

**MASTER DEVELOPMENT DRAINAGE PLAN**  
for  
**HEWLETT PACKARD EXPANSION**  
**Garden of the Gods Road Facility**

February, 1998  
Revised March, 1998

RETURN TO:  
Land Development  
101 West Costilla, Suite 122  
Colorado Springs, CO 80903

**MASTER DEVELOPMENT DRAINAGE PLAN  
for  
HEWLETT PACKARD EXPANSION  
Garden of the Gods Road Facility**

**February, 1998  
Revised March, 1998**

Project No. 97059

Prepared for:

**HEWLETT PACKARD**  
Colorado Springs, CO 809

Prepared by:

**OBERING, WURTH & ASSOCIATES**  
Consulting Civil Engineers  
Professional Land Surveyors

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1015 Elkton Drive  
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Drainage Plan

# Obering, Wurth & Associates

Consulting Civil Engineers  
Professional Land Surveyors

1015 Elkton Drive • Colorado Springs, Colorado 80907 • Phone (719) 531-6200 • Fax (719) 531-6266

March 30, 1998

City of Colorado Springs  
Department of Planning & Development  
Engineering Division  
101 W. Costilla, Suite 22  
P.O. Box 1575, Mail Code 1119  
Colorado Springs, CO 80901

Re: Master Development  
Drainage Plan  
Hewlett Packard Expansion  
Garden of the Gods Road  
Facility

Project No. 97059

Attn: Mr. Gary Haynes  
Mr. Brian Kelly

Gentlemen:

Attached for your review and comment is a copy of the Master Development Drainage Plan (MDDP) for the referenced project. The main purpose of this report is to provide an overall plan for the handling of stormwater as it impacts this site. Existing drainage systems are evaluated with respect to current criteria. Recommendations regarding additional improvements are made in order to supplement inadequate facilities where required.

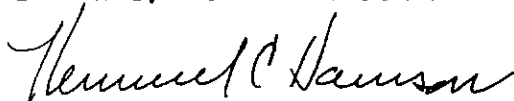
The main purpose of this report will focus on the major outfalls associated with this project. The report will also address the impact that this MDDP will have on adjacent sites. Recommendations for onsite drainage facilities will be made in future drainage reports that will be prepared for each parcel as it is developed.

The attached report is a compilation of information obtained from various sources provided by the City of Colorado Springs, various hydrologic and hydraulic evaluations performed by Obering, Wurth & Associates, and decisions made jointly by all parties involved with the development of this project.

This report also addresses the review comments that were made by the City of Colorado Springs of the February 26th report submittal.

If you need additional information or have any questions, please do not hesitate to contact the undersigned.

Very truly yours,  
OBERING, WURTH & ASSOCIATES



Kenneth C. Harrison, P.E.

KCH/I

cc: Hewlett Packard, Barry Hinton  
OZ Architecture, Tom Bauer

# Obering, Wurth & Associates


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Professional Land Surveyors

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Master Development Drainage Plan  
Hewlett Packard Expansion  
Garden of the Gods Road Facility  
Project No. 97059

## 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 for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

  
\_\_\_\_\_  
Roland G. Obering, P.E. & P.L.S. Colorado 13226



## DEVELOPER'S STATEMENT

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

Hewlett-Packard Co.  
Business Name

  
By  
Facilities Engineering Manager

Title  
1900 Garden of the Gods Road  
Address

Colorado Springs, CO 80907

## CITY OF COLORADO SPRINGS

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

for   
City Engineer

Date 4/13/98

## Conditions:

Final drainage reports are required for both the Hewlett Packard Filing #3 site and the remaining undeveloped portions of the Hewlett Packard First Filing site. These reports are to address onsite drainage facilities that are to be installed in order to meet the requirements and criteria set forth in this MDDP.

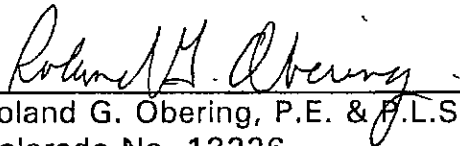
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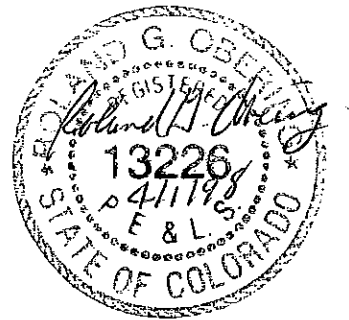
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**FLOODPLAIN STATEMENT**

To the best of my knowledge and belief, no portion of the "Hewlett Packard" development is located within a designated floodplain as designated by the Flood Insurance Rate Map Panel No. 513F of 1300, dated March 17, 1997 (see Appendix, FEMA Floodplain Exhibit).



Roland G. Obering, P.E. & P.L.S.  
Colorado No. 13226



## **I. PURPOSE**

The following presents a summary of the hydrologic/hydraulic analyses that were performed for the Hewlett Packard site which is located North of Garden of the Gods Road and West of Centennial Boulevard. The study will provide the following:

- A review of the hydrologic characteristics of the overall drainage area, of which the Hewlett Packard site is a part, with respect to existing and ultimate development conditions.
- A review of the hydraulic characteristics of existing drainage facilities with respect to the conveyance of the design storms to suitable outfall points in accordance with current drainage criteria and requirements.
- Recommendations regarding drainage improvements that are required to meet requirements of current drainage criteria.
- A presentation of an overall plan of existing and recommended drainage improvements required to serve the Hewlett Packard project.

The analysis was performed in accordance with criteria set forth in the current edition of the City of Colorado Springs Drainage Criteria Manual (DCM). Information was obtained from the pertinent major basin planning study, final drainage reports prepared for surrounding developments, and available construction plans.

## **II. GENERAL**

### **A. LOCATION**

The Hewlett Packard (HP) site is located North of Garden of the Gods Road approximately 1,600 feet West of the Centennial Boulevard intersection. It is located in Section 23, Township 13 South, Range 67 West. (See Vicinity Map, Appendix.) The site is bounded on the North by several filings of the Pinon Valley Industrial Park, on the East by the Kaman Sciences Subdivision Filing No. 1 and 2, and the unplatted Crestone tract, on the South by Garden of the Gods Road, and on the West by the Hotsy Subdivision and Pinon Valley Industrial Park Filing No. 8.

### **B. PROJECT DESCRIPTION**

The HP development site consists of two (2) tracts totaling approximately 118 acres. The first tract consists of approximately 98 acres and is platted as Hewlett Packard First Filing. Approximately 60% of this tract has been developed. This tract is referred to in this report as tract "A". There are currently no immediate plans for the development of the remaining 40% of this tract.

The second tract is located immediately East of the tract "A". It consists of approximately 20 acres and is currently unplatted. This tract is referred to in this report as tract "B". It is the intent of HP to develop a portion of this tract in the near future.

Both tracts generally slope from the Northwest to the Southeast with an average cross slope of approximately 3%. Vegetation generally consists of native grasses and weeds. Onsite soils consist of predominately Columbine and Stapleton soils which are well drained, gravelly soils, and belonging to the A and B hydrologic group, respectively. (See SCS Soils Map Exhibit, Appendix).

### **C. LAND USE**

The entire 118-acre site is currently zoned for Planned Industrial Park (PIP-1). As previously discussed, the 118-acre site is divided into two (2) tracts. One is platted and represents the main campus area. The other tract is unplatted. It is the intent of the Owner to develop the unplatted tract as



office building facilities in two (2) phases consisting of the buildings and associated parking facilities.

**D. PROJECT PHASING**

There are currently no established project phasing plans for either of the two (2) tracts. Phasing for the two (2) tracts will be accomplished on an "as needed" basis.

There is no plan for construction at this time on tract "A". The South half of tract "B" is planned to be developed into the first of a two-building office complex starting in May, 1998

### **III. DATA SUMMARY**

Data was obtained from various sources and used to identify the hydrologic and hydraulic characteristics that impact the HP site. The data was also used to evaluate the existing drainage facilities that accommodate stormwater runoff from the site. The following presents a brief summary of the data that was obtained and reviewed.

#### **A. DOUGLAS CREEK DRAINAGE BASIN PLANNING STUDY (DBPS)**

This study helped identify general hydrologic and hydraulic characteristics of the areas that affect or impact the drainage characteristics of the HP site. The study was prepared in March of 1981. The drainage criteria at that time was published in City of Colorado Springs Criteria for Determination of Storm Runoff, March, 1977.

The DBPS basins that impact the HP site are Subbasins E-18, a portion of E-19, F-1, and F-2. The following presents a summary of each subbasin.

##### **Subbasins E-18 and E-19:**

Subbasins E-18 and E-19 are located immediately West of the HP site. A portion of the runoff from this area is collected by onsite storm sewer facilities and is conveyed under Garden of the Gods Road via a culvert located at Point #1 on the Plan. According to the DBPS, it appears that all drainage facilities were sized for the minor storm event. Any stormwater that does not enter this system is directed to the East along the North side of Garden of the Gods Road. An analysis of the existing storm facilities will be presented in the following sections of this report.

##### **Subbasin F-1:**

Subbasin F-1 encompasses the majority of the HP site. Stormwater flows in a Southeasterly direction and is partially intercepted by private facilities that were installed in the early 1970's. These facilities direct the water to either the public storm sewer system in Garden of the Gods or to a 42-inch storm sewer located along the East side of the site. Both systems join together at the Southeast corner of the tract "A" site and pass under Garden of the Gods Road via a double 34" by 53" storm sewer. The water is then discharged into a 60" storm sewer where it is conveyed to Douglas Creek. Any storm water that is not intercepted by the above systems remains on the North side of

Garden of the Gods Road and flows in an Easterly direction toward the Centennial Boulevard intersection.

Subbasin F-2:

The unplatted portion of the HP site, shown as tract "B", is located in Subbasin F-2. Stormwater flows in a Southeasterly direction to the North side of Garden of the Gods Road. The water then flows East to the Centennial Boulevard intersection where it is intercepted by inlets and conveyed to Douglas Creek via the Centennial Boulevard outfall system. This system is only sized for the minor storm.

In summary, the majority of the drainage facilities shown in the DBPS were sized to accommodate only the minor storm event. The impact of the 100 year storm event was not evaluated. This is consistent with the drainage criteria that was in effect at the time of the preparation of the DBPS. However, current criteria requires that the 100 year storm be evaluated and that storm drainage facilities be installed where required. The impact of this requirement is substantial and will be discussed in the following sections of this report.

**B. MASTER DEVELOPMENT DRAINAGE PLAN  
FOR CRESTONE DEVELOPMENT (MDDP)**

The Crestone MDDP provides a detailed analysis of the 100 year storm event for the drainage area of which the HP project is a part. The following assumptions and conditions were established in the Crestone MDDP that significantly impact the drainage characteristics of the HP site.

- The Centennial Boulevard outfall system, located South of Garden of the Gods Road, was only sized for the 5 year storm event. The system cannot accommodate any additional developed flow from the West.
- All storm water runoff for both the 5 year and 100 year storms from HP's tract "A" is to be accommodated by drainage facilities downstream of Point #1. This requires an upgrade to the existing facilities.
- No bypass is assumed to occur to the East of Points #1 and #11 for either the 5 year or 100 year storm events. Additional facilities across Garden of the Gods Road are to be installed if adequate facilities do not exist.
- Storm sewer facilities are to be installed along the Northerly side of Garden of the Gods Road from Point #12 to Point #14 in order to accommodate runoff from the Kaman Sciences and Crestone tracts.

**C. HEWLETT PACKARD FIRST FILING**

The Final Drainage Report and Plan was reviewed to obtain information regarding drainage subbasins, hydrologic characteristics, locations and sizes of existing drainage facilities, and future development plans. Minimal information was available for review since the information was obtained from microfilm records. The report and plan indicates that all facilities were sized to accommodate runoff from only the minor storm event. Offsite flows from the West and North of the HP site were not permitted to flow on to the HP site. Onsite runoff is conveyed to the Southeast corner of the site (Point #5) where it either passes under Garden of the Gods Road via a double 34" x 53" HERCP culvert or it continues to flow to the East along the North side of Garden of the Gods Road.

**D. FINAL DRAINAGE STUDIES FOR AREAS WEST OF THE HEWLETT PACKARD SITE**

These studies were reviewed to determine the hydrological and hydraulic impacts that runoff from these parcels would have on the HP site and the associated drainage systems. The reports that were reviewed included the Hotsy Subdivision, Pinon Valley Industrial Park No. 8, Pinon Valley Industrial Park No. 1 and Mountain Research Business Park Filing No. 1.

According to these reports, all runoff is to be directed to drainage facilities located along the Westerly property line of the HP site. The stormwater crosses under Garden of the Gods Road via a horizontal elliptical RCP culvert. This facility was only sized to accommodate runoff from the minor storm. Any stormwater not intercepted by this system flows East along the North side of Garden of the Gods Road. This condition will be discussed in more detail in the following sections of this report.

**E. FINAL DRAINAGE STUDIES FOR AREAS NORTH OF THE HEWLETT PACKARD SITE**

These studies were reviewed to determine the hydrological and hydraulic impacts that runoff from these parcels would have on the HP site and its associated drainage systems. The reports that were reviewed include Pinon Valley Industrial Park No. 1, No. 8 and No. 11, and CW Business Park Filing No. 1.

In accordance with each report, all runoff is to be directed to the East in a concrete swale located along the Northerly property line of the HP tract. The concrete swale directs the stormwater to a culvert under Centennial

Boulevard. The capacity of the swale and culvert were evaluated in the Crestone Development MDDP.

#### **F. FINAL DRAINAGE REPORT FOR THE ROCKWELL SUBDIVISION**

This report was used to obtain hydrologic and hydraulic information regarding the HP storm sewer outfall facility that passes through the Rockwell site. The contributing drainage subbasins within the Rockwell site are shown on the attached drainage plan. All facilities, other than the 60-inch outfall system, were sized to accommodate the minor storm event. Surface runoff from the 100 year event is anticipated to pass overland to Douglas Creek.

#### **G. CONSTRUCTION PLANS**

Construction plans for the Garden of the Gods storm sewer system and the Rockwell system were used to obtain physical data necessary to conduct a hydraulic evaluation of each system.

The Garden of the Gods system consists of storm sewer facilities ranging from 24 inches to 36 inches in diameter, manholes and inlets. The system intercepts stormwater from the HP site and conveys it to a culvert crossing under Garden of the Gods Road at Point #11. This system appears to have been sized to accommodate runoff for only the minor storm.

The Rockwell system extends from the South side of Garden of the Gods Road, through the Rockwell Development, to the Douglas Creek outfall at Point #21. This system appears to have been sized for a large portion of the 100 year storm event. An analysis of this system was accomplished per this study and will be summarized in the following sections of this report.

Construction plans for onsite storm sewers system were not available. Information regarding the facilities shown on the attached drainage plan was obtained from the various drainage reports reviewed for this project.

## **IV. HYDROLOGIC ANALYSIS SUMMARY**

### **A. CRITERIA**

The hydrologic criteria used in this analysis was based on the criteria set forth in the current City of Colorado Springs Drainage Criteria Manual for an MDDP level of effort. Previously prepared drainage reports were reviewed in

order to verify runoff coefficients, times of concentrations, and anticipated discharges for both the minor 5 year storm event and the major 100 year storm event. Since the majority of the previously prepared drainage reports were prepared under older and now obsolete drainage criteria, the entire contributing offsite area was evaluated in accordance with current City of Colorado Springs drainage criteria.

### **Methods**

The Soils Conservation Service Method was used for estimating runoff amounts for offsite flows since the total drainage area was greater than 100 acres. The Rational Method was used for estimating runoff amounts for drainage areas less than 100 acres.

### **Runoff Coefficients**

Runoff coefficients for both hydrological methods were obtained from the City of Colorado Springs Drainage Criteria Manual. These coefficients were also compared with those used in previously prepared reports.

### **Time of Concentration**

Times of concentration were determined by combining travel times for overland flow, channel flow, curb and gutter flow, and storm sewer flow where applicable. Specific charts and formulas, as presented in the DCM and the CDOT Design Manual, were used to determine the appropriate travel time for each of the above components.

### **Rainfall Intensities**

Rainfall intensities for specific times of concentration for both the 5 year and 100 year storm events for the Rational Method were obtained from the Drainage Criteria Manual. The rainfall distribution used for the SCS method was the 24 hour SCS Type IIA storm as designated in the DCM.

## **B. OFFSITE CONSIDERATIONS WEST OF THE HEWLETT PACKARD SITE**

A limited analysis was performed for the area West of the HP site. This area is shown as subbasin "A" on the attached drainage plan. Estimates for both the 5 year and 100 year storm events were determined at Point #1. These estimates were then used to hydraulically evaluate existing storm drainage facilities.

Both the SCS Method and Rational Method were used to determine runoff amounts at Point #1. The SCS Method was used when subbasin "A" was evaluated as part of the entire drainage basin contributing runoff to the HP outfall at Point #11. The Rational Method was used when subbasin "A" was evaluated as an independent basin for the purpose of sizing drainage facilities that would accommodate runoff from subbasin "A".

The following table provides a summary of the analysis performed for subbasin "A".

| TABLE 1<br>(Summary Point #1)   |      |                |                  |                    |                      |
|---------------------------------|------|----------------|------------------|--------------------|----------------------|
| Tc (min)                        | CN   | C <sub>5</sub> | C <sub>100</sub> | Q <sub>5</sub> cfs | Q <sub>100</sub> cfs |
| Existing Development Conditions |      |                |                  |                    |                      |
| 24.2                            | 70.4 |                |                  | NA                 | 40                   |
| 24.2                            |      | 0.35           | 0.44             | 28.4               | 63.1                 |
| Fully Developed Conditions      |      |                |                  |                    |                      |
| 9.1                             | 88   |                |                  | 58                 | 132                  |
| 9.1                             |      | 0.80           | 0.90             | 102.3              | 202.2                |

As expected, the estimated runoff values for the Rational Method are significantly higher than those for the SCS Method. The values obtained from the Rational Method were used to evaluate existing drainage facilities and to make recommendations regarding additional facilities required to meet current drainage criteria requirements.

### C. OFFSITE CONSIDERATIONS NORTH OF THE HEWLETT PACKARD SITE

Information regarding the hydrologic conditions of the area North of the HP site was obtained from the "MDDP for Crestone Development." This report states that the total flow estimated for the 100 year event at the Centennial Boulevard for existing developed conditions is 194 cfs. The concrete channel was estimated to have a capacity of 195 cfs with 6" of freeboard. This is based on the following physical characteristics of the channel:

|              |   |                  |
|--------------|---|------------------|
| Bottom Width | = | 2.0 feet         |
| Depth        | = | 2.5 feet         |
| Side Slope   | = | (1.5 - 2.0) to 1 |

For purposes of this report, it is assumed that no portion of the 100 year developed flow will enter the HP site from the North but will be directed to the East to the Centennial Boulevard crossing.

#### **D. ONSITE HYDROLOGIC CONDITIONS**

A hydrologic analysis was performed for subbasins B, C, D, E, F, and G as shown on the attached drainage plan. Subbasins B, C, and D are located within the platted area of Hewlett Packard First Filing (tract "A"). Subbasin E is owned by the City of Colorado Springs. Subbasins F and G encompass the unplatted parcel (tract "B") owned by Hewlett Packard.

##### **Existing Development Conditions**

For purposes of this report, tract "A" was divided into three subbasins. Subbasins B and D include the developed portion of the tract. Subbasin C includes the undeveloped Northerly portion of the tract.

Stormwater from subbasins B and D flows in a Southeasterly direction and is intercepted by onsite facilities that convey the stormwater to the storm sewer system located in Garden of the Gods Road. Stormwater from the subbasin C flows in a Southeasterly direction to a series of grass-lined swales that convey the water to the 42-inch storm sewer (Point #4) located along the Easterly property line of tract "A."

Both storm sewer systems convey stormwater to the Southeast corner of tract "A" where a double <sup>34"</sup>33" by 54" culvert conveys the water under the Garden of the Gods Road to the 60-inch outfall in Rockwell.

Runoff from subbasin F and G is currently directed to Point #7 where it enters the North side of Garden of the Gods Road and flows East to the Centennial Boulevard intersection at Point #14.

Both the SCS Method and Rational Method were used in the hydrologic analysis of the above subbasins. The SCS method was used where contributing drainage areas were greater than 100 acres. This occurred when the HP outfall facilities located downstream of Point #11 were evaluated. The Rational Method was used when contributing drainage areas were less than 100 acres. This typically occurred when onsite facilities were evaluated.



### Proposed Development Conditions

The following development scenarios were evaluated as part of the analysis of the storm sewer outfall facilities located downstream of Point #11.

#### Development Scenario No. 1

This scenario reflects existing development of all areas contributing stormwater runoff to Point #5. This includes subbasins A, B, C, and D.

#### Development Scenario No. 2

This scenario reflects existing development of only subbasins B, C, and D.

#### Development Scenario No. 3

This scenario reflects full development of the tract "A", which includes subbasins B, C, and D. It does not include any runoff diversion from subbasins E and F.

#### Development Scenario No. 3A

This scenario reflects full development of tract "A" and full development of the areas West of the HP site. This condition was used to determine bypass amounts at Point #1.

#### Development Scenario No. 4

This scenario reflects full development of tract "A", no flow from subbasin A, and diverted flow from subbasins E and F. This was used in preparing recommendations for ultimate drainage facilities in Garden of the Gods Road and the 60-foot outfall system through the Rockwell site.

#### Development Scenario No. 5

This scenario reflects existing development of tract "A" and the full development of subbasins E, F, and G with no runoff from areas West of the HP site. It also assumes runoff diversion from subbasins E and F.

The following Table 2 (Page 11A) summarizes the results of the analysis.

TABLE 2

**Hydrologic Summary at Summary Point #5**

**Master Development Drainage Plan**

**Date: February, 1998**

**Project #: 97059**

| Development Conditions  | Drainage Area |              | Runoff Coeficients |      |      | Runoff   |            |
|---|---------------|--------------|--------------------|------|------|----------|------------|
|   | ID            | Area (acres) | C5                 | C100 | CN   | Q5 (cfs) | Q100 (cfs) |
| 1. Existing Dev. w/ Area West of HP   | A,B,C,D       | 135.3        | NA                 | NA   | 80.1 | NA       | 283        |
| 2. Existing Dev. w/o Area West of HP  | B,C,D         | 104.2        | NA                 | NA   | 83   | 91       | 243        |
| 3. Full Development of Platted HP site w/o Area West of HP  | B,C,D         | 104.2        | NA                 | NA   | 88   | 195      | 439        |
| 3A. Full development of platted HP w/ full development of areas west of HP site                               | A,B,C,D       | 135.3        | NA                 | NA   | 88   | 253      | 571        |
| 4. Full Development of HP Platted site and 20.7 acres of Unplatted site                                       | B,C,D,E,F     | 124.7        | NA                 | NA   | 88   | 233      | 527        |
| 5. Exist Dev of Platted HP site and Full Dev of 20.7 Acres of Unplatted Site, no runoff from areas West of HP | B,C,D,E,F     | 124.9        | NA                 | NA   | 83.8 | 115      | 302        |

Tract "B" was included in this analysis since it was decided to divert developed runoff from subbasins "E" and "F" to Point #6 as opposed to Point #7. This was done in order to reduce the amount of developed runoff that would enter the Centennial Boulevard outfall system at Point #14. It was decided to limit the runoff amount from HP's tract "B" to historic levels. This was accomplished as follows:

| TABLE 3              |                |                  |                      |                |                  |                    |                      |
|----------------------|----------------|------------------|----------------------|----------------|------------------|--------------------|----------------------|
| Area - Acres         | C <sub>5</sub> | C <sub>100</sub> | T <sub>c</sub> (min) | I <sub>5</sub> | I <sub>100</sub> | Q <sub>5</sub> cfs | Q <sub>100</sub> cfs |
| Existing Conditions  |                |                  |                      |                |                  |                    |                      |
| 25.7                 | 0.30           | 0.40             | 29.3                 | 2.4            | 4.2              | 18.5               | 43.2                 |
| Developed Conditions |                |                  |                      |                |                  |                    |                      |
| 25.7                 | 0.80           | 0.90             | 5 min                | 5.2            | 9.0              | 106.9              | 208.2                |

In order to not exceed the historic 100 year flow of 43.2 cfs, it was determined that the developed area of subbasin G could be no larger than 5.3 acres.

A limited hydrological analysis was performed for the platted area encompassed within Hewlett Packard First Filing. The results of the study were used to evaluate the existing onsite drainage facilities. Since these facilities were installed in the early 1970's, only a limited amount of information was available for review. The drainage facilities shown on the drainage plan were obtained from microfilm files made available by the City of Colorado Springs.

Runoff from subbasin B is partially intercepted by private onsite facilities and conveyed to the public storm sewer located in Garden of the Gods Road. Based on topographic information obtained from FIM's maps, it appears that any runoff not intercepted by the onsite systems flows to a sump location at Point #3.

Runoff from subbasin C is directed to Point #4 at the upstream end of the 42-inch RCP via a series of grass-lined swales.

Runoff from subbasin D is partially intercepted by private onsite facilities and is conveyed to the 42-inch pipe located along the East property line of

tract "A." All stormwater not intercepted by the onsite systems appear to flow to a sump location at Point #5.

Due to the lack of information, the onsite facilities other than the 42-inch storm sewer and the Garden of the Gods storm sewer discussed above, were not evaluated.

The following Table 4 presents a summary of the hydrological analysis performed for fully developed conditions:

| TABLE 4                         |         |              |                |                  |      |                    |                      |
|---------------------------------|---------|--------------|----------------|------------------|------|--------------------|----------------------|
| Sum Pnt                         | Area ID | Area - Acres | C <sub>5</sub> | C <sub>100</sub> | Tc   | Q <sub>5</sub> cfs | Q <sub>100</sub> cfs |
| 3                               | B       | 23.7         | 0.80           | 0.90             | 8.7  | 77.7               | 153.6                |
| 4                               | C       | 38.5         | 0.80           | 0.90             | 10.2 | 123.2              | 242.6                |
| 5                               | D       | 36.4         | 0.80           | 0.90             | 10.2 | 116.5              | 229.3                |
| Existing Conditions at Point #4 |         |              |                |                  |      |                    |                      |
| 4                               | C       | 38.5         | 0.25           | 0.35             | 27.7 | 24.1               | 57.9                 |

#### **E. OFFSITE CONDITIONS EAST OF THE HEWLETT PACKARD SITE**

A hydrologic analysis was performed for developed conditions of subbasins E, F, G, and H. This was accomplished in order to determine the impact that the runoff diversion from subbasins E and F would have on proposed downstream facilities. As a result of the diversion, runoff to the East has been reduced. The following Table 5 summarizes the hydrological changes that occur at Point #13:

| TABLE 5           |      |                |                  |        |                |                  |                    |                      |
|-------------------|------|----------------|------------------|--------|----------------|------------------|--------------------|----------------------|
| Drg Sub Basin     | Area | C <sub>5</sub> | C <sub>100</sub> | Tc min | I <sub>5</sub> | I <sub>100</sub> | Q <sub>5</sub> cfs | Q <sub>100</sub> cfs |
| Without Diversion |      |                |                  |        |                |                  |                    |                      |
| E,F,G,H           | 53.8 | 0.80           | 0.90             | 15.9   | 3.4            | 5.8              | 148.4              | 285.5                |
| With Diversion    |      |                |                  |        |                |                  |                    |                      |
| G,H               | 38.1 | 0.80           | 0.90             | 13.4   | 3.7            | 6.4              | 100.0              | 190.7                |

## V. HYDRAULIC ANALYSIS SUMMARY

### A. CRITERIA

The following criteria was used in the evaluation of existing and proposed drainage facilities pertinent to the project. These facilities include street and storm sewer facilities. Both the 5 year and 100 year design flows were evaluated where required.

#### Street Capacity Analysis

The street capacity for Garden of the Gods Road was analyzed along the frontage of the Hewlett Packard site and the Kaman Sciences tract. Street capacity criteria is summarized as follows for a major arterial:

- Maximum depth of flow at flowline is 8 inches for street sections on grade.
- Maximum depth of water at low points on sump conditions is 12 inches or 4 inches maximum depth at crown whichever is more restrictive.

#### Storm Sewer Design

Storm sewers were hydraulically evaluated based on principals of uniform channel flow and pressure flow where applicable. It was assumed that losses through manholes, fittings, etc., under open channel flow conditions will be minimized as a result of the relative high velocities that typically pass through these structures. Minor head losses through these structures under pressurized flow conditions were determined based upon friction loss coefficients and velocity considerations presented in the Drainage Criteria Manual.

Existing and proposed storm sewer systems are shown on the attached drainage plan. The physical characteristics of the storm sewer systems were obtained from construction plans.

Detention Pond Design

At the City’s request, detention pond facilities were not to be included in the proposed drainage facility recommendation although those options were investigated as part of reaching the conclusions of this study.

**B. HOTSY OUTFALL FACILITIES**

Existing Conditions

The upstream end of the Hotsy outfall system is located at Point #1. Information obtained from drainage reports and from the City of Colorado Springs storm sewer maps indicate that the facility consists of a horizontal elliptical concrete pipe of 42 inch equivalent diameter on a slope of 4.0%. The 42-inch pipe appears to have been installed relatively high in order to avoid conflicts with existing utilities on Garden of the Gods Road. The outfall accommodates runoff from subbasin "A". A small concrete swale, located along the Easterly side of subbasin "A" collects runoff from the subbasin and directs it to Point #1. Based on information obtained from final drainage studies, it was assumed that this facility was sized for only the minor storm event. It is recommended that the internal storm sewer system be analyzed in more detail as unplatted parcels that contribute to this system are developed.

The capacity of the facility was determined to be as follows:

|   |         |
|---|---------|
| 42" RCP with a Headwater to Depth Ratio of 1: | 50 cfs  |
| 42" RCP on a slope of 4%:                     | 215 cfs |

The subbasin hydrology is summarized as follows:

|                             |                   |                       |
|-----------------------------|-------------------|-----------------------|
| Existing Conditions         | $Q_6 = 28.4$ cfs  | $Q_{100} = 63.1$ cfs  |
| Full Development Conditions | $Q_6 = 102.3$ cfs | $Q_{100} = 202.2$ cfs |

Based on information obtained from recent field visits and conversations with the City of Colorado Springs it appears that storm sewer facilities have recently been installed along the Westerly property line of the Hotsy Subdivision. These facilities accommodate runoff from a recent development located in the Pinon Valley Industrial Park Filing No. 8 tract. It appears that those facilities direct runoff away from the current outfall location at MDDP Point #1 to an outfall located approximately 250 feet North of Garden of the Gods Road into an existing concrete channel located along the Westerly side of Subbasin "A". The purpose of these facilities is to reduce the amount of runoff that passes through the Hotsy development to the Garden of the Gods

culvert crossing at Point #1. It is recommended that as additional unplatted sites within Subbasin "A" are developed that additional facilities be constructed in order to accomplish the same purpose. The hydrologic and hydraulic impacts at MDDP Point #1 created by the above installation were not evaluated as part of this report. This is in part due to the newness of the installation and the unavailability of the drainage report for the development that is currently being processed by the City of Colorado Springs.

Hydraulic analysis of drainage facilities downstream of the 42-inch pipe is not part of this report. It is recommended that as parcels within subbasin "A" are platted that these facilities be evaluated and any deficiencies be corrected.

### **C. HEWLETT PACKARD OUTFALL FACILITIES**

#### **Existing Facilities**

The Hewlett Packard outfall facilities extend from Point #11 to Point #21. The facilities include a double 34" by 53" HERCP culvert under Garden of the Gods Road and a 60-inch storm sewer system that extends from Point #15 to No. 21. The following Table 6 provides a summary of the capacities of the system based on open channel flow conditions:

| TABLE 6<br>HYDRAULIC CAPACITIES OF EXISTING DRAINAGE FACILITIES |     |                               |          |            |                           |                                       |
|---|-----|-------------------------------|----------|------------|---------------------------|---------------------------------------|
| Pnt   | Pnt | Facility Description          | Slope/ft | Appra. Cap | Hydraulic Sizing Criteria | Comments                              |
| 1   |     | 42" RCP                       | 4        |            | O.C.                      |                                       |
|   |     | 42" RCP                       | 4        |            | Inlet Control             |                                       |
| Garden of the Gods System                                       |     |                               |          |            |                           |                                       |
| 1   | 9   | 24" RCP                       | 1.35     | 28         |                           |                                       |
| 9   | 10  | 30" RCP                       | 2.00     | 60         |                           |                                       |
| 10  | 11  | 36" RCP                       | 1%       | 70         |                           |                                       |
|   |     | 36" RCP                       | 1.68     | 95         |                           |                                       |
| Hewlett Packard Outfall System                                  |     |                               |          |            |                           |                                       |
| 11  | 15  | 2-34" by 53" Horiz Ellip Pipe | 1.00     | 220        |                           | Controlling section of outfall system |
| 11  | 15  | 2-34" by 53" Horiz Ellip Pipe |          | 50         | Inlet Control             |                                       |
| 15  | 17  | 60" Reinforced Concrete Pipe  | 3.00     | 490        |                           |                                       |
| 17  | 18  | 60" Reinforced Concrete Pipe  | 2.00     | 400        |                           |                                       |
| 18  | 19  | 60" Reinforced Concrete Pipe  | 1.50     | 330        |                           |                                       |
| 19  | 20  | 60" Reinforced Concrete Pipe  | 3.80     | 530        |                           |                                       |
| 20  | 21  | 60" Reinforced Concrete Pipe  | 3.60     | 520        |                           |                                       |
| Onsite (Main Campus) Facilities                                 |     |                               |          |            |                           |                                       |
| 4   | 11  | 42" RCP                       | 1.4      | 140        |                           |                                       |



The double 34" by 53" pipe was sized to accommodate runoff from the minor storm event. Its capacity is 220 cfs. Hydraulic analysis of the 60-inch system, downstream of the double pipe, reveals that there is some additional capacity that can be utilized if additional drainage facilities are installed under Garden of the Gods Road. Open channel flow analysis of the 60-inch pipe system reveals the limiting capacity of the 60-inch pipe to be 330 cfs. Based on information obtained from construction plans, it appears that the vertical location of facilities under Garden of the Gods Road is restricted due to existing utility locations.

Physical data used for the pressure flow analysis was obtained from the construction plans prepared for the 60-inch facility. The analysis is included in the Appendix of the report. It was determined that the 60-inch storm sewer has a capacity of 425 cfs under pressure flow conditions. This analysis maintains the proposed water surface level to approximately within 12 inches of the ground surface. This analysis was previously reviewed and accepted by the City.

In order to accommodate the anticipated design flows at Point #11, it is recommended to replace the existing double 34" by 54" HERCP with a 10' by 4' reinforced concrete box culvert. This facility was sized based on outlet control conditions due to pressurized conditions downstream. The 10' by 4' RCB was chosen in order to minimize head losses due to friction and losses due to entrance and exit conditions as well as fitting the existing crossing conditions relative to utilities. The above assumptions need to be verified once field data has been obtained. Copies of the calculations that provide the basis for this recommendation are included in the Appendix of this report.

Once the culvert under Garden of the Gods Road has been replaced, the downstream facilities can accommodate runoff from Development Scenarios No. 3 or No. 5. However, the facilities do not have the capacity to accommodate runoff from Development Scenario No. 4 which represents full development of subbasins B, C, D, E, and F. This situation was discussed with the City and it was decided at the time full development occurs, either Hewlett Packard will construct detention pond facilities within subbasin C or additional drainage facilities will be constructed downstream with responsibility and financing to be determined at the time of the need for the upgrades.

## D. GARDEN OF THE GODS OUTFALL FACILITIES

### Existing Facilities

Currently, stormwater from the HP site that is not intercepted by the HP outfall system (#11 to #21) is directed to the East along the North side of Garden of the Gods Road to Point #14. The stormwater passes under Garden of the Gods Road via a 4' by 7' concrete box culvert and discharges into a 42" RCP system. This outfall system extends from the South side of Garden of the Gods Road, along the West side of Centennial Boulevard, to the Douglas Creek channel. This outfall system was evaluated extensively in the Crestone Development MDDP. The MDDP stated that this facility currently does not have any additional capacity to accommodate additional developed flows from the West. As a result, it was decided to limit the flows from subbasins E, F, and G to historic levels.

### Proposed Facilities

The following Table 7 presents a hydrological summary of the anticipated runoff amounts from subbasins E, F, G, and H along Garden of the Gods Road.

| TABLE 7  |                      |                        |
|--|----------------------|------------------------|
| Point No.  | Q <sub>5</sub> (cfs) | Q <sub>100</sub> (cfs) |
| Without diversion of runoff from subbasins E and F |                      |                        |
| 7  | 72.0                 | 138.8                  |
| 13   | 148.4                | 285                    |
| 14   | 166.9                | NA                     |
| With Diversion of Runoff From Subbasins E and F    |                      |                        |
| 7  | 20.8                 | 40.5                   |
| 13   | 100.0                | 190.7                  |
| 14   | 119.6                | 228.5                  |

The proposed storm sewer along Garden of the Gods Road was sized by subtracting the street capacity from design flow. Based on information obtained from the Crestone MDDP, the street capacity of Garden of the Gods Road for the 100 year storm event was determined to be between 65 and 70 cfs. Therefore, the following drainage facilities are recommended:

| <u>Location</u> | <u>Q Design</u>  | <u>Facility</u>      |
|-----------------|------------------|----------------------|
| #11 - #12       |                  | None required        |
| #12 - #13       | 20 cfs - 100 cfs | 24" - 36" RCP @ 1.5% |
| #13 - #14       | 130 cfs          | 42" @ 1.0%           |

Currently, Obering, Wurth & Associates is preparing construction plans for the installation of a 48" RCP storm sewer along the South side of the Crestone property. The 48" RCP was sized based on hydrological conditions presented in the Crestone MDDP. As previously stated, these conditions included runoff from subbasins "E" and "F." Upon approval of this report, it is recommended that the 48" be reduced to 42" RCP. Savings from this downsizing would be applied to future upgrades of the HP outfall facilities discussed under Item "C" in this section.

#### **E. GARDEN OF THE GODS DRAINAGE FACILITIES ALONG HEWLETT PACKARD SITE**

##### **Existing Facilities**

The drainage facilities that are located along the South side of the HP site were constructed in the early 1970's. The facilities consist of 24-inch through 36-inch RCP storm sewer, inlets, manholes, etc. The system collects stormwater from private onsite systems and conveys the water to the HP outfall point located at Point #11. Based on the drainage criteria in force at the time, the storm sewer was designed to accommodate runoff from the minor storm event. The following table presents the hydraulic capacity of this system:

|         |         |       |        |
|---------|---------|-------|--------|
| 1 - 9   | 24" RCP | 1.35% | 28 cfs |
| 9 - 10  | 30" RCP | 2.00% | 60 cfs |
| 10 - 11 | 36" RCP | 1.00% | 70 cfs |
| -       | 36" RCP | 1.68% | 95 cfs |

### **Proposed Facilities**

The estimated runoff for the 100 year storm event at Point #3 is expected to be approximately 153.6 cfs under fully developed conditions (see Table 4). The capacity of the storm sewer in Garden of the Gods from Point #3 to Point #5 is between 70 cfs and 90 cfs. Coupled with the 100 year capacity of Garden of the Gods Road, approximately 60 cfs, the total capacity of the combined storm sewer and street system is between 130 cfs and 145 cfs. As a result, it is anticipated that ponding will occur at Point #3 during the 100 year storm event under fully developed conditions if no additional facilities are installed.

The developed runoff for the 100 year storm at Point #5 is estimated to be 229.3 cfs (see Table 4). Since the existing facilities appear to be designed for the minor storm event, it is recommended that additional facilities be installed in order to accommodate the runoff from the 100 year event. It is recommended that these facilities be constructed onsite and be sized to intercept the 100 year surface flows. These facilities will be discussed in the following section of this report.

## **F. ONSITE FACILITIES**

### **Existing Facilities**

Existing drainage facilities located within tract "A" of the HP site were also constructed in the early 1970's. Information regarding these facilities was obtained from microfilm provided by the City. This information was limited to horizontal location only. Due to the lack of information regarding the vertical location of the systems, a hydraulic analysis could not be performed. However, field observations revealed that the onsite inlets are not of sufficient size to intercept even the anticipated runoff from the minor storm event. Therefore, for purposes of this report, it was assumed that only a small portion of the design runoff will be intercepted by the existing facilities and that the majority of the runoff will be conveyed to onsite sump locations via surface flow. These sump locations are at Points #3 and #5.

Another onsite system is located along the Easterly property line of tract "A". This system consists of a 42" RCP storm sewer that extends North of Garden of the Gods Road from Point #5 to Point #4. The capacity of this system was determined based on the assumption that the slope of the 42-inch pipe approximated the slope of the adjacent natural ground, which was estimated to be 1.4%. Based on this assumption, the estimated capacity of the 42-inch RCP was determined to be 140 cfs.

### Proposed Facilities

The following recommendations are limited to major outfall facilities for tracts "A" and "B." A detailed design of onsite facilities will be presented in the final drainage reports that are to be prepared for the individual parcels as they are developed. The following recommendations are made. The main purpose of the following recommendations is to recommend storm drainage facilities that will accommodate the 100 year runoff prior to it entering Garden of the Gods Road.

- Since the onsite facilities are only sized to accommodate runoff from the minor storm event, it is recommended that additional inlets and storm sewer facilities be installed at the Southeast corner of tract "A." It is recommended that these facilities be sized to intercept the 100 year surface flow and convey it to the storm sewer system located along the East property line of tract "A."
- It is recommended to extend the 4 foot by 10 foot CBC proposed for the Garden of the Gods Road crossing at Point #11 to the North approximately 200 feet in order to provide additional capacity for runoff from the East and from the West.
- It is recommended to extend a 42" storm sewer into tract "B" sized to accommodate the developed 100 year runoff from tract "B."
- It is recommended to install sump inlets at locations shown on the attached drainage plan. The purpose of these inlets will be to intercept the 100 year surface runoff prior to it entering Garden of the Gods Road.
- It is recommended that the capacity of the existing 42-inch pipe along the Easterly property line of tract "A" be reserved for the development of subbasin "C."

Additional recommendations for onsite facilities will be made upon the preparation of the final drainage reports for each phase within the HP site which is to be developed.

## VI. ENVIRONMENTAL ISSUES

Based on information obtained from field reconnaissance, various reports, drainage studies, and meetings with the City of Colorado Springs, there does not appear to be any environmental issues that need to be addressed in this report.

## VII. DRAINAGE BASIN FEES

Douglas Creek Drainage Basin fees were applied to this project and are summarized below. Only the unplatted acreage is subject to drainage fees since the bulk of the acreage is within the limits of the Hewlett Packard First Filing.

|  |                      |
|--|----------------------|
| Drainage Fees: 19.025 acres @ \$ 6,440/ac. = | \$ 122,521.00        |
| Bridge Fees: 19.025 acres @ \$ 142/ac. =     | <u>\$ 2,701.55</u>   |
| Total Drainage and Bridge Fees:              | <u>\$ 125,222.55</u> |

These fees will be applied to the proposed public drainage facility under Garden of the Gods Road.

## VIII. SUMMARY AND RECOMMENDATIONS

In summary, the Master Development Drainage Plan (MDDP) has established the following:

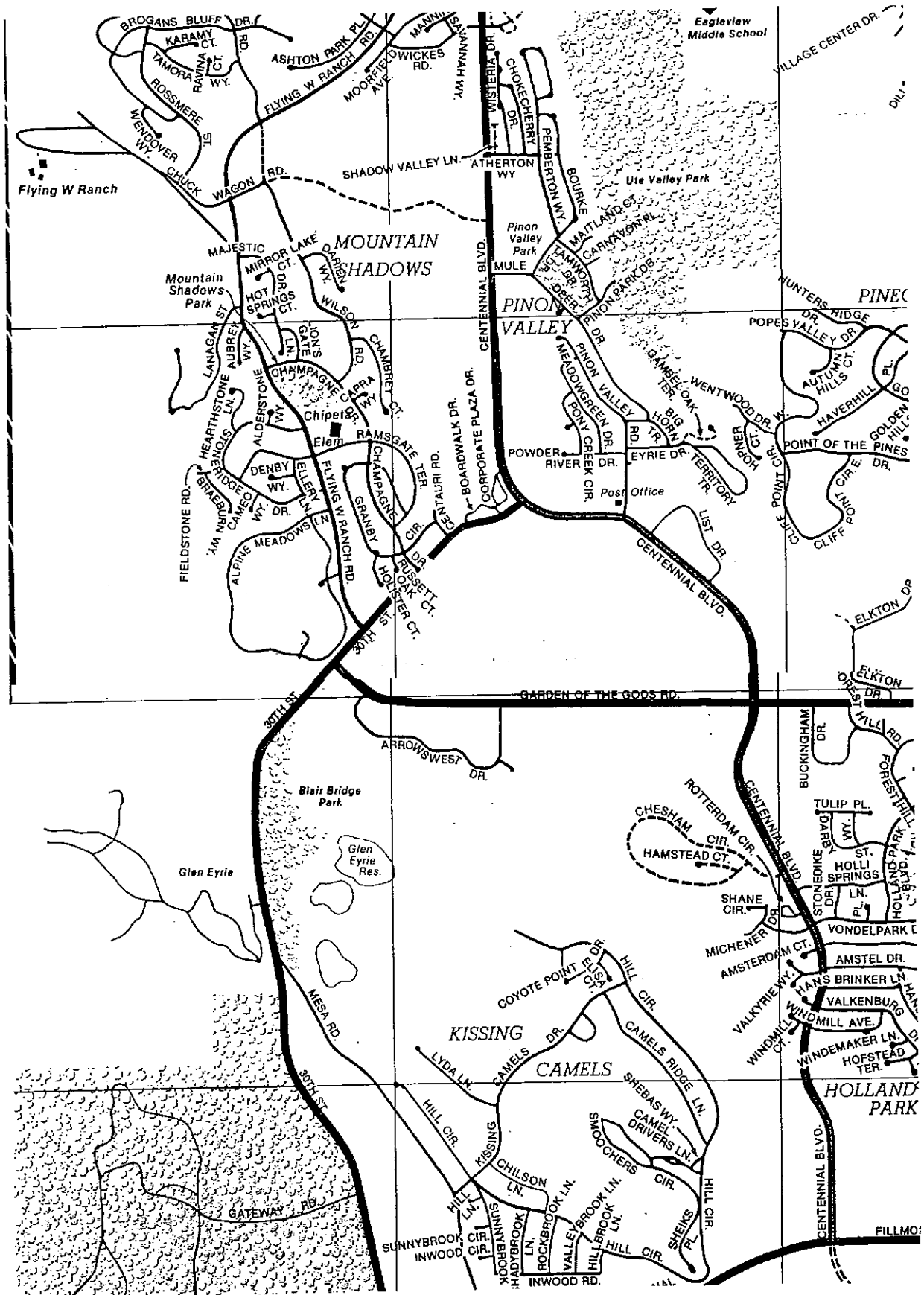
1. All of the drainage facilities that cross Garden of the Gods Road were historically sized for the minor storm event. These facilities include the Hotsy outfall system at Point #1, the HP outfall system at Point #11, and the Centennial outfall system at Point #4.
2. Additional drainage facilities are required at all Garden of the Gods Road crossings in order to meet the DCM requirements regarding the 100 year storm event.
3. The existing HP outfall system has the capacity to accommodate a portion of the 100 year storm runoff from contributing properties.
4. Drainage areas, as defined in the Crestone MDDP, are being modified in order to reduce developed runoff to the Centennial Boulevard outfall.

5. Additional study is recommended for contributing drainage subbasins located outside the limits of the HP site in order to assess the hydraulic capacities of the internal systems.
6. The culvert crossing at Point #5 is to be replaced with a 4' by 10' which is sized to accommodate fully developed flow from the HP sites and would be a public system, creditable against fee obligations.
7. Drainage facilities downstream of the Garden of the Gods Road culvert crossing at Point #11 will accommodate approximately 425 cfs under pressurized conditions. Runoff from the existing HP developed area (Tract A) and a fully developed Tract B site is anticipated to be 302 cfs. Runoff from the fully developed Tract "A" and Tract "B" sites is estimated to be 527 cfs. Therefore, additional facilities downstream of the Garden of the Gods Road crossing may be required prior to full development of the existing HP tract. Implementation will be determined at the time of the need and will be based on the area under development as well as the estimated discharge amount. Onsite detention on the existing campus is an acceptable alternate to upgrade of downstream facilities.

# APPENDIX

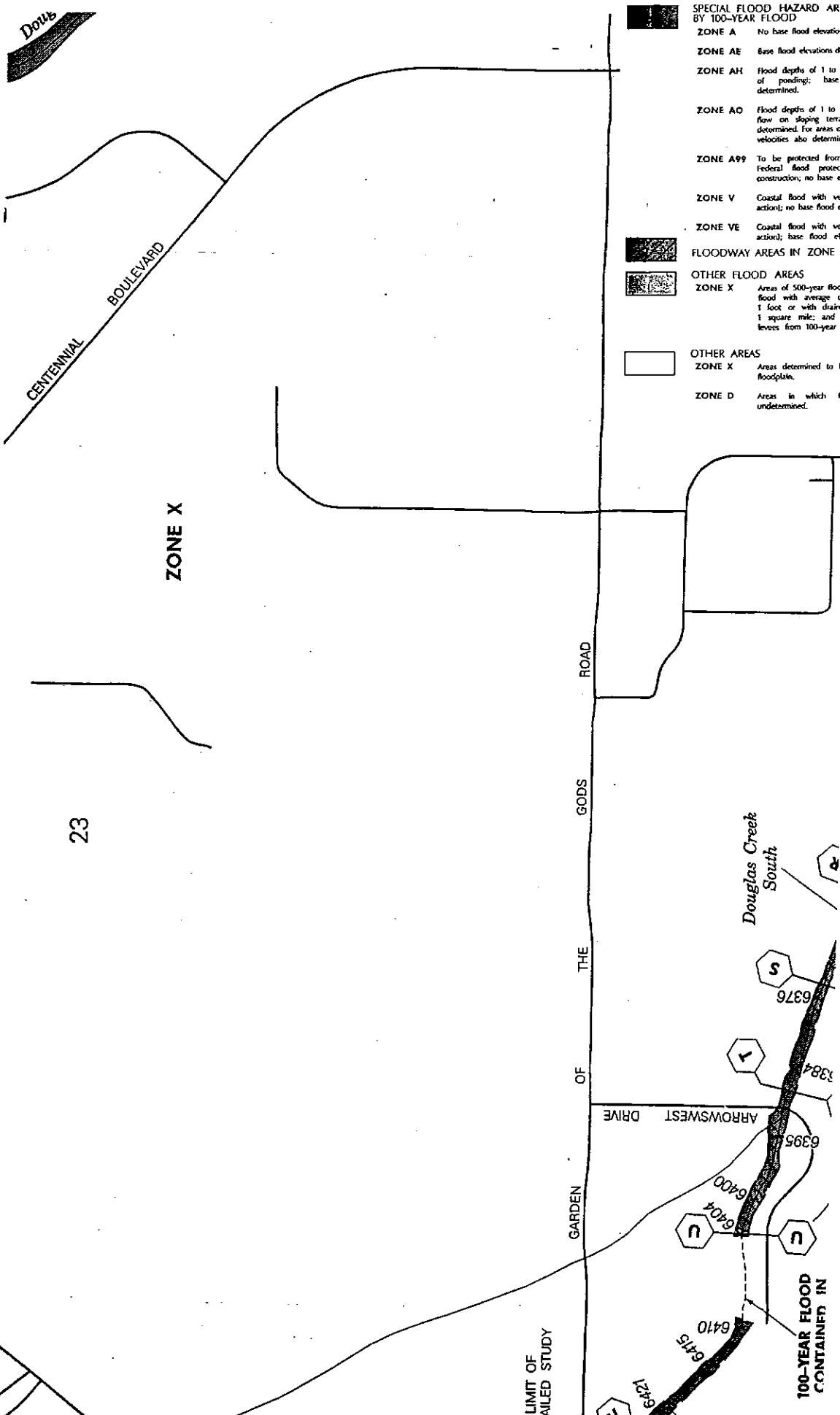


**VICINITY MAP**







**VICINITY MAP**

**FEMA FLOODPLAIN  
EXHIBIT**



**LEGEND**

-  SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AD** Flood depths of 1 to 3 feet usually sheet flow on sloping terrain; average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.
- FLOODWAY AREAS IN ZONE AE** 
- OTHER FLOOD AREAS** 
- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.
- OTHER AREAS** 
- ZONE X** Areas determined to be outside 500-year floodplain.
- ZONE D** Areas in which flood hazards are undetermined.



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM FLOOD INSURANCE RATE MAP**  
**EL PASO COUNTY, COLORADO AND INCORPORATED AREAS**

**PANEL 513 OF 1300**  
 (SEE MAP INDEX FOR PANELS NOT PRINTED)

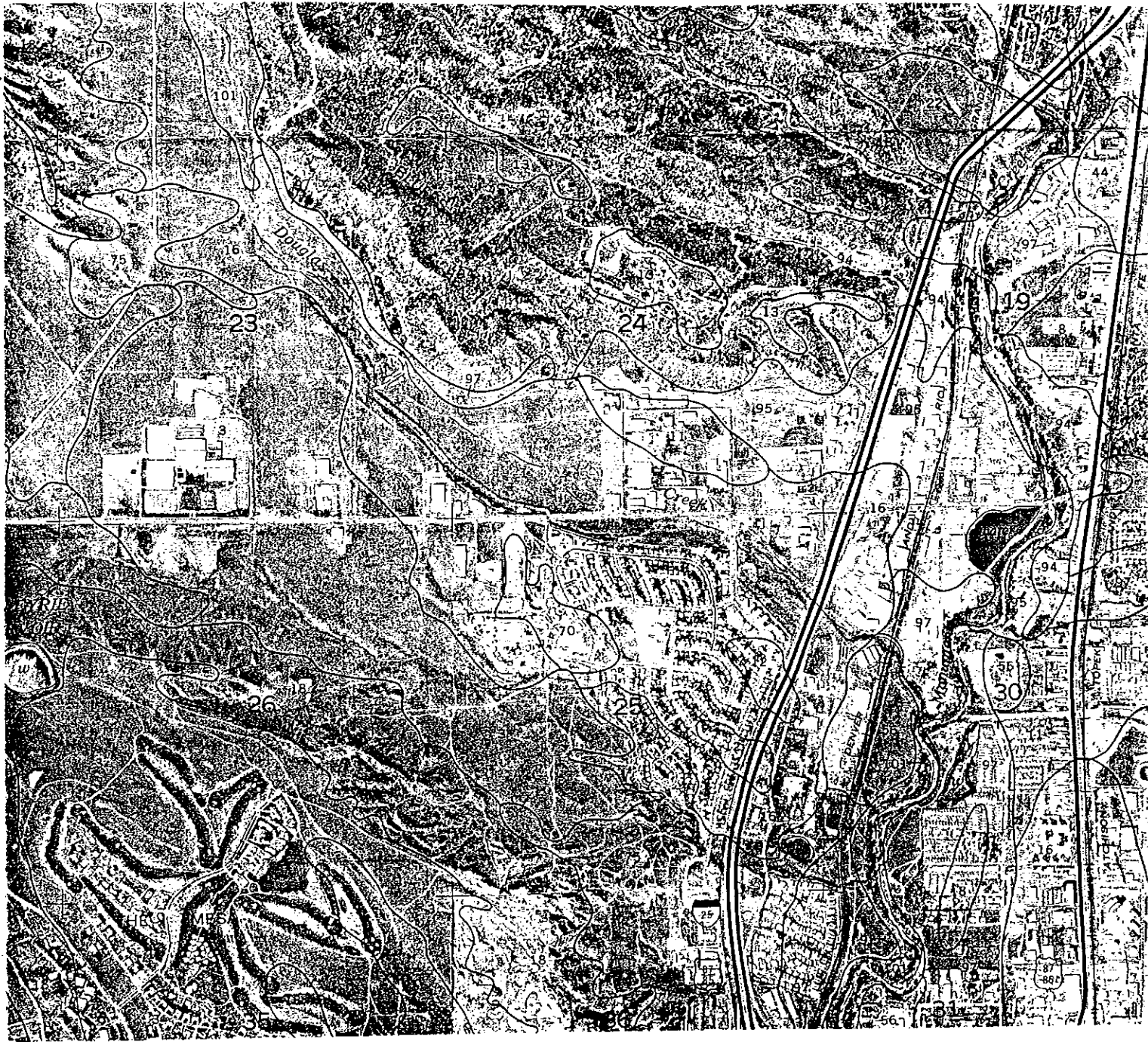
| CONTAINS:                 | NUMBER | PANEL | SUFFIX |
|---------------------------|--------|-------|--------|
| COMMUNITY                 |        |       |        |
| COLORADO SPRINGS, CITY OF | 080050 | 0513  | F      |



**MAP NUMBER**  
 08041C0513 F  
**EFFECTIVE DATE:**  
 MARCH 17, 1997

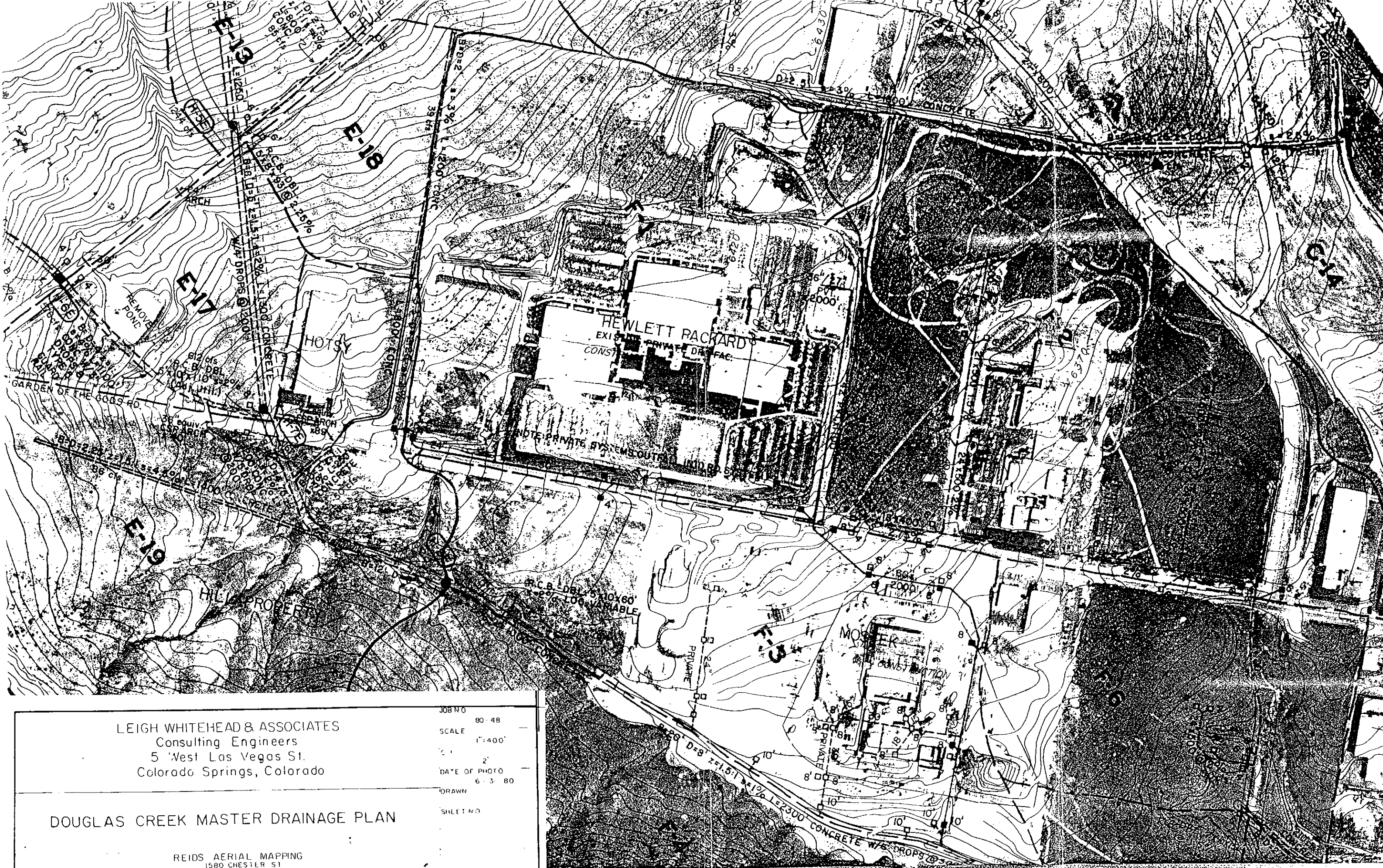
**SCS SOILS MAP**

**DOUGLAS CREEK  
DRAINAGE BASIN  
PLANNING STUDY  
EXHIBITS**



SHEET NO. 8  
EL PASO COUNTY AREA, COLORADO  
(PIKEVIEW QUADRANGLE)

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE



|  |         |
|--|---------|
| LEIGH WHITEHEAD & ASSOCIATES<br>Consulting Engineers<br>5 West Las Vegas St.<br>Colorado Springs, Colorado |         |
| JOB NO   | 80-48   |
| SCALE  | 1"=400' |
| DATE OF PHOTO  | 6-3-80  |
| DRAWN  |         |
| SHEET NO   |         |

DOUGLAS CREEK MASTER DRAINAGE PLAN

REIDS AERIAL MAPPING  
1580 CHESTER ST  
AURORA, COLORADO 80010  
344-9949



| SUB BASIN | AREA  |          | Tc (Hr.) | Tpo (Hr.) | Tb (Hr.) | CURVE NUMBER (CN) | PEAK DISCHARGE (CSM/IN.) | RUNOFF (Inches) |         | PEAK FLOW (c.f.s.) |         |
|-----------|-------|----------|----------|-----------|----------|-------------------|--------------------------|-----------------|---------|--------------------|---------|
|           | Acres | Sq.Miles |          |           |          |                   |                          | 5 YR.           | 100 YR. | 5 YR.              | 100 YR. |
| E 11      | 86    | 0.134    | 0.229    | 1.637     | 4.372    | 70                | 1020                     | 0.28            | 1.01    | 38                 | 138     |
| 12        | 44    | 0.069    | 0.133    | 1.580     | 4.219    | 84                | 1200                     | 0.82            | 1.94    | 68                 | 161     |
| 13        | 17    | 0.027    | 0.123    | 1.574     | 4.203    | 83                | 1220                     | 0.765           | 1.86    | 25                 | 61      |
| 14        | 74    | 0.116    | 0.197    | 1.618     | 4.288    | 90                | 1070                     | 1.18            | 2.45    | 146                | 304     |
| 15        | 25    | 0.039    | 0.062    | 1.537     | 4.104    | 79                | 1260                     | 0.58            | 1.57    | 29                 | 77      |
| 16        | 30    | 0.047    | 0.112    | 1.567     | 4.184    | 90                | 1245                     | 1.18            | 2.45    | 69                 | 143     |
| 17        | 26    | 0.041    | 0.115    | 1.569     | 4.189    | 89                | 1240                     | 1.115           | 2.36    | 57                 | 120     |
| 18        | 19    | 0.030    | 0.112    | 1.567     | 4.184    | 88                | 1245                     | 1.05            | 2.27    | 39                 | 85      |
| 19        | 99    | 0.155    | 0.132    | 1.579     | 4.216    | 81                | 1200                     | 0.665           | 1.71    | 124                | 318     |
| 1         | 96    | 0.150    | 0.284    | 1.670     | 4.340    | 88                | 940                      | 1.05            | 2.27    | 148                | 320     |
| 2         | 95    | 0.148    | 0.332    | 1.699     | 4.536    | 86                | 885                      | 0.92            | 2.10    | 121                | 275     |
| 3         | 74    | 0.116    | 0.324    | 1.694     | 4.523    | 88                | 890                      | 1.05            | 2.27    | 108                | 234     |

SUMMARY OF HYDROLOGIC COMPUTATIONS - DOUGLAS CREEK DRAINAGE BASIN

| SUB<br>BASIN | AREA  |          | Tc<br>(Hr.) | Tpo<br>(Hr.) | Tb<br>(Hr.) | CURVE<br>NUMBER<br>(CN) | PEAK<br>DISCHARGE<br>(CSM/IN.) | RUNOFF (Inches) |         | PEAK FLOW (c.f.s.) |         |
|--------------|-------|----------|-------------|--------------|-------------|-------------------------|--------------------------------|-----------------|---------|--------------------|---------|
|              | Acres | Sq.Miles |             |              |             |                         |                                | 5 YR.           | 100 YR. | 5 YR.              | 100 YR. |
| F 4          | 82    | 0.128    | 0.362       | 1.717        | 4.585       | 74                      | 850                            | 0.40            | 1.24    | 44                 | 135     |
| 5            | 59    | 0.092    | 0.211       | 1.627        | 4.344       | 66                      | 1055                           | 0.18            | 0.80    | 17                 | 78      |
| 6            | 44    | 0.069    | 0.190       | 1.614        | 4.309       | 90                      | 1085                           | 1.18            | 2.45    | 88                 | 183     |
| 7            | 24    | 0.038    | 0.177       | 1.606        | 4.288       | 85                      | 1105                           | 0.87            | 2.02    | 37                 | 85      |
| 8            | 59    | 0.092    | 0.192       | 1.615        | 4.312       | 81                      | 1080                           | 0.665           | 1.71    | 66                 | 170     |
| 9            | 57    | 0.089    | 0.386       | 1.732        | 4.623       | 60                      | 830                            | 0.08            | 0.53    | 6                  | 39      |
| 10           | 21    | 0.033    | 0.121       | 1.573        | 4.200       | 67                      | 1225                           | 0.205           | 0.85    | 8                  | 34      |
| 11           | 39    | 0.061    | 0.241       | 1.645        | 4.392       | 88                      | 1000                           | 1.05            | 2.27    | 64                 | 138     |
| 12           | 6     | 0.009    | 0.177       | 1.606        | 4.288       | 88                      | 1105                           | 1.05            | 2.27    | 10                 | 23      |
| 13           | 42    | 0.066    | 0.205       | 1.623        | 4.333       | 80                      | 1055                           | 0.62            | 1.64    | 43                 | 114     |
| 14           | 26    | 0.041    | 0.196       | 1.618        | 4.320       | 85                      | 1075                           | 0.87            | 2.02    | 38                 | 89      |
| 15           | 70    | 0.109    | 0.340       | 1.704        | 4.550       | 79                      | 875                            | 0.58            | 1.57    | 55                 | 150     |
| 16           | 37    | 0.058    | 0.177       | 1.606        | 4.211       | 84                      | 1105                           | 0.82            | 1.94    | 53                 | 124     |

SUMMARY OF HYDROLOGIC COMPUTATIONS-DOUGLAS CREEK DRAINAGE BASIN

| LOCATION  |            |                                    | EXISTING                                      |             |              |                | MAXIMUM DESIGN FLOW (Q <sub>5</sub> ) | REQUIRED   |                          |              |   |                |
|-----------|------------|------------------------------------|---|-------------|--------------|----------------|---------------------------------------|--|--------------------------|--------------|---|----------------|
| SUB BASIN | NEAR POINT | STREET                             | PIPE  | LENGTH      | CATCH BASINS | OUTLET STRUCT. |                                       | FACILITY   | LENGTH                   | CATCH BASINS | COMMENTS  | ESTIMATED COST |
| E-15      | -          | None                               | None  | -           | -            | -              | 29                                    | None   | -                        | -            | Probably Undevelopable ROW 15'  | -              |
| E-16      | H-6E       | Area South of Mtn. Shad. Filing 1  | 30"   | 25'         | -            | Nat'l Drg.     | 52                                    | Chan. Chan.<br>B=D=2.5'<br>@6% 1:1 Sides           | 1400'                    | 2-4'         | Chan. Impr. Proposed  | \$ 75,000      |
|           |            |                                    |   |             |              |                |                                       | RCB 5' x 8' @2%                                    | 80'                      |              |   |                |
| E-17      | H-7E       | Garden of Gods Rd. Re-aligned      | 36" Arch                                      | 40'         | -            | Nat'l Drg.     | 612                                   | Conc. Chan. 1100'<br>B=D=4' @ 4% 1:1 Sides         | Chan. 1100'<br>Guardrail | 2-8'         | Outfalls to Major Chan.   | \$ 89,000      |
|           |            |                                    |   |             |              |                |                                       | 3' Drops W/Type 5 Guardrail                        |                          |              |   |                |
| E-18      | H-7E       | Garden of Gods Rd. at Hotsy.       | 42" Arch Conc. Chan.<br>B=3.3'<br>D=2.25' @3% | 89'<br>800' | -            | Dirt Chan.     | 39                                    | Extend Conc. Chan.<br>B=D=2' @ 3%                  | 1200'                    | -            | Extension of Existing Channel   | \$ 29,000      |
| E-19      | H-8E       | None - Undeveloped-No Master Plan  | None  | -           | -            | -              | 86                                    | Conc. Chan.<br>B=D=2.25' @4.5% 1:1 Sides. No Drops | 1400'                    | -            | ROW 15'   | \$ 54,000      |
| E-19      | H-8E       | None                               | Unimproved Dirt Chan.                         | 400'        | -            | Nat'l Drg.     | 50                                    | Conc. Chan.<br>B=D=3' @ 3% 1:1 Sides               | 250'                     | -            | ROW 15'   | \$ 10,000      |
|           |            |                                    |   |             |              |                |                                       | (Continue Existing)                                |                          |              |   |                |
| F-1       | -          | Hewlett Packard E. Bndry.          | 42"   | 1100'       | 1-8'         | 60" in Mostek  | -                                     | None   | -                        | -            | All Constr. Satisfactory  | -              |
| F-1       | -          | Garden of Gods Rd. South Side H.P. | 24"-36"                                       | 2000'       | 3-4'         | 60" in Mostek  | -                                     | 18" Outlet Pipe                                    | 100'                     | 1-4'         | Called for in Mast. Plan-Not Inst. Incl. Asph. Repair does not incl. Util. Adj. | \$ 4,000       |

**SUMMARY OF HYDRAULICS (Facilities Inventory) - DOUGLAS CREEK DRAINAGE BASIN**  
**EXHIBIT 7. STORM SYSTEMS INVENTORY**

NOTE: The Max. Design Flow is that Flow for which the Largest Portion of the Storm System was Sized.

| LOCATION  |            |                                    | EXISTING          |                                      |                       |                         | MAXIMUM DESIGN FLOW (Q <sub>5</sub> ) | REQUIRED  |                              |                               |  |                |
|-----------|------------|------------------------------------|-------------------|--------------------------------------|-----------------------|-------------------------|---------------------------------------|---|------------------------------|-------------------------------|--|----------------|
| SUB BASIN | NEAR POINT | STREET                             | PIPE              | LENGTH                               | CATCH BASINS          | OUTLET STRUCT.          |                                       | FACILITY  | LENGTH                       | CATCH BASINS                  | COMMENTS   | ESTIMATED COST |
| F-2       | -          | Garden of Gods Side Kaman Sciences |                   |                                      |                       |                         | 40                                    | 18" @ 2.75%<br>36" @ 2%<br>42" @ 2%<br>48" @ 2% | 400'<br>800'<br>350'<br>400' | 2-4'<br>6-6'                  | Tie to Exist. 48" Stub.out of G.of G.ROW Cost incl. Asph.Repair  | \$130,000      |
| F-2       | -          | Kaman Sciences Interior            | None in possible  | unplatted area. in improved portion. |                       | Some                    | 121                                   | W. 24" @ 2%<br>21" @ 1.5%<br>18" @ 1.0%         | 500'<br>500'<br>500'         | 6-6'                          | Reimbursable if located in public street   | \$ 80,000      |
|           |            |                                    |                   |                                      |                       |                         |                                       | E. 24" @ 1%<br>18" @ 2%                         | 500'<br>500'                 | 4-6'                          |  |                |
| F-3       | H-1F       | Mostek Site                        | 60"               | 2000'                                | 4-8'<br>1-10'         | Major Channel           |                                       |   |                              |                               | Construction of the Balance of the proposed private facilities within the site. No public facilities required. |                |
| F-4       | H-1F       | No name-Hill Prop. S. of Mostek    | None              | -                                    | -                     | -                       | 20                                    | 18" RCP @ 2%                                    | 200'                         | 2-8'                          | No street Planned-No Master Plan Available   | \$ 8,000       |
| F-5       | H-1F       | Along Nat'l Drg. South of Above    | None              | -                                    | -                     | -                       | 17                                    | 18" RCP @ 2%                                    | 100'                         | 2-6'                          | Flow can be handled in possible future road.   | \$ 6,000       |
| F-6       | -          | Centennial Blvd. & area West       | None              | -                                    | -                     | -                       | 50<br>121                             | 24" RCP @ 2%<br>48" RCP @ 2%                    | 500'<br>1100'                | 3-4'<br>2-6'<br>1-8'<br>1-12' | Outfalls into Prop. Conc. Chan. in F-13  | \$135,000      |
| F-6       | -          | Centennial Blvd. & Chan. Area East | None              | -                                    | -                     | -                       | 210                                   | Conc. Chan. B=D=275' @ 4%                       | 500'                         | -                             |  |                |
|           |            |                                    |                   |                                      |                       |                         |                                       | 1 1/2:1 Sides ROW 20'                           |                              |                               |  |                |
| F-7       | H-2F       | Centennial Blvd.                   | None              | -                                    | -                     | -                       | 37                                    | -   | -                            | 2-6'                          | Tie to major Chan. @ Bridge Structure in Master Plan   | \$ 4,000       |
| F-8       | H-2F       | Centennial Blvd.                   | 54" to 24" System | 1600'                                | 4-4'<br>1-6'<br>1-10' | Major Chan. Future Imp. | 50                                    | 24" RCP @ 6%                                    | 1000'                        | 4-8'                          | -  | \$ 35,000      |

**SUMMARY OF HYDRAULICS (Facilities Inventory) - DOUGLAS CREEK DRAINAGE BASIN**  
**EXHIBIT 7. STORM SYSTEMS INVENTORY**

NOTE: The Max. Design Flow is that Flow for which the Largest Portion of the Storm System was Sized.

**FINAL DRAINAGE  
REPORT EXHIBITS**

# COX SURVEYING COMPANY

P.O. BOX 5151 • 3017 DELTA DR. • SECURITY, COLORADO 80931 • PHONE 392-7198

DRAINAGE REPORT

. FOR

HOTSY SUBDIVISION

May 25, 1977

REVISED 6-28-77

Prepared by:

Cox and Associates  
3017 Delta Drive  
Colorado Springs, Colorado

# COX SURVEYING COMPANY

P.O. BOX 5151 • 3017 DELTA DR. • SECURITY, COLORADO 80931 • PHONE 392-7198

## HOTSY SUBDIVISION

### DRAINAGE REPORT

#### GENERAL CONSIDERATIONS:

HOTSY SUBDIVISION is a 10.00 acre tract of land bounded on the south by Garden of the Gods Road, on the east by Hewlett-Packard First Filing, and on the north and west by undeveloped private property. It is located in the SW $\frac{1}{4}$  SW $\frac{1}{4}$  of Section 23, T 13 S, R 67 W of the 6th P.M., City of Colorado Springs, El Paso County, Colorado.

The soils of the area are of the Jugef association, with sandy and loamy soils being on the surface, they fall into Hydrologic Soil Group D.

The general drainage is to the southeast and flows into South Douglas Creek.

The subdivision lies within the Douglas Creek Drainage Basin.

Runoff routing in the area complies generally with the approved Douglas Creek Drainage Study - June, 1974, however some variations have been incorporated into this report for the area after a field inspection with the City of Colorado Springs Engineering Department and an extensive study of the new topographical map prepared for this area.

#### EXTERIOR DRAINAGE:

Exterior Drainage will enter the subdivision from the north and west, these areas have been divided into four (4) Subbasins as shown on the drainage plan and designated as basins I, II, III, & IV.

#### INTERIOR DRAINAGE:

Interior Drainage developed onsite has been divided into two (2) basins as shown on the drainage plan and designated as basins A-1 & A-2.

#### DESIGN CRITERIA:

Five year frequency, six hour duration  
 $p = 2.1$  inches,  $q = qp A Q$

# COX SURVEYING COMPANY

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## RECOMMENDATIONS:

It is recommended that the drainage flows be contained in paved and grassed swales located and sectioned as shown on the drainage plan. These swales are adequate for the run-off.

A 42" concrete pipe culvert is required at Garden of the Gods Road adjacent to the existing 18" x 29" CMPA.

## SUBBASIN DESCRIPTIONS

### Basin I

This basin has an area of 9.6 acres and will develop 51.4 cfs, this flow will enter the Section A-A swale at point of interest /3 and flow south to point of interest /5

### Basin II

This basin has an area of 7.8 acres and will develop 41.1 cfs, this flow will enter the section B-B swale between points of interest /1 and /2 and flow east to point of interest /3.

### Basin III

This basin has an area of 3.1 acres and will develop 17.1 cfs, this flow will enter the paved drainage swale at point of interest /1-a and will flow south to point of interest /5.

### Basin IV

This basin has an area of 5.2 acres and will develop 26.1 cfs, 6.0 cfs of this flow will enter the paved drainage swale at point of interest /1-a. The remaining 20.1 cfs will flow to the Garden of the Gods Road by sheet flow along the west side of the paved driveway, this flow will be conveyed in the street to point of interest /5 where it will enter the existing 18" x 29" CMPA or the new 42" CPC.

### Basin A-1

This basin has an area of 5.0 acres and will develop 26.7 cfs, this flow will enter the section A-A swale between points of interest /3 and /5 and flow south to point of interest /5.



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## Basin A-2

This basin has an area of 5.0 acres and will develop 26.7 cfs, this flow will be contained in the paved driveway swale and flow south and east to point of interest /5

STORM DRAINAGE from this area will be discharged at point of interest /5 through a 42" CPC, to be constructed by this developer, and through the existing 18" x 29" CMPA into South Douglas Creek.

DRAINAGE REPORT  
FOR  
PINON VALLEY INDUSTRIAL PARK  
FILING NO. 8

Berge-Brewer & Assoc., Inc. dba  
H.J. KRAETTLI & SONS  
15 North Iowa Ave.  
Colorado Springs, Colorado 80909

FLOWS LEAVING SITE:

Flows will leave the platted boundaries of the subdivision at five district locations. Point 1 as shown on the attached plan is in the gutter lines of Wilson Road flowing to the North-east towards Centennial Boulevard. Approximately 2.05 c.f.s. will be found in each curb at this point. The grade of this reach has a minimum slope of 0.56% and a minimum capacity of 20 c.f.s. for further information as to additional flows entering this reach, routing, or facilities please see the following reports or plans:

1. Pinon Valley Industrial Park Filing No. 7 Drainage Report
2. Pinon Valley Industrial Park Filing No. 4 Drainage Report.
3. Wilson Road Plan and Profiles
4. Corporate Club Plaza Drainage Report

Point 2 occurs at the 8' D-10R catch basins built as part of the Wilson Road improvements. These catchbasins will be connected to a proposed concrete ditch that will be constructed in conjunction with the Mountain Shadows Development. Until this construction occurs the inlets will be plugged and the flows (3.8 c.f.s.) will be allowed to continue to Point 3. The inlets each have a capacity of about 9.4 c.f.s..

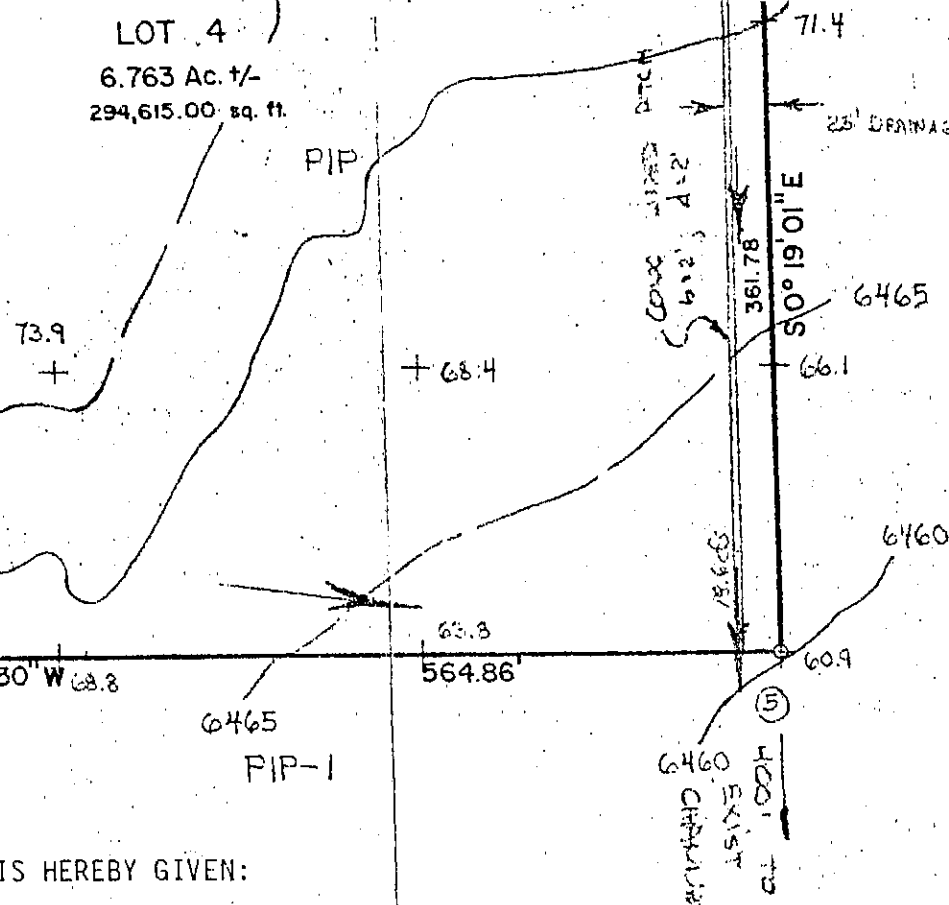
Point 3 is located at the South line of Wilson Road. Upon final development 1.7 c.f.s. will be released at this point to travel via curb and gutter to the concrete channel constructed as part of the Mountain Shadows Development. Until construction of the concrete ditch mentioned in the previous section, 5.9 c.f.s. will be discharged at Point 3. The slope of the road to this point is approximately 0.96 % and has a capacity of 30 c.f.s.

Point 4, 8.9 c.f.s., is confined within the swale described earlier. Construction of this should be accomplished such that runoff is not allowed on Hewlett-Packard Land. This swale will outfall at the existing channel behind Hewlett-Packard.

Point 5, 18.6 c.f.s., is the concrete channel that has been described earlier.

LOT 4

6.763 Ac. +/-  
294,615.00 sq. ft.



NOTES:

1. All corners set are No. 5 rebar with Surveyor's cap.
2. All bearings are relative to Pinon Valley Industrial Park Filing No. 4.
3. o indicates found corner.

IS HEREBY GIVEN:

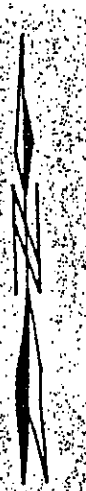
a included in this plat is subject to the code of the City of Colorado Springs adopted in 1968 as

TS: Unless shown greater in width, both sides of all lot lines are hereby platted with a five (5) sement for public utilities only, and both sides of all rear lot lines are hereby platted with 7) foot easement for drainage and public utilities only, with the sole responsibility for maintenance ested with adjacent property owners.

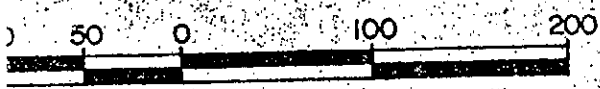
lding permits shall be issued for building sites until all required fees have been paid and all ed public improvements and utilities have been installed as specified by the City of Colorado , or alternatively until acceptable assurances, including but not limited to letters of credit, istributed bond for obligations to wit, guaranteeing the payment of the fees and the and for all required public improvements and utilities have been placed on file with the City rado Springs. All streets, alleys, and easements shown on this plat for access purposes are from this provision.

Fees: \_\_\_\_\_  
ge Fees: \_\_\_\_\_

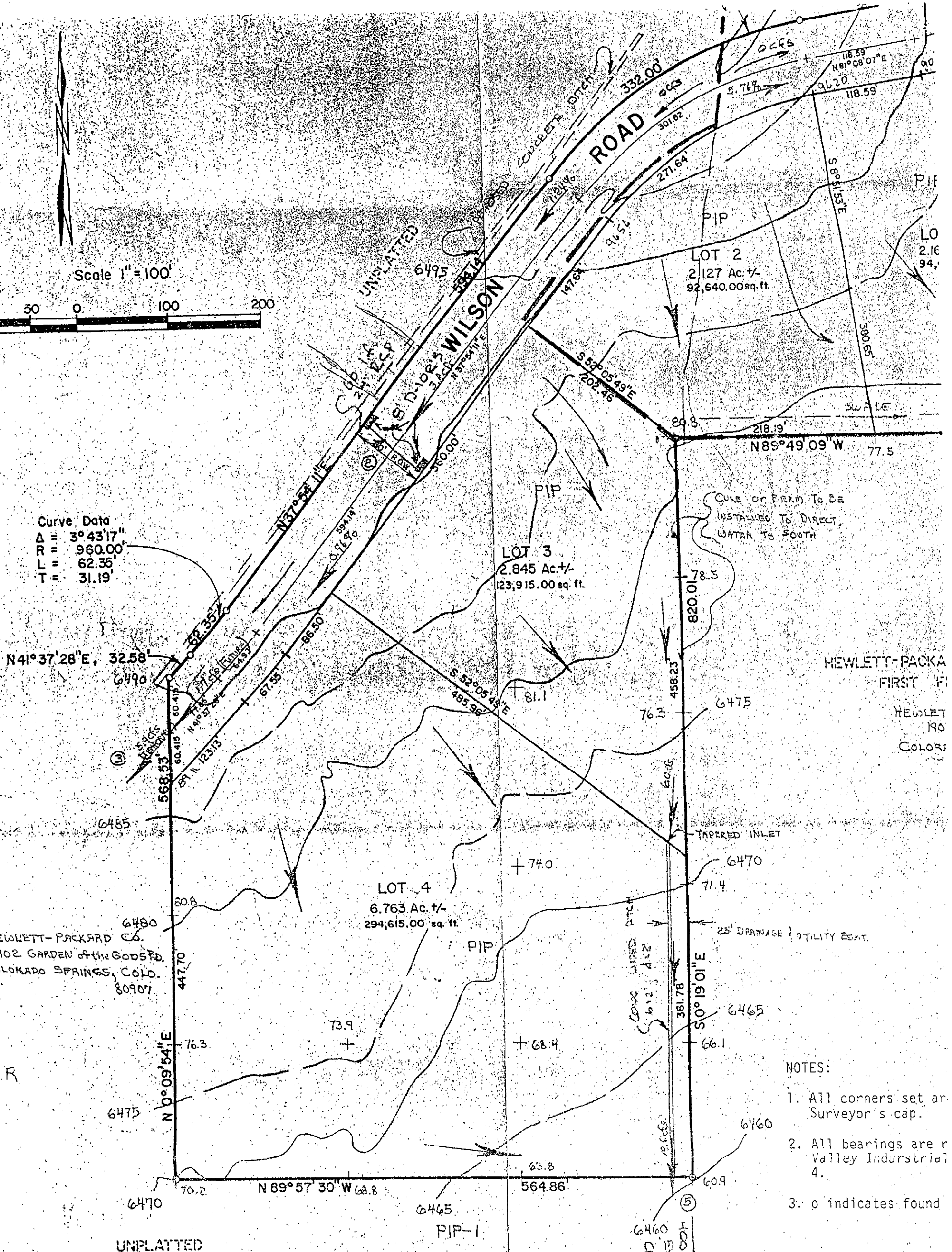
Park Fees: \_\_\_\_\_  
Bridge Fees: \_\_\_\_\_



Scale 1" = 100'



Curve Data  
 $\Delta = 3^{\circ}43'17''$   
 $R = 960.00'$   
 $L = 62.35'$   
 $T = 31.19'$



HEWLETT-PACKARD  
 FIRST  
 HEWLETT  
 190  
 COLORS

HEWLETT-PACKARD CO.  
 1902 GARDEN of the GODS RD.  
 SLOKADO SPRINGS, COLO.  
 80907

- NOTES:
1. All corners set and Surveyor's cap.
  2. All bearings are r Valley Industrial
  3. o indicates found

NOTICE IS HEREBY GIVEN:

The area included in this plat is subject to the code of the City of Colorado Springs adopted and amended.

EASEMENTS: Unless shown greater in width, both sides of all lot lines are hereby platted foot easement for public utilities only, and both sides of all rear lot lines are hereby platted seven (7) foot easement for drainage and public utilities only, with the sole responsibility being vested with adjacent property owners.

"No building permits shall be issued for building sites until all required fees have been required public improvements and utilities have been installed as specified by the City of Colorado Springs, or alternatively until acceptable assurances, including but not limited to letter of construction bond, are provided, guaranteeing the payment of the fees and completion of all required public improvements and utilities have been placed on file with the City of Colorado Springs. All streets, alleys, and easements shown on this plat for access purposes shall be subject to the provisions of the City of Colorado Springs Code of Ordinances.

# PINON VALLEY INDUSTRY FILING NO. 8

IN THE CITY OF COLORADO

H. J. KRAETTLI & SONS, INC.  
15 NORTH IOWA  
ENGINEERS & SURVEYORS

NOVEMBER 12, 1981

REVISED JUNE 21, 1982

P.V. INVESTMENT COMPANY  
1585 YORK ROAD  
COLORADO SPRINGS, COLORADO  
80918

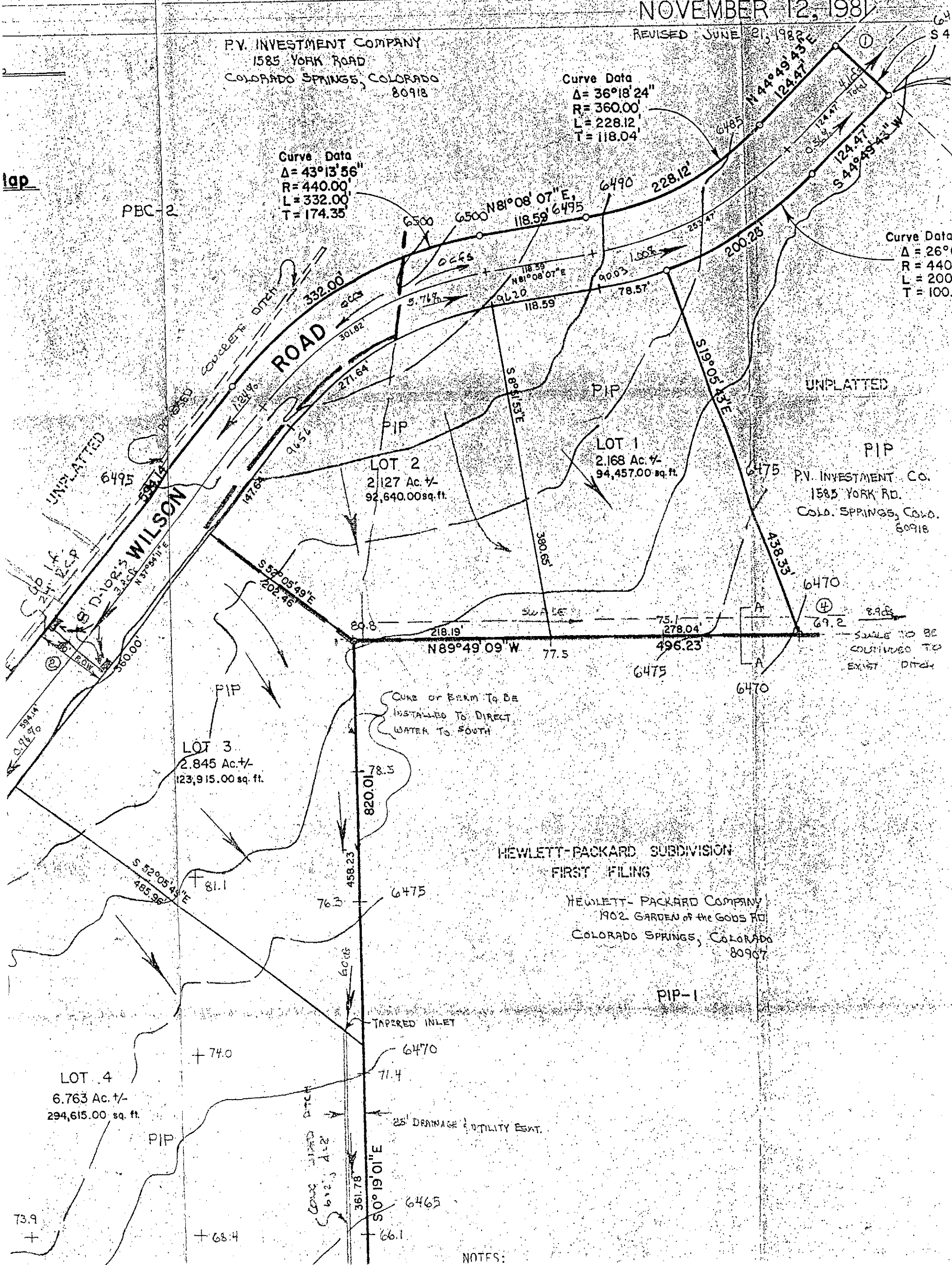
Curve Data  
 $\Delta = 36^{\circ}18'24''$   
 $R = 360.00'$   
 $L = 228.12'$   
 $T = 118.04'$

Curve Data  
 $\Delta = 43^{\circ}13'56''$   
 $R = 440.00'$   
 $L = 332.00'$   
 $T = 174.35'$

Curve Data  
 $\Delta = 26^{\circ}00'$   
 $R = 440.00'$   
 $L = 200.00'$   
 $T = 100.00'$

lap

PBC-2



CURVE OR BERM TO BE  
INSTALLED TO DIRECT  
WATER TO SOUTH

SCALE TO BE  
CONTINUED TO  
EXIST DITCH

HEWLETT-PACKARD SUBDIVISION  
FIRST FILING

HEWLETT-PACKARD COMPANY  
1902 GARDEN of the GODS RD  
COLORADO SPRINGS, COLORADO  
80907

PIP-1

NOTES:

**ROCKWELL SEMICONDUCTOR  
SYSTEMS FILING NO. 1**

**FINAL DRAINAGE REPORT**

February 5, 1996  
M.V.E. Project No. 50855

**PREPARED FOR:**

Rockwell Semiconductor Systems  
c/o Jacobs-Serrine Engineers  
PO Box 5210  
Portland, OR 97208-5210  
(503) 624-3000

**PREPARED BY:**

M.V.E., Inc.  
1911 Lelaray St.  
Colorado Springs, CO 80909  
(719) 635-5736

241 CFS FROM TMIN  
34" X 53" OVALS

GARDEN OF THE

C1  
1.13

16

G

50 LF 24" RCP

C2  
5.02

B3  
0.52

NEW  
ADMIN/  
CAFETERIA

EXIST.  
BUILDING  
FAB 7

F.F. = 6368.00

F.F. = 6364.00

NEW  
BUILDING

FAB 8

B1  
2.32

B5  
2.52

C3  
3.05

C5  
3.20

B2  
2.30

C6  
1.15

SERVICE  
YARD

EXIST.  
M.E.  
BLDG.

NEW  
MECHANICAL  
BUILDING  
EXPANSION

EXIST.  
D.I.  
BLDG.

B7  
2.38

C7  
1.67

SECURITY WALL

NEW  
POWER

EXIST.  
POWER

EX 30" OUTLET

EX 36" OUTLET

EX 36" OUTLET

N 89°32'57" E

UNPLATTED



## STORM DRAIN INLET DATA

| INLET NO. | SIZE      | TYPE                         | DESIGN CRITERIA | $Q_i$ (cfs) | $Q_c$ (cfs) |
|-----------|-----------|------------------------------|-----------------|-------------|-------------|
| 2a        | 13'       | CURB OPEN. TO ACCESS RAMP    | 100 YR          | 7.4         | 0.0         |
| 3a        | 8'        | CURB INLET                   | 5 YR            | 4.1         | 1.4         |
| 4a        | 8'        | DBL THROAT CURB INLET        | 5 YR            | 2.6         | 1.0         |
| 4b        | 8'        | DBL THROAT CURB INLET        | 5 YR            | 8.9         | 0.0         |
| 4c        | 6'        | CORNER CURB INLET            | 5 YR            | 1.3         | 0.0         |
| 4d        | 6'        | CURB INLET                   | 5 YR            | 1.2         | 0.4         |
| 7a        | 6'        | CURB INLET                   | 5 YR            | 5.6         | 0.0         |
| 8a        | 3.5'x3.5' | EXIST GRATE INLET            | 5 YR            | 1.0         | 0.0         |
| 10a       | 14'       | CURB INLET                   | 5 YR            | 1.9         | 1.4         |
| 10b       | 6'        | CURB INLET                   | 5 YR            | 4.1         | 0.0         |
| 10c       | 38'       | CURB OPENING                 | 100 YR          | 33.2        | 0.0         |
| 11a       | 4'        | CURB INLET                   | 5 YR            | 1.3         | 0.0         |
| 12a       | 4.0'x4.0' | GATE INLET (SUMP)            | 100 YR          | 3.8         | 0.0         |
| 12b       | 4'        | CURB INLET (SUMP)            | 100 YR          | 1.4         | 0.0         |
| 12c       | 4'        | CURB INLET (SUMP)            | 100 YR          | 1.4         | 0.0         |
| 12d       | 8'        | CURB INLET                   | 5 YR            | 2.8         | 2.6         |
| 15a       | 4'        | CURB INLET                   | 5 YR            | 0.9         | 0.2         |
| 15b       | 2.5'x2.5' | GRATE INLET                  | 5 YR            | 0.6         | 0.0         |
| 15c       | 6'        | CURB INLET                   | 5 YR            | 5.0         | 1.3         |
| 15d       | 2.5'x2.5' | GRATE INLET                  | 5 YR            | 0.2         | 0.0         |
| 16a       | 6'        | CURB INLET                   | 5 YR            | 1.2         | 0.8         |
| 17a       | 8'        | EXIST DBL THROAT CURB INLET  | 5 YR            | 1.5         | 0.4         |
| 17b       | 8'        | EXIST DBL THROAT CURB INLET  | 5 YR            | 3.9         | 3.2         |
| 17c       | 8'        | DBL THROAT CURB INLET        | 5 YR            | 9.2         | 0.0         |
| 18a       | 6'        | DBL THROAT CURB INLET (SUMP) | 100 YR          | 9.9         | 1.1         |
| 19a       | 8'        | EXIST CURB INLET             | 5 YR            | 0.5         | 0.0         |

## SITE HYDROLOGY DATA

| DESIGN POINT | INCL. BASINS             | AREA (Ac) | Q <sub>5</sub> (cfs) | Q <sub>100</sub> (cfs) |
|--------------|--------------------------|-----------|----------------------|------------------------|
| 1            | A1                       | 0.40      | 1.9                  | 3.4                    |
| 2            | A2                       | 1.80      | 3.8                  | 7.4                    |
| 3            | A1,A2                    | 1.48      | 6.1                  | 11.2                   |
| 4            | A4                       | 4.59      | 14.0                 | 26.5                   |
| 5            | A5                       | 2.53      | 10.9                 | 20.2                   |
| 6            | A6                       | 2.52      | 10.9                 | 20.1                   |
| 7            | A5,A6,A7                 | 6.48      | 25.8                 | 48.2                   |
| 8            | A8                       | 1.36      | 1.3                  | 2.9                    |
| 9            | B1                       | 2.52      | 10.9                 | 20.1                   |
| 10           | A4-A7,B1,B2              | 15.89     | 48.7                 | 91.5                   |
| 11           | B3                       | 0.32      | 1.3                  | 2.4                    |
| 12           | B3,B4                    | 3.31      | 10.1                 | 19.1                   |
| 13           | B5                       | 2.52      | 10.9                 | 20.1                   |
| 14           | B3-B6                    | 7.50      | 23.0                 | 43.3                   |
| 15           | A4-A8,B1-B7              | 27.11     | 77.0                 | 145.0                  |
| 16           | A1,A3,C1                 | 2.58      | 9.4                  | 17.3                   |
| 17           | C2                       | 5.02      | 14.8                 | 28.0                   |
| 18           | C2,C3                    | 7.07      | 20.5                 | 38.6                   |
| 19           | C4                       | 0.12      | 0.5                  | 0.9                    |
| 20           | C2,C3,C5                 | 10.27     | 29.7                 | 56.0                   |
| 21           | C2,C3,C5,C6              | 11.40     | 31.7                 | 60.7                   |
| 22           | A4-A8,B1-B7, C2,C3,C5-C7 | 43.18     | 120.5                | 226.8                  |
| 23           | C4,C8                    | 0.36      | 1.3                  | 2.3                    |
| 24           | D1                       | 3.18      | 14.5                 | 26.8                   |
| 25           | D1,D2                    | 8.70      | 28.1                 | 51.7                   |
| 26           | A4-A8,B1-B5, C2-C8,D1-D3 | 53.08     | 143.8                | 270.4                  |
| 27           | E1                       | 0.21      | 0.3                  | 0.7                    |
| 28           | E2                       | 0.49      | 0.6                  | 1.4                    |
| 29           | E3                       | 1.08      | 1.1                  | 2.7                    |

### STORM DRAIN INLET DATA

| INLET NO. | SIZE      | TYPE                         | DESIGN CRITERIA | $Q_i$ (cfs) | $Q_c$ (cfs) |
|-----------|-----------|------------------------------|-----------------|-------------|-------------|
| 2a        | 13'       | CURB OPEN. TO ACCESS RAMP    | 100 YR          | 7.4         | 0.0         |
| 3a        | 8'        | CURB INLET                   | 5 YR            | 4.1         | 1.4         |
| 4a        | 8'        | DBL THROAT CURB INLET        | 5 YR            | 2.6         | 1.0         |
| 4b        | 8'        | DBL THROAT CURB INLET        | 5 YR            | 8.9         | 0.0         |
| 4c        | 6'        | CORNER CURB INLET            | 5 YR            | 1.3         | 0.0         |
| 4d        | 6'        | CURB INLET                   | 5 YR            | 1.2         | 0.4         |
| 7a        | 6'        | CURB INLET                   | 5 YR            | 5.6         | 0.0         |
| 8a        | 3.5'x3.5' | EXIST GRATE INLET            | 5 YR            | 1.0         | 0.0         |
| 10a       | 14'       | CURB INLET                   | 5 YR            | 1.9         | 1.4         |
| 10b       | 6'        | CURB INLET                   | 5 YR            | 4.1         | 0.0         |
| 10c       | 38'       | CURB OPENING                 | 100 YR          | 33.2        | 0.0         |
| 11a       | 4'        | CURB INLET                   | 5 YR            | 1.3         | 0.0         |
| 12a       | 4.0'x4.0' | GATE INLET (SUMP)            | 100 YR          | 3.8         | 0.0         |
| 12b       | 4'        | CURB INLET (SUMP)            | 100 YR          | 1.4         | 0.0         |
| 12c       | 4'        | CURB INLET (SUMP)            | 100 YR          | 1.4         | 0.0         |
| 12d       | 8'        | CURB INLET                   | 5 YR            | 2.8         | 2.6         |
| 15a       | 4'        | CURB INLET                   | 5 YR            | 0.9         | 0.2         |
| 15b       | 2.5'x2.5' | GRATE INLET                  | 5 YR            | 0.6         | 0.0         |
| 15c       | 6'        | CURB INLET                   | 5 YR            | 5.0         | 1.3         |
| 15d       | 2.5'x2.5' | GRATE INLET                  | 5 YR            | 0.2         | 0.0         |
| 16a       | 6'        | CURB INLET                   | 5 YR            | 1.2         | 0.8         |
| 17a       | 8'        | EXIST DBL THROAT CURB INLET  | 5 YR            | 1.5         | 0.4         |
| 17b       | 8'        | EXIST DBL THROAT CURB INLET  | 5 YR            | 3.9         | 3.2         |
| 17c       | 8'        | DBL THROAT CURB INLET        | 5 YR            | 9.2         | 0.0         |
| 18a       | 6'        | DBL THROAT CURB INLET (SUMP) | 100 YR          | 9.9         | 1.1         |
| 19a       | 8'        | EXIST CURB INLET             | 5 YR            | 0.5         | 0.0         |

**HYDROLOGIC  
SUMMARY EXHIBITS**

**RUNOFF CURVE DETERMINATION FOR SCS METHOD**  
**MASTER DRAINAGE PLANNING STUDY**  
**HEWLETT PACKARD EXPANSION**  
**Date: February, 1998**  
**Project No.**

| Summary Pnt               | Drainage Subbasin | Area ID                 | Existing Land Use | Area | Curve Number | CN*A   | Total Subbasin Area | Total Area @ Summ Pnt | Average CN | Comments |
|---------------------------|-------------------|-------------------------|-------------------|------|--------------|--------|---------------------|-----------------------|------------|----------|
| Development Conditions #1 |                   |                         |                   |      |              |        |                     |                       |            |          |
| 1                         | A                 | Hotsy S/D               | Paved/Buildings   | 2.6  | 98           | 254.8  |                     |                       |            |          |
|                           |                   | Hotsy S/D               | Vacant/Platted    | 7.4  | 65           | 481.0  |                     |                       |            |          |
|                           |                   | PV Indus Prk #8         | Vacant/Platted    | 6.8  | 65           | 442.0  |                     |                       |            |          |
|                           |                   | Mtn Rsrch Bus Prk #1    | Industrial        | 2.8  | 94           | 263.2  |                     |                       |            |          |
|                           |                   | Unplatted Area          | Vacant            | 11.6 | 65           | 754.0  | 31.2                |                       |            |          |
| 5                         | B,C,D             | Hewlett Packard         | Paved/Buildings   | 54.7 | 96           | 5251.2 |                     |                       |            |          |
|                           |                   |                         | Vacant Platted    | 43.9 | 65           | 2853.5 | 98.6                |                       |            |          |
|                           | M                 | Garden of the Gods Road | Roadway           | 5.5  | 98           | 539.0  | 5.5                 |                       |            |          |
| TOTALS                    |                   |                         |                   |      |              |        |                     | 135.3                 | 80.1       |          |
| Development Conditions #2 |                   |                         |                   |      |              |        |                     |                       |            |          |
| 5                         | B,C,D             | Hewlett Packard         | Paved/Buildings   | 54.7 | 96           | 5251.2 |                     |                       |            |          |
|                           |                   |                         | Vacant Platted    | 43.9 | 65           | 2853.5 | 98.6                |                       |            |          |
|                           | M                 | Garden of the Gods Road | Roadway           | 5.5  | 98           | 539.0  | 5.5                 |                       |            |          |
| TOTALS                    |                   |                         |                   |      |              |        |                     | 104.1                 | 83.0       |          |
| Development Conditions #3 |                   |                         |                   |      |              |        |                     |                       |            |          |
| 5                         | B,C,D             | Hewlett Packard         | Industrial        | 98.6 | 87.5         | 8627.5 |                     |                       |            |          |
|                           |                   |                         | Vacant Platted    | 0.0  | 65           | 0.0    | 98.6                |                       |            |          |
|                           | M                 | Garden of the Gods Road | Roadway           | 5.5  | 98           | 539.0  | 5.5                 |                       |            |          |
| TOTALS                    |                   |                         |                   |      |              |        |                     | 104.1                 | 88.1       |          |
| Development Conditions #4 |                   |                         |                   |      |              |        |                     |                       |            |          |
| 5                         | B,C,D             | Hewlett Packard         | Industrial        | 98.6 | 87.5         | 8627.5 |                     |                       |            |          |
|                           |                   |                         | Vacant Platted    | 0.0  | 65           | 0.0    | 98.6                |                       |            |          |
|                           | M                 | Garden of the Gods Road | Roadway           | 5.5  | 98           | 539.0  | 5.5                 | 104.1                 | 88.1       |          |
|                           | E,F,G             | Unplatted               | Industrial        | 20.7 | 88           | 1821.6 |                     |                       |            |          |
| TOTALS                    |                   |                         |                   |      |              |        |                     | 124.8                 | 88.0       |          |

CNSUMM.XLS

| Summary Pnt               | Drainage Subbasin | Area ID                 | Existing Land Use | Area | Curve Number | CN*A   | Total Subbasin Area | Total Area @ Summ Pnt | Average CN | Comments |
|---------------------------|-------------------|-------------------------|-------------------|------|--------------|--------|---------------------|-----------------------|------------|----------|
| Development Conditions #5 |                   |                         |                   |      |              |        |                     |                       |            |          |
|                           | B,C,D             | Hewlett Packard         | Industrial        | 54.7 | 96           | 5251.2 |                     |                       |            |          |
|                           |                   |                         | Vacant Platted    | 43.9 | 65           | 2853.5 | 98.6                |                       |            |          |
|                           | M                 | Garden of the Gods Road | Roadway           | 5.5  | 98           | 539.0  | 5.5                 | 104.1                 | 83.0       |          |
|                           | E,F,G             | Unplatted               | Industrial        | 20.7 | 88           | 1821.6 |                     |                       |            |          |
| TOTALS                    |                   |                         |                   |      |              |        |                     | 124.8                 | 83.9       |          |
|                           |                   |                         |                   |      |              |        |                     |                       |            |          |
|                           |                   |                         |                   |      |              |        |                     |                       |            |          |
|                           |                   |                         |                   |      |              |        |                     |                       |            |          |
|                           |                   |                         |                   |      |              |        |                     |                       |            |          |

**RUNOFF COEFFICIENT DETERMINATION FOR RATIONAL METHOD**  
**MASTER DRAINAGE PLANNING STUDY**  
**HEWLETT PACKARD EXPANSION**

**Date: January, 1998**

**Project No.**

| Summ Pnt                                      | Drainage Subbasin | Area ID          | Land Use        | Area  | C5   | C100 | C*A 5yr | C*A 100yr | Total Area | Ave C5 | Ave C100 | Comments |
|---|-------------------|------------------|-----------------|-------|------|------|---------|-----------|------------|--------|----------|----------|
| Existing or Historical Development Conditions |                   |                  |                 |       |      |      |         |           |            |        |          |          |
| 1   | A                 | Hotsy S/D        | Paved/Buildings | 2.60  | 0.90 | 0.95 | 2.34    | 2.47      |            |        |          |          |
|   |                   | Hotsy S/D        | Vacant/Platted  | 7.40  | 0.25 | 0.30 | 1.85    | 2.22      |            |        |          |          |
|   |                   | PV Indus Prk #8  | Vacant/Platted  | 6.80  | 0.25 | 0.35 | 1.70    | 2.38      |            |        |          |          |
|   |                   | Mtn Rsrch B P #1 | Industrial      | 2.80  | 0.80 | 0.90 | 2.24    | 2.52      |            |        |          |          |
|   |                   | Unplatted Area   | Vacant          | 11.60 | 0.25 | 0.35 | 2.90    | 4.06      | 31.20      | 0.35   | 0.44     |          |
| 3   | B                 | HP Main Campus   | Industrial      | 19.60 | 0.80 | 0.90 | 15.68   | 17.64     |            |        |          |          |
|   |                   | HP Main Campus   | Vacant/Platted  | 4.10  | 0.25 | 0.35 | 1.03    | 1.44      | 23.70      | 0.70   | 0.80     |          |
| 4   | C                 | HP Main Campus   | Vacant/Platted  | 38.60 | 0.25 | 0.35 | 9.65    | 13.51     |            |        |          |          |
| 5   | D                 | HP Main Campus   | Industrial      | 36.40 | 0.80 | 0.90 | 29.12   | 32.76     |            |        |          |          |
| 7   | E                 | CS Substation    | Vacant          | 6.90  | 0.25 | 0.35 | 1.73    | 2.42      |            |        |          |          |
|   | F                 | HP Unplatted     | Vacant          | 13.80 | 0.25 | 0.35 | 3.45    | 4.83      |            |        |          |          |
|   | G                 | HP Unplatted     | Vacant          | 5.00  | 0.25 | 0.35 | 1.25    | 1.75      | 25.70      | 0.25   | 0.35     |          |
| Full Development Conditions                   |                   |                  |                 |       |      |      |         |           |            |        |          |          |
| 1   | A                 | Hotsy S/D        | Industrial      | 10.00 | 0.80 | 0.90 | 8.00    | 9.00      |            |        |          |          |
|   |                   | PV Indus Prk #8  | Industrial      | 6.80  | 0.80 | 0.90 | 5.44    | 6.12      |            |        |          |          |
|   |                   | Mtn Rsrch B P #1 | Industrial      | 2.80  | 0.80 | 0.90 | 2.24    | 2.52      |            |        |          |          |
|   |                   | Unplatted Area   | Industrial      | 11.60 | 0.80 | 0.90 | 9.28    | 10.44     | 31.20      | 0.80   | 0.90     |          |
| 3   | B                 | HP Main Campus   | Industrial      | 23.70 | 0.80 | 0.90 |         |           |            |        |          |          |
| 4   | C                 | HP Main Campus   | Industrial      | 38.50 | 0.80 | 0.90 |         |           |            |        |          |          |
| 5   | D                 | HP Main Campus   | Industrial      | 36.40 | 0.80 | 0.90 |         |           |            |        |          |          |
| 6   | E                 | CS Substation    | Industrial      | 6.90  | 0.80 | 0.90 |         |           |            |        |          |          |
|   | F                 | HP Unplatted     | Industrial      | 13.80 | 0.80 | 0.90 |         |           |            |        |          |          |
| 7   | E                 | CS Substation    | Vacant          | 6.90  | 0.80 | 0.90 | 5.52    | 6.21      |            |        |          |          |





Time of Concentration Calculations

Hewlett Packard MDDP

Date: February, 1998

Project #: 97059

| Summ Pnt   | Overland Travel Time |     |       |      | Channel Travel Time |         |                |     | C & G Travel Time |       |     |     | Strm Swr/Channel Travel Time |              |          |     | Cum Tc | Comments |
|--|----------------------|-----|-------|------|---------------------|---------|----------------|-----|-------------------|-------|-----|-----|------------------------------|--------------|----------|-----|--------|----------|
|  | Length               | C   | Slope | Tt   | Length              | H1 - H2 | Ave. Vel (fps) | Tt  | Length            | Slope | Vel | Tt  | Length                       | Diam         | Appr Vel | Tt  |        |          |
| Hotey Outfall (Point #1)                               |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| Existing Conditions                                    |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 1  | 300                  | 0.3 | 3.3   | 18   | 800                 | 28      | 2.7            | 4.9 |                   |       |     |     |                              |              |          |     |        |          |
|  |                      |     |       |      | 800                 |         | 10             | 1.3 |                   |       |     |     |                              |              |          |     | 24.2   |          |
| Developed Conditions                                   |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 1  | 100                  | 0.3 | 3.3   | 6    |                     |         |                |     | 300               | 3     | 5   | 1   | 1500                         |              | 12       | 2.1 | 9.1    |          |
| HP Tract "A": Main Campus                              |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| Garden of the Gods Road                                |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 2  | 100                  | 0.3 | 10    | 5    |                     |         |                | Neg | 450               | 2     | 4   | 1.9 | 800                          | 24-27        | 12       | 1.1 | 8      |          |
| 3  |                      |     |       |      |                     |         |                |     |                   |       |     |     | 500                          | 30           | 12       | 0.7 | 8.7    |          |
| 11   |                      |     |       |      |                     |         |                |     |                   |       |     |     | 1100                         | 36           | 12       | 1.5 | 10.2   |          |
| Existing Conditions for subbasin "C"                   |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 4  | 500                  | 0.8 | 4     | 21   | 2400                | na      | 6              | 6.7 |                   |       |     |     |                              |              |          |     | 27.7   |          |
| 11   |                      |     |       |      |                     |         |                |     |                   |       |     |     | 1000                         | 42           | 15       | 1.1 | 28.8   |          |
| Developed Conditions for subbasin "C"                  |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 4  | 100                  | 0.3 | 10    | 5    |                     |         |                | neg | 500               | 2     | 4   | 2.1 | 2200                         | 24-36        | 12       | 3.1 | 10.2   |          |
| 11   |                      |     |       |      |                     |         |                |     |                   |       |     |     | 1000                         | 42           | 15       | 1.1 | 11.3   |          |
| HP drainage outfall through Rockwell site @ Sum Pnt #5 |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| Development Scenario #1                                |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 1  | 300                  | 0.3 | 3.3   | 18   | 800                 | 28      | 2.7            | 4.9 |                   |       |     |     | 800                          | Cono Channel | 10       | 1.3 | 24.2   |          |
| 5  |                      |     |       |      |                     |         |                |     |                   |       |     |     | 2100                         | 24-36        | 12       | 2.9 | 27.1   |          |
| Development Scenario #2                                |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 5  | 500                  | 0.3 | 3.2   | 21.9 | 2300                | 74      | 8              | 4.7 |                   |       |     |     | 1000                         | 42           | 12       | 1.4 | 28     |          |
| Development Scenario #3                                |                      |     |       |      |                     |         |                |     |                   |       |     |     |                              |              |          |     |        |          |
| 5  | 200                  | 0.9 | 2     | 5    |                     |         |                |     | 500               | 4     | 4   | 2.1 | 3200                         | 24-36        | 12       | 4.4 | 11.5   |          |

| Summ Pnt                                   | Overland Travel Time  |      |       |      | Channel Travel Time |         |                |      | C & G Travel Time |       |     |     | Strm Swr/Channel Travel Time |       |          |     | Cum Tc | Comments |
|--|---|------|-------|------|---------------------|---------|----------------|------|-------------------|-------|-----|-----|------------------------------|-------|----------|-----|--------|----------|
|  | Length  | C    | Slope | Tt   | Length              | H1 - H2 | Ave. Vel (fps) | Tt   | Length            | Slope | Vel | Tt  | Length                       | Diam  | Appr Vel | Tt  |        |          |
|  | Development Scenario #4   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
| 5  | 200   | 0.9  | 2     | 5    |                     |         |                |      | 500               | 4     | 4   | 2.1 | 3200                         | 24-36 | 12       | 4.4 | 11.5   |          |
|  | Development Scenario #5   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
| 5  | 500   | 0.3  | 3.2   | 21.9 | 2300                | 74      | 8              | 4.7  |                   |       |     |     | 1000                         | 42    | 12       | 1.4 | 28     |          |
| Areas east of HP First Filling (Tract "A") |   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
|  | Existing Conditions   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
| 7  | 500   | 0.3  | 4     | 17.7 | 1650                | 28      | 2.4            | 11.6 |                   |       |     |     |                              |       |          |     | 29.3   |          |
|  | Developed Conditions w/ subbasins E & F contributing runoff to Pnt #7 |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
| 7  | 150   | 0.35 | 4     | 10.4 |                     |         |                |      | 500               | 4     | 4   | 2.1 | 1350                         | 24-30 | 12       | 1.9 | 14.4   |          |
| 13   |   |      |       |      |                     |         |                |      |                   |       |     |     | 1050                         | 36    | 12       | 1.5 | 15.9   |          |
| 14   |   |      |       |      |                     |         |                |      |                   |       |     |     | 500                          | 42    | 12       | 0.7 | 18.6   |          |
|  | Developed Conditions w/ subbasins E & F contributing runoff to Pnt #8 |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
| 8  | 150   | 0.35 | 4     | 10.4 |                     |         |                |      | 500               | 4     | 4   | 2.1 | 1000                         | 42    | 12       | 1.4 | 13.9   |          |
| 7  |   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     | <5     |          |
| 13   | 150   | 0.35 | 4     | 10.4 |                     |         |                |      | 400               |       | 4   | 1.7 | 900                          | 24-30 | 12       | 1.3 | 13.4   |          |
| 14   |   |      |       |      |                     |         |                |      |                   |       |     |     | 500                          | 42    | 12       | 0.7 | 14.1   |          |
| HP Outfall System                          |   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
|  | Existing Conditions   |      |       |      |                     |         |                |      |                   |       |     |     |                              |       |          |     |        |          |
| 11   | 300   | 0.3  | 2.7   | 18.5 | 700                 | 30      | 2.7            | 4.3  | 400               |       | 4   | 1.7 | 2300                         | 24-36 | 12       | 3.2 | 27.9   |          |
| 15   |   |      |       |      |                     |         |                |      |                   |       |     |     | Neg                          |       |          |     | 27.9   |          |
| 17   |   |      |       |      |                     |         |                |      |                   |       |     |     | 450                          | 60    | 12       | 0.6 | 28.5   |          |
| 18   |   |      |       |      |                     |         |                |      |                   |       |     |     | 450                          | 60    | 12       | 0.6 | 29.1   |          |
| 19   |   |      |       |      |                     |         |                |      |                   |       |     |     | 150                          |       |          | neg | 29.1   |          |
| 20   |   |      |       |      |                     |         |                |      |                   |       |     |     | 500                          | 60    | 12       | 0.7 | 29.8   |          |

Summary of Design Flows for Rational Method

Master Development Drainage Plan

Hewlett Packard Expansion

Date: February, 1998

Project #:

| Summ Pnt                       | Drainage Area        |              | Runoff Coefficients |      |          | Rainfall Intensity |      |       | Cummulative |    | Comments |
|--------------------------------|----------------------|--------------|---------------------|------|----------|--------------------|------|-------|-------------|----|----------|
|                                | ID                   | Area (acres) | C5                  | C100 | Tc (min) | I5                 | I100 | Q5    | Q100        | Q5 |          |
| Hotsy Outfall                  |                      |              |                     |      |          |                    |      |       |             |    |          |
|                                | Existing Conditions  |              |                     |      |          |                    |      |       |             |    |          |
| 1                              | A                    | 31.2         | 0.35                | 0.44 | 24.2     | 2.6                | 4.6  | 28.4  | 63.1        |    |          |
|                                | Developed Conditions |              |                     |      |          |                    |      |       |             |    |          |
| 1                              | A                    | 31.2         | 0.80                | 0.90 | 9.1      | 4.1                | 7.2  | 102.3 | 202.2       |    |          |
| HP Tract "A": Main Campus      |                      |              |                     |      |          |                    |      |       |             |    |          |
|                                | Existing Conditions  |              |                     |      |          |                    |      |       |             |    |          |
| 3                              | B                    | 23.7         | 0.80                | 0.90 | 8.7      | 4.1                | 7.2  | 77.7  | 153.6       |    |          |
| 4                              | C                    | 38.5         | 0.25                | 0.35 | 27.7     | 2.5                | 4.3  | 24.1  | 57.9        |    |          |
| 5                              | D                    | 36.4         | 0.80                | 0.90 | 10.2     | 4.0                | 7.0  | 116.5 | 229.3       |    |          |
|                                | Developed Conditions |              |                     |      |          |                    |      |       |             |    |          |
| 3                              | B                    | 23.7         | 0.80                | 0.90 | 8.7      | 4.1                | 7.2  | 77.7  | 153.6       |    |          |
| 4                              | C                    | 38.5         | 0.80                | 0.90 | 10.2     | 4.0                | 7.0  | 123.2 | 242.6       |    |          |
| 5                              | D                    | 36.4         | 0.80                | 0.90 | 10.2     | 4.0                | 7.0  | 116.5 | 229.3       |    |          |
| 6                              | E,F                  | 20.7         | 0.80                | 0.90 | 13.9     | 3.6                | 6.2  | 59.6  | 115.5       |    |          |
| HP Tract "B": Unplatted Parcel |                      |              |                     |      |          |                    |      |       |             |    |          |
|                                | Existing Conditions  |              |                     |      |          |                    |      |       |             |    |          |
| 7                              | E,F,G                | 25.7         | 0.30                | 0.40 | 29.3     | 2.4                | 4.2  | 18.5  | 43.2        |    |          |
|                                | Developed Conditions |              |                     |      |          |                    |      |       |             |    |          |
| 7                              | E,F,G                | 25.7         | 0.80                | 0.90 | <5       | 5.2                | 9.0  | 106.9 | 208.2       |    |          |

| Summ Pnt                                  | Drainage Area |              | Runoff Coefficients |      | Tc (min) | Rainfall Intensity |      |       |       | Cummulative |       | Comments                |
|---|---------------|--------------|---------------------|------|----------|--------------------|------|-------|-------|-------------|-------|-------------------------|
|   | ID            | Area (acres) | C5                  | C100 |          | I5                 | I100 | Q5    | Q100  | Q5          | Q100  |                         |
| Developed Conditions w/ Diversion of E,F  |               |              |                     |      |          |                    |      |       |       |             |       |                         |
| 6   | E,F           | 20.7         | 0.80                | 0.90 | 13.9     | 3.8                | 6.2  | 59.8  | 115.5 |             |       |                         |
| 7   | G             | 5.0          | 0.80                | 0.90 | <5       | 5.2                | 9.0  | 20.8  | 40.5  |             |       |                         |
| Discharge Points East of HP Site          |               |              |                     |      |          |                    |      |       |       |             |       |                         |
| w/o diversion of subbasins E and F        |               |              |                     |      |          |                    |      |       |       |             |       |                         |
| 7   | E,F,G         | 25.7         | 0.80                | 0.90 | 14.4     | 3.5                | 6.0  | 72.0  | 138.8 |             |       |                         |
| 13  | H             | 28.1         | 0.90                | 0.90 | 15.9     | 3.4                | 5.8  | 76.4  | 146.7 | 148.4       | 285.5 |                         |
| 14  | I             | 7.0          | 0.80                | 0.90 | 16.6     | 3.3                | 5.7  | 18.5  | 35.9  | 166.9       | 321.4 |                         |
| w/ diversion of subbasins E and F         |               |              |                     |      |          |                    |      |       |       |             |       |                         |
| 7   | G             | 5.0          | 0.80                | 0.90 | <5       | 5.2                | 9.0  | 20.8  | 40.5  |             |       |                         |
| 13  | G,H           | 33.1         | 0.80                | 0.90 | 13.4     | 3.7                | 6.4  | 100.0 | 190.7 | 100.0       | 190.7 |                         |
| 14  | I             | 7.0          | 0.80                | 0.90 | 14.1     | 3.5                | 6.0  | 19.6  | 37.8  | 119.6       | 228.5 |                         |
| HP Outfall: for information purposes only |               |              |                     |      |          |                    |      |       |       |             |       |                         |
| 11  | Offsite       | 104.2        | CN=83.0             |      | 27.9     | na                 | na   | 91.0  | 243.0 |             |       | Based on Hec 1 analysis |
| 15  |               | 1.1          | 0.90                | 0.95 | 27.9     | 2.5                |      | 2.4   |       |             |       |                         |
| 18  |               | 0.3          | 0.84                |      |          |                    |      |       |       |             |       |                         |
|   |               | 5.0          | 0.74                |      |          |                    |      |       |       |             |       |                         |
|   |               | 0.1          | 0.90                |      |          |                    |      |       |       |             |       |                         |
|   | Totals        | 2.1          | 0.71                |      | 29.1     | 2.4                |      | 9.8   |       |             |       |                         |
| 19  |               | 2.1          | 0.71                |      | 29.1     | 2.4                |      | 3.5   |       |             |       |                         |
| 20  |               | 3.2          | 0.80                |      |          |                    |      |       |       |             |       |                         |
|   |               | 1.1          | 0.61                |      |          |                    |      |       |       |             |       |                         |
|   |               | 4.7          | 0.77                |      |          |                    |      |       |       |             |       |                         |
|   |               | 0.2          | 0.90                |      |          |                    |      |       |       |             |       |                         |
|   | Totals        | 9.2          | 0.76                |      | 29.8     | 2.4                |      | 16.9  |       |             |       |                         |
|   | Total         |              |                     |      |          |                    |      | 32.6  |       |             |       |                         |

**Hydrologic Summary at Summary Point #5****Master Development Drainage Plan****Date: February, 1998****Project #: 97059**

| Development Conditions  | Drainage Area |              | Runoff Coefficients |      |      | Runoff   |            |
|---|---------------|--------------|---------------------|------|------|----------|------------|
|   | ID            | Area (acres) | C5                  | C100 | CN   | Q5 (cfs) | Q100 (cfs) |
| 1. Existing Dev. w/ Area West of HP   | A,B,C,D       | 135.3        | NA                  | NA   | 80.1 | NA       | 283        |
| 2. Existing Dev. w/o Area West of HP  | B,C,D         | 104.2        | NA                  | NA   | 83   | 91       | 243        |
| 3. Full Development of Platted HP site w/o Area West of HP  | B,C,D         | 104.2        | NA                  | NA   | 88   | 195      | 439        |
| 3A. Full development of platted HP w/ full development of areas west of HP site                               | A,B,C,D       | 135.3        | NA                  | NA   | 88   | 253      | 571        |
| 4. Full Development of HP Platted site and 20.7 acres of Unplatted site                                       | B,C,D,E,F     | 124.7        | NA                  | NA   | 88   | 233      | 527        |
| 5. Exist Dev of Platted HP site and Full Dev of 20.7 Acres of Unplatted Site, no runoff from areas West of HP | B,C,D,E,F     | 124.9        | NA                  | NA   | 83.8 | 115      | 302        |

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*     MAY 1991                      *
*     VERSION 4.0.1E                *
*
* RUN DATE **/**/1997 TIME 00:00:** *
*
*****

```

```

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

```

Runoff Determination @ Hewlett Packard Outfall  
Existing Conditions w/ Areas West of HP Contributing Runoff  
100 yr/ 24 hour Storm=4.6" (97059A.HC1)

```

5 10      OUTPUT CONTROL VARIABLES
          IPRNT      5  PRINT CONTROL
          IPLOT      0  PLOT CONTROL
          QSCAL      0. HYDROGRAPH PLOT SCALE

```

```

IT        HYDROGRAPH TIME DATA
          NMIN      15  MINUTES IN COMPUTATION INTERVAL
          IDATE     14NOV97  STARTING DATE
          ITIME     1000  STARTING TIME
          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
          NDDATE    17NOV97  ENDING DATE
          NDTIME    1245  ENDING TIME
          ICENT     19  CENTURY MARK

          COMPUTATION INTERVAL  0.25 HOURS
          TOTAL TIME BASE      74.75 HOURS

```

```

ENGLISH UNITS
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH  INCHES
LENGTH, ELEVATION  FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT

```

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10       |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                     |
| 2    | ID Existing Conditions w/ Areas West of HP Contributing Runoff        |
| 3    | ID 100 yr/ 24 hour Storm=4.6" (97059A.HC1)                            |
| 4    | IT 15 14NOV97 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea West of HP's Easterly Property Line and N of Garden of Gods |
| 7    | KM Basin Runoff from <del>101,2,5A</del> , B,C,D                      |
| 8    | BA 0.2116   |
| 9    | PB 4.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165        |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060         |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000              |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600        |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975        |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300        |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550        |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800        |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925        |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000                                |
| 21   | LS 80.1   |
| 22   | UD 0.2700   |
| 23   | ZZ  |

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 283.         | 5.75            | 47.                             | 15.     | 5.      | 0.21          |                  |                      |

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



|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10       |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                     |
| 2    | ID Existing Conditions w/o Area West of HP                            |
| 3    | ID 100 yr/ 24 hour Storm=4.6" (97059B.HC1)                            |
| 4    | IT 15 14NOV97 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea West of HP's Easterly Property Line and N of Garden of Gods |
| 7    | KM Basin Runoff from <del>5</del> B, A, D                             |
| 8    | BA 0.1628   |
| 9    | PB 4.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165        |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060         |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000              |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600        |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975        |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300        |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550        |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800        |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925        |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000                                |
| 21   | LS 83.0   |
| 22   | UD 0.2790   |
| 23   | ZZ  |

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*     MAY 1991                       *
*     VERSION 4.0.1E                 *
*
* RUN DATE **/**/1997 TIME 00:00:** *
*
*****
```

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

Runoff Determination @ Hewlett Packard Outfall  
 Existing Conditions w/o Area West of HP  
 100 yr/ 24 hour Storm=4.6" (97059B.HC1)

5 IO      OUTPUT CONTROL VARIABLES

```
IPRNT      5    PRINT CONTROL
IPLOT      0    PLOT CONTROL
QSCAL      0.    HYDROGRAPH PLOT SCALE
```

IT      HYDROGRAPH TIME DATA

```
NMIN      15    MINUTES IN COMPUTATION INTERVAL
IDATE      14NOV97    STARTING DATE
ITIME      1000    STARTING TIME
NQ      300    NUMBER OF HYDROGRAPH ORDINATES
NDDATE      17NOV97    ENDING DATE
NDTIME      1245    ENDING TIME
ICENT      19    CENTURY MARK
```

```
COMPUTATION INTERVAL    0.25 HOURS
TOTAL TIME BASE        74.75 HOURS
```

ENGLISH UNITS

```
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH    INCHES
LENGTH, ELEVATION    FEET
FLOW                CUBIC FEET PER SECOND
STORAGE VOLUME      ACRE-FEET
SURFACE AREA        ACRES
TEMPERATURE         DEGREES FAHRENHEIT
```

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 243.         | 5.75            | 41.                             | 13.     | 4.      | 0.16          |                  |                      |

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

| LINE | ID | 1  | 2       | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------|----|--|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1    | ID | Runoff Determination @ Hewlett Packard Outfall                     |         |       |       |       |       |       |       |       |       |
| 2    | ID | Existing Conditions w/o Area West of HP                            |         |       |       |       |       |       |       |       |       |
| 3    | ID | 5 yr/ 24 hour Storm=2.6" (97059C.HC1)                              |         |       |       |       |       |       |       |       |       |
| 4    | IT | 15   | 14NOV97 | 1000  | 300   |       |       |       |       |       |       |
| 5    | IO | 5  | 0       | 0     |       |       |       |       |       |       |       |
| 6    | KK | GGArea West of HP's Easterly Property Line and N of Garden of Gods |         |       |       |       |       |       |       |       |       |
| 7    | KM | Basin Runoff from <del>GGZ</del> B, C, D                           |         |       |       |       |       |       |       |       |       |
| 8    | BA | 0.1628   |         |       |       |       |       |       |       |       |       |
| 9    | PB | 2.6  |         |       |       |       |       |       |       |       |       |
| 10   | IN | 15   |         |       |       |       |       |       |       |       |       |
| 11   | PC | .0005  | .0015   | .0030 | .0045 | .0060 | .0080 | .0100 | .0120 | .0143 | .0165 |
| 12   | PC | .0188  | .0210   | .0233 | .0255 | .0278 | .0320 | .0390 | .0460 | .0530 | .060  |
| 13   | PC | .0750  | .1      | .4    | .7000 | .7250 | .7500 | .7650 | .7800 | .7900 | .8000 |
| 14   | PC | .8100  | .8200   | .8250 | .8300 | .8350 | .8400 | .8430 | .8500 | .8550 | .8600 |
| 15   | PC | .8638  | .8675   | .8713 | .8750 | .8788 | .8825 | .8863 | .8900 | .8938 | .8975 |
| 16   | PC | .9013  | .9050   | .9083 | .9115 | .9148 | .9180 | .9210 | .9240 | .9270 | .9300 |
| 17   | PC | .9325  | .9350   | .9375 | .9400 | .9425 | .9450 | .9475 | .9500 | .9525 | .9550 |
| 18   | PC | .9275  | .9600   | .9625 | .9650 | .9675 | .9700 | .9725 | .9750 | .9775 | .9800 |
| 19   | PC | .9813  | .9825   | .9838 | .9850 | .9863 | .9875 | .9888 | .9900 | .9913 | .9925 |
| 20   | PC | .9938  | .9950   | .9963 | .9975 | .9988 | 1.000 |       |       |       |       |
| 21   | LS |  | 83.0    |       |       |       |       |       |       |       |       |
| 22   | UD | 0.2790   |         |       |       |       |       |       |       |       |       |
| 23   | ZZ |  |         |       |       |       |       |       |       |       |       |

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*     MAY 1991 *
*     VERSION 4.0.1E *
*
* RUN DATE **/**/1997 TIME 00:00:** *
*
*****

```

```

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

```

Runoff Determination @ Hewlett Packard Outfall  
Existing Conditions w/o Area West of HP  
5 yr/ 24 hour Storm=2.6" (97059C.HC1)

5 IO

OUTPUT CONTROL VARIABLES

```

IPRNT      5 PRINT CONTROL
IPLOT      0 PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE

```

IT

HYDROGRAPH TIME DATA

```

NMIN      15 MINUTES IN COMPUTATION INTERVAL
IDATE     14NOV97 STARTING DATE
ITIME     1000 STARTING TIME
NQ        300 NUMBER OF HYDROGRAPH ORDINATES
MDDATE    17NOV97 ENDING DATE
NDTIME    1245 ENDING TIME
ICENT     19 CENTURY MARK

```

```

COMPUTATION INTERVAL  0.25 HOURS
TOTAL TIME BASE       74.75 HOURS

```

ENGLISH UNITS

```

DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION  FEET
FLOW                CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT

```

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 91.          | 6.00            | 16.                             | 5.      | 2.      | 0.16          |                  |                      |

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

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10       |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                     |
| 2    | ID Developed Conditions of HP Platted Area w/o Area West of HP Site   |
| 3    | ID 100 yr/ 24 hour Storm=4.6" (97059D.HC1)                            |
| 4    | IT 15 14NOV97 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea West of HP's Easterly Property Line and N of Garden of Gods |
| 7    | KM Basin Runoff from <del>area</del> B,C,D                            |
| 8    | BA 0.1628   |
| 9    | PB 4.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165        |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060         |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000              |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600        |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975        |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300        |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550        |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800        |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925        |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000                                |
| 21   | LS 88.0   |
| 22   | UD 0.1150   |
| 23   | ZZ  |

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*     MAY 1991                       *
*     VERSION 4.0.1E                 *
*
* RUN DATE **/**/1997 TIME 00:00:** *
*
*****
```

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

Runoff Determination @ Hewlett Packard Outfall  
 Developed Conditions of HP Platted Area w/o Area West of HP Site  
 100 yr/ 24 hour Storm=4.6" (970590.HC1)

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

```
IT      HYDROGRAPH TIME DATA
          NMIN      15  MINUTES IN COMPUTATION INTERVAL
          IDATE     14NOV97  STARTING DATE
          ITIME     1000  STARTING TIME
          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
          NDDATE    17NOV97  ENDING DATE
          NDTIME    1245  ENDING TIME
          ICENT     19  CENTURY MARK
```

```
COMPUTATION INTERVAL  0.25 HOURS
TOTAL TIME BASE      74.75 HOURS
```

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



RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---------------|---------|-----------|--------------|---------------------------------|---------|---------|------------|---------------|-------------------|
|               |         |           |              | 6-HOUR                          | 24-HOUR | 72-HOUR |            |               |                   |
| HYDROGRAPH AT | GG      | 439.      | 5.75         | 48.                             | 15.     | 5.      | 0.16       |               |                   |

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

HEC-1 INPUT

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10       |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                     |
| 2    | ID Developed Conditions of HP Platted Area w/o Area West of HP        |
| 3    | ID 5 yr/ 24 hour Storm=2.6" (97059E.HC1)                              |
| 4    | IT 15 14NOV97 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea West of HP's Easterly Property Line and N of Garden of Gods |
| 7    | KM Basin Runoff from <del>8025</del> B, C, D                          |
| 8    | BA 0.1628   |
| 9    | PB 2.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165        |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060         |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000              |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600        |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975        |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300        |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550        |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800        |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925        |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000                                |
| 21   | LS 88.0   |
| 22   | UD 0.1150   |
| 23   | ZZ  |

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
*
* RUN DATE **/**/1997 TIME 00:00:** *
*
*****
```

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

Runoff Determination @ Hewlett Packard Outfall  
 Developed Conditions of HP Platted Area w/o Area West of HP  
 5 yr/ 24 hour Storm=2.6" (97059E.HC1)

5 10

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL  
 IPLOT 0 PLOT CONTROL  
 QSCAL 0. HYDROGRAPH PLOT SCALE

IT

HYDROGRAPH TIME DATA

NMIN 15 MINUTES IN COMPUTATION INTERVAL  
 IDATE 14NOV97 STARTING DATE  
 ITIME 1000 STARTING TIME  
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES  
 NDDATE 17NOV97 ENDING DATE  
 NDTIME 1245 ENDING TIME  
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.25 HOURS  
 TOTAL TIME BASE 74.75 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES  
 PRECIPITATION DEPTH INCHES  
 LENGTH, ELEVATION FEET  
 FLOW CUBIC FEET PER SECOND  
 STORAGE VOLUME ACRE-FEET  
 SURFACE AREA ACRES  
 TEMPERATURE DEGREES FAHRENHEIT

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 195.         | 5.75            | 21.                             | 7.      | 2.      | 0.16          |                  |                      |

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

| LINE | ID | 1  | 2       | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------|----|--|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1    | ID | Runoff Determination @ Hewlett Packard Outfall                   |         |       |       |       |       |       |       |       |       |
| 2    | ID | Developed Conditions of HP Platted Area w/ Area West of HP Site  |         |       |       |       |       |       |       |       |       |
| 3    | ID | 100 yr/ 24 hour Storm=4.6" (97059N.HC1)                          |         |       |       |       |       |       |       |       |       |
| 4    | IT | 15   | 02FEB98 | 1000  | 300   |       |       |       |       |       |       |
| 5    | IO | 5  | 0       | 0     |       |       |       |       |       |       |       |
| 6    | KK | Area West of HP's Easterly Property Line and N of Garden of Gods |         |       |       |       |       |       |       |       |       |
| 7    | KM | Basin Runoff from A,B,C,D  |         |       |       |       |       |       |       |       |       |
| 8    | BA | 0.2116   |         |       |       |       |       |       |       |       |       |
| 9    | PB | 4.6  |         |       |       |       |       |       |       |       |       |
| 10   | IN | 15   |         |       |       |       |       |       |       |       |       |
| 11   | PC | .0005  | .0015   | .0030 | .0045 | .0060 | .0080 | .0100 | .0120 | .0143 | .0165 |
| 12   | PC | .0188  | .0210   | .0233 | .0255 | .0278 | .0320 | .0390 | .0460 | .0530 | .060  |
| 13   | PC | .0750  | .1      | .4    | .7000 | .7250 | .7500 | .7650 | .7800 | .7900 | .8000 |
| 14   | PC | .8100  | .8200   | .8250 | .8300 | .8350 | .8400 | .8430 | .8500 | .8550 | .8600 |
| 15   | PC | .8638  | .8675   | .8713 | .8750 | .8788 | .8825 | .8863 | .8900 | .8938 | .8975 |
| 16   | PC | .9013  | .9050   | .9083 | .9115 | .9148 | .9180 | .9210 | .9240 | .9270 | .9300 |
| 17   | PC | .9325  | .9350   | .9375 | .9400 | .9425 | .9450 | .9475 | .9500 | .9525 | .9550 |
| 18   | PC | .9275  | .9600   | .9625 | .9650 | .9675 | .9700 | .9725 | .9750 | .9775 | .9800 |
| 19   | PC | .9813  | .9825   | .9838 | .9850 | .9863 | .9875 | .9888 | .9900 | .9913 | .9925 |
| 20   | PC | .9938  | .9950   | .9963 | .9975 | .9988 | 1.000 |       |       |       |       |
| 21   | LS |  | 88.0    |       |       |       |       |       |       |       |       |
| 22   | UD | 0.1150   |         |       |       |       |       |       |       |       |       |
| 23   | ZZ |  |         |       |       |       |       |       |       |       |       |

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*      MAY 1991 *
*      VERSION 4.0.1E *
*
* RUN DATE **/**/1998 TIME 00:00:** *
*
*****
```

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

Runoff Determination @ Hewlett Packard Outfall  
 Developed Conditions of HP Platted Area w/ Area West of HP Site  
 100 yr/ 24 hour Storm=4.6" (97059N.HC1)

5 10 OUTPUT CONTROL VARIABLES

```
IPRNT      5 PRINT CONTROL
IPLOT      0 PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE
```

IT HYDROGRAPH TIME DATA

```
NMIN      15 MINUTES IN COMPUTATION INTERVAL
IDATE     2FEB98 STARTING DATE
ITIME     1000 STARTING TIME
NQ        300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE    5FEB98 ENDING DATE
NDTIME    1245 ENDING TIME
ICENT     19 CENTURY MARK
```

```
COMPUTATION INTERVAL  0.25 HOURS
TOTAL TIME BASE      74.75 HOURS
```

ENGLISH UNITS

```
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION  FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT
```

RUNOFF SUMMARY  
 FLOW IN CUBIC FEET PER SECOND  
 TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT |         | 571.         | 5.75            | 63.                             | 19.     | 6.      | 0.21          |                  |                      |

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

Developed  
Candeler #3A

HEC-1 INPUT

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10       |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                     |
| 2    | ID Developed Conditions of HP Platted Area w/ Area West of HP         |
| 3    | ID 5 yr/ 24 hour Storm=2.6" (97059M.HC1)                              |
| 4    | IT 15 02FEB98 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea West of HP's Easterly Property Line and N of Garden of Gods |
| 7    | KM Basin Runoff from A,B,C,D  |
| 8    | BA 0.2116   |
| 9    | PB 2.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165        |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060         |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000              |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600        |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975        |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300        |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550        |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800        |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925        |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000                                |
| 21   | LS 88.0   |
| 22   | UD 0.1150   |
| 23   | ZZ  |



\*\*\*\*\*  
\*  
\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \*  
\*            MAY 1991            \*  
\*            VERSION 4.0.1E       \*  
\*  
\* RUN DATE \*\*/\*\*/1998 TIME 00:00:\*\* \*  
\*  
\*\*\*\*\*

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

Runoff Determination @ Hewlett Packard Outfall  
Developed Conditions of HP Platted Area w/ Area West of HP  
5 yr/ 24 hour Storm=2.6" (97059M.HC1)

5 IO            OUTPUT CONTROL VARIABLES

    IPRNT            5    PRINT CONTROL  
    IPLOT            0    PLOT CONTROL  
    QSCAL            0.    HYDROGRAPH PLOT SCALE

IT            HYDROGRAPH TIME DATA

    NMIN            15    MINUTES IN COMPUTATION INTERVAL  
    IDATE            2FEB98    STARTING DATE  
    ITIME            1000    STARTING TIME  
    NQ              300    NUMBER OF HYDROGRAPH ORDINATES  
    NDDATE           5FEB98    ENDING DATE  
    NDTIME           1245    ENDING TIME  
    ICENT            19    CENTURY MARK

    COMPUTATION INTERVAL    0.25 HOURS  
    TOTAL TIME BASE        74.75 HOURS

ENGLISH UNITS

    DRAINAGE AREA            SQUARE MILES  
    PRECIPITATION DEPTH      INCHES  
    LENGTH, ELEVATION        FEET  
    FLOW                      CUBIC FEET PER SECOND  
    STORAGE VOLUME            ACRE-FEET  
    SURFACE AREA              ACRES  
    TEMPERATURE                DEGREES FAHRENHEIT

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 253.         | 5.75            | 27.                             | 9.      | 3.      | 0.21          |                  |                      |

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

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10               |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                             |
| 2    | ID Developed Conditions of HP Platted/Unplatted Area w/o Area West of HP Site |
| 3    | ID 100 yr/ 24 hour Storm=4.6" (97059F.HC1)                                    |
| 4    | IT 15 27JAN98 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea Includes all of HP property except for 5.0 acres                    |
| 7    | KM Basin Runoff from <del>A</del> ,B,C,D,E,F                                  |
| 8    | BA 0.1952   |
| 9    | PB 4.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165                |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060                 |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000                      |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600                |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975                |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300                |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550                |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800                |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925                |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000  |
| 21   | LS 88.0   |
| 22   | UD 0.1150   |
| 23   | ZZ  |

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*      MAY 1991 *
*      VERSION 4.0.1E *
*
* RUN DATE **/**/1998 TIME 00:00:** *
*
*****

```

```

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

```

Runoff Determination @ Hewlett Packard Outfall  
 Developed Conditions of HP Platted/Unplatted Area w/o Area West of HP Site  
 100 yr/ 24 hour Storm=4.6" (97059F.HC1)

```

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

```

```

IT      HYDROGRAPH TIME DATA
          NMIN      15 MINUTES IN COMPUTATION INTERVAL
          IDATE     27JAN98 STARTING DATE
          ITIME     1000 STARTING TIME
          NQ        300 NUMBER OF HYDROGRAPH ORDINATES
          NDDATE    30JAN98 ENDING DATE
          NDTIME    1245 ENDING TIME
          ICENT     19 CENTURY MARK

          COMPUTATION INTERVAL  0.25 HOURS
          TOTAL TIME BASE       74.75 HOURS

```

ENGLISH UNITS

```

DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION  FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-FEET
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT

```

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 527.         | 5.75            | 58.                             | 18.     | 6.      | 0.20          |                  |                      |

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

Development  
Conditions #4

HEC-1 INPUT

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10               |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                             |
| 2    | ID Developed Conditions of HP Platted/Unplatted Area w/o Area West of HP Site |
| 3    | ID 5yr/ 24 hour Storm=2.6" (97059G.HC1)                                       |
| 4    | IT 15 27JAN98 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea Includes all of HP property except for 5.0 acres                    |
| 7    | KM Basin Runoff from B,C,D,E,F  |
| 8    | BA 0.1952   |
| 9    | PB 2.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165                |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060                 |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000                      |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600                |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975                |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300                |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550                |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800                |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925                |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000  |
| 21   | LS 88.0   |
| 22   | UD 0.1150   |
| 23   | ZZ  |

\*\*\*\*\*  
\*  
\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \*  
\*                    MAY 1991                    \*  
\*                    VERSION 4.0.1E                    \*  
\*  
\* RUN DATE \*\*/\*\*/1998 TIME 00:00:\*\* \*  
\*  
\*\*\*\*\*

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

Runoff Determination @ Hewlett Packard Outfall  
Developed Conditions of HP Platted/Unplatted Area w/o Area West of HP Site  
5yr/ 24 hour Storm=2.6" (97059G.HC1)

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

IT             HYDROGRAPH TIME DATA  
                NMIN            15    MINUTES IN COMPUTATION INTERVAL  
                IDATE           27JAN98    STARTING DATE  
                ITIME           1000    STARTING TIME  
                NQ              300    NUMBER OF HYDROGRAPH ORDINATES  
                NDDATE          30JAN98    ENDING DATE  
                NDTIME          1245    ENDING TIME  
                ICENT           19    CENTURY MARK

COMPUTATION INTERVAL    0.25 HOURS  
TOTAL TIME BASE        74.75 HOURS

ENGLISH UNITS  
DRAINAGE AREA            SQUARE MILES  
PRECIPITATION DEPTH     INCHES  
LENGTH, ELEVATION        FEET  
FLOW                     CUBIC FEET PER SECOND  
STORAGE VOLUME          ACRE-FEET  
SURFACE AREA             ACRES  
TEMPERATURE              DEGREES FAHRENHEIT

RUNOFF SUMMARY  
 FLOW IN CUBIC FEET PER SECOND  
 TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 233.         | 5.75            | 25.                             | 8.      | 3.      | 0.20          |                  |                      |

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



Development  
Condition #5

HEC-1 INPUT

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

1 ID Runoff Determination @ Hewlett Packard Outfall

2 ID Exist Conditions: HP Platted; 20.7 Unplatted Acres Developed, No flow from Wes

3 ID 100 yr/ 24 hour Storm=4.6" (97059H.HC1)

4 IT 15 27JAN98 1000 300

5 IO 5 0 0

6 KK GGArea Includes all of HP property except for 5.0 acres

7 KM Basin Runoff from B,C,D,E,F

8 BA 0.1952

9 PB 4.6

10 IN 15

11 PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165

12 PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060

13 PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000

14 PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600

15 PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975

16 PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300

17 PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550

18 PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800

19 PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925

20 PC .9938 .9950 .9963 .9975 .9988 1.000

21 LS 83.8

22 UD 0.2790

23 ZZ

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 302.         | 5.75            | 50.                             | 16.     | 5.      | 0.20          |                  |                      |

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

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*     MAY 1991                       *
*     VERSION 4.0.1E                 *
*
* RUN DATE **/**/1998 TIME 00:00:** *
*
*****
```

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

Runoff Determination @ Hewlett Packard Outfall  
 Exist Conditions: HP Platted; 20.7 Unplatted Acres Developed, No flow from Wes  
 100 yr/ 24 hour Storm=4.6" (97059H.HC1)

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

```
IT        HYDROGRAPH TIME DATA
          NMIN      15 MINUTES IN COMPUTATION INTERVAL
          IDATE     27JAN98 STARTING DATE
          ITIME     1000 STARTING TIME
          NQ        300 NUMBER OF HYDROGRAPH ORDINATES
          NDDATE    30JAN98 ENDING DATE
          NDTIME    1245 ENDING TIME
          ICENT     19 CENTURY MARK
```

```
COMPUTATION INTERVAL  0.25 HOURS
TOTAL TIME BASE       74.75 HOURS
```

ENGLISH UNITS

```
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION  FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME    ACRE-FEET
SURFACE AREA      ACRES
TEMPERATURE        DEGREES FAHRENHEIT
```

HEC-1 INPUT

|      |   |
|------|---|
| LINE | ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10                   |
| 1    | ID Runoff Determination @ Hewlett Packard Outfall                                 |
| 2    | ID Exist Conditions: HP Platted; 20.7 Unplatted Acres Developed, No flow from Wes |
| 3    | ID 5 yr/ 24 hour Storm=2.6" (970591.HC1)  |
| 4    | IT 15 27JAN98 1000 300  |
| 5    | IO 5 0 0  |
| 6    | KK GGArea Includes all of HP property except for 5.0 acres                        |
| 7    | KM Basin Runoff from B,C,D,E,F  |
| 8    | BA 0.1952   |
| 9    | PB 2.6  |
| 10   | IN 15   |
| 11   | PC .0005 .0015 .0030 .0045 .0060 .0080 .0100 .0120 .0143 .0165                    |
| 12   | PC .0188 .0210 .0233 .0255 .0278 .0320 .0390 .0460 .0530 .060                     |
| 13   | PC .0750 .1 .4 .7000 .7250 .7500 .7650 .7800 .7900 .8000                          |
| 14   | PC .8100 .8200 .8250 .8300 .8350 .8400 .8430 .8500 .8550 .8600                    |
| 15   | PC .8638 .8675 .8713 .8750 .8788 .8825 .8863 .8900 .8938 .8975                    |
| 16   | PC .9013 .9050 .9083 .9115 .9148 .9180 .9210 .9240 .9270 .9300                    |
| 17   | PC .9325 .9350 .9375 .9400 .9425 .9450 .9475 .9500 .9525 .9550                    |
| 18   | PC .9275 .9600 .9625 .9650 .9675 .9700 .9725 .9750 .9775 .9800                    |
| 19   | PC .9813 .9825 .9838 .9850 .9863 .9875 .9888 .9900 .9913 .9925                    |
| 20   | PC .9938 .9950 .9963 .9975 .9988 1.000  |
| 21   | LS 83.8   |
| 22   | UD 0.2790   |
| 23   | ZZ  |

```
*****  
*  
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *  
* MAY 1991 *  
* VERSION 4.0.1E *  
*  
* RUN DATE **/**/1998 TIME 00:00:** *  
*  
*****
```

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

Runoff Determination @ Hewlett Packard Outfall  
Exist Conditions: HP Platted; 20.7 Unplatted Acres Developed, No flow from Wes  
5 yr/ 24 hour Storm=2.6" (97059I.HC1)

5 10      OUTPUT CONTROL VARIABLES

|       |    |                       |
|-------|----|-----------------------|
| IPRNT | 5  | PRINT CONTROL         |
| IPLOT | 0  | PLOT CONTROL          |
| QSCAL | 0. | HYDROGRAPH PLOT SCALE |

IT      HYDROGRAPH TIME DATA

|        |         |                                 |
|--------|---------|---------------------------------|
| NMIN   | 15      | MINUTES IN COMPUTATION INTERVAL |
| IDATE  | 27JAN98 | STARTING DATE                   |
| ITIME  | 1000    | STARTING TIME                   |
| NQ     | 300     | NUMBER OF HYDROGRAPH ORDINATES  |
| NDDATE | 30JAN98 | ENDING DATE                     |
| NDTIME | 1245    | ENDING TIME                     |
| ICENT  | 19      | CENTURY MARK                    |

COMPUTATION INTERVAL    0.25 HOURS  
TOTAL TIME BASE        74.75 HOURS

ENGLISH UNITS

|                     |                       |
|---------------------|-----------------------|
| DRAINAGE AREA       | SQUARE MILES          |
| PRECIPITATION DEPTH | INCHES                |
| LENGTH, ELEVATION   | FEET                  |
| FLOW                | CUBIC FEET PER SECOND |
| STORAGE VOLUME      | ACRE- FEET            |
| SURFACE AREA        | ACRES                 |
| TEMPERATURE         | DEGREES FAHRENHEIT    |

RUNOFF SUMMARY  
FLOW IN CUBIC FEET PER SECOND  
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION     | STATION | PEAK<br>FLOW | TIME OF<br>PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD |         |         | BASIN<br>AREA | MAXIMUM<br>STAGE | TIME OF<br>MAX STAGE |
|---------------|---------|--------------|-----------------|---------------------------------|---------|---------|---------------|------------------|----------------------|
|               |         |              |                 | 6-HOUR                          | 24-HOUR | 72-HOUR |               |                  |                      |
| HYDROGRAPH AT | GG      | 115.         | 6.00            | 20.                             | 6.      | 2.      | 0.20          |                  |                      |

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

**HYDRAULIC  
SUMMARY EXHIBITS**

Hydraulic Analysis

Project: Hewlett Packard Expansion

Project #: 97059

Date: December 9, 1997

| Des. Q (cfs) | Downstream |        |          |          |         | Upstream |         |             |       |      |       |       | Storm Description |            |         | Non Pressure |                  |         | Pressure Flow  |         |         | Structures     |     |           |         |         |         |  |
|--------------|------------|--------|----------|----------|---------|----------|---------|-------------|-------|------|-------|-------|-------------------|------------|---------|--------------|------------------|---------|----------------|---------|---------|----------------|-----|-----------|---------|---------|---------|--|
|              | Sta        | Inv    | WS Elev. | WS - Inv | NG Elev | Sta      | Inv     | Length (ft) | Slope | Size | Area  | n     | Cap (cfs)         | Flow Depth | WS Elev | Vel          | Friction HL (ft) | WS Elev | Friction Slope | NG Elev | Sta     | Structure Type | Ku  | Head Loss | WS Elev | NG Elev | NG - WS |  |
| 425          | -15.04     | 6308.4 | 6312.4   | 4        | 6317    | 52.66    | 6310.39 | 67.7        | 2.98% | 60   | 19.63 | 0.013 | 483               | 4          | 6314    | NA           | NA               | NA      | NA             | 6323.0  | 52.66   | MH             | NA  | NA        | NA      | 6323.0  | NA      |  |
| 425          | 52.66      | 6310.5 | 6314.4   | 3.9      | 6323.0  | 120      | 6312.59 | 67.34       | 3.10% | 60   | 19.63 | 0.013 | 485               | 3.9        | 6316    | NA           | NA               | NA      | NA             | 6323.0  | 120.00  | Inlet          | NA  | NA        | NA      | 6328.0  | NA      |  |
| 425          | 120        | 6313.3 | 6316.5   | 3.2      | 6323.0  | 425      | 6324.52 | 305         | 3.68% | 60   | 19.63 | 0.013 | 531               | 3.6        | 6328    | NA           | NA               | NA      | NA             | 6345.0  | 425.00  | Cleanout       | NA  | NA        | NA      | 6345.0  | NA      |  |
| 425          | 425        | 6324.8 | 6328.1   | 3.4      | 6345.0  | 561.4    | 6329.72 | 136.4       | 3.85% | 60   | 19.63 | 0.013 | 531               | 3.6        | 6333    | NA           | NA               | NA      | NA             | 6351.0  | 561.35  | Inlet          | NA  | NA        | NA      | 6351.0  | NA      |  |
| 425          | 561.4      | 6330   | 6333.3   | 3.3      | 6351.0  | 927.9    | 6343.77 | 366.5       | 3.75% | 60   | 19.63 | 0.013 | 546               | 3.5        | 6347    | NA           | NA               | NA      | NA             | 6356.0  | 927.85  | Inlet          | NA  | NA        | NA      | 6356.0  | NA      |  |
| 425          | 927.9      | 6343.9 | 6347.3   | 3.4      | 6356.0  | 1295     | 6349.29 | 366.7       | 1.47% | 60   | 19.63 | 0.013 | 343               | NA         | NA      | 21.6         | 9.7              | 6357.0  | 2.66%          | 6363.0  | 1294.53 | Inlet          | 0.1 | 0.7       | 6357.7  | 6363.0  | 5.3     |  |
| 425          | 1295       | 6349.4 | 6357.7   | 8.3      | 6363.0  | 1615     | 6355.65 | 320.5       | 1.95% | 60   | 19.63 | 0.013 | 396               | NA         | NA      | 21.6         | 8.5              | 6366.3  | 2.66%          | 6369.0  | 1615.00 | Inlet          | 0.1 | 0.7       | 6367.0  | 6369.0  | 2.0     |  |
| 425          | 1615       | 6355.8 | 6367.0   | 11.2     | 6369.0  | 2048     | 6368.65 | 433.1       | 2.96% | 60   | 19.63 | 0.013 | 485               | NA         | NA      | 21.6         | 11.5             | 6378.5  | 2.66%          | 6380.0  | 2048.06 | Box MH         | 0.1 | 0.7       | 6379.2  | 6380.0  | 0.8     |  |



**Storm Sewer/ Drainage Facilities Summary**

**Master Development Drainage Plan**

**Hewlett Packard Expansion**

**Date: February, 1998**

**Project #: 97059**

|   |                  |       |         |          | Exist Drainage Facilities            |       |          |      | Proposed Drainage Facilities |       |          |      |  |
|---|------------------|-------|---------|----------|--------------------------------------|-------|----------|------|------------------------------|-------|----------|------|--|
| Summ Pnt  | Drainage Area ID | Q 5yr | Q 100yr | Design Q | Diameter /Size                       | Slope | Capacity | Vel. | Diameter /Size               | Slope | Capacity | Vel. | Comments   |
| Outfall Storm Sewer for Sub basins E & F  |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| 6   | E&F              | 59.8  | 115.5   | 115.5    |                                      |       |          |      | 42                           | 1     | 120      | 12   | Sized for 100 yr flow  |
| Outfall Storm Sewer for Sub Basin C   |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| 4   | C                | 123.2 | 242.6   | 123.2    | 42                                   | 1.4   | 140      |      |                              |       |          |      | Sized for 5yr runoff   |
| 4   | C                |       |         | 119.4    |                                      |       |          |      |                              |       |          |      |  |
| Comments: Additional inlets are required at the upstream end of the proposed 4' by 10' CBC extension in order to accommodate the anticipated surface flow from  |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| the 100 year storm event. Decisions regarding these facilities will be made upon development of subbasin C  |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| 5   | D                | 116.5 | 229.3   | 112.8    | (Difference between 100 yr and 5 yr) |       |          |      | 42                           | 1     | 120      | 12   | Sized for surface flow assuming that the 5 yr event is intercepted by the system |
| Comments: Install 2 15ft inlets in the existing parking lot to intercept anticipated 100 year surface flow  |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| 3   | B                | 77.7  | 153.6   | 77.7     | 36                                   | 1     | 75       |      |                              |       |          |      |  |
| Comments: No additional facilities are required to accommodate the 5 year storm event. Additional facilities will be required to accommodate the 100 year event |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| Recommend routing the 100 year surface flow to the East to be intercepted by the proposed 4' by 10' CBC   |                  |       |         |          |                                      |       |          |      |                              |       |          |      |  |
| 12  | G                | 20.8  | 40.5    | 40.5     |                                      |       |          |      | 30                           | 1     | 45       | 10   | Sized to accommodate the 100 yr storm event                                      |
| 13  | H                | 100   | 190.7   | 130.7    |                                      |       |          |      | 42                           | 1.5   | 140      | 12   | Design Flow = 100 runoff - street cap(80cfs)                                     |
| 12-12A  |                  |       |         | 40.5     |                                      |       |          |      | 30                           | 1     | 45       | 10   |  |
| 2A-12B  |                  |       |         | 70       |                                      |       |          |      | 36                           | 1     |          |      |  |
| 12B-13  |                  |       |         | 100      |                                      |       |          |      | 42                           | 1     |          |      |  |
| 13-14   |                  |       |         | 130.7    |                                      |       |          |      | 42                           | 1.5   |          |      |  |

**Sump Inlet Interception Rates**

Formula:  $Q = ChL(2gd)^{1/2}$

Assumption: Inlet is located in true sump condition

w/depth of water @12" above top of curb

| Length of Opening (ft) | Capacity (cfs) |
|------------------------|----------------|
| 5                      | 18             |
| 10                     | 36             |
| 15                     | 54             |
| 20                     | 72             |
| 25                     | 90.1           |