET)	(HR)				
	6928.52	6.08	6924.06	6923.63	6923.62	6923.62

CUMULATIVE AREA = .45 SQ MI

*** ***

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          ***************
          *             *
197 KK    *   POND2.9   *
          *             *
          ***************

199 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          3  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

200 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     6766.00  INITIAL CONDITION
                          X         .00 WORKING R AND D COEFFICIENT

202 SA              AREA          .0       .1       .4       .7      1.1      1.6

203 SE          ELEVATION     6766.00  6770.00  6780.00  6790.00  6800.00  6810.00

201 SQ          DISCHARGE          0.      190.      700.      980.     1100.     1250.
                                                                      ***

                                                COMPUTED STORAGE-ELEVATION DATA

                STORAGE        .00       .12      2.27      7.36     16.11     29.68
              ELEVATION     6766.00  6770.00  6780.00  6790.00  6800.00  6810.00


     ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION  POND2.9
                          FOR PLAN 1, RATIO =  .68

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     24.92-HR
+   (CPS)       (HR)
                              (CPS)
+     777.      6.17              271.       216.       215.       215.
                           (INCHES)    2.021      6.444      6.652      6.652
                           (AC-FT)     134.       428.       442.       442.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                        6-HR       24-HR       72-HR     24.92-HR
+ (AC-FT)       (HR)
        4.      6.17                1.         0.         0.         0.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                        6-HR       24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
    6782.75     6.17             6771.63    6770.53    6770.50    6770.50

                        CUMULATIVE AREA =    1.25 SQ MI


     ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION  POND2.9
                          FOR PLAN 1, RATIO = 1.00
```

```
  PEAK FLOW     TIME                            MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+    1119.      6.25                 370.        245.        243.        243.
                        (INCHES)    2.759       7.308       7.516       7.516
                         (AC-FT)     183.        486.        500.        500.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                    6-HR       24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
       18.      6.25                   2.          1.          1.          1.

  PEAK STAGE    TIME                           MAXIMUM AVERAGE STAGE
                                    6-HR       24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
   6801.24      6.25              6774.72     6771.38     6771.32     6771.32

                         CUMULATIVE AREA =    1.25 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  217 KK   *   POND6.1  *
           *            *
           **************

  219 KO        OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

  220 RS        STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC    6780.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

  222 SA             AREA          .0         .3

  223 SE        ELEVATION    6780.00   6790.00

  221 SQ        DISCHARGE          0.        70.

  224 SS        SPILLWAY
                       CREL    6790.00  SPILLWAY CREST ELEVATION
                      SPWID      50.00  SPILLWAY WIDTH
                       COQW       3.00  WEIR COEFFICIENT
                       EXPW       1.50  EXPONENT OF HEAD

  225 ST        TOP OF DAM
                      TOPEL    6790.00  ELEVATION AT TOP OF DAM
                     DAMWID     100.00  DAM WIDTH
                       COQD       3.00  WEIR COEFFICIENT
                       EXPD       1.50  EXPONENT OF HEAD

                                                         ***
```

STORAGE	.00	.84
ELEVATION	6780.00	6790.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

(INCLUDING FLOW OVER DAM)

STORAGE	.00	.84
OUTFLOW	.00	70.00
ELEVATION	6780.00	6790.00

*** *** *** *** ***

HYDROGRAPH AT STATION POND6.1
FOR PLAN 1, RATIO = .68

PEAK OUTFLOW IS 47. AT TIME 6.17 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 47.	6.17		6.	2.	2.	2.
		(INCHES)	.736	.961	.961	.961
		(AC-FT)	3.	4.	4.	4.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
0.	6.17		0.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
6786.75	6.17		6780.89	6780.29	6780.28	6780.28

CUMULATIVE AREA = .08 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND6.1
FOR PLAN 1, RATIO = 1.00

PEAK OUTFLOW IS 119. AT TIME 6.17 HOURS

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 119.	6.17		13.	4.	4.	4.
		(INCHES)	1.572	1.973	1.973	1.973
		(AC-FT)	7.	8.	8.	8.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
1.	6.17		0.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR

6790.29	6.17	6781.76	6780.56	6780.54	6780.54

CUMULATIVE AREA = .08 SQ MI

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          ***************
          *             *
240 KK    *   POND7.1   *
          *             *
          ***************
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242 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

243 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	6856.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

245 SA	AREA	.0	.0	.2	.5
246 SE	ELEVATION	6856.00	6860.00	6870.00	6880.00
244 SQ	DISCHARGE	0.	55.	110.	140.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.06	1.32	4.91
ELEVATION	6856.00	6860.00	6870.00	6880.00

*** *** *** *** ***

HYDROGRAPH AT STATION POND7.1
FOR PLAN 1, RATIO = .68

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 73.	6.17		10.	3.	3.	3.
		(INCHES)	.736	.961	.961	.961
		(AC-FT)	5.	7.	7.	7.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
0.	6.17		0.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
6863.28	6.17		6856.85	6856.26	6856.25	6856.25

CUMULATIVE AREA = .13 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND7.1
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 118.	6.25		22.	7.	7.	7.
		(INCHES)	1.571	1.972	1.972	1.972
		(AC-FT)	11.	14.	14.	14.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
2.	6.25	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
6872.82	6.25	6858.41	6856.71	6856.69	6856.69

CUMULATIVE AREA = .13 SQ MI

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          **************
          *            *
277 KK    *   POND8.2  *
          *            *
          **************

279 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

280 RS        STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       ELEV  TYPE OF INITIAL CONDITION
                   RSVRIC    6410.00  INITIAL CONDITION
                        X        .00  WORKING R AND D COEFFICIENT

282 SA              AREA          .0        .1        .3

283 SE         ELEVATION     6410.00   6420.00   6430.00

281 SQ         DISCHARGE          0.      675.     1050.
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***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.23	1.93
ELEVATION	6410.00	6420.00	6430.00

*** *** *** *** ***

HYDROGRAPH AT STATION POND8.2
FOR PLAN 1, RATIO = .68

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 275.	6.08		35.	12.	11.	11.
		(INCHES)	.626	.834	.834	.834
		(AC-FT)	17.	23.	23.	23.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
0.	6.08		0.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
6414.08	6.08		6410.52	6410.17	6410.17	6410.17

CUMULATIVE AREA = .52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND8.2
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 614.	6.08		78.	25.	24.	24.
		(INCHES)	1.402	1.782	1.782	1.782
		(AC-FT)	39.	49.	49.	49.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
0.	6.08		0.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
6419.09	6.08		6411.16	6410.37	6410.36	6410.36

CUMULATIVE AREA = .52 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO PRECIPITATION	
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2
					.68	1.00
HYDROGRAPH AT						
+	D1.1	.12	1	FLOW	97.	198.

ROUTED TO						
+	POND1.1	.12	1	FLOW	84.	200.
				TIME	6.17	6.00
			** PEAK STAGES IN FEET **			
			1	STAGE	7145.94	7146.51
				TIME	6.17	6.00
ROUTED TO						
+	RTD1.1	.12	1	FLOW	83.	186.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	D2.1	.20	1	FLOW	172.	350.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D2.2	.11	1	FLOW	97.	194.
				TIME	6.08	6.08
2 COMBINED AT						
+	DP2.2	.31	1	FLOW	269.	544.
				TIME	6.08	6.08
ROUTED TO						
+	RTDP2.2	.31	1	FLOW	262.	538.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D2.3	.03	1	FLOW	32.	59.
				TIME	6.00	6.00
ROUTED TO						
+	POND2.3	.03	1	FLOW	22.	68.
				TIME	6.17	6.08
			** PEAK STAGES IN FEET **			
			1	STAGE	7360.00	7362.26
				TIME	6.17	6.08
ROUTED TO						
+	RTD2.3	.03	1	FLOW	22.	53.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	D2.4	.04	1	FLOW	37.	75.
				TIME	6.00	6.00
3 COMBINED AT						
+	DP2.4	.38	1	FLOW	315.	655.
				TIME	6.08	6.08
ROUTED TO						
+	RTDP2.4	.38	1	FLOW	309.	647.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D3.1	.05	1	FLOW	60.	111.
				TIME	6.00	6.00
HYDROGRAPH AT						
+	D2.5	.04	1	FLOW	32.	67.
				TIME	6.08	6.00

+	DP2.5	.58	1	FLOW	466.	985.
				TIME	6.08	6.08
ROUTED TO						
+	RTD2.5	.58	1	FLOW	462.	982.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D4.1	.05	1	FLOW	55.	105.
				TIME	6.00	6.00
HYDROGRAPH AT						
+	D2.6	.01	1	FLOW	9.	21.
				TIME	6.00	6.00
3 COMBINED AT						
+	DP2.6	.64	1	FLOW	519.	1090.
				TIME	6.08	6.08
ROUTED TO						
+	RTDP2.6	.64	1	FLOW	509.	1083.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D2.7	.03	1	FLOW	18.	42.
				TIME	6.08	6.08
ROUTED TO						
+	RTD2.7	.03	1	FLOW	17.	41.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D2.8	.04	1	FLOW	26.	59.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D5.1	.15	1	FLOW	146.	285.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D5.2	.17	1	FLOW	154.	303.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D5.3	.04	1	FLOW	39.	76.
				TIME	6.08	6.08
ROUTED TO						
+	POND5.3.	.04	1	FLOW	30.	51.
				TIME	6.17	6.17
			** PEAK STAGES IN FEET **			
			1	STAGE	7114.57	7118.07
				TIME	6.17	6.17
ROUTED TO						
+	POND5.3.	.04	1	FLOW	27.	39.
				TIME	6.25	6.42
			** PEAK STAGES IN FEET **			
			1	STAGE	7099.90	7102.75
				TIME	6.25	6.42
3 COMBINED AT						
+	DP5.3	.36	1	FLOW	323.	619.

```
 ROUTED TO
+                POND5.3       .36    1   FLOW          260.     339.
                                          TIME          6.17     6.25

                                      ** PEAK STAGES IN FEET **
                                      1   STAGE      7050.07  7062.87
                                          TIME          6.17     6.25

 ROUTED TO
+                RTDP5.3       .36    1   FLOW          255.     339.
                                          TIME          6.17     6.25

 HYDROGRAPH AT
+                  D5.4        .09    1   FLOW           77.     165.
                                          TIME          6.00     6.00

  2 COMBINED AT
+                  DP5.4       .45    1   FLOW          298.     469.
                                          TIME          6.17     6.08

 ROUTED TO
+                POND5.4       .45    1   FLOW          301.     468.
                                          TIME          6.17     6.08

                                      ** PEAK STAGES IN FEET **
                                      1   STAGE      6925.47  6928.52
                                          TIME          6.17     6.08

  4 COMBINED AT
+                  DP2.8       1.17    1   FLOW          843.    1651.
                                          TIME          6.08     6.08

 ROUTED TO
+                RTDP2.8       1.17    1   FLOW          827.    1637.
                                          TIME          6.08     6.08

 HYDROGRAPH AT
+                  D2.9        .07    1   FLOW           57.     120.
                                          TIME          6.08     6.08

  2 COMBINED AT
+                  DP2.9       1.25    1   FLOW          884.    1757.
                                          TIME          6.08     6.08

 ROUTED TO
+                POND2.9       1.25    1   FLOW          777.    1119.
                                          TIME          6.17     6.25

                                      ** PEAK STAGES IN FEET **
                                      1   STAGE      6782.75  6801.24
                                          TIME          6.17     6.25

 ROUTED TO
+                RTDP2.9       1.25    1   FLOW          775.    1115.
                                          TIME          6.25     6.25

 HYDROGRAPH AT
+                 D2.10        .11    1   FLOW           72.     160.
                                          TIME          6.08     6.08

 HYDROGRAPH AT
+                  D6.1        .08    1   FLOW           58.     124.
                                          TIME          6.08     6.08
```

+	POND6.1	.08	1	FLOW	47.	119.
				TIME	6.17	6.17
				** PEAK STAGES IN FEET **		
			1	STAGE	6786.75	6790.29
				TIME	6.17	6.17
ROUTED TO						
+	RTD6.1	.08	1	FLOW	46.	111.
				TIME	6.17	6.17
3 COMBINED AT						
+	DP2.10	1.43	1	FLOW	871.	1322.
				TIME	6.17	6.17
ROUTED TO						
+	RTDP2.10	1.43	1	FLOW	866.	1317.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	D7.1	.13	1	FLOW	98.	208.
				TIME	6.08	6.08
ROUTED TO						
+	POND7.1	.13	1	FLOW	73.	118.
				TIME	6.17	6.25
				** PEAK STAGES IN FEET **		
			1	STAGE	6863.28	6872.82
				TIME	6.17	6.25
ROUTED TO						
+	RTD7.1	.13	1	FLOW	72.	118.
				TIME	6.25	6.25
HYDROGRAPH AT						
+	D7.2	.04	1	FLOW	34.	71.
				TIME	6.00	6.00
2 COMBINED AT						
+	DP7.2	.17	1	FLOW	94.	168.
				TIME	6.08	6.08
ROUTED TO						
+	RTDP7.2	.17	1	FLOW	93.	168.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D8.1	.14	1	FLOW	83.	190.
				TIME	6.08	6.08
ROUTED TO						
+	RTD8.1	.14	1	FLOW	80.	179.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	D8.2	.21	1	FLOW	110.	268.
				TIME	6.08	6.08
3 COMBINED AT						
+	DP8.2	.52	1	FLOW	277.	614.
				TIME	6.08	6.08
ROUTED TO						
+	POND8.2	.52	1	FLOW	275.	614.

** PEAK STAGES IN FEET **

			1	STAGE	6414.08	6419.09
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D2.11	.04	1	FLOW	30.	65.
				TIME	6.00	6.00
3 COMBINED AT						
+	DP2.11	1.99	1	FLOW	1140.	1928.
				TIME	6.17	6.08
ROUTED TO						
+	RTDP2.11	1.99	1	FLOW	1131.	1900.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	D8.3	.07	1	FLOW	35.	85.
				TIME	6.08	6.08
ROUTED TO						
+	RTD8.3	.07	1	FLOW	33.	82.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	D2.12	.06	1	FLOW	44.	99.
				TIME	6.08	6.00
HYDROGRAPH AT						
+	D2.13	.04	1	FLOW	29.	64.
				TIME	6.08	6.08
4 COMBINED AT						
+	DP2.13	2.17	1	FLOW	1212.	2110.
				TIME	6.17	6.08
ROUTED TO						
+	RTDP2.13	2.17	1	FLOW	1203.	2081.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	D2.14	.03	1	FLOW	24.	54.
				TIME	6.08	6.00
2 COMBINED AT						
+	DP2.14	2.20	1	FLOW	1219.	2125.
				TIME	6.17	6.08

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .68									
RTD1.1	MANE	.61	84.05	370.90	1.07	5.00	83.49	370.00	1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6703E+01 EXCESS= .0000E+00 OUTFLOW= .6705E+01 BASIN STORAGE= .1324E-03 PERCENT ERROR= .0

```
 RTD1.1  MANE          .56    199.14    361.13      2.13      5.00    186.45    365.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1334E+02 EXCESS= .0000E+00 OUTFLOW= .1334E+02 BASIN STORAGE= .1514E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
 RTDP2.2  MANE          .70    267.16    366.19      1.09      5.00    262.43    365.00        1.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1819E+02 EXCESS= .0000E+00 OUTFLOW= .1820E+02 BASIN STORAGE= .4627E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
 RTDP2.2  MANE          .62    540.94    365.75      2.16      5.00    538.49    365.00        2.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3596E+02 EXCESS= .0000E+00 OUTFLOW= .3597E+02 BASIN STORAGE= .4586E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
  RTD2.3  MANE         1.29     22.33    372.22      1.52      5.00     22.03    370.00        1.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2071E+01 EXCESS= .0000E+00 OUTFLOW= .2073E+01 BASIN STORAGE= .1344E-03 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO= 1.00
  RTD2.3  MANE          .94     66.50    367.07      2.74      5.00     52.93    365.00        2.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3724E+01 EXCESS= .0000E+00 OUTFLOW= .3727E+01 BASIN STORAGE= .1522E-03 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .68
 RTDP2.4  MANE          .40    313.99    365.92      1.12      5.00    309.27    365.00        1.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2249E+02 EXCESS= .0000E+00 OUTFLOW= .2250E+02 BASIN STORAGE= .5795E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
 RTDP2.4  MANE          .38    651.54    365.54      2.20      5.00    646.77    365.00        2.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4412E+02 EXCESS= .0000E+00 OUTFLOW= .4413E+02 BASIN STORAGE= .7084E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
  RTD2.5  MANE          .28    464.52    365.38      1.12      5.00    462.01    365.00        1.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3474E+02 EXCESS= .0000E+00 OUTFLOW= .3475E+02 BASIN STORAGE= .5327E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
  RTD2.5  MANE          .18    984.41    365.34      2.20      5.00    981.95    365.00        2.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6817E+02 EXCESS= .0000E+00 OUTFLOW= .6817E+02 BASIN STORAGE= .6758E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
 RTDP2.6  MANE          .55    515.20    365.71      1.13      5.00    508.93    365.00        1.13
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3863E+02 EXCESS= .0000E+00 OUTFLOW= .3864E+02 BASIN STORAGE= .2130E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RTDP2.6	MANE	.50	1085.56	365.32	2.21	5.00	1083.08	365.00	2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7571E+02 EXCESS= .0000E+00 OUTFLOW= .7572E+02 BASIN STORAGE= .2746E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .68

RTD2.7	MANE	1.32	17.37	367.55	.72	5.00	16.58	365.00	.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1220E+01 EXCESS= .0000E+00 OUTFLOW= .1221E+01 BASIN STORAGE= .6311E-04 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= 1.00

RTD2.7	MANE	1.06	41.24	365.73	1.60	5.00	41.00	365.00	1.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2736E+01 EXCESS= .0000E+00 OUTFLOW= .2737E+01 BASIN STORAGE= .9682E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .68

RTDP5.3	MANE	.53	260.00	371.11	20.51	5.00	255.02	370.00	20.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3924E+03 EXCESS= .0000E+00 OUTFLOW= .3924E+03 BASIN STORAGE=-.2120E+00 PERCENT ERROR= .1

FOR PLAN = 1 RATIO= 1.00

RTDP5.3	MANE	.53	339.19	375.92	20.91	5.00	338.75	375.00	20.91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4000E+03 EXCESS= .0000E+00 OUTFLOW= .4000E+03 BASIN STORAGE=-.2120E+00 PERCENT ERROR= .1

FOR PLAN = 1 RATIO= .68

RTDP2.8	MANE	.49	839.68	365.83	7.01	5.00	827.11	365.00	7.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4388E+03 EXCESS= .0000E+00 OUTFLOW= .4384E+03 BASIN STORAGE= .3842E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RTDP2.8	MANE	.46	1643.06	365.56	7.87	5.00	1636.79	365.00	7.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4922E+03 EXCESS= .0000E+00 OUTFLOW= .4918E+03 BASIN STORAGE= .3843E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .68

RTDP2.9	MANE	.66	776.61	371.82	6.64	5.00	774.85	375.00	6.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4422E+03 EXCESS= .0000E+00 OUTFLOW= .4417E+03 BASIN STORAGE= .5123E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RTDP2.9	MANE	.49	1118.28	376.27	7.51	5.00	1115.02	375.00	7.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4997E+03 EXCESS= .0000E+00 OUTFLOW= .4992E+03 BASIN STORAGE= .5126E+00 PERCENT ERROR= .0

```
        FOR PLAN = 1  RATIO=  .68
          RTD6.1  MANE        1.07     47.00    372.32       .96      5.00     46.07    370.00        .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4028E+01 EXCESS= .0000E+00 OUTFLOW= .4030E+01 BASIN STORAGE= .1726E-03 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO= 1.00
          RTD6.1  MANE         .80    117.65    371.55      1.97      5.00    111.15    370.00       1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8271E+01 EXCESS= .0000E+00 OUTFLOW= .8278E+01 BASIN STORAGE= .2241E-03 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .68
        RTDP2.10  MANE         .44    870.03    370.75      5.89      5.00    866.30    370.00       5.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4509E+03 EXCESS= .0000E+00 OUTFLOW= .4506E+03 BASIN STORAGE= .2897E+00 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
        RTDP2.10  MANE         .27   1321.28    370.51      6.77      5.00   1317.14    370.00       6.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5182E+03 EXCESS= .0000E+00 OUTFLOW= .5180E+03 BASIN STORAGE= .2929E+00 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
          RTD7.1  MANE         .86     72.88    371.88       .96      5.00     71.53    375.00        .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6752E+01 EXCESS= .0000E+00 OUTFLOW= .6755E+01 BASIN STORAGE= .1288E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
          RTD7.1  MANE         .78    118.35    375.91      1.97      5.00    118.22    375.00       1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1385E+02 EXCESS= .0000E+00 OUTFLOW= .1386E+02 BASIN STORAGE= .2259E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
         RTDP7.2  MANE         .56     93.60    365.72       .96      5.00     93.27    365.00        .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8758E+01 EXCESS= .0000E+00 OUTFLOW= .8760E+01 BASIN STORAGE= .2734E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
         RTDP7.2  MANE         .49    167.76    365.27      1.97      5.00    167.60    365.00       1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1797E+02 EXCESS= .0000E+00 OUTFLOW= .1797E+02 BASIN STORAGE= .3333E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .68
          RTD8.1  MANE        1.50     82.47    368.37       .86      5.00     79.57    370.00        .86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6231E+01 EXCESS= .0000E+00 OUTFLOW= .6234E+01 BASIN STORAGE= .7833E-03 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO= 1.00
          RTD8.1  MANE        1.21    186.72    366.75      1.82      5.00    178.85    365.00       1.82
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1322E+02 EXCESS= .0000E+00 OUTFLOW= .1323E+02 BASIN STORAGE= .1133E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .68

RTDP2.11	MANE	.90	1137.92	371.71	4.47	5.00	1131.28	370.00	4.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4755E+03 EXCESS= .0000E+00 OUTFLOW= .4747E+03 BASIN STORAGE= .8813E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RTDP2.11	MANE	.72	1923.76	366.94	5.37	5.00	1900.04	370.00	5.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5712E+03 EXCESS= .0000E+00 OUTFLOW= .5704E+03 BASIN STORAGE= .8811E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .68

RTD8.3	MANE	1.16	34.63	367.44	.71	5.00	32.72	365.00	.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2516E+01 EXCESS= .0000E+00 OUTFLOW= .2517E+01 BASIN STORAGE= .1319E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RTD8.3	MANE	.92	83.52	366.89	1.60	5.00	82.24	365.00	1.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5644E+01 EXCESS= .0000E+00 OUTFLOW= .5647E+01 BASIN STORAGE= .1990E-03 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .68

RTDP2.13	MANE	.38	1211.54	370.81	4.17	5.00	1203.26	370.00	4.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4820E+03 EXCESS= .0000E+00 OUTFLOW= .4816E+03 BASIN STORAGE= .4144E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00

RTDP2.13	MANE	.38	2108.28	365.95	5.07	5.00	2081.37	370.00	5.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5863E+03 EXCESS= .0000E+00 OUTFLOW= .5860E+03 BASIN STORAGE= .4145E+00 PERCENT ERROR= .0

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION POND1.1
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	7138.00	7146.00	7146.00
STORAGE	0.	0.	0.
OUTFLOW	0.	85.	85.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.68	7145.94	.00	0.	84.	.00	6.17	.00
1.00	7146.51	.51	0.	200.	.42	6.00	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION POND2.3
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	7352.00	7362.00	7362.00
STORAGE	0.	1.	1.
OUTFLOW	0.	28.	28.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.68	7360.00	.00	0.	22.	.00	6.17	.00
1.00	7362.26	.26	1.	68.	.25	6.08	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION POND5.3.
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	7108.00	7118.00	7118.00
STORAGE	0.	1.	1.
OUTFLOW	0.	45.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.68	7114.57	.00	0.	30.	.00	6.17	.00
1.00	7118.07	.07	1.	51.	.17	6.17	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION POND5.3.
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	7094.00	7104.00	7104.00
STORAGE	0.	1.	1.
OUTFLOW	0.	45.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.68	7099.90	.00	0.	27.	.00	6.25	.00
1.00	7102.75	.00	0.	39.	.00	6.42	.00

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION POND6.1
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	6780.00	6790.00	6790.00
STORAGE	0.	1.	1.
OUTFLOW	0.	70.	70.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.68	6786.75	.00	0.	47.	.00	6.17	.00
1.00	6790.29	.29	1.	119.	.17	6.17	.00

*** NORMAL END OF HEC-1 ***