County of Los Angeles

Tentative Tract Map No. 053653
Regional Hydrology Study

Final Draft

June 2006

COUNTY OF LOS ANGELES – TENTATIVE TRACT MAP NO. 053653

Regional Hydrology Study

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Preface

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Table of Contents

List of Figures

List of Tables

List of Equations

PAGE

Appendices

1. **Exhibits**

   Exhibit A – Existing Drainage Area Map

   Exhibit B – Existing Land Use Map

   Exhibit C – Existing Imperviousness Area Map

   Exhibit D – Existing Soil Area Map

   Exhibit E – Rainfall Map

   Exhibit F – Debris Potential Area Map

   Exhibit G – Proposed Drainage Area Map

   Exhibit H – Proposed Imperviousness Area Map

   Exhibit I – Proposed Imperviousness Area Map

   Exhibit J – Proposed SUSMP Facilities Map

2. **Existing Structures**

3. **Proposed Basins**

4. **Existing Burned Watershed (2-year and 50-year, 24-hour design storms)**

5. **Proposed Burned Watershed (2-year and 50-year, 24-hour design storms)**

6. **Peak Mitigated Flow**

7. **HEC-RAS Analysis**

Nomenclature

'	feet
"	inch
<	less than
>	greater than
ac	acre
ac-ft	acre - feet
APN	County Assessor's parcel number
ARC	antecedent runoff condition
BMPs	best management practices
C	Rational Method runoff coefficient
Caltrans	California Department of Transportation
CDMG	California Division of Mines & Geology
cfs	cubic feet per second
City	City of Santa Clarita
CMP	corrugated metal pipe
CN	SCS curve number
Cnl	open channel
Consult-ant	Diamond West Engineering
County	County of Los Angeles
C_p	pan coefficient
d/s	downstream
DWR	California Department of Water Resources
E	evaporation
EGL	energy grade line
FEMA	Federal Emergency Management Agency
FIP	Finance and Implementation Plan
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
ft	feet
ft/s	feet per second
g	acceleration due to gravity
gpm	U.S. gallons per minute
gpd	U.S. gallons per day
gpd/ft^2	U.S. gallons per day per square foot
H	total hydraulic head
h	horizontal
HEC	Hydrologic Engineering Center
HEC-HMS	HEC-HMS Computer Program
HEC-RAS	HEC-RAS Computer Program
HGL	hydraulic grade line
hr	hour
i	rainfall intensity
i_a	initial abstraction
i.d.	inside diameter
imp	impervious
in	inch
L_o	overland flow path length
MAP	Mean annual precipitation
max	maximum
MEP	maximum extent practicable
mi	mile
min	minimum
misc	miscellaneous
msl	mean sea level
MWC	municipal water company
MWD	municipal water district
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
o.d.	outside diameter
O&M	Operations and maintenance
ped.	Pedestrian
Q	flow quantity
Qty	quantity
R.C.E.	California, Registered Civil Engineer
RCP	reinforced concrete pipe
req'd	required
RWQCB	California Regional Water Quality Control Board
s	second
SCS	Soil Conservation Service
sf	square feet
SUSMP	County, Standard Urban Storm Water Mitigation Plan
t_c	storm duration (time of concentration)
t_p	time from start of storm to peak runoff
t_r	rain storm duration
T	transmissivity
TR-20	SCS Technical Release Number 20
TR-55	SCS Technical Release Number 55
UMP	Urban Management Plan
u/s	upstream
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
V	volume
v	vertical
w.s.	water surface

Executive Summary

The purpose of this report is to facilitate the planning and implementation of drainage infrastructure improvements to accommodate storm water runoff in the general vicinity of the proposed Tentative Tract Map No. 053653.

This report includes an evaluation of existing land use projections in the watershed, existing drainage patterns, alternative storm drainage solutions, potential utility relocation requirements, potential right-of-way issues, and environmental issues. Additionally, this report will identify a lead drainage alternative(s). The results of this report will be the basis for subsequent storm drainage improvements solely for the Tract.

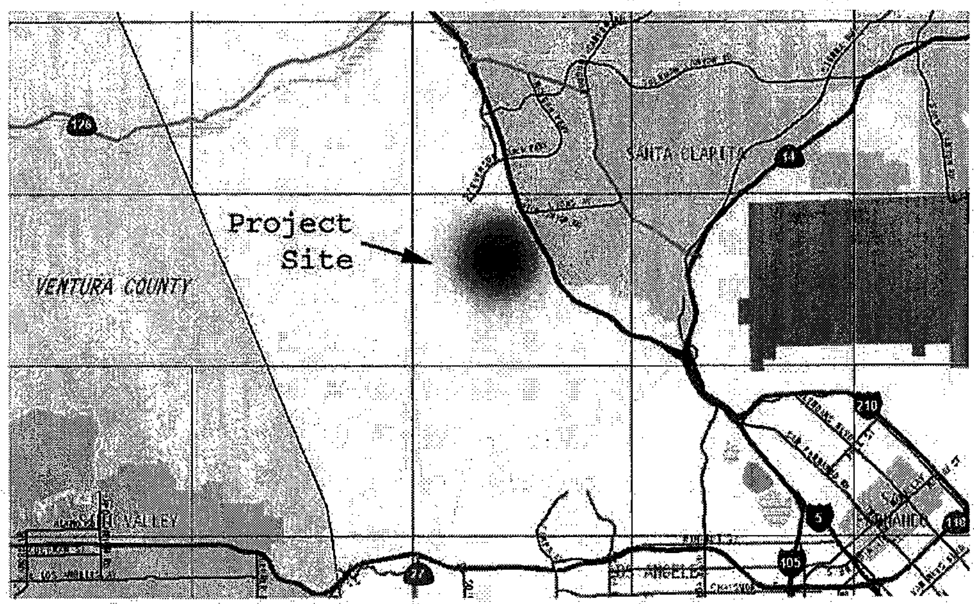
The project (Tract No. 053653) is located on the west side of the City of Santa Clarita roughly between Lyons Avenue, Calgrove Boulevard, and adjacent to and west of the The Old Road (see Figure 1). The project is situated on APN 2826-022-025, -026, -027, & 2826-023-014 which according to the County Assessor contains roughly 232 acres. The vicinity of the detailed study area is the northerly ridge of Towsley Canyon on the south, the southerly ridge of Dewitt Canyon on the north, and The Old Road on the east (see Figure 2 and Appendix 1, Exhibit A). The detailed study area contains roughly 890 acres and is located entirely in the County. The existing land use in the study area contains mainly open space with a small portion of residential and commercial zoning (see Appendix 1, Exhibit B).

This report addresses the impacts from a 2-year and 50-year, 24-hour design storm event. Its intended use is for the development of drainage infrastructure solely by the project.

Authorization

This report has been performed at the request of D.R. Horton to redetermine the existing drainage patterns and any storm drainage impacts from the proposed development on the study area. Previous studies by Diamond West Engineering and RBF were for a larger project area. It is not the intent of this report to suggest remediation for any regional drainage issues outside of the project area.

Figure 1. Regional Location Map



The following information is contained within this report:

1. A description of the existing drainage conditions for the study area.

2. A recommended drainage infrastructure plan showing the locations and sizes of the primary components of the drainage infrastructure that will be needed to accommodate or alleviate storm water runoff generated by the proposed project. See Exhibit J in Appendix 1 and the approved Tentative Map for more information. Drainage infrastructure elements evaluated include:

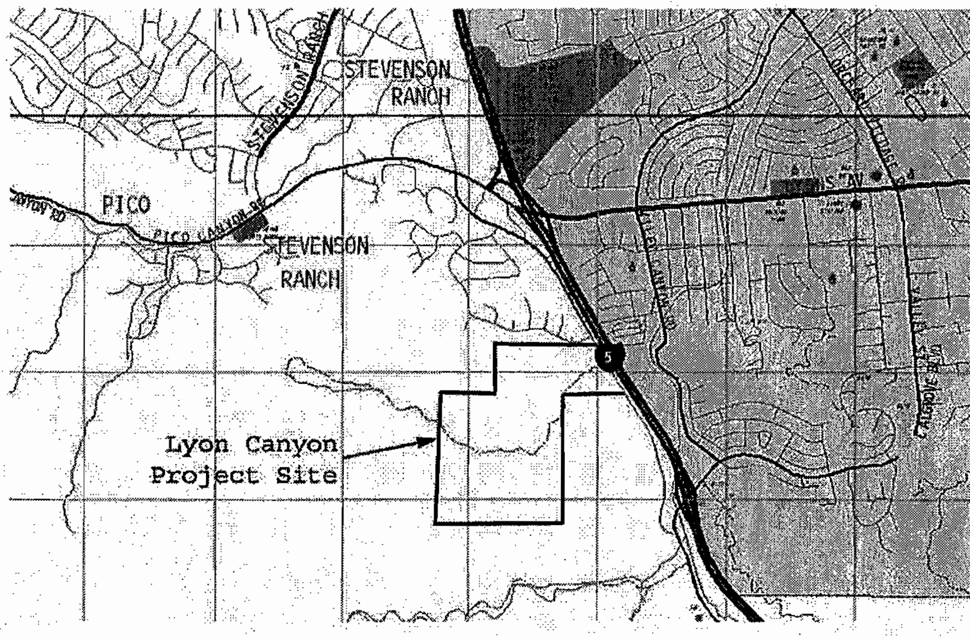
   - storm drain pipes and/or open channels
   - storm drain culverts
   - storm water impoundments & debris basins (and inlets)

3. Watershed catchment boundaries and hydrologic information that support the drainage infrastructure plan. The County Modified Rational (MODRAT) computer model has been used as the basis for hydrologic evaluations. Discharges expected at numerous key points of concentration have been estimated using the MODRAT computer model for the 50-year, 24-hour storm event.

4. Hydraulic analyses that examine the functional characteristics of the proposed drainage infrastructure. The hydraulic capacities of the proposed storm drains have been evaluated using standard formulas. Volumetric analysis of runoff hydrographs have been evaluated using WMS.

5. Cost estimates for the components of the recommended drainage infrastructure plan(s) are not provided.

Figure 2. Vicinity Map



Study Approach

The Lyons Canyon project was originally submitted to the City of Santa Clarita for review and possible annexation in 2002. Pursuant to the State CEQA Guidelines, the City first circulated a NOP in March 2003. Due to change in project description, another NOP was circulated in December 2003. Subsequently, the project was withdrawn from the City in May 2005. The project area has now been redesigned and entitlement applications were submitted to the County in June 2005. This is the basis for this study report.

The project site is vacant with current on-site structures such as fencing, an abandoned water tank, water wells, and irrigation lines. Other utility structures, such as Southern California Edison electrical distribution lines, are adjacent to or traverse portions of the site.

The project site is currently located within unincorporated Los Angeles County, and is designated as Non-Urban 2 (N2) and Hillside Management (HM) in the Santa Clarita Valley Areawide General Plan, and Non-Urban (R) and Significant Ecological Area (SEA) in the County General Plan. The subject property is zoned as Heavy Agricultural (A-2-2/A-2-1).

The general lay of the land drains from southwest to northeast. Most of the project area drains under The Old Road and Interstate 5 through a double 8-foot by 8-foot box culvert. This culvert ties into a channel that eventually connects to the South Fork of the Santa Clara River. The entire length of the culvert is currently about 75% full of sediment and debris buildup. This existing condition could have adverse drainage impacts on adjacent properties during moderate or even small rainfall events. The results contained herein for existing and proposed capacity of this structure will assume the facility if free and clear of any sediment accumulation.

Both Diamond West Engineering and RBF completed similar hydrologic studies based on previous project designs. Both MORA and MODRAT are acronyms for the Modified Rational Method. They both refer to different sets of hydrologic equations used (and approved) by the County. The previous hydrology reports both used a DOS-based MORA program called FO604.

The MODRAT equations can be found in a program called WMS. WMS is a GIS-based program. The MODRAT parameters and equations are more current than MORA, and WMS is the preferred program at the County.

Summary of objectives and hydrologic conditions

The proposed study area was broken into 48 sub-basins (as shown in Appendix 1, Exhibit G. This includes both on-site and off-site areas. The main objective of this study is to design drainage infrastructure that will not change the historic runoff patterns that are experienced by adjacent properties. With a free discharge and clear of any sediment buildup, the existing double 8-foot by 8-foot culvert has a discharge capacity of about 1,800 cfs without overtopping The Old Road.

Because of the fire hazard in the surrounding area the drainage infrastructure design should consider the effects of burned and bulked runoff from the project area. Drainage facilities should be designed accordingly to accommodate these runoff conditions. Based on conversations with County staff, all debris from the design runoff event is required to be retained on-site. The most feasible way to accomplish this is by installing debris basins according to County design standards.

Two debris basins are planned as shown in Appendix 1, Exhibit J. These basins will retain the debris from the two main branches of off-site run-on to the project area. In addition to the benefits they provide for water quality, they will also serve as combination storm water detention basins. Table 1 shows the difference between existing and proposed runoff conditions (without detention).

Table 1. Pre- vs. Post-Development Runoff

Concentration Point	50-yr, 24-hr (burned & bulked) Flow Rate (cfs)	
	Existing Condition	Proposed Condition
double 8-foot by 8-foot box culvert	1,950	1,425
48-inch CMP culvert	183	120
30-inch CMP culvert	190	190

The proposed roadway grading at the two debris basins is creating a significant amount of storage for storm water runoff. Both basins have a total storage capacity of over 30 acre-feet at the spillway elevations. Assuming an average design rainfall of 8.4-inches and a 50% runoff yield, the runoff from the entire watershed would be about 312 acre-feet. Removing the bulked flow, reducing the potential burned area with the development, and the detaining affects of the debris basins will reduce the runoff for the proposed condition at the double 8-foot by 8-foot culvert from the existing condition. The information shown in this report actually shows an increase in runoff from the project area under burned runoff conditions. This will not occur since the debris basins will act as detention basins. It should also be noted that the existing condition design (burned and bulked) flow rate would inundate The Old Road around the double box culvert.

The purpose of the spillway within each debris basin is to keep it from becoming a jurisdictional dam under the California Division of Safety of Dams (DSOD). The main requirements to remain non-jurisdictional are the storage height needs to be less than 25-feet tall and the potential storage volume is less than 50 acre-feet. The storage height, according to County Public Works, is measured from the spillway elevation to the lowest natural grade on the downstream side of the embankment.

The following items outline the approval process by the DSOD if a basin is determined to be a jurisdictional dam.

- ✓ Submit an application for water rights with the State Water Resources Control Board as required.
- ✓ Hold a pre-application meeting with DSOD to streamline the review process.
- ✓ File an application for the construction of a dam and pay a filing fee.
- ✓ Submit 90% plans and specifications.
- ✓ Submit the environmental documentation as prepared by the lead agency or provide the information required for the DSOD to prepare the environmental documents as the lead agency.
- ✓ Final review and approval of the construction documents.
- ✓ Construct the facilities and obtain a Certificate of Approval from the DSOD.
- ✓ Pay annual fees.

This process could add significant time to the overall project schedule.

Peak Flow Standard

By using the debris basins, the developed runoff from the project area satisfies the peak flow standard. See Appendix 1, Exhibits A and G and Appendix 4 and 5 for the 2-year and 50-year, 24-hour storm events.

Project Setting

The project (Tract No. 053653) is located in and on the west side of the City of Santa Clarita roughly between Lyons Avenue, Calgrove Boulevard, and adjacent to and west of the The Old Road (see Figure 2). The detailed study area contains roughly 890 acres and is located entirely in the County. The existing land use in the study area contains open space and a small portion of residential and commercial zoning (see Appendix 1, Exhibit B).

The existing utilities in the area are a water system, a gas distribution system, an electric service system, and a telephone/fiber optic system. There are production domestic water wells within one mile of the study area. There are no existing storm drainage infrastructure facilities to adequately serve the project area.

BASIS OF CONTROL

The horizontal coordinates shown herein are based on the California Coordinate System of 1983, Zone V in U.S. Survey Feet.

EXISTING WATERSHED CHARACT-ERISTICS

The detailed study area consists of approximately 890 acres that is divided into 48 sub-basin watersheds (as shown in Appendix 1, Exhibits A & G). These watersheds are defined by the physical constraints and topographic features that exist and points of interest in the study area. The land uses within the study area consist of open space, residential and commercial zoning. The natural slopes within the sub-basin areas vary roughly from 5% to over 40%.

Storm water runoff generated from the detailed study area generally drains northeasterly as overland flow and as concentrated flow. Concentrated flow generally occurs within the lower elevations. The overland flow from the sub-basins cascades down the respective low points. At each low point, the storm water is either detained, or is further conveyed through downstream sub-basins to the north and east.

The runoff leaves the project area through a series of culverts that cross The Old Road and Interstate 5. A majority of the runoff is conveyed by a double 8-foot by 8-foot box culvert located at the northeast corner of the project area. This culvert is currently about 75% full of sediment and debris buildup and does not have enough discharge capacity to convey the existing design runoff event without flooding The Old Road. The runoff from the project area eventually joins the South Fork of the Santa Clara River.

Flood Insurance Study

The detailed study area is located on the following FEMA FIRM.

Los Angeles County, California (Unincorporated Areas), community panel number 065043 0460 B, December 2, 1980. The detailed study area is located in Zone A and Zone C.

Zone C and Zone X are defined as areas of minimal flooding or outside the 500-year floodplain. Zone A is defined as areas of 100-year flood with base flood elevations and factors not determined.

Any construction in Zone A will require a Conditional Letter of Map Revision from FEMA prior to issuance of grading permits. A Letter of Map Revision will be required prior to building occupancy.

Native Soil Properties

The soil types within the study area were identified from the current County Hydrology Manual. Individual soil types are given unique values ranging from 1-180. There are four soil types within the study area, 20, 91, 93, and 97. Soil values can be seen in Appendix 1, Exhibit D.

EXISTING GROUNDWATER CONDITIONS

The depth to the seasonal high groundwater table is assumed not high enough to be significant. Additional design requirements may be required if it is found to encroach on any new drainage infrastructure, appurtenances, or excavations.

Proposed Drainage Study Approach

The purpose of this hydrology study is to facilitate the planning and implementation of drainage infrastructure improvements to accommodate storm water runoff in the general vicinity of the project area. Additional study objectives include:

- Develop a phased plan that alleviates localized flooding.
- Provide study services consistent with City and County standards.
- Develop phased solutions where the capital improvements can be funded incrementally.
- Develop phased solutions that maximize the cost to benefit ratio.
- Develop solutions that limit O&M costs.
- Develop phased solutions that can fit or be adapted in the ultimate, area-wide solution.
- Involve City and County staff in the development and implementation of the phased solutions.
- Develop phased solutions that will minimize any disturbance to the City, County, and surrounding community.
- Site and operate storm drainage facilities in such a manner that minimizes adverse environmental impacts.

DESIGN ANALYSIS

The approach to design process is to explore a range of solutions. The drainage design presented in this report has been developed based on evaluations of the following constraints:

- Watershed characteristics
- Topography
- Existing land use & its adaptability
- Location of transportation corridors
- Property boundaries & acquisition
- Logical points of drainage outfall
- Agency objectives
- Retrofitting opportunities
- Design level of protection
- Environmental impacts
- Financing (expenses)
- Structure relocation
- Operation and maintenance
- Regulatory compliance
- Agency compliance

- Hydrologic criteria
- Hydraulic capacities & characteristics
- Flexibility of service area

Formulation of the infrastructure design was characterized by an evaluation of all of the above constraints, their level of importance to the successful completion of the project, and their interrelationships with each other.

Debris/Storage Basin Approach

Based on the above mentioned constraints, the proposed design is to develop a series of storm water impoundments to remove accumulated debris and to provide storm water detention to help relieve downstream drainage infrastructure. As requested by the County, the discharge information contained herein does not account for the affects of the detention basins. But it should be recognized that they will exist. These basins need to be designed such that the storage height is less than 25-feet and the storage volume is less than 50 acre-feet to remain as non-jurisdictional dams according to County Public Works and the DSOD.

UTILITY CONFLICT ANALYSIS

The location of the utilities shown herein is for information only. The location, type, size, and/or depths indicated were obtained from sources of varying reliability. The consultant is not responsible or liable for the accuracy or completeness of those records. All utilities should be field verified as to their actual location, type, size, and depth prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire, structure or other utilities subject to concerns for safety, displacement, and/or damage by reason of such operations.

The existing utilities in the area are a water system, a gas distribution system, an electric service system, and a telephone/fiber optic system. There are production domestic water wells within one mile of the study area. Ground water monitoring should be considered at any domestic well within one mile of a proposed storm water impoundment. There are no existing storm drainage infrastructure facilities to adequately serve the project area.

For the most part, the drainage collection system has been placed away or adjacent to existing utilities. In reviewing record information, it does not appear that there are any major crossing conflicts. Any conflicts will need to be addressed during the preparation of the construction documents for those facilities.

RIGHT-OF-WAY ANALYSIS

The property boundaries shown herein are based upon record information. Field verification should be performed during the construction process for any drainage improvements defined herein.

There are no planned right-of-way acquisitions for drainage purposes. Nor are there any planned drainage easements or agreements for the development of the project.

LAND USE ANALYSIS

The County and City General Plan and Zoning Code regulate land use in the study area. Generally, existing land use in the area is consistent with these policy documents. There are no known pending formal applications in the County or City to change land use within the study area. No provisions have been made for changes in future land use within the study area.

ENVIRONMENT-AL ANALYSIS

A Specific Plan EIR is being prepared by others.

Proposed Drainage Description

In order to adequately evaluate the impacts and requirements of the proposed project, the existing drainage conditions were analyzed. Research efforts were made to identify any drainage studies that documented the existing drainage conditions for the study area. The results of these efforts did not find any study that adequately documented those conditions. The purpose of this drainage study is to document the impacts of certain rainfall events on the study area. This information will be the basis of comparison between pre-development and post-development of storm drainage infrastructure improvements.

This proposed drainage description will analyze the effects of the 2-year and 50-year, 24-hour storm events within the study area.

RELATED DOCUMENTS

The Consultant pursued the City, County, and Caltrans for any drainage reports on the study area. The following documents were found which identified potential drainage improvements within the study area.

Drainage Concept / SUSMP Study, 2004

This plan was completed in June 2004 by Diamond West Engineering. The purpose of the study was to evaluate the impacts of the Lyons Canyon Ranch project as it was currently designed. Since that time the project design has changed.

Hydrology and Water Quality Technical Appendix, 2004

This plan was completed in November 2004 by RBF. The purpose of the study was to evaluate the impacts of the Lyons Canyon Ranch project when it was considered to be annexed to the City. Since then the project has been redesigned and it will remain in the County.

METHODOLOGY

Due to the complex nature of the sub-basins, a hydrograph method was chosen to estimate the design storm runoff. The complex aspects of the sub-basins include consideration of available storage and varying times of travel. The Modified Rational Method, as defined in the current County Hydrology Manual was employed to generate the effective runoff within each sub-basin.

The County Hydrology Manual utilizes a Modified Rational Method approach for its hydrologic calculations. The Rational Method is understood to provide peak discharge relative to rainfall intensity. It is not generally preferred in watershed catchments where ponding of storm water occurs. Additionally, it does not typically provide a reasonable relationship between peak storm water discharge and storm water runoff volume. This phenomenon can be seen in Figure 3. As seen on the synthetic rainfall distribution, the County method yields little runoff before or after the peak. This typically produces a sharp, narrow peak, which ultimately requires less storage volume for detention basin analysis.

Because the MODRAT method is considered the 'standard of practice' for this area it will be used to generate the regional hydrology contained herein.

Equation 1. Rational Method

$$Q = CiA$$

Where	C	= runoff coefficient
	i	= rainfall intensity (in/hr)
	A	= drainage area (ac)

Equation 2. Manning Equation

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

Where	V	= average velocity (ft/s)
	n	= pipe roughness coefficient
	R	= hydraulic radius (ft)
	S	= head loss per unit length of pipe (ft/ft)

The rainfall intensity was taken from County Standards. The runoff coefficient in the rational formula is dependent on the soil type, antecedent moisture condition, recurrence interval, land use, slope, amount of urban development, rainfall intensity, surface and channel roughness, and duration of storm. Equation 3 provides a relationship between all of these factors and was used to calculate the runoff coefficients.

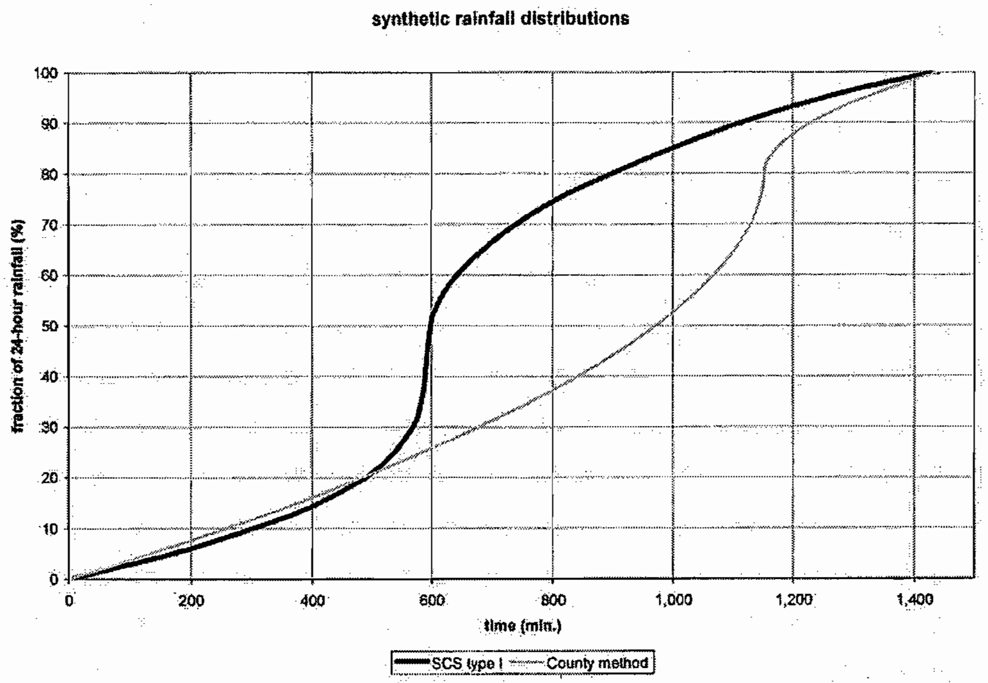
Equation 3. Rational Runoff Coefficient

$$C = 7.2\left(10^{-7}\right)CN^{3}T^{0.05}\left[\left((0.01CN)^{0.6}\right)\right]^{-S^{0.2}}\left(0.001CN^{1.48}\right)^{(0.15-0.11)}\left[(P+1)/2\right]^{0.7}$$

Where	CN	= SCS composite curve number
	T	= recurrence interval (years)
	S	= average sub-basin land slope (%)
	I	= rainfall intensity of recurrence interval (in/hr)
	P	= percent impervious (decimal)

The average rainfall for the design storm event for the study area per the County Hydrology Manual is about 8.4 inches. With this data and normal antecedent moisture conditions, the runoff yield is roughly 36%. According to County staff a runoff yield analysis is not required with the current hydrologic methods.

Figure 3. synthetic rainfall distribution comparison



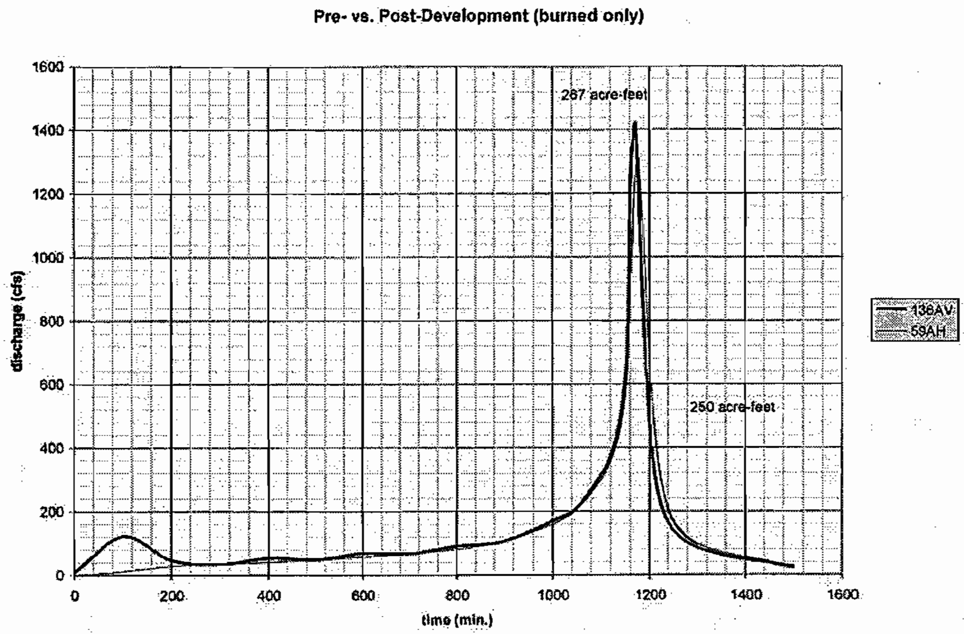
Hydrologic Model

The computer models MODRAT was used to simulate, combine, and route outflow hydrographs within each watershed. The simulation of the hydrologic data is generated by the development of the synthetic unit hydrograph, 50-year design storm pattern, and the runoff hydrograph.

See Figure 4 for a graph of pre-developed vs. post-developed hydrographs at the existing double 8-foot by 8-foot box culvert. The total volume of runoff for both scenarios can be increased 1-3% because the runoff is still occurring at the end of the design storm.

The development of the synthetic unit hydrograph involves the identification of several watershed characteristics including composite curve numbers, soil cover, percent impervious, antecedent moisture conditions, land use, basin area, initial abstractions, hydraulic length, basin slope, and lag time. These parameters are calculated in the following steps:

Figure 4. Pre- v. Post-Development Hydrograph at Double Box Culvert



- The sub-basin watershed boundaries were delineated by WMS on the USGS map.

- Rainfall excess is that part of the total precipitation depth that appears as surface flow during and after a storm event. Rainfall excess equals to total rainfall depth minus losses due to interception by vegetation, infiltration into the soil, and surface depression storage. This process is defined internally in the MODRAT method. The information is based on:

  1. Soil data from the current County Hydrology Manual
  2. Zoning designations in the City and County

- The catchment time of concentration is defined as the time from the center of mass of net rainfall and the center of mass of runoff. The time of concentration for each sub-basin was identified from the County method. This method is shown in equation 4.

Equation 4. Time of Concentration

$$T_c = 10^{-0.507} * (C_d * I)^{-0.519} * L^{0.483} * S^{-0.135}$$

Where

T_c	= time of concentration in minutes
C_d	= developed runoff coefficient
I	= rainfall intensity in inches per hour
L	= hydrologic length of the catchment in feet
S	= average watershed land slope in feet per feet

- To adequately define the unit hydrograph, the unit time period of the synthetic critical storm pattern should generally be 30 percent of the basin time of concentration and should use multiples of 1 minute. The unit time period utilized in this report is 1 minute.

- See Appendix catchment soil characteristics, catchment hydrologic characteristics, and hydrograph plots for various locations.

Bulking Analysis

A bulking analysis was performed for the proposed burned runoff conditions by County methods. The entire study area is in debris potential area #3 (see Appendix 1, Exhibit F). Table 2 shows the minimum required size for the debris basins and desilting inlets.

Table 2. Proposed Watershed Debris Analysis

node	area (ac.)	bulking factor	bulking rate (cy/sm)	yield (cy)	note
40A	549	1.48	64,000	54,900	basin #1
115AQ	195	1.52	87,000	26,535	basin #2
131U	6	1.62	140,000	1,315	inlet #8
43F	7	1.62	140,000	1,535	inlet #6
53I	10	1.62	140,000	2,190	inlet #1
79P	10	1.62	140,000	2,190	inlet #2
75O	9	1.62	140,000	1,970	inlet #3
72N	4	1.62	140,000	875	inlet #4
70M	5	1.62	140,000	1,100	inlet #5
140X	4	1.62	140,000	875	inlet #7

The yield results for the inlets should be considered somewhat arbitrary because the curves for Plate 2 and 5 from the County Sedimentation Manual have a minimum drainage area of 64 acres.

Upon final design the debris inlets should be sized according to Table 2.

Flow Routing

Flow routing methods for storage areas (reservoirs), channel, and sheet flow were estimated from proposed dimensions and parameters. The Modified Puls method was used to route flow through storage areas. The MODRAT method was used to route flow through existing open channels and sub-basins. Proposed dimensions were used for all open channel routing. The discharge relationship from the storage areas used the Normal Depth method with similar dimensions. See Appendix 1 for a diagram of the entire watershed hydrologic model.

Hydraulic Model

Manning's Equation and Caltrans HDS No. 5 was used to simulate the hydraulic analysis of the existing and proposed storm drainage conveyance systems. The simulation of the hydraulic system utilized either the design storm event or the capacity of the existing system whichever was less. This capacity was defined from street grades, curb inlets, and assumed maximum energy gradients.

The main branch of Lyons Canyon will be diverted at debris basin #1. The remainder of downstream existing watershed is collected in a culvert near debris basin #2. A HEC-RAS model was developed for both existing and proposed conditions to show that adjacent properties are not adversely affected by the new culvert.

ASSUMPTIONS

The rainfall and runoff parameters are based on the County Hydrology Manual and the County Design Standards.

Rainfall

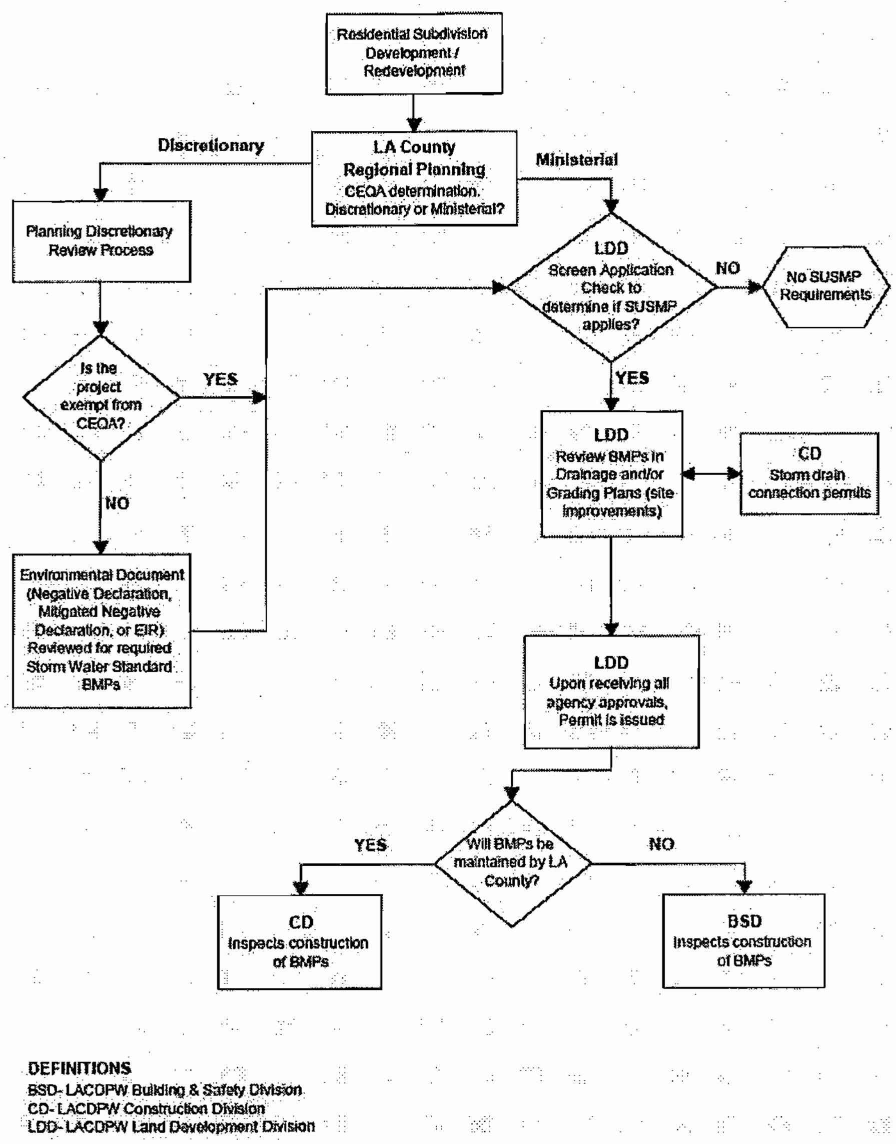
According to the isohyetal rainfall map in the County Hydrology Manual, the study area has an average 50-year, 24-hour rainfall depth of about 8.4 inches.

The mean annual precipitation is identified from DWR, Bulletin No. 195, October 1976. According to Plate 3, the MAP is about 18-inches. Plate 4 reports the mean annual 24-hour storm at roughly 3.5-inches.

SUSMP

The regulation governing the development of the project area is the County Standard Urban Storm Water Mitigation Plan (SUSMP). The project would fall under the subdivision development section. See Figure 5 for the permitting and inspection process for a residential development in the County. The subdivision improvements would need to be designed and installed according to this process.

Figure 5. SUSMP permitting & inspection process



Source control measures are recommended for implementation during specific project design, construction, and operations phases. These measures should include conserving natural areas, minimizing storm water pollutant of concern, protecting slopes and channels, providing storm drain stenciling and signage, properly design and construct outdoor material and refuse storage areas, and properly design and construct parking lots.

In addition to source control measures, treatment control Best Management Practices (BMPs) will need to be provided to remove the pollutants of concerns from the runoff before leaving the site. Treatment control BMPs will require ongoing maintenance. BMPs can be provided in a variety of ways that can vary from catch basin filters, to proprietary treatment devices placed in the main storm drain infrastructure, to grass swale filters, to extended impoundment facilities that allow sedimentation of pollutants to occur. For large watersheds the use of catch basin filtration is not practical due to the number of installations necessary and the ongoing maintenance required. Debris basins (which could be considered extended detention basins or T-6 basins), debris inlets, catch basin filtration inserts, and centralized off-line devices (or water quality treatment devices) were selected as the initial BMPs. Due to the relatively long confinement period fencing (around each basin) is recommended to protect the facilities.

The other alternative BMPs identified above could be used in-lieu of the water quality devices and debris basins but they may not mitigate the increased peak runoff from the new development or help alleviate any adverse drainage conditions downstream of the project area.

See Table 3 for the proposed water quality devices. The SUSMP Manual specifies that 0.75 inches of rainfall be mitigated for water quality purposes. See Appendix 6 for the peak mitigated flow calculations.

Table 3. Water Quality Treatment Devices

Device #	node	Q_{pm} (cfs)
Off-line Device #1	94FJ	11.4
Off-line Device #2	99A+119S+123T	3.1
C.B. Insert #1	98A	1.0
C.B. Insert #2	128A	2.3
C.B. Insert #3	143Y	1.2

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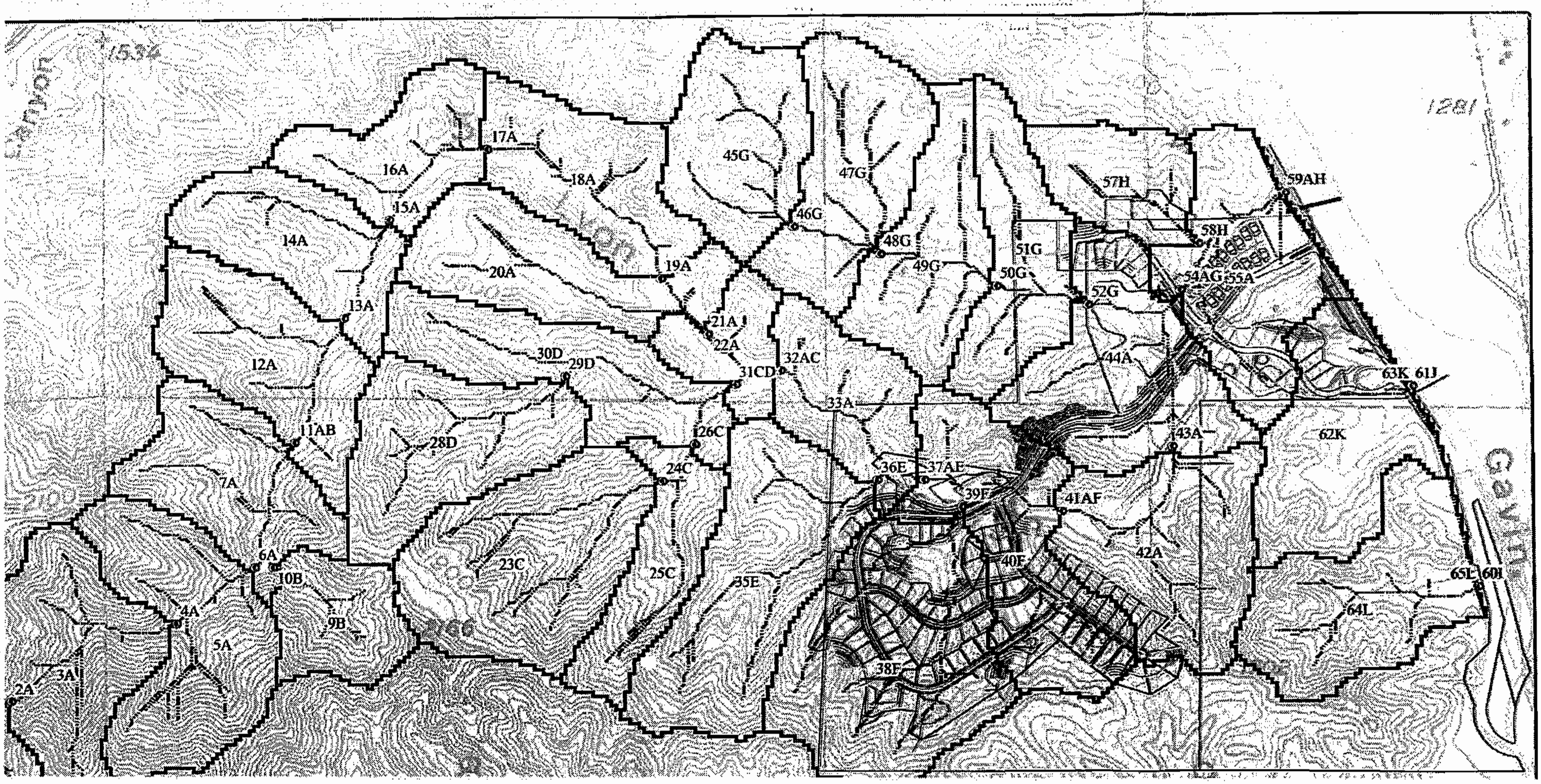

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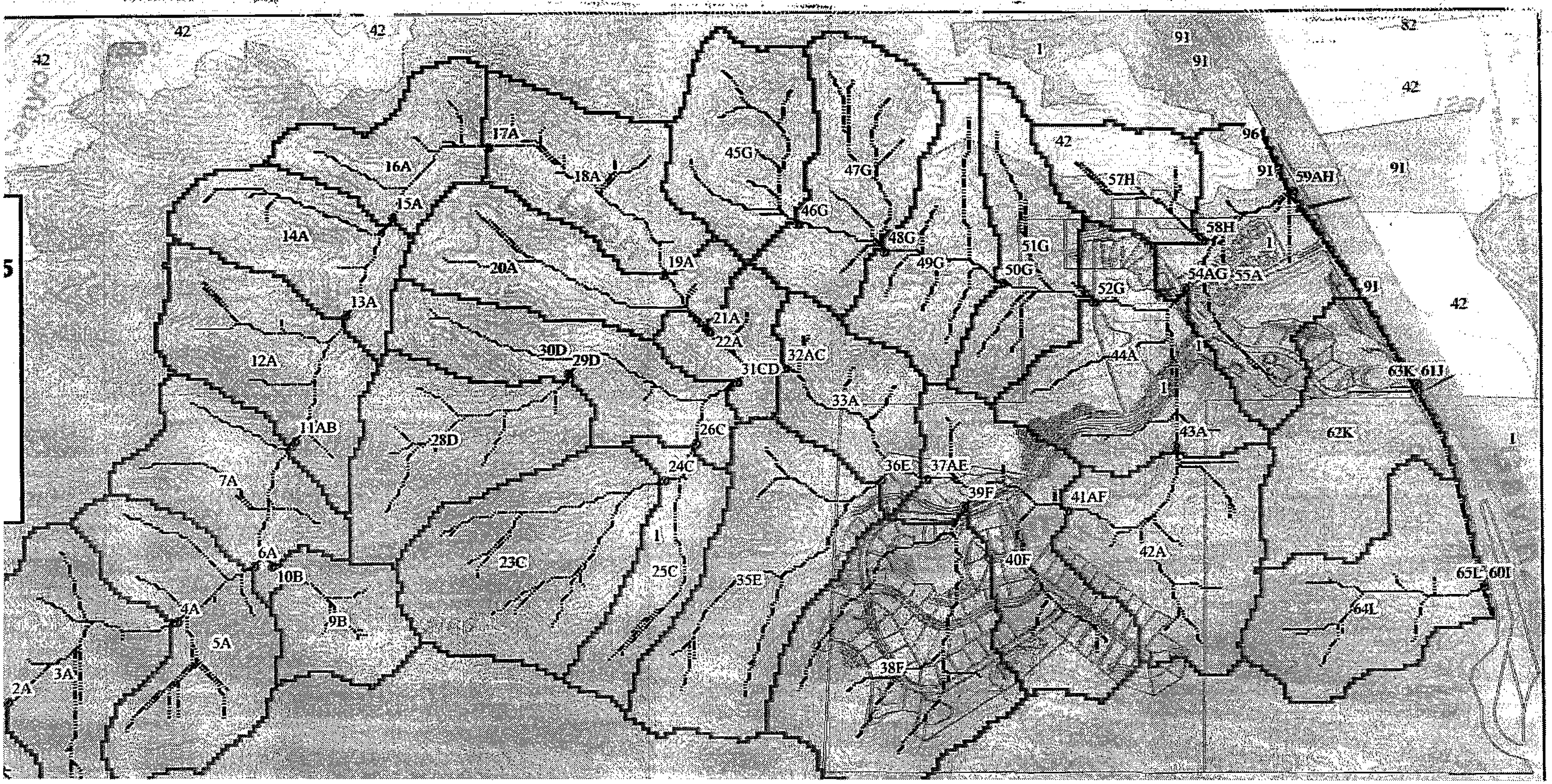
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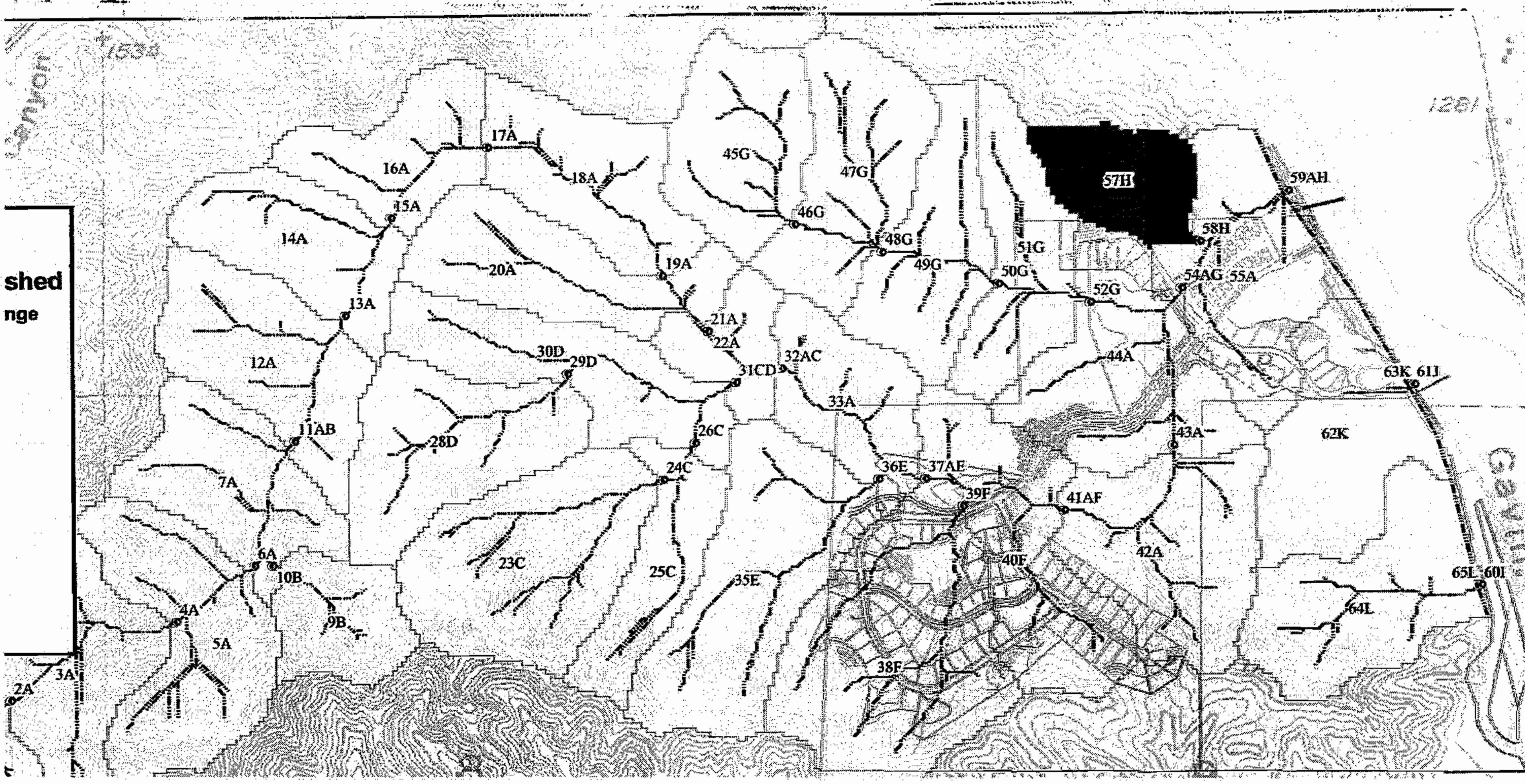
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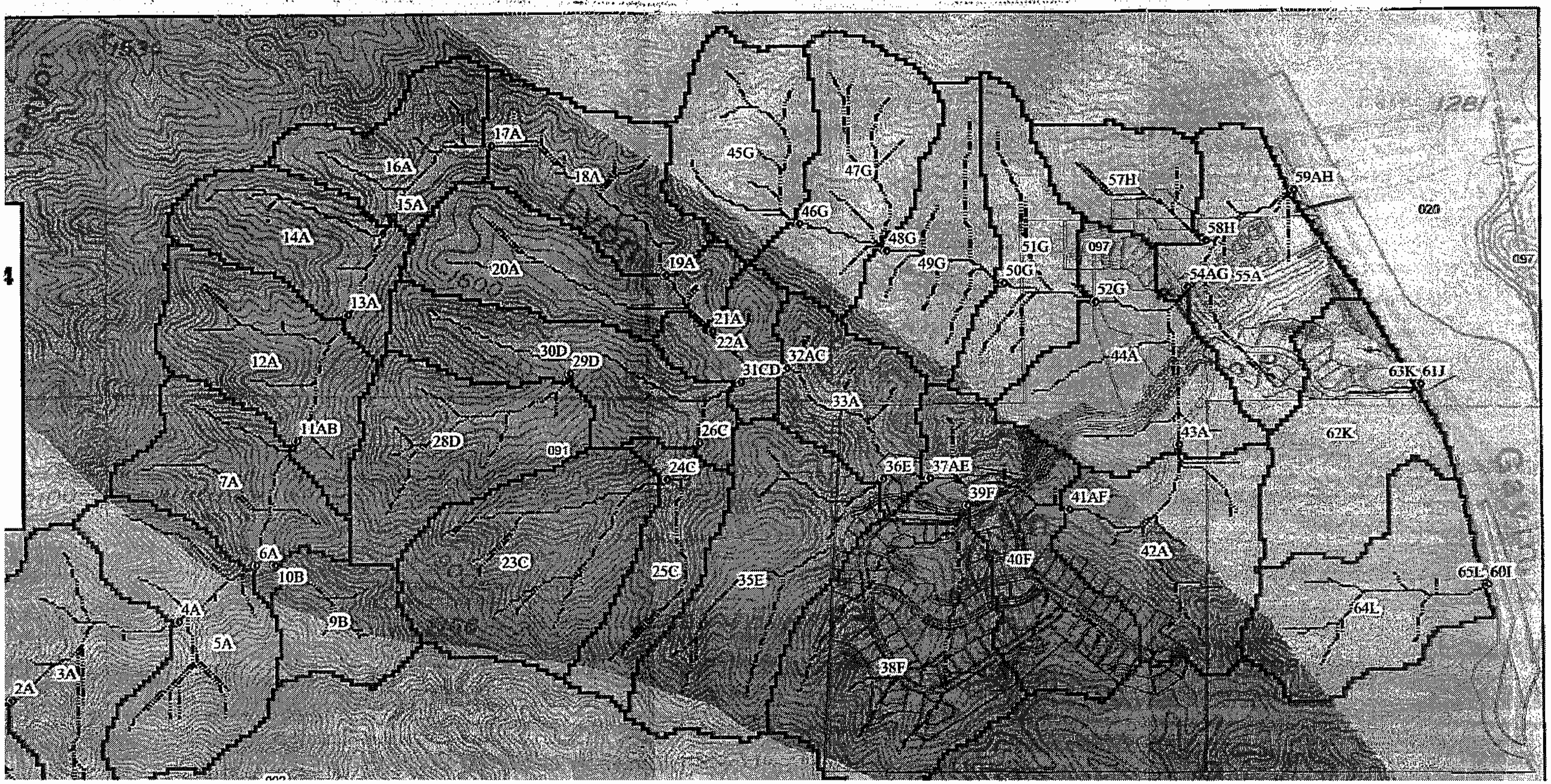

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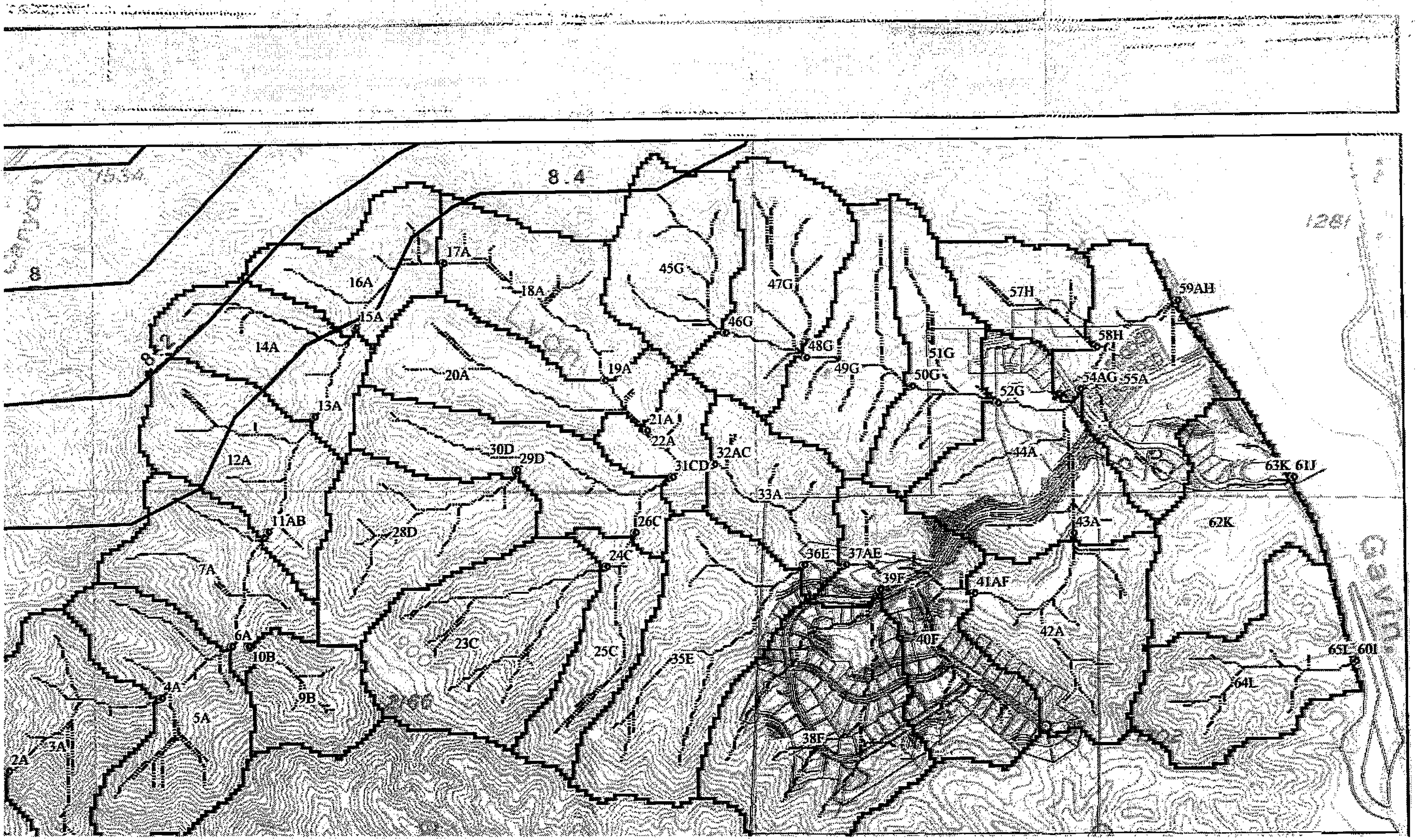

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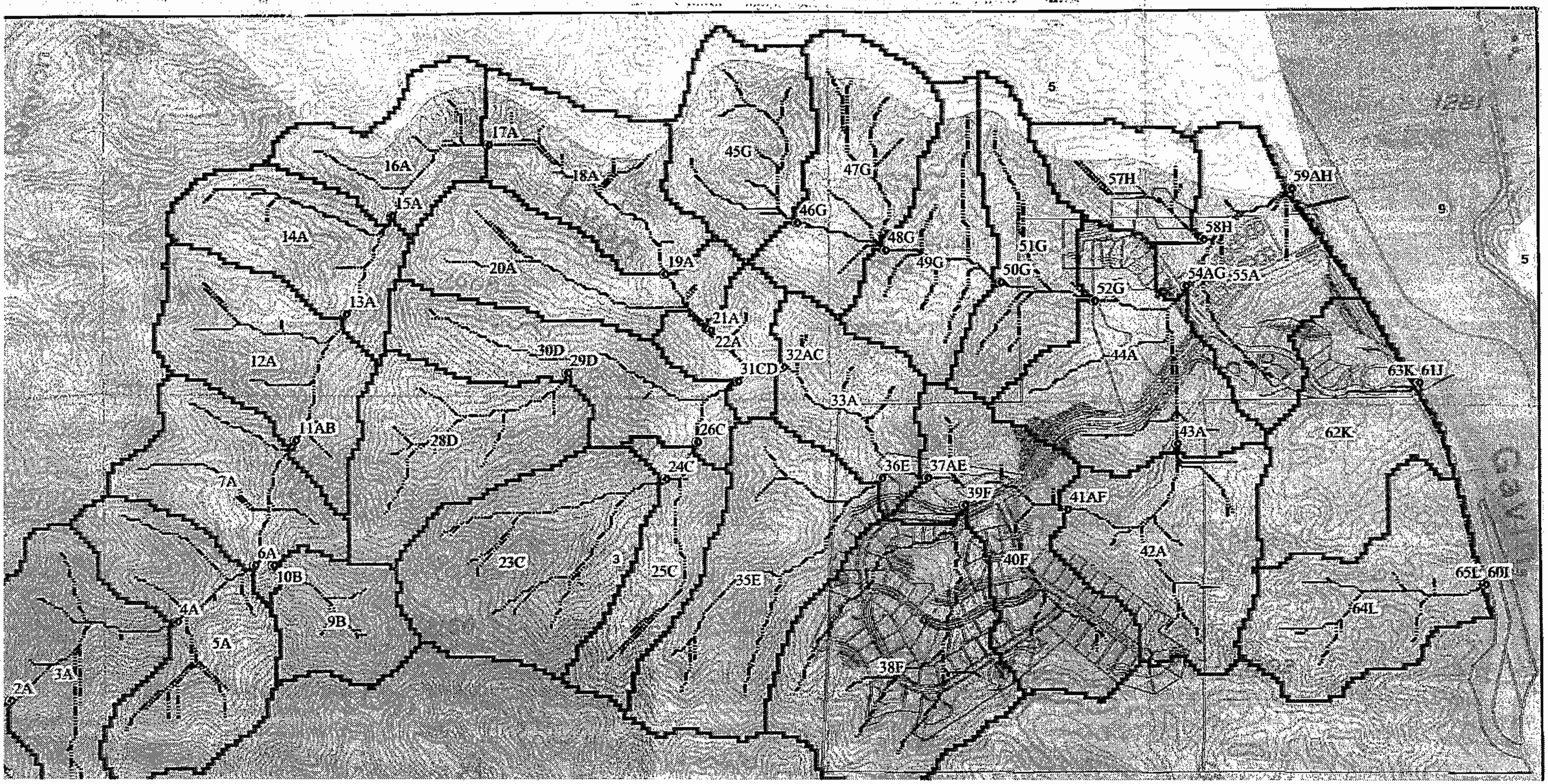

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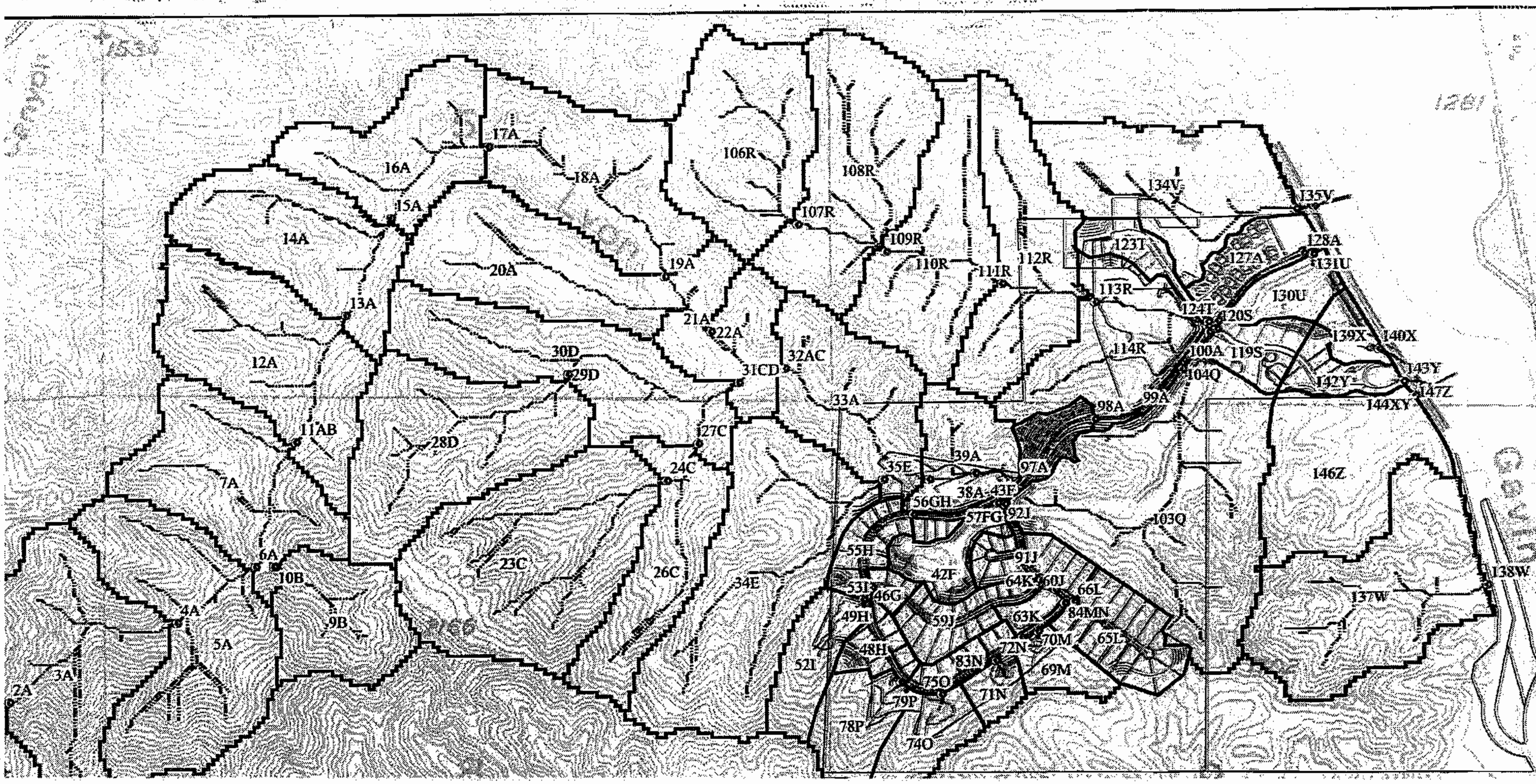

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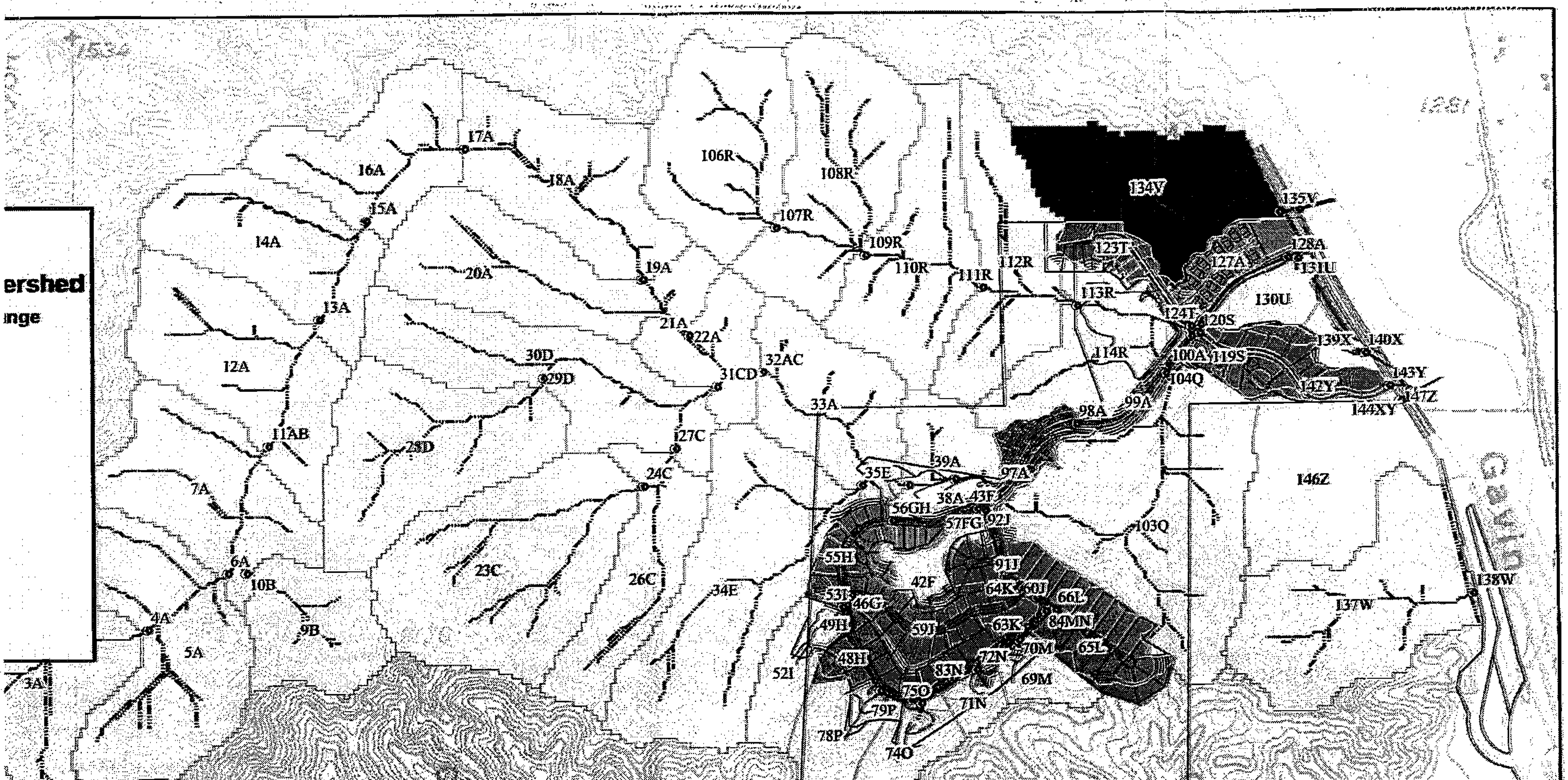

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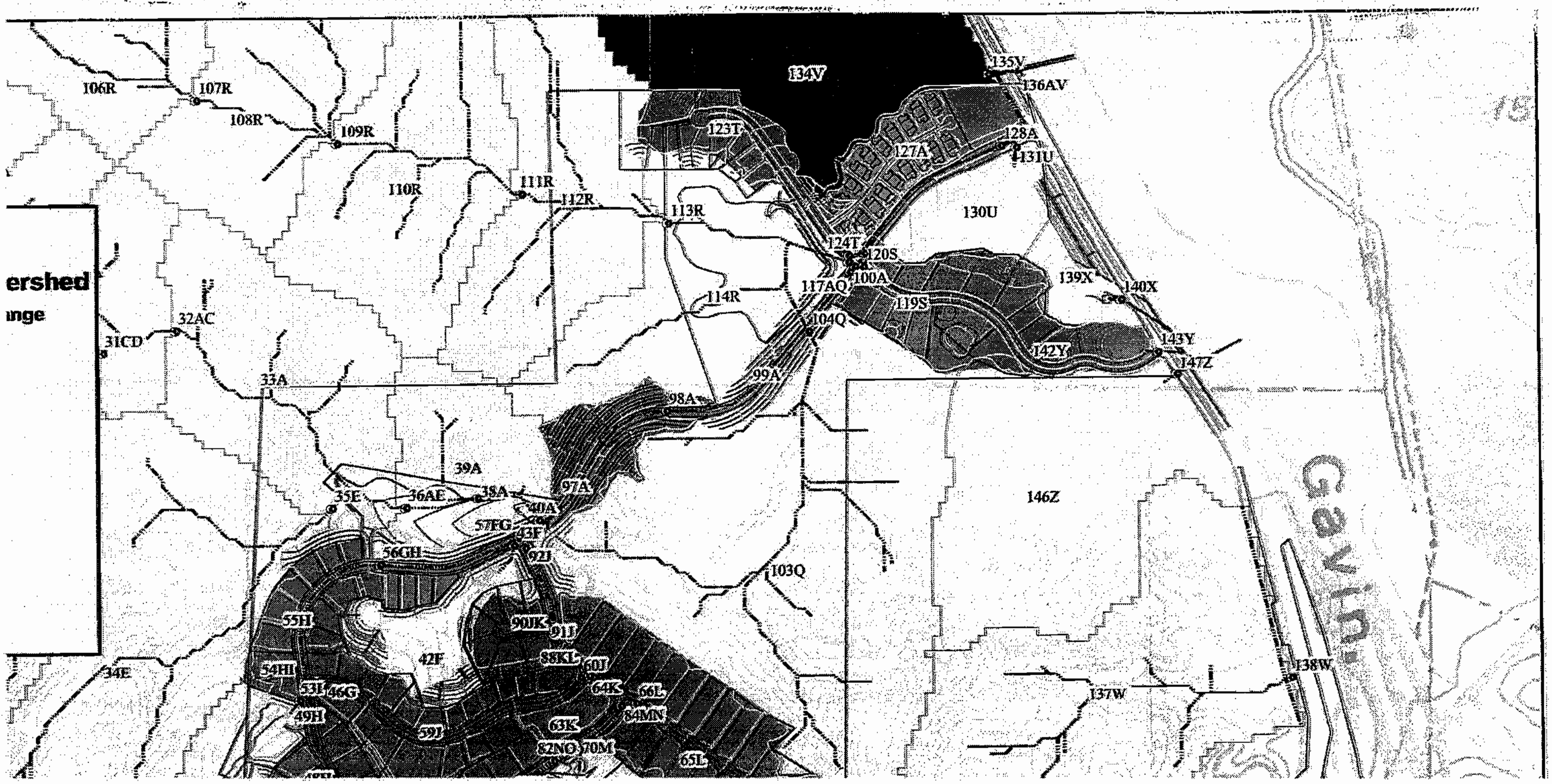
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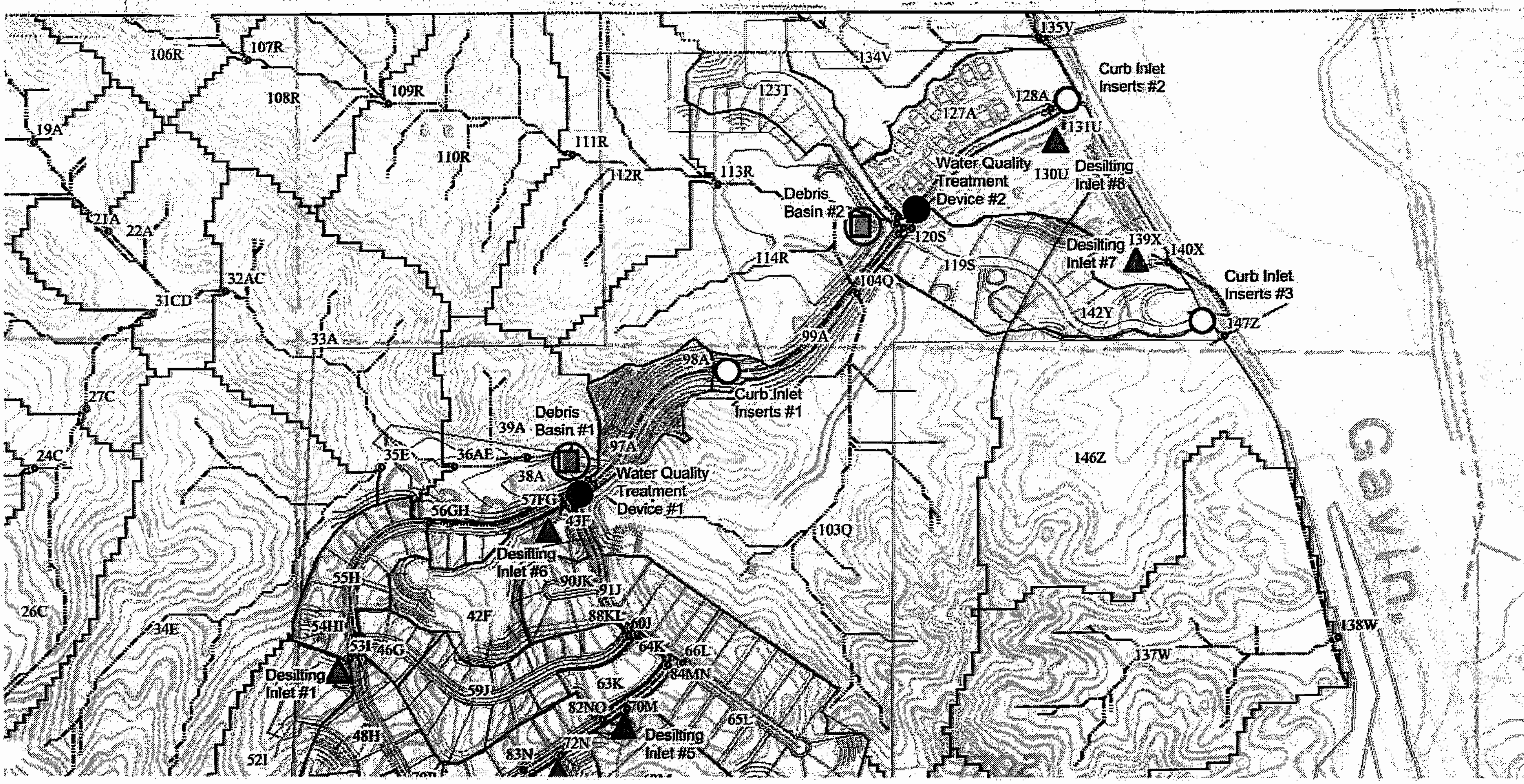
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Appendix 2
Existing Structures

Culvert Calculator Report
24 CSP

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	1,319.00 ft	Headwater Depth/Height	4.00
Computed Headwater Elev:	1,319.00 ft	Discharge	19.53 cfs
Inlet Control HW Elev.	1,314.20 ft	Tailwater Elevation	1,311.00 ft
Outlet Control HW Elev.	1,319.00 ft	Control Type	Outlet Control

Grades

Upstream Invert	1,311.00 ft	Downstream Invert	1,306.50 ft
Length	270.00 ft	Constructed Slope	0.016667 ft/ft

Hydraulic Profile

Profile	PressureProfile	Depth, Downstream	4.50 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	1.59 ft
Velocity Downstream	6.22 ft/s	Critical Slope	0.026963 ft/ft

Section

ction Shape	Circular	Mannings Coefficient	0.024
tion Material	CMP	Span	2.00 ft
Section Size	24 Inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	1,319.00 ft	Upstream Velocity Head	0.60 ft
Ke	0.90	Entrance Loss	0.54 ft

Inlet Control Properties

Inlet Control HW Elev.	1,314.20 ft	Flow Control	N/A
Inlet Type	Projecting	Area Full	3.1 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Calculator Report
30 CSP

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	1,340.00 ft	Headwater Depth/Height	1.20
Computed Headwater Elev:	1,340.00 ft	Discharge	24.34 cfs
Inlet Control HW Elev.	1,339.89 ft	Tailwater Elevation	1,337.00 ft
Outlet Control HW Elev.	1,340.00 ft	Control Type	Outlet Control

Grades

Upstream Invert	1,337.00 ft	Downstream Invert	1,336.30 ft
Length	65.00 ft	Constructed Slope	0.010769 ft/ft

Hydraulic Profile

Profile	M2	Depth, Downstream	1.68 ft
Slope Type	Mild	Normal Depth	2.21 ft
Flow Regime	Subcritical	Critical Depth	1.68 ft
Velocity Downstream	6.94 ft/s	Critical Slope	0.019080 ft/ft

Section

Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	2.50 ft
Section Size	30 inch	Rise	2.50 ft
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	1,340.00 ft	Upstream Velocity Head	0.48 ft
Ke	0.90	Entrance Loss	0.43 ft

Inlet Control Properties

Inlet Control HW Elev.	1,339.89 ft	Flow Control	N/A
Inlet Type	Projecting	Area Full	4.9 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Calculator Report
48 CSP

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	1,314.00 ft	Headwater Depth/Height	2.22
Computed Headwater Elev:	1,314.00 ft	Discharge	122.97 cfs
Inlet Control HW Elev.	1,312.54 ft	Tailwater Elevation	1,305.00 ft
Outlet Control HW Elev.	1,314.00 ft	Control Type	Outlet Control

Grades

Upstream Invert	1,305.10 ft	Downstream Invert	1,304.00 ft
Length	140.00 ft	Constructed Slope	0.007857 ft/ft

Hydraulic Profile

Profile	CompositeM2PressureProfile	Depth, Downstream	3.33 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	3.33 ft
Velocity Downstream	10.99 ft/s	Critical Slope	0.024273 ft/ft

Section

Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	4.00 ft
Section Size	48 inch	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	1,314.00 ft	Upstream Velocity Head	1.49 ft
Ke	0.90	Entrance Loss	1.34 ft

Inlet Control Properties

Inlet Control HW Elev.	1,312.54 ft	Flow Control	N/A
Inlet Type	Projecting	Area Full	12.6 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Rating Table Report
2-8x8 RCB

Range Data:

	Minimum	Maximum	Increment
Allowable HW E	1,296.00	1,310.00	1.00 ft

HW Elev. (ft)	Discharge (cfs)
1,296.00	0.00
1,297.00	40.94
1,298.00	115.81
1,299.00	212.76
1,300.00	327.56
1,301.00	457.78
1,302.00	601.76
1,303.00	758.31
1,304.00	926.48
1,305.00	1,105.51
1,306.00	1,294.79
1,307.00	1,421.27
1,308.00	1,560.88
1,309.00	1,705.44
1,310.00	1,838.66

Culvert Calculator Report
2-8x8 RCB

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	1,308.00 ft	Headwater Depth/Height	1.50
Computed Headwater Elev:	1,308.00 ft	Discharge	1,538.21 cfs
Inlet Control HW Elev.	1,308.00 ft	Tailwater Elevation	1,296.00 ft
Outlet Control HW Elev.	1,307.22 ft	Control Type	Inlet Control

Grades

Upstream Invert	1,296.00 ft	Downstream Invert	1,293.00 ft
Length	300.00 ft	Constructed Slope	0.010000 ft/ft

Hydraulic Profile

Profile	S2	Depth, Downstream	5.16 ft
Slope Type	Steep	Normal Depth	4.95 ft
Flow Regime	Supercritical	Critical Depth	6.60 ft
Velocity Downstream	18.65 ft/s	Critical Slope	0.004814 ft/ft

Section

Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 8 ft	Rise	8.00 ft
Number Sections	2		

Outlet Control Properties

Outlet Control HW Elev.	1,307.22 ft	Upstream Velocity Head	3.30 ft
Ke	0.40	Entrance Loss	1.32 ft

Inlet Control Properties

Inlet Control HW Elev.	1,308.00 ft	Flow Control	N/A
Inlet Type	30 to 75° wingwall flares	Area Full	128.0 ft²
K	0.02600	HDS 5 Chart	8
M	1.00000	HDS 5 Scale	1
C	0.03470	Equation Form	1
Y	0.86000		

4. SEDIMENT CONTROL

This Section discusses the type of structure acceptable to the Department for sediment control. The type of structure depends on the volume of sediment computed to be delivered to the site. This, in turn, depends on the Debris (sediment) Potential Area (DPA) zone for the particular watershed. The following table is used to determine the type of structure. See Section 3 for methods of computing the sediment production volume.

Total Sediment Production (cubic yards)	Type of Structure: DPA zone 1-4 requirement	Type of Structure: DPA zone 5-11 requirement
20,000 or greater	Debris Basin	Debris Basin
5,000 to 19,999	Debris Basin	Elevated Inlet
1,000 to 4,999	Debris Basin or Elevated Inlet *	Desilting Inlet
250 to 999	Desilting Inlet *	Inlet with bulked flow drain
less than 250	Inlet* with bulked flow drain	Inlet with bulked flow drain

* The use of elevated or desilting inlets and bulked flow drains in DPA zones 1 through 4 will only be approved by the Department in special circumstances. The reason being that the steepness of the watershed, presence of boulders, and higher sediment and mudflow potential result in a greater risk of plugging the storm drain and damaging the desilting wall.

Table 4.1

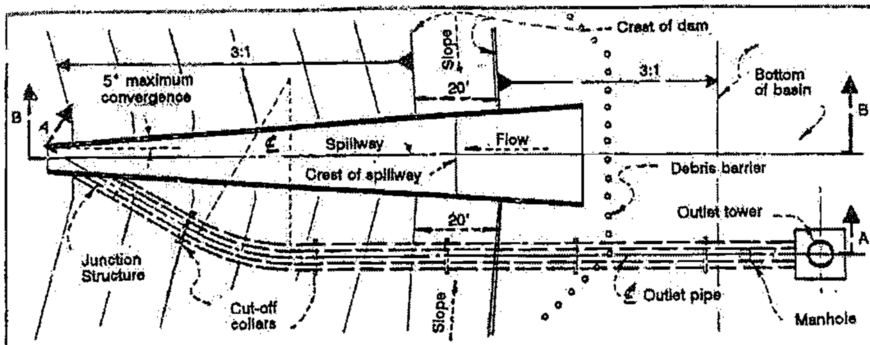
Where sediment production is less than 250 cubic yards, sediment control is generally not needed. Design the conveying storm drain following the closed conduit bulked flow design criteria listed in Section 5.D-2.

As stated in the State Water Code, Division 3, Section 6000-6452, certain dams are under State jurisdiction (refer to Figure 4.1). The State may have additional requirements for the design of the facility.

A. GENERAL DESIGN CONSIDERATIONS

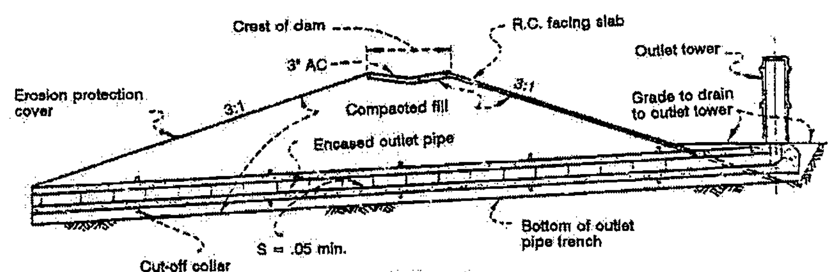
A-1. Location and Alignment

Locate all sediment retaining facilities in the existing watercourse. Align dams perpendicular to the original flow paths (see Figure 4.2(a)). In order to insure maximum capacity, place the longer

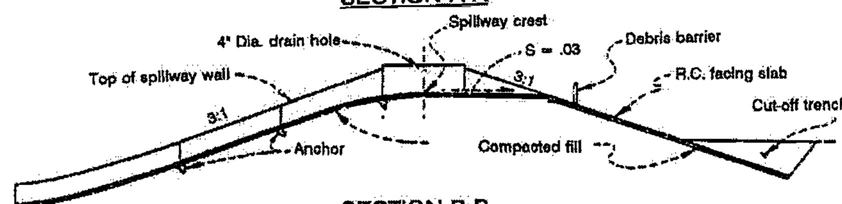


PLAN

TYPICAL SPILLWAY AND OUTLET WORKS



SECTION A-A



SECTION B-B

TYPICAL DEBRIS BASIN

FIGURE 4.4

Table 4.2

	Debris Basin[1]	Elevated Inlet See Figure 4.5	
General Location		Locate both facilities such that should an overflow occur a street or other safe path is avail sediment.	
Horizontal alignment	Locate in the original watercourse where the dam is perpendicular to the flow path (see Figure 4.2(a)). Longer dimension of the basin shall fall along the flow l		
Outlet Tower and Conduit	Refer to the section on Outlet Works in the Department's Debris Dams and Basins Design Manual.	A standard concrete outlet tower and conduit is required (see the Debris Dams and Basin Design Manual), except in phased upstream development where corrugated metal pipe (CMP) tower with a concrete base may be substituted.[2]	A corrugat required up
Gage Boards	Gage boards are required on basins under State Jurisdiction. Sediment lines painted on towers, marking from the lowest port invert suffice for all others. See the section on Gage Board Pipe Support in the Department's Debris Dams and Basins Design Manual.	Gage boards or sediment lines painted on towers, marking from the lowest port invert can	
Earth Embankment	Upstream and downstream embankment slopes less than or equal to 3H:1V. Steeper slopes require complete geotechnical stability analysis. Also refer to the section on Earthen Dam Design in the Department's Debris Dams and Basins Design Manual.	Maximum berm slope is 3H:1V. Steeper slopes require complete geotechnical stability analysis. Also refer to the section on Earth Dam Design in the Department's Debris Dams and Basins Design Manual.	Protect the desilting w concrete fa acceptable
Embankment Crest	The top width of the berm over the inlet shall be 20-feet paved 3 inches of asphalt concrete. A berm width of 15-feet may be approved if geological analysis is		
Facing Slab	6-inch concrete or gunite with No. 5 reinforcing steel at 18-inch spacing each way. See section on Earthen Dam Design, Protection for Dam Slopes in the Department's Debris Dams and Basins Design Manual.	A 6-inch thick reinforced concrete facing slab with reinforcing steel (no wire mesh) exte placed concrete is acceptable). Provide facing slabs around the basin wall if cut and fill r	
Trash Barriers	Refer to the section on Debris Barrier in the Department's Debris Dams and Basins Design Manual.	A swinging trash rack is required for conduits greater than 48-inches in diameter. A sloping trash rack per LACDPW[4] 3089-0 can be used for smaller conduits. Trash posts spaced at 4-feet or 2/3 the diameter of the conduit, whichever is smaller, are also required at all elevated inlets.	A sloping trash posts conduit ar
Access Roads	Access roads with 12 ft wide paving (3-inch asphalt concrete on 4-inch crushed aggregate base) within a 15-ft easement with minimum radius of 40 feet can be used for structures with capacity less than 20,000 cubic yards. See section on Access to Dam and Basin in the Department's Debris Dams and Basins Design Manual.	Provide a vehicular access road into the basin at least 12-feet wide within a 15-feet easen concrete over 4 inches of crushed aggregate base.	

Footnotes:

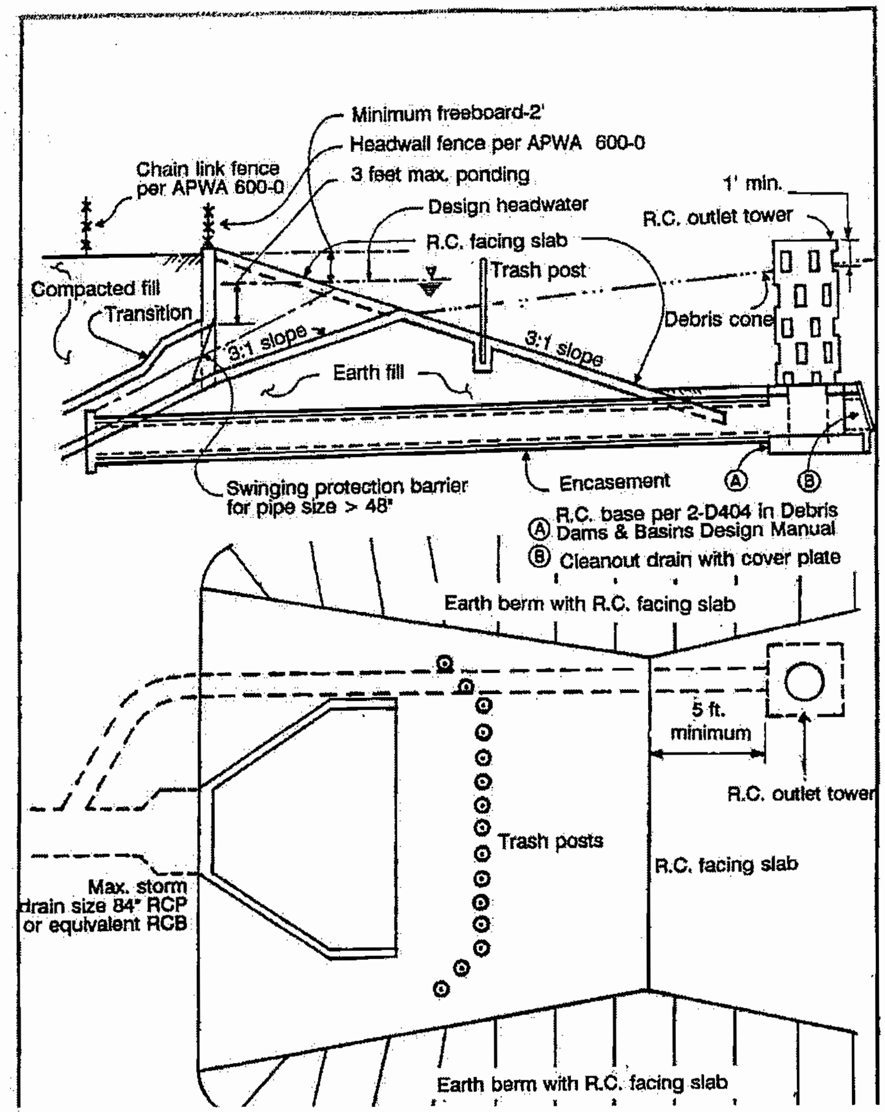
1 Criteria listed in this table for debris basins amends the criteria given in the Department's Debris Dams and Basins Design Manual.

2 The tower base can be modified to include a cleanout drain with a cover plate to allow flushing of the conduit. Extend the encasement on the conduit to the junction with from the intersection of the upstream face and the design headwater elevation meets the conduit, whichever is lesser.

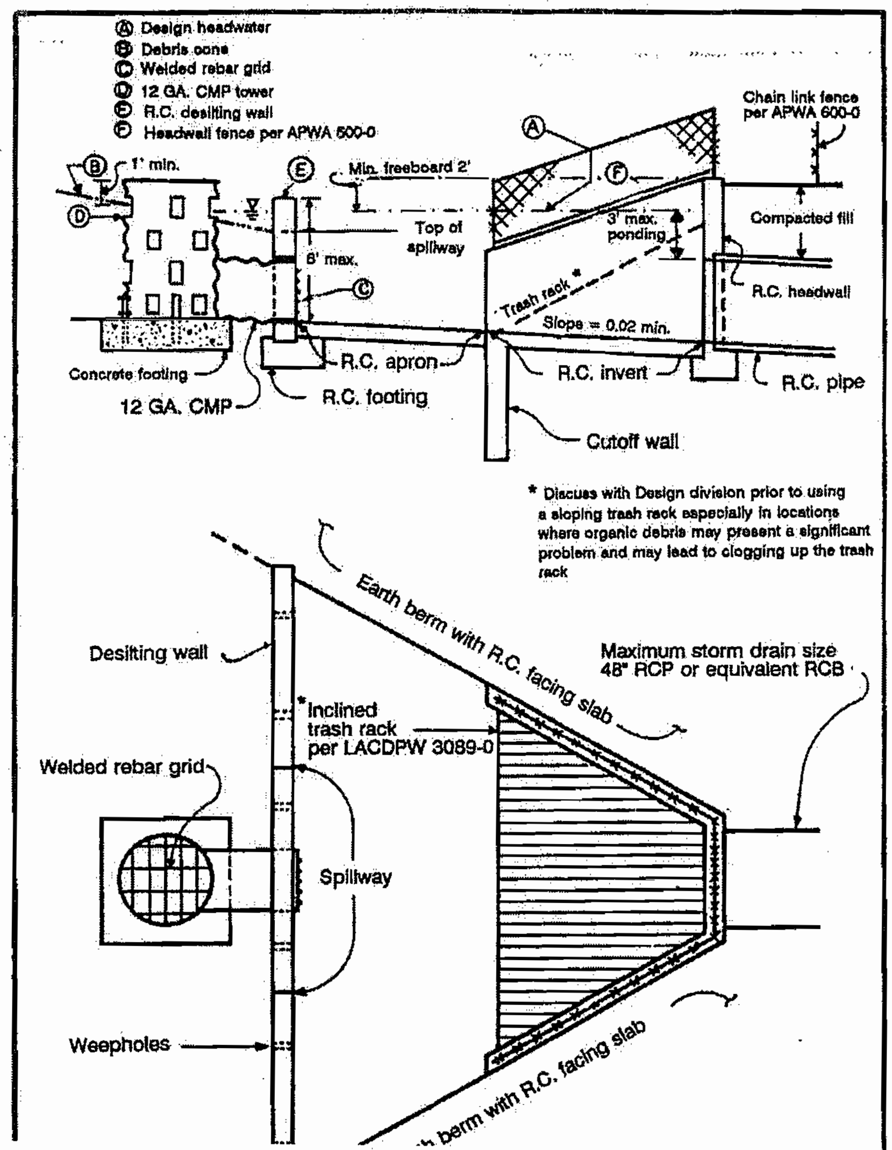
3 Discuss with Design Division prior to using a sloping trash rack especially in locations where organic debris may present a significant problem and may lead to clogging up

4 Standard plans designated by an LACDPW number refer to the Department's Standard Plan Manual (1992 Edition).

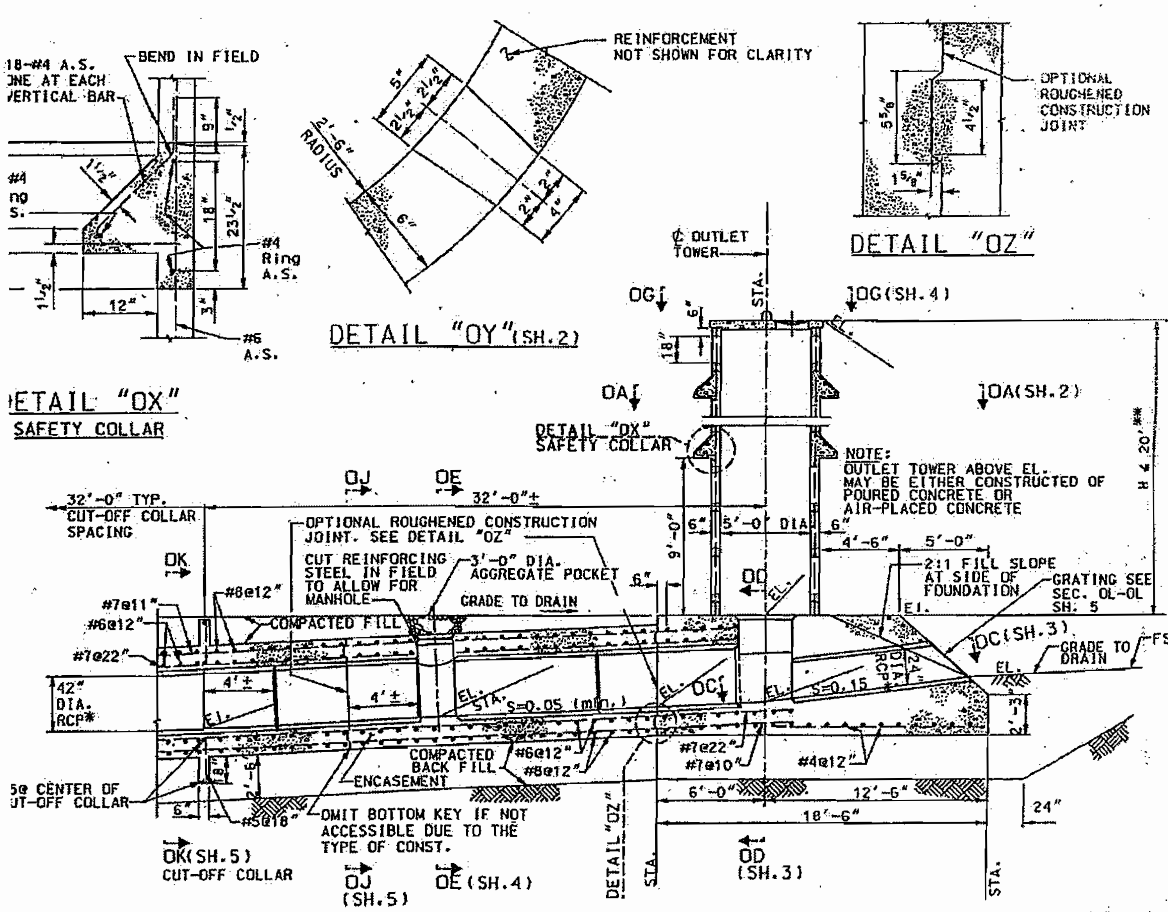
5 Standard plans designated by an APWA number refer to the Standard Plans for Public Works Construction Manual by the American Public Works Association, 1985 Edition



Minimum freeboard-2'
Headwall fence per APWA 600-0
3 feet max. ponding
Design headwater
R.C. facing slab
Trash post
Chain link fence per APWA 600-0
1' min.
R.C. outlet tower
Debris cone
Compacted fill
Transition
3:1 slope
3:1 slope
Earth fill
Swinging protection barrier for pipe size > 48"
Encasement
Ⓐ Ⓑ
Ⓐ R.C. base per 2-D404 in Debris Dams & Basins Design Manual
Ⓑ Cleanout drain with cover plate
Earth berm with R.C. facing slab
5 ft. minimum
R.C. outlet tower
Trash posts
R.C. facing slab
Max. storm drain size 84" RCP or equivalent RCB
Earth berm with R.C. facing slab



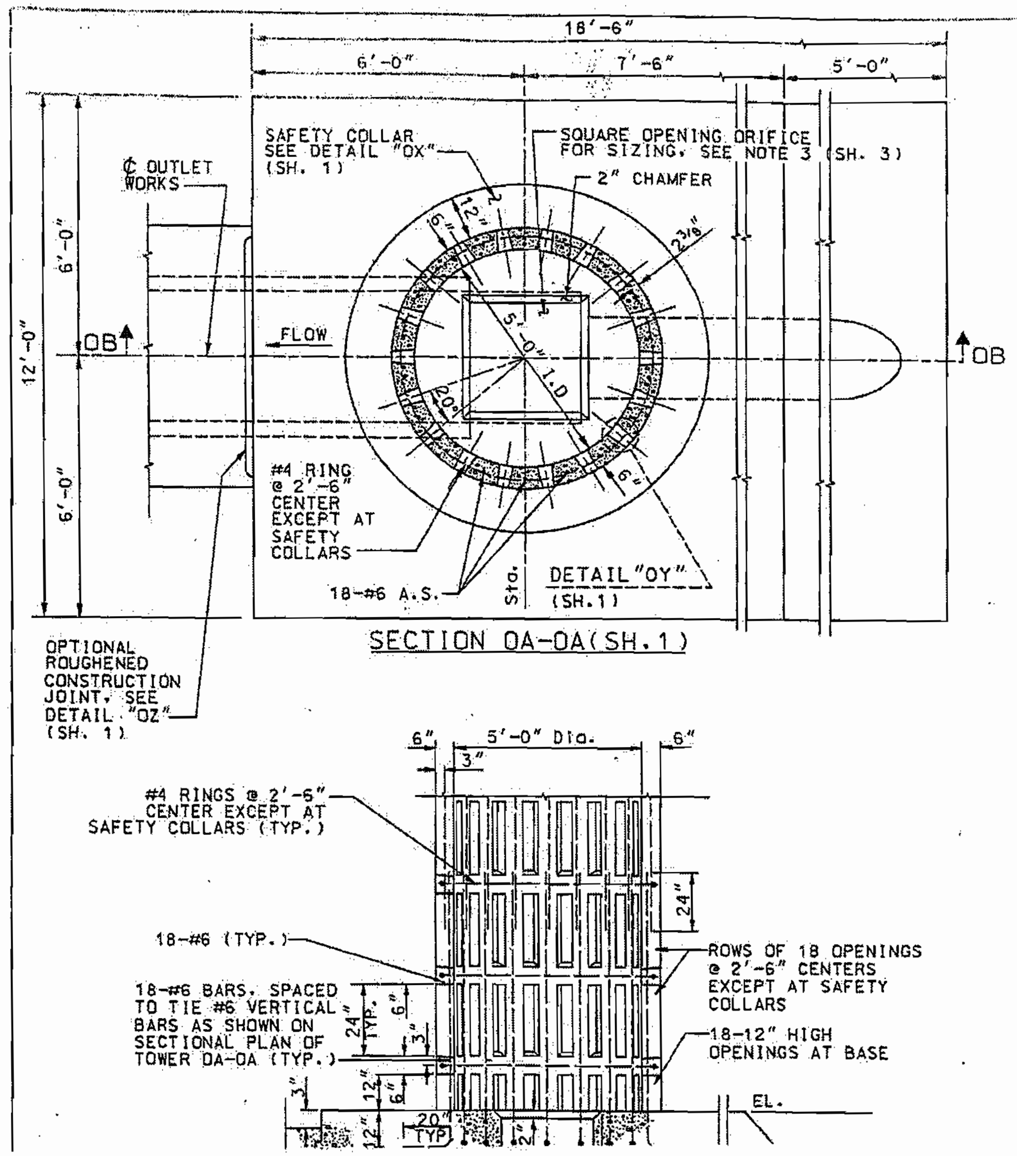
Ⓐ Design headwater
Ⓑ Debris cone
Ⓒ Welded rebar grid
Ⓓ 12 GA. CMP tower
Ⓔ R.C. desilting wall
Ⓕ Headwall fence per APWA 600-0
1' min.
Min. freeboard 2'
Top of spillway
6' max.
3' max. ponding
Trash rack *
Slope = 0.02 min.
Chain link fence per APWA 600-0
Compacted fill
R.C. headwall
R.C. pipe
R.C. invert
R.C. apron
R.C. footing
Concrete footing
12 GA. CMP
Cutoff wall
* Discuss with Design division prior to using a sloping trash rack especially in locations where organic debris may present a significant problem and may lead to clogging up the trash rack
Earth berm with R.C. facing slab
Maximum storm drain size 48" RCP or equivalent RCB
Desilting wall
*Inclined trash rack per LACDPW 3089-0
Welded rebar grid
Spillway
Weepholes
h berm with R.C. facing slab



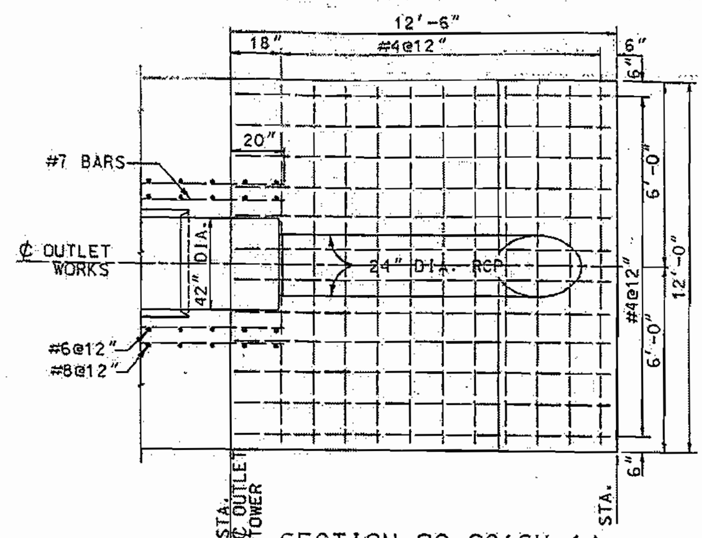
SECTION THROUGH OUTLET WORKS

* – 2000 D – MIN. INTERIOR STEEL COVER $1\frac{3}{4}$"

** – FOR DESIGN H > 20' CONSULT PUBLIC WORKS' DESIGN DIVISION



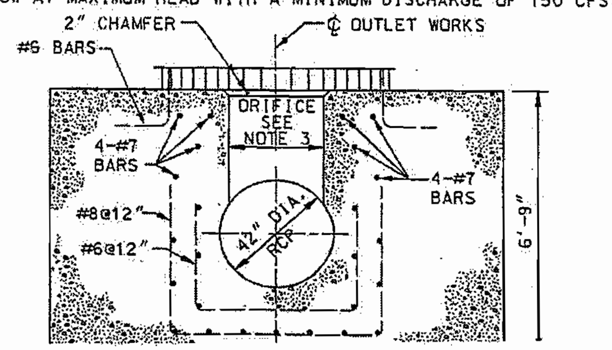
SECTION OA-OA(SH.1)

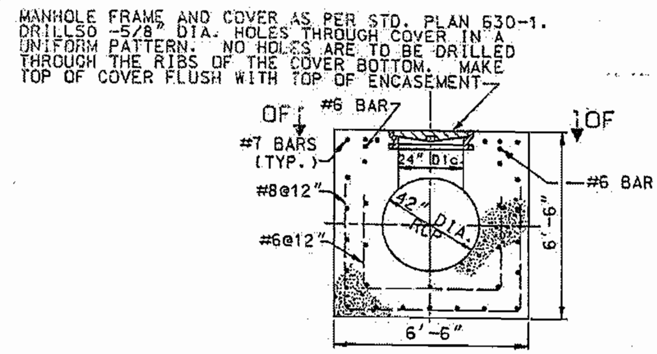


SECTION OC-OC(SH.1)

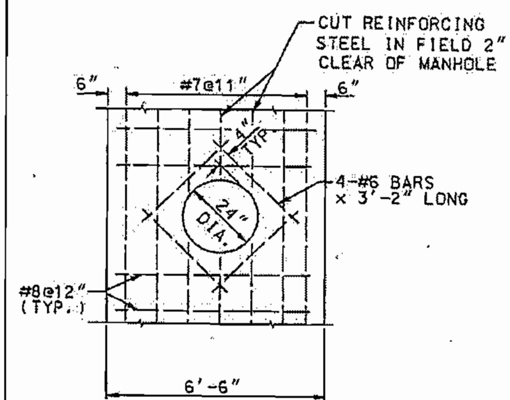
NOTE:

1. THE 42" RCP SHALL BE SECURELY ANCHORED WHILE CONCRETE ENCASEMENT IS BEING PLACED
2. THE LONGITUDINAL #7 BARS SHOWN IN THE OUTLET PIPE ENCASEMENT ARE DESIGNED FOR HARD GRADE STEEL ONLY. IF MEDIUM GRADE STEEL IS USED IN PLACE OF HARD GRADE STEEL, THE SIZE OR NUMBER OF LONGITUDINAL BARS MUST BE INCREASED TO PROVIDE A TOTAL STEEL AREA EQUAL TO 1.275 TIMES THE TOTAL AREA OF LONGITUDINAL BARS SHOWN HEREON.
3. THE ORIFICE OPENING SIZE SHALL BE SIZED FOR NON-PRESSURE FLOW AT MAXIMUM HEAD WITH A MINIMUM DISCHARGE OF 150 CFS

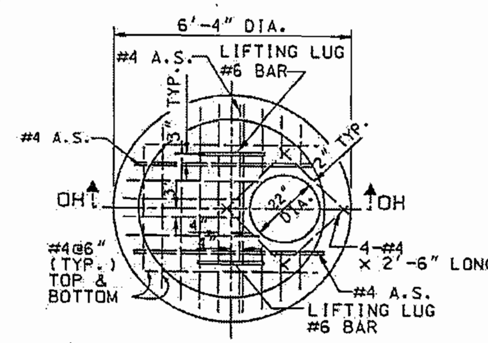




SECTION OE-OE (SH.1)

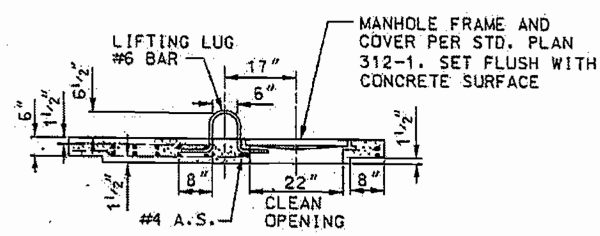


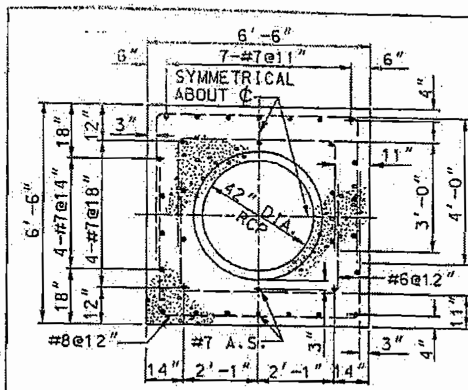
SECTION OF-OF



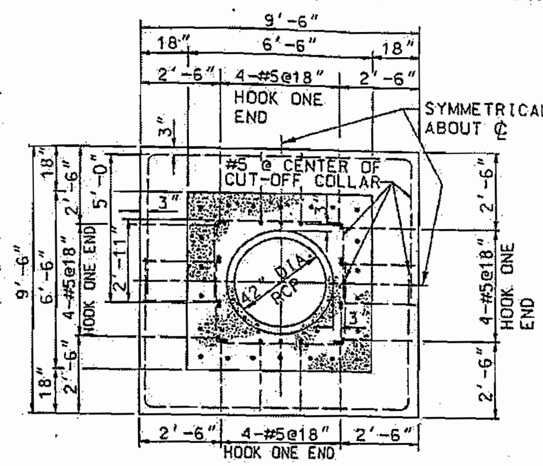
PLAN OG-OG (SH.1)

SHOWING OUTLET TOWER COVER



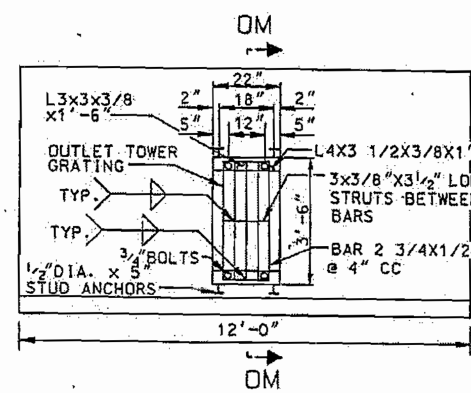


SECTION OJ-OJ(SH.1)

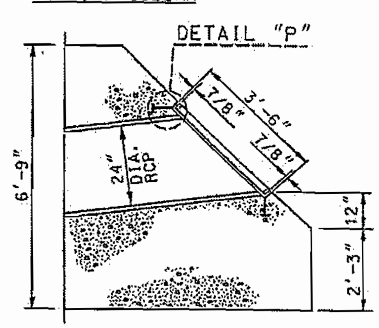


SECTION OK-OK(SH.1)

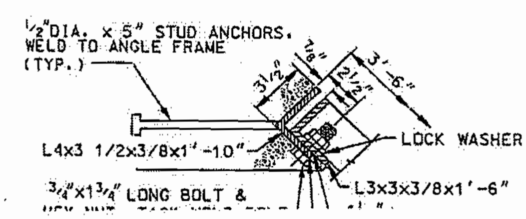
CUT-OFF COLLAR



SECTION OL-OL(SH.1)



SECTION OM-OM



Appendix 4
Existing Burned Watershed
50-Years, 24-hour event

Appendix 4
Existing Burned Watershed
50-Years, 24-hour event

[illegible] Run date: Mon Jan 30 08:27:50 2006

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA	SUBAREA Q	TOTAL AREA	TOTAL Q	TOTAL VOLUME	CONV TYPE	CONV LNGTH	CONV SLOPE	CONV SIZE	CONV Z	CONTROL Q	SOIL NAME	TC	RAIN	PCT IMPV
1	1A	37.6	[illegible]	37.6	122.35	[illegible].940	[illegible]	0	0.00000	0.00	0.00	0	293	8	8.51	0.01
1	2A	0.0	0.00	37.8	122.[illegible]	[illegible].119	1	1517	0.14568	0.00	0.00	0	293	0	8.51	0.00
1	3A	41.0	125.10	78.8	227.[illegible]	[illegible].836	0	0	0.00000	0.00	0.00	0	293	9	8.51	0.01
1	4A	0.0	0.00	78.8	227.97	16.859	1	727	0.10127	0.00	0.00	0	293	0	8.51	0.00
1	5A	40.6	131.54	119.4	337.56	25.493	0	0	0.00000	0.00	0.00	0	293	8	8.51	0.01
1	6A	0.0	0.00	119.4	337.56	25.553	1	1016	0.07674	0.00	0.00	0	293	0	8.51	0.00
1	7A	30.4	103.68	149.8	410.67	35.069	0	0	0.00000	0.00	0.00	0	291	8	8.51	0.01
1	9B	17.6	70.51	17.8	70.51	5.573	0	0	0.00000	0.00	0.00	0	291	6	8.51	0.01
1	10B	0.0	0.00	17.8	70.51	5.646	1	1044	0.02760	0.00	0.00	0	291	0	8.51	0.00
1	11AB	17.8	62.41	167.6	473.08	40.783	1	1044	0.06035	0.00	0.00	0	291	0	8.51	0.00
1	12A	34.8	117.68	202.4	535.88	51.537	0	0	0.00000	0.00	0.00	0	291	8	8.44	0.01
1	13A	0.0	0.00	202.4	535.88	51.599	1	832	0.04569	0.00	0.00	0	291	0	8.44	0.00
1	14A	28.3	94.27	230.7	556.16	60.145	0	0	0.00000	0.00	0.00	0	291	8	8.33	0.01
1	15A	0.0	0.00	230.7	556.16	60.206	1	978	0.04602	0.00	0.00	0	291	0	8.33	0.00
1	16A	23.8	75.61	254.5	571.25	67.517	0	0	0.00000	0.00	0.00	0	291	9	8.41	0.01
1	17A	0.0	0.00	254.5	571.25	67.575	1	1815	0.04297	0.00	0.00	0	291	0	8.41	0.00
1	18A	30.8	93.67	285.3	572.13	77.177	0	0	0.00000	0.00	0.00	0	291	10	8.49	0.01
1	19A	0.0	0.00	285.3	572.13	77.188	1	534	0.02809	0.00	0.00	0	291	0	8.49	0.00
1	20A	32.0	92.89	317.3	590.21	87.196	0	0	0.00000	0.00	0.00	0	291	11	8.51	0.01
1	21A	0.0	0.00	317.3	590.21	87.210	1	666	0.04052	0.00	0.00	0	291	0	8.51	0.00
1	22A	13.3	52.69	330.6	593.34	91.374	0	0	0.00000	0.00	0.00	0	291	6	8.51	0.01
1	23C	46.5	149.55	46.5	149.55	14.558	0	0	0.00000	0.00	0.00	0	291	9	8.51	0.01
1	24C	0.0	0.00	46.5	149.55	14.634	1	419	0.05016	0.00	0.00	0	291	0	8.51	0.00
1	25C	21.3	68.51	67.8	214.46	21.303	0	0	0.00000	0.00	0.00	0	291	9	8.51	0.01
1	26C	0.0	0.00	67.8	214.46	21.345	1	611	0.04440	0.00	0.00	0	291	0	8.51	0.00
1	28D	35.9	115.44	35.9	115.44	11.236	0	0	0.00000	0.00	0.00	0	291	9	8.51	0.01
1	29D	0.0	0.00	35.9	115.44	11.342	1	1490	0.04037	0.00	0.00	0	291	0	8.51	0.00
1	30D	33.1	91.88	69.0	179.63	21.697	0	0	0.00000	0.00	0.00	0	291	12	8.51	0.01
1	31CD	69.0	179.63	136.8	386.81	43.068	1	372	0.04261	0.00	0.00	0	291	0	8.51	0.00
1	32AC	136.8	384.67	467.4	896.02	134.513	1	1490	0.02349	0.00	0.00	0	291	0	8.51	0.00
1	33A	23.9	76.87	491.3	889.96	141.996	0	0	0.00000	0.00	0.00	0	291	9	8.51	0.01
1	35E	48.0	146.36	48.0	146.36	15.026	0	0	0.00000	0.00	0.00	0	291	10	8.51	0.01
1	36E	0.0	0.00	48.0	146.36	15.112	1	386	0.02852	0.00	0.00	0	291	0	8.51	0.00
1	37AE	48.0	144.21	539.3	950.49	157.121	1	1116	0.02420	0.00	0.00	0	291	0	8.51	0.00
1	38F	56.8	173.22	56.8	173.22	17.784	0	0	0.00000	0.00	0.00	0	291	10	8.51	0.01
1	39F	0.0	0.00	56.8	173.22	17.907	1	898	0.02450	0.00	0.00	0	291	0	8.51	0.00
1	40F	41.5	126.56	98.3	273.31	30.901	0	0	0.00000	0.00	0.00	0	291	10	8.51	0.01
1	41AF	98.3	273.31	637.6	1089.38	188.023	1	1289	0.02947	0.00	0.00	0	291	0	8.51	0.00
1	42A	40.1	129.01	677.7	1104.25	200.584	0	0	0.00000	0.00	0.00	0	291	9	8.51	0.01
1	43A	0.0	0.00	677.7	1104.25	200.542	1	1207	0.02167	0.00	0.00	0	291	0	8.51	0.00
1	44A	41.5	120.58	719.2	1112.45	209.820	0	0	0.00000	0.00	0.00	0	297	10	8.51	0.01
1	45G	29.7	96.86	29.7	96.86	6.640	0	0	0.00000	0.00	0.00	0	297	8	8.51	0.01
1	46G	0.0	0.00	29.7	96.86	6.713	1	711	0.05487	0.00	0.00	0	297	0	8.51	0.00
1	47G	33.8	110.51	63.5	194.11	14.546	0	0	0.00000	0.00	0.00	0	297	8	8.51	0.03
1	48G	0.0	0.00	63.5	194.11	14.602	1	923	0.01842	0.00	0.00	0	297	0	8.51	0.00
1	49G	28.4	93.09	91.9	233.63	21.416	0	0	0.00000	0.00	0.00	0	297	8	8.51	0.05
1	50G	0.0	0.00	91.9	233.63	21.451	1	716	0.03914	0.00	0.00	0	297	0	8.51	0.00
1	51G	27.4	84.77	119.3	283.06	28.248	0	0	0.00000	0.00	0.00	0	297	9	8.51	0.07
1	52G	0.0	0.00	119.3	283.06	28.291	1	777	0.02590	0.00	0.00	0	297	0	8.51	0.00
1	54AG	119.3	273.70	838.5	1310.17	238.037	1	1121	0.01452	0.00	0.00	0	297	0	8.51	0.00
1	55A	37.4	104.35	875.9	1316.96	247.450	0	0	0.00000	0.00	0.00	0	297	11	8.51	0.08
1	57H	18.4	64.03	18.4	64.03	5.255	0	0	0.00000	0.00	0.00	0	97	7	8.51	0.23
1	58H	0.0	0.00	18.4	64.03	5.338	1	774	0.01588	0.00	0.00	0	97	0	8.51	0.00
1	59AH	18.4	52.72	894.3	1333.67	247.604	0	0	0.00000	0.00	0.00	0	97	0	8.51	0.00
1	60I	0.0	0.00	0.0	0.00	0.000	0	0	0.00000	0.00	0.00	0	97	0	8.51	0.00
1	61J	0.0	0.00	0.0	0.00	0.000	0	0	0.00000	0.00	0.00	0	97	0	8.51	0.00
1	62K	36.5	112.51	36.5	112.51	8.611	0	0	0.00000	0.00	0.00	0	297	9	8.51	0.04
1	63K	0.0	0.00	36.5	112.51	8.611	0	0	0.00000	0.00	0.00	0	297	0	8.51	0.00
1	64L	38.0	116.68	38.0	116.68	8.501	0	0	0.00000	0.00	0.00	0	297	9	8.51	0.01
1	65L	0.0	0.00	38.0	116.68	8.501	0	0	0.00000	0.00	0.00	0	297	0	8.51	0.00

Normal End of MODRAT

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 11AP STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	[illegible]	100	[illegible]	200	5.88	300	6.00	400	7.28
500	[illegible]	600	9.42	700	10.76	800	13.43	900	17.94
1000	27.94	1050	37.20	1100	57.9[illegible]	1110	64.79	1120	74.45
1130	89.24	1131	90.99	1132	92.78	1133	94.63	1134	96.62
1135	98.73	1136	100.99	1137	103.40	1138	105.97	1139	108.73
1140	111.69	1141	114.00	1142	118.38	1143	122.15	1144	126.32
1145	130.90	1146	135.95	1147	141.48	1148	147.64	1149	154.54
1150	162.34	1151	171.32	1152	181.87	1153	194.38	1154	210.06
1155	231.26	1156	274.56	1157	313.12	1158	358.10	1159	405.72
1160	442.18	1161	464.44	1162	473.08	1163	466.35	1164	425.84
1165	382.21	1166	337.66	1167	296.91	1168	259.26	1169	224.79
1170	194.76	1171	170.00	1172	143.60	1173	132.89	1174	119.19
1175	107.94	1176	98.58	1177	90.76	1178	84.15	1179	78.82
1180	73.77	1181	69.48	1182	65.77	1183	62.50	1184	59.55
1185	56.96	1186	54.61	1187	52.50	1188	50.60	1189	48.83
1190	47.17	1191	45.62	1192	44.16	1193	42.83	1194	41.55
1195	40.37	1196	39.26	1197	38.18	1198	37.16	1199	36.21
1200	35.32	1201	34.48	1202	33.71	1203	32.97	1204	32.23
1205	31.53	1206	30.82	1207	30.16	1208	29.52	1209	28.91
1210	28.30	1211	27.73	1212	27.16	1213	26.64	1214	26.14
1215	25.68	1216	25.21	1217	24.77	1218	24.34	1219	23.90
1220	23.50	1221	23.08	1222	22.70	1223	22.33	1224	21.96
1225	21.61	1226	21.25	1227	20.93	1228	20.61	1229	20.29
1230	19.98	1231	19.67	1232	19.41	1233	19.12	1234	18.85
1235	18.58	1236	18.33	1237	18.09	1238	17.84	1239	17.61
1240	17.38	1241	17.17	1242	16.97	1243	16.78	1244	16.57
1245	16.38	1246	16.21	1247	16.02	1248	15.84	1249	15.65
1250	15.49	1251	15.31	1252	15.15	1253	14.98	1254	14.82
1255	14.66	1256	14.52	1257	14.36	1258	14.20	1259	14.06
1260	13.92	1261	13.79	1262	13.65	1263	13.52	1264	13.38
1265	13.26	1266	13.14	1267	13.01	1268	12.90	1269	12.78
1270	12.67	1271	12.57	1272	12.46	1273	12.35	1274	12.24
1275	12.15	1276	12.03	1277	11.94	1278	11.84	1279	11.74
1280	11.65	1281	11.54	1282	11.46	1283	11.37	1284	11.29
1285	11.20	1286	11.11	1287	11.03	1288	10.95	1289	10.88
1290	10.80	1291	10.72	1292	10.65	1293	10.57	1294	10.50
1295	10.43	1296	10.37	1297	10.30	1298	10.24	1299	10.18
1300	10.11	1310	9.54	1320	9.01	1330	8.49	1340	8.03
1350	7.59	1360	7.19	1370	6.82	1380	6.50	1390	6.21
1400	5.95	1420	5.49	1440	5.08	1460	2.99	1500	1.13

Total Runoff = 40.714 Acre-ft.
Peak Q = 473.08 CFS
Time to Peak = 1162 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 11RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.80	100	3.80	200	5.97	300	5.85	400	7.18
500	7.86	600	9.33	700	10.64	800	13.24	900	17.63
1000	27.26	1050	36.18	1100	55.77	1110	61.92	1120	70.39
1130	83.37	1131	84.91	1132	86.44	1133	88.03	1134	89.71
1135	91.50	1136	93.38	1137	95.37	1138	97.47	1139	99.71
1140	102.10	1141	104.67	1142	107.42	1143	110.39	1144	113.61
1145	117.11	1146	120.94	1147	125.16	1148	129.82	1149	134.97
1150	140.68	1151	147.09	1152	154.35	1153	162.68	1154	172.43
1155	184.13	1156	198.86	1157	221.16	1158	253.89	1159	293.95
1160	339.84	1161	386.43	1162	425.19	1163	451.24	1164	462.71
1165	454.04	1166	426.72	1167	390.89	1168	352.72	1169	315.75
1170	280.92	1171	248.73	1172	219.75	1173	194.73	1174	173.21
1175	154.90	1176	139.37	1177	126.24	1178	115.09	1179	105.61
1180	97.51	1181	90.56	1182	84.65	1183	79.42	1184	74.74
1185	70.66	1186	67.08	1187	63.83	1188	60.99	1189	58.40
1190	56.09	1191	54.04	1192	52.11	1193	50.29	1194	48.59
1195	46.99	1196	45.49	1197	44.09	1198	42.77	1199	41.54
1200	40.37	1201	39.26	1202	38.21	1203	37.22	1204	36.33
1205	35.53	1206	34.75	1207	33.99	1208	33.25	1209	32.53
1210	31.82	1211	31.14	1212	30.48	1213	29.84	1214	29.23
1215	28.63	1216	28.05	1217	27.52	1218	27.04	1219	26.56
1220	26.10	1221	25.65	1222	25.20	1223	24.76	1224	24.34
1225	23.92	1226	23.52	1227	23.13	1228	22.74	1229	22.37
1230	22.01	1231	21.66	1232	21.32	1233	20.99	1234	20.67
1235	20.36	1236	20.06	1237	19.76	1238	19.48	1239	19.20
1240	18.93	1241	18.67	1242	18.42	1243	18.17	1244	17.93
1245	17.71	1246	17.51	1247	17.31	1248	17.11	1249	16.92
1250	16.73	1251	16.54	1252	16.35	1253	16.17	1254	15.99
1255	15.81	1256	15.64	1257	15.47	1258	15.30	1259	15.13
1260	14.97	1261	14.81	1262	14.66	1263	14.50	1264	14.35
1265	14.21	1266	14.07	1267	13.93	1268	13.79	1269	13.66
1270	13.53	1271	13.40	1272	13.28	1273	13.16	1274	13.05
1275	12.94	1276	12.83	1277	12.72	1278	12.61	1279	12.50
1280	12.39	1281	12.29	1282	12.19	1283	12.08	1284	11.98
1285	11.88	1286	11.79	1287	11.69	1288	11.60	1289	11.51
1290	11.42	1291	11.33	1292	11.25	1293	11.16	1294	11.08
1295	11.00	1296	10.92	1297	10.84	1298	10.77	1299	10.69
1300	10.63	1310	9.99	1320	9.43	1330	8.92	1340	8.42
1350	7.96	1360	7.54	1370	7.15	1380	6.80	1390	6.48
1400	6.19	1420	5.71	1440	5.29	1460	4.09	1500	1.73

Total Runoff = 40.783 Acre-ft.
Peak Q = 462.71 CFS
Time to Peak = 1164 Minutes

Why are these hydrographs included?

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 32AC STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.60	100	10.50	200	18.87	300	20.37	400	24.65
500	28.72	600	34.04	700	39.41	800	47.82	900	61.83
1000	91.91	1050	118.70	1100	174.43	1110	191.30	1120	213.66
1130	246.48	1131	250.26	1132	254.10	1133	258.19	1134	262.46
1135	266.96	1136	271.69	1137	276.69	1138	281.94	1139	287.51
1140	293.41	1141	299.69	1142	306.41	1143	313.63	1144	321.40
1145	329.81	1146	338.87	1147	348.76	1148	359.62	1149	371.56

1150	384.70	1151	399.38	1152	415.96	1153	435.76	1154	458.17
1155	487.08	1156	535.04	1157	590.68	1158	650.69	1159	710.10
1160	[illegible]	1161	[illegible]	1162	[illegible]	1163	855.83	1164	874.80
1165	[illegible]	1166	[illegible]	1167	893.71	1168	863.60	1169	[illegible]
1170	[illegible]	1171	[illegible]	1172	755.5[illegible]	1173	736.5[illegible]	1174	[illegible]
1175	689.37	1176	661.00	1177	630.63	1178	598.[illegible]	1179	566.11
1180	533.95	1181	502.47	1182	472.31	1183	443.80	1184	417.03
1185	392.04	1186	366.59	1187	347.11	1188	327.43	1189	309.20
1190	292.65	1191	277.41	1192	260.44	1193	250.65	1194	238.93
1195	228.16	1196	218.25	1197	209.15	1198	200.83	1199	193.19
1200	186.01	1201	179.29	1202	173.07	1203	167.27	1204	161.81
1205	156.80	1206	152.10	1207	147.70	1208	143.74	1209	139.94
1210	136.32	1211	132.87	1212	129.55	1213	126.36	1214	123.34
1215	120.42	1216	117.60	1217	114.88	1218	112.30	1219	109.81
1220	107.46	1221	105.21	1222	103.16	1223	101.25	1224	99.42
1225	97.67	1226	95.56	1227	94.31	1228	92.71	1229	91.15
1230	89.64	1231	88.15	1232	86.73	1233	85.33	1234	83.98
1235	82.68	1236	81.45	1237	80.30	1238	79.18	1239	78.11
1240	77.06	1241	76.05	1242	75.05	1243	74.07	1244	73.11
1245	72.16	1246	71.23	1247	70.31	1248	69.43	1249	68.55
1250	67.70	1251	66.86	1252	66.05	1253	65.25	1254	64.47
1255	63.70	1256	62.94	1257	62.20	1258	61.48	1259	60.79
1260	60.10	1261	59.43	1262	58.78	1263	58.15	1264	57.52
1265	56.92	1266	56.37	1267	55.83	1268	55.32	1269	54.80
1270	54.30	1271	53.81	1272	53.32	1273	52.86	1274	52.38
1275	51.93	1276	51.47	1277	51.02	1278	50.59	1279	50.14
1280	49.72	1281	49.29	1282	48.88	1283	48.47	1284	48.06
1285	47.67	1286	47.27	1287	46.89	1288	46.51	1289	46.14
1290	45.77	1291	45.41	1292	45.06	1293	44.71	1294	44.37
1295	44.05	1296	43.73	1297	43.42	1298	43.11	1299	42.81
1300	42.52	1310	39.79	1320	37.35	1330	35.07	1340	32.86
1350	30.80	1360	28.88	1370	27.10	1380	25.50	1390	24.03
1400	22.70	1420	20.38	1440	18.38	1460	13.79	1500	7.12

Total Runoff = 134.442 Acre-ft.
Peak Q = 896.02 CFS
Time to Peak = 1166 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 32RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.60	100	8.29	200	18.06	300	20.15	400	23.96
500	28.31	600	33.27	700	38.90	800	46.72	900	60.40
1000	88.76	1050	114.21	1100	165.32	1110	180.22	1120	199.04
1130	226.08	1131	229.27	1132	232.51	1133	235.77	1134	239.14
1135	242.64	1136	246.29	1137	250.18	1138	254.25	1139	258.51
1140	263.00	1141	267.72	1142	272.69	1143	277.96	1144	283.54
1145	289.48	1146	295.83	1147	302.63	1148	309.96	1149	317.88
1150	326.47	1151	335.84	1152	346.13	1153	357.47	1154	370.06
1155	384.22	1156	400.41	1157	419.49	1158	443.92	1159	477.23
1160	520.52	1161	571.84	1162	628.37	1163	685.50	1164	736.29
1165	777.37	1166	811.00	1167	838.54	1168	859.72	1169	872.94
1170	874.76	1171	863.47	1172	843.32	1173	821.00	1174	799.92
1175	780.11	1176	760.31	1177	739.83	1178	717.47	1179	693.14
1180	667.23	1181	639.55	1182	611.35	1183	582.39	1184	553.67
1185	525.28	1186	497.77	1187	471.22	1188	446.06	1189	422.21
1190	399.71	1191	378.59	1192	358.86	1193	340.46	1194	323.35
1195	307.46	1196	292.73	1197	279.07	1198	266.42	1199	254.69
1200	243.85	1201	233.88	1202	224.55	1203	215.78	1204	207.53
1205	200.02	1206	192.95	1207	186.26	1208	180.17	1209	174.41
1210	169.03	1211	164.12	1212	159.44	1213	154.99	1214	150.75
1215	146.72	1216	142.87	1217	139.20	1218	135.69	1219	132.32
1220	129.10	1221	126.01	1222	123.04	1223	120.19	1224	117.46
1225	115.01	1226	112.72	1227	110.50	1228	108.36	1229	106.30
1230	104.33	1231	102.42	1232	100.58	1233	98.80	1234	97.08
1235	95.41	1236	93.80	1237	92.23	1238	90.70	1239	89.35
1240	88.02	1241	86.72	1242	85.45	1243	84.22	1244	83.02
1245	81.85	1246	80.72	1247	79.62	1248	78.54	1249	77.49
1250	76.47	1251	75.46	1252	74.48	1253	73.52	1254	72.58
1255	71.66	1256	70.75	1257	69.87	1258	69.01	1259	68.16
1260	67.33	1261	66.52	1262	65.72	1263	64.94	1264	64.18
1265	63.43	1266	62.70	1267	61.99	1268	61.29	1269	60.66
1270	60.05	1271	59.44	1272	58.85	1273	58.27	1274	57.71
1275	57.15	1276	56.61	1277	56.08	1278	55.56	1279	55.05
1280	54.54	1281	54.05	1282	53.57	1283	53.09	1284	52.62
1285	52.16	1286	51.71	1287	51.26	1288	50.82	1289	50.39
1290	49.96	1291	49.54	1292	49.12	1293	48.72	1294	48.31
1295	47.92	1296	47.53	1297	47.16	1298	46.81	1299	46.45
1300	46.11	1310	42.92	1320	40.17	1330	37.74	1340	35.48
1350	33.31	1360	31.29	1370	29.37	1380	27.61	1390	26.01
1400	24.52	1420	22.00	1440	19.82	1460	17.02	1500	10.11

Total Runoff = 134.513 Acre-ft.
Peak Q = 874.76 CFS
Time to Peak = 1170 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 37AE STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.00	100	10.93	200	21.36	300	23.81	400	28.43
500	33.55	600	39.51	700	46.06	800	55.51	900	71.69
1000	105.66	1050	136.03	1100	197.83	1110	216.27	1120	240.12
1130	274.66	1131	278.73	1132	282.88	1133	287.10	1134	291.50
1135	296.12	1136	300.94	1137	306.08	1138	311.50	1139	317.20
1140	323.25	1141	329.65	1142	336.46	1143	343.72	1144	351.49
1145	359.86	1146	368.90	1147	378.62	1148	389.22	1149	400.77
1150	413.49	1151	427.65	1152	443.67	1153	461.96	1154	483.43
1155	509.99	1156	554.03	1157	600.32	1158	649.01	1159	693.81
1160	738.69	1161	786.52	1162	836.27	1163	883.60	1164	920.40
1165	932.75	1166	945.63	1167	950.49	1168	947.63	1169	944.00
1170	935.21	1171	917.06	1172	892.08	1173	866.07	1174	842.04
1175	819.75	1176	797.86	1177	775.54	1178	751.55	1179	725.80
1180	698.58	1181	669.71	1182	640.42	1183	610.46	1184	580.80
1185	551.56	1186	523.26	1187	495.98	1188	470.14	1189	445.65
1190	422.56	1191	400.89	1192	380.64	1193	361.76	1194	344.23
1195	327.91	1196	312.78	1197	298.73	1198	285.67	1199	273.55
1200	262.34	1201	251.99	1202	242.28	1203	233.15	1204	224.56

1205	216.70	1206	209.31	1207	202.32	1208	195.95	1209	189.91
1210	184.26	1211	179.00	1212	174.12	1213	169.44	1214	164.97
1215	160.[illegible]	1216	155.6?	1217	152.7?	1218	149.03	1219	145.47
1220	[illegible]	1221	13?.??	1222	135.62	1223	132.??	1224	129.70
1225	127.0?	1226	124.6?	1227	122.??	1228	119.9?	1229	117.77
1230	115.66	1231	113.61	1232	111.6?	1233	109.??	1234	107.89
1235	106.12	1236	104.38	1237	102.69	1238	101.09	1239	99.59
1240	98.16	1241	96.74	1242	95.3?	1243	94.06	1244	92.74
1245	91.47	1246	90.23	1247	89.0?	1248	87.85	1249	86.75
1250	85.64	1251	84.55	1252	83.4?	1253	82.44	1254	81.42
1255	80.42	1256	79.44	1257	78.48	1258	77.55	1259	76.63
1260	75.73	1261	74.85	1262	73.99	1263	73.15	1264	72.31
1265	71.51	1266	70.72	1267	69.94	1268	69.19	1269	68.49
1270	67.82	1271	67.16	1272	66.51	1273	65.88	1274	65.25
1275	64.65	1276	64.05	1277	63.47	1278	62.89	1279	62.33
1280	61.78	1281	61.24	1282	60.71	1283	60.18	1284	59.67
1285	59.17	1286	58.66	1287	58.18	1288	57.69	1289	57.21
1290	56.75	1291	56.28	1292	55.83	1293	55.38	1294	54.93
1295	54.50	1296	54.07	1297	53.66	1298	53.27	1299	52.88
1300	52.50	1310	48.96	1320	45.89	1330	43.08	1340	40.45
1350	37.92	1360	35.59	1370	33.40	1380	31.40	1390	29.57
1400	27.88	1420	24.98	1440	22.49	1460	18.09	1500	10.51

Total Runoff = 157.107 Acre-ft.
Peak Q = 950.49 CFS
Time to Peak = 1167 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 37RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.00	100	9.24	200	20.60	300	23.59	400	27.90
500	33.16	600	38.93	700	45.59	800	54.66	900	70.49
1000	103.17	1050	132.39	1100	190.64	1110	207.58	1120	228.82
1130	259.04	1131	262.56	1132	266.07	1133	269.67	1134	273.46
1135	277.46	1136	281.62	1137	285.93	1138	290.43	1139	295.13
1140	300.09	1141	305.31	1142	310.83	1143	316.67	1144	322.85
1145	329.43	1146	336.45	1147	343.97	1148	352.05	1149	360.78
1150	370.22	1151	380.50	1152	391.76	1153	404.18	1154	418.07
1155	433.79	1156	451.98	1157	474.26	1158	504.22	1159	542.72
1160	586.74	1161	633.39	1162	681.12	1163	730.37	1164	780.94
1165	830.31	1166	872.45	1167	903.07	1168	923.82	1169	936.44
1170	941.97	1171	942.21	1172	937.18	1173	925.73	1174	908.33
1175	887.25	1176	864.87	1177	842.74	1178	820.85	1179	798.94
1180	776.42	1181	752.74	1182	727.95	1183	701.87	1184	674.88
1185	647.31	1186	619.30	1187	591.59	1188	564.02	1189	537.37
1190	511.40	1191	486.55	1192	462.94	1193	440.53	1194	419.31
1195	399.33	1196	380.56	1197	362.99	1198	346.55	1199	331.17
1200	316.81	1201	303.39	1202	290.86	1203	279.18	1204	268.37
1205	258.26	1206	248.63	1207	239.53	1208	231.07	1209	223.23
1210	215.78	1211	208.86	1212	202.42	1213	196.30	1214	190.74
1215	185.49	1216	180.45	1217	175.62	1218	170.99	1219	166.57
1220	162.33	1221	158.28	1222	154.40	1223	150.68	1224	147.11
1225	143.69	1226	140.41	1227	137.26	1228	134.27	1229	131.69
1230	129.17	1231	126.72	1232	124.35	1233	122.06	1234	119.84
1235	117.69	1236	115.61	1237	113.61	1238	111.67	1239	109.79
1240	107.97	1241	106.20	1242	104.51	1243	103.02	1244	101.56
1245	100.12	1246	98.71	1247	97.32	1248	95.97	1249	94.65
1250	93.36	1251	92.11	1252	90.88	1253	89.69	1254	88.52
1255	87.38	1256	86.27	1257	85.18	1258	84.11	1259	83.07
1260	82.04	1261	81.04	1262	80.06	1263	79.11	1264	78.17
1265	77.25	1266	76.35	1267	75.47	1268	74.60	1269	73.75
1270	72.93	1271	72.12	1272	71.32	1273	70.61	1274	69.93
1275	69.25	1276	68.59	1277	67.93	1278	67.28	1279	66.64
1280	66.02	1281	65.40	1282	64.80	1283	64.21	1284	63.63
1285	63.06	1286	62.50	1287	61.95	1288	61.41	1289	60.88
1290	60.36	1291	59.84	1292	59.34	1293	58.84	1294	58.35
1295	57.87	1296	57.39	1297	56.93	1298	56.47	1299	56.01
1300	55.56	1310	51.70	1320	48.33	1330	45.32	1340	42.62
1350	40.02	1360	37.60	1370	35.32	1380	33.18	1390	31.26
1400	29.45	1420	26.35	1440	23.71	1460	20.40	1500	12.78

Total Runoff = 157.121 Acre-ft.
Peak Q = 942.21 CFS
Time to Peak = 1171 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 43A STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	12.28	200	26.00	300	30.36	400	35.82
500	42.77	600	50.20	700	58.81	800	70.53	900	90.78
1000	132.62	1050	169.94	1100	244.40	1110	266.35	1120	294.07
1130	333.51	1131	338.10	1132	342.72	1133	347.48	1134	352.48
1135	357.78	1136	363.28	1137	369.02	1138	375.08	1139	381.42
1140	388.12	1141	395.18	1142	402.67	1143	410.62	1144	419.10
1145	428.21	1146	438.01	1147	448.44	1148	459.74	1149	472.06
1150	485.61	1151	500.63	1152	517.56	1153	536.73	1154	559.20
1155	587.43	1156	640.05	1157	678.19	1158	713.49	1159	753.16
1160	794.70	1161	841.05	1162	891.14	1163	940.22	1164	982.83
1165	1000.10	1166	1031.27	1167	1064.10	1168	1085.76	1169	1098.41
1170	1104.25	1171	1102.51	1172	1093.92	1173	1080.71	1174	1064.48
1175	1045.25	1176	1023.11	1177	998.43	1178	972.56	1179	946.30
1180	920.57	1181	895.02	1182	869.84	1183	844.38	1184	818.44
1185	792.03	1186	764.74	1187	737.29	1188	709.25	1189	681.38
1190	653.63	1191	626.26	1192	599.43	1193	573.39	1194	548.40
1195	524.44	1196	501.59	1197	479.78	1198	459.10	1199	439.53
1200	421.08	1201	403.69	1202	387.30	1203	371.91	1204	357.46
1205	343.86	1206	331.11	1207	319.28	1208	308.06	1209	297.32
1210	287.11	1211	277.69	1212	268.75	1213	260.28	1214	252.41
1215	245.00	1216	237.94	1217	231.60	1218	225.50	1219	219.65
1220	214.02	1221	208.63	1222	203.43	1223	198.48	1224	193.68
1225	189.12	1226	184.71	1227	180.50	1228	176.46	1229	172.56
1230	168.82	1231	165.29	1232	162.18	1233	159.17	1234	156.23
1235	153.42	1236	150.68	1237	148.01	1238	145.43	1239	142.93
1240	140.53	1241	138.18	1242	135.92	1243	133.73	1244	131.59
1245	129.56	1246	127.74	1247	125.98	1248	124.25	1249	122.56
1250	120.90	1251	119.28	1252	117.69	1253	116.14	1254	114.63
1255	113.14	1256	111.71	1257	110.29	1258	108.90	1259	107.55

1260	106.23	1261	104.94	1262	103.68	1263	102.[illegible]	1264	101.24
1265	100.06	1266	[illegible]	1267	97.76	1268	[illegible]	1269	95.56
[illegible]	94.[illegible]	[illegible]	93.46	1272	92.4[illegible]	1273	91.46	1274	90.45
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1278	[illegible]	[illegible]	86.14
1280	85.34	1281	84.55	1282	[illegible]	1283	[illegible]	1284	82.26
1285	81.53	1286	80.79	1287	80.09	1288	79.39	1289	78.69
1290	78.02	1291	77.34	1292	76.69	1293	76.05	1294	75.41
1295	74.80	1296	74.18	1297	73.57	1298	72.99	1299	72.40
1300	71.84	1310	66.77	1320	62.43	1330	58.44	1340	54.91
1350	51.55	1360	48.40	1370	45.48	1380	42.74	1390	40.23
1400	37.92	1420	33.84	1440	30.42	1460	24.08	1500	15.96

Total Runoff = 200.584 Acre-ft.
Peak Q = 1104.25 CFS
Time to Peak = 1170 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 43RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	10.26	200	24.72	300	30.05	400	35.12
500	42.19	600	49.45	700	58.11	800	69.47	900	89.14
1000	129.43	1050	165.16	1100	235.27	1110	255.34	1120	280.10
1130	314.50	1131	318.49	1132	322.48	1133	326.55	1134	330.79
1135	335.24	1136	339.87	1137	344.71	1138	349.76	1139	355.03
1140	360.55	1141	366.33	1142	372.41	1143	378.80	1144	385.55
1145	392.69	1146	400.27	1147	408.35	1148	417.00	1149	426.28
1150	436.24	1151	447.00	1152	458.71	1153	471.57	1154	485.83
1155	501.82	1156	520.09	1157	541.98	1158	572.39	1159	609.94
1160	648.14	1161	687.54	1162	729.03	1163	773.35	1164	820.98
1165	870.31	1166	916.62	1167	955.23	1168	989.07	1169	1021.76
1170	1050.25	1171	1071.99	1172	1086.43	1173	1093.51	1174	1093.59
1175	1087.68	1176	1077.05	1177	1062.60	1178	1044.82	1179	1024.31
1180	1001.65	1181	977.76	1182	953.26	1183	928.70	1184	903.99
1185	879.45	1186	854.54	1187	829.57	1188	803.98	1189	778.17
1190	751.91	1191	725.45	1192	699.02	1193	672.66	1194	646.55
1195	621.08	1196	595.94	1197	571.70	1198	548.33	1199	525.90
1200	504.41	1201	483.88	1202	464.35	1203	445.77	1204	428.16
1205	411.48	1206	395.69	1207	380.78	1208	366.69	1209	353.42
1210	340.90	1211	329.15	1212	318.05	1213	307.42	1214	297.26
1215	287.60	1216	278.70	1217	270.19	1218	262.09	1219	254.61
1220	247.52	1221	240.79	1222	234.67	1223	228.75	1224	223.00
1225	217.45	1226	212.09	1227	206.92	1228	201.95	1229	197.16
1230	192.55	1231	188.12	1232	183.87	1233	179.77	1234	175.84
1235	172.12	1236	168.62	1237	165.50	1238	162.54	1239	159.65
1240	156.82	1241	154.06	1242	151.37	1243	148.76	1244	146.22
1245	143.76	1246	141.37	1247	139.05	1248	136.80	1249	134.64
1250	132.59	1251	130.67	1252	128.93	1253	127.20	1254	125.51
1255	123.83	1256	122.19	1257	120.58	1258	119.00	1259	117.46
1260	115.94	1261	114.46	1262	113.00	1263	111.58	1264	110.19
1265	108.83	1266	107.51	1267	106.21	1268	104.93	1269	103.69
1270	102.47	1271	101.28	1272	100.11	1273	98.96	1274	97.84
1275	96.74	1276	95.67	1277	94.61	1278	93.58	1279	92.57
1280	91.59	1281	90.65	1282	89.77	1283	88.95	1284	88.15
1285	87.35	1286	86.55	1287	85.77	1288	84.99	1289	84.23
1290	83.47	1291	82.73	1292	81.99	1293	81.27	1294	80.56
1295	79.86	1296	79.17	1297	78.49	1298	77.83	1299	77.17
1300	76.53	1310	70.74	1320	66.03	1330	61.75	1340	57.91
1350	54.47	1360	51.17	1370	48.13	1380	45.27	1390	42.59
1400	40.17	1420	35.81	1440	32.19	1460	27.82	1500	18.71

Total Runoff = 200.542 Acre-ft.
Peak Q = 1093.59 CFS
Time to Peak = 1174 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 52G STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.40	100	2.87	200	4.00	300	3.98	400	4.55
500	4.89	600	5.59	700	6.36	800	7.72	900	11.18
1000	19.65	1050	27.00	1100	42.48	1110	47.32	1120	53.92
1130	63.85	1131	65.01	1132	66.21	1133	67.45	1134	68.78
1135	70.23	1136	71.74	1137	73.32	1138	75.00	1139	76.78
1140	78.70	1141	80.76	1142	82.99	1143	85.40	1144	88.03
1145	90.92	1146	94.12	1147	97.55	1148	101.34	1149	105.56
1150	110.35	1151	115.87	1152	122.40	1153	130.13	1154	139.76
1155	152.86	1156	182.26	1157	203.58	1158	222.84	1159	239.60
1160	252.10	1161	263.44	1162	274.17	1163	281.97	1164	283.06
1165	260.01	1166	240.80	1167	227.42	1168	214.74	1169	200.66
1170	185.11	1171	169.23	1172	153.57	1173	138.88	1174	125.56
1175	113.87	1176	103.60	1177	94.57	1178	86.70	1179	79.86
1180	73.93	1181	68.74	1182	64.22	1183	60.25	1184	56.77
1185	53.71	1186	50.92	1187	48.38	1188	46.14	1189	44.10
1190	42.23	1191	40.57	1192	39.02	1193	37.66	1194	36.40
1195	35.20	1196	34.09	1197	33.01	1198	31.96	1199	30.97
1200	30.02	1201	29.11	1202	28.24	1203	27.43	1204	26.66
1205	25.91	1206	25.22	1207	24.57	1208	24.00	1209	23.43
1210	22.88	1211	22.35	1212	21.83	1213	21.33	1214	20.84
1215	20.37	1216	19.91	1217	19.46	1218	19.02	1219	18.60
1220	18.18	1221	17.82	1222	17.46	1223	17.13	1224	16.78
1225	16.46	1226	16.12	1227	15.81	1228	15.51	1229	15.21
1230	14.92	1231	14.63	1232	14.35	1233	14.08	1234	13.80
1235	13.56	1236	13.30	1237	13.06	1238	12.81	1239	12.58
1240	12.36	1241	12.14	1242	11.93	1243	11.72	1244	11.51
1245	11.31	1246	11.12	1247	10.94	1248	10.76	1249	10.58
1250	10.41	1251	10.27	1252	10.12	1253	9.98	1254	9.84
1255	9.71	1256	9.59	1257	9.47	1258	9.34	1259	9.23
1260	9.12	1261	9.00	1262	8.90	1263	8.79	1264	8.69
1265	8.59	1266	8.49	1267	8.39	1268	8.30	1269	8.20
1270	8.12	1271	8.03	1272	7.94	1273	7.86	1274	7.78
1275	7.70	1276	7.62	1277	7.55	1278	7.48	1279	7.41
1280	7.35	1281	7.29	1282	7.23	1283	7.17	1284	7.11
1285	7.06	1286	7.00	1287	6.96	1288	6.90	1289	6.85
1290	6.81	1291	6.75	1292	6.71	1293	6.66	1294	6.62
1295	6.58	1296	6.53	1297	6.49	1298	6.45	1299	6.40
1300	6.37	1310	6.00	1320	5.69	1330	5.42	1340	5.18
1350	4.96	1360	4.76	1370	4.58	1380	4.42	1390	4.27
1400	4.14	1420	3.89	1440	3.69	1460	2.17	1500	1.04

Total Runoff = 28.249 Acre-ft
Peak Q = 283.66 CFS
Time to Peak = 1164 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 52RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.40	100	2.37	200	4.03	300	3.89	400	4.53
500	4.82	600	5.52	700	[illegible]	800	7.57	900	10.82
1000	15.93	1050	25.98	1100	40.44	1110	44.77	1120	50.46
1130	58.93	1131	59.94	1132	60.54	1133	61.97	1134	63.04
1135	64.18	1136	65.38	1137	66.65	1138	68.00	1139	69.43
1140	70.94	1141	72.53	1142	74.23	1143	76.05	1144	78.00
1145	80.10	1146	82.38	1147	84.86	1148	87.59	1149	90.58
1150	93.85	1151	97.46	1152	101.53	1153	106.13	1154	111.46
1155	117.77	1156	125.48	1157	136.05	1158	152.61	1159	173.77
1160	195.03	1161	215.07	1162	232.57	1163	247.58	1164	260.49
1165	270.48	1166	273.70	1167	267.30	1168	255.09	1169	242.00
1170	229.22	1171	216.36	1172	202.91	1173	188.88	1174	174.99
1175	160.99	1176	147.80	1177	135.49	1178	124.34	1179	114.30
1180	105.27	1181	97.21	1182	90.03	1183	83.64	1184	77.95
1185	72.89	1186	68.38	1187	64.37	1188	60.83	1189	57.61
1190	54.65	1191	51.95	1192	49.58	1193	47.37	1194	45.37
1195	43.57	1196	41.90	1197	40.44	1198	39.07	1199	37.77
1200	36.55	1201	35.38	1202	34.26	1203	33.19	1204	32.17
1205	31.20	1206	30.26	1207	29.38	1208	28.53	1209	27.73
1210	26.96	1211	26.27	1212	25.66	1213	25.07	1214	24.49
1215	23.93	1216	23.38	1217	22.85	1218	22.33	1219	21.83
1220	21.34	1221	20.86	1222	20.40	1223	19.95	1224	19.51
1225	19.12	1226	18.76	1227	18.40	1228	18.05	1229	17.71
1230	17.37	1231	17.04	1232	16.71	1233	16.39	1234	16.08
1235	15.70	1236	15.48	1237	15.19	1238	14.90	1239	14.63
1240	14.36	1241	14.09	1242	13.83	1243	13.58	1244	13.33
1245	13.09	1246	12.86	1247	12.63	1248	12.41	1249	12.20
1250	11.99	1251	11.78	1252	11.58	1253	11.39	1254	11.20
1255	11.02	1256	10.87	1257	10.72	1258	10.57	1259	10.43
1260	10.29	1261	10.15	1262	10.01	1263	9.88	1264	9.76
1265	9.63	1266	9.51	1267	9.39	1268	9.28	1269	9.16
1270	9.05	1271	8.95	1272	8.84	1273	8.74	1274	8.64
1275	8.54	1276	8.44	1277	8.35	1278	8.26	1279	8.17
1280	8.08	1281	8.00	1282	7.91	1283	7.83	1284	7.76
1285	7.68	1286	7.61	1287	7.55	1288	7.48	1289	7.42
1290	7.36	1291	7.30	1292	7.24	1293	7.19	1294	7.13
1295	7.08	1296	7.02	1297	6.97	1298	6.92	1299	6.87
1300	6.82	1310	6.39	1320	6.03	1330	5.72	1340	5.45
1350	5.21	1360	4.99	1370	4.79	1380	4.61	1390	4.45
1400	4.30	1420	4.04	1440	3.82	1460	3.11	1500	1.53

Total Runoff = 28.291 Acre-ft.
Peak Q = 273.70 CFS
Time to Peak = 1166 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 54AG STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.80	100	13.70	200	29.91	300	35.20	400	41.02
500	48.55	600	56.71	700	66.40	800	79.54	900	103.79
1000	155.29	1050	200.81	1100	291.30	1110	317.75	1120	351.07
1130	398.30	1131	403.79	1132	409.32	1133	414.99	1134	420.92
1135	427.17	1136	433.71	1137	440.57	1138	447.77	1139	455.33
1140	463.30	1141	471.73	1142	480.64	1143	490.09	1144	500.17
1145	510.93	1146	522.53	1147	534.98	1148	548.33	1149	562.88
1150	578.81	1151	596.43	1152	616.17	1153	638.63	1154	664.63
1155	696.87	1156	752.39	1157	797.26	1158	845.58	1159	903.39
1160	960.47	1161	1016.24	1162	1070.06	1163	1122.71	1164	1174.58
1165	1221.76	1166	1239.17	1167	1256.43	1168	1273.25	1169	1289.78
1170	1303.28	1171	1310.17	1172	1309.59	1173	1301.33	1174	1286.41
1175	1265.58	1176	1240.92	1177	1213.39	1178	1183.69	1179	1152.45
1180	1120.16	1181	1087.66	1182	1055.47	1183	1024.06	1184	993.25
1185	963.26	1186	933.51	1187	904.18	1188	874.75	1189	845.44
1190	815.95	1191	786.54	1192	757.50	1193	728.73	1194	700.41
1195	672.94	1196	645.94	1197	620.06	1198	595.09	1199	571.12
1200	548.19	1201	526.26	1202	505.42	1203	485.57	1204	466.76
1205	448.94	1206	432.05	1207	416.09	1208	401.01	1209	386.79
1210	373.36	1211	360.80	1212	348.94	1213	337.60	1214	326.74
1215	316.41	1216	306.84	1217	297.72	1218	288.99	1219	280.89
1220	273.23	1221	265.92	1222	259.26	1223	252.80	1224	246.53
1225	240.51	1226	234.71	1227	229.11	1228	223.72	1229	218.51
1230	213.50	1231	208.67	1232	204.03	1233	199.54	1234	195.25
1235	191.16	1236	187.32	1237	183.85	1238	180.54	1239	177.31
1240	174.16	1241	171.10	1242	168.09	1243	165.19	1244	162.36
1245	159.60	1246	156.93	1247	154.34	1248	151.83	1249	149.42
1250	147.12	1251	144.96	1252	142.98	1253	141.01	1254	139.10
1255	137.23	1256	135.41	1257	133.63	1258	131.89	1259	130.18
1260	128.50	1261	126.86	1262	125.26	1263	123.69	1264	122.16
1265	120.66	1266	119.19	1267	117.75	1268	116.35	1269	114.98
1270	113.63	1271	112.32	1272	111.03	1273	109.77	1274	108.53
1275	107.32	1276	106.13	1277	104.97	1278	103.83	1279	102.72
1280	101.64	1281	100.60	1282	99.63	1283	98.72	1284	97.82
1285	96.93	1286	96.06	1287	95.20	1288	94.35	1289	93.51
1290	92.68	1291	91.87	1292	91.06	1293	90.27	1294	89.50
1295	88.73	1296	87.98	1297	87.24	1298	86.51	1299	85.80
1300	85.09	1310	78.79	1320	73.64	1330	68.97	1340	64.80
1350	61.06	1360	57.49	1370	54.20	1380	51.12	1390	48.23
1400	45.63	1420	40.94	1440	37.04	1460	30.93	1500	20.23

Total Runoff = 238.111 Acre-ft.
Peak Q = 1310.17 CFS
Time to Peak = 1171 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 54RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.80	100	11.30	200	28.16	300	34.86	400	40.16
500	47.90	600	55.80	700	65.56	800	78.24	900	101.63

1000	153.08	1050	194.37	1100	279.43	1110	303.57	1120	333.16
1130	374.93	1131	378.72	1132	382.54	1133	388 38	1134	393.40
1135	[illegible]	1136	[illegible]	1137	409.61	1138	431.75	1139	[illegible]
1140	[illegible]	1141	425.22	1142	[illegible]	1143	448.2[illegible]	1144	[illegible].82
1145	466.20	1146	475.05	1147	486.53	1148	496.9[illegible]	1149	505.44
1150	517.65	1151	529.57	1152	543.[illegible]	1153	557.99	1154	574.34
1155	592.61	1156	613.32	1157	637.49	1158	663.70	1159	709.96
1160	754.07	1161	803.56	1162	858.10	1163	915.07	1164	972.75
1165	1030.05	1166	1086.35	1167	1138.88	1168	1183.48	1169	1213.18
1170	1238.49	1171	1259.89	1172	1277.87	1173	1291.41	1174	1299.19
1175	1300.44	1176	1295.02	1177	1283.33	1178	1266.42	1179	1245.24
1180	1220.81	1181	1193.89	1182	1165.17	1183	1135.14	1184	1104.74
1185	1074.12	1186	1043.90	1187	1014.04	1188	984.70	1189	955.72
1190	927.09	1191	898.50	1192	870.29	1193	841.92	1194	813.86
1195	785.95	1196	758.36	1197	731.27	1198	704.54	1199	678.44
1200	653.10	1201	628.57	1202	604.87	1203	582.05	1204	560.11
1205	539.11	1206	519.00	1207	499.82	1208	481.52	1209	464.10
1210	447.53	1211	431.78	1212	416.83	1213	402.66	1214	389.36
1215	376.75	1216	364.65	1217	353.03	1218	341.91	1219	331.63
1220	321.75	1221	312.27	1222	303.48	1223	295.10	1224	287.06
1225	279.76	1226	272.77	1227	266.00	1228	259.46	1229	253.14
1230	247.04	1231	241.15	1232	235.46	1233	229.98	1234	224.68
1235	219.57	1236	214.64	1237	209.89	1238	205.32	1239	200.93
1240	196.86	1241	193.24	1242	189.71	1243	186.29	1244	182.96
1245	179.72	1246	176.56	1247	173.48	1248	170.48	1249	167.57
1250	164.73	1251	161.97	1252	159.29	1253	156.70	1254	154.19
1255	151.94	1256	149.81	1257	147.73	1258	145.70	1259	143.71
1260	141.77	1261	139.87	1262	138.01	1263	136.20	1264	134.42
1265	132.68	1266	130.98	1267	129.31	1268	127.68	1269	126.09
1270	124.52	1271	123.00	1272	121.50	1273	120.04	1274	118.60
1275	117.20	1276	115.83	1277	114.48	1278	113.17	1279	111.88
1280	110.62	1281	109.38	1282	108.17	1283	106.98	1284	105.82
1285	104.69	1286	103.59	1287	102.56	1288	101.63	1289	100.71
1290	99.81	1291	98.91	1292	98.02	1293	97.15	1294	96.28
1295	95.43	1296	94.59	1297	93.76	1298	92.94	1299	92.13
1300	91.34	1310	84.15	1320	78.18	1330	73.19	1340	68.62
1350	64.56	1360	60.88	1370	57.38	1380	54.17	1390	51.14
1400	48.31	1420	43.40	1440	39.16	1460	34.33	1500	23.75

Total Runoff = 238.037 Acre-ft.
Peak Q = 1300.44 CFS
Time to Peak = 1175 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 59AH STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	3.20	100	13.50	200	30.72	300	37.50	400	43.05
500	51.00	600	59.24	700	69.41	800	82.77	900	107.93
1000	161.46	1050	208.55	1100	301.07	1110	327.72	1120	360.80
1130	406.98	1131	412.34	1132	417.75	1133	423.27	1134	429.02
1135	435.05	1136	441.33	1137	447.91	1138	454.78	1139	461.96
1140	469.53	1141	477.49	1142	485.92	1143	494.81	1144	504.28
1145	514.35	1146	525.09	1147	536.66	1148	548.95	1149	562.25
1150	576.75	1151	592.66	1152	610.31	1153	630.26	1154	652.94
1155	680.53	1156	726.87	1157	763.15	1158	798.93	1159	842.87
1160	892.07	1161	946.11	1162	1002.32	1163	1058.10	1164	1111.75
1165	1161.70	1166	1205.83	1167	1227.67	1168	1252.45	1169	1274.75
1170	1292.99	1171	1308.70	1172	1321.98	1173	1331.64	1174	1336.19
1175	1334.71	1176	1326.97	1177	1313.33	1178	1294.52	1179	1271.72
1180	1245.87	1181	1217.69	1182	1187.84	1183	1156.79	1184	1125.46
1185	1093.99	1186	1063.02	1187	1032.45	1188	1002.45	1189	972.90
1190	943.72	1191	914.71	1192	885.95	1193	857.15	1194	828.68
1195	800.37	1196	772.42	1197	744.97	1198	717.90	1199	691.42
1200	665.73	1201	640.85	1202	616.84	1203	593.73	1204	571.49
1205	550.22	1206	529.86	1207	510.42	1208	491.90	1209	474.24
1210	457.44	1211	441.48	1212	426.32	1213	411.95	1214	398.45
1215	385.66	1216	373.37	1217	361.59	1218	350.31	1219	339.85
1220	329.82	1221	320.20	1222	311.26	1223	302.76	1224	294.57
1225	287.15	1226	280.02	1227	273.14	1228	266.48	1229	260.04
1230	253.83	1231	247.82	1232	242.04	1233	236.44	1234	231.03
1235	225.84	1236	220.81	1237	215.98	1238	211.30	1239	206.82
1240	202.67	1241	198.97	1242	195.37	1243	191.86	1244	188.45
1245	185.14	1246	181.91	1247	178.75	1248	175.69	1249	172.72
1250	169.82	1251	167.00	1252	164.26	1253	161.60	1254	159.03
1255	156.73	1256	154.56	1257	152.43	1258	150.36	1259	148.33
1260	146.35	1261	144.40	1262	142.51	1263	140.66	1264	138.84
1265	137.07	1266	135.34	1267	133.63	1268	131.97	1269	130.35
1270	128.75	1271	127.19	1272	125.67	1273	124.18	1274	122.72
1275	121.30	1276	119.89	1277	118.53	1278	117.19	1279	115.87
1280	114.59	1281	113.33	1282	112.10	1283	110.89	1284	109.70
1285	108.55	1286	107.43	1287	106.39	1288	105.43	1289	104.50
1290	103.57	1291	102.65	1292	101.75	1293	100.86	1294	99.97
1295	99.10	1296	98.25	1297	97.40	1298	96.56	1299	95.74
1300	94.93	1310	87.59	1320	81.48	1330	76.37	1340	71.69
1350	67.53	1360	63.76	1370	60.17	1380	56.89	1390	53.79
1400	50.89	1420	45.86	1440	41.52	1460	35.26	1500	24.29

Total Runoff = 252.795 Acre-ft.
Peak Q = 1336.19 CFS
Time to Peak = 1174 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 59RES STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.00	100	10.30	200	27.52	300	34.30	400	39.85
500	47.80	600	56.04	700	66.21	800	79.57	900	104.73
1000	158.26	1050	205.35	1100	299.20	1110	325.02	1120	357.66
1130	402.60	1131	407.47	1132	412.70	1133	418.09	1134	423.65
1135	429.44	1136	435.49	1137	441.80	1138	448.39	1139	455.28
1140	463.02	1141	471.05	1142	479.20	1143	487.75	1144	496.78
1145	506.37	1146	516.59	1147	527.52	1148	539.22	1149	551.75
1150	565.33	1151	580.16	1152	596.48	1153	615.37	1154	636.49
1155	660.84	1156	695.34	1157	735.32	1158	772.22	1159	811.68
1160	856.90	1161	907.31	1162	964.12	1163	1021.65	1164	1076.72
1165	1128.88	1166	1176.53	1167	1211.45	1168	1236.28	1169	1259.99
1170	1280.72	1171	1297.46	1172	1309.63	1173	1321.32	1174	1329.89
1175	1333.67	1176	1331.75	1177	1323.86	1178	1310.30	1179	1290.98

1180	1263.04	1181	1235.90	1182	1207.14	1183	1176.91	1184	1145.84
1185	1114.49	1186	1083.19	1187	1052.33	1188	1021.97	1189	992.12
1190	962.69	1191	933.55	1192	906.14	1193	878.10	1194	849.58
1195	821.17	1196	792.98	1197	765.19	1198	737.97	1199	711.16
1200	684.93	1201	659.46	1202	634.82	1203	611.04	1204	588.83
1205	567.42	1206	546.47	1207	526.32	1208	507.06	1209	488.70
1210	471.20	1211	454.88	1212	440.39	1213	425.71	1214	411.55
1215	398.08	1216	385.26	1217	372.98	1218	361.22	1219	350.07
1220	339.55	1221	329.51	1222	320.31	1223	311.51	1224	303.01
1225	294.98	1226	287.44	1227	280.26	1228	273.35	1229	266.67
1230	260.23	1231	254.01	1232	248.00	1233	242.21	1234	236.61
1235	231.20	1236	225.99	1237	220.97	1238	216.12	1239	208.72
1240	200.77	1241	200.87	1242	193.47	1243	193.76	1244	186.55
1245	187.04	1246	180.01	1247	180.65	1248	173.79	1249	174.62
1250	167.92	1251	168.90	1252	162.35	1253	163.50	1254	157.13
1255	158.63	1256	152.66	1257	154.32	1258	148.46	1259	150.23
1260	144.45	1261	146.30	1262	140.61	1263	142.56	1264	136.94
1265	138.98	1266	133.44	1267	135.53	1268	130.07	1269	132.25
1270	126.85	1271	129.09	1272	123.77	1273	126.08	1274	120.82
1275	123.20	1276	117.99	1277	120.43	1278	115.29	1279	117.77
1280	112.69	1281	115.23	1282	110.20	1283	112.79	1284	107.80
1285	110.45	1286	105.53	1287	108.29	1288	103.53	1289	106.40
1290	101.67	1291	104.55	1292	99.85	1293	102.76	1294	98.07
1295	101.01	1296	96.35	1297	99.30	1298	94.66	1299	97.64
1300	93.03	1310	85.69	1320	79.58	1330	74.47	1340	69.79
1350	65.63	1360	61.86	1370	58.27	1380	54.99	1390	51.89
1400	48.99	1420	43.96	1440	39.61	1460	33.36	1500	22.39

Total Runoff = 247.604 Acre-ft.
Peak Q = 1333.67 CFS
Time to Peak = 1175 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 59RT STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.00	100	10.30	200	27.52	300	34.30	400	39.85
500	47.80	600	56.04	700	66.21	800	79.57	900	104.73
1000	158.26	1050	205.35	1100	299.20	1110	325.02	1120	357.66
1130	402.60	1131	407.47	1132	412.70	1133	418.09	1134	423.65
1135	429.44	1136	435.49	1137	441.80	1138	448.39	1139	455.28
1140	463.02	1141	471.05	1142	479.20	1143	487.75	1144	496.78
1145	506.37	1146	516.59	1147	527.52	1148	539.22	1149	551.75
1150	565.33	1151	580.16	1152	596.48	1153	615.37	1154	636.49
1155	660.84	1156	695.34	1157	735.32	1158	772.22	1159	811.68
1160	856.90	1161	907.31	1162	964.12	1163	1021.65	1164	1076.72
1165	1128.88	1166	1176.53	1167	1211.45	1168	1236.28	1169	1259.99
1170	1280.72	1171	1297.46	1172	1309.63	1173	1321.32	1174	1329.89
1175	1333.67	1176	1331.75	1177	1323.86	1178	1310.30	1179	1290.98
1180	1263.04	1181	1235.90	1182	1207.14	1183	1176.91	1184	1145.84
1185	1114.49	1186	1083.19	1187	1052.33	1188	1021.97	1189	992.12
1190	962.69	1191	933.55	1192	906.14	1193	878.10	1194	849.58
1195	821.17	1196	792.98	1197	765.19	1198	737.97	1199	711.16
1200	684.93	1201	659.46	1202	634.82	1203	611.04	1204	588.83
1205	567.42	1206	546.47	1207	526.32	1208	507.06	1209	488.70
1210	471.20	1211	454.88	1212	440.39	1213	425.71	1214	411.55
1215	398.08	1216	385.26	1217	372.98	1218	361.22	1219	350.07
1220	339.55	1221	329.51	1222	320.31	1223	311.51	1224	303.01
1225	294.98	1226	287.44	1227	280.26	1228	273.35	1229	266.67
1230	260.23	1231	254.01	1232	248.00	1233	242.21	1234	236.61
1235	231.20	1236	225.99	1237	220.97	1238	216.12	1239	208.72
1240	200.77	1241	200.87	1242	193.47	1243	193.76	1244	186.55
1245	187.04	1246	180.01	1247	180.65	1248	173.79	1249	174.62
1250	167.92	1251	168.90	1252	162.35	1253	163.50	1254	157.13
1255	158.63	1256	152.66	1257	154.33	1258	148.46	1259	150.23
1260	144.45	1261	146.30	1262	140.61	1263	142.56	1264	136.94
1265	138.98	1266	133.44	1267	135.53	1268	130.07	1269	132.25
1270	126.85	1271	129.09	1272	123.77	1273	126.08	1274	120.82
1275	123.20	1276	117.99	1277	120.43	1278	115.29	1279	117.77
1280	112.69	1281	115.23	1282	110.20	1283	112.79	1284	107.80
1285	110.45	1286	105.53	1287	108.29	1288	103.53	1289	106.40
1290	101.67	1291	104.55	1292	99.85	1293	102.76	1294	98.07
1295	101.01	1296	96.35	1297	99.30	1298	94.66	1299	97.64
1300	93.03	1310	85.69	1320	79.58	1330	74.47	1340	69.79
1350	65.63	1360	61.86	1370	58.27	1380	54.99	1390	51.89
1400	48.99	1420	43.96	1440	39.61	1460	33.36	1500	22.39

Total Runoff = 247.604 Acre-ft.
Peak Q = 1333.67 CFS
Time to Peak = 1175 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 60I STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.00	100	0.00	200	0.00	300	0.00	400	0.00
500	0.00	600	0.00	700	0.00	800	0.00	900	0.00
1000	0.00	1050	0.00	1100	0.00	1110	0.00	1120	0.00
1130	0.00	1131	0.00	1132	0.00	1133	0.00	1134	0.00
1135	0.00	1136	0.00	1137	0.00	1138	0.00	1139	0.00
1140	0.00	1141	0.00	1142	0.00	1143	0.00	1144	0.00
1145	0.00	1146	0.00	1147	0.00	1148	0.00	1149	0.00
1150	0.00	1151	0.00	1152	0.00	1153	0.00	1154	0.00
1155	0.00	1156	0.00	1157	0.00	1158	0.00	1159	0.00
1160	0.00	1161	0.00	1162	0.00	1163	0.00	1164	0.00
1165	0.00	1166	0.00	1167	0.00	1168	0.00	1169	0.00
1170	0.00	1171	0.00	1172	0.00	1173	0.00	1174	0.00
1175	0.00	1176	0.00	1177	0.00	1178	0.00	1179	0.00
1180	0.00	1181	0.00	1182	0.00	1183	0.00	1184	0.00
1185	0.00	1186	0.00	1187	0.00	1188	0.00	1189	0.00
1190	0.00	1191	0.00	1192	0.00	1193	0.00	1194	0.00
1195	0.00	1196	0.00	1197	0.00	1198	0.00	1199	0.00
1200	0.00	1201	0.00	1202	0.00	1203	0.00	1204	0.00
1205	0.00	1206	0.00	1207	0.00	1208	0.00	1209	0.00
1210	0.00	1211	0.00	1212	0.00	1213	0.00	1214	0.00
1215	0.00	1216	0.00	1217	0.00	1218	0.00	1219	0.00
1220	0.00	1221	0.00	1222	0.00	1223	0.00	1224	0.00
1225	0.00	1226	0.00	1227	0.00	1228	0.00	1229	0.00
1230	0.00	1231	0.00	1232	0.00	1233	0.00	1234	0.00

1235	0.00	1236	0.00	1237	0.00	1238	0.00	1239	0.00
1240	0.00	1241	0.00	1242	0.00	1243	0.00	1244	0.00
1245	0.00	1246	0.00	1247	0.00	1248	0.00	1249	0.00
1250	0.00	1251	0.00	1252	0.00	1253	0.00	1254	0.00
1255	0.00	1256	0.00	1257	0.00	1258	0.00	1259	0.00
1260	0.00	1261	0.00	1262	0.00	1263	0.00	1264	0.00
1265	0.00	1266	0.00	1267	0.00	1268	0.00	1269	0.00
1270	0.00	1271	0.00	1272	0.00	1273	0.00	1274	0.00
1275	0.00	1276	0.00	1277	0.00	1278	0.00	1279	0.00
1280	0.00	1281	0.00	1282	0.00	1283	0.00	1284	0.00
1285	0.00	1286	0.00	1287	0.00	1288	0.00	1289	0.00
1290	0.00	1291	0.00	1292	0.00	1293	0.00	1294	0.00
1295	0.00	1296	0.00	1297	0.00	1298	0.00	1299	0.00
1300	0.00	1310	0.00	1320	0.00	1330	0.00	1340	0.00
1350	0.00	1360	0.00	1370	0.00	1380	0.00	1390	0.00
1400	0.00	1420	0.00	1440	0.00	1460	0.00	1500	0.00

Total Runoff = 0.000 Acre-ft.
Peak Q = 0.00 CFS
Time to Peak = 1239952 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 61J STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.00	100	0.00	200	0.00	300	0.00	400	0.00
500	0.00	600	0.00	700	0.00	800	0.00	900	0.00
1000	0.00	1050	0.00	1100	0.00	1110	0.00	1120	0.00
1130	0.00	1131	0.00	1132	0.00	1133	0.00	1134	0.00
1135	0.00	1136	0.00	1137	0.00	1138	0.00	1139	0.00
1140	0.00	1141	0.00	1142	0.00	1143	0.00	1144	0.00
1145	0.00	1146	0.00	1147	0.00	1148	0.00	1149	0.00
1150	0.00	1151	0.00	1152	0.00	1153	0.00	1154	0.00
1155	0.00	1156	0.00	1157	0.00	1158	0.00	1159	0.00
1160	0.00	1161	0.00	1162	0.00	1163	0.00	1164	0.00
1165	0.00	1166	0.00	1167	0.00	1168	0.00	1169	0.00
1170	0.00	1171	0.00	1172	0.00	1173	0.00	1174	0.00
1175	0.00	1176	0.00	1177	0.00	1178	0.00	1179	0.00
1180	0.00	1181	0.00	1182	0.00	1183	0.00	1184	0.00
1185	0.00	1186	0.00	1187	0.00	1188	0.00	1189	0.00
1190	0.00	1191	0.00	1192	0.00	1193	0.00	1194	0.00
1195	0.00	1196	0.00	1197	0.00	1198	0.00	1199	0.00
1200	0.00	1201	0.00	1202	0.00	1203	0.00	1204	0.00
1205	0.00	1206	0.00	1207	0.00	1208	0.00	1209	0.00
1210	0.00	1211	0.00	1212	0.00	1213	0.00	1214	0.00
1215	0.00	1216	0.00	1217	0.00	1218	0.00	1219	0.00
1220	0.00	1221	0.00	1222	0.00	1223	0.00	1224	0.00
1225	0.00	1226	0.00	1227	0.00	1228	0.00	1229	0.00
1230	0.00	1231	0.00	1232	0.00	1233	0.00	1234	0.00
1235	0.00	1236	0.00	1237	0.00	1238	0.00	1239	0.00
1240	0.00	1241	0.00	1242	0.00	1243	0.00	1244	0.00
1245	0.00	1246	0.00	1247	0.00	1248	0.00	1249	0.00
1250	0.00	1251	0.00	1252	0.00	1253	0.00	1254	0.00
1255	0.00	1256	0.00	1257	0.00	1258	0.00	1259	0.00
1260	0.00	1261	0.00	1262	0.00	1263	0.00	1264	0.00
1265	0.00	1266	0.00	1267	0.00	1268	0.00	1269	0.00
1270	0.00	1271	0.00	1272	0.00	1273	0.00	1274	0.00
1275	0.00	1276	0.00	1277	0.00	1278	0.00	1279	0.00
1280	0.00	1281	0.00	1282	0.00	1283	0.00	1284	0.00
1285	0.00	1286	0.00	1287	0.00	1288	0.00	1289	0.00
1290	0.00	1291	0.00	1292	0.00	1293	0.00	1294	0.00
1295	0.00	1296	0.00	1297	0.00	1298	0.00	1299	0.00
1300	0.00	1310	0.00	1320	0.00	1330	0.00	1340	0.00
1350	0.00	1360	0.00	1370	0.00	1380	0.00	1390	0.00
1400	0.00	1420	0.00	1440	0.00	1460	0.00	1500	0.00

Total Runoff = 0.000 Acre-ft.
Peak Q = 0.00 CFS
Time to Peak = 1239952 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT 1 63K STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.00	100	1.11	200	1.19	300	1.28	400	1.40
500	1.55	600	1.74	700	2.01	800	2.45	900	3.65
1000	6.41	1050	8.84	1100	14.14	1110	15.96	1120	18.54
1130	22.44	1131	22.89	1132	23.38	1133	23.90	1134	24.45
1135	25.08	1136	25.71	1137	26.37	1138	27.12	1139	27.90
1140	28.78	1141	29.72	1142	30.77	1143	31.90	1144	33.15
1145	34.57	1146	36.17	1147	37.82	1148	39.66	1149	41.78
1150	44.29	1151	47.31	1152	51.07	1153	55.65	1154	61.76
1155	71.14	1156	100.07	1157	111.58	1158	112.51	1159	111.10
1160	108.13	1161	103.74	1162	97.60	1163	89.22	1164	77.36
1165	46.16	1166	31.64	1167	26.98	1168	24.04	1169	21.93
1170	20.15	1171	18.66	1172	17.44	1173	16.40	1174	15.53
1175	14.77	1176	14.09	1177	13.40	1178	12.75	1179	12.19
1180	11.69	1181	11.22	1182	10.81	1183	10.43	1184	10.07
1185	9.75	1186	9.45	1187	9.17	1188	8.91	1189	8.67
1190	8.44	1191	8.23	1192	8.02	1193	7.85	1194	7.67
1195	7.48	1196	7.34	1197	7.15	1198	6.94	1199	6.73
1200	6.54	1201	6.36	1202	6.18	1203	6.02	1204	5.88
1205	5.72	1206	5.58	1207	5.43	1208	5.31	1209	5.18
1210	5.06	1211	4.95	1212	4.82	1213	4.72	1214	4.61
1215	4.52	1216	4.43	1217	4.34	1218	4.25	1219	4.16
1220	4.07	1221	4.00	1222	3.91	1223	3.85	1224	3.77
1225	3.71	1226	3.63	1227	3.57	1228	3.52	1229	3.45
1230	3.39	1231	3.33	1232	3.27	1233	3.22	1234	3.15
1235	3.12	1236	3.06	1237	3.01	1238	2.96	1239	2.91
1240	2.87	1241	2.82	1242	2.79	1243	2.75	1244	2.70
1245	2.65	1246	2.62	1247	2.58	1248	2.55	1249	2.51
1250	2.48	1251	2.44	1252	2.41	1253	2.37	1254	2.35
1255	2.33	1256	2.31	1257	2.29	1258	2.28	1259	2.26
1260	2.24	1261	2.22	1262	2.21	1263	2.20	1264	2.18
1265	2.17	1266	2.15	1267	2.13	1268	2.12	1269	2.10
1270	2.09	1271	2.08	1272	2.06	1273	2.05	1274	2.03
1275	2.02	1276	2.01	1277	2.00	1278	1.98	1279	1.97
1280	1.96	1281	1.95	1282	1.93	1283	1.92	1284	1.91
1285	1.90	1286	1.89	1287	1.88	1288	1.87	1289	1.86

1290	1.85	1291	1.83	1292	1.83	1293	1.81	1294	1.80
[illegible]	1.80	[illegible]	1.79	1297	1.77	1298	1.77	1299	1.76
[illegible]	[illegible]	1310	1.64	1320	1.57	1330	1.52	1340	1.46
1350	[illegible]	1360	[illegible]	1370	1.30	[illegible]	1.27	1390	1.23
1400	[illegible]	1420	1.12	1440	1.07	1460	0.00	1500	.00

Total Runoff = 8.61[illegible] Acre-ft.
Peak Q = 112.51 CFS
Time to Peak = 1158 Minutes

MODIFIED RATIONAL METHOD HYDROLOGY
TOTAL HYDROGRAPH AT : 65L STORM DAY 4 STORM FREQ. 50 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.00	100	0.98	200	1.08	300	1.15	400	1.25
500	1.40	600	1.59	700	1.65	800	2.29	900	3.52
1000	6.38	1050	8.09	1100	14.37	1110	16.26	1120	18.93
1130	22.98	1131	23.44	1132	23.96	1133	24.49	1134	25.07
1135	25.71	1136	26.37	1137	27.06	1138	27.83	1139	28.65
1140	29.56	1141	30.54	1142	31.62	1143	32.80	1144	34.10
1145	35.58	1146	37.24	1147	38.95	1148	40.87	1149	43.07
1150	45.68	1151	48.82	1152	52.74	1153	57.50	1154	63.85
1155	73.61	1156	103.73	1157	115.71	1158	116.68	1159	115.21
1160	112.12	1161	107.55	1162	101.16	1163	92.43	1164	80.09
1165	47.62	1166	32.53	1167	27.69	1168	24.64	1169	22.46
1170	20.61	1171	19.06	1172	17.79	1173	16.72	1174	15.82
1175	15.03	1176	14.33	1177	13.60	1178	12.94	1179	12.36
1180	11.84	1181	11.35	1182	10.92	1183	10.53	1184	10.16
1185	9.83	1186	9.52	1187	9.23	1188	8.96	1189	8.71
1190	8.47	1191	8.26	1192	8.04	1193	7.86	1194	7.68
1195	7.49	1196	7.34	1197	7.14	1198	6.92	1199	6.71
1200	6.51	1201	6.32	1202	6.13	1203	5.97	1204	5.82
1205	5.66	1206	5.51	1207	5.35	1208	5.23	1209	5.09
1210	4.97	1211	4.86	1212	4.72	1213	4.63	1214	4.51
1215	4.41	1216	4.32	1217	4.22	1218	4.13	1219	4.04
1220	3.95	1221	3.87	1222	3.78	1223	3.72	1224	3.63
1225	3.58	1226	3.49	1227	3.43	1228	3.38	1229	3.31
1230	3.25	1231	3.18	1232	3.13	1233	3.07	1234	3.01
1235	2.97	1236	2.91	1237	2.86	1238	2.81	1239	2.76
1240	2.72	1241	2.67	1242	2.63	1243	2.59	1244	2.54
1245	2.49	1246	2.46	1247	2.42	1248	2.38	1249	2.35
1250	2.31	1251	2.28	1252	2.24	1253	2.21	1254	2.18
1255	2.16	1256	2.15	1257	2.13	1258	2.11	1259	2.09
1260	2.08	1261	2.06	1262	2.04	1263	2.03	1264	2.01
1265	2.00	1266	1.99	1267	1.97	1268	1.96	1269	1.94
1270	1.93	1271	1.91	1272	1.90	1273	1.89	1274	1.87
1275	1.86	1276	1.85	1277	1.83	1278	1.82	1279	1.81
1280	1.80	1281	1.79	1282	1.77	1283	1.76	1284	1.75
1285	1.75	1286	1.73	1287	1.72	1288	1.71	1289	1.70
1290	1.69	1291	1.68	1292	1.67	1293	1.66	1294	1.65
1295	1.64	1296	1.63	1297	1.62	1298	1.61	1299	1.60
1300	1.60	1310	1.51	1320	1.44	1330	1.37	1340	1.32
1350	1.26	1360	1.21	1370	1.17	1380	1.13	1390	1.09
1400	1.06	1420	1.00	1440	0.94	1460	0.00	1500	0.00

Total Runoff = 8.501 Acre-ft.
Peak Q = 116.68 CFS
Time to Peak = 1158 Minutes

** LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS **
** MODIFIED RATIONAL METHOD HYDROLOGY **
** RESERVOIR ROUTING OUTPUT **

********************** RESERVOIR ROUTING STORM DAY 4 ********************

RESERVOIR ROUTING at 59AH STORM DAY 4 STORM FREQ. 50
INITIAL WATER SURFACE ELEVATION: 1296.00
RESERVOIR COMPOSITE ELEVATION-STORAGE-DISCHARGE DATA at 59AH

ELEVATION (ft.)	STORAGE (a.f.)	OUTFLOW (cfs)
1296.00	0.00	0.00
1297.00	0.00	40.90
1298.00	0.00	115.80
1299.00	0.00	212.80
1300.00	0.16	327.60
1301.00	0.33	457.80
1302.00	0.49	601.80
1303.00	0.65	758.30
1304.00	0.82	926.50
1305.00	0.98	1105.50
1306.00	1.15	1294.80
1307.00	1.31	1414.60
1308.00	1.47	1538.20
1309.00	1.64	1670.80
1310.00	1.80	1793.70

RESERVOIR DISCHARGE DATA: 59AH Known discharge 1

ELEVATION (ft.)	OUTFLOW (cfs)
1296.00	0.00
1297.00	40.90
1298.00	115.80
1299.00	212.80
1300.00	327.60
1301.00	457.80
1302.00	601.80
1303.00	758.30
1304.00	926.50
1305.00	1105.50
1306.00	1294.80
1307.00	1414.60
1308.00	1538.20
1309.00	1670.80
1310.00	1793.70

how was this discharge table obtained?

RESERVOIR ROUTING TABLE at 59AH

TIME	INFLOW (cfs)	OUTFLOW (cfs)	W.S.ELEV (ft.)	STORAGE (a.f.)
0	3.20	0.00	1296.00	0.00
100	13.50	10.30	1296.25	0.00
200	30.72	27.52	1296.67	0.00
300	37.50	34.30	1296.84	0.00
400	43.05	39.85	1296.97	0.00
500	51.00	47.80	1297.09	0.00
600	59.24	56.04	1297.20	0.00
700	69.41	66.21	1297.34	0.00
800	82.77	79.57	1297.52	0.00
900	107.93	104.73	1297.85	0.00
1000	161.46	158.26	1298.44	0.00
1050	208.55	205.35	1298.92	0.00
1100	301.07	299.20	1299.75	0.12
1110	327.72	325.02	1299.98	0.16
1120	360.80	357.66	1300.23	0.20
1130	406.98	402.60	1300.58	0.26

1131	412.34	407.47	1300.61	0.26
[illegible]	[illegible]	412.70	1300.65	0.27
1133	423.27	418.09	1300.70	0.28
1134	429.02	423.65	1300.74	0.29
1135	435.05	429.44	1300.78	0.29
1136	441.33	435.49	1300.83	0.30
1137	447.91	441.80	1300.88	0.31
1138	454.78	448.39	1300.93	0.32
1139	461.96	455.28	1300.98	0.33
1140	469.53	463.02	1301.04	0.34
1141	477.49	471.05	1301.09	0.34
1142	485.92	479.20	1301.15	0.35
1143	494.81	487.75	1301.21	0.36
1144	504.28	496.78	1301.27	0.37
1145	514.35	506.37	1301.34	0.38
1146	525.09	516.59	1301.41	0.40
1147	536.66	527.52	1301.48	0.41
1148	548.95	539.22	1301.57	0.42
1149	562.25	551.75	1301.65	0.43
1150	576.75	565.33	1301.75	0.45
1151	592.66	580.16	1301.85	0.47
1152	610.31	596.48	1301.96	0.48
1153	630.26	615.37	1302.09	0.50
1154	652.94	636.49	1302.22	0.53
1155	680.53	660.84	1302.38	0.55
1156	726.87	695.34	1302.60	0.59
1157	763.15	735.32	1302.85	0.63
1158	798.93	772.22	1303.08	0.66
1159	842.87	811.68	1303.32	0.70
1160	892.07	856.90	1303.59	0.75
1161	946.11	907.31	1303.89	0.80
1162	1002.32	964.12	1304.21	0.85
1163	1058.10	1021.65	1304.53	0.91
1164	1111.75	1076.72	1304.84	0.95
1165	1161.70	1128.88	1305.12	1.00
1166	1205.83	1176.53	1305.38	1.04
1167	1227.67	1211.45	1305.56	1.08
1168	1252.45	1236.28	1305.69	1.10
1169	1274.75	1259.99	1305.82	1.12
1170	1292.99	1280.72	1305.93	1.14
1171	1308.70	1297.46	1306.02	1.15
1172	1321.98	1309.63	1306.12	1.17
1173	1331.64	1321.32	1306.22	1.19
1174	1336.19	1329.89	1306.29	1.20
1175	1334.71	1333.67	1306.32	1.20
1176	1326.97	1331.75	1306.31	1.20
1177	1313.33	1323.86	1306.24	1.19
1178	1294.52	1310.30	1306.13	1.17
1179	1271.72	1290.98	1305.98	1.15
1180	1245.87	1263.04	1305.83	1.12
1181	1217.69	1235.90	1305.69	1.10
1182	1187.84	1207.14	1305.54	1.07
1183	1156.79	1176.91	1305.38	1.04
1184	1125.46	1145.84	1305.21	1.02
1185	1093.99	1114.49	1305.05	0.99
1186	1063.02	1083.19	1304.88	0.96
1187	1032.45	1052.33	1304.70	0.93
1188	1002.45	1021.97	1304.53	0.91
1189	972.90	992.12	1304.37	0.88
1190	943.72	962.69	1304.20	0.85
1191	914.71	933.55	1304.04	0.83
1192	885.95	906.14	1303.88	0.80
1193	857.15	878.10	1303.71	0.77
1194	828.68	849.58	1303.54	0.74

1195	800.37	821.17	1303.37	0.71
1196	[illegible]	[illegible]92.98	1303.21	0.69
1197	744.97	[illegible]	1303.04	0.66
1198	717.90	[illegible]	1302.87	0.63
1199	691.42	711.16	1302.70	0.60
1200	665.73	684.93	1302.53	0.57
1201	640.85	659.46	1302.37	0.55
1202	616.84	634.82	1302.21	0.52
1203	593.73	611.04	1302.06	0.50
1204	571.49	588.83	1301.91	0.48
1205	550.22	567.42	1301.76	0.45
1206	529.86	546.47	1301.62	0.43
1207	510.42	526.32	1301.48	0.41
1208	491.90	507.06	1301.34	0.38
1209	474.24	488.70	1301.21	0.36
1210	457.44	471.20	1301.09	0.34
1211	441.48	454.88	1300.98	0.33
1212	426.32	440.39	1300.87	0.31
1213	411.95	425.71	1300.75	0.29
1214	398.45	411.55	1300.64	0.27
1215	385.66	398.08	1300.54	0.25
1216	373.37	385.26	1300.44	0.24
1217	361.59	372.98	1300.35	0.22
1218	350.31	361.22	1300.26	0.20
1219	339.85	350.07	1300.17	0.19
1220	329.82	339.55	1300.09	0.18
1221	320.20	329.51	1300.01	0.16
1222	311.26	320.31	1299.94	0.15
1223	302.76	311.51	1299.86	0.14
1224	294.57	303.01	1299.79	0.13
1225	287.15	294.98	1299.72	0.11
1226	280.02	287.44	1299.65	0.10
1227	273.14	280.26	1299.59	0.09
1228	266.48	273.35	1299.53	0.08
1229	260.04	266.67	1299.47	0.08
1230	253.83	260.23	1299.41	0.07
1231	247.82	254.01	1299.36	0.06
1232	242.04	248.00	1299.31	0.05
1233	236.44	242.21	1299.26	0.04
1234	231.03	236.61	1299.21	0.03
1235	225.84	231.20	1299.16	0.03
1236	220.81	225.99	1299.11	0.02
1237	215.98	220.97	1299.07	0.01
1238	211.30	216.12	1299.03	0.00
1239	206.82	208.72	1298.96	0.00
1240	202.67	200.77	1298.88	0.00
1241	198.97	200.87	1298.88	0.00
1242	195.37	193.47	1298.80	0.00
1243	191.86	193.76	1298.80	0.00
1244	188.45	186.55	1298.73	0.00
1245	185.14	187.04	1298.73	0.00
1246	181.91	180.01	1298.66	0.00
1247	178.75	180.65	1298.67	0.00
1248	175.69	173.79	1298.60	0.00
1249	172.72	174.62	1298.61	0.00
1250	169.82	167.92	1298.54	0.00
1251	167.00	168.90	1298.55	0.00
1252	164.26	162.35	1298.48	0.00
1253	161.60	163.50	1298.49	0.00
1254	159.03	157.13	1298.43	0.00
1255	156.73	158.63	1298.44	0.00
1256	154.56	152.66	1298.38	0.00
1257	152.43	154.33	1298.40	0.00
1258	150.36	148.46	1298.34	0.00

1259	148.33	150.23	1298.35	0.00
1260	[illegible]	144.45	1298.30	0.00
1261	144.40	146.30	1298.33	0.00
1262	142.51	140.61	1298.26	0.00
1263	140.66	142.56	1298.28	0.00
1264	138.84	136.94	1298.22	0.00
1265	137.07	138.98	1298.24	0.00
1266	135.34	133.44	1298.18	0.00
1267	133.63	135.53	1298.20	0.00
1268	131.97	130.07	1298.15	0.00
1269	130.35	132.25	1298.17	0.00
1270	128.75	126.85	1298.11	0.00
1271	127.19	129.09	1298.14	0.00
1272	125.67	123.77	1298.08	0.00
1273	124.18	126.08	1298.11	0.00
1274	122.72	120.82	1298.05	0.00
1275	121.30	123.20	1298.08	0.00
1276	119.89	117.99	1298.02	0.00
1277	118.53	120.43	1298.05	0.00
1278	117.19	115.29	1297.99	0.00
1279	115.87	117.77	1298.02	0.00
1280	114.59	112.69	1297.96	0.00
1281	113.33	115.23	1297.99	0.00
1282	112.10	110.20	1297.93	0.00
1283	110.89	112.79	1297.96	0.00
1284	109.70	107.80	1297.89	0.00
1285	108.55	110.45	1297.93	0.00
1286	107.43	105.53	1297.86	0.00
1287	106.39	108.29	1297.90	0.00
1288	105.43	103.53	1297.84	0.00
1289	104.50	106.40	1297.87	0.00
1290	103.57	101.67	1297.81	0.00
1291	102.65	104.55	1297.85	0.00
1292	101.75	99.85	1297.79	0.00
1293	100.86	102.76	1297.83	0.00
1294	99.97	98.07	1297.76	0.00
1295	99.10	101.01	1297.80	0.00
1296	98.25	96.35	1297.74	0.00
1297	97.40	99.30	1297.78	0.00
1298	96.56	94.66	1297.72	0.00
1299	95.74	97.64	1297.76	0.00
1300	94.93	93.03	1297.70	0.00
1310	87.59	85.69	1297.60	0.00
1320	81.48	79.58	1297.52	0.00
1330	76.37	74.47	1297.45	0.00
1340	71.69	69.79	1297.39	0.00
1350	67.53	65.63	1297.33	0.00
1360	63.76	61.86	1297.28	0.00
1370	60.17	58.27	1297.23	0.00
1380	56.89	54.99	1297.19	0.00
1390	53.79	51.89	1297.15	0.00
1400	50.89	48.99	1297.11	0.00
1420	45.86	43.96	1297.04	0.00
1440	41.52	39.61	1296.97	0.00

Arc Travel Time Data Computed in WMS
Tue Aug 02 13:53:56 2005

BASIN 1A   AREA 37.83 acres

```
ARC 23    Travel Time
8.00 min.
   TYPE:  LACDPW TC
    EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
        L    Length                    2081.96 ft
        S    Slope                     0.3564
        %I   Percent impervious        1.00
        SN   Soil number               293
        RD   Rainfall depth            8.51
        Cd   Soil runoff coefficient   0.80
        i    Rainfall intensity        4.07
```

Time of Concentration for 1A   8.00 min.

BASIN 3A   AREA 41.02 acres

```
ARC 22    Travel Time
9.00 min.
   TYPE:  LACDPW TC
    EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
        L    Length                    2523.32 ft
        S    Slope                     0.3107
        %I   Percent impervious        1.00
        SN   Soil number               293
        RD   Rainfall depth            8.51
        Cd   Soil runoff coefficient   0.79
        i    Rainfall intensity        3.85
```

Time of Concentration for 3A   9.00 min.

BASIN 5A   AREA 40.57 acres

```
ARC 26    Travel Time
8.00 min.
   TYPE:  LACDPW TC
    EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
        L    Length                    2128.74 ft
        S    Slope                     0.3711
        %I   Percent impervious        1.00
        SN   Soil number               293
        RD   Rainfall depth            8.51
        Cd   Soil runoff coefficient   0.80
        i    Rainfall intensity        4.07
```

Time of Concentration for 5A   8.00 min.

```
--------------------------------------------------------------------
BASIN 7A    AREA 30.39 acres
--------------------------------------------------------------------

ARC 37    Travel Time
8.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
       L   Length                    1941.62 ft
       S   Slope                     0.2112
       %I  Percent impervious        1.00
       SN  Soil number               291
       RD  Rainfall depth            8.51
       Cd  Soil runoff coefficient   0.84
       i   Rainfall intensity        4.07
--------------------------------------------------------------------
Time of Concentration for 7A    8.00 min.
--------------------------------------------------------------------

--------------------------------------------------------------------
BASIN 10B    AREA 17.78 acres
--------------------------------------------------------------------

ARC 13    Travel Time
6.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
       L   Length                    1277.71 ft
       S   Slope                     0.2653
       %I  Percent impervious        1.00
       SN  Soil number               291
       RD  Rainfall depth            8.51
       Cd  Soil runoff coefficient   0.85
       i   Rainfall intensity        4.66
--------------------------------------------------------------------
Time of Concentration for 10B    6.00 min.
--------------------------------------------------------------------

--------------------------------------------------------------------
BASIN 12A    AREA 34.81 acres
--------------------------------------------------------------------

ARC 18    Travel Time
8.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
       L   Length                    1723.78 ft
       S   Slope                     0.1833
       %I  Percent impervious        1.00
       SN  Soil number               291
       RD  Rainfall depth            8.44
       Cd  Soil runoff coefficient   0.84
       i   Rainfall intensity        4.04
--------------------------------------------------------------------
Time of Concentration for 12A    8.00 min.
--------------------------------------------------------------------

--------------------------------------------------------------------
BASIN 14A    AREA 28.28 acres
--------------------------------------------------------------------

ARC 11    Travel Time
```

```
8.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      1941.62 ft
      S    Slope                       0.1767
      %I   Percent impervious          1.00
      SN   Soil number                 291
      RD   Rainfall depth              8.33
      Cd   Soil runoff coefficient     0.84
      i    Rainfall intensity          3.98
---------------------------------------------------------------------
Time of Concentration for 14A    8.00 min.
---------------------------------------------------------------------

---------------------------------------------------------------------
BASIN 16A    AREA 23.76 acres
---------------------------------------------------------------------

ARC 38     Travel Time
9.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      1834.36 ft
      S    Slope                       0.1172
      %I   Percent impervious          1.00
      SN   Soil number                 291
      RD   Rainfall depth              8.41
      Cd   Soil runoff coefficient     0.83
      i    Rainfall intensity          3.81
---------------------------------------------------------------------
Time of Concentration for 16A    9.00 min.
---------------------------------------------------------------------

---------------------------------------------------------------------
BASIN 18A    AREA 30.80 acres
---------------------------------------------------------------------

ARC 27     Travel Time
10.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      2189.22 ft
      S    Slope                       0.1019
      %I   Percent impervious          1.00
      SN   Soil number                 291
      RD   Rainfall depth              8.49
      Cd   Soil runoff coefficient     0.83
      i    Rainfall intensity          3.66
---------------------------------------------------------------------
Time of Concentration for 18A    10.00 min.
---------------------------------------------------------------------

---------------------------------------------------------------------
BASIN 20A    AREA 31.98 acres
---------------------------------------------------------------------

ARC 55     Travel Time
11.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      2490.25 ft
      S    Slope                       0.1000
      %I   Percent impervious          1.00
```

```
      SN  Soil number                 291
      RD  Rainfall depth              8.51
      Cd  Soil runoff coefficient     0.83
      i   Rainfall intensity          3.50
------------------------------------------------------------------
Time of Concentration for 20A    11.00 min.
------------------------------------------------------------------

------------------------------------------------------------------
BASIN 22A    AREA 13.34 acres
------------------------------------------------------------------

ARC 28    Travel Time
6.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L   Length                      1200.21 ft
      S   Slope                       0.1325
      %I  Percent impervious          1.00
      SN  Soil number                 291
      RD  Rainfall depth              8.51
      Cd  Soil runoff coefficient     0.85
      i   Rainfall intensity          4.66
------------------------------------------------------------------
Time of Concentration for 22A    6.00 min.
------------------------------------------------------------------

------------------------------------------------------------------
BASIN 23C    AREA 46.52 acres
------------------------------------------------------------------

ARC 24    Travel Time
9.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L   Length                      2332.88 ft
      S   Slope                       0.2310
      %I  Percent impervious          1.00
      SN  Soil number                 291
      RD  Rainfall depth              8.51
      Cd  Soil runoff coefficient     0.84
      i   Rainfall intensity          3.85
------------------------------------------------------------------
Time of Concentration for 23C    9.00 min.
------------------------------------------------------------------

------------------------------------------------------------------
BASIN 27C    AREA 21.32 acres
------------------------------------------------------------------

ARC 25    Travel Time
9.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L   Length                      2255.38 ft
      S   Slope                       0.2310
      %I  Percent impervious          1.00
      SN  Soil number                 291
      RD  Rainfall depth              8.51
      Cd  Soil runoff coefficient     0.84
      i   Rainfall intensity          3.85
------------------------------------------------------------------
Time of Concentration for 27C    9.00 min.
```

```
-----------------------------------------------------------------------

-----------------------------------------------------------------------
BASIN 28D    AREA 35.89 acres
-----------------------------------------------------------------------

ARC 35     Travel Time
9.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
         L    Length                    2335.23 ft
         S    Slope                     0.2188
         %I   Percent impervious        1.00
         SN   Soil number               291
         RD   Rainfall depth            8.51
         Cd   Soil runoff coefficient   0.84
         i    Rainfall intensity        3.85
-----------------------------------------------------------------------
Time of Concentration for 28D    9.00 min.
-----------------------------------------------------------------------

-----------------------------------------------------------------------
BASIN 30D    AREA 33.06 acres
-----------------------------------------------------------------------

ARC 12     Travel Time
12.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
         L    Length                    2924.96 ft
         S    Slope                     0.1180
         %I   Percent impervious        1.00
         SN   Soil number               291
         RD   Rainfall depth            8.51
         Cd   Soil runoff coefficient   0.83
         i    Rainfall intensity        3.36
-----------------------------------------------------------------------
Time of Concentration for 30D    12.00 min.
-----------------------------------------------------------------------

-----------------------------------------------------------------------
BASIN 33A    AREA 23.89 acres
-----------------------------------------------------------------------

ARC 14     Travel Time
9.00 min.
  TYPE:  LACDPW TC
   EQN:  (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
         L    Length                    1994.08 ft
         S    Slope                     0.1023
         %I   Percent impervious        1.00
         SN   Soil number               291
         RD   Rainfall depth            8.51
         Cd   Soil runoff coefficient   0.84
         i    Rainfall intensity        3.85
-----------------------------------------------------------------------
Time of Concentration for 33A    9.00 min.
-----------------------------------------------------------------------

-----------------------------------------------------------------------
BASIN 36E    AREA 47.95 acres
-----------------------------------------------------------------------
```

```
ARC 34    Travel Time
10.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      2808.70 ft
      S    Slope                       0.1901
      %I   Percent impervious          1.00
      SN   Soil number                 291
      RD   Rainfall depth              8.51
      Cd   Soil runoff coefficient     0.83
      i    Rainfall intensity          3.67
---------------------------------------------------------------------
Time of Concentration for 36E    10.00 min.
---------------------------------------------------------------------

---------------------------------------------------------------------
BASIN 38F     AREA 56.77 acres
---------------------------------------------------------------------

ARC 44    Travel Time
10.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      2514.32 ft
      S    Slope                       0.1714
      %I   Percent impervious          1.00
      SN   Soil number                 291
      RD   Rainfall depth              8.51
      Cd   Soil runoff coefficient     0.83
      i    Rainfall intensity          3.67
---------------------------------------------------------------------
Time of Concentration for 38F    10.00 min.
---------------------------------------------------------------------

---------------------------------------------------------------------
BASIN 40F     AREA 41.49 acres
---------------------------------------------------------------------

ARC 29    Travel Time
9.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      2103.69 ft
      S    Slope                       0.1155
      %I   Percent impervious          1.00
      SN   Soil number                 291
      RD   Rainfall depth              8.51
      Cd   Soil runoff coefficient     0.84
      i    Rainfall intensity          3.85
---------------------------------------------------------------------
Time of Concentration for 40F    9.00 min.
---------------------------------------------------------------------

---------------------------------------------------------------------
BASIN 42A     AREA 40.09 acres
---------------------------------------------------------------------

ARC 32    Travel Time
9.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                      2043.21 ft
      S    Slope                       0.1581
```

```
    %I   Percent impervious        1.00
    SN   Soil number               291
    RD   Rainfall depth            8.51
    Cd   Soil runoff coefficient   0.84
    i    Rainfall intensity        3.85
------------------------------------------------------------------
Time of Concentration for 42A     9.00 min.
------------------------------------------------------------------

------------------------------------------------------------------
BASIN 44A     AREA 41.55 acres
------------------------------------------------------------------

ARC 31     Travel Time
9.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                  2090.96 ft
      S    Slope                   0.1345
      %I   Percent impervious      1.00
      SN   Soil number             297
      RD   Rainfall depth          8.51
      Cd   Soil runoff coefficient 0.80
      i    Rainfall intensity      3.85
------------------------------------------------------------------
Time of Concentration for 44A     9.00 min.
------------------------------------------------------------------

------------------------------------------------------------------
BASIN 45G     AREA 29.66 acres
------------------------------------------------------------------

ARC 30     Travel Time
8.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                  1748.83 ft
      S    Slope                   0.1744
      %I   Percent impervious      1.00
      SN   Soil number             297
      RD   Rainfall depth          8.51
      Cd   Soil runoff coefficient 0.80
      i    Rainfall intensity      4.07
------------------------------------------------------------------
Time of Concentration for 45G     8.00 min.
------------------------------------------------------------------

------------------------------------------------------------------
BASIN 47G     AREA 33.81 acres
------------------------------------------------------------------

ARC 39     Travel Time
8.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
      L    Length                  1814.99 ft
      S    Slope                   0.1868
      %I   Percent impervious      2.98
      SN   Soil number             297
      RD   Rainfall depth          8.51
      Cd   Soil runoff coefficient 0.80
      i    Rainfall intensity      4.07
------------------------------------------------------------------
```

Time of Concentration for 47G 8.00 min.

BASIN 49G AREA 28.41 acres

ARC 57 Travel Time
8.00 min.
TYPE: LACDPW TC
EQN: (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)

L	Length	1680.32 ft
S	Slope	0.1660
%I	Percent impervious	5.35
SN	Soil number	297
RD	Rainfall depth	8.51
Cd	Soil runoff coefficient	0.81
i	Rainfall intensity	4.07

Time of Concentration for 49G 8.00 min.

BASIN 53G AREA 27.35 acres

ARC 59 Travel Time
9.00 min.
TYPE: LACDPW TC
EQN: (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)

L	Length	2085.29 ft
S	Slope	0.1506
%I	Percent impervious	7.34
SN	Soil number	297
RD	Rainfall depth	8.51
Cd	Soil runoff coefficient	0.80
i	Rainfall intensity	3.85

Time of Concentration for 53G 9.00 min.

BASIN 55A AREA 37.38 acres

ARC 16 Travel Time
11.00 min.
TYPE: LACDPW TC
EQN: (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)

L	Length	2283.30 ft
S	Slope	0.0720
%I	Percent impervious	7.65
SN	Soil number	297
RD	Rainfall depth	8.51
Cd	Soil runoff coefficient	0.80
i	Rainfall intensity	3.51

Time of Concentration for 55A 11.00 min.

BASIN 58H AREA 18.36 acres

```
ARC 33    Travel Time
7.00 min.
  TYPE:   LACDPW TC
   EQN:   (10.0^-0.507) * ((Cd*i)^-0.519) * (L^0.483) * (S^-0.135)
       L   Length                      1566.42 ft
       S   Slope                       0.1705
      %I   Percent impervious          23.32
      SN   Soil number                 97
      RD   Rainfall depth              8.51
      Cd   Soil runoff coefficient     0.81
       i   Rainfall intensity          4.33
---------------------------------------------------------------------
Time of Concentration for 58H    7.00 min.
---------------------------------------------------------------------
```

Appendix 4
Existing Burned Watershed
2-Year, 24-hour event

File name: C:\Work\1493\10 - H & H Study\Civil-Survey\Wpr\1493EC11.lac Run date: Mon Jan 30 09:43:36 2006

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 4 Storm Frequency 50

LOCATION		SUBAREA AREA	SUBAREA Q	TOTAL AREA	TOTAL Q	TOTAL VOLUME	CONV TYPE	CONV LNGTH	CONV SLOPE	CONV SIZE	CONV Z	CONTROL Q	SOIL NAME	TC	RAIN	PCT IMPV
1	1A	37.8	37.20	37.8	37.20	1.741	0	0	0.00000	0.00	0.00	0	293	8	3.29	0.01
1	2A	0.0	0.00	37.8	37.20	1.898	1	1517	0.14566	0.00	0.00	0	293	0	3.29	0.00
1	3A	41.0	37.52	78.0	61.45	3.782	0	0	0.00000	0.00	0.00	0	293	9	3.29	0.01
1	4A	0.0	0.00	78.8	61.45	3.791	1	727	0.10127	0.00	0.00	0	293	0	3.29	0.00
1	5A	40.6	39.95	119.4	87.54	5.661	0	0	0.00000	0.00	0.00	0	293	8	3.29	0.01
1	6A	0.0	0.00	119.4	87.54	5.673	1	1016	0.07674	0.00	0.00	0	293	0	3.29	0.00
1	7A	30.4	35.54	149.8	104.85	7.607	0	0	0.00000	0.00	0.00	0	291	8	3.29	0.01
1	9B	17.8	24.40	17.8	24.40	1.134	0	0	0.00000	0.00	0.00	0	291	6	3.29	0.01
1	10B	0.0	0.00	17.8	24.40	1.483	1	1044	0.07760	0.00	0.00	0	291	0	3.29	0.00
1	11AB	17.8	19.77	167.6	124.62	9.108	1	1044	0.06035	0.00	0.00	0	291	0	3.29	0.00
1	12A	34.8	40.32	202.4	126.10	11.294	0	0	0.00000	0.00	0.00	0	291	8	3.27	0.01
1	13A	0.0	0.00	202.4	126.10	11.309	1	832	0.04569	0.00	0.00	0	291	0	3.27	0.00
1	14A	28.3	32.27	230.7	127.96	13.045	0	0	0.00000	0.00	0.00	0	291	8	3.22	0.01
1	15A	0.0	0.00	230.7	127.96	13.062	1	978	0.04602	0.00	0.00	0	291	0	3.22	0.00
1	16A	23.8	25.75	254.5	129.54	14.547	0	0	0.00000	0.00	0.00	0	291	9	3.26	0.01
1	17A	0.0	0.00	254.5	129.54	14.559	1	1815	0.04297	0.00	0.00	0	291	0	3.26	0.00
1	18A	30.8	31.68	285.3	127.93	16.509	0	0	0.00000	0.00	0.00	0	291	10	3.29	0.01
1	19A	0.0	0.00	285.3	127.93	16.513	1	534	0.02809	0.00	0.00	0	291	0	3.29	0.00
1	20A	32.0	31.18	317.3	130.21	18.543	0	0	0.00000	0.00	0.00	0	291	11	3.29	0.01
1	21A	0.0	0.00	317.3	130.21	18.549	1	666	0.04052	0.00	0.00	0	291	0	3.29	0.00
1	22A	13.3	18.23	330.6	130.39	19.396	0	0	0.00000	0.00	0.00	0	291	6	3.29	0.01
1	23C	46.5	51.05	46.5	51.05	2.958	0	0	0.00000	0.00	0.00	0	291	9	3.29	0.01
1	24C	0.0	0.00	46.5	51.05	3.033	1	419	0.05016	0.00	0.00	0	291	0	3.29	0.00
1	25C	21.3	23.38	67.8	71.92	4.388	0	0	0.00000	0.00	0.00	0	291	9	3.29	0.01
1	26C	0.0	0.00	67.8	71.92	4.400	1	611	0.04440	0.00	0.00	0	291	0	3.29	0.00
1	28D	35.9	39.40	35.9	39.40	2.283	0	0	0.00000	0.00	0.00	0	291	9	3.29	0.01
1	29D	0.0	0.00	35.9	39.40	2.417	1	1490	0.04037	0.00	0.00	0	291	0	3.29	0.00
1	30D	33.1	30.62	69.0	52.93	4.516	0	0	0.00000	0.00	0.00	0	291	12	3.29	0.01
1	31CD	69.0	52.93	136.8	120.70	8.927	1	372	0.04261	0.00	0.00	0	291	0	3.29	0.00
1	32AC	136.8	119.52	467.4	228.69	28.350	1	1490	0.02349	0.00	0.00	0	291	0	3.29	0.00
1	33A	23.9	26.24	491.3	216.15	29.871	0	0	0.00000	0.00	0.00	0	291	9	3.29	0.01
1	35E	48.0	49.52	48.0	49.52	3.050	0	0	0.00000	0.00	0.00	0	291	10	3.30	0.01
1	36E	0.0	0.00	48.0	49.52	3.120	1	386	0.02852	0.00	0.00	0	291	0	3.30	0.00
1	37AE	48.0	47.72	539.3	229.22	33.006	1	1116	0.02420	0.00	0.00	0	291	0	3.30	0.00
1	38F	56.8	58.61	56.8	58.61	3.610	0	0	0.00000	0.00	0.00	0	291	10	3.30	0.01
1	39F	0.0	0.00	56.8	58.61	3.687	1	898	0.02450	0.00	0.00	0	291	0	3.30	0.00
1	40F	41.5	42.82	98.3	84.13	6.325	0	0	0.00000	0.00	0.00	0	291	10	3.30	0.01
1	41AF	98.3	84.13	637.6	252.73	39.351	1	1289	0.02947	0.00	0.00	0	291	0	3.30	0.00
1	42A	40.1	44.04	677.7	254.52	41.903	0	0	0.00000	0.00	0.00	0	291	9	3.30	0.01
1	43A	0.0	0.00	677.7	254.52	41.914	1	1207	0.02167	0.00	0.00	0	291	0	3.30	0.00
1	44A	41.5	38.15	719.2	253.46	43.861	0	0	0.00000	0.00	0.00	0	297	10	3.30	0.01
1	45G	29.7	31.26	29.7	31.26	1.397	0	0	0.00000	0.00	0.00	0	297	8	3.29	0.01
1	46G	0.0	0.00	29.7	31.26	1.646	1	711	0.05487	0.00	0.00	0	297	0	3.29	0.00
1	47G	33.8	35.82	63.5	58.23	3.369	0	0	0.00000	0.00	0.00	0	297	8	3.29	0.03
1	48G	0.0	0.00	63.5	58.23	3.382	1	923	0.01842	0.00	0.00	0	297	0	3.29	0.00
1	49G	28.4	30.31	91.9	56.35	4.942	0	0	0.00000	0.00	0.00	0	297	8	3.29	0.05
1	50G	0.0	0.00	91.9	56.35	4.951	1	716	0.03914	0.00	0.00	0	297	0	3.29	0.00
1	51G	27.4	27.55	119.3	67.45	6.563	0	0	0.00000	0.00	0.00	0	297	9	3.30	0.07
1	52G	0.0	0.00	119.3	67.45	6.569	1	777	0.02590	0.00	0.00	0	297	0	3.30	0.00
1	54AG	119.3	63.41	838.5	297.16	50.419	1	1121	0.01452	0.00	0.00	0	297	0	3.30	0.00
1	55A	37.4	33.26	875.9	295.50	52.689	0	0	0.00000	0.00	0.00	0	297	11	3.30	0.08
1	57H	18.4	21.37	18.4	21.37	1.615	0	0	0.00000	0.00	0.00	0	97	7	3.29	0.23
1	58H	0.0	0.00	18.4	21.37	1.675	1	774	0.01588	0.00	0.00	0	97	0	3.29	0.00
1	59AH	18.4	15.23	894.3	298.65	49.554	0	0	0.00000	0.00	0.00	0	97	0	3.29	0.00
1	60I	0.0	0.00	0.0	0.00	0.000	0	0	0.00000	0.00	0.00	0	97	0	3.29	0.00
1	61J	0.0	0.00	0.0	0.00	0.000	0	0	0.00000	0.00	0.00	0	97	0	3.29	0.00
1	62K	36.5	36.31	36.5	36.31	1.932	0	0	0.00000	0.00	0.00	0	297	9	3.30	0.04
1	63K	0.0	0.00	36.5	36.31	1.932	0	0	0.00000	0.00	0.00	0	297	0	3.30	0.00
1	64L	38.0	37.39	38.0	37.39	1.786	0	0	0.00000	0.00	0.00	0	297	9	3.30	0.01
1	65L	0.0	0.00	38.0	37.39	1.786	0	0	0.00000	0.00	0.00	0	297	0	3.30	0.00

Normal End of MODRAT