- Final Report -

Hydrologic and Hydraulic Investigation for

Proposed Campgrounds in Yosemite National Park, CA

Prepared for

NATIONAL PARK SERVICE
Department of the Interior

National Park Service

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FINAL REPORT

HYDROLOGIC AND HYDRAULIC INVESTIGATION FOR PROPOSED CAMPGROUNDS IN YOSEMITE NATIONAL PARK, CALIFORNIA

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Prepared For:
National Park Service

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HYDROLOGIC AND HYDRAULIC
INVESTIGATION FOR PROPOSED CAMPGROUNDS
YOSEMITE NATIONAL PARK, CALIFORNIA
May 6, 1998

INTRODUCTION

The National Park Service (NPS) is in the process of planning new and improved existing campground facilities in the general area of the confluence of the Merced River and Tenaya Creek in Yosemite National Park, California. The proposed development will replace and relocate facilities that were damaged by a flood in January 1997. In order to properly plan facilities, detailed information on the surface hydrology and hydraulic conditions must be obtained. This report presents the results of hydrologic and hydraulic investigations for the Merced River and Tenaya Creek in the study area for the proposed campgrounds. The study area is depicted on Figure 5, which is an exhibit entitled "Alternative 2, The Proposed Action, Ahwahnee Hotel & Campgrounds" furnished by the NPS.

The main purpose of this investigation is to:

- Determine the magnitude of the 2-, 10-, 25-, and 100-year peak discharges for the Merced River, Tenaya Creek, and the local "fen" tributary within the study area boundary.

- Determine the extent of the existing floodplain boundaries and water surface elevations for the 2-, 10-, 25-, and 100-year flood events for the study reaches of the Merced River and Tenaya Creek.

- Delineate depth zones for the 10-, 25-, and 100-year flood events.

- Delineate velocity zones for the 10-, 25-, and 100-year flood events.

HYDROLOGY

Merced River

The Merced River is a major stream in Yosemite Valley flowing from east to west. The main tributaries to the Merced River are Tenaya Creek, Yosemite Creek, Bridalveil Creek, and several minor streams. The drainage area of the Merced River at Happy Isles (approximately 3 miles upstream of Yosemite Village and at the upstream limit of the study) is 181.9 square miles, and at Pohono Bridge (approximately 6 miles southwest and downstream of Yosemite Village) is 321 square miles. Watershed boundaries for the Merced River are shown on Figure 1. The Merced River watershed consists of steep mountain slopes, deposits of talus and rockfalls at the base of steep slopes, and flatter areas on the valley floor. Watershed slopes vary widely and range from approximately 0.1 percent on the valley floor to nearly vertical along the rock face of the valley walls. The elevation near Yosemite Lodge is 3,970 and the highest elevation in the watershed is 13,114 (Mt. Lyell). According to the United States Department of Agriculture, National Resources Conservation Services' (NRCS) *Interim Soil Report, Soil Survey of Yosemite National Park, Yosemite Valley, California*, the soils within the upper portions of the watershed are "undetermined," and soils within the lower portions (within and adjacent to the valley floor) are of hydrologic groups A and B, which tend to be well-drained and coarse-textured with a low runoff potential. Soils of clay and silt may also be found on the valley floor.

The United States Geological Survey (USGS) has operated two stream gauging stations on the Merced River. One gauge (#11264500) is located near Happy Isles at the upper end of Yosemite Valley, approximately 3 miles upstream of Yosemite Village. The second gauge (#11266500) is located approximately 100 feet upstream of Pohono Bridge at the lower end of the valley approximately 6 miles southwest of Yosemite Village. The Happy Isles gauge has been in operation since 1916 and the Pohono Bridge gauge since 1917, with each gauge providing continuous stream flow data for about 80 years.

In early January of 1997, the largest flood during the 80-year period of stream gauge record occurred on the Merced River in Yosemite National Park. The flood inundated roads, picnic areas, park offices, and lodging units. The January 1997 flood was measured at the two USGS stream gauging stations mentioned above. The USGS estimated that the January 1997 flood had a peak discharge of 10,000 cubic feet per second (cfs) at Happy Isles and 25,000 cfs at Pohono Bridge; however, floodwaters were noted to have overtopped Pohono Bridge and the gauge during this event and prior major events.

Merced River at Happy Isles

The USGS, under contract with the Federal Emergency Management Agency (FEMA), has performed flood frequency analyses (FFA) for the Merced River at Happy Isles to assign a

frequency for the flood event of January 1997. The USGS used a log-Pearson Type III distribution of the 80 years of stream flow data, including the January 1997 event, to estimate the recurrence interval of the flood. Based on the FFA, the 100-year peak discharges for the Merced River at Happy Isles was estimated by the USGS to be 10,225 cfs. This value and the FFA has been adopted in this study. Fitting a linear regression curve through high flow events, the USGS preliminary calculations (December 1, 1997) estimated that the January 1997 flood at Happy Isles had a recurrence interval of 90 years. The USGS data is included in the Appendix, but has not been published and is officially regarded as "preliminary." Table 1 depicts the 2-, 10-, 25-, and 100-year discharges adopted in this study for the Merced River at Happy Isles.

Tenaya Creek - Upstream of the Confluence with the Merced River

Tenaya Creek is a major tributary of the Merced River. The confluence is located approximately one mile upstream of Yosemite Village and within the study area for the Yosemite Campgrounds. Tenaya Creek, from its confluence upstream, has an increasing slope and narrowing valley width. The main channel slope is approximately 490 feet per mile. The elevation near the confluence is 3,970 and the highest elevation in the watershed is 10,940 at Cathedral Peak. The drainage area for Tenaya Creek at the confluence with the Merced River is 46.9 square miles. The watershed boundary for Tenaya Creek is shown on Figure 1.

The USGS previously operated a stream gauging station on Tenaya Creek. The gauge was in operation from 1912 to 1958 and has 46 years of stream flow record. At the request of CBA, the USGS performed a FFA for Tenaya Creek at the confluence with the Merced River using a log-Pearson Type III frequency distribution on 46 years of stream flow data. A traditional approach to the FFA yields a 100-year discharge for Tenaya Creek of 3,710 cfs at the confluence with the Merced River. This FFA is graphically depicted on Figure 3.

A more thorough review of the 46 years of stream flow data for Tenaya indicates that there are three high flow events. They occurred in 1938 (6,800 cfs), 1951 (5,150 cfs), and 1956 (4,730 cfs). Similar high flows occurred in the adjacent Merced River watershed on the same dates. Fitting the frequency curve through the annual peak flows showed that these high flow events do not fit the curve with the rest of the data points. The FFA essentially treated these events as high outliers.

Since similar high flows were also recorded in the Merced River stream gauging stations at Happy Isles and Pohono Bridge on the same dates, and the occurrence of 3 high outliers in 46 years of record is highly unlikely, CBA has concluded that the high flows of record should not be considered as high outliers. Instead, two frequency curves were drawn and fitted through the data points; one curve for the low flow events and one for high flows. Figure 4 contains these three frequency curves for Tenaya Creek. The lower curve was used to estimate the 2- and 10-year discharges, and the upper curve was used to estimate the 25- and 100-year discharges. A

middle curve is also shown and is based on all data being combined. Based on the upper curve, the 100-year peak discharge for Tenaya Creek is approximately 7,100 cfs, which was considered to be more reasonable. A similar approach was used by the USGS in their most current evaluation of the Merced River gauge data.

As a cross-check, the 100-year discharge for Tenaya Creek at the confluence with the Merced River was also calculated using the regional flood-frequency equations contained in the publication entitled *Magnitude and Frequency of Floods in California, U.S. Geological Survey, Water Resources Investigation 77-21* dated July 1977. Based on the regional regression equation for the Sierra Region, the 100-year peak discharge for Tenaya Creek would be calculated at 8,044 cfs. Calculations are included in the Appendix of this report. The U.S. Army Corps of Engineers (COE) used 7,500 cfs as a 100-year peak discharge for Tenaya Creek in their 1981/1991 hydraulic analysis to determine the 100-year water surface elevations and floodplain boundaries for Tenaya Creek. These values corroborate well with the 7,100 cfs value.

CBA used 7,100 cfs as the 100-year discharge for Tenaya Creek based on the adjustments to the FFA performed by the USGS. The recommended 2-, 10-, 25-, and 100-year peak discharges for Tenaya Creek at the confluence with the Merced River are presented in Table 1. The supporting data is included in the Appendix of this report.

Merced River - Downstream of the Confluence with Tenaya Creek

In order to estimate the 2-, 10-, 25-, and 100-year peak discharges for the reach of the Merced River between its confluence with Tenaya Creek and Yosemite Creek, the COE HEC-1 computer program was used as an additional tool to assist in the analysis. The HEC-1 model is designed to simulate the surface response of a watershed to precipitation. The model develops runoff hydrographs for individual sub-basins. The computed hydrographs are then routed and/or combined with other sub-basins to yield peak discharges that may be expected to occur at key concentration points along a given stream reach. Input parameters used in the HEC-1 model are: rainfall depth, duration, and distribution; size of watershed; unit hydrograph procedure; lag time; and runoff curve number (based on land use, soil types, and vegetation).

A simulated HEC-1 model for the 100-year event was prepared for the Merced River at Happy Isles and for Tenaya Creek at its confluence with the Merced River. Rainfall, drainage area size, SCS unit hydrograph, lag time, and runoff curve numbers for both watersheds were input into the HEC-1 model. The model was then adjusted and calibrated to fit the discharges computed at these locations from the stream gauge records. Once the results matched closely, the runoff hydrographs of the Merced River and Tenaya Creek were added to produce a combined peak at the confluence of the Merced River and Tenaya Creek. The combined hydrograph was then routed downstream to the confluence of the Merced River and Yosemite Creek in order to attenuate the hydrograph, accounting for channel and overbank storage.

The results of the HEC-1 model indicated that the combined 100-year discharge for the Merced River and Tenaya Creek corroborated well with the results of the FFA's performed for the individual streams. In order to determine the combined 2-, 10-, and 25-year discharges for the Merced River/Tenaya Creek confluence, the USGS Pohono Bridge gauge percentage ratios of the 2-, 10-, and 25-year discharge to the 100-year discharge were applied to the HEC-1 model 100-year discharge. The 2-, 10-, 25-, and 100-year peak discharges for the reach of the Merced River between its confluence with Tenaya Creek and Yosemite Creek is shown in Table 1. The HEC-1 input and output is included in the Appendix of this report.

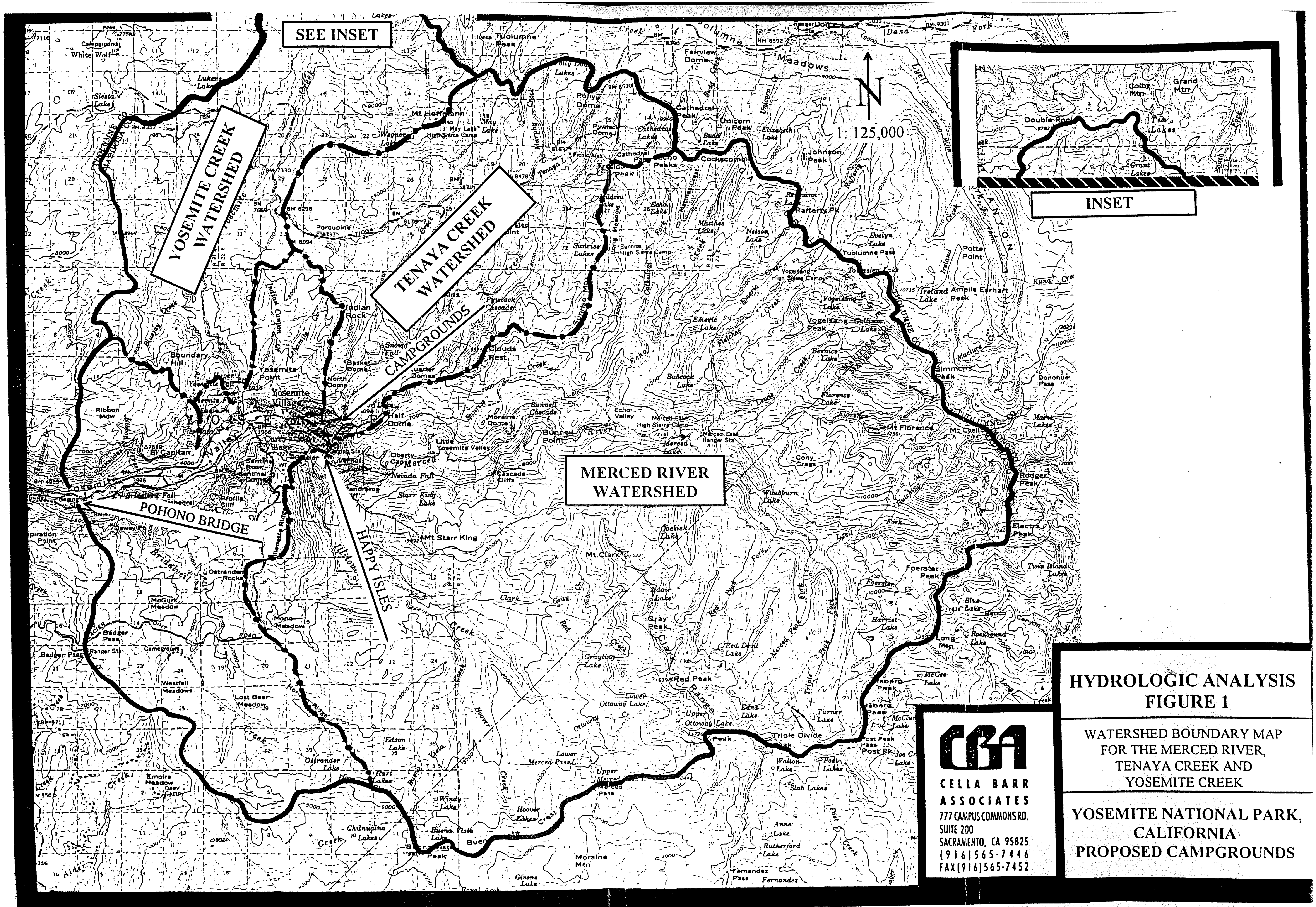
Merced River at Pohono Bridge

The USGS, under contract with the Federal Emergency Management Agency (FEMA), has performed a FFA for the Merced River at the Pohono Bridge gauging station. The USGS used a log-Pearson Type II distribution of the 80 years of stream flow data, including the January 1997 event and estimated a 100-year discharge of 25,100 cfs. Fitting a linear regression curve through high flow events, the USGS estimated that the January 1997 flood has a recurrence interval of 93 years at Pohono Bridge. The USGS data is included in the Appendix and is officially regarded as "preliminary," similar to the Happy Isles data.

The COE Sacramento District, in a draft report entitled *Merced River Near Yosemite, California, Hydrology Letter Report*, dated September 17, 1997, estimated the 100-year discharge for the Merced River at Pohono Bridge to be 36,000 cfs based on a separate FFA.

The COE split the stream flow data into two groups: rain floods and snowmelt floods. In their analysis, the period of October through March was selected for analysis of rain floods. Stream flow records during this period were also examined for snowmelt floods, and these events were selectively removed from the record as much as practical, and were not used in the FFA. The FFA was performed by the COE using recorded one-day duration flows. A peak flow frequency curve was developed from a ratio of observed peaks to one-day flows and the statistics of the one-day flow frequency curve. Peak flows were found to be approximately one and a half times the one-day flows. Based on the rain flood FFA by the COE, the 100-year peak discharge for the Merced River at Pohono Bridge was estimated to be 36,000 cfs.

Given the substantial discrepancy that exists between the USGS and the COE discharges at Pohono Bridge, Cella Barr Associates (CBA) developed and attempted to calibrate a base hydraulic model of the Merced River from Pohono Bridge to Happy Isles. The objective was to determine the 100-year discharge magnitudes that would most closely fit actual flood limits and elevations identified by the NPS between Yosemite Lodge and Happy Isles after the flood of January 1997, particularly in light of the fact that the USGS estimated that this flood was nearly equivalent to a 100-year return period event. The HEC-2 "Water Surface Profiles" computer program developed by the COE was used in the hydraulic analysis.



HYDROLOGIC ANALYSIS
FIGURE 1

WATERSHED BOUNDARY MAP FOR THE MERCED RIVER, TENAYA CREEK AND YOSEMITE CREEK

YOSEMITE NATIONAL PARK, CALIFORNIA
PROPOSED CAMPGROUNDS

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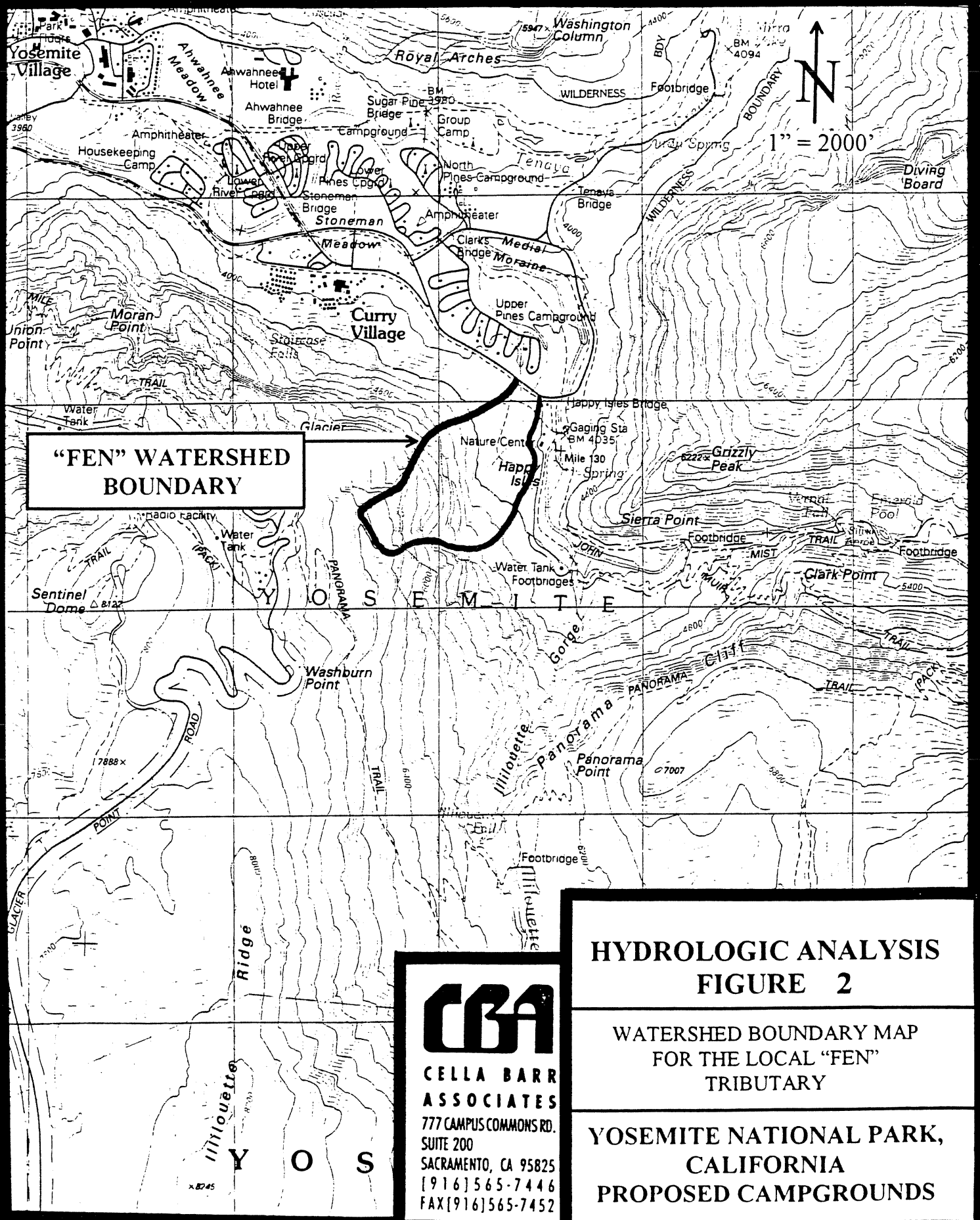

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HYDROLOGIC ANALYSIS FIGURE 2

WATERSHED BOUNDARY MAP FOR THE LOCAL "FEN" TRIBUTARY

YOSEMITE NATIONAL PARK, CALIFORNIA PROPOSED CAMPGROUNDS

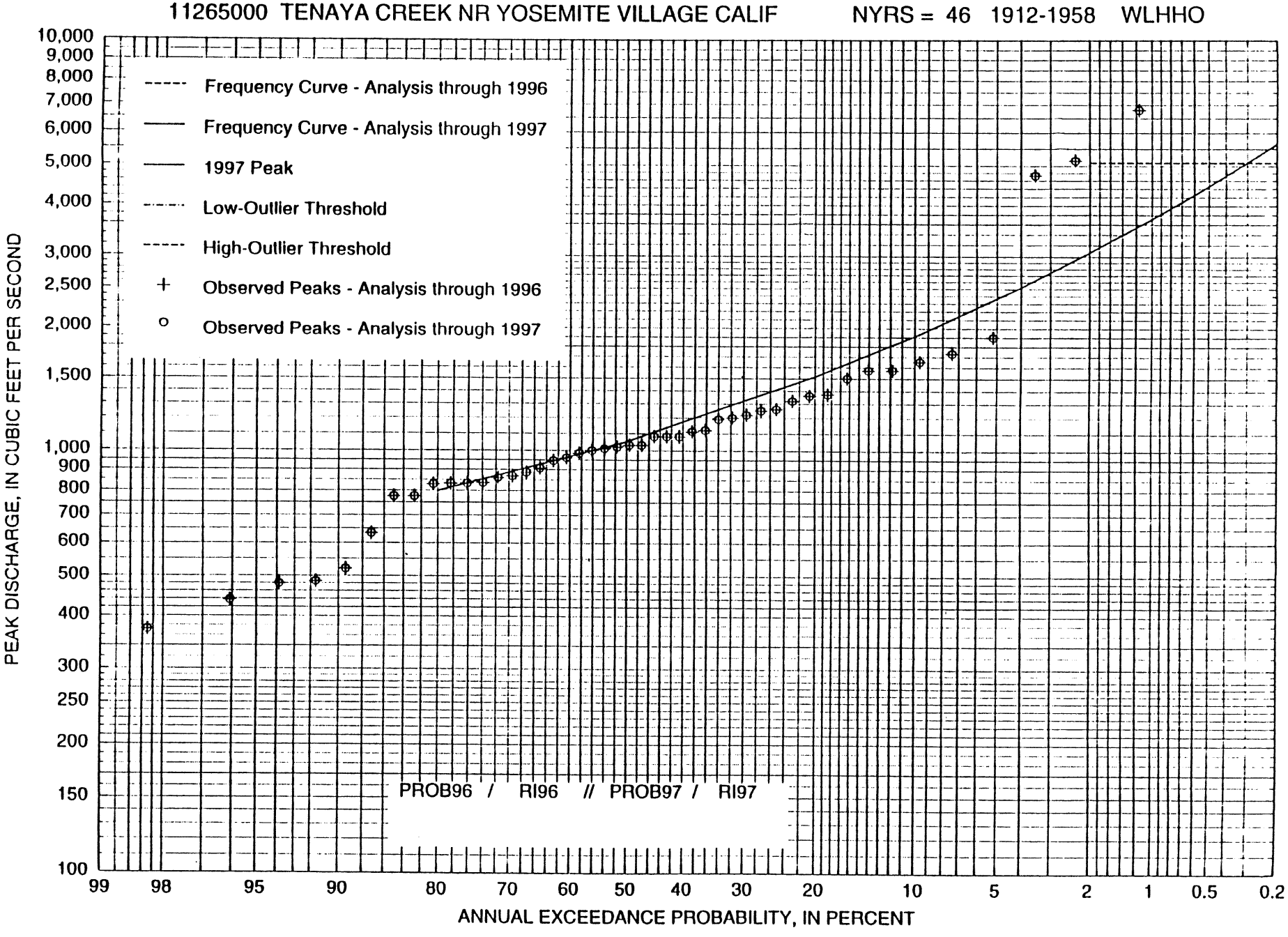


FIGURE 3:

11265000

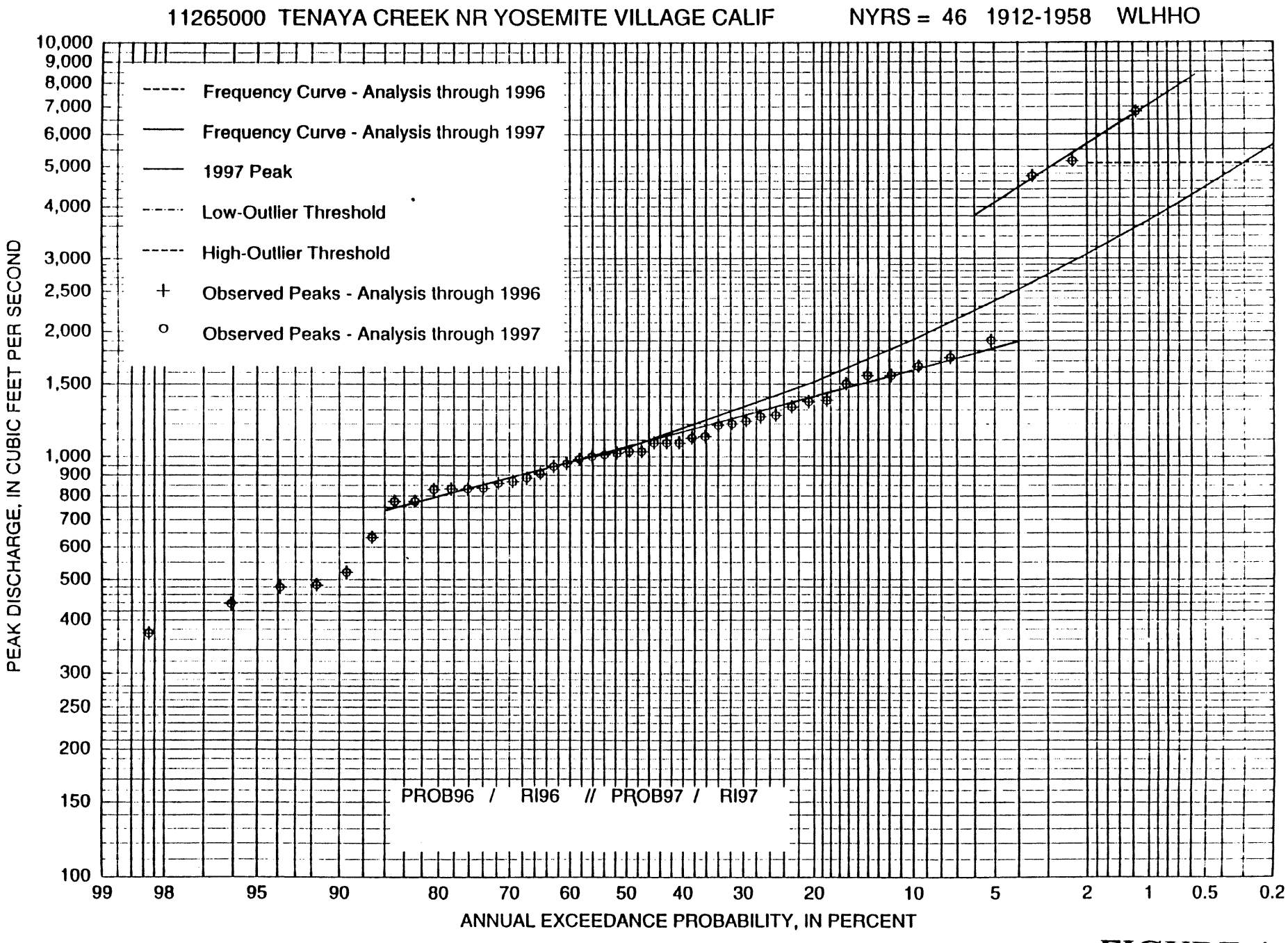


FIGURE 4:

11265000

A significant and unique geologic feature known as the Terminal Moraine exists roughly 1.7 miles upstream of Pohono Bridge. The Terminal Moraine is known to act as a significant hydraulic control that induces backwater in the Merced River as far upstream as 4.5 miles past Sentinel Bridge during major floods. Yosemite Lodge is located within this backwater area. New cross-sections of the Terminal Moraine area were obtained by Towill, Inc., under contract with the NPS, and this information was incorporated into the hydraulic model. Cross-sectional data from Pohono Bridge to Swinging Bridge was obtained from the COE based on their 1991 floodplain study of the Merced River. Upstream of Swinging Bridge, cross-sectional information was obtained from a recent aerial and field surveyed topographic map provided by the NPS at a scale of 1" = 100'.

Both the 25,100 and 36,000 cfs discharges were incorporated into the HEC-2 model at Pohono Bridge, and the resultant water surface elevations and floodplain limits at each cross-section were plotted on available mapping. The water surface elevations and floodplain limits were compared with actual high water marks from the 1997 flood obtained by the NPS and Towill, Inc., near Yosemite Lodge. The comparison indicated that the water surface elevations and floodplain limits resulting from the discharge of 36,000 cfs matched closely with the actual high water marks near the Yosemite Lodge. The discharge of 25,100 cfs produced water surface elevations that were 3.5 feet lower than observed at Yosemite Lodge.

The USGS 100-year discharge of 10,225 cfs for the Merced River, the 100-year discharge of 7,100 cfs for Tenaya Creek developed by CBA, and their combined 100-year discharge of 16,300 from their confluence to the Merced River confluence with Yosemite Creek (developed by CBA) were also incorporated into the calibration hydraulic model. The resultant water surface elevations also compared favorably with high water marks obtained by the NPS in applicable campground areas and at bridges.

On the surface, it would appear that adoption of the COE 100-year discharge of 36,000 cfs at Pohono Bridge would possibly be warranted. However, it is CBA's opinion that the tributary contributions to the Merced River from Yosemite Lodge to Pohono Bridge (Yosemite Creek, Bridalveil Creek, and minor additional tributaries) are not hydrologically sufficient to cause an increase in the 100-year discharge from 16,300 cfs to 36,000 cfs. It is also possible that the USGS estimate of 25,100 cfs for the 100-year discharge at Pohono Bridge is too low, as gauge readings for the larger floods may be in question since the gauge has been overtopped. Our conclusion is that the 100-year discharge at Pohono Bridge is somewhere between the USGS and COE estimates and that the hydraulic discrepancy at Yosemite Lodge may be explained by the unique backwater conditions induced during large floods by the Terminal Moraine.

Given the abundance of flood record available from the NPS regarding historical flows and stages in the Yosemite Lodge area, the downstream reach from Yosemite Lodge to Pohono Bridge was considered unnecessary to the flood hazard analysis of the proposed campgrounds and was

eliminated from the hydraulic model that would be used to determine flood hazard conditions within the upstream campground study areas. Thus, a final resolution of the discharge discrepancy at Pohono Bridge is not provided in this report.

Local "Fen" Tributary

The "fen" area is a local watershed located near Happy Isles (west of the Nature Center) at the upper end of Yosemite Valley (see Figure 2). The drainage area contributing runoff to the "fen" area is approximately 96 acres and consists of very flat area on the valley floor (with a slope of less than one percent) to a slope that is nearly vertical along the rock face of the valley walls. The elevation on the valley floor is 4,015 feet and the highest elevation in the upper watershed is 6,800 feet.

The 2-, 10-, 25-, and 100-year peak discharges expected to occur from the "fen" drainage basin depicted on Figure 2 were calculated by utilizing the Rational Method. For a description summary of the Rational Method, see the report entitled *Hydrologic/Drainage Analysis for the Proposed Lodge Development,* prepared by CBA, dated October 2, 1997.

Table 1 contains the 2-, 10-, 25-, and 100-year discharges for the "fen" tributary. Supporting calculations are included in the Appendix of this report.

Table 1
Peak Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs)			
		2-year	10-year	25-year	100-year
Merced River at Happy Isles Gauge	181.9	2,650	5,300	9,000	10,225
Merced River Between Confluence with Tenaya Creek and Confluence with Yosemite Creek	228.0	2,950	7,035	14,400	16,360
Tenaya Creek Upstream of Confluence with Merced River	46.9	1,050	1,600	4,250	7,100
Local "Fen" Tributary Near Happy Isles	0.15	24	38	46	54

DESCRIPTION OF EXISTING CHANNELS

Merced River

The hydraulic and geomorphic characteristics of the Merced River change as it extends through Yosemite Valley. In order to understand the river channel hydraulics and morphology, it is useful to divide the study reach of the Merced River into three geomorphically similar reaches. The upper reach extends from Happy Isles Bridge (shuttle bus bridge) to approximately 500 feet downstream of Clark's Bridge, the middle reach is from Clark's Bridge downstream to the Terminal Moraine (approximately 4,100 feet downstream of El Capitan Bridge), and the lower reach extends from the Terminal Moraine to Pohono Bridge.

The upper reach of the Merced River has an increasing slope and narrowing valley width. The main channel slope is approximately 1.1 percent. This reach is 5,000 feet in length and represents the transition from a high-gradient mountain stream to a low-gradient valley stream. Stream bed material consists of bedrock and large boulders. Main channel width ranges from 100 feet to 300 feet. Flood flows are mainly confined within the channel banks with minor flow breakout occurring along the left over-bank areas. The Happy Isles and Clark's Bridges in this reach span the width of the existing main channel. Due to a lack of sufficient vertical clearance they cause a degree of upstream backwater in a 100-year event. Upstream of the Happy Isles Bridge, flow breaks out of the main channel during the 25- and 100-year events and causes flooding of the left overbank areas downstream of the bridge where the Upper Pines Campground is located. Though Clark's Bridge produces some backwater in a 100-year event, it was able to convey all of the flow generated by the January 1997 flood event.

The middle reach of the Merced River extends from downstream of Clark's Bridge to the Terminal Moraine. The length of this reach is approximately 6.5 miles. The valley is flat and wide with an average slope of 0.1 percent. The Merced River in this reach flows through a shallow channel approximately 100 to 300 feet wide. The main channel at this location has the capacity to convey between the 2- and 5-year flow events within the existing channel banks. The low flow channel meanders across a broad floodplain and through a series of bends and divides. The floodplain covers a gently sloping area with an overall width of approximately 2,000 feet. The majority of the floodplain extends along the north side of the main channel. The floodplain represents the total extent of the lateral shifting of the channel through the history of the river. Stream bed material consists of pebbles and sand. Channel banks and floodplain areas are comprised of finer-grained materials. Most of the park infrastructure including administrative offices, lodging, employee housing, and bridges is located in this reach.

There are three foot bridges and five vehicle bridges crossing the Merced River in this reach. The length of these bridges ranges from 70 feet to 225 feet. Several of these bridges are considered as "perched" bridges for which the approaching roadway section is at the floodplain ground level,

and only in the immediate area of the bridge does the road rise above ground level to span the water course. A typical flood flow situation with this type of bridge is to have low flow pass under the bridge and high flow spill around the bridge because the road approaching the bridge is not elevated. Sentinel Bridge and Sugar Pine Bridge are exceptions where the approach roadway is elevated and influence higher flow events. The hydraulic performance of Sentinel Bridge and El Capitan Bridge and the two pedestrian bridges in between them are influenced by water impounded behind the Terminal Moraine (El Capitan Moraine) which is located approximately 4.2 miles downstream of Sentinel Bridge. The Terminal Moraine functions as a dam during high flow events, causing water to back up behind it. The backwater influence extends approximately 4.5 miles upstream of the Terminal Moraine and past Sentinel Bridge.

The lower reach of the Merced River extends from the Terminal Moraine to Pohono Bridge. This reach is approximately 1.7 miles in length and represents a transitional reach from the steep character downstream to the very mild slope upstream. In this reach, the Merced River has a mild slope (approximately 40 - 50 feet per mile) with a tight meander pattern. The channel and overbank areas are comprised of glacial outwash deposits associated with Bridalveil Moraine, the lower Terminal Moraine found in Yosemite Valley. This material ranges in size from fine material to boulders. Channel morphology is quite stable in this reach except where the river passes through the Moraine deposits. The channel in this reach is well incised and the floodplain is contained within the channel section and by the narrow valley walls. Pohono Bridge has the capacity to convey approximately 11,000 cfs before pressure flow begins.

Tenaya Creek

Tenaya Creek is a major tributary of the Merced River. Its confluence with the Merced River is located approximately 1,700 feet downstream of Clark's Bridge. Tenaya Creek, from its confluence upstream, has an increasing slope and narrowing valley width. The lower portion of the main channel from its confluence with the Merced River to Tenaya Bridge has a slope of approximately 0.4 percent and is shallow with some meandering pattern, with a capacity to convey between the 2- and 10-year discharges. The lower reach of Tenaya Creek is influenced greatly by the flow of the Merced River and is located in the backwater area created by the confluence of the two rivers. Therefore, the flow of Tenaya Creek is impeded by the effect of backwater, which creates a wide floodplain upstream. The width of the 100-year floodplain in some locations is approximately 1,200 feet. The banks and floodplain areas of Tenaya Creek are heavily vegetated with mature trees, grass, and low-growing brush. As a result of the flood of January 1997, the channel and overbank areas were covered with fallen trees and other woody debris. There are two bridges within the study reach of Tenaya Creek. One bridge is a one-cell concrete arch bridge (Tenaya Bridge) located approximately 3,600 feet upstream of the confluence with the Merced River and the other is a 35 foot long bridge across a 1,000 foot wide 100-year floodplain located approximately 800 feet upstream of the confluence with the Merced

River (foot bridge). The North Pines Campground, a horse stable, and a group campground are located within the 100-year floodplain limit of Tenaya Creek.

HYDRAULIC ANALYSIS

General

Detailed hydraulic analyses of the Merced River and Tenaya Creek were performed to determine basic hydraulic parameters within the study area such as water surface elevations, floodplain boundaries, and flow depths and velocities. Floodplain boundaries were determined for the 2-, 10-, 25-, and 100-year flow events and the depth and velocity zones were determined for 10-, 25-, and 100-year storm events. Hydraulic analyses were performed utilizing the COE HEC-2 computer program. Subcritical flow conditions were assumed in the hydraulic modeling effort. Subcritical flow is tranquil flow in which gravitational forces are dominant over inertial forces. Subcritical flow is controlled by downstream conditions. Supercritical flow is rapid flow in which inertial forces are dominant over gravitational forces. Supercritical flow is controlled by upstream conditions. Subcritical flow conditions dominate within the study area.

The computational procedure used in the HEC-2 program requires cross-sections of the channel to be coded at representative locations throughout the study reach, peak discharges, roughness coefficients, a starting water surface elevation, loss coefficients, and other parameters. Channel cross-sections should be located where significant changes occur in slope, cross-sectional area, channel roughness, and at culverts and bridges. The HEC-2 program applies Bernoulli's Theorem for total energy at each cross-section and the Manning Formula for the friction head loss between cross-sections. Other losses, such as transitional expansion or contraction, or losses caused by various hydraulic structures such as culverts and bridges, are also computed.

Information compiled by the HEC-2 program for cross-sections includes an allocation of discharges for the channel and the overbanks, the average velocity of the flow in the channel and in the overbank areas, the mean velocity head across the entire cross-section, the mean energy grade line elevation, and the water surface elevation. Overbanks are areas adjacent to the channel that are subject to inundation when the capacity of the channel is exceeded. Limitations of the program require application of engineering judgment to interpret computed results.

Merced River

During the initial calibration process, a HEC-2 model was developed for a 9 mile reach of the Merced River, starting at a location approximately 700 feet downstream of Pohono Bridge and ending at a location 400 feet upstream of Happy Isles Bridge. The intent was to commence the model well downstream of the study area for the proposed campgrounds to capture the backwater impacts caused by the Terminal Moraine. One hundred (100) stream cross-sections were input into the HEC-2 model to simulate the Merced River channel and overbank areas. Forty-three (43) cross-sections from Pohono Bridge to Swinging Bridge were obtained from the COE and are based on their 1991 floodplain study of the Merced River. In the COE data, three cross-sections

of the Terminal Moraine were removed from the HEC-2 model and were replaced with more recent (November 13, 1997) field cross-sections provided by Towill, Inc. Upstream of Swinging Bridge cross-sectional information utilized in the HEC-2 model was based on an aerial topographic map provided by the NPS at a scale of 1" = 100' and 1-foot contour interval. Figure 6 shows the reach of the Merced River studied by the COE, the location of the three field cross-sections at the Terminal Moraine, and the location of several of the cross-sections between Swinging Bridge and Camp 7 Bridge.

There are three pedestrian and eight vehicle bridges crossing the Merced River within the initially studied reach. All vehicle bridges are single- or multiple-cell arched bridges. Three of these vehicle bridges (Happy Isles, Clark's, and Stoneman) have equestrian portals located on the banks of the river. The geometry of all these bridges was field surveyed by Towill, Inc., in November 1997. The Pohono, Clark's, and Happy Isles Bridges are located where the floodwater of the Merced River is largely confined within the channel and valley walls and where it flows directly downstream. These bridges span approximately the entire width of the natural floodplain. The remaining bridges cross the Merced River at locations where the channel is shallow and the floodplain is wide. The length of these bridges range from 70 feet to 225 feet. Most of these bridges are considered as "perched" bridges for which the approaching roadway section is at the floodplain ground level, with the roadway rising above ground level in the immediate area of the bridge. A typical flood flow situation with this type of bridge is to have low flow pass directly under the bridge and high flow spill across low lying areas around the bridge. For those bridges where a large percentage of the total discharge would occur in the overbank areas, the normal bridge routine of the HEC-2 program was used.

The topographic map shows the water surface elevation (edge of water) in the main channel and does not show channel invert elevations. Channel invert elevations for all cross-sections were adjusted using the COE 1991 channel bed profiles for both the Merced River and Tenaya Creek.

Supercritical flow conditions can occur in some channel reaches (in the upper and lower reaches) and at some bridge sections, but as a conservative measure, the hydraulic analysis was performed assuming subcritical flow conditions for the entire study reach of the Merced River. As such, all cross-sections were coded from left to right looking downstream, starting with the most downstream cross-section.

Manning's roughness values ("n") used in the hydraulic model for the channel areas ranged from 0.04 to 0.2. For overbank areas, the range is from 0.05 to 0.2. The "n" value of 0.2 for channel and overbank areas was used at the vicinity of the Terminal Moraine in the COE's 1991 study and in the current hydraulic model. Upstream of Swinging Bridge, the "n" values for the channel range from 0.04 to 0.1 and from 0.05 to 0.1 for overbank areas. These "n" values are chosen based on field investigations, examination or aerial photographs, and USGS guidelines.

In accordance with COE guidelines, contraction and expansion coefficients of 0.1 and 0.3 were used for the open channel reaches. Contraction coefficients at bridges ranged from 0.3 to 0.5 depending on bridge configuration. An expansion coefficient of 0.5 was used at bridges.

As discussed in the Hydrology section of this report, the USGS and the COE have derived significantly different discharge values for the Merced River at Pohono Bridge. The calibration HEC-2 model tended to support the COE values downstream of the Yosemite Creek confluence at Yosemite Lodge and the USGS values upstream of the Yosemite Creek confluence. CBA's conclusion was that the unique hydraulic impact of the Terminal Moraine was difficult for the HEC-2 model to completely simulate and that the downstream discharges were probably in a range between the USGS estimates and the COE estimates. Discharges that CBA adopted for stream reaches upstream of the Yosemite Creek confluence were based on interpretations of USGS data.

In working with the NPS staff at Yosemite National Park, it was determined that accurate flood stages had been obtained at the Residence #1 garage just upstream of the Yosemite Creek confluence near Yosemite Lodge for a number of significant flood events from 1950 to the January 1997 event. The return period of the largest events were estimated by CBA using the flood gauge record and FFA data for the Merced River at Happy Isles. Based on the availability of this recorded information, it was concluded that the HEC-2 data downstream of the Yosemite Creek confluence would not be needed for hydraulic modeling of the upstream campground areas. Hence, the HEC-2 model was revised to commence at the Residence #1 garage as the downstream limit (cross-section 9). For the 100-year analysis, a starting water surface elevation of 3,966.6 feet was used (based on the NPS surveyed flood stage for the January 1997 flood event). For the 25-year analysis, a starting water surface elevation of 3,964.0 feet was used (based on interpretation of the NPS surveyed flood stages for the November 1950 and December 1955 flood events). The starting water surface elevations for the 2- and 10-year HEC-2 models were approximated using the slope/area method. The NPS flood stage data at the Residence #1 garage is included in the Appendix.

The results of the HEC-2 analysis indicated that the 100-year discharge of the Merced River from Happy Isles Bridge to downstream of Clark's Bridge is substantially contained within the existing channel banks, with minor flow breakouts occurring along the left overbank and downstream of the Happy Isles Bridge. Upstream of the Happy Isles Bridge, the Merced River channel does not have the capacity to convey the 25- and 100-year discharges within the existing channel banks. As a result, approximately 153 cfs during the 25-year event and 481 cfs during the 100-year event will break out of the main channel and flow in the left overbank areas. The flow will cross the shuttle bus road and flow under the road through an existing culvert. Once the flow crosses the shuttle bus road west of the Happy Isles Bridge, the discharge flows in a northwesterly direction and causes flooding of portions of the Upper Pines Campground. The flow returns back to the main channel of the Merced River upstream of Clark's Bridge. A separate HEC-2 analysis was

performed for this overflow area to determine floodplain limits. Since the 2- and 10-year flows are contained with the Merced River channel upstream of the Happy Isles Bridge, and only the 25- and 100-year flows spill into the left overbank area, only the 25- and 100-year floodplain limits are plotted for this breakout area on the floodplain maps.

Downstream of Clark's Bridge, the main channel of the Merced River is shallow with a broad adjacent floodplain. The main channel has the capacity to convey between the 2- and 5-year discharges within the banks of a meandering low flow channel. The 100-year discharge will substantially ignore the meandering low flow channel path and flow straight down the valley. The 100-year floodplain is approximately 2,000 feet wide in some locations. All bridges downstream of Clark's Bridge are considered "perched" bridges and have the capacity to convey between 40 to 75 percent of the 100-year discharge. The remaining discharge sheet flows around the bridges, and these bridges do not cause significant backwater upstream.

Water surface elevations and floodplain limits for the 2-, 10-, 25-, and 100-year storm events, and depth and velocity zones for the 10-, 25-, and 100-year events for channel and overbank areas of the Merced River were determined using the HEC-2 computer model output. The floodplain maps included in the Attachment to this report depict the 2-, 10-, 25-, and 100-year floodplain boundaries and water surface elevations for the Merced River. The 10-, 25-, and 100-year depth and velocity zones for the Merced River are also depicted on separate maps in the Attachment.

Tenaya Creek

The study reach of Tenaya Creek is approximately 3,700 feet in length starting at the confluence with the Merced River and ending approximately 120 feet upstream of Tenaya Bridge. Eight (8) cross-sections were input into the HEC-2 model. The geometry of the channel and the overbank areas were derived from a 1" = 100', one-foot contour interval topographic map of Tenaya Creek provided by the NPS. The hydraulic analysis was performed assuming a subcritical flow condition. Due to a large amount of fallen trees and other woody debris in both the channel and overbank areas, the Manning's roughness ("n") coefficient of 0.08 was chosen for both the channel and overbank areas.

Cross-sections 36, 36.5, and 37 of the Merced River HEC-2 model extend across the floodplain of both Tenaya Creek and the Merced River at their confluence. The combined discharge of Tenaya Creek and the Merced River is used for these cross-sections. The starting water surface elevation for Tenaya Creek at cross-section 1 is based on known water surface elevations taken from cross-section 37.

The Tenaya Bridge was modeled in HEC-2 using the normal bridge routine, and the existing foot bridge is considered a low water bridge and was modeled as a cross-section at the upstream side of the bridge.

The 2-, 10-, 25-, and 100-year floodplain limits for Tenaya Creek are shown on the Attachment. The 2-year flow is confined within the existing low flow channel banks and the 100-year floodplain is wide and shallow. The width of the 100-year floodplain is approximately 1,200 feet in some locations. Depth and velocity zones for the 10-, 25-, and 100-year events are shown on the Attachment.

HYDRAULIC ANALYSIS OF SELECTED BRIDGES

The NPS, under the Valley Implementation Plan (VIP), is considering the removal of three bridges crossing the Merced River in Yosemite National Park, to restore and to promote a more naturally functioning river environment. The three bridges proposed to be removed are the Stoneman Bridge, the Ahwahnee Bridge, and the Sugar Pine Bridge. This portion of the report presents the results of a hydraulic evaluation to determine the effect of removing the above bridges on the flow conditions for the Merced River.

Stoneman Bridge

Stoneman Bridge crosses the Merced River approximately 5,000 feet upstream of Yosemite Village and connects Southside Drive with Northside Drive. The bridge is an arched concrete structure approximately 70 feet wide at the bottom and 18 feet high above the channel invert. Adjacent to the main bridge opening there are also 2 equestrian portals (6 feet by 13 feet). There is a long approach roadway that accesses the north side of the bridge and extends across roughly 1,500 feet of low lying overbank areas north of the channel. The north approach roadway is elevated approximately 1 to 3 feet above adjacent grade.

Stoneman Bridge and its approach roadway traverse perpendicularly across the 100-year floodplain for the Merced River. The bridge will pass flows somewhat in excess of the 10-year event before any spillover will occur across the north approach roadway. The bridge is located near the south edge of the 100-year floodplain for the Merced River and at the south edge of an accentuated meander loop in the river. The natural geomorphic tendency for the river in this area is to periodically cut a straighter, down valley alignment, either during a major flood event or as a result of a series of moderate flood events. The combination of a bridge opening that spans the channel and an elevated approach roadway traversing across the 100-year floodplain has tended to act as a control for the alignment of the channel at this location. Some existing park improvements (including Lower Pines Campground, River Campgrounds, and the Housekeeping Area) would be significantly impacted by a shift in the alignment of the river in this area.

In a 100-year flood event, the combination of the Stoneman Bridge and elevated approach roadway produce an upstream backwater of approximately 0.81 feet (see Table 2). This backwater could be substantially eliminated by the lowering or removing the north approach roadway.

Should the NPS determine that it is appropriate to remove the Stoneman Bridge and approach roadway, there will be a greater tendency for the river to resume its natural geomorphology. A meandering pattern is likely to develop (or continue) from successive low flow and smaller storm events. A straighter, down valley alignment may occur as a result of a large flood or several moderate floods (> 10-year events). It should be noted that if the river shifts to a straighter

alignment in this area, the flow velocity and erosive power of the river will be temporarily increased along the impacted reach due to an increased local slope resulting from a shorter travel length. The channel shift may cause damage to existing manmade park improvements in the area if they are proposed to remain operational.

If the NPS chooses to retain the Stoneman Bridge, but desires to encourage the river to more readily resume its natural geomorphic processes, consideration may also be given to simply lowering the north approach roadway. This action alone would reduce the alignment controlling tendency of the Stoneman Bridge.

Ahwahnee and Sugar Pine Bridges

The Ahwahnee and Sugar Pine Bridges are located upstream of Stoneman Bridge. The Ahwahnee Bridge is a multiple arched bridge with each section measuring 38 feet wide at the bottom and 13 feet above the channel invert. Sugar Pine Bridge is a single span arched bridge approximately 100 feet at the bottom and 16 feet high above the channel invert. Both of these bridges and the roadway section (bike path) between them are located at the north end of a very large meander loop of the Merced River and are parallel to the overall direction of flow during high flow events. Low flows up to 2-year events are contained within the existing channel banks and bridge sections. High flows such as 25-year and 100-year events flow straight down the valley and do not necessarily follow the meandering path of the low flow channel. A large cutoff channel has formed upstream of Sugar Pine Bridge. Before entering the Sugar Pine Bridge, some flow is redirected by this channel along the south side of the roadway connecting the two bridges and is delivered to the main channel downstream of the Ahwahnee Bridge. This cutoff channel has formed during high flow events due to insufficient capacity of Sugar Pine Bridge and due to the existence of the elevated roadway section between the Sugar Pine and Ahwahnee Bridges. The roadway deflects the flow which exceeds the capacity of Sugar Pine Bridge and turns it 90 degrees to the west. The cutoff channel matches the invert elevation of the main channel at the point of outlet.

Separate hydraulic analyses were performed to remove the above-mentioned bridges from the base hydraulic model developed for the Merced River under existing conditions. Each of these bridges was individually removed from the hydraulic model one at a time to determine their individual impact on the 100-year water surface elevation and floodplain limits. When the Ahwahnee Bridge was removed from the model, the maximum drop in the 100-year water surface elevation was 0.01 feet (see Table 2). With the removal of the Sugar Pine Bridge, a maximum drop of 0.16 feet in the 100-year water surface elevations was noted (see Table 2).

Low flows (up to a 2-year event) are confined within the existing channel banks and bridge openings and follow the meandering path of the low flow channel. High flows will bypass the river meander and flow straight down the valley. This condition will remain with or without the

removal of these bridges. The results of HEC-2 analysis indicated that the removal of these bridges does not cause significant changes to the 100-year water surface elevations and floodplain limits. However, the removal of the Sugar Pine and Ahwahnee Bridges and the roadway section between them will (1) improve the hydraulic conditions of the channel by removing restrictions from the flow path, (2) reduce the rate of enlargement of the secondary channel (cutoff channel) along the south side of the roadway section between the two bridges, and (3) restore and promote a more natural appearing and geomorphologically functioning river environment.

Table 2
Comparison of 100-Year Water Surface Elevations
Before and After the Removal of Selected Bridges

Removing Stoneman Bridge				
Cross-Section	**W.S.E. Base Run**	**Stoneman Bridge Removed**	**Change in W.S.E.**	
27	3969.09	3969.09	0	
28	3969.35			Stoneman Bridge
28.3	3970.45			
29	3970.85	3970.04	-0.81	
30	3971.29	3970.79	-0.50	
31	3971.65	3971.28	-0.37	Ahwahnee Bridge
31.3	3971.74	3971.39	-0.35	
32	3971.91	3971.59	-0.32	
33	3972.01	3971.73	-0.28	
34	3972.35	3972.13	-0.22	Sugar Pine Bridge
34.3	3972.53	3972.34	-0.19	
35	3972.87	3972.75	-0.12	
36	3973.59	3973.53	-0.06	
36.5	3974.65	3974.63	-0.02	
37	3976.05	3976.06	0.01	
37.5	3977.33	3977.34	0.01	
38	3977.69	3977.70	0.01	
39	3980.55	3980.55	0	Clark's Bridge
39.3	3982.03	3982.03	0	
39.5	3982.09	3982.09	0	
40	3983.21	3983.21	0	
41	3984.56	3984.55	0	
42	3986.70	3986.70	0	
43	3989.93	3989.93	0	

Table 2 (Continued)
Comparison of 100-Year Water Surface Elevations
Before and After the Removal of Selected Bridges

Removing Ahwahnee Bridge				
Cross-Section	**W.S.E. Base Run**	**Ahwahnee Bridge Removed**	**Change in W.S.E.**	
27	3969.09	3969.09	0	
28	3969.35	3969.35	0	Stoneman Bridge
28.3	3970.45	3970.45	0	
29	3970.85	3970.85	0	
30	3971.29	3971.29	0	
31	3971.65			Ahwahnee Bridge
31.3	3971.74			
32	3971.91	3971.90	-0.01	
33	3972.01	3972.00	-0.01	
34	3972.35	3972.34	-0.01	Sugar Pine Bridge
34.3	3972.53	3972.52	-0.01	
35	3972.87	3972.87	0	
36	3973.59	3973.59	0	
36.5	3974.65	3974.65	0	
37	3976.06	3976.05	-0.01	
37.5	3977.33	3977.33	0	
38	3977.69	3977.69	0	
39	3980.55	3980.55	0	Clark's Bridge
39.3	3982.03	3982.03	0	
39.5	3982.09	3982.09	0	
40	3983.21	3983.21	0	
41	3984.56	3984.56	0	
42	3986.70	3986.70	0	
43	3989.93	3989.93	0	

Table 2 (Continued)
Comparison of 100-Year Water Surface Elevations
Before and After the Removal of Selected Bridges

Removing Sugar Pine Bridge				
Cross-Section	**W.S.E. Base Run**	**Sugar Pine Bridge Removed**	**Change in W.S.E.**	
27	3969.09	3969.09	0	
28	3969.35	3969.35	0	Stoneman Bridge
28.3	3970.45	3970.45	0	
29	3970.85	3970.85	0	
30	3971.29	3971.29	0	
31	3971.65	3971.65	0	Ahwahnee Bridge
31.3	3971.74	3971.74	0	
32	3971.91	3971.91	0	
33	3972.01	3972.01	0	
34	3972.35			Sugar Pine Bridge
34.3	3972.53			
35	3972.87	3972.71	-0.16	
36	3973.59	3973.52	-0.07	
36.5	3974.65	3974.63	-0.02	
37	3976.05	3976.06	0.01	
37.5	3977.33	3977.34	0.01	
38	3977.69	3977.70	0.01	
39	3980.55	3980.55	0	Clark's Bridge
39.3	3982.03	3982.03	0	
39.5	3982.09	3982.09	0	
40	3983.21	3983.21	0	
41	3984.56	3984.56	0	
42	3986.70	3986.70	0	
43	3989.93	3989.93	0	

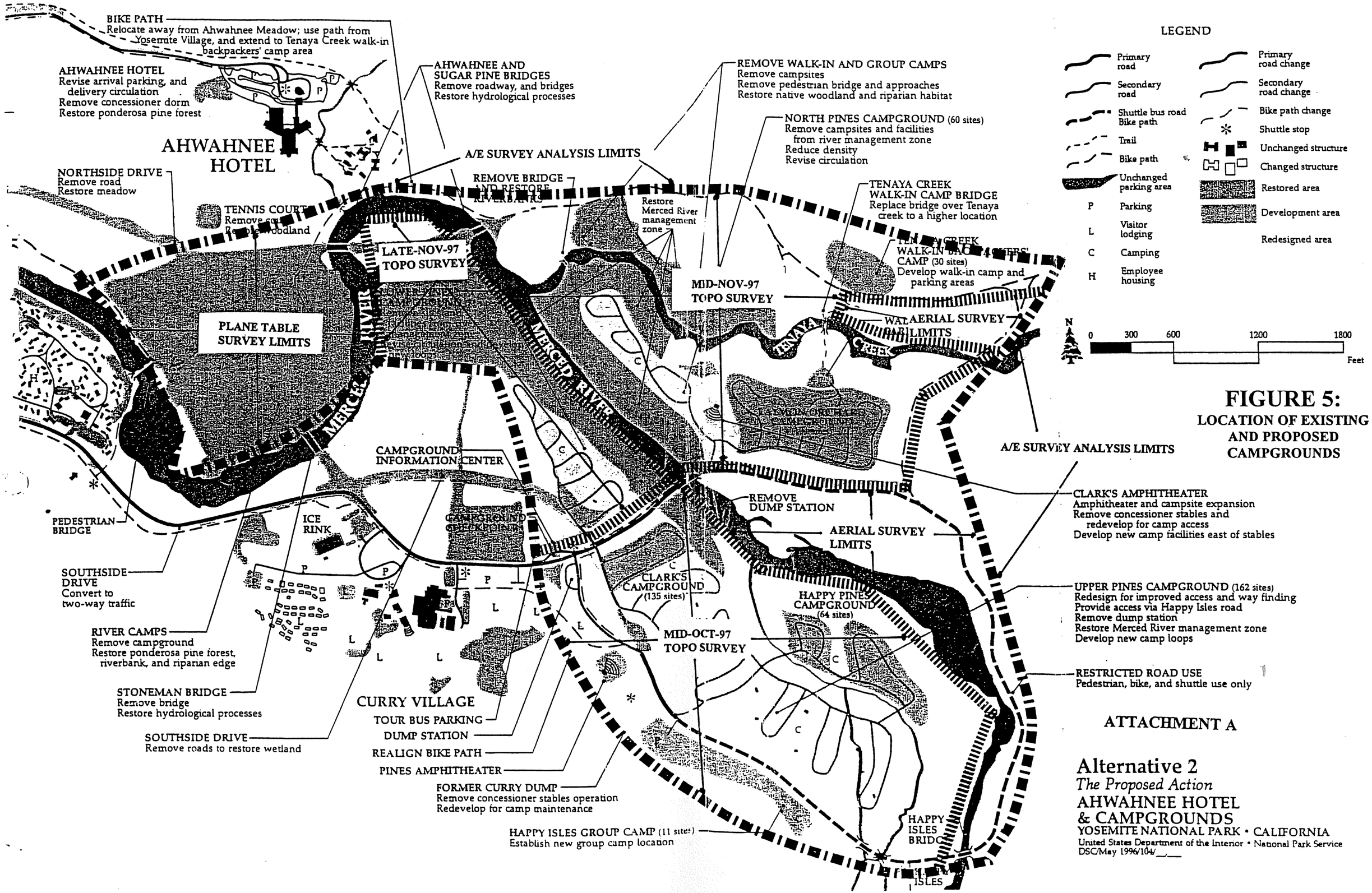


FIGURE 5:
LOCATION OF EXISTING AND PROPOSED CAMPGROUNDS

ATTACHMENT A

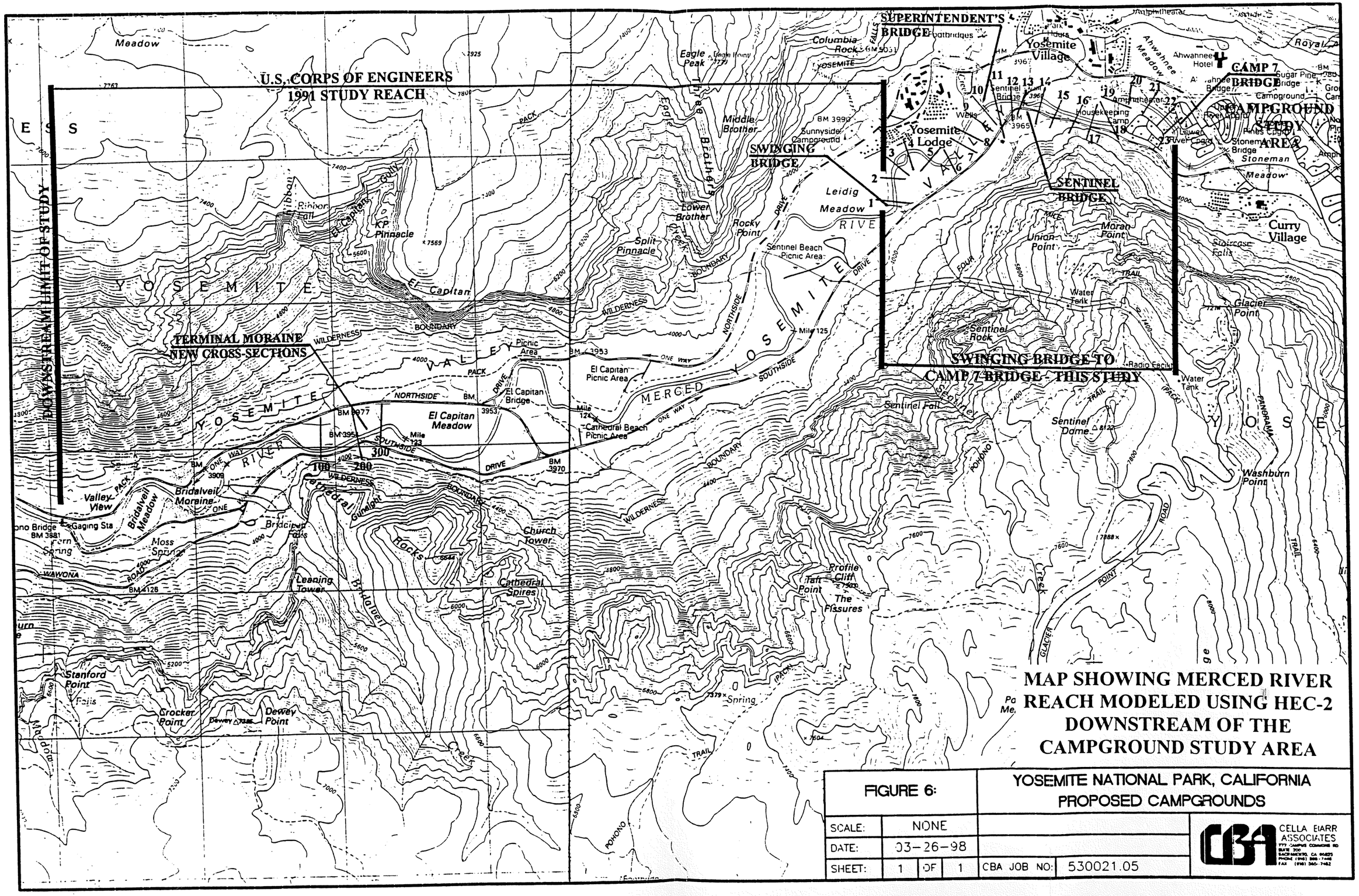
Alternative 2
The Proposed Action

AHWAHNEE HOTEL & CAMPGROUNDS

YOSEMITE NATIONAL PARK • CALIFORNIA

United States Department of the Interior • National Park Service

DSC/May 1996/104/__/__



MAP SHOWING MERCED RIVER REACH MODELED USING HEC-2 DOWNSTREAM OF THE CAMPGROUND STUDY AREA

FIGURE 6:				YOSEMITE NATIONAL PARK, CALIFORNIA PROPOSED CAMPGROUNDS	
SCALE:	NONE				
DATE:	03-26-98				
SHEET:	1	OF	1	CBA JOB NO:	530021.05

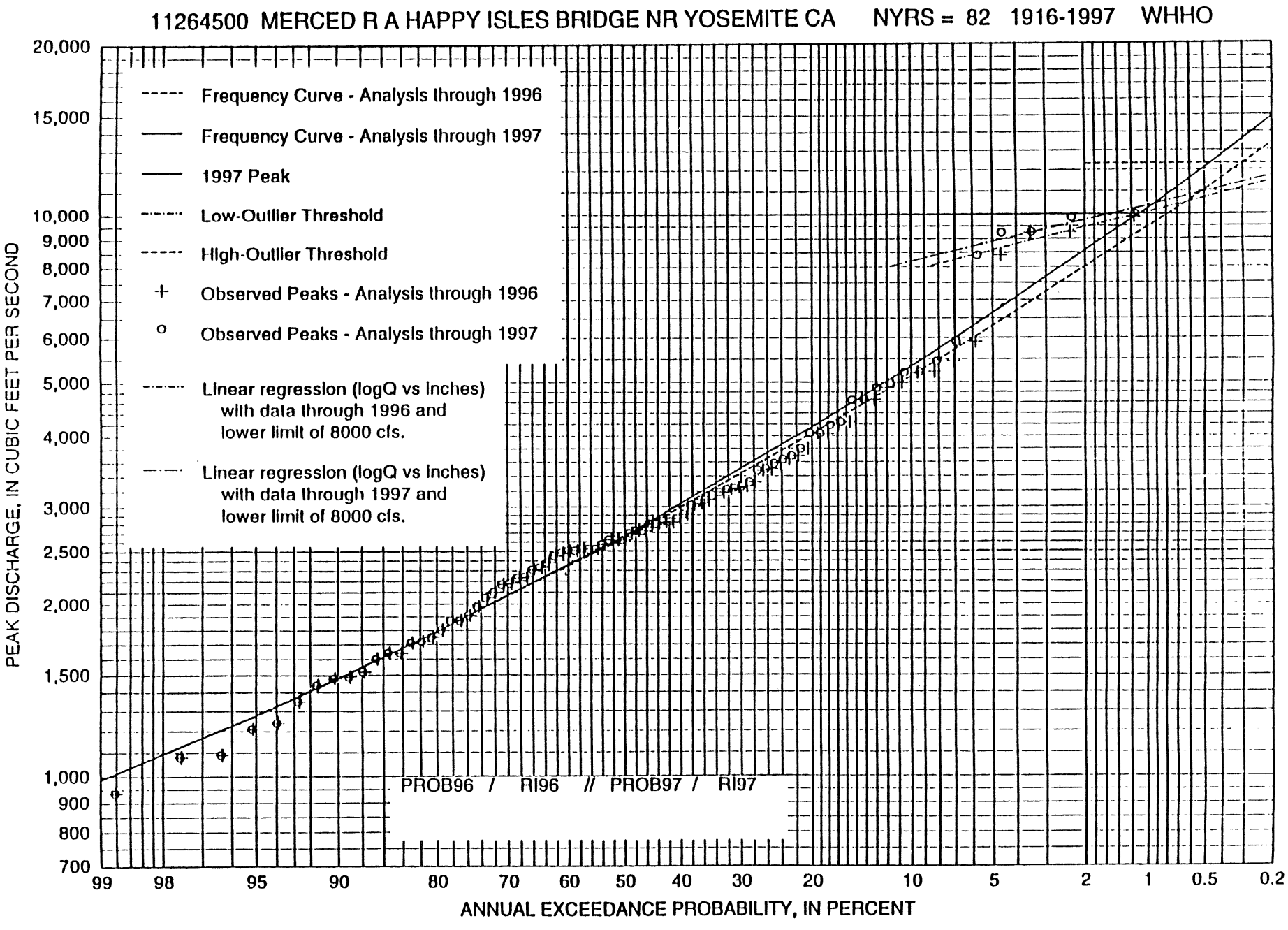
CELLA BARR ASSOCIATES
777 CAMPUS COMMONS RD
SUITE 200
SACRAMENTO, CA 95825
PHONE (916) 369-7448
FAX (916) 340-7482

Appendix

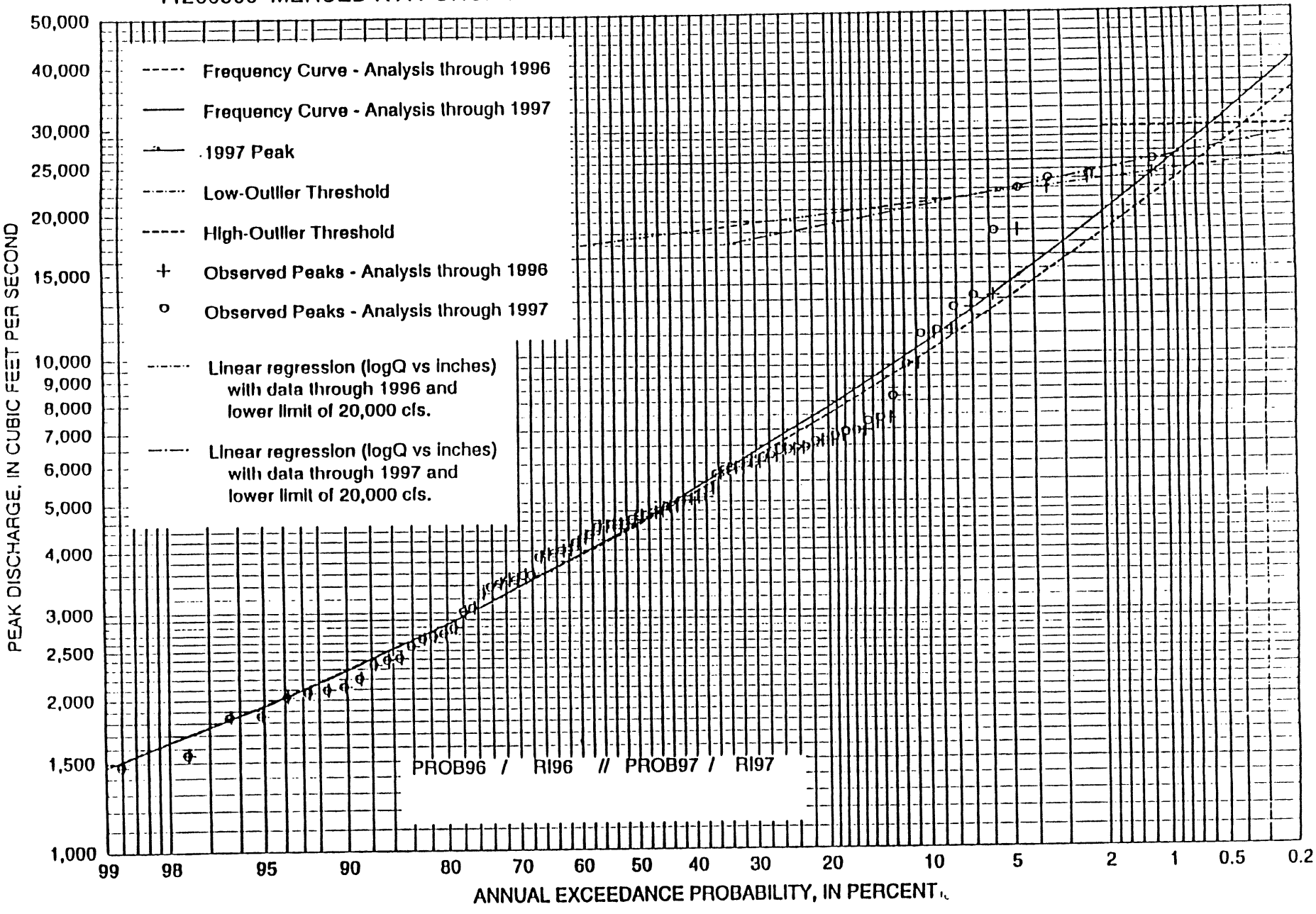
CELLA BARR
ASSOCIATES

CBA File No. 530021-05-0307

FLOOD FREQUENCY ANALYSIS
BY USGS


11264500 MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA NYRS = 82 1916-1997 WHHO
Frequency Curve - Analysis through 1996
Frequency Curve - Analysis through 1997
1997 Peak
Low-Outlier Threshold
High-Outlier Threshold
Observed Peaks - Analysis through 1996
Observed Peaks - Analysis through 1997
Linear regression (logQ vs inches) with data through 1996 and lower limit of 8000 cfs.
Linear regression (logQ vs inches) with data through 1997 and lower limit of 8000 cfs.
PROB96 / RI96 // PROB97 / RI97
PEAK DISCHARGE, IN CUBIC FEET PER SECOND
20,000
15,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,500
2,000
1,500
1,000
900
800
700
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
ANNUAL EXCEEDANCE PROBABILITY, IN PERCENT

11266500 MERCED R A POHONO BRIDGE NR YOSEMITE CA NYRS = 81 1917-1997 WHHO



530021-05

3M J407 VER 3.7
.REV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0001

OPTIONS IN EFFECT -- PLOT BCPU LGPT NODB PPOS NORS EXPR CLIM

STATION - 11264500 /USGS MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA 1916-1997 * HISTORIC * 11264500 /USGS

I N P U T D A T A S U M M A R Y

-- YEARS OF RECORD -- SYSTEMATIC	HISTORIC	HISTORIC PEAKS	GENERALIZED SKEW	STD. ERROR OF GENERAL. SKEW	SKEW OPTION	GAGE BASE DISCHARGE	USER-SET OUTLIER CRITERIA HIGH OUTLIER	LOW OUTLIER
82	86	0	0.100	--	WRC WEIGHTED	0.0	8000.0	--

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE. 0.0
*WCF161I-USER HIGH OUTLIER CRITERION REPLACES WRC. 8000.0 12316.3
WCF165I-HIGH OUTLIERS AND HISTORIC PEAKS ABOVE HHBASE. 5 0 8000.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION. 618.1

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE DISCHARGE	FLOOD BASE EXCEEDANCE PROBABILITY	LOGARITHMIC MEAN	LOGARITHMIC STANDARD DEVIATION	LOGARITHMIC SKEW
SYSTEMATIC RECORD	0.0	1.0000	3.4409	0.2203	0.486
W R C ESTIMATE	0.0	1.0000	3.4393	0.2186	0.392

ANNUAL FREQUENCY CURVE ORDINATES -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	W R C ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CONFIDENCE LIMITS FOR W R C ESTIMATES LOWER	UPPER
0.9950	904.8	941.4	874.0	746.9	1055.3
0.9900	987.2	1018.8	961.1	824.0	1142.1
0.9500	1275.6	1292.7	1259.9	1098.1	1443.6
0.9000	1479.0	1487.9	1465.0	1294.0	1655.2
0.8000	1788.4	1787.7	1779.5	1593.3	1978.2
0.5000	2661.3	2649.3	2661.3	2425.3	2917.0
0.2000	4148.6	4161.1	4176.1	3754.2	4648.9
0.1000	5333.2	5397.2	5408.4	4751.1	6122.9
0.0400	7075.5	7257.5	7250.5	6159.4	8393.1
0.0200	8563.5	8880.4	8897.4	7325.1	10405.3
0.0100	10224.8	10724.4	10762.1	8597.0	12715.8
0.0050	12082.9	12822.5	12976.7	9990.3	15367.7
0.0020	14883.2	16046.7	16200.6	12043.8	19478.2

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0001

STATION - 11264500 /USGS MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA 1916-1997 * HISTORIC * 11264500 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
1916	2500.0	
1917	3320.0	
1918	3180.0	
1919	3800.0	
1920	2720.0	
1921	2720.0	
1922	3240.0	
1923	2620.0	
1924	1240.0	
1925	2620.0	
1926	2240.0	
1927	2820.0	
1928	2050.0	
1929	2520.0	
1930	1870.0	
1931	1350.0	
1932	2570.0	
1933	2520.0	
1934	935.0	
1935	2820.0	
1936	2380.0	
1937	3020.0	
1938	8400.0	
1939	1210.0	
1940	2620.0	
1941	3220.0	
1942	2800.0	
1943	3480.0	
1944	1980.0	
1945	3040.0	
1946	3690.0	
1947	2450.0	
1948	3080.0	
1949	2480.0	
1950	2520.0	
1951	9260.0	
1952	3580.0	
1953	2180.0	
1954	2500.0	
1955	2800.0	

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1997	10000.0	0.0120	0.0115
1956	9860.0	0.0241	0.0230
1951	9260.0	0.0361	0.0345
1965	9240.0	0.0482	0.0460
1938	8400.0	0.0602	0.0575
1996	5900.0	0.0723	0.0693
1983	5450.0	0.0843	0.0814
1995	5220.0	0.0964	0.0934
1963	5200.0	0.1084	0.1055
1969	4980.0	0.1205	0.1176
1982	4880.0	0.1325	0.1297
1975	4650.0	0.1446	0.1418
1967	4640.0	0.1566	0.1539
1973	4240.0	0.1687	0.1660
1978	4190.0	0.1807	0.1781
1980	4040.0	0.1928	0.1902
1986	4040.0	0.2048	0.2023
1919	3800.0	0.2169	0.2144
1946	3690.0	0.2289	0.2265
1958	3640.0	0.2410	0.2385
1952	3580.0	0.2530	0.2506
1979	3500.0	0.2651	0.2627
1943	3480.0	0.2771	0.2748
1917	3320.0	0.2892	0.2869
1974	3260.0	0.3012	0.2990
1922	3240.0	0.3133	0.3111
1941	3220.0	0.3253	0.3232
1918	3180.0	0.3373	0.3353
1993	3140.0	0.3494	0.3474
1948	3080.0	0.3614	0.3595
1945	3040.0	0.3735	0.3715
1937	3020.0	0.3855	0.3836
1957	2910.0	0.3976	0.3957
1984	2859.0	0.4096	0.4078
1927	2820.0	0.4217	0.4199
1935	2820.0	0.4337	0.4320
1942	2800.0	0.4458	0.4441
1955	2800.0	0.4578	0.4562
1920	2720.0	0.4699	0.4683
1921	2720.0	0.4819	0.4804

-- CONTINUED --

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0001

STATION - 11264500 /USGS MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA 1916-1997 * HISTORIC * 11264500 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES

-- CONTINUED --

WATER YEAR	DISCHARGE
1956	9860.0
1957	2910.0
1958	3640.0
1959	1520.0
1960	1710.0
1961	1080.0
1962	2230.0
1963	5200.0
1964	1720.0
1965	9240.0
1966	1640.0
1967	4640.0
1968	1480.0
1969	4980.0
1970	2330.0
1971	2170.0
1972	2690.0
1973	4240.0
1974	3260.0
1975	4650.0
1976	1440.0
1977	1800.0
1978	4190.0
1979	3500.0
1980	4040.0
1981	2100.0
1982	4880.0
1983	5450.0
1984	2859.0
1985	1600.0
1986	4040.0
1987	1750.0
1988	1640.0
1989	1910.0
1990	1090.0

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1972	2690.0	0.4940	0.4925
1923	2620.0	0.5060	0.5046
1925	2620.0	0.5181	0.5166
1940	2620.0	0.5301	0.5287
1932	2570.0	0.5422	0.5408
1929	2520.0	0.5542	0.5529
1933	2520.0	0.5663	0.5650
1950	2520.0	0.5783	0.5771
1916	2500.0	0.5904	0.5892
1954	2500.0	0.6024	0.6013
1949	2480.0	0.6145	0.6134
1947	2450.0	0.6265	0.6255
1936	2380.0	0.6386	0.6376
1970	2330.0	0.6506	0.6496
1991	2310.0	0.6627	0.6617
1926	2240.0	0.6747	0.6738
1962	2230.0	0.6867	0.6859
1953	2180.0	0.6988	0.6980
1971	2170.0	0.7108	0.7101
1981	2100.0	0.7229	0.7222
1928	2050.0	0.7349	0.7343
1944	1980.0	0.7470	0.7464
1989	1910.0	0.7590	0.7585
1930	1870.0	0.7711	0.7706
1994	1870.0	0.7831	0.7827
1977	1800.0	0.7952	0.7947
1987	1750.0	0.8072	0.8068
1964	1720.0	0.8193	0.8189
1960	1710.0	0.8313	0.8310
1966	1640.0	0.8434	0.8431
1988	1640.0	0.8554	0.8552
1985	1600.0	0.8675	0.8673
1959	1520.0	0.8795	0.8794
1992	1490.0	0.8916	0.8915
1968	1480.0	0.9036	0.9036

-- CONTINUED --

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0001

STATION - 11264500 /USGS MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA 1916-1997 * HISTORIC * 11264500 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
		-- CONTINUED --
1991	2310.0	
1992	1490.0	
1993	3140.0	
1994	1870.0	
1995	5220.0	
1996	5900.0	
1997	10000.0	

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

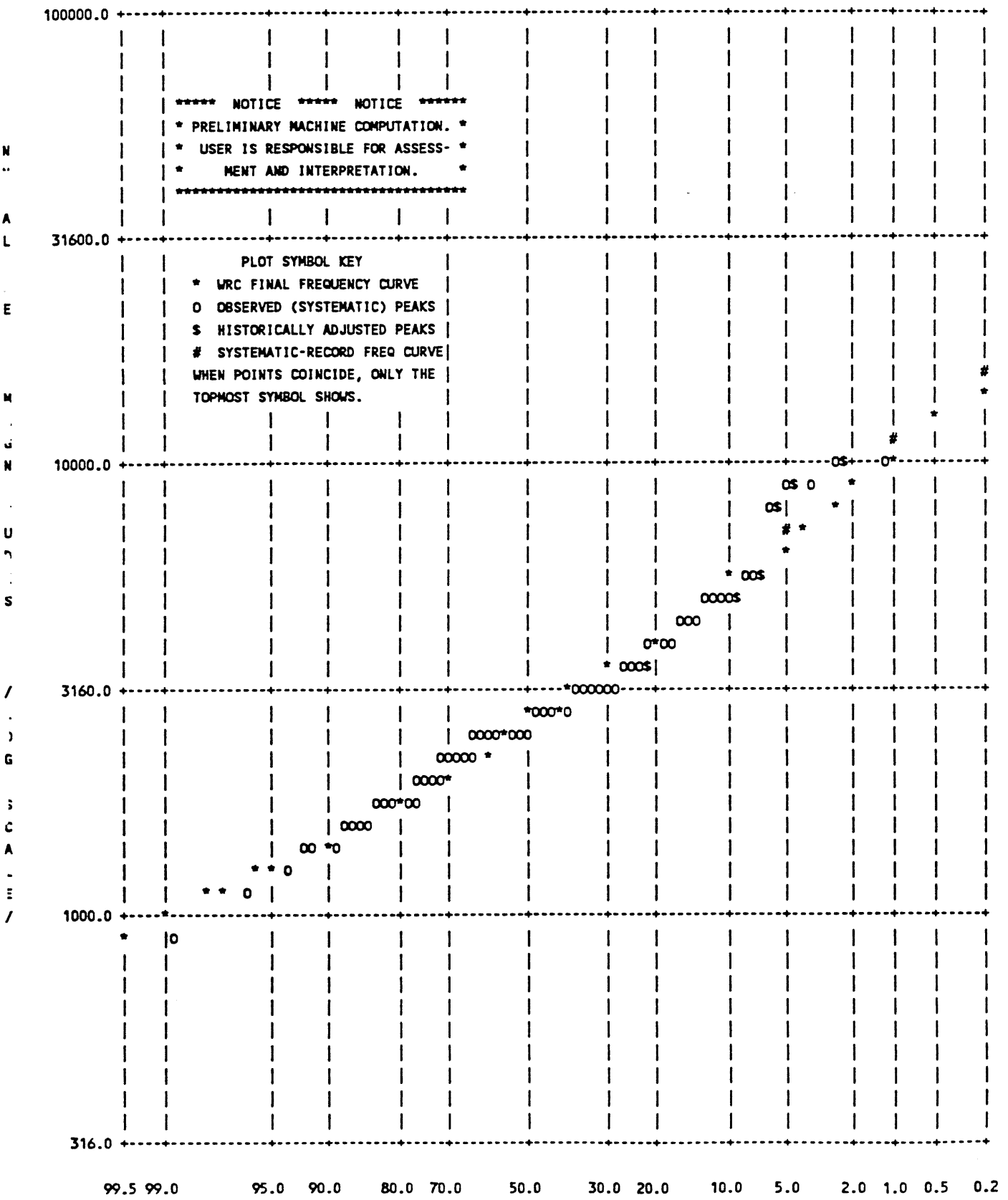
WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1976	1440.0	0.9157	0.9157
1931	1350.0	0.9277	0.9277
1924	1240.0	0.9398	0.9398
1939	1210.0	0.9518	0.9519
1990	1090.0	0.9639	0.9640
1961	1080.0	0.9759	0.9761
1934	935.0	0.9880	0.9882

3M J407 VER 3.7
REV 11/5/81)

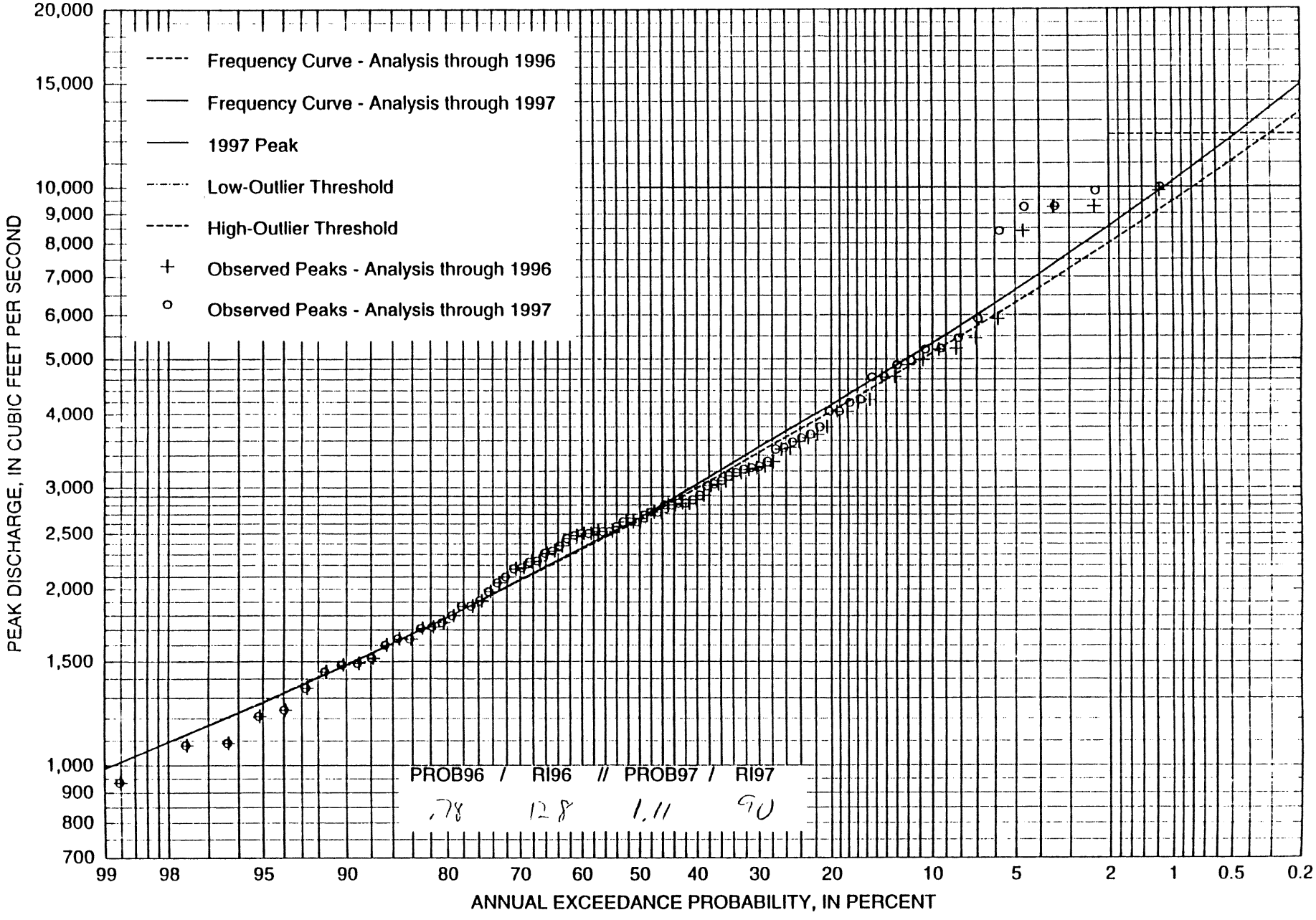
U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0001

STATION - 11264500 /USGS MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA 1916-1997 * HISTORIC * 11264500 /USGS



11264500 MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA NYRS = 82 1916-1997 WHHO



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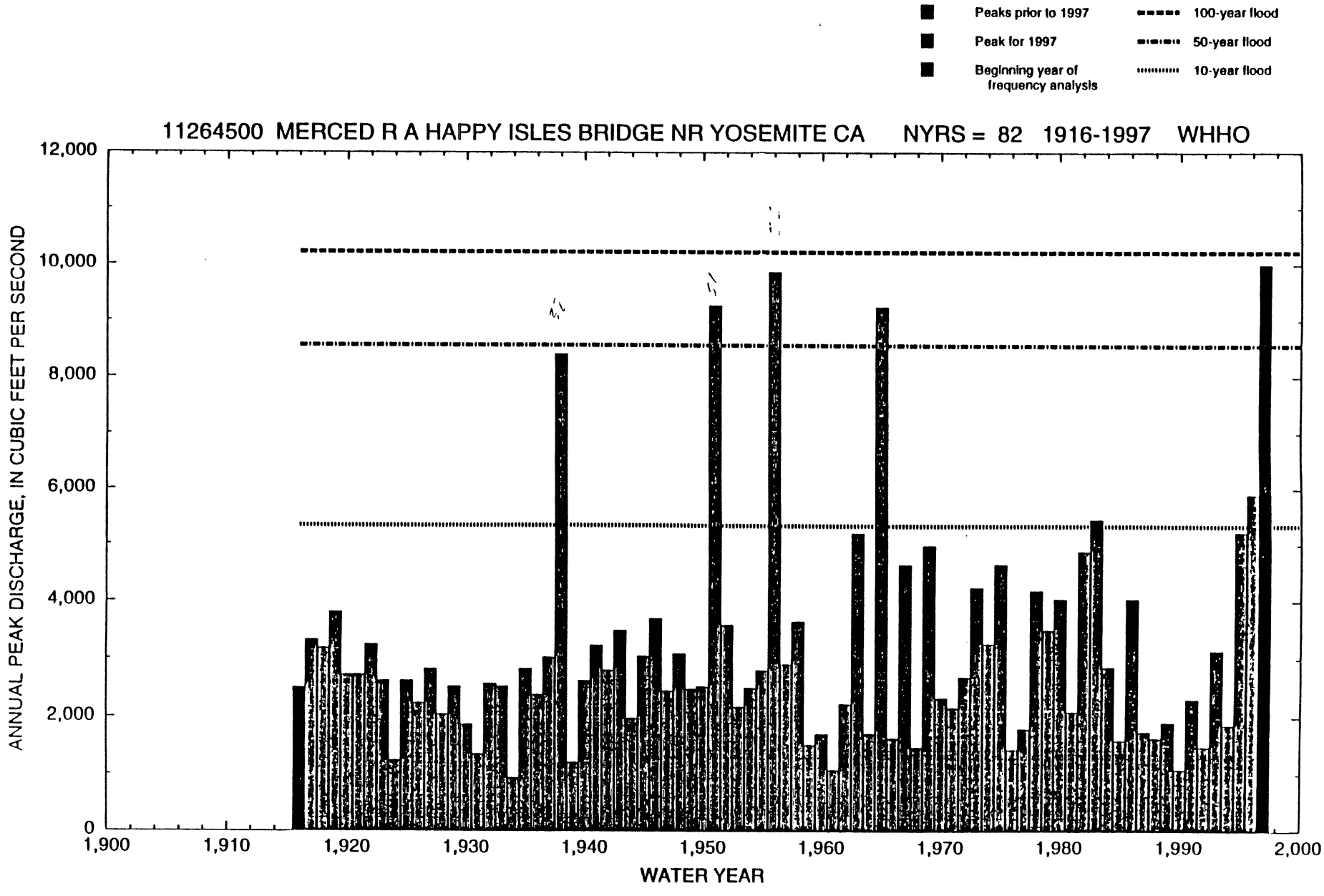
Peaks prior to 1997
Peak for 1997
Beginning year of frequency analysis
100-year flood
50-year flood
10-year flood
11264500 MERCED R A HAPPY ISLES BRIDGE NR YOSEMITE CA NYRS = 82 1916-1997 WHHO
ANNUAL PEAK DISCHARGE, IN CUBIC FEET PER SECOND
12,000
10,000
8,000
6,000
4,000
2,000
0
1,900
1,910
1,920
1,930
1,940
1,950
1,960
1,970
1,980
1,990
2,000
WATER YEAR

11264500

3 32021-09

GM J407 VER 3.7
REV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0003

OPTIONS IN EFFECT -- PLOT BCPU LGPT NODB PPOS NORS EXPR CLIM

STATION - 11266500 /USGS MERCED R A POHONO BRIDGE NR YOSEMITE CA 1917-1997 * HISTORIC * 11266500 /USGS

I N P U T D A T A S U M M A R Y

-- YEARS OF RECORD -- SYSTEMATIC	HISTORIC	HISTORIC PEAKS	GENERALIZED SKEW	STD. ERROR OF GENERAL. SKEW	SKEW OPTION	GAGE BASE DISCHARGE	USER-SET OUTLIER CRITERIA HIGH OUTLIER	LOW OUTLIER
81	86	0	0.100	--	WRC WEIGHTED	0.0	15000.0	--

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE. 0.0
*WCF161I-USER HIGH OUTLIER CRITERION REPLACES WRC. 15000.0 29213.4
WCF165I-HIGH OUTLIERS AND HISTORIC PEAKS ABOVE HHBASE. 5 0 15000.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION. 786.4

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE DISCHARGE	FLOOD BASE EXCEEDANCE PROBABILITY	LOGARITHMIC MEAN	LOGARITHMIC STANDARD DEVIATION	LOGARITHMIC SKEW
SYSTEMATIC RECORD	0.0	1.0000	3.6805	0.2666	0.674
W R C ESTIMATE	0.0	1.0000	3.6779	0.2637	0.522

ANNUAL FREQUENCY CURVE ORDINATES -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	W R C ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CONFIDENCE LIMITS FOR W R C ESTIMATES LOWER	UPPER
0.9950	1340.1	1448.2	1293.0	1071.6	1604.2
0.9900	1467.6	1562.6	1426.8	1187.2	1742.3
0.9500	1934.5	1988.9	1908.1	1617.3	2243.2
0.9000	2280.6	2310.9	2256.3	1941.2	2612.2
0.8000	2831.2	2831.2	2814.9	2460.3	3200.1
0.5000	4519.6	4474.4	4519.6	4036.3	5051.5
0.2000	7773.7	7793.9	7839.0	6888.2	8922.2
0.1000	10646.8	10852.7	10840.4	9250.1	12598.3
0.0400	15254.7	15953.9	15747.9	12865.2	18827.2
0.0200	19506.9	20836.5	20513.3	16078.5	24842.9
0.0100	24561.3	26822.9	26285.4	19790.7	32251.9
0.0050	30563.4	34151.2	33616.8	24084.6	41347.1
0.0020	40237.1	46387.1	45090.8	30808.9	56554.6

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(REV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0003

STATION - 11266500 /USGS MERCED R A POHONO BRIDGE NR YOSEMITE CA 1917-1997 * HISTORIC * 11266500 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
1917	5880.0	
1918	4000.0	
1919	6150.0	
1920	5050.0	
1921	4610.0	
1922	6370.0	
1923	4500.0	
1924	2120.0	
1925	4500.0	
1926	3950.0	
1927	5700.0	
1928	4680.0	
1929	4890.0	
1930	2780.0	
1931	1840.0	
1932	4780.0	
1933	4230.0	
1934	1470.0	
1935	5110.0	
1936	4450.0	
1937	6010.0	
1938	22000.0	
1939	2200.0	
1940	4750.0	
1941	6410.0	
1942	5860.0	
1943	6370.0	
1944	3470.0	
1945	5810.0	
1946	4680.0	
1947	3930.0	
1948	5100.0	
1949	4450.0	
1950	4490.0	
1951	23000.0	
1952	6790.0	
1953	3480.0	
1954	3990.0	
1955	3870.0	
1956	23400.0	

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1997	25000.0	0.0122	0.0115
1956	23400.0	0.0244	0.0230
1951	23000.0	0.0366	0.0345
1938	22000.0	0.0488	0.0460
1965	18000.0	0.0610	0.0575
1963	13200.0	0.0732	0.0693
1996	12500.0	0.0854	0.0816
1982	11200.0	0.0976	0.0938
1980	11000.0	0.1098	0.1061
1983	9520.0	0.1220	0.1183
1969	8190.0	0.1341	0.1306
1995	7370.0	0.1463	0.1428
1975	7280.0	0.1585	0.1551
1967	6950.0	0.1707	0.1673
1986	6930.0	0.1829	0.1796
1952	6790.0	0.1951	0.1918
1958	6630.0	0.2073	0.2041
1973	6620.0	0.2195	0.2163
1978	6440.0	0.2317	0.2286
1941	6410.0	0.2439	0.2408
1922	6370.0	0.2561	0.2531
1943	6370.0	0.2683	0.2654
1993	6210.0	0.2805	0.2776
1919	6150.0	0.2927	0.2899
1937	6010.0	0.3049	0.3021
1979	6010.0	0.3171	0.3144
1917	5880.0	0.3293	0.3266
1942	5860.0	0.3415	0.3389
1945	5810.0	0.3537	0.3511
1927	5700.0	0.3659	0.3634
1974	5320.0	0.3780	0.3756
1935	5110.0	0.3902	0.3879
1948	5100.0	0.4024	0.4001
1920	5050.0	0.4146	0.4124
1984	5030.0	0.4268	0.4246
1929	4890.0	0.4390	0.4369
1957	4880.0	0.4512	0.4491
1932	4780.0	0.4634	0.4614
1940	4750.0	0.4756	0.4736
1928	4680.0	0.4878	0.4859

-- CONTINUED --

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0003

STATION - 11266500 /USGS MERCED R A POHONO BRIDGE NR YOSEMITE CA 1917-1997 * HISTORIC * 11266500 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
1957	4880.0	
1958	6630.0	
1959	2340.0	
1960	3010.0	
1961	1550.0	
1962	4300.0	
1963	13200.0	
1964	2710.0	
1965	18000.0	
1966	2670.0	
1967	6950.0	
1968	2020.0	
1969	8190.0	
1970	4150.0	
1971	3420.0	
1972	3270.0	
1973	6620.0	
1974	5320.0	
1975	7280.0	
1976	2060.0	
1977	2390.0	
1978	6440.0	
1979	6010.0	
1980	11000.0	
1981	3560.0	
1982	11200.0	
1983	9520.0	
1984	5030.0	
1985	3060.0	
1986	6930.0	
1987	2410.0	
1988	2090.0	
1989	3370.0	
1990	1850.0	
1991	3560.0	

-- CONTINUED --

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1946	4680.0	0.5000	0.4981
1921	4610.0	0.5122	0.5104
1923	4500.0	0.5244	0.5226
1925	4500.0	0.5366	0.5349
1950	4490.0	0.5488	0.5471
1936	4450.0	0.5610	0.5594
1949	4450.0	0.5732	0.5716
1962	4300.0	0.5854	0.5839
1933	4230.0	0.5976	0.5961
1970	4150.0	0.6098	0.6084
1918	4000.0	0.6220	0.6206
1954	3990.0	0.6341	0.6329
1926	3950.0	0.6463	0.6451
1947	3930.0	0.6585	0.6574
1955	3870.0	0.6707	0.6696
1981	3560.0	0.6829	0.6819
1991	3560.0	0.6951	0.6941
1953	3480.0	0.7073	0.7064
1944	3470.0	0.7195	0.7186
1971	3420.0	0.7317	0.7309
1989	3370.0	0.7439	0.7431
1972	3270.0	0.7561	0.7554
1985	3060.0	0.7683	0.7676
1960	3010.0	0.7805	0.7799
1930	2780.0	0.7927	0.7921
1964	2710.0	0.8049	0.8044
1966	2670.0	0.8171	0.8166
1994	2640.0	0.8293	0.8289
1992	2550.0	0.8415	0.8411
1987	2410.0	0.8537	0.8534
1977	2390.0	0.8659	0.8656
1959	2340.0	0.8780	0.8779
1939	2200.0	0.8902	0.8901
1924	2120.0	0.9024	0.9024
1988	2090.0	0.9146	0.9146

-- CONTINUED --

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0003

STATION - 11266500 /USGS MERCED R A POHONO BRIDGE NR YOSEMITE CA 1917-1997 * HISTORIC * 11266500 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
1992	2550.0	
1993	6210.0	
1994	2640.0	
1995	7370.0	
1996	12500.0	
1997	25000.0	

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

-- CONTINUED --

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1976	2060.0	0.9268	0.9269
1968	2020.0	0.9390	0.9391
1990	1850.0	0.9512	0.9514
1931	1840.0	0.9634	0.9636
1961	1550.0	0.9756	0.9759
1934	1470.0	0.9878	0.9881

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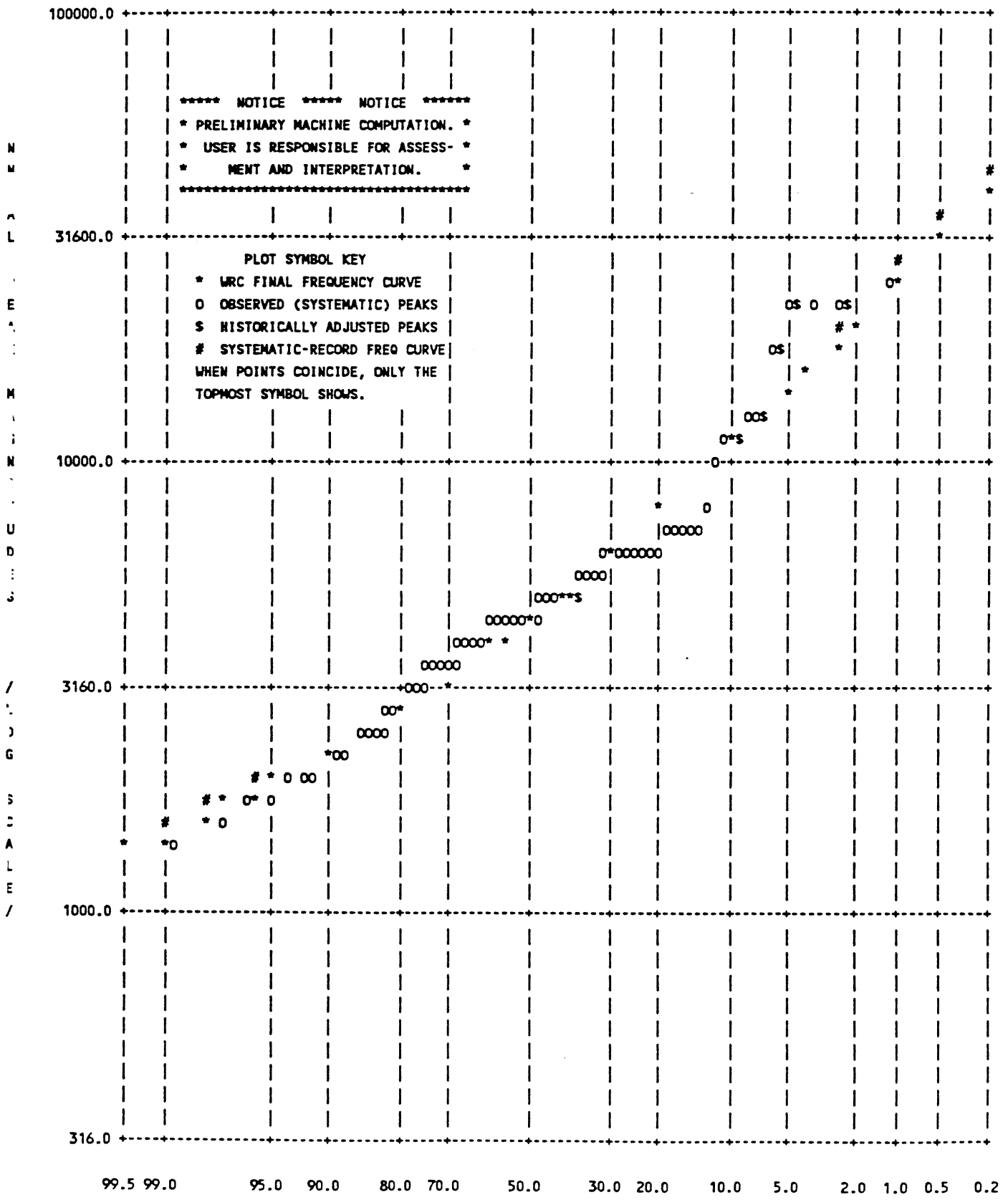
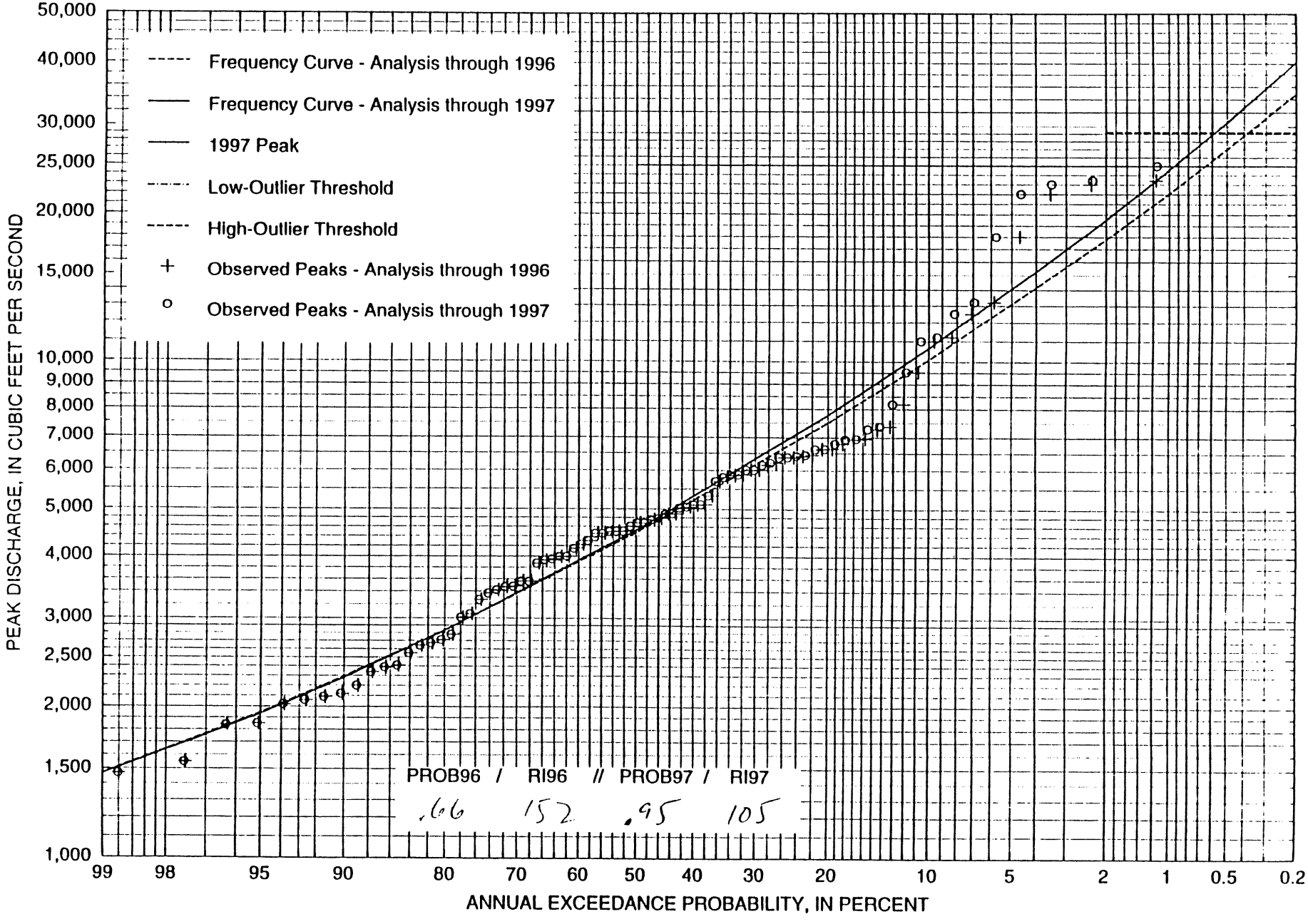
U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 7/ 8/97 AT 1557 SEQ 1.0003

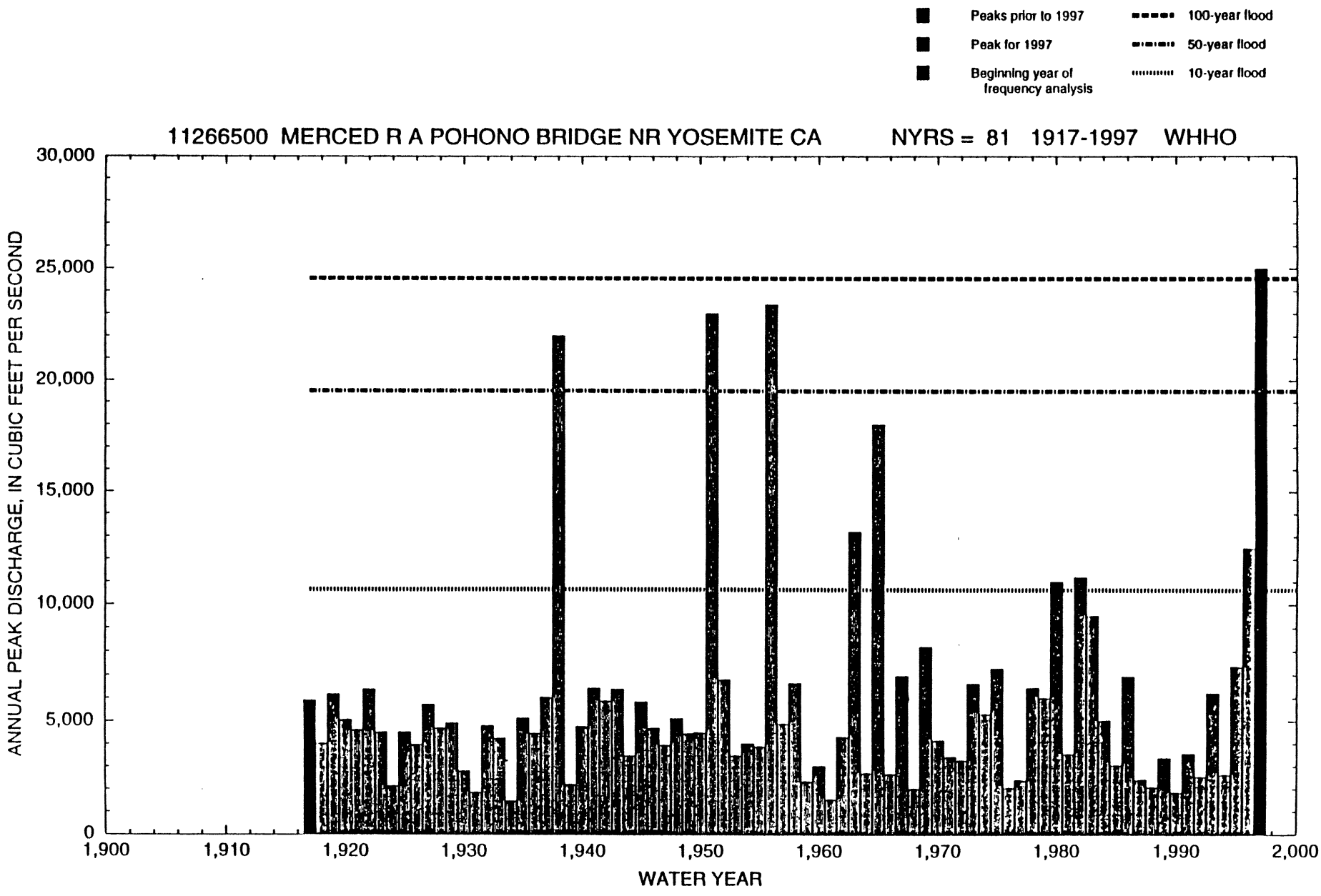
STATION - 11266500 /USGS MERCED R A POHONO BRIDGE NR YOSEMITE CA 1917-1997 * HISTORIC * 11266500 /USGS



11266500 MERCED R A POHONO BRIDGE NR YOSEMITE CA NYRS = 81 1917-1997 WHHO



11266


Peaks prior to 1997
Peak for 1997
Beginning year of frequency analysis
100-year flood
50-year flood
10-year flood
11266500 MERCED R A POHONO BRIDGE NR YOSEMITE CA
NYRS = 81 1917-1997 WHHO
ANNUAL PEAK DISCHARGE, IN CUBIC FEET PER SECOND
30,000
25,000
20,000
15,000
10,000
5,000
0
1,900
1,910
1,920
1,930
1,940
1,950
1,960
1,970
1,980
1,990
2,000
WATER YEAR

11266500

ɜM J407 VER 3.7
ɛEV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 11/ 7/97 AT 241 SEQ 1.0001

ɔPTIONS IN EFFECT -- PLOT BCPU LGPT NODB PPOS NORS EXPR CLIM

STATION - 11265000 /USGS TENAYA CREEK NR YOSEMITE VILLAGE CALIF 1912-1958 * HISTORIC * 11265000 /USGS

I N P U T D A T A S U M M A R Y

-- YEARS OF RECORD -- SYSTEMATIC	HISTORIC	HISTORIC PEAKS	GENERALIZED SKEW	STD. ERROR OF GENERAL. SKEW	SKEW OPTION	GAGE BASE DISCHARGE	USER-SET OUTLIER CRITERIA HIGH OUTLIER	LOW OUTLIER
46	85	0	0.100	--	WRC WEIGHTED	0.0	4500.0	700.0

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

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 WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.                0.0
*WCF161I-USER HIGH OUTLIER CRITERION REPLACES WRC.     4500.0    5087.0
 WCF165I-HIGH OUTLIERS AND HISTORIC PEAKS ABOVE HHBASE.  3  0    4500.0
*WCF191I-USER LOW-OUTLIER CRITERION SUPERSEDES WRC.      700.0     249.4
 WCF198I-LOW OUTLIERS BELOW FLOOD BASE WERE DROPPED.        6     700.0
```

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE DISCHARGE	FLOOD BASE EXCEEDANCE PROBABILITY	LOGARITHMIC MEAN	LOGARITHMIC STANDARD DEVIATION	LOGARITHMIC SKEW
SYSTEMATIC RECORD	0.0	1.0000	3.0405	0.2434	1.238
W R C ESTIMATE	700.0	0.8654	3.0494	0.1728	0.980

ANNUAL FREQUENCY CURVE ORDINATES -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	W R C ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CONFIDENCE LIMITS FOR W R C ESTIMATES LOWER	UPPER
0.9950	--	481.3	--	--	--
0.9900	--	494.3	--	--	--
0.9500	--	551.3	--	--	--
0.9000	--	600.1	--	--	--
0.8000	798.3	684.9	794.1	704.0	886.4
0.5000	1051.1	980.8	1051.1	950.4	1157.7
0.2000	1516.0	1650.4	1532.7	1368.2	1711.4
0.1000	1909.6	2326.4	1956.5	1693.4	2225.8
0.0400	2520.4	3553.0	2634.2	2169.7	3078.8
0.0200	3069.4	4825.7	3295.7	2579.6	3887.8
0.0100	3709.5	6499.4	4085.6	3042.3	4871.7
0.0050	4457.3	8698.3	5105.6	3567.0	6067.6
0.0020	5642.9	12690.5	6623.7	4372.4	8050.6

GM J407 VER 3.7
REV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 11/ 7/97 AT 241 SEQ 1.0001

STATION - 11265000 /USGS TENAYA CREEK NR YOSEMITE VILLAGE CALIF 1912-1958 * HISTORIC * 11265000 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
1912	835.0	
1913	520.0	
1914	1010.0	
1915	1120.0	
1916	775.0	
1917	1190.0	
1918	775.0	
1919	1730.0	
1920	1320.0	
1921	960.0	
1922	1500.0	
1923	1020.0	
1924	485.0	
1925	1080.0	
1926	885.0	
1927	1370.0	
1929	1360.0	
1930	633.0	
1931	437.0	
1932	1000.0	
1933	1080.0	
1934	372.0	
1935	1260.0	
1936	1110.0	
1937	1570.0	
1938	6800.0	
1939	479.0	
1940	985.0	
1941	1200.0	
1942	1030.0	
1943	1900.0	
1944	832.0	
1945	1250.0	
1946	1030.0	
1947	945.0	

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1938	6800.0	0.0213	0.0116
1951	5150.0	0.0426	0.0233
1956	4730.0	0.0638	0.0349
1943	1900.0	0.0851	0.0518
1919	1730.0	0.1064	0.0740
1958	1650.0	0.1277	0.0961
1937	1570.0	0.1489	0.1183
1952	1570.0	0.1702	0.1405
1922	1500.0	0.1915	0.1627
1927	1370.0	0.2128	0.1848
1929	1360.0	0.2340	0.2070
1920	1320.0	0.2553	0.2292
1935	1260.0	0.2766	0.2514
1945	1250.0	0.2979	0.2735
1948	1220.0	0.3191	0.2957
1941	1200.0	0.3404	0.3179
1917	1190.0	0.3617	0.3400
1915	1120.0	0.3830	0.3622
1936	1110.0	0.4043	0.3844
1925	1080.0	0.4255	0.4066
1933	1080.0	0.4468	0.4287
1950	1080.0	0.4681	0.4509
1942	1030.0	0.4894	0.4731
1946	1030.0	0.5106	0.4953
1923	1020.0	0.5319	0.5174
1914	1010.0	0.5532	0.5396
1932	1000.0	0.5745	0.5618
1940	985.0	0.5957	0.5840
1921	960.0	0.6170	0.6061
1947	945.0	0.6383	0.6283
1957	906.0	0.6596	0.6505
1926	885.0	0.6809	0.6727
1949	867.0	0.7021	0.6948
1954	859.0	0.7234	0.7170
1912	835.0	0.7447	0.7392

-- CONTINUED --

M J407 VER 3.7
EV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

RUN-DATE 11/ 7/97 AT 241 SEQ 1.0001

STATION - 11265000 /USGS TENAYA CREEK NR YOSEMITE VILLAGE CALIF 1912-1958 * HISTORIC * 11265000 /USGS

********* NOTICE -- PRELIMINARY MACHINE COMPUTATIONS. *********
********* USER RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION. *********

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES
		-- CONTINUED --
1948	1220.0	
1949	867.0	
1950	1080.0	
1951	5150.0	
1952	1570.0	
1953	828.0	
1954	859.0	
1955	832.0	
1956	4730.0	
1957	906.0	
1958	1650.0	

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

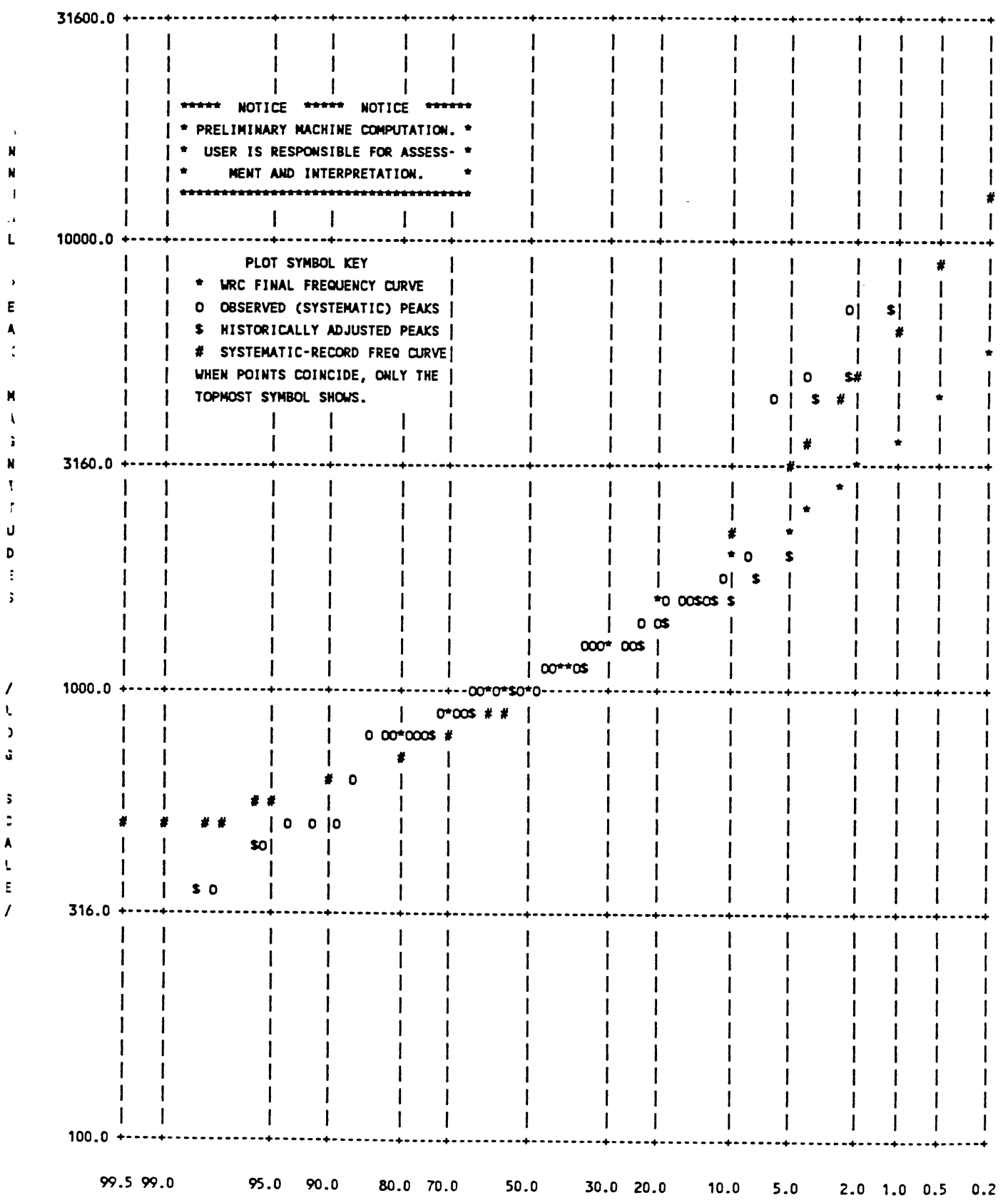
WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	W R C ESTIMATE
1944	832.0	0.7660	0.7614
1955	832.0	0.7872	0.7835
1953	828.0	0.8085	0.8057
1916	775.0	0.8298	0.8279
1918	775.0	0.8511	0.8501
1930	633.0	0.8723	0.8722
1913	520.0	0.8936	0.8944
1924	485.0	0.9149	0.9166
1939	479.0	0.9362	0.9388
1931	437.0	0.9574	0.9609
1934	372.0	0.9787	0.9831

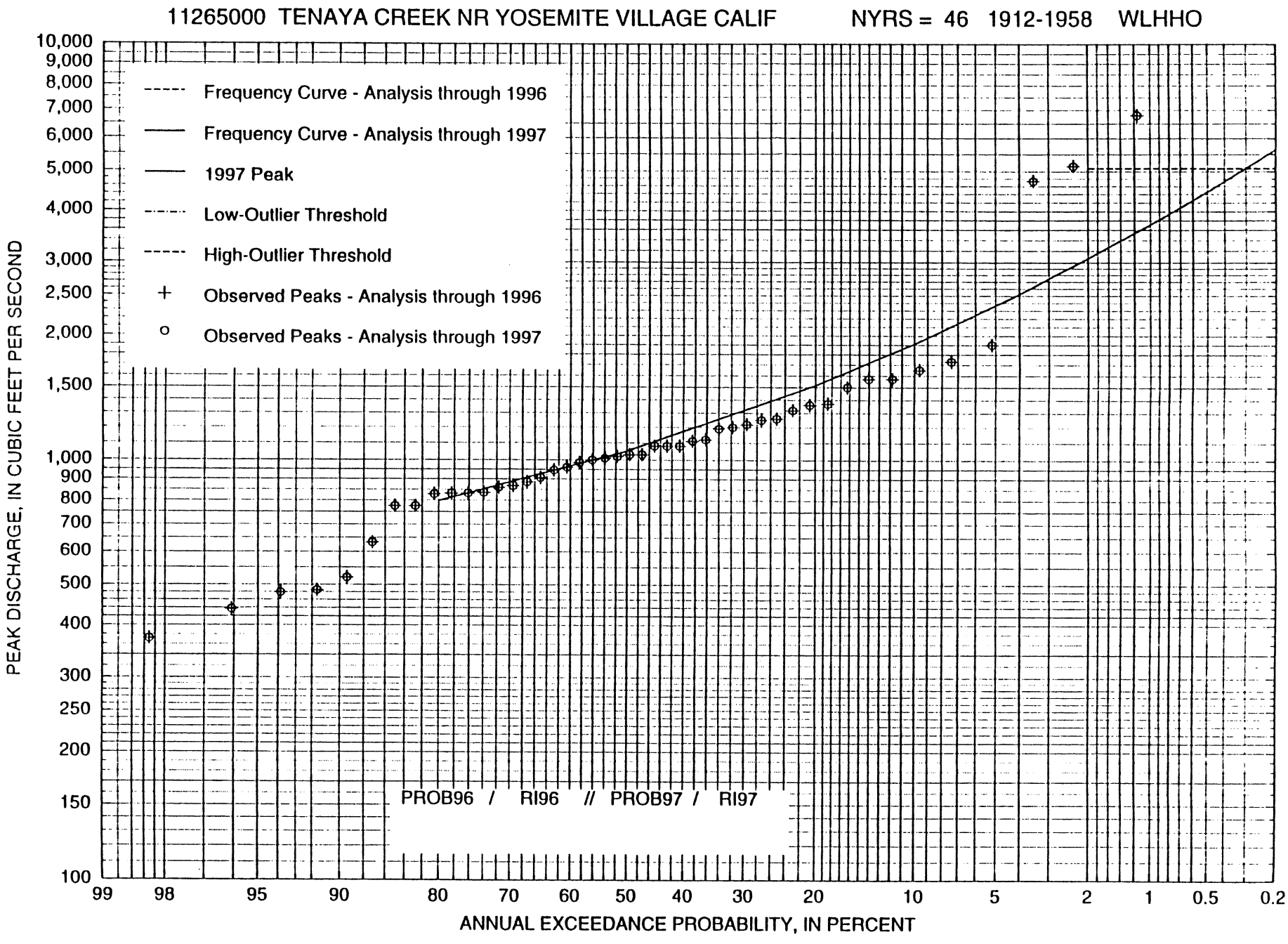
GM J407 VER 3.7
REV 11/5/81)

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
FOLLOWING WRC GUIDELINES BULL. 17-B.

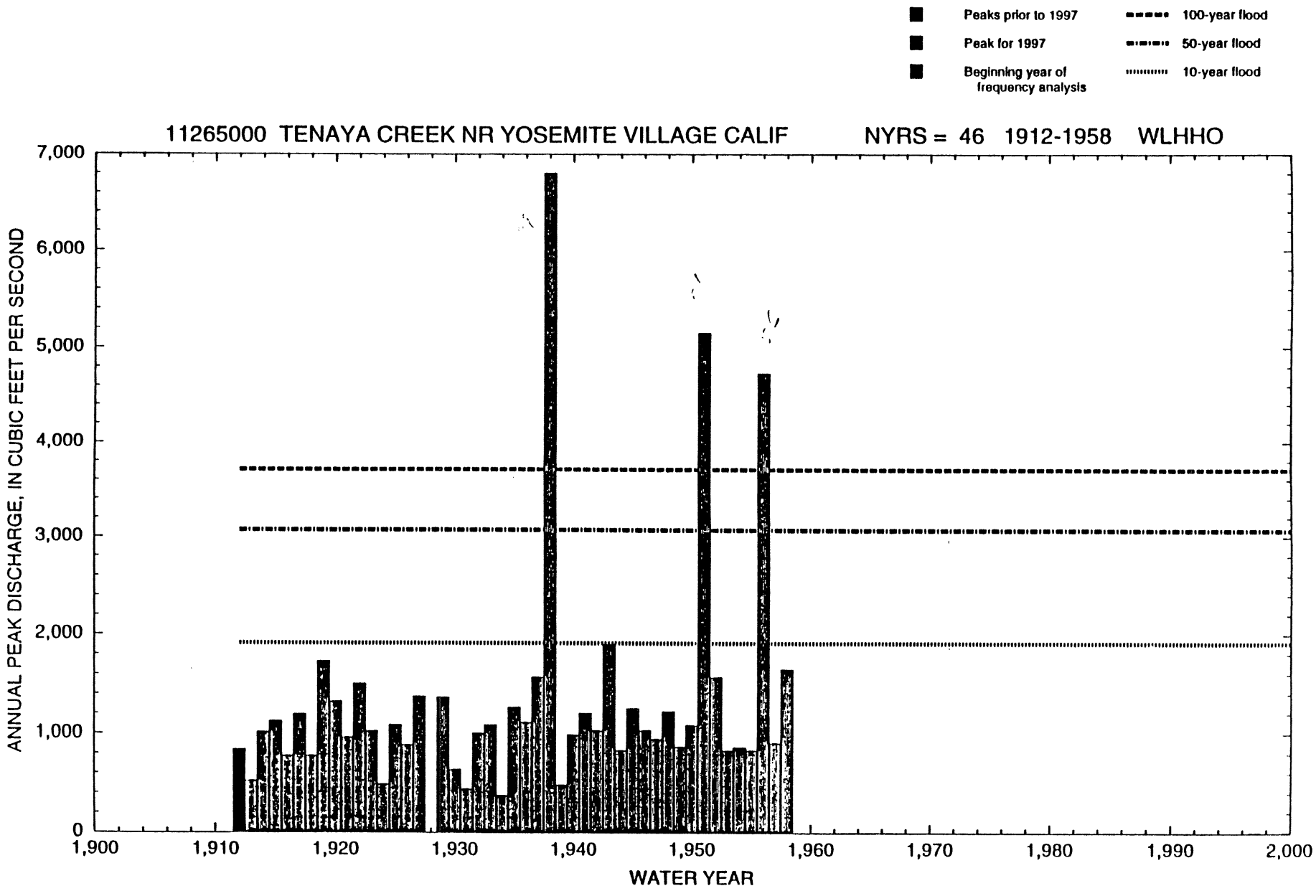
RUN-DATE 11/ 7/97 AT 241 SEQ 1.0001

STATION - 11265000 /USGS TENAYA CREEK NR YOSEMITE VILLAGE CALIF 1912-1958 * HISTORIC * 11265000 /USGS




11265000 TENAYA CREEK NR YOSEMITE VILLAGE CALIF
NYRS = 46 1912-1958 WLHHO
Frequency Curve - Analysis through 1996
Frequency Curve - Analysis through 1997
1997 Peak
Low-Outlier Threshold
High-Outlier Threshold
Observed Peaks - Analysis through 1996
Observed Peaks - Analysis through 1997
PROB96 / RI96 // PROB97 / RI97
PEAK DISCHARGE, IN CUBIC FEET PER SECOND
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,500
2,000
1,500
1,000
900
800
700
600
500
400
300
250
200
150
100
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
ANNUAL EXCEEDANCE PROBABILITY, IN PERCENT

112650


Peaks prior to 1997
Peak for 1997
Beginning year of frequency analysis
100-year flood
50-year flood
10-year flood
11265000 TENAYA CREEK NR YOSEMITE VILLAGE CALIF
NYRS = 46 1912-1958 WLHHO
ANNUAL PEAK DISCHARGE, IN CUBIC FEET PER SECOND
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1,900
1,910
1,920
1,930
1,940
1,950
1,960
1,970
1,980
1,990
2,000
WATER YEAR

11265000

REGIONAL FLOOD FREQUENCY ANALYSIS

SUBJECT: Yosemite Campgrounds

JOB NO.: 530021-05

REGIONAL FLOOD-FREQUENCY ANALYSIS

FOR TENAYA CREEK

SIERRA REGION

$$Q_{25} = 6.55\, A^{0.79}\, P^{1.12}\, H^{-0.52}$$

$$Q_{100} = 15.7\, A^{0.77}\, P^{1.02}\, H^{-0.43}$$

A = DRAINAGE AREA = 46.9 SQ. MI

P = MEAN ANNUAL PRECIPITATION = 55 INCHES

H = ALTITUDE INDEX IN THOUSANDS OF FEET = 6.6

Q = PEAK DISCHARGE

$$Q_{25} = 6.55\,(46.9)^{0.79}\,(55)^{1.12}\,(6.6)^{-0.52} = 4566 \text{ CFS}$$

$$Q_{100} = 15.7\,(46.9)^{0.77}\,(55)^{1.02}\,(6.6)^{-0.43} = 8044 \text{ CFS}$$

PREPARED BY: JA DATE: 12/3/97 CHECKED BY: SHEET NO.: OF

CELLA BARR ASSOCIATES
777 CAMPUS COMMONS ROAD
SUITE 200
SACRAMENTO, CA 95825-8309
(916) 649 3137
FAX (916) 649-8797

LOCAL "FEN" TRIBUTARY
PEAK DISCHARGE CALCULATIONS

DESIGN NOTES AND COMPUTATIONS

SUBJECT: Yosemite Campgrounds

JOB NO.: 530071-05

LOCAL 'FEN' TRIBUTARY

PEAK DISCHARGE CALCULATIONS

RATIONAL METHOD

$Q = CIA$

A = DRAINAGE AREA = 96 AC

I = RAINFALL INTENCITY INCHES/HOUR

C = RUNOFF COEFFICIENT

$I_2 = 0.56$, $I_{10} = 0.88$, $I_{25} = 1.06$, $I_{100} = 1.24$

$C = 0.45$

$Q_2 = 0.45(0.56)\,96 = 24$ CFS

$Q_{10} = 0.45(0.88)\,96 = 38$ CFS

$Q_{25} = 0.45(1.06)\,96 = 46$ CFS

$Q_{100} = 0.45(1.24)\,96 = 54$ CFS

PREPARED BY: JA DATE: 12/2/97 CHECKED BY: SHEET NO.: OF

CELLA BARR ASSOCIATES
777 CAMPUS COMMONS ROAD
SUITE 200
SACRAMENTO, CA 95825-8309
(916)649-3137
FAX (916)649-8797

STAGE HEIGHTS AT
THE RESIDENCE #1

To Louise Johnson From Sean Eagan

Stage heights at the Residence #1 garage in Yosemite Valley

November 19 1950	3964.17
December 23 1955	3964.45
February 1, 1963	3960.66
December 23, 1964	3962.32
May 15, 1996	3962.25
January 2, 1997	3966.63

The January 2 1997 high water line was surveyed in late January of 1997 by Mike Martin and Sean Eagan. It was survey off a monument that exists between Residence #1 and the Yosemite Creek Bridge. The other elevations were arrived at by measuring the distance down door jam below the 1997 line, and subtracting the measured amount from 3966.63.

HEC-1 INPUT/OUTPUT

```
**********************************
*                                *
*  FLOOD HYDROGRAPH PACKAGE (HEC-1)  *
*            MAY  1991           *
*          VERSION 4.0.1E        *
*   Lahey F77L-EM/32 version 5.01  *
*      Dodson & Associates, Inc.  *
* RUN DATE 01/13/98  TIME 08:43:53 *
**********************************
```

```
**********************************
*                                *
*   U.S. ARMY CORPS OF ENGINEERS *
*   HYDROLOGIC ENGINEERING CENTER *
*        609 SECOND STREET       *
*      DAVIS, CALIFORNIA 95616   *
*        (916) 551-1748          *
*                                *
**********************************
```

MERCED RIVER
&
TENAYA CREEK

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

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

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

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

  1           ID       NATIONAL PARK SERVICE
  2           ID       YOSEMITE CAMPGROUND FLOOD ANALYSIS
  3           ID       RUNOFF ESTIMATION
  4           ID    ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  5           ID       CELLA BARR ASSOCIATES
  6           ID         FILE:530021-05-
  7           ID       HEC-1 FILE: 1YOSE100
  8           ID       NOV.7,97
  9           ID       SCS METHODS
 10           ID       100-YEAR 24-HR STORM
 11           ID       TYPE IA DISTRIBUTION
 12           IT      5              0    540
 13           IN     30              0
 14           IO      5
 15           JR   PREC   0.459    0.71   0.833     1.0

 16           KK   BAS 1        MERCED RIVER
 17           KM       compute runoff from basin 1
 18           KO      3                          21
 19           BA    181
              * ++++++++++++ 100-YR. 24-HR RAINFALL DISTRIBUTION+++++++++++++++
              *                     TYPE IA
 20           PB   7.08
 21           PC   0.00   0.010   0.022   0.036   0.051   0.067   0.083   0.099   0.116   0.135
 22           PC  0.156   0.179   0.204   0.233   0.268   0.310   0.425   0.480   0.520   0.550
 23           PC  0.577   0.601   0.623   0.644   0.664   0.683   0.701   0.719   0.736   0.753
 24           PC  0.769   0.785   0.800   0.815   0.830   0.844   0.858   0.871   0.884   0.896
 25           PC  0.908   0.920   0.932   0.944   0.956   0.967   0.978   0.989   1.000   1.000
 26           LS             48
 27           UD    4.4

 28           KK   BAS 2        TENAYA CREEK
 29           KO      3                          21
 30           KM       compute runoff from basin 2
 31           BA   46.9
 32           LS             65
 33           UD   2.88

 34           KK  COMB 1
 35           KO      3                          21
 36           HC      2

 37           KK   ROUTE
 38           KM       ROUTE FLOW OF MERCED RIVER & TENAYA CK. TO YOSEMITE CK.
 39           RS      4   FLOW     -1
 40           RC   0.06    0.06    0.06    8000 0.00175
 41           RX      0     197     223     266     390     439     800    1000
 42           RY   63.8    61.3    61.4    52.4    52.4    59.2      60      70

 43           KK   BAS 3        INDIAN CANYAN CREEK
 44           KM       AREA BETWEEN TENAYA CK. & YOSEMITE CK.
 45           BA    8.7
 46           LS             65
 47           UD    1.9
```

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

  48          KK  COMB 2
  49          HC       2

  50          KK   BAS 4        YOSEMITE CREEK
              *      3                          21
  51          BA    42.7
  52          LS              65
  53          UD     3.4

  54          KK  COMB 4
              *      3                          21
  55          HC       2
  56          ZZ
```

```
***************************************                               ***************************************
*                                     *                               *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                               *   U.S. ARMY CORPS OF ENGINEERS      *
*              MAY   1991              *                               *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.0.1E             *                               *        609 SECOND STREET            *
*    Lahey F77L-EM/32 version 5.01     *                               *     DAVIS, CALIFORNIA 95616         *
*      Dodson & Associates, Inc.       *                               *         (916) 551-1748              *
* RUN DATE  01/13/98  TIME  08:43:53   *                               *                                     *
***************************************                               ***************************************



                           NATIONAL PARK SERVICE
                           YOSEMITE CAMPGROUND FLOOD ANALYSIS
                           RUNOFF ESTIMATION
                         ****************************************************************
                           CELLA BARR ASSOCIATES
                             FILE:530021-05-
                           HEC-1 FILE: 1YOSE100
                           NOV.7,97
                           SCS METHODS
                           100-YEAR 24-HR STORM
                           TYPE IA DISTRIBUTION

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

    IT         HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        540  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2    0  ENDING DATE
                   NDTIME       2055  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    0.08 HOURS
                     TOTAL TIME BASE   44.92 HOURS

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

    JP         MULTI-PLAN OPTION
                    NPLAN          1  NUMBER OF PLANS

    JR         MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                 0.46      0.71      0.83      1.00


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


            *************
            *           *
 16 KK      *   BAS 1   *            MERCED RIVER
            *           *
            *************

 18 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
                    IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                     IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                    ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                    ISAV2        540  LAST ORDINATE PUNCHED OR SAVED
                   TIMINT      0.083  TIME INTERVAL IN HOURS
```

```
13 IN        TIME DATA FOR INPUT TIME SERIES
                 JXMIN          30  TIME INTERVAL IN MINUTES
                JXDATE     1    0  STARTING DATE
                JXTIME          0  STARTING TIME

           SUBBASIN RUNOFF DATA

19 BA        SUBBASIN CHARACTERISTICS
                 TAREA     181.00  SUBBASIN AREA

             PRECIPITATION DATA

20 PB            STORM       7.00  BASIN TOTAL PRECIPITATION

21 PI          INCREMENTAL PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00
                0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

26 LS        SCS LOSS RATE
                 STRTL       2.17  INITIAL ABSTRACTION
                CRVNBR      48.00  CURVE NUMBER
                 RTIMP       0.00  PERCENT IMPERVIOUS AREA

27 UD        SCS DIMENSIONLESS UNITGRAPH
                 TLAG       4.40  LAG

                                        ***

                                   UNIT HYDROGRAPH
                              266 END-OF-PERIOD ORDINATES
      111.      222.      332.      443.      554.      764.     1022.     1281.     1539.     1798.
     2081.     2414.     2746.     3079.     3411.     3744.     4188.     4631.     5074.     5517.
     5960.     6504.     7095.     7686.     8277.     8868.     9497.    10199.    10901.    11602.
    12304.    13004.    13594.    14185.    14776.    15367.    15958.    16422.    16828.    17234.
    17640.    18047.    18386.    18608.    18830.    19051.    19273.    19489.    19526.    19563.
    19600.    19636.    19673.    19659.    19622.    19585.    19548.    19511.    19406.    19184.
    18962.    18741.    18519.    18296.    18038.    17779.    17521.    17262.    17004.    16719.
    16423.    16128.    15833.    15537.    15214.    14844.    14475.    14106.    13736.    13363.
    12920.    12477.    12034.    11591.    11147.    10757.    10388.    10019.     9649.     9280.
     8954.     8696.     8437.     8178.     7920.     7664.     7442.     7220.     6999.     6777.
     6556.     6361.     6176.     5992.     5807.     5622.     5458.     5323.     5188.     5053.
     4919.     4784.     4649.     4514.     4379.     4245.     4110.     3993.     3882.     3771.
     3660.     3550.     3439.     3328.     3217.     3106.     2996.     2888.     2814.     2740.
     2666.     2592.     2518.     2445.     2371.     2297.     2223.     2149.     2083.     2028.
     1972.     1917.     1861.     1806.     1751.     1695.     1640.     1584.     1529.     1485.
     1444.     1404.     1363.     1322.     1282.     1241.     1200.     1160.     1119.     1080.
     1052.     1024.      997.      969.      941.      914.      886.      858.      831.      803.
      778.      758.      738.      718.      697.      677.      657.      636.      616.      596.
      575.      559.      545.      530.      515.      500.      485.      471.      456.      441.
```

312.	301.	292.	284.	277.	270.	262.	255.	248.	240.
233.	225.	218.	213.	209.	204.	200.	195.	191.	186.
182.	178.	173.	169.	164.	160.	155.	151.	147.	142.
138.	133.	129.	124.	120.	115.	111.	107.	102.	98.
94.	90.	87.	83.	79.	76.	72.	68.	65.	61.
57.	54.	50.	46.	42.	39.	35.	31.	28.	24.
20.	17.	13.	9.	6.	2.				

TOTAL RAINFALL = 7.08, TOTAL LOSS = 5.55, TOTAL EXCESS = 1.53

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
10574.	19.75	(CFS)	10453.	7340.	3987.	3987.
		(INCHES)	0.537	1.508	1.533	1.533
		(AC-FT)	5183.	14558.	14799.	14799.

CUMULATIVE AREA = 181.00 SQ MI

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

HYDROGRAPH AT STATION BAS 1
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.25, TOTAL LOSS = 3.15, TOTAL EXCESS = 0.10

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
1118.	25.67	(CFS)	1016.	477.	256.	256.
		(INCHES)	0.052	0.098	0.098	0.098
		(AC-FT)	504.	946.	950.	950.

CUMULATIVE AREA = 181.00 SQ MI

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

HYDROGRAPH AT STATION BAS 1
FOR PLAN 1, RATIO = 0.71

TOTAL RAINFALL = 5.03, TOTAL LOSS = 4.43, TOTAL EXCESS = 0.60

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
4667.	24.42	(CFS)	4580.	2868.	1553.	1553.
		(INCHES)	0.235	0.589	0.597	0.597
		(AC-FT)	2271.	5688.	5767.	5767.

CUMULATIVE AREA = 181.00 SQ MI

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

HYDROGRAPH AT STATION BAS 1
FOR PLAN 1, RATIO = 0.83

TOTAL RAINFALL = 5.90, TOTAL LOSS = 4.94, TOTAL EXCESS = 0.96

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
6899.	21.58	(CFS)	6847.	4580.	2485.	2485.
		(INCHES)	0.352	0.941	0.956	0.956
		(AC-FT)	3395.	9085.	9226.	9226.

CUMULATIVE AREA = 181.00 SQ MI

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

HYDROGRAPH AT STATION BAS 1
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.08, TOTAL LOSS = 5.55, TOTAL EXCESS = 1.53

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
10574.	19.75	(CFS)	10453.	7340.	3987.	3987.
		(INCHES)	0.537	1.508	1.533	1.533

CUMULATIVE AREA = 181.00 SQ MI

*** ***

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             *************
             *           *
28 KK        *   BAS 2   *          TENAYA CREEK
             *           *
             *************
```

29 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	21	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	540	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

compute runoff from basin 2

SUBBASIN RUNOFF DATA

31 BA SUBBASIN CHARACTERISTICS

TAREA 46.90 SUBBASIN AREA

PRECIPITATION DATA

20 PB STORM 7.00 BASIN TOTAL PRECIPITATION

21 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

32 LS SCS LOSS RATE

STRTL	1.08	INITIAL ABSTRACTION
CRVNBR	65.00	CURVE NUMBER
RTIMP	0.00	PERCENT IMPERVIOUS AREA

33 UD SCS DIMENSIONLESS UNITGRAPH

TLAG 2.60 LAG

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UNIT HYDROGRAPH

175 END-OF-PERIOD ORDINATES

66.	133.	199.	309.	464.	619.	774.	972.	1171.	1370.
1601.	1867.	2132.	2397.	2749.	3103.	3457.	3842.	4262.	4682.
5103.	5459.	5813.	6167.	6470.	6713.	6957.	7200.	7338.	7471.
7603.	7687.	7709.	7731.	7753.	7734.	7711.	7689.	7619.	7486.
7354.	7221.	7068.	6913.	6758.	6594.	6417.	6240.	6063.	5846.
5625.	5403.	5164.	4899.	4633.	4368.	4142.	3921.	3700.	3505.
3351.	3196.	3041.	2906.	2773.	2640.	2516.	2406.	2295.	2184.
2100.	2019.	1939.	1858.	1777.	1697.	1616.	1548.	1481.	1415.
1348.	1282.	1216.	1149.	1102.	1058.	1014.	969.	925.	881.
837.	802.	769.	735.	702.	669.	636.	603.	577.	553.
528.	504.	480.	455.	431.	413.	396.	380.	363.	347.
330.	313.	300.	288.	276.	264.	252.	240.	227.	218.
209.	200.	191.	182.	174.	165.	158.	151.	144.	138.
131.	124.	118.	113.	108.	104.	100.	95.	91.	86.
83.	81.	78.	75.	73.	70.	67.	65.	62.	59.
57.	54.	51.	49.	46.	43.	41.	38.	36.	34.
32.	29.	27.	25.	23.	21.	18.	16.	14.	12.
10.	7.	5.	3.	1.					

TOTAL RAINFALL = 7.08, TOTAL LOSS = 3.92, TOTAL EXCESS = 3.16

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
7439.	11.75	(CFS)	6512.	3972.	2132.	2132.
		(INCHES)	1.291	3.150	3.165	3.165
		(AC-FT)	3229.	7878.	7916.	7916.

CUMULATIVE AREA = 46.90 SQ MI

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

HYDROGRAPH AT STATION BAS 2
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.25, TOTAL LOSS = 2.63, TOTAL EXCESS = 0.62

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
1167.	18.42	(CFS)	1156.	786.	421.	421.
		(INCHES)	0.229	0.623	0.625	0.625
		(AC-FT)	573.	1558.	1563.	1563.

CUMULATIVE AREA = 46.90 SQ MI

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

HYDROGRAPH AT STATION BAS 2
FOR PLAN 1, RATIO = 0.71

TOTAL RAINFALL = 5.03, TOTAL LOSS = 3.36, TOTAL EXCESS = 1.67

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
3488.	12.17	(CFS)	3224.	2101.	1126.	1126.
		(INCHES)	0.639	1.666	1.671	1.671
		(AC-FT)	1599.	4167.	4181.	4181.

CUMULATIVE AREA = 46.90 SQ MI

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

HYDROGRAPH AT STATION BAS 2
FOR PLAN 1, RATIO = 0.83

TOTAL RAINFALL = 5.90, TOTAL LOSS = 3.62, TOTAL EXCESS = 2.28

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
5057.	12.00	(CFS)	4537.	2861.	1534.	1534.
		(INCHES)	0.899	2.268	2.277	2.277
		(AC-FT)	2250.	5674.	5696.	5696.

CUMULATIVE AREA = 46.90 SQ MI

HYDROGRAPH AT STATION BAS 2
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.08, TOTAL LOSS = 3.92, TOTAL EXCESS = 3.16

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	44.92-HR
7438.	11.75	(CFS)	6512.	3972.	2132.	2132.
		(INCHES)	1.291	3.150	3.165	3.165
		(AC-FT)	3229.	7878.	7916.	7916.

CUMULATIVE AREA = 46.90 SQ MI

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              **************
              *            *
 34 KK        *   COMB 1   *
              *            *
              **************
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35 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          3  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
                  IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                  IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                  ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                  ISAV2        540  LAST ORDINATE PUNCHED OR SAVED
                 TIMINT      0.083  TIME INTERVAL IN HOURS

36 HC        HYDROGRAPH COMBINATION
                  ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
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HYDROGRAPH AT STATION COMB 1
FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	44.92-HR
2151.	24.75	(CFS)	2015.	1248.	677.	677.
		(INCHES)	0.082	0.204	0.207	0.207
		(AC-FT)	999.	2475.	2513.	2513.

CUMULATIVE AREA = 227.90 SQ MI

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

HYDROGRAPH AT STATION COMB 1
FOR PLAN 1, RATIO = 0.71

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	44.92-HR
7072.	20.92	(CFS)	7029.	4932.	2680.	2680.
		(INCHES)	0.287	0.805	0.818	0.818
		(AC-FT)	3485.	9783.	9947.	9947.

CUMULATIVE AREA = 227.90 SQ MI

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

HYDROGRAPH AT STATION COMB 1
FOR PLAN 1, RATIO = 0.83

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	44.92-HR
10300.	19.67	(CFS)	10181.	7396.	4020.	4020.
		(INCHES)	0.415	1.207	1.229	1.228

(AC-FT)	5049.	14669.	14922.	14922.

CUMULATIVE AREA = 227.90 SQ MI

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HYDROGRAPH AT STATION COMB 1
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	44.92-HR
15462.	17.00	(CFS)	15351.	11250.	6119.	6119.
		(INCHES)	0.626	1.836	1.869	1.869
		(AC-FT)	7612.	22314.	22715.	22715.

CUMULATIVE AREA = 227.90 SQ MI

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

					RATIOS APPLIED TO PRECIPITATION			
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2	RATIO 3	RATIO 4
					0.46	0.71	0.83	1.00
HYDROGRAPH AT	BAS 1	181.00	1	FLOW	1118.	4667.	6899.	10574.
				TIME	25.67	24.42	21.58	19.75
HYDROGRAPH AT	BAS 2	46.90	1	FLOW	1167.	3488.	5057.	7438.
				TIME	18.42	12.17	12.00	11.75
2 COMBINED AT	COMB 1	227.90	1	FLOW	2151.	7072.	10300.	15462.
				TIME	24.75	20.92	19.67	17.00
ROUTED TO	ROUTE	227.90	1	FLOW	2146.	7069.	10296.	15460.
				TIME	25.33	21.58	20.17	17.58
			** PEAK STAGES IN FEET **					
			1	STAGE	57.48	61.32	62.56	64.02
				TIME	25.33	21.58	20.17	17.58
HYDROGRAPH AT	BAS 3	8.70	1	FLOW	219.	753.	1111.	1653.
				TIME	16.17	10.58	10.50	10.33
2 COMBINED AT	COMB 2	236.60	1	FLOW	2321.	7513.	10904.	16358.
				TIME	25.00	21.33	19.83	16.75
HYDROGRAPH AT	BAS 4	42.70	1	FLOW	1055.	3000.	4314.	6306.
				TIME	19.00	13.00	12.75	12.58
2 COMBINED AT	COMB 4	279.30	1	FLOW	3296.	9929.	14236.	21616.
				TIME	24.75	20.17	18.42	15.00

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

HEC-2 INPUT/OUTPUT

MERCED RIVER
Swinging Bridge to Happy Isles Bridge

THIS RUN EXECUTED 04MAY98 17:13:13

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+++++++++++++++++++++++++++++++++
HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
+++++++++++++++++++++++++++++++++

T1      YOSEMITE NAT. PARK              DELLA BARR ASSOCIATES
T2      MERCED RIVER                    777 CAMPUS COMMONS RD. #200
T3      2-, 10-, 25-, & 100-YR          SACRAMENTO CA 95825
T4        FILE : 7MERCED
T5          MAY 6 ,98
T6      COMBINE X-SECTIONS AT CONF. OF MERCED R. & TENAYA CK.
T7      STARTING W S E FOR 2- AND 10-YR. ARE BASED ON SLOPE-AREA
T8      ELEV/STA FOR X-SECTIONS 30 TO 35 ARE BASED ON NEW TOPO DATED 4-15-98

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2                        0.000512                           3954.63

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1               -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38        1        26        42        8        4        14        43        13        15
      5       53        54

J5  LPRNT    NUMSEC                 ++++++++REQUESTED SECTION NUMBERS++++++++

    -10      -10
      4     6200   14750   30200   34313

QT        4      4500     10700     22000     25100
NC     0.06      0.06      0.04       0.3       0.5

X1   665750        18      1249      1530
GR     3976       600      3974       670      3972       720      3970       850      3968       980
GR   3967.8      1000    3955.9      1249    3953.7      1265    3945.4      1285    3945.1      1470
GR     3953      1530    3954.7      1760    3953.6      2170      3954      2450      3960      2700
GR     3966      2950      3968      3100      3970      3150


NC                                    0.3       0.5
NH        5      0.08       780      0.06      1061      0.04      1275      0.06      2625      0.08
NH     3035

        ++++++++++++++  SWINGING BRIDGE  +++++++++++++
        ++++++++++++++   DOWNSTREAM SECTION  +++++++++++++++++
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X1       1       49     1061     1275       65       65       65
    10
X4       3     3960      910     3953   1061.1     3953   1274.9
GR    3970      570     3969      600     3968      670     3965      780     3962      850
GR    3955     1000   3953.8     1020   3954.2     1052     3953     1061   3947.3     1073
GR  3947.5     1078     3945     1086     3947     1095     3947     1095     3947     1101
GR    3947     1101     3945     1115   3944.8     1149   3946.5     1155   3946.5     1155
GR  3946.3     1161   3946.8     1161   3943.4     1177   3941.5     1200     3942     1210
GR  3944.5     1215   3944.5     1215     3946     1221     3946     1221     3943     1244
GR  3943.5     1250     3943     1257     3953     1275   3953.5     1277     3954     1282
GR    3955     1295   3954.4     1303     3958     1368     3955     1450     3955     1485
GR    3950     1765     3952     1805     3952     1990     3950     2090     3950     2160
GR  3953.8     2440     3955     2625     3960     2815     3965     3035

X1     1.5                                  10       10       10
BT     -46      570     3970     3970      600     3969     3969      670     3968     3968
BT              780     3965     3965      850     3962     3962      910     3960     3960
BT             1000   3955.8   3955.8     1020   3956.3   3953.8     1052   3957.3   3954.2
BT             1061   3957.5     3953   1061.1   3957.3     3955     1073   3957.5     3955
BT             1078   3957.5     3955     1086   3957.5     3955     1095   3957.5     3947
BT             1101   3957.5     3947     1115   3957.5     3955     1149   3957.5     3955
BT             1155   3957.5   3946.5     1161   3957.5   3946.8     1177   3957.5   3943.4
BT             1200   3957.5     3955     1210   3957.5     3955     1215   3957.5   3944.5
BT             1221   3957.5     3946     1244   3957.5     3943     1250   3957.5     3955
BT             1257   3957.5     3955     1273   3957.5     3955   1274.9   3957.5     3955
BT             1275   3957.5     3953     1282   3957.5     3954     1295   3957.5     3955
BT             1303   3957.5   3954.4     1368     3958     3958     1450     3955     3955
BT             1485     3955     3955     1765     3950     3950     1805     3952     3952
BT             1990     3952     3952     2090     3950     3950     2160     3950     3950
BT             2440   3953.8   3953.8     2625     3955     3955     2815     3960     3960
BT             3035     3965     3965

X1       2                                  10       10       10
X2                                                         1

X1     2.5                                  10       10       10
    10

NC                              0.1      0.3
NH       5     0.08     1160     0.06     1880     0.04     2110     0.06     2620     0.08
NH    3370

       ******* CHANNEL INVERT ELEVS. ON X4 ARE TAKEN FROM COE PROFILE  *****
X1     3.0       26     1880     2110      350      480      475
X4       2     3945     1905     3945     2095
GR    3970     1000     3965     1130     3965     1160     3960     1250     3958     1300
GR    3957     1420     3955     1470   3950.9     1535     3953     1660   3954.1     1730
GR  3954.1     1745   3952.5     1880   3950.8     1905   3950.8     2090     3954     2110
GR    3955     2120     3951     2430     3951     2540     3954     2620     3955     2635
GR    3956     2910     3958     2950     3959     3040     3960     3065     3965     3150
GR    3970     3370
```

```
NH      5     0.08     1250     0.06     2085     0.04     2370     0.06     2540     0.08
NH   3260

X1    4.0       27     2085     2370      210      650      520
X4      2   3945.5     2145   3945.5     2255
GR   3970     1000     3965     1150     3965     1180     3960     1250     3955     1520
GR   3952     1580     3952     1615     3955     1890     3955     2085     3951     2140
GR   3951     2350     3955     2370     3955     2540     3956     2555     3957     2590
GR   3958     2645     3959     2685     3960     2705     3961     2810     3962     2830
GR   3963     2855     3964     2925     3965     2980     3966     3010     3967     3090
GR 3968.7     3160     3970     3250

NH      5     0.08     1355     0.06     2040     0.04     2405     0.06     2580     0.08
NH   3360

X1    5.0       31     2040     2405      220      630      420
X4      2     3946     2200     3946     2390
GR   3970     1000     3963     1225     3963     1265     3960     1355     3957     1445
GR   3956     1540     3955     1560     3953     1640     3955     1700     3955     1910
GR 3955.8     1945     3955     2010     3955     2040     3953     2050     3952     2070
GR   3952     2120   3951.3     2195   3951.3     2395     3952     2405     3952     2515
GR   3953     2580     3953     2635     3955     2650     3959     2730     3960     2805
GR   3965     2980     3967     3035     3968     3115     3969     3140     3970     3175
GR   3975     3360

NH      5     0.08     1460     0.06     1990     0.04     2180     0.06     2770     0.08
NH   3700

X1    6.0       44     1990     2180      330      400      555
X4      2   3946.8     2005   3946.8     2150
GR   3980     1000     3970     1115     3965     1230     3960     1385     3959     1460
GR   3959     1515     3958     1525     3957     1535     3956     1600     3955     1655
GR   3956     1760     3955     1820     3955     1845     3956     1850     3956     1990
GR   3955     1995   3951.7     2000   3951.7     2155     3952     2180     3953     2260
GR 3954.3     2285     3955     2315     3956.2     2430     3955     2510     3953     2530
GR   3953     2555   3955.5     2610     3955     2675     3952     2735     3952     2770
GR   3955     2870     3954     2885     3954     3020     3955     3035     3960     3115
GR   3961     3130     3963     3215     3965     3265     3966     3290     3967     3355
GR   3969     3435     3970     3455     3971     3515     3975     3700

NH      5     0.08     1465     0.06     1875     0.04     2235     0.06     2845     0.08
NH   3545


X1    7.0       48     1875     2235      640      240      515
X4      1   3947.5     1895   3947.5     2215
GR   3980     1000     3957     1465     3957     1490     3957     1540     3957.4     1655
GR   3958     1670     3958     1705     3957     1710     3955     1725     3952.1     1775
GR   3955     1805     3957     1835     3957     1875     3955     1880     3952.1     1890
GR 3952.1     2220     3954     2225     3955     2235   3955.8     2280     3955     2365
GR   3956     2460     3956     2500     3955     2520     3956     2545     3956     2555
GR   3955     2640     3953     2650     3953     2690     3957     2720     3957     2765
GR   3955     2845     3955     2915     3956     2930     3957     2970     3958     3025
```

```
GR     3959      3080      3960      3140      3961      3195      3962      3220      3963      3270
GR     3964      3285      3965      3350      3966      3365      3967      3415      3968      3465
GR     3969      3490      3970      3530      3971      3545

NH        4      0.08      1250      0.06      2195      0.04      2480      0.08      3800

       ################  CONFLUENCE WITH YOSEMITE CREEK  #########

X1      9.0        45      2195      2480       550       360       540
X4        2    3948.2      2225    3948.2      2450
GR     4000      1000      3960      1070      3957      1120      3957      1250      3957      1335
GR   3958.2      1330      3957      1370    3957.5      1445      3957      1485      3957      1535
GR     3958      1550    3958.5      1645    3958.5      1670      3958      1675      3955      1695
GR     3956      1710      3956      1755      3955      1770      3955      1830      3954      1840
GR     3954      1925      3955      1932    3957.5      2035      3955      2095      3957      2195
GR     3955      2205      3953      2220      3953      2455      3954      2465      3955      2470
GR     3957      2480      3957      2510      3958      2615      3959      3000      3960      3185
GR     3961      3240      3962      3340      3964      3405      3965      3450      3966      3460
GR     3967      3470      3968      3555      3969      3590      3970      3620      3975      3800

NH        4      0.08      1125      0.06      2150      0.04      2465      0.08      3635
       ########  WATER SURFACE ELEVS. OF 3964 & 3966.5 ON X5 CARD ARE  ######
       ########  BASED ON HIGH WATER MARKS FROM RES. ONE      ##############

X1      9.0        41      2150      2375       280       400       330
X4        2    3948.8      2185    3948.8      2335
X5        2                          3964    3966.6
GR     3980      1000      3960      1030      3958      1085      3958      1125      3958      1230
GR     3958      1255    3959.9      1335      3959      1365      3958      1480      3958      1595
GR     3956      1615      3956      1680      3957      1740      3957      1865      3955      1870
GR     3955      1880    3957.3      1950    3958.3      2020      3957      2045      3956      2060
GR     3955      2095      3956      2150      3955      2165      3954      2175    3953.4      2180
GR   3953.4      2340      3954      2350      3955      2355      3958      2375      3955      2390
GR   3953.4      2405    3953.4      2465      3955      2475      3957      2490      3958      2540
GR     3959      2750      3960      2890      3961      3155      3965      3340      3970      3465
GR     3975      3635

NC                                     0.3       0.5
NH        5      0.08       695      0.06      1086      0.08      1272      0.06      1560      0.08
NH     2630

       ###############       FOOTBRIDGE      ################
       ############### SUPERINTENDENT'S BRIDGE      ##################
       ############### DOWNSTREAM SECTION    ####################
NC                                     0.3       0.5
X1       10        52      1086      1272       440       580       430
X3       10
X4        1      3958       755
GR     3975       220      3970       360      3965       450      3964       540      3960       695
GR   3957.4      1000    3957.7      1036    3957.2      1066    3955.9      1073    3954.4      1086
GR   3953.5      1090    3953.1      1101    3951.5      1111      3952      1121    3958.5    1121.5
GR   3958.5    1123.5    3951.3      1124    3950.8      1134      3951      1148    3950.8      1159
GR   3958.5      1160    3950.5      1162      3951      1163    3950.3      1171    3950.2      1182
GR   3949.5      1197    3958.5    1197.5    3958.5    1199.5    3949.2      1200    3949.3      1208
```

```
GR   3950.1    1218   3951.4   1224   3952.5   1234   3958.5   1234.5   3958.5   1236.5
GR   3953.3    1237   3954.2   1259   3953.5   1272   3954     1282     3955.1   1293
GR   3954.8    1322   3957.5   1354   3957     1455   3954.8   1560     3958     1620
GR   3959      1640   3960     1675   3960     1810   3961.1   2065     3960     2220
GR   3960      2400   3963     2630

X1   10.1                                   10       10       10
BT   -36       220    3975     3975   363      3970     3970     450      3965     3965
BT              540    3964     3964   695      3960     3960     755      3958     3958
BT              1000   3957.4   3957.4 1036     3957.7   3957.7   1066     3957.2   3957.2
BT              1073   3955.9   3955.9 1086     3954.4   3954.4   1086.1   3960.5   3958.5
BT              1121.5 3960.5   3958.5 1123.5   3960.5   3958.5   1160     3960.5   3958.5
BT              1162   3960.5   3958.5 1197.5   3960.5   3958.5   1199.5   3960.5   3958.5
BT              1234.5 3960.5   3958.5 1236.5   3960.5   3953.5   1272     3960.5   3958.5
BT              1272.1 3960.5   3953.5 1282     3960.2   3954     1293     3957.3   3956.1
BT              1322   3957.7   3956.8 1354     3957.5   3957.5   1455     3957     3957
BT              1560   3954.8   3954.8 1620     3958     3958     1640     3959     3959
BT              1675   3960     3960   1810     3960     3960     2065     3961.1   3961.1
BT              2220   3960     3960   2400     3960     3960     2630     3963     3963

X1   10.2                                   10       10       10
X2                                                           1

X1   10.3                                   10       10       10

NC                                  0.1    0.3
NH      5    0.08   1335     0.06   1720     0.04     1845     0.06     2335     0.08
NH   2870

X1   11.0    39     1720     1845   180      390      265
X4      2    3951   1735     3951   1835
GR   3975    1000   3970     1100   3969     1115     3968     1180     3966     1210
GR   3965    1250   3963     1295   3963     1335     3960     1435     3957.5   1505
GR   3958.1  1570   3958.2   1665   3957     1695     3956.2   1720     3955     1730
GR   3955    1840   3957     1845   3957     1875     3956.2   1895     3956.2   1915
GR   3957    1945   3957     2000   3958.3   2035     3958     2100     3958.9   2125
GR   3958    2150   3958     2205   3957     2250     3957.7   2265     3957     2290
GR   3955.8  2290   3955.8   2335   3960     2360     3961     2395     3962     2480
GR   3963    2600   3964     2700   3964     2820     3964.2   2870

QT      4    2950   7035     14400  16360
NH      5    0.08   1320     0.06   1525     0.04     1700     0.06     2715     0.08
NH   3030

X1   12.0    27     1525     1700   210      420      300
X4      3    3966   1180     3951.2 1530     3951.2   1695
GR   3975    1000   3970     1100   3968     1135     3967     1155     3965     1210
GR   3964.2  1320   3964     1385   3960     1455     3959     1475     3958     1525
GR   3955.2  1560   3955.2   1685   3957.4   1700     3958.7   1865     3958.5   1935
```

```
GR    3957     1960     3957     2245     3958     2280     3958     2420     3958     2485
GR    3960     2520     3965     2600     3967     2670     3967     2715     3968     2810
GR    3969     2925     3970     3030

      ############### SENTINEL BRIDGE ##################
      ############### DOWNSTREAM SECTION ##################

NC                                 0.3      0.5
NH       6     0.08      905     0.06     1027     0.08     1200     0.06     1400     0.08
NH    1710     0.06     2270

X1    13.0       32     1027     1200      200      360      280
     10
X4       4     3965      905     3950   1065.1   3946.8     1107     3954   1172.9
GR    3975      640     3973      670     3970      740     3968      770     3967      850
GR    3965     1000     3965     1027     3959     1050   3955.3     1060     3950     1065
GR  3946.8     1075   3943.8     1080   3944.9     1090     3946     1100   3948.2     1130
GR  3948.2     1135   3949.2     1150     3951     1164     3954     1173     3957     1178
GR    3959     1185     3960     1200     3962     1240     3960     1305     3958     1400
GR    3957     1710     3957     1800     3959     1830     3959     2010     3960     2053
GR    3965     2135   3970.3     2270


X1    13.1                                 10       10       10
BT     -36      640     3975     3975      670     3973     3973      740     3970     3970
BT              770     3968     3968      850     3967     3967      905     3965     3965
BT             1000     3965     3965     1027     3965     3965     1050   3965.4     3959
BT             1060   3965.6   3955.3     1065   3965.7     3950   1065.1   3965.7   3956.2
BT             1075   3966.2     3958     1080   3966.2   3958.9     1090     3967     3960
BT             1100   3967.1     3961     1107   3967.1   3961.4     1120   3967.1   3961.5
BT             1135   3967.1     3961     1150     3967     3960     1164   3966.5     3958
BT           1172.9     3966   3956.5     1173     3966     3954     1178   3965.8     3957
BT             1185   3965.5     3959     1200     3964     3960     1240     3962     3962
BT             1305     3960     3960     1400     3958     3958     1710     3957     3957
BT             1800     3957     3957     1830     3959     3959     2010     3959     3959
BT             2050     3960     3960     2135     3965     3965     2270   3970.3   3970.3

NH       6     0.08      950     0.06     1028     0.08     1200     0.06     1400     0.08
NH    1710     0.06     2270

X1    13.2                                 25       25       25
X2                                                          1


X1    13.3       36     1028     1200       10       10       10
     10
GR    3975      660     3972      710     3970      770     3967      890     3965      950
GR    3965     1000   3964.2     1028     3960     1045     3955     1057     3951     1065
GR    3945     1075     3945     1086   3944.8     1100   3946.8     1120   3946.8     1130
GR  3948.4     1140     3949.8     1150   3951.6     1166   3951.2     1174     3954     1180
GR    3958     1183   3960.6     1193   3961.5     1200   3963.2     1227     3962     1240
GR    3960     1325     3958     1440     3958     1690     3957     1720     3957     1825
GR    3959     1845     3959     2055     3960     2080     3965     2140     3967     2210
GR  3970.3     2280
```

```
NH      5     0.08     1428     0.04     1712     0.06     1882     0.08     2432     0.06
NH   2840

NC                              0.1      0.3
X1     14       28     1428     1712      390      480      460
X4      2   3951.2     1535   3951.2     1690
GR   3978     1000     3975     1060     3970     1170     3965     1230     3962     1429
GR   3961     1432     3960     1438     3959     1442     3958     1460     3958     1518
GR   3955.1   1530   3955.1     1695   3956.5     1712     3956     1722     3956     1832
GR   3955.4   1998   3955.4     2040     3956     2045     3959     2060     3960     2077
GR   3961     2080     3961     2112     3960     2130     3959     2432     3959     2503
GR   3960.1   2740     3965     2815     3970     2840

NH      4     0.08     1640     0.04     2030     0.08     2265     0.06     3140

X1     15       40     1640     2030      450      400      395
X4      2   3951.5     1470   3951.5     1620
GR   3980     1000     3975     1010     3965     1035     3962     1070     3962     1265
GR   3962     1305     3962     1330     3962     1365     3960     1370     3959     1390
GR   3958     1430     3957     1440     3956     1450   3955.3     1465   3953.3     1525
GR   3957     1635     3958     1640   3958.2     1730   3958.7     1790   3958.5     1925
GR   3958     2020     3957     2030     3957     2075     3958     2090     3958     2210
GR   3960     2250     3962     2265     3962     2295   3961.4     2390     3962     2545
GR   3963     2560     3964     2590     3965     2725     3966     2740     3968     2790
GR   3969.2   2820     3969     2865     3970     2900     3975     3055     3980     3140

NC      0.08     0.08     0.04

X1     16       27     1060     1180      350      350      350
X4      2     3952     1080     3952     1160
GR   3980     1000     3965     1020     3962     1035     3962     1050     3960     1060
GR   3955.3   1075   3955.3     1165     3956     1170     3937     1175     3959     1180
GR   3959     1245   3959.8     1320   3959.9     1495     3960     1690     3961     1855
GR   3962     2050     3963     2135     3964     2180     3965     2190     3966     2195
GR   3956     2225     3965     2235     3965     2310     3966     2350   3969.7     2440
GR   3970     2575     3975     2695


X1     17       31     1110     1270      330      300      320
X4      2   3952.2     1130   3952.2     1255
GR   4000     1000     3960     1040     3965     1060     3962     1070     3961     1105
GR   3960     1110     3956     1120   3955.4     1125   3955.4     1260     3957     1270
GR   3957     1410   3955.4     1415   3955.4     1425     3959     1435     3960     1530
GR   3960.3   1610     3961     1740     3962     1920     3963     1980     3963     2085
GR   3964     2185     3965     2195     3966     2200     3966     2225     3965     2235
GR   3965     2410     3966     2440     3967     2590     3968     2645     3970     2655
GR   3974     2670
```

```
X1      18      39    1170    1370     400     300     395
X4       2  3952.3    1225  3952.3    1325
GR    4000    1000    3975    1125    3970    1130    3966    1140    3966    1165
GR    3965    1170    3960    1180    3958    1190    3957    1200    3956    1215
GR  3955.7    1220  3955.7    1330    3957    1345    3953    1360    3959    1370
GR    3960    1400    3959    1450  3955.7    1515  3955.7    1550    3957    1555
GR    3958    1645    3958    1670  3955.7    1685    3956    1690    3957    1705
GR    3960    1740    3961    1755    3962    1895    3963    2105    3964    2250
GR    3965    2270    3965    2300  3966.4    2335  3966.3    2440  3965.6    2550
GR    3967    2635    3968    2700    3970    2835    3975    3020

NC     0.1

X1      19      37    1865    2285     520     150     790
X4       2    3953    1885    3953    1935
GR    3985    1000    3980    1025    3975    1080    3970    1115    3969    1155
GR    3965    1175    3960    1185    3959    1195    3959    1220    3960    1245
GR    3960    1390    3961    1420  3961.4    1430    3961    1575    3960    1595
GR  3959.8    1685    3958    1730    3958    1760  3959.1    1800    3958    1865
GR    3956    1880    3956    1940  3957.9    1970    3956    2020    3956    2250
GR    3958    2270    3959    2285    3960    2320    3961    2330  3962.4    2395
GR    3962    2570    3965    2920    3967    2910    3958    3075    3959    3170
GR    3970    3285    3975    3560

NH      4     0.1    2000    0.04    2180    0.08    2745    0.06    3560

X1      20      37    2000    2180     190     740     550
X4       2  3953.7    2020  3953.7    2145
GR    3985    1000    3980    1035    3975    1090    3970    1160    3965    1185
GR    3961    1220    3960    1440    3962    1505    3962    1935    3961    1990
GR    3960    2000  3956.9    2015  3956.9    2150    3957    2155    3958    2180
GR  3959.5    2190    3958    2205    3958    2295    3960    2305    3961    2315
GR    3961    2355  3962.2    2375    3960    2405    3960    2490    3960    2555
GR    3961    2625  3964.3    2650    3964    2745    3965    2790    3966    2820
GR    3966    3080    3967    3115    3967    3190    3968    3330    3969    3390
GR    3970    3460    3972    3550

NH      4     0.1    1890    0.04    2070    0.08    2630    0.06    3760

X1      21      38    1890    2070     290     530     465
X4       2  3954.2    1930  3954.2    2050
GR    3985    1000    3980    1040    3975    1095    3970    1155    3967    1180
GR    3966    1220    3965    1235    3964    1275    3963    1290    3962    1540
GR    3961    1575    3962    1735    3962    1820    3961    1890    3960    1900
GR    3958    1915  3957.7    1925  3957.7    2055    3960    2065    3962    2070
GR    3962    2125    3961    2220    3961    2440    3962    2460    3963    2560
GR  3964.9    2630    3964    2655    3964    2745    3965    2810    3965    2885
GR  3967.6    3035  3966.1    3170  3968.5    3380    3967    3530    3967    3560
GR    3968    3625    3970    3650    3975    3760
```

```
NH      4      0.1     1830     0.04     1995     0.08     3030     0.06     3980

X1     22       29     1830     1995      310      455      425
X4      2     3955     1845     3955     1980
GR   3990     1000     3980     1085     3975     1165     3970     1255     3965     1375
GR   3954     1420     3963     1465     3963     1735     3952     1740     3961     1830
GR   3960     1835     3959.1   1840     3959.1   1955     3960     1990     3963     1995
GR   3963     2015     3963.7   2020     3962.9   2190     3963     2255     3964     2405
GR   3964     2590     3965     2610     3967     2900     3968.2   3020     3963.7   3120
GR   3969     3220     3970     3270     3970     3600     3975     3980

NC                              0.3      0.5
NH      4      0.1     1032     0.08     1179     0.04     2400     0.06     3275
        ################ CAMP 7 BRIDGE ################
        ######## ###### DOWNSTREAM CROSS-SECTION ##################

X1     23       55     1032     1179      200      140      210
     10
X4      1     3964      865
GR   4000      180     3980      350     3975      445     3970      575     3965      725
GR   3963.6    1000     3961.5    1017     3960.8    1027     3959.3    1027     3958.3    1032
GR   3956.5    1042     3955.5    1044     3955.2    1047     3955.3    1057     3955.7    1062
GR   3957      1065     3965.7    1066     3965.7    1070     3957.4    1071     3955.8    1073
GR   3955.2    1081     3954.8    1090     3955.5    1096     3955.4    1102     3965.7    1103
GR   3965.7    1107     3955.9    1108     3955.2    1122     3956.1    1136     3955.3    1140
GR   3965.7    1141     3965.7    1145     3956      1146     3955.6    1148     3955.6    1160
GR   3955.9    1171     3956.4    1179     3963.5    1185     3963.7    1190     3963.4    1207
GR   3962.9    1280     3963      1430     3965      1500     3962.2    1515     3965      1530
GR   3965      1785     3966      1875     3967      1960     3968      2100     3969      2175
GR   3969      2400     3970      2470     3971      2800     3972      2970     3975      3275

X1     23.1                                 10       10       10
BT    -37       180     4000      4000      350     3980     3980      445     3975     3975
BT              575     3970      3970      725     3965     3965      865     3964     3964
BT             1000     3963.6    3963.6    1017    3963.7   3961.5    1027     3967     3959.3
BT             1032     3967      3958.3    1032.1  3967     3965.7    1066     3967     3965.7
BT             1070     3967      3965.7    1103    3967     3965.7    1107     3967     3965.7
BT             1141     3967      3965.7    1145    3967     3965.7    1178.9   3967     3965.7
BT             1179     3967      3965.4    1185    3967     3963.5    1190     3963.7   3963.3
BT             1207     3963.4    3963.4    1280    3962.9   3962.9    1430     3963     3963
BT             1500     3965      3965      1515    3962.2   3962.2    1530     3965     3965
BT             1785     3965      3965      1875    3966     3966      1960     3967     3967
BT             2100     3968      3968      2175    3969     3969      2400     3969     3969
BT             2470     3970      3970      2800    3971     3971      2970     3972     3972
BT             3275     3975      3975
```

```
X1     23.2                                  9         9         9
X2                                                       1

X1     23.3                                 10        10        10
      10

NC                                     0.1       0.3
NH       4       0.1      1710      0.04      1965      0.08      3225      0.06      3880

X1      24        29      1710      1965        45       165       180
X4       3      3969      1465    3956.5      1725    3956.5      1930
GR    4000      1000      3990      1065      3985      1105      3980      1155      3975      1250
GR    3970      1420      3965      1550      3964      1635      3963      1650      3975      1710
GR    3960      1715    3959.8      1720    3959.8      1935      3960      1940      3964      1965
GR    3964      1990    3963.3      2060      3963      2200    3964.8      2280      3965      2520
GR    3966      2720      3966      2930      3967      2880      3968      2960      3963      3010
GR    3969      3115      3970      3205      3972      3615      3975      3880

NC    0.08      0.08      0.04

X1      25        32      1365      1550       590       170       665
                                                                   15
X4       2      3957      1380      3957      1485
GR    4000      1000      3985      1120      3984      1155      3981      1175      3980      1200
GR    3975      1295      3970      1350      3965      1365    3960.3      1375    3960.3      1490
GR    3961      1520      3962      1550    3962.5      1580      3962      1680      3964      1710
GR  3964.5      1750    3964.7      1910      3965      2110    3965.1      2480      3966      2585
GR    3967      2590      3967      2650      3966      2775      3967      2915      3968      2995
GR    3969      3025      3969      3170      3970      3225    3971.2      3360    3972.2      3545
GR  3973.4      3665      3975      3860

X1      26        24      1175      1405       650       120       435
                                                                   15
X4       2      3958      1200      3958      1390
GR    3975      1020      3975      1110      3973      1145      3972      1165      3970      1175
GR    3970      1175      3965      1185    3960.7      1195    3960.7      1395      3964      1405
GR  3964.1      1525      3965      1785    3965.1      1970      3966      2320      3967      2325
GR    3967      2400    3966.5      2725      3967      2825      3967      2870      3969      2905
GR    3969      3000      3970      3040      3971      3150      3975      3565

X1      27        31      1480      1670       390        90       380
                                                                   15
X4       3    3958.5      1560    3958.5      1645    3968.7      3095
GR    3979      1020      3975      1080      3972      1155      3972      1220      3970      1355
GR    3969      1480      3965      1490      3961      1555      3961      1650      3962      1660
GR    3963      1670      3964      1720      3965      1840    3965.3      2115      3966      2330
GR    3967      2340      3967      2425    3966.6      2675      3967      2780      3967      2920
GR    3967      3015      3970      3040      3969      3260      3969      3115      3970      3200
GR  3970.4      3265      3971      3325    3971.3      3445      3972      3495      3974      3615
```

```
GR    3975      3660

NC                      0.04      0.3       0.5

      ################ STONEMAN BRIDGE ################
      ################ DOWNSECTION CROSS-SECTION ##############
X1      28        50      1154      1395       310       220       245
                                                                    15
X4       1      3973       845
GR    3980       550      3977       670      3976       690      3975       710      3974       750
GR  3972.2      1000    3973.8      1154    3968.4      1185      3963      1207    3959.9      1215
GR  3958.7      1217    3958.6      1220    3958.5      1223    3958.5      1225      3960      1228
GR  3955.2      1242    3953.2      1248      3952      1254    3952.5      1253    3953.8      1280
GR  3954.4      1294    3956.8      1303    3957.8      1310    3958.5      1315      3962      1325
GR    3960      1333    3959.8      1335    3958.8      1338      3959      1340    3959.1      1341
GR  3962.1      1347    3973.5      1395      3973      1430      3972      1455      3971      1480
GR    3970      1520      3969      1570      3968      1665      3967      1635      3967      1940
GR    3967      2465      3967      2590      3959      2605      3970      2625      3959      2660
GR    3969      2695      3970      2760      3971      2920      3972      3050      3975      3185

X1    29.1                                      10        10        10
                                                                    15
BT     -51       550      3980      3980       670      3977      3977       690      3976      3976
BT               710      3975      3975       760      3974      3974       845      3973      3973
BT              1000    3972.2    3972.2      1154    3973.8    3973.8      1185    3974.1    3968.4
BT              1207    3974.9      3963      1215      3975    3958.9      1217    3975.1    3971.7
BT              1220    3975.1    3971.9      1223    3975.2    3971.5      1225    3975.3    3958.5
BT              1228    3975.5      3960      1242    3975.6    3955.2      1248    3975.7    3964.5
BT              1254    3975.9      3968      1263      3976      3970      1280      3976    3971.8
BT              1294      3976      3970      1303    3975.9      3958      1310    3975.9      3965
BT              1315    3975.8    3958.5      1325    3975.5      3962      1333    3975.1      3960
BT              1335    3975.1    3971.8      1338      3975      3972      1340      3975    3971.8
BT              1341    3974.9    3959.1      1347    3974.8    3962.1      1395    3973.5    3973.5
BT              1430      3973      3973      1455      3972      3972      1480      3971      3971
BT              1520      3970      3970      1570      3969      3969      1665      3968      3968
BT              1685      3967      3967      1940      3967      3967      2465      3967      3967
BT              2590      3967      3967      2605      3969      3969      2625      3970      3970
BT              2660      3969      3969      2695      3969      3969      2760      3970      3970
BT              2920      3971      3971      3050      3972      3972      3185      3975      3975

X1    28.2                                      40        45        45
X2                                                                   1

X1    28.3                                      10        10        10
```

```
NC                    0.04     0.1      0.3
X1      29      37    2370     2540     350     300     350
                                                      15
X4       2    3959    2405     3959    2520
GR    3985    1000    3980     1490    3975    1620    3968.3    1785    3972    1805
GR    3972    1845    3970     1855    3969.7  1910    3969.1    1975    3968.9  2080
GR    3968    2140    3966.5   2150    3968    2170    3968.2    2290    3968    2240
GR    3968    2300    3967     2370    3965    2390    3962      2400    3962    2525
GR    3965    2535    3966     2540    3967    2900    3967.5    3105    3967    3145
GR    3968    3585    3969     3610    3970    3620    3973      3640    3973    3655
GR    3970    3670    3970     3755    3971    3810    3972      3925    3973    4260
GR    3974    4220    3975     4270

NH       5    0.08    1460     0.06    2190    0.08    2795      0.04    2995    0.08
NH    4430

X1      30      38    2795     2995     135     350     560
                                                      15
X4      11    3968    2250     3968    2400    3967    2435      3967    2500    3966
X4    2555    3964    2670     3966    2690    3967    2710      3967    2750    3959.4
X4    2810    3959.4  2990
GR    3982    1000    3980     1090    3990    1330    3975      1460    3970    1505
GR    3971.7  1690    3969     1945    3967    1980    3968      1990    3968.5  2190
GR    3968.5  2190    3968.5   2190    3968.5  2190    3968.5    2190    3967.4  2770
GR    3967    2795    3965     2803    3962.3  2807    3962.3    2990    3965    2995
GR    3966    3020    3967     3055    3967.4  3200    3967      3400    3968    3590
GR    3969    3645    3970     3655    3971    3668    3972      3678    3975    3695
GR    3970    3715    3970     3850    3971    3865    3972      4005    3973    4150
GR    3973    4330    3974     4350    3975    4430

NC    0.08    0.08    0.04     0.3     0.5

        ################ AHWAHNEE BRIDGE ################
        ################ DOWNSTREAM SECTION ################
X1      31      59    3276     3433     460     460     500
                                                      15
X4      13    3969    2230     3969    2260    3968    2350      3967    2370    3967
X4    2410    3967    2470     3967    2650    3967    2870      3965    2940    3964
X4    2955    3963    3020     3962    3040    3971.5  3265.1
GR    3980    1000    3975     1400    3970    1540    3971      1615    3972    1655
GR    3970    1665    3969.7   1835    3969    1880    3967      1905    3968    1920
GR    3968.8  2185    3968.8   2185    3968.8  2185    3968.8    2185    3968.8  2185
GR    3968.8  2185    3968.8   2185    3968.8  3040    3962      3215    3967    3230
GR    3972.6  3260    3971.5   3265    3971.5  3270    3970.6    3276    3961.7  3283
GR    3961.5  3285    3961     3288    3960.5  3292    3959.7    3301    3960    3312
GR    3960.5  3316    3962     3319    3962.1  3321    3962.4    3329    3962.2  3331
GR    3961.9  3334    3960     3338    3959.8  3349    3959.7    3362    3960    3365
GR    3961    3368    3962     3371    3962.5  3375    3962      3378    3961.9  3380
GR    3961.7  3382    3959.7   3387    3959.7  3397    3959.9    3407    3960    3412
GR    3961    3415    3963     3417    3971.3  3433    3975      3475    3970    3480
GR    3970    3625    3972     3730    3973    4110    3975      4220
```

```
X1     31.1                                  10        10        10
                                                        15
BT     -65     1000      3980      3980      1400      3975      3975      1540      3970      3970
BT             1615      3971      3971      1655      3972      3972      1665      3970      3970
BT             1835      3969.7    3969.7    1880      3969      3969      1905      3967      3967
BT             1930      3968      3968      2185      3968.3    3968.8    2220      3969      3969
BT             2250      3969      3969      2250      3968      3968      2370      3967      3967
BT             2410      3967      3967      2470      3967      3967      2550      3967      3967
BT             2870      3967      3967      2940      3965      3965      2955      3964      3964
BT             3020      3963      3963      3040      3962      3962      3215      3962      3962
BT             3230      3967      3967      3250      3972.6    3972.6    3265      3974.6    3971.5
BT             3265.1    3974.8    3971.5    3270      3974.9    3971.5    3276      3975      3970.6
BT             3283      3975.2    3961.7    3285      3975.2    3967      3288      3975.3    3969
BT             3292      3975.4    3971      3301      3975.5    3972.5    3312      3975.6    3971
BT             3316      3975.7    3962.4    3319      3975.7    3967      3321      3975.8    3962.1
BT             3329      3975.9    3962.4    3331      3975.9    3967      3334      3976      3969
BT             3338      3976      3971      3349      3976      3973      3362      3976      3971
BT             3365      3976      3969      3368      3976      3967      3371      3976      3962
BT             3375      3976      3962.5    3378      3976      3962      3380      3976      3967
BT             3382      3976      3969      3387      3976      3971      3397      3976      3972.8
BT             3407      3975.9    3971      3412      3975.9    3969      3415      3975.9    3967
BT             3417      3975.9    3963      3433      3975.7    3971.3    3475      3975      3975
BT             3480      3970      3970      3625      3970      3970      3730      3972      3972
BT             4110      3973      3973      4220      3975      3975

X1     31.2                                  42        42        42
X2                                                      1

X1     31.3                                  10        10        10
                                                        15

NC                                     0.1       0.3
NH       5     0.08      1400      0.06      2180      0.08      3475      0.04      3640      0.08
NH    3790

X1      32       37      3475      3640       290       530       375
                                                        15
X4      21     3969      2350      3968      2390      3967      2430      3967      2465      3967
X4    2590     3967      2710      3968      2850      3968      2910      3967      2990      3966
X4    3000     3966      3050      3966      3060      3967      3070      3967      3090      3964
X4    3110     3962      3030      3965      3160      3967      3180      3967      3220      3959.9
X4    3495   3959.9      3625
GR    3980     1000      3975      1400      3970      1510      3970      1670      3971.7    1700
GR    3970     1740      3969      1885      3967.5    1910      3968      1925      3968      2010
GR    3969     2035      3968.6    2185      3968.6    2185      3968.6    2185      3968.6    2185
GR  3968.6     2185      3968.6    2185      3968.6    2185      3968.6    2185      3968.6    2185
GR  3968.6     2185      3970      3250      3970      3295      3964.9    3345      3968      3395
GR  3968.5     3450      3968      3475      3965      3485      3962.7    3490      3962.7    3630
GR    3965     3635      3970      3638      3971      3640      3972      3655      3973      3690
GR    3974     3760      3975      3790
```

```
NH      5     0.08     1360     0.06     2330     0.08     3470     0.04     3610     0.08
NH   3680

X1     33       35     3470     3610       90      290      265
                                                            15
X4     21     3969     2375     3968     2420     3967     2450     3967     2470     3967
X4   2530     3967     2620     3968     2840     3968     2953     3968     3053     3963
X4   3080     3965     3110     3965     3120     3966     3130     3966     3140     3964
X4   3150     3963     3180     3962     3190     3963     3210     3969     3220     3968
X4   3165     3960     3180
GR   3980     1000     3975     1360     3970     1630     3970     1685     3971.8     1710
GR   3970     1735     3968     1765     3971.1     1805     3969     1860     3969     2120
GR   3968.4     2150     3969     2190     3969     2330     3969     2330     3969     2330
GR   3969     2330     3969     2330     3969     2330     3969     2330     3969     2330
GR   3970     3240     3972     3255     3972     3275     3970     3290     3967     3310
GR   3967     3470     3965     3475     3963     3480     3963     3600     3965     3605
GR   3970     3610     3972     3615     3973     3625     3974     3640     3975     3660

NC                                0.3      0.5
NH      5     0.08     1280     0.06     2375     0.08     3411     0.04     3576     0.08
NH   3703

        ################  SUGAR PINE BRIDGE  ################
        ################  DOWNSTREAM SECTION  ################

X1     34       43     3411     3576      380      600      425
                                                            15
X4     14     3968     2480     3968     2540     3969     2720     3969     2750     3969
X4   2850     3969     2880     3969     3060     3969     3090     3968     3140     3967
X4   3150     3966     3170     3965     3200     3965     3230     3966     3250
GR   3980     1000     3975     1280     3971     1485     3971     1700     3972     1715
GR   3972     1740     3970     1755     3968.5     1770     3970     1780     3970.9     1885
GR   3970     2040     3970     2300     3969     2375     3969     2375     3969     2375
GR   3969     2375     3969     2375     3967     3290     3975     3335     3978     3350
GR   3978     3390     3978     3411     3977     3420     3974.8     3425     3970     3435
GR   3962.8     3445     3961.9     3450     3961.2     3456     3960.6     3468     3960.2     3480
GR   3960     3489     3960.5     3493     3960.8     3497     3961.3     3503     3961.7     3517
GR   3962.2     3530     3962.1     3540     3962.1     3545     3972     3548     3977     3567
GR   3977.8     3574     3979.2     3576     3979.6     3703

X1   34.1                                       10       10       10
                                                            15
BT    -53     1000     3980     3980     1280     3975     3975     1485     3971     3971
BT            1700     3971     3971     1715     3972     3972     1740     3972     3972
BT            1755     3970     3970     1770     3968.5     3968.5     1780     3970     3970
BT            1885     3970.9     3970.9     2040     3970     3970     2300     3970     3970
BT            2375     3969     3969     2480     3968     3968     2540     3968     3968
BT            2720     3969     3969     2750     3969     3969     2850     3969     3969
BT            2880     3969     3969     3060     3969     3969     3090     3969     3969
BT            3140     3968     3968     3150     3967     3967     3170     3966     3966
BT            3200     3965     3965     3230     3965     3965     3250     3966     3966
BT            3290     3967     3967     3335     3975     3975     3350     3978     3978
```

```
BT              3390     3978     3978     3411     3978     3977.5   3420     3979.2   3977
BT              3425     3979.5   3974.8   3435     3979.6   3970     3445     3979.8   3962.8
BT              3450     3979.9   3969     3456     3980     3971     3468     3980     3973.4
BT              3480     3980.1   3975     3489     3980.2   3975.8   3493     3980.3   3975.9
BT              3497     3980.3   3975.8   3503     3980.4   3975.4   3517     3980.5   3974
BT              3520     3980.8   3971.5   3540     3980.8   3967.6   3545     3980.7   3962.1
BT              3548     3980.7   3972     3557     3980.6   3977     3574     3980.6   3977.8
BT              3576     3980.5   3979.2   3703     3979.6   3979.6

X1    34.2                                 42       42       42
X2                                                          1


X1    34.3                                 10       10       10
                                                            15

NC                                 0.1      0.3
NH       5     0.08     1750     0.06     2445     0.08     3000     0.04     3275     0.08
NH    3345

      ################  CONFLUENCE WITH TENAYA CREEK  ################

X1       35       28     3000     3275      240      430      460
                                                            15
X4        9     3969     2510     3970     2550     3970     2590     3970     2730     3970
X4     2820     3970     2830     3971     2940     3960.8   3085     3960.8   3245
GR     3980     1000     3975     1210     3973     1290     3973     1425     3972     1510
GR     3972     1750     3973     1780     3970     1850     3969     1865     3970     1875
GR     3971     1905     3973.8   2010     3971.7   2240     3971     2370     3971     2445
GR     3971     2445     3971     2445     3972     3000     3971     3030     3970     3060
GR     3969     3070     3968.5   3080     3968.5   3250     3969     3255     3970     3260
GR     3975     3275     3980     3320     3985     3345
       4    2650    5300    9000   10225

NH       6     0.08     1735     0.06     2145     0.08     2765     .055     2930     0.08
NH     2990     0.08     3985

X1       36       59     2765     2930      270      430      420
                                                            15
X3                                       2535     3975
X4        4     3961     2790     3961     2905     3967.2   3608.1   3966.3   3640.9
GR     3980     1000     3975     1420     3971.6   1735     3973.8   1785     3971     1820
GR     3973     1830     3974     1870     3974     2145     3971     2300     3972     2340
GR     3973     2375     3974     2405     3975     2445     3975     2535     3974     2595
GR     3973     2620     3970     2665     3967     2700     3966     2765     3965     2775
GR     3964     2780     3970     2915     3971     2920     3972     2930     3973     2960
GR   3973.5     2990     3973     3020     3972     3130     3972     3185     3971     3310
GR     3971     3375     3972.3   3415     3972     3525     3972     3560     3970.8   3579
GR   3969.2     3595     3968.9   3604     3967.5   3604     3967.2   3608     3967     3613
GR     3965     3616     3963.4   3630     3964.7   3635     3966.3   3641     3966.2   3645
GR     3967     3649     3969.2   3651     3970.8   3666     3971.8   3676     3972     3695
GR     3972     3705     3973     3750     3974     3785     3975     3850     3976     3875
GR     3977     3895     3978     3935     3979     3965     3980     3985
```

```
NC     0.08      0.08      .055

X1     36.5        33      1078      1295       360       350       350
X4        5    3964.5      1140    3964.5      1250      3968      1955      3968      2035    3973.5
X4     2385
GR     3976      1000      3975      1025      3974      1055      3973      1075      3972      1105
GR     3971      1110      3973      1130      3969      1135      3970      1155      3971      1185
GR     3972      1275      3973      1295      3974      1295      3975      1370      3974      1350
GR     3973      1718      3973      1940      3971      1945      3970      1950      3969      1960
GR   3970.7      2040      3971      2045      3972      2050      3973      2055      3974      2080
GR   3974.2      2230      3974      2300      3974      2495      3975      2515      3976      2540
GR     3977      2560      3978      2615      3980      2635

X1       37        43      1680      1820       190       140       185
                                                                    15
X3                                       1650      3978
       2  3962.2    1710  3962.2    1800
X4        4      3967      1710      3967      1820    3968.5      2470    3968.5      2535
GR   3977.5      1000      3977      1015      3976      1100      3975      1135      3974      1140
GR     3975      1150      3975      1260      3975      1280      3977      1375      3976      1490
GR     3975      1525      3975      1550      3976      1575      3977      1595      3978      1620
GR     3978      1650      3977      1670      3975      1680      3978      1695      3969      1720
GR     3970      1800      3971      1805      3974      1820      3975      1825      3975      1885
GR     3976      1915      3975      2075      3974      2195      3974      2335      3973      2455
GR   3971.2      2465    3971.2      2540      3972      2560      3973      2565      3974      2575
GR     3974      3030    3973.9      3100      3974      3195      3975      3235      3976      3260
GR     3977      3275      3978      3290      3980      3330

X1     37.5        41      1165      1315       220       220       220
                                                                    15
X3                                                          2355    3975.6
X4        6    3968.5      1188    3968.5      1270      3977      1435      3969      1955      3969
X4     2050    3975.3      2355
GR     3980      1000      3979      1010      3978      1030      3978      1095      3977      1165
GR     3975      1170      3975      1172      3974      1175      3973      1178      3970      1182
GR   3968.5      1275      3969      1278      3970      1282      3971      1285      3973      1290
GR     3974      1295      3975      1315      3976      1325      3977      1390      3977      1390
GR   3977.5      1415      3976      1510      3975      1660      3974      1925    3971.5      1950
GR   3971.5      2055      3972      2080      3973      2090      3974      2110    3974.6      2155
GR     3975      2205      3975      2400      3974      2585      3974      2695      3975      2750
GR     3976      2760      3977      2790      3978      2800      3979      2820      3980      2835
GR     3985      2900

QT        4      2650      5300      9000     10225
X1       38        13      1080      1225       240       245       245
       2  3963.4    1120  3963.4    1215
X4        2      3969      1120      3969      1215
GR     3981      1000      3980      1060      3979      1080      3976      1095      3970      1105
GR     3970      1195      3972      1205      3973      1219      3975      1225      3976      1235
GR     3977      1245      3978      1255      3979      1280
```

```
NC                                  0.3       0.5

        ##############  CLARK BRIDGE  ##############
        ##############  DOWNSTREAM SECTION  ##############

X1      39        29        1021      1270      295       310       300
                                                                     15
X3      10
GR   3984.3     1021      3981.5     1051      3979.9     1059      3974.8     1070      3974.7     1071
GR   3974.6     1074      3974.5     1077      3974.3     1078       3974      1083       3970      1085
GR    3968      1091      3966.3     1093      3965.8     1100      3965.5     1107      3965      1120
GR    3965      1134      3966.6     1148      3968.7     1154      3970.5     1161      3971      1166
GR    3974      1179      3974.1     1180      3974.1     1183      3974.2     1186      3974.2     1187
GR   3980.2     1203      3980.9     1207      3980.7     1222       3984      1270       3983      1321

X1     39.1                                     10        10        10
X3      10
BT     -30      1021      3984.3     3984.3     1051      3984.9     3981.5     1059       3985      3979.9
BT              1070      3985.2     3974.8     1071      3985.3      3983      1074      3985.3     3983.5
BT              1077      3985.4      3983      1078      3985.4     3974.3     1083      3985.5      3974
BT              1085      3985.5      3970      1091      3985.7      3968      1093      3985.7     3972.3
BT              1100      3985.8      3978      1107      3985.9     3980.9     1120      3986       3983
BT              1134      3986.1      3983      1148       3985      3981      1154      3986       3979
BT              1161      3985.9     3975.5     1166      3985.8      3971      1179      3985.7      3974
BT              1180      3985.7      3983      1183      3985.6     3983.5     1186      3985.6      3983
BT              1187      3985.6     3974.2     1203      3985.4     3980.2     1207      3985.3     3980.9
BT              1222      3984.9     3980.7     1270       3984      3984      1321       3983      3983

X1     39.2                                     42        42        42
X2                                                                    1
X3      10

QT      4       2650      5300      9000      10225
NC     0.04
X1     39.3      30       1019      1230       10        10        10
                                                                     15
X3                                   920      3983
GR    3981      380       3981      750       3982      815       3983      920       3983.7     1000
GR   3984.2     1019      3982      1065      3979.4     1074      3978      1078      3974      1086
GR   3974.5     1093      3975.4     1100      3973.8     1100      3972      1105      3966      1109
GR   3965.2     1119      3965.7     1129      3965.5     1139      3966.7     1151      3967.5     1173
GR   3967.7     1180      3968.7     1183      3972.8     1185      3972.7     1190      3974.5     1193
GR   3974.5     1203      3976      1205      3981      1215      3982.2     1223      3984.5     1230

NC     0.08      0.08      .065      0.1       0.3
```

```
X1     39.5       18      1770      1925       65       40       50
                                                                 15
X3                                  1620     3983
X4        2     3970      1820      3970     1915
GR     3982     1000      3981      1030     3981     1500     3982     1600     3983     1620
GR     3982     1650      3982      1730     3981     1755     3980     1770     3979     1790
GR     3978     1795      3976      1805     3975     1810     3973     1815     3975     1920
GR     3980     1925      3985      1935     3987     1945

X1       40       15      1045      1245      220      245      235
                                                                 15
         2  3967.2    1095  3967.2    1235
X4        2   3971.5      1095    3971.5     1235
GR   3984.5      920      3984       940     3983      960   3983.5     1000     3983     1015
GR     3982     1025      3980      1045     3979     1060     3975     1075     3973     1083
GR     3974     1240      3980      1245     3985     1270     3990     1280     3995     1210

X1       41       25      1478      1785      520      330      460
                                                                 15
X3                                  1430   3987.5
         2    3973    1495    3973    1555
X4        2     3976      1495      3976     1555
GR     3988     1000    3988.5      1012     3988     1025     3987     1105     3985     1145
GR     3983     1160      3983      1218     3982     1225     3982     1265     3985     1290
GR     3987     1330      3988      1365   3987.5     1430     3985     1478     3973     1505
GR     3978     1560      3980      1570     3980     1665     3979     1710     3978     1720
GR     3978     1760      3979      1765     3980     1770     3985     1785     3990     1810

NH        4      0.1      1295      0.08     1995     .065     2210     0.08     2265

X1       42       27      1995      2210      600      310      370
                                                                 15
         2    3977    2025    3977    2185
X4        2     3979      2025      3979     2185
GR   3998.5     1000      3996      1170     3994     1295     3993     1320     3991     1335
GR     3991     1365      3992      1395     3992     1480     3993     1505     3994     1610
GR   3994.5     1690      3994      1715     3993     1760     3992     1835     3991     1885
GR     3990     1920      3989      1940     3987     1975     3985     1995     3980     2020
GR   3981.3     2190      3983      2195     3984     2200     3985     2210     3986     2215
GR     3990     2230      4000      2265

QT        4     2650      5130      8847     9744
NH        4      0.1      1195      0.08     2070     .065     2230     0.08     2260

X1       43       25      2025      2230      345      390      390
                                                                 15
         2    3981    2085    3981    2200
X4        2   3982.5      2085    3982.5     2200
GR     4003     1000      4001      1150     4000     1195     3998     1250     3997     1275
GR     3996     1290      3994      1295     3994     1320     3996     1330     3996     1425
GR     3997     1450      3997      1540     3996     1600     3994     1725     3991     1935
GR     3990     1965      3988      2025     3987     2040     3985     2070     3981     2080
```

```
GR   3983.5     2205     3985     2210     3990     2220     3995     2250     4000     2260

NH       4      0.1     1225     0.08     1970     .065     2290     0.08     2330

X1      44       35     1970     2290      240      380      370
                                                           15
      2   3995   2165   3985   2270
X4       2     3986     2065     3986     2270
GR   4003.5     1020     4003     1040     4002     1140     4001     1225     4000     1250
GR    4000     1280     3997     1320     3996     1340     3995     1350     3996     1360
GR    3999     1375     4000     1390     4000     1425     3999     1430     3998     1530
GR    3997     1595     3996     1675     3994     1715     3994     1890     3993     1970
GR    3988     1980     3987     1985     3987.5   2000     3988     2050     3988     2085
GR   3986.5    2095    3986.5    2115     3988     2125     3988     2145     3986     2150
GR    3986     2275     3987     2285     3990     2290     3995     2305     4000     2330

NH       4      0.1     1285     0.08     1935     .065     2290     0.08     2475

X1      45       35     1935     2290      130      450      390
                                                           15
GR   4004.5     1000     4004     1055     4002     1180     4002     1230     4003     1255
GR    4003     1285     3999     1335     3999     1350     4001     1375     4001     1405
GR    3999     1480     3999     1565     3996     1700     3996     1755     3997     1810
GR    3997     1890     3995     1935     3994     1945     3990     1960     3989     1965
GR    3989     2115     3990     2130     3992.6   2150     3990     2205     3989     2208
GR    3989     2250     3990     2265     3995     2285     3995     2330     3994     2355
GR    3995     2370    3996.5    2390     3997     2420     4000     2445     4005     2475

NH       4      0.1     1235     0.08     1790     .065     2120     0.08     2200

X1      46       35     1790     2120      140      165      165
                                                           15
X3                              1790     3997
GR   4007.5     1000     4004     1035     4003     1100     4002     1150     4003     1175
GR    4005     1205     4005     1215     4004     1235     4000     1290     4000     1325
GR    4001     1335     4001     1495     4000     1525     3998     1570     3997     1665
GR    3995     1720     3994     1735     3997     1790     3996     1815     3992     1825
GR   3992.5    1910     3993     1925     3993.9   1940     3993     1955     3992     1975
GR    3991     1978     3991     1995     3994     2010     3992     2030     3991     2045
GR    3991     2105     3994     2110     3995     2115     4000     2150     4002     2195

NH       4      0.1     1265     0.08     1795     .065     2055     0.08     2105

X1      47       30     1795     2070      150      140      160
                                                           15
X3                              1795     4020
X4       2     3993     1865     3993     2035
      2   3992   1865   3992   2035
GR   4005.5     1000     4005     1030     4004     1055     4003     1080     4003     1110
GR    4005     1180     4005     1190     4003     1210     4002     1255     4000     1285
GR    4000     1305     4002     1395     4001.5   1450     4001     1530     3998     1565
GR    3998     1585     3999     1600     3999     1660     4002.5   1715     4003     1735
GR    4000     1795     3999     1810     3995     1835     3994.7   1860     3994     2040
GR    3995     2045     3996     2055     4000     2070     4005     2080     4007     2105
```

```
NH      4       0.1     1265    0.08    1975    .065    2070    0.08    2110

X1     48        36     1975    2070     240     325     315
                                                         15
X3                              1785    4006
X4      2    3997.5     2015  3997.5    2050
      2   3993   2015   3993   2050
GR   4007      1000    4005    1065    4005    1100    4006    1150    4006    1130
GR   4005      1215    4004    1255    4000    1330    4005    1370    4006    1385
GR   4006      1420    4005    1475    4001    1520    4001    1540    4006    1535
GR   4006      1655    4007    1665    4006    1685    4005    1700    4006    1720
GR   4006      1785    4005    1790    4004    1810    4005    1850    4004    1865
GR   4003      1875    4003    1905    4002    1925    4002    1960    4000    1975
GR   3995      2010    4000    2055    4001    2060    4005    2070    4010    2075
GR   4015      2110

NH      4       0.1     1210    0.08    1760    .065    1850    0.08    2070

X1     49        31     1760    1850     245     480     430
                                                         15
X3                              1510   4011.35
X4      3      4008     1580    4003     1783    4003    1830
      3   4008   1580  3997.5   1783  3997.5   1830
GR  4011.5     1000    4011    1060    4010    1150    4009    1210    4008    1260
GR   4005      1310    4003    1320    4003    1330    4005    1345    4010    1400
GR   4010      1460    4011    1475    4011    1545    4009    1565    4009    1605
GR   4010      1660    4009    1710   4010.5   1740    4010    1750   4003.7   1778
GR  4003.7     1835    4004    1838    4005    1840    4006    1850    4007    1870
GR   4008      1900    4009    1930    4010    1950    4011    1970    4011    2010
GR   4015      2070

NC   0.08       0.08    .065

X1     50        27     1600    1735     230     280     285
                                                         15
X3                              1535   4015.5
X4      2      4007     1645    4007     1695
GR  4015.5     1000    4015    1040    4013    1080    4013    1095    4015    1150
GR   4010      1190    4007    1305    4007    1315    4010    1330    4012    1410
GR   4012      1445    4015    1500    4015    1560    4014    1575    4013    1590
GR   4012      1620    4010    1630    4005    1640   4007.5   1700    4010    1725
GR   4012      1715    4013    1725    4014    1735    4015    1770    4016    1825
GR   4017      1835    4018    1865

NC                     .065     0.3     0.5
QT      4      2650    5300    9000   10225

        ++++++++++++++  HAPPY ISIES BRIDGE  ++++++++++++++
        ++++++++++++++  DOWNSTREAM SECTION  ++++++++++++++++
```

```
X1      51      46    1040    1163     310     260     290
                                                      15
X4       2  4008.5   797.9    4026     955
GR    4020     700    4020     765    4021     792  4008.5   792.1  4008.5   793.5
GR  4008.5     795  4008.5   796.5    4021     798    4023     855    4024     920
GR    4027     983    4025    1007  4023.2    1016    4020    1030  4016.3    1039
GR  4016.3    1040  4016.3    1041  4016.3    1043  4016.3    1046  4016.3  1046.5
GR  4016.3    1047  4015.7    1052    4013    1061    4009    1063  4009.3    1065
GR  4003.2    1072  4007.5    1080  4007.7    1092  4007.3    1113  4007.5    1119
GR    4027    1127  4007.5    1135  4007.3    1139  4009.5    1143  4010.8    1145
GR  4014.3    1152  4015.5    1153  4016.3    1154  4016.3    1155  4016.3    1159
GR  4015.3    1162  4016.3    1163  4018.8    1170  4022.7    1179  4024.8    1188
GR    4027    1214

X1    51.1                          10      10      10
                                                      15
BT     -48     700    4020    4020     765    4020    4020     792    4021    4021
BT           792.1    4021  4014.5   793.5    4021    4015     795    4021  4015.5
BT           796.5    4021    4015   797.9    4021  4014.5     798    4021    4021
BT             855    4023    4023     920    4024    4024     955    4026    4026
BT             983    4027    4027    1007  4027.8    4025    1016    4028  4023.2
BT            1030  4028.3    4020    1039  4028.5  4016.3    1040  4028.6    4025
BT            1041  4028.6  4025.7    1043  4028.7  4026.3    1046  4028.8    4026
BT          1046.5  4028.8  4025.5    1047  4028.9  4016.3    1052    4029  4015.7
BT            1061  4029.1    4013    1063  4029.1    4009.2    1065  4029.2    4016
BT            1072  4029.3    4021    1080  4029.3    4024    1092  4029.4  4026.3
BT            1107  4029.4  4026.3    1119  4029.3  4024.1    1127  4029.2  4021.5
BT            1135  4029.1  4017.5    1139    4029  4007.7    1143  4028.9  4008.5
BT            1145  4028.9  4010.8    1152  4028.8  4014.3    1153  4028.7  4016.5
BT            1154  4028.7  4016.3    1155  4028.6  4025.3    1159  4028.5  4026.3
BT            1162  4028.4    4025    1163  4028.3  4016.3    1170  4028.2  4018.8
BT            1179  4027.9  4022.7    1188  4027.7  4024.8    1214    4027    4027

X1    51.2                          40      40      40
X2                                                     1

X1    51.3      34     988    1179      10      10      10
                                                      15
X4       6    4021     792  4008.5   792.1  4008.5   793.5  4008.5     795  4008.5
X4   796.5    4026     955
GR    4020     700    4020     765    4021     798    4023     855    4025     920
GR  4027.4     988  4024.7    1002  4017.7    1013  4017.2    1022  4016.7    1024
GR  4016.7    1033  4008.8    1035  4004.2    1048  4004.3    1051    4005    1058
GR  4006.3    1067  4008.8    1078  4009.8    1092  4010.3    1100  4010.3    1107
GR  4009.5    1115  4007.8    1123    4010    1124  4011.5    1130    4014    1131
GR  4014.2    1135  4016.3    1139  4016.2    1149  4016.5    1151    4018    1152
GR  4019.5    1159    4024    1168    4026    1172    4028    1179
```

```
NC      0.1       0.1       0.1       0.1       0.3
X1       52        20      1615      1725       100        70       100
                                                                       15
X4        2      4011      1625      4011      1635
GR     4024      1000      4023      1035      4022      1110      4022      1245      4023      1333
GR     4023      1535      4022      1590      4020      1635      4019      1615      4015      1115
GR  4012.7      1620   4012.7      1700      4015      1710      4013      1725      4019      1740
GR     4020      1750      4022      1790      4023      1815      4024      1855      4025      1865

X1       53        22      1355      1480       140       140       145
                                                                       15
X3                                   1220    4024.5
X4        2      4013      1420      4013      1455
GR     4027      1000      4026      1100      4025      1130      4024      1205      4024      1230
GR   4024.5      1320      4024      1330      4024      1355      4019      1370      4018      1335
GR     4017      1415      4017      1460      4018      1470      4020      1475      4021      1490
GR     4022      1455      4023      1535      4024      1520      4025      1530      4026      1555
GR     4027      1590      4030      1620

X1       54        11      1060      1180       170       155       170
                                                                       15
X4        2    4015.5      1080    4015.5      1140
GR  4030.5      1000      4030      1035      4025      1060    4020.5      1075    4020.5      1145
GR     4023      1160      4024      1170      4025      1180      4030      1210      4031      1230
GR     4035      1270
```

T1
T2
T3 10-YEAR EVENT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	3			0.000250				3959.36	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLOC	IBW	CHNIM	ITRACE
	2		-1							

T3 25-YEAR EVENT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	4			0.000143				2954.50	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLOC	IBW	CHNIM	ITRACE
	3		-1							

T3 100-YEAR

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FD
	-10	5			0.000143				3965.61	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLOC	IBW	CHNIM	ITRACE
	15		-1							

THIS RUN EXECUTED 04MAY98 17:13:54

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

2-, 10-, 25-, & 100-YR

SUMMARY PRINTOUT

	SECNO	CWSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLOB	QROB	10*WS	SSTA	ENDST
	665750.000	3952.44	2.82	3945.10	7.34	257.76	4500.00	4500.00	.00	.00	5.12	1263.33	1525.79
	665750.000	3957.24	2.76	3945.10	12.14	1363.75	7995.52	10700.00	5.55	2698.93	2.47	1221.26	2554.81
	665750.000	3962.17	2.70	3945.10	17.07	1672.33	11562.54	22000.00	253.31	10179.15	1.41	1117.90	2790.23
	665750.000	3963.01	2.79	3945.10	17.91	1725.17	12619.85	25100.00	361.02	12119.13	1.40	1120.23	2825.41
	1.000	3952.51	2.56	3941.50	11.01	932.90	3972.85	4500.00	.00	527.15	3.46	1062.21	2345.27
*	1.000	3957.31	2.15	3941.50	15.81	1723.07	5534.95	10700.00	135.00	5030.05	1.26	958.41	2712.79
	1.000	3962.22	2.18	3941.50	20.72	2067.52	7895.50	22000.00	736.17	13368.32	.82	844.97	2912.49
	1.000	3963.06	2.26	3941.50	21.56	2124.41	8607.53	25100.00	934.18	15558.29	.83	825.25	2949.66
*	1.500	3952.48	3.63	3941.50	10.98	928.91	3475.02	4500.00	.00	1024.98	13.97	1062.28	2343.07
*	1.500	3957.32	1.66	3941.50	15.82	1723.79	2014.34	10700.00	29.84	8655.82	3.82	958.29	2713.06
*	1.500	3962.23	1.20	3941.50	20.73	2067.60	2673.70	22000.00	493.19	18833.12	1.68	844.94	2912.54
	1.500	3963.07	1.25	3941.50	21.57	2124.51	2993.84	25100.00	655.42	21450.74	1.62	825.22	2949.73
	2.000	3952.50	3.62	3941.50	11.00	930.09	3468.48	4500.00	.00	1031.52	13.88	1062.26	2343.72
	2.000	3957.33	1.66	3941.50	15.83	1724.56	2008.84	10700.00	30.10	8661.26	3.80	958.15	2713.35
	2.000	3962.23	1.20	3941.50	20.73	2068.29	2673.37	22000.00	494.17	18832.76	1.67	844.70	2912.99
	2.000	3963.07	1.24	3941.50	21.57	2125.23	2993.16	25100.00	655.59	21450.25	1.62	824.97	2950.20
*	2.500	3952.60	2.51	3941.50	11.10	944.95	3936.58	4500.00	.00	563.42	3.27	1062.01	2351.91
*	2.500	3957.32	2.14	3941.50	15.82	1725.13	5524.04	10700.00	135.95	5040.01	1.25	958.05	2713.56
*	2.500	3962.23	2.17	3941.50	20.73	2068.44	7889.44	22000.00	737.52	13373.03	.82	844.65	2913.09
*	2.500	3963.07	2.25	3941.50	21.57	2125.40	8601.04	25100.00	935.80	15563.17	.82	824.91	2950.31
*	3.000	3952.90	3.90	3945.00	7.90	695.01	3946.92	4500.00	125.89	427.19	14.55	1504.82	2588.10
*	3.000	3957.39	2.58	3945.00	12.39	1572.03	5331.25	10700.00	2114.28	3254.46	2.74	1372.80	2944.83
	3.000	3962.27	2.40	3945.00	17.27	1894.55	7649.10	22000.00	5843.76	8507.14	1.36	1209.09	3103.64
	3.000	3963.11	2.47	3945.00	18.11	1924.14	8370.87	25100.00	6844.77	9884.36	1.34	1193.87	3118.01
*	4.000	3953.27	2.58	3945.50	7.77	438.02	4442.49	4500.00	57.51	.00	3.90	1558.76	2365.69
	4.000	3957.50	2.86	3945.50	12.00	1221.54	8315.00	10700.00	2038.35	346.65	2.77	1395.47	2617.02
	4.000	3962.31	2.91	3945.50	16.81	1614.98	12438.40	22000.00	7438.94	2122.76	1.70	1222.93	2837.92
	4.000	3963.15	3.00	3945.50	17.65	1656.90	13569.14	25100.00	8866.66	3564.20	1.68	1209.41	2866.21

	SECND	CASEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLOB	QROB	10*KS	SSTA	ENDST
	5.000	3953.48	2.52	3946.20	7.48	624.68	4327.70	4500.00	1.36	170.44	5.75	1520.76	2638.61
	5.000	3957.63	2.51	3946.00	11.63	1275.15	8096.66	10700.00	1169.00	1434.34	2.54	1425.31	2702.46
	5.000	3962.39	2.61	3946.00	16.39	1604.66	12971.83	22000.00	5355.55	3672.62	1.55	1282.62	2888.28
	5.000	3963.23	2.72	3946.00	17.23	1699.88	14313.81	25100.00	6482.51	4303.68	1.55	1217.37	2917.76
	6.000	3953.80	3.33	3946.30	7.50	460.25	4257.14	4500.00	.00	242.86	9.39	1396.22	2630.36
	6.000	3957.77	3.43	3946.20	12.97	1551.91	6272.49	10700.00	751.32	3576.19	4.23	1527.34	2675.25
	6.000	3962.47	3.01	3946.30	15.67	1883.45	8233.04	22000.00	4110.75	9636.21	1.93	1238.66	2912.13
	6.000	3963.31	3.07	3946.30	16.51	1943.04	8941.10	25100.00	5021.38	11137.82	1.37	1292.57	2922.50
	7.000	3954.36	2.89	3947.50	6.86	465.83	4390.25	4500.00	55.10	54.65	8.47	1726.20	2700.21
	7.000	3957.36	2.97	3947.50	10.46	1541.49	8342.55	10700.00	646.44	1710.99	4.18	1445.50	2722.05
	7.000	3962.55	2.71	3947.50	15.05	1894.69	12074.53	22000.00	3120.79	6804.68	1.88	1252.80	3247.49
	7.000	3963.39	2.77	3947.50	15.89	1940.08	13130.23	25100.00	3783.77	8130.95	1.60	1335.79	3275.87
	8.000	3954.74	2.91	3948.20	6.54	359.25	4467.82	4500.00	32.18	.00	5.89	1832.63	2468.69
	8.000	3958.17	3.58	3948.20	9.97	1486.45	8912.45	10700.00	1746.55	42.00	5.27	1100.51	2580.23
	8.000	3962.64	3.28	3948.20	14.44	2295.47	11538.72	22000.00	8220.69	2180.60	2.25	1065.38	3260.34
	8.000	3963.48	3.10	3948.20	15.28	2324.09	12391.39	25100.00	9792.10	2916.81	2.09	1063.92	3288.00
*	9.000	3954.93	4.38	3948.80	6.13	272.83	4282.92	4500.00	.00	197.98	15.83	2165.71	2474.56
	9.000	3958.34	4.65	3948.80	9.54	1252.18	7942.08	10700.00	1343.56	1414.35	10.73	1075.79	2510.34
*	9.000	3964.00	2.86	3948.80	15.20	2269.75	8542.09	22000.00	8774.73	4683.19	1.94	1024.00	3293.75
*	9.000	3966.50	2.29	3948.80	17.80	2359.90	8183.60	25100.00	10821.89	6094.51	.98	1020.10	3380.00
*	10.000	3955.91	5.79	3949.20	6.71	297.58	4346.13	4500.00	13.49	140.37	44.79	1072.96	1590.76
*	10.000	3959.00	5.81	3949.20	9.80	915.08	7576.47	10700.00	843.62	2279.90	25.68	724.96	1640.04
*	10.000	3964.12	3.39	3949.20	14.92	2099.95	7630.91	22000.00	4620.39	9748.70	4.20	520.05	2630.00
	10.000	3966.56	2.51	3949.20	17.46	2210.00	6837.54	25100.00	5742.09	12520.37	1.78	420.20	2630.00
	10.100	3955.95	5.81	3949.20	6.75	300.62	4392.51	4500.00	14.68	92.80	45.84	1072.78	1581.39
*	10.100	3959.10	5.52	3949.20	9.90	921.51	6671.38	10700.00	1250.90	2677.71	53.45	722.00	1643.50
	10.100	3964.16	2.12	3949.20	14.96	2104.08	4024.59	22000.00	6082.08	11893.33	7.08	525.92	2630.00
	10.100	3966.67	1.51	3949.20	17.47	2210.00	3567.87	25100.00	7031.79	14500.35	2.67	420.00	2630.00
	10.200	3956.02	5.69	3949.20	6.82	307.62	4381.37	4500.00	16.67	101.96	43.17	1072.26	1582.96
	10.200	3959.17	5.40	3949.20	9.97	926.35	6527.28	10700.00	1424.36	2748.36	51.15	719.76	1646.11
	10.200	3964.16	2.12	3949.20	14.96	2104.61	4021.71	22000.00	6082.08	11896.21	7.06	525.39	2630.00
	10.200	3966.68	1.51	3949.20	17.48	2210.16	3565.45	25100.00	7032.28	14532.27	2.66	419.84	2630.20
	10.300	3956.12	5.46	3949.20	6.92	316.53	4306.65	4500.00	18.73	174.61	37.83	1071.82	1584.72
*	10.300	3959.20	5.50	3949.20	10.00	927.87	7354.13	10700.00	958.57	2377.30	22.12	719.06	1646.93
	10.300	3964.16	3.25	3949.20	14.96	2104.81	7584.22	22000.00	4630.32	9785.45	4.09	525.19	2630.00
	10.300	3966.67	2.50	3949.20	17.47	2210.21	6831.34	25100.00	5743.97	12524.69	1.77	419.79	2630.00
	11.000	3956.96	6.67	3951.00	5.96	277.93	4353.06	4500.00	7.15	128.99	36.67	1595.19	2241.92
	11.000	3959.72	7.07	3951.00	8.72	915.59	7071.01	10700.00	891.55	2727.44	22.45	1442.68	2359.37
	11.000	3964.23	5.37	3951.00	13.23	1602.66	8385.67	22000.00	4449.17	9165.16	7.44	1257.34	2873.00
	11.000	3966.70	4.16	3951.00	15.70	1670.47	7777.05	25100.00	5802.57	11520.38	3.51	1199.53	2973.00

	SECNO	CWSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLCS	QRCS	104KS	SSTA	ENDST
	12.000	3959.36	3.64	3951.20	7.16	868.39	2230.68	2950.00	1.09	613.23	17.97	1506.98	2491.31
	12.000	3960.67	3.29	3951.20	9.47	1087.61	3424.63	7035.00	143.57	3465.75	7.53	1443.19	2530.80
	12.000	3964.56	2.86	3951.20	13.36	1322.22	4932.30	14400.00	709.20	8759.00	2.96	1269.32	2593.04
	12.000	3966.36	2.33	3951.20	15.16	1506.74	4957.37	16350.00	1199.32	10203.11	1.49	1158.44	2665.19
*	12.000	3958.33	2.05	3943.80	15.00	598.73	2547.22	2950.00	.00	-02.73	6.05	1050.54	1827.20
	12.000	3960.98	2.59	3943.80	17.18	970.41	4049.71	7035.00	.00	2935.59	9.50	1242.43	2896.59
	12.000	3964.70	2.36	3943.80	20.90	1101.97	4937.16	14400.00	.00	9462.84	5.00	1029.11	2130.39
	12.000	3966.93	1.82	3943.80	23.13	1332.33	4657.59	16350.00	155.23	11535.18	2.77	851.37	2184.21
	13.100	3958.81	2.17	3943.80	15.01	599.75	2472.00	2950.00	.00	477.99	9.05	1050.50	1827.22
	13.100	3960.99	2.56	3943.80	17.19	970.98	3246.32	7035.00	.00	3789.68	15.37	1042.40	2866.73
	13.100	3964.70	1.74	3943.80	20.90	1101.91	2223.16	14400.00	.00	12176.84	9.08	1029.12	2130.03
	13.100	3966.93	1.04	3943.80	23.13	1322.40	1461.07	16350.00	214.73	14634.21	4.51	851.34	2184.24
	13.200	3958.83	2.17	3943.80	15.03	600.59	2466.57	2950.00	.00	483.43	9.00	1050.47	1827.40
	13.200	3961.03	2.53	3943.80	17.23	973.53	3207.03	7035.00	.00	3827.96	15.09	1042.26	2857.32
	13.200	3964.72	1.73	3943.80	20.92	1102.17	2216.41	14400.00	.00	12183.59	9.02	1029.37	2130.24
	13.200	3966.94	1.03	3943.80	23.14	1322.57	1460.39	16350.00	215.21	14634.41	4.51	851.75	2184.32
	13.300	3958.85	1.98	3944.80	14.05	589.42	2649.02	2950.00	.00	300.97	5.03	1043.48	1842.39
	13.300	3961.24	2.60	3944.80	16.24	957.48	4311.85	7035.00	.00	2723.15	8.36	1040.73	2092.51
	13.300	3964.75	2.32	3944.80	19.95	1127.89	5280.63	14400.00	1.23	9119.14	5.29	1039.01	2136.91
	13.300	3966.95	1.87	3944.80	22.15	1316.37	4972.88	16350.00	128.99	11258.13	2.80	891.44	2208.32
*	14.000	3959.02	1.52	3951.20	7.82	698.07	2160.77	2950.00	.00	789.23	1.85	1441.93	2506.63
*	14.000	3961.26	2.09	3951.20	10.06	1326.71	4257.11	7035.00	.00	2777.89	2.28	1430.98	2757.59
*	14.000	3964.89	2.21	3951.20	13.69	1527.65	6768.21	14400.00	79.55	7552.24	1.50	1255.61	2812.26
*	14.000	3967.04	1.89	3951.20	15.84	1590.00	6942.82	16350.00	289.88	9127.30	.36	1235.19	2825.19
*	15.000	3959.14	.87	3951.50	7.64	845.72	268.36	2950.00	2503.36	178.29	7.37	1387.14	2232.86
*	15.000	3961.40	1.97	3951.50	9.90	893.97	2344.92	7035.00	3859.09	832.01	6.37	1356.51	2250.48
*	15.000	3964.97	2.31	3951.50	13.47	1665.25	5969.93	14400.00	5575.68	2854.39	3.12	1035.37	2720.72
	15.000	3967.08	1.97	3951.50	15.58	1737.24	6709.65	16350.00	5752.19	3897.95	1.55	1029.80	2757.03
	16.000	3959.33	3.60	3937.00	22.33	214.16	2920.81	2950.00	.00	29.19	10.05	1062.13	1276.29
*	16.000	3961.51	5.42	3937.00	24.51	901.17	5801.17	7035.00	3.44	1220.39	16.00	1052.47	1953.64
*	16.000	3965.02	4.97	3937.00	28.02	1246.29	7416.04	14400.00	122.90	6361.06	8.64	1019.97	2310.92
*	16.000	3967.11	3.93	3937.00	30.11	1350.00	6855.62	16350.00	217.33	9256.74	4.40	1017.18	2377.18
*	17.000	3959.64	2.48	3952.20	7.44	384.91	2628.44	2950.00	.00	221.56	3.65	1110.90	1495.81
*	17.000	3962.01	3.81	3952.20	9.81	850.62	5485.81	7035.00	9.46	1539.73	5.77	1059.97	1920.59
	17.000	3965.25	4.46	3952.20	13.05	1321.50	8732.35	14400.00	173.29	5494.35	5.25	1059.67	2417.45
	17.000	3967.22	3.78	3952.20	15.02	1544.52	8575.06	16350.00	275.66	7509.28	3.08	1057.85	2501.57
	18.000	3959.91	2.35	3952.30	7.51	541.47	2371.84	2950.00	.00	578.16	4.37	1180.96	1737.75
	18.000	3962.28	3.31	3952.30	9.98	777.54	4910.32	7035.00	.00	2124.68	5.40	1175.45	1953.09
	18.000	3965.48	3.93	3952.30	13.18	1144.47	8311.33	14400.00	.05	6088.58	4.92	1167.59	2312.06
	18.000	3967.34	3.44	3952.30	15.04	1521.35	8562.27	16350.00	18.42	7779.31	3.34	1136.62	2657.98

	SECNO	CWSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLOB	QROB	10*KS	SSTA	ENDST
	19.000	3960.10	1.63	3953.00	7.10	937.01	2834.97	2950.00	110.32	4.71	2.92	1194.31	2229.97
*	19.000	3962.59	2.14	3953.00	9.59	1435.79	5965.73	7035.00	959.25	109.92	2.58	1179.31	2615.50
*	19.000	3965.76	2.52	3953.00	12.76	1670.47	10255.73	14400.00	2661.86	1082.42	2.20	1171.21	2841.58
*	19.000	3967.52	2.35	3953.00	14.52	1832.82	12937.34	16350.00	2652.92	1759.24	1.42	1152.42	2995.24
	20.000	3960.27	2.79	3953.70	6.57	553.39	2753.23	2950.00	.38	196.65	5.35	1379.34	2574.40
*	20.000	3962.74	3.65	3953.70	9.04	1435.83	5524.72	7035.00	512.55	1316.33	5.18	1324.22	2533.14
	20.000	3965.87	3.84	3953.70	12.17	1635.48	7651.46	14400.00	3029.17	3740.37	4.40	1120.55	2816.13
	20.000	3967.59	3.26	3953.70	13.89	2100.81	7497.47	16350.00	4005.83	4855.70	2.51	1172.04	3272.35
	21.000	3960.57	3.35	3954.20	6.37	172.13	2950.00	2950.00	.00	.00	9.42	1894.29	2056.43
	21.000	3963.02	4.59	3954.20	8.32	1271.04	6052.88	7035.00	346.95	635.18	10.99	1289.70	2550.74
	21.000	3966.87	4.53	3954.20	11.87	1729.20	8454.76	14400.00	2487.23	3458.01	6.72	1217.33	2945.54
	21.000	3967.71	3.72	3954.20	13.51	2293.48	8035.60	16350.00	3317.57	5006.74	3.72	1174.10	3525.24
	22.000	3960.96	3.42	3955.00	5.96	167.62	2949.99	2950.00	.00	.01	9.27	1830.16	2192.29
	22.000	3963.45	5.18	3955.00	8.45	867.33	6558.66	7035.00	201.52	264.73	13.21	1444.57	2228.57
	22.000	3966.00	5.73	3955.00	11.00	1450.76	9948.93	14400.00	1702.92	2563.45	10.63	1346.59	2737.24
	22.000	3967.33	4.83	3955.00	12.33	1677.67	9613.16	16350.00	2535.21	4210.63	6.00	1312.55	2990.33
*	23.000	3961.34	3.94	3954.80	6.54	149.11	3886.05	2950.00	22.55	42.40	59.78	1019.30	1182.17
*	23.000	3963.98	5.42	3954.80	9.18	620.40	5885.31	7035.00	208.21	941.47	76.27	870.11	1524.55
*	23.000	3966.79	3.74	3954.80	11.99	1271.16	5518.27	14400.00	1530.55	7251.18	28.15	671.22	1942.38
*	23.000	3968.09	2.78	3954.80	13.29	1474.90	4635.52	16350.00	1957.99	9765.49	13.24	632.17	2107.87
	23.100	3961.40	3.96	3954.80	6.60	150.04	2987.17	2950.00	.00	42.83	63.28	1018.46	1183.22
	23.100	3964.05	5.53	3954.80	9.25	615.76	5927.04	7035.00	23.93	1084.02	86.79	857.82	1524.92
	23.100	3966.79	3.05	3954.80	11.99	1271.98	3900.82	14400.00	1552.63	8946.55	43.59	671.01	1942.98
	23.100	3968.08	1.75	3954.80	13.28	1473.61	2514.48	16350.00	2099.88	11745.64	28.14	632.54	2105.15
	23.200	3961.46	3.92	3954.80	6.66	150.91	2906.53	2950.00	.00	43.47	61.28	1017.67	1183.27
	23.200	3964.17	5.30	3954.80	9.37	638.83	5763.65	7035.00	42.10	1229.25	78.74	840.49	1525.53
	23.200	3966.84	3.01	3954.80	12.04	1275.35	3851.10	14400.00	1561.37	9987.83	42.49	670.13	1945.47
	23.200	3968.18	1.74	3954.80	13.38	1475.28	2505.49	16350.00	2101.26	11753.24	19.89	632.08	2107.29
	23.300	3961.54	3.90	3954.80	6.74	151.94	2881.32	2950.00	26.20	42.33	53.72	1016.75	1183.34
	23.300	3964.35	4.78	3954.80	9.55	671.77	5421.01	7035.00	268.38	1345.61	56.75	815.75	1526.53
	23.300	3966.97	3.51	3954.80	12.17	1291.60	5274.32	14400.00	1566.55	7559.14	24.25	665.89	1957.49
	23.300	3968.19	2.70	3954.80	13.39	1485.46	4540.95	16350.00	1958.48	9850.57	12.33	629.16	2114.61
*	24.000	3961.90	2.51	3956.50	5.40	227.51	2950.00	2950.00	.00	.00	5.50	1714.37	1951.98
*	24.000	3964.74	3.61	3956.50	8.24	746.38	6763.27	7035.00	15.32	255.41	6.68	1572.45	2373.58
*	24.000	3967.12	4.75	3956.50	10.62	1342.53	11748.47	14400.00	282.22	2369.30	8.88	1504.97	2889.53
*	24.000	3968.26	4.41	3956.50	11.76	1521.27	12185.97	16350.00	462.01	3712.02	6.05	1480.62	3027.31
*	25.000	3962.42	4.24	3957.00	5.42	278.55	2943.42	2950.00	.00	6.58	21.92	1270.47	1686.41
*	25.000	3965.24	5.15	3957.00	8.24	1132.63	6225.44	7035.00	.00	809.56	16.12	1364.27	2495.99
	25.000	3967.63	5.71	3957.00	10.63	1608.06	9408.86	14400.00	8.05	4983.09	13.06	1357.12	2965.18
	25.000	3968.62	5.15	3957.00	11.62	1659.53	9444.72	16350.00	15.94	6899.34	9.24	1354.13	3013.66

	SECNO	CASEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLOB	QROB	10*KS	SSTA	ENDST
*	26.000	3963.11	2.89	3958.00	5.11	212.90	2950.00	2950.00	.00	.00	7.52	1189.40	1402.50
	26.000	3965.84	4.24	3958.00	7.84	1075.54	5549.24	7035.00	.00	485.65	8.49	1183.31	2559.55
	26.000	3968.06	4.97	3958.00	10.06	1709.50	10508.75	14400.00	.00	2891.24	9.26	1172.90	3338.40
	26.000	3968.90	4.68	3958.00	10.90	1726.10	10605.72	16350.00	.00	5744.28	7.40	1177.19	2920.32
*	27.000	3962.44	5.53	3958.50	4.94	176.35	2947.31	2953.00	.00	2.69	12.37	1215.42	1691.73
*	27.000	3966.15	6.15	3958.50	7.65	344.24	6169.49	7035.00	.00	865.51	28.67	1487.12	2331.47
*	27.000	3968.34	6.50	3958.50	9.84	1544.53	9161.54	14400.00	.00	5238.46	21.17	1481.85	3121.17
*	27.000	3969.11	5.99	3958.50	10.61	1633.88	9325.24	16350.00	.00	7024.37	16.00	1465.15	3124.42
*	28.000	3964.15	2.83	3952.00	12.15	153.22	2950.00	2950.00	.00	.00	4.72	1202.31	1355.53
*	28.000	3966.75	4.79	3952.00	14.75	174.52	7035.00	7035.00	.00	.00	10.19	1191.74	1356.55
	28.000	3968.69	6.93	3952.00	16.69	1195.10	12645.28	14400.00	.00	1754.72	18.00	1182.31	2622.71
	28.000	3969.37	6.22	3952.00	17.37	1328.92	12346.26	16350.00	.00	3013.94	16.54	1179.44	2713.99
*	28.100	3964.10	3.96	3952.00	12.10	152.93	2950.00	2950.00	.00	.00	10.19	1202.50	1355.44
*	28.100	3966.51	7.47	3952.00	14.51	172.86	7035.00	7035.00	.00	.00	34.55	1192.70	1355.55
*	28.100	3968.06	12.08	3952.00	16.06	1125.23	12514.30	14400.00	.00	1785.10	88.72	1186.35	2530.51
*	28.100	3969.10	10.24	3952.00	17.10	1284.40	11428.05	16350.00	.00	4951.95	57.38	1180.92	2721.19
	28.200	3964.15	3.85	3952.00	12.15	153.27	2950.00	2950.00	.00	.00	10.87	1202.34	1355.51
	28.200	3966.69	7.37	3952.00	14.69	174.37	7035.00	7035.00	.00	.00	32.54	1191.95	1356.33
*	28.200	3970.43	6.13	3952.00	18.43	1534.35	7118.61	14400.00	.00	7281.39	25.63	1173.35	2828.52
	28.200	3970.23	7.40	3952.00	18.23	1493.09	8547.50	16350.00	.00	7812.40	36.57	1174.48	2797.07
*	28.300	3964.30	2.77	3952.00	12.30	154.59	2950.00	2950.00	.00	.00	4.43	1201.70	1356.27
*	28.300	3967.42	4.35	3952.00	15.42	1097.09	6921.47	7035.00	.00	113.53	7.91	1188.98	2593.19
*	28.300	3970.53	4.70	3952.00	18.53	1556.34	10295.84	14400.00	.00	4104.16	7.28	1172.76	2945.27
*	28.300	3970.44	5.44	3952.00	18.44	1537.28	11818.26	16350.00	.00	4541.93	9.32	1173.23	2830.74
*	29.000	3964.45	4.29	3959.00	5.45	141.37	2950.00	2950.00	.00	.00	16.60	2291.82	2533.19
	29.000	3967.71	5.42	3959.00	8.71	1254.86	6523.46	7035.00	14.47	497.08	15.98	2143.82	3550.63
	29.000	3970.83	4.73	3959.00	11.83	1976.07	8193.51	14400.00	1149.96	5056.53	7.48	1731.01	3820.59
	29.000	3970.85	5.34	3959.00	11.85	1973.24	9281.09	16350.00	1316.88	5762.03	9.53	1730.45	3301.73
	30.000	3965.36	3.47	3959.40	5.96	226.22	2941.51	2950.00	8.15	.34	12.43	2559.80	3003.99
*	30.000	3968.53	3.93	3959.40	9.13	1666.12	5806.46	7035.00	682.95	543.59	8.02	1953.13	3619.30
	30.000	3971.17	3.93	3959.40	11.77	2201.33	7887.55	14400.00	3718.12	2794.33	5.35	1571.00	3889.13
	30.000	3971.23	4.35	3959.40	11.83	2237.95	8824.53	16350.00	4336.60	3229.87	6.45	1567.75	3904.79
	31.000	3965.93	2.72	3959.70	6.23	452.25	1983.60	2950.00	966.40	.00	6.28	2937.59	3422.64
	31.000	3969.98	3.12	3959.70	9.28	1474.65	3683.50	7035.00	3351.50	.00	4.83	1880.27	3429.52
	31.000	3971.47	3.59	3959.70	11.77	2120.47	5506.72	14400.00	8662.95	130.33	4.67	1499.58	3722.47
	31.000	3971.65	3.92	3959.70	11.95	2151.92	6253.51	16350.00	9925.72	172.75	5.47	1493.58	3711.55
	31.100	3965.93	2.84	3959.70	6.23	452.70	1805.37	2950.00	1144.93	.00	8.87	2937.23	3422.66
	31.100	3969.00	3.03	3959.70	9.30	1479.73	2820.87	7035.00	4214.13	.00	7.62	1883.09	3423.55
	31.100	3971.52	2.88	3959.70	11.82	2132.88	3202.54	14400.00	11024.06	172.30	7.32	1497.29	3705.08
	31.100	3971.71	3.28	3959.70	12.01	2150.04	3445.03	16350.00	12583.58	231.29	8.61	1492.14	3714.73

	SECND	CHSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLCR	QRCR	104KS	SSTA	SNOST
	31.200	3965.97	2.82	3959.70	6.27	453.95	1600.15	2950.00	1149.85	.00	8.71	2906.24	3422.71
	31.200	3969.04	3.00	3959.70	9.34	1514.14	2300.19	7035.00	4234.81	.00	7.45	1873.12	3429.62
	31.200	3971.56	2.86	3959.70	11.86	2136.52	3179.28	14400.00	11043.22	177.31	7.23	1496.60	3726.38
	31.200	3971.75	3.05	3959.70	12.05	2154.41	3414.68	16350.00	12706.41	235.91	8.48	1491.01	3715.29
	31.300	3965.98	2.68	3959.70	6.28	454.64	1977.47	2950.00	972.53	.00	6.14	2905.69	3422.74
	31.300	3969.04	3.37	3959.70	9.34	1515.14	2534.45	7035.00	3250.55	.00	4.66	1877.14	3429.65
	31.300	3971.55	3.52	3959.70	11.85	2137.28	5559.47	14400.00	8700.21	140.32	4.47	1496.46	3726.65
	31.300	3971.73	3.86	3959.70	12.03	2153.54	6199.37	16350.00	9975.34	185.29	5.24	1491.43	3715.98
*	32.000	3966.21	3.79	3959.90	6.31	229.94	2708.56	2950.00	241.43	.00	13.87	2997.87	3625.73
	32.000	3969.19	3.85	3959.90	9.29	1718.93	4534.44	7035.00	2450.55	.00	7.85	1557.53	3637.51
	32.000	3971.69	3.82	3959.90	11.79	2177.17	6106.33	14400.00	8292.92	.75	5.32	1472.81	3850.26
	32.000	3971.90	4.12	3959.90	12.00	2185.37	6722.83	16350.00	9625.54	1.53	6.32	1463.16	3853.53
*	33.000	3966.63	4.55	3960.00	6.63	258.09	2123.01	2950.00	826.99	.00	29.35	2893.68	3606.63
	33.000	3969.37	4.38	3960.00	9.37	1720.54	3703.14	7035.00	3221.85	.00	12.97	1744.44	3609.37
	33.000	3971.79	4.10	3960.00	11.79	2055.20	4555.78	14400.00	9542.42	1.79	7.29	1528.32	3614.49
	33.000	3972.01	4.40	3960.00	12.01	2094.39	5243.17	16350.00	11014.24	2.59	8.10	1521.23	3615.17
*	34.000	3967.43	4.29	3960.00	7.43	254.56	2724.43	2950.00	225.57	.00	13.45	3145.82	3546.61
	34.000	3969.85	5.68	3960.00	9.85	1130.20	5131.21	7035.00	1903.79	.00	15.39	1756.42	3547.35
	34.000	3972.09	5.64	3960.00	12.09	2006.75	6531.73	14400.00	7868.22	.00	12.20	1429.50	3548.22
	34.000	3972.35	5.90	3960.00	12.35	2022.93	7015.22	16350.00	9344.78	.00	13.12	1416.23	3549.30
	34.100	3967.43	4.53	3960.00	7.43	254.70	2599.57	2950.00	250.43	.00	16.33	3145.74	3546.61
	34.100	3969.85	5.95	3960.00	9.86	1131.24	4814.87	7035.00	2220.13	.00	21.24	1756.22	3547.35
	34.100	3972.18	5.24	3960.00	12.18	2012.96	5139.17	14400.00	9260.83	.00	15.20	1424.43	3548.69
	34.100	3972.45	5.40	3960.00	12.45	2029.95	5385.01	16350.00	10974.99	.00	15.17	1410.54	3549.72
	34.200	3967.51	4.47	3960.00	7.51	255.91	2688.16	2950.00	261.84	.00	15.65	3145.04	3546.54
	34.200	3970.00	5.73	3960.00	10.00	1405.38	4673.64	7035.00	2361.36	.00	19.30	1754.97	3547.40
	34.200	3972.26	5.12	3960.00	12.26	2217.26	5839.03	14400.00	9360.97	.00	14.50	1421.09	3548.94
	34.200	3972.53	5.25	3960.00	12.53	2035.07	5357.68	16350.00	11192.32	.00	15.29	1406.37	3553.03
	34.300	3967.57	4.15	3960.00	7.57	257.16	2702.99	2950.00	247.02	.00	12.22	3144.32	3546.56
	34.300	3970.05	5.36	3960.00	10.05	1420.22	4957.76	7035.00	2077.24	.00	13.79	1754.60	3547.41
	34.300	3972.25	5.34	3960.00	12.25	2017.15	6298.43	14400.00	8101.57	.00	10.84	1421.00	3548.35
	34.300	3972.52	5.57	3960.00	12.52	2034.35	6751.21	16350.00	9598.79	.00	11.57	1406.95	3549.99
*	35.000	3968.00	2.49	3960.00	7.20	169.35	2950.00	2950.00	.00	.00	3.55	3020.22	3249.68
	35.000	3970.53	4.13	3960.00	9.78	709.79	6902.27	7035.00	132.73	.00	8.64	1826.51	3251.73
	35.000	3972.59	5.49	3960.00	11.79	1608.04	11946.59	14400.00	2453.41	.00	13.99	1459.88	3257.77
	35.000	3972.87	5.84	3960.00	12.07	1599.14	13135.52	16350.00	3213.38	.00	15.16	1435.98	3258.51
*	36.000	3968.22	2.91	3961.00	7.22	273.33	2726.57	2950.00	93.75	149.68	9.22	2885.80	3658.11
	36.000	3971.05	4.17	3961.00	10.05	436.65	5794.57	7035.00	665.90	594.52	13.33	2649.31	3668.46
	36.000	3973.26	5.31	3961.00	12.26	1116.71	10152.01	14400.00	1816.71	2432.23	20.57	2613.51	3759.39
	36.000	3973.59	6.19	3961.00	12.59	1165.60	11154.72	16350.00	2096.24	3099.34	22.40	2605.17	3772.75

	SECNO	CWSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLOB	QROB	10*KS	SSTA	ENDST
*	36.500	3968.61	6.25	3964.50	4.11	169.96	2937.49	2950.00	.00	12.51	98.57	1135.43	2026.13
*	36.500	3971.66	6.90	3964.50	7.16	269.24	5092.95	7035.00	.00	942.05	72.13	1105.73	2248.20
*	36.500	3974.24	7.76	3964.50	9.74	1237.69	10855.33	14400.00	19.71	3524.46	71.91	1047.10	2499.94
*	36.500	3974.65	7.37	3964.50	10.15	1377.46	11755.21	15350.00	44.23	4550.51	67.99	1035.38	2508.23
*	37.000	3971.00	7.46	3967.00	4.00	187.24	2040.52	2950.00	.00	909.48	247.70	1592.01	2553.62
*	37.000	3973.25	8.55	3967.00	6.25	271.70	4692.39	7035.00	.00	2341.11	151.86	1225.15	2557.51
	37.000	3975.71	7.60	3967.00	8.71	1519.25	6722.23	14400.00	.00	7666.22	71.34	1676.48	2552.10
	37.000	3976.05	7.53	3967.00	9.05	1586.18	7094.25	15350.00	2.73	9253.01	66.34	1674.70	2550.59
*	37.500	3973.09	3.85	3968.50	4.59	270.68	1828.31	2950.00	.00	1141.69	30.39	1177.71	2391.94
*	37.500	3975.43	4.78	3968.50	6.93	907.13	3672.35	7035.00	.00	3362.64	34.23	1171.15	2355.00
	37.500	3977.06	5.75	3968.50	8.56	1589.38	5784.57	14400.00	.01	8615.42	36.50	1161.14	2790.55
	37.500	3977.33	6.00	3968.50	8.83	1635.61	6294.76	15350.00	1.24	10073.90	37.74	1141.69	2793.33
*	38.000	3972.94	5.44	3969.00	4.94	122.88	2650.00	2650.00	.00	.00	67.34	1098.43	1221.20
*	38.000	3976.15	6.88	3969.00	7.15	142.31	5292.57	5300.00	.00	7.33	64.82	1094.23	1226.54
*	38.000	3977.53	9.26	3969.00	8.53	152.92	8321.40	9000.00	.00	78.50	95.32	1087.26	1250.38
*	38.000	3977.69	10.37	3969.00	8.69	155.43	10122.50	10225.00	.00	102.50	113.53	1086.52	1251.95
*	39.000	3975.15	3.50	3965.00	10.15	120.37	2650.00	2650.00	.00	.00	15.71	1069.26	1139.52
*	39.000	3977.55	4.96	3965.00	12.55	132.41	5300.00	5300.00	.00	.00	22.08	1063.32	1196.24
*	39.000	3979.91	6.53	3965.00	14.91	143.26	9000.00	9000.00	.00	.00	30.41	1058.96	1202.22
*	39.000	3980.55	6.95	3965.00	15.55	149.20	10225.00	10225.00	.00	.00	33.23	1055.77	1204.97
	39.100	3975.13	4.12	3965.00	10.13	120.19	2650.00	2650.00	.00	.00	22.24	1069.29	1189.48
*	39.100	3977.57	6.38	3965.00	12.57	131.95	5300.00	5300.00	.00	.00	47.26	1064.23	1195.99
*	39.100	3979.52	9.29	3965.00	14.52	141.85	9000.00	9000.00	.00	.00	97.03	1059.90	1201.45
*	39.100	3980.17	10.20	3965.00	15.17	145.31	10225.00	10225.00	.00	.00	117.25	1057.52	1202.93
	39.200	3975.33	4.07	3965.00	10.33	120.68	2650.00	2650.00	.00	.00	21.52	1069.07	1189.75
	39.200	3977.79	6.25	3965.00	12.79	133.04	5300.00	5300.00	.00	.00	44.99	1063.54	1196.58
	39.200	3980.12	9.01	3965.00	15.12	144.38	9000.00	9000.00	.00	.00	91.48	1057.90	1202.79
	39.200	3980.79	9.86	3965.00	15.79	160.21	10225.00	10225.00	.00	.00	110.17	1054.53	1203.35
	39.300	3975.33	3.55	3965.00	10.13	120.21	2650.00	2650.00	.00	.00	16.71	1083.34	1204.13
*	39.300	3978.15	4.81	3965.00	12.95	131.71	5300.00	5300.00	.00	.00	20.73	1077.55	1209.39
*	39.300	3981.38	5.96	3965.00	15.38	147.46	9000.00	9000.00	.00	.00	24.18	1068.15	1215.61
*	39.300	3982.03	6.19	3965.00	16.03	157.40	10225.00	10225.00	.00	.00	25.10	1064.44	1221.84
*	39.500	3975.35	4.83	3970.00	5.35	112.11	2650.00	2650.00	.00	.00	55.79	1808.24	1920.35
*	39.500	3978.17	5.96	3970.00	8.17	129.02	5300.00	5300.00	.00	.00	54.54	1794.15	1922.17
*	39.500	3981.14	6.82	3970.00	11.14	175.71	8999.19	9000.00	9.69	1.12	53.73	1751.56	1927.27
	39.500	3982.09	6.93	3970.00	12.09	291.99	10162.12	10225.00	57.48	5.41	48.15	1647.19	1929.19
	40.000	3976.48	3.34	3971.50	4.98	174.44	2650.00	2650.00	.00	.00	28.79	1067.63	1242.26
*	40.000	3979.33	4.22	3971.50	7.83	194.43	5300.00	5300.00	.00	.00	24.76	1050.02	1244.44
*	40.000	3982.31	4.69	3971.50	10.81	224.54	8950.68	9000.00	26.90	12.42	21.00	1021.90	1253.55
*	40.000	3983.21	4.84	3971.50	11.71	273.31	10128.39	10225.00	67.55	29.06	20.16	955.81	1261.05

	SECNO	CASEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	QLOS	QROB	104WS	SSTA	ENDST
*	41.000	3979.10	7.53	3973.00	6.10	135.40	2650.00	2650.00	.00	.00	312.32	1489.14	1755.50
*	41.000	3981.42	5.35	3973.00	8.42	239.50	5300.00	5300.00	.00	.00	146.37	1464.75	1774.35
*	41.000	3983.00	5.50	3973.00	10.00	301.12	9000.00	9000.00	.00	.00	65.53	1438.27	1731.09
*	41.000	3984.55	5.55	3973.00	11.55	304.37	10225.00	10225.00	.00	.00	54.93	1473.33	1733.69
*	42.000	3983.19	3.61	3979.00	4.19	191.22	2650.00	2650.00	.00	.00	42.17	2004.00	2115.31
*	42.000	3984.79	5.03	3979.00	5.79	211.74	5300.00	5300.00	.00	.00	57.34	1966.09	2027.03
	42.000	3986.21	6.61	3979.00	7.21	232.32	8337.53	9000.00	3.14	4.05	72.09	1922.95	2215.77
	42.000	3986.70	6.95	3979.00	7.70	239.57	10193.52	10225.00	20.39	11.50	72.27	1979.24	2217.21
*	43.000	3985.82	5.77	3981.00	4.82	155.68	2650.00	2650.00	.00	.00	158.03	2057.62	2213.09
*	43.000	3987.54	6.54	3981.00	6.54	193.13	5120.00	5120.00	.00	.00	115.35	2020.42	2229.55
	43.000	3989.48	7.72	3981.00	8.48	247.30	8794.42	8847.00	52.57	.00	111.16	1990.32	2227.32
	43.000	3989.93	7.94	3981.00	8.93	262.54	9639.93	9744.00	104.06	.00	106.17	1967.17	2229.71
*	44.000	3989.46	3.24	3986.00	3.46	312.02	2650.00	2650.00	.00	.00	55.31	1977.00	2229.10
*	44.000	3990.84	4.03	3986.00	4.84	318.26	5120.21	5120.00	.00	.79	51.12	1974.20	2292.55
*	44.000	3992.59	4.88	3986.00	6.59	226.97	8822.46	8847.00	.00	14.54	45.45	1970.31	2297.76
*	44.000	3992.97	5.24	3986.00	6.97	229.34	9723.35	9744.00	.00	20.64	44.85	1970.37	2298.53
	45.000	3991.95	3.63	3989.00	2.95	301.60	2650.00	2650.00	.00	.00	75.03	1952.11	2273.03
	45.000	3993.21	4.52	3989.00	4.21	339.83	5120.00	5120.00	.00	.00	75.58	1947.99	2277.31
	45.000	3994.71	5.38	3989.00	5.71	374.59	8839.22	8847.00	.00	7.97	69.53	1937.35	2285.72
	45.000	3995.05	5.52	3989.00	6.05	435.65	9721.21	9744.00	.00	22.79	68.26	1933.95	2373.62
*	46.000	3993.87	5.23	3991.00	2.87	286.43	2650.00	2650.00	.00	.00	246.14	1820.33	2109.79
*	46.000	3994.91	6.31	3991.00	3.91	296.34	5120.00	5120.00	.00	.00	201.20	1817.72	2114.56
*	46.000	3996.16	7.47	3991.00	5.16	311.87	8839.13	8847.00	.00	7.87	175.96	1811.20	2122.36
*	46.000	3996.44	7.64	3991.00	5.44	321.30	9729.71	9744.00	.00	14.29	172.10	1803.33	2125.13
*	47.000	3995.23	4.20	3993.00	3.23	229.59	2650.00	2650.00	.00	.00	87.68	1827.20	2055.33
	47.000	3997.35	5.73	3993.00	4.35	233.36	5120.00	5120.00	.00	.00	110.38	1829.24	2150.10
	47.000	3998.61	7.36	3993.00	5.61	252.37	8847.00	8847.00	.00	.00	122.40	1812.42	2064.60
	47.000	3998.88	7.68	3993.00	5.88	254.98	9744.00	9744.00	.00	.00	126.49	1810.80	2065.77
*	48.000	4000.77	10.06	3995.00	5.77	89.50	2645.50	2650.00	4.49	.00	432.73	1969.24	2058.34
*	48.000	4002.81	11.14	3995.00	7.81	155.30	4912.02	5120.00	217.98	.00	292.15	1908.73	2054.53
*	48.000	4004.75	11.99	3995.00	9.75	260.93	7422.55	8847.00	1424.45	.00	221.33	1794.92	2069.38
*	48.000	4005.10	12.19	3995.00	10.10	280.63	7947.93	9744.00	1796.06	.00	224.31	1789.48	2070.10
*	49.000	4008.76	5.82	4003.00	5.76	189.80	2428.21	2650.00	10.19	211.60	80.89	1558.57	1922.36
*	49.000	4010.34	7.14	4003.00	7.34	395.23	3972.77	5120.00	363.41	792.82	87.52	1551.64	1955.72
*	49.000	4011.66	8.25	4003.00	8.66	509.90	5543.87	8847.00	1498.00	1705.13	92.62	1510.00	2019.39
*	49.000	4011.91	8.55	4003.00	8.91	1023.79	5979.48	9744.00	1222.35	1942.24	92.83	1000.20	2023.79
*	50.000	4011.76	7.31	4005.00	6.76	92.62	2650.00	2650.00	.00	.00	171.56	1621.19	1713.81
*	50.000	4013.68	8.62	4005.00	8.68	152.05	5125.36	5120.00	4.64	.00	215.00	1579.77	1731.62
*	50.000	4014.93	11.26	4005.00	9.93	235.55	8725.17	8847.00	94.25	27.58	255.95	1551.24	1767.53
*	50.000	4015.13	11.59	4005.00	10.13	239.67	9552.37	9744.00	120.44	51.19	232.17	1535.00	1774.57

	SECNO	CASEL	VCH	ELMIN	DEPTH	TOPWID	QCH	Q	CLOB	QBOB	10*HS	SSTA	END
*	51.000	4014.45	4.44	4007.00	7.45	101.79	2650.00	2650.00	36.46	.00	26.00	792.05	1152.
*	51.000	4017.13	5.07	4007.00	10.13	134.56	5112.07	5000.00	133.11	.00	51.94	792.03	1155.
*	51.000	4019.48	7.51	4007.00	12.48	146.35	8557.43	9000.00	210.31	22.13	80.53	792.01	1171.
*	51.000	4019.98	8.09	4007.00	12.99	148.55	9819.43	10025.00	251.47	45.10	93.20	792.01	1172.
*	51.100	4014.45	4.35	4007.00	7.45	101.81	2650.07	2650.00	36.42	.00	46.17	792.05	1152.
*	51.100	4017.12	7.17	4007.00	10.12	134.28	5194.35	5000.00	136.14	.00	91.55	792.03	1155.
*	51.100	4019.55	9.79	4007.00	12.36	145.23	8563.23	9000.00	136.48	.00	122.20	792.01	1171.
*	51.100	4019.99	10.71	4007.00	12.99	147.33	10075.45	10025.00	148.55	.00	155.54	792.01	1172.
*	51.200	4014.66	4.32	4007.00	7.66	102.59	2650.01	2650.00	96.69	.00	42.36	792.05	1152.
*	51.200	4017.51	6.85	4007.00	10.51	135.39	5201.10	5000.00	98.90	.00	71.00	792.03	1155.
*	51.200	4019.36	9.22	4007.00	12.35	148.57	8872.57	9000.00	127.43	.00	114.12	792.01	1172.
*	51.200	4020.59	9.92	4007.00	13.59	223.53	10033.18	10025.00	195.22	.00	129.35	700.00	1174.
	51.300	4014.84	3.95	4004.00	10.84	107.95	2674.00	2650.00	75.72	.00	29.72	792.05	1136.
	51.300	4018.00	5.81	4004.00	13.80	145.09	5122.94	5000.00	157.35	.00	37.69	792.03	1152.
*	51.300	4021.04	5.37	4004.00	16.34	250.39	8153.35	9000.00	347.14	.00	26.49	700.00	1152.
*	51.300	4021.90	5.81	4004.00	17.70	331.14	9675.11	10025.00	549.39	.00	35.20	700.00	1153.
*	52.000	4014.84	10.09	4011.00	3.84	82.13	2650.00	2650.00	.00	.00	1019.74	1515.63	1738.
*	52.000	4018.27	8.91	4011.00	7.27	112.34	5299.55	5000.00	.33	.44	882.11	1515.31	1739.
*	52.000	4021.22	9.43	4011.00	10.22	178.76	8154.20	9000.00	87.15	233.33	245.20	1595.79	1774.
*	52.000	4022.05	9.51	4011.00	11.05	445.57	9632.72	10025.00	145.77	475.00	219.75	1105.62	1791.
*	52.000	4020.90	5.05	4012.00	7.90	115.20	2650.00	2650.00	.00	.00	159.37	1354.20	1479.
	52.000	4022.78	7.06	4012.00	9.78	142.01	5275.31	5000.00	.00	23.39	209.57	1353.55	1500.
	53.000	4024.83	8.55	4012.00	11.83	330.50	8553.33	9000.00	92.39	349.79	316.11	1156.11	1536.
	53.000	4025.39	8.69	4013.20	12.39	425.33	9310.35	10025.00	397.35	517.55	203.72	1119.27	1544.
	54.000	4023.19	4.85	4015.50	7.69	95.81	2650.00	2650.00	.00	.00	111.39	1066.05	1161.
	54.000	4025.94	6.26	4015.50	10.34	129.22	5291.23	5000.00	1.72	2.25	140.35	1055.91	1195.
	54.000	4028.06	8.00	4015.50	12.55	153.61	8874.19	9000.00	57.05	68.74	157.93	1244.72	1198.
	54.000	4028.52	8.52	4015.50	13.02	158.53	10034.72	10025.00	85.31	103.95	172.03	1042.44	1201.

TENAYA CREEK

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****************************************
* HEC-2 WATER SURFACE PROFILES         *
*                                      *
* Version   4.6.2;  May 1991           *
*                                      *
* RUN DATE    24APR98    TIME   10:09:19 *
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****************************************
* U.S. ARMY CORPS OF ENGINEERS         *
* HYDROLOGIC ENGINEERING CENTER        *
* 609 SECOND STREET, SUITE D           *
* DAVIS, CALIFORNIA 95616-4687         *
*          (916) 756-1104              *
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TENAYA CREEK

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X     X  XXXXXXX   XXXXX            XXXXX
X     X  X       X     X          X     X
X     X  X       X                      X
XXXXXXX  XXXX     X         XXXXX   XXXXX
X     X  X       X                  X
X     X  X       X     X            X
X     X  XXXXXXX   XXXXX            XXXXXXX
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THIS RUN EXECUTED 24APR98 10:09:19

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**********************************
HEC-2 WATER SURFACE PROFILES

Version  4.6.2;  May 1991
**********************************

T1      YOSEMITE NAT. PARK              CELLA BARR ASSOCIATES
T2      TENAYA CREEK                    777 CAMPUS COMMONS RD. #200
T3      2-,10-,25- & 100-RY.            SACRAMENTO CA 95825
T4        FILE:  2TENAYA
T5      APRIL 24,98

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      10       2                                                      3971

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1               -1

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38       1        26       42       8        4        14       3        53       54

J5  LPRNT    NUMSEC                  ********REQUESTED SECTION NUMBERS********

   -10      -10

QT       4      2950      7035     14400     16360
NC    0.08      0.08      .055       0.3       0.5
       ***************  CHANNEL INVERT ELEVS. ON X4 ARE FROM COE DATA ***
       ******** X-SEC. 37 IS    FOR BOTH MERCED R. & TENAYA CK. *********
X1      37        43      1680      1820
X3                                  1650      3978
X4       4    3962.2      1710    3962.2    3968.5      2470    3968.5      2535
GR  3977.5      1000      3977      1015      3976      1100      3975      1135      3974      1140
GR    3975      1150      3975      1250      3976      1280      3977      1375      3976      1490
GR    3975      1525      3975      1550      3976      1575      3977      1595      3978      1620
GR    3978      1650      3977      1670      3975      1680      3970      1695      3969      1700
GR    3970      1800      3971      1805      3974      1820      3975      1825      3975      1885
GR    3976      1915      3975      2075      3974      2195      3974      2235      3973      2455
GR  3971.2      2465    3971.2      2540      3972      2560      3973      2565      3974      2575
GR    3974      3030    3973.9      3100      3974      3195      3975      3235      3976      3260
GR    3977      3275      3978      3290      3980      3330

NC    0.08      0.08      0.08
QT       4      1050      1600      4250      7100
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X1      1       21     1490     1675      330      240      295
X3                                        1920   3975.3
X4      4     3977     1000     3969     1520     3969     1615   3975.3     1920
GR   3977.5      980     3976     1075     3975     1225     3974     1490   3971.5     1515
GR   3971.5     1620     3972     1645     3973     1655     3974     1675   3974.6     1720
GR     3975     1870     3975     1965     3974     2150     3974     2250     3975     2315
GR     3976     2325     3977     2335     3978     2365     3979     2385     3980     2400
GR     3985     2465

X1      2       24     1870     1960      540      240      435
X3                                        2030   3976.2
X4      3     3976     1630   3970.1     1905   3970.1     1955
GR     3982     1000     3980     1050     3979     1135     3978     1255     3977     1365
GR     3976     1415     3976     1470     3975     1790   3975.5     1842     3975     1870
GR   3972.6     1900   3972.6     1960     3975     1970     3976     1980   3976.2     2020
GR     3976     2065     3976     2290     3976     2335     3976     2540     3976     2590
GR     3977     2610     3979     2625     3980     2645     3985     2680

NH      4     0.08     1185     0.06     1795     0.08     1970     0.08     2335

X1      3       19     1795     1970      330      350      380
X4      2   3971.5     1813   3971.5     1940
GR     3986     1000     3979     1070     3978     1085     3977     1185     3977     1305
GR     3978     1350     3978     1770     3977     1795     3975     1805   3974.2     1828
GR   3974.1     1945     3975     1965     3976     1970     3977     2005     3978     2055
GR     3979     2235     3980     2245     3985     2275     3990     2335

NH      5     0.08     1210     0.06     1660     0.08     2055     0.08     2170     0.08
NH   2190

X1      4       20     2055     2170      350      360      430
X3                              1660     3980
X4      2   3973.5     2075   3973.5     2133
GR     3986     1000     3979     1050     3978     1060     3978     1170     3977     1190
GR     3978     1210     3979     1285     3979     1440     3980     1610     3980     1660
GR     3981     1775     3981     2045     3980     2055     3977     2062     3976     2070
GR     3976     2143     3977     2148     3980     2160     3985     2170     3990     2190

NC     0.08     0.08     0.08

X1      5       23     1852     2018      330      380      385
X3     10                       1690     3982
X4      3     3983     1012   3975.1     1967   3975.1     2007
GR   3983.8     1000     3981     1020     3980     1025     3980     1080     3979     1100
GR     3978     1115     3978     1145     3979     1160     3980     1205     3981     1370
GR     3981     1655     3982     1690     3981     1852     3980     1858     3978     1962
GR     3978     2012     3980     2018     3981     2110     3982     2155     3983     2245
GR     3984     2260     3985     2270     3990     2280
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X1       6       13     1155     1255      370      355      390
X4       2   3976.2     1170   3976.2     1225
GR  3991.5     1000     3990     1030     3985     1060     3984     1125     3983     1135
GR    3982     1155     3980     1160     3979     1165     3979     1230     3980     1255
GR    3985     1470     3990     1485     3995     1500

NC                               0.3      0.5

      ################ TENAYA CREEK BRIDGE ############
      ################ DOWNSTREAM SECTION ############

X1       7       21     1052     1182      220      130      190    0.857
GR  3993.1     1000   3989.8     1052   3989.5     1067   3987.8     1078     3987     1084
GR  3985.3     1089     3980     1092   3973.4     1096   3972.3     1102   3971.6     1108
GR    3972     1112   3972.8     1120   3973.5     1127   3973.8     1131   3973.8     1138
GR    3974     1145     3981     1149   3987.8     1158   3991.4     1171   3993.2     1182
GR  3993.5     1236

X1     7.1                                 10       10       10
X2                                                                           0.857
BT     -21     1000   3993.1   3993.1     1052   3994.2   3989.8     1067   3994.4   3989.5
BT             1078   3994.5   3987.8     1084   3994.6     3987     1089   3994.7   3985.3
BT             1092   3994.8     3980     1095   3994.9   3985.4     1102     3995   3989.4
BT             1108     3995   3991.2     1112     3995     3992     1120   3995.1   3992.6
BT             1127   3995.2   3992.4     1131   3995.2   3991.9     1138   3995.3     3990
BT             1145   3995.2   3986.5     1149   3995.2     3981     1158   3995.1   3987.8
BT             1171   3994.9   3991.4     1182   3994.6   3993.2     1236   3993.5   3993.5

X1     7.2                                 42       42       42
X2                                                         1                 0.857

X1     7.3                                 10       10       10    0.857

NC                               0.1      0.3

X1       8       11     1050     1160      100      165      115
X4       2     3977     1060     3977     1097
GR    4000     1000     3995     1015     3990     1022     3985     1050     3980     1055
GR    3980     1102     3981     1120     3985     1160     3987     1185     3990     1250
GR  3992.9     1290
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T1
T2
T3 10-YEAR EVENT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	3							3973.25	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2		-1							

T3 25-YEAR EVENT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	4							3975.71	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	3		-1							

T3 100-YEAR EVENT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10	5							3976.05	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLOC	IBW	CHNIM	ITRACE
	15		-1							

THIS RUN EXECUTED 24APR98 10:09:22

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

2-,10-,25- & 100-RY.

SUMMARY PRINTOUT

	SECNO	CWSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	EG	SSTA	ENDST
	37.000	3971.00	3.98	2470.00	1501.00	195.97	2016.42	3971.20	1692.00	3968.50
	37.000	3973.25	5.85	2470.00	1503.25	377.56	4566.55	3973.65	1685.25	3968.50
	37.000	3975.71	6.25	2470.00	1505.71	1648.42	6997.28	3976.05	1676.45	3968.50
	37.000	3976.05	6.42	2470.00	1506.05	1716.43	7488.82	3976.39	1674.75	3968.50
*	1.000	3972.16	3.17	3969.00	3.16	138.16	1050.00	3972.31	1508.42	1646.58
*	1.000	3974.74	2.05	3969.00	5.74	478.26	1560.44	3974.80	1294.03	1772.29
*	1.000	3976.80	2.12	3969.00	7.80	1317.76	2421.71	3976.84	1015.22	2332.97
*	1.000	3977.19	3.00	3969.00	8.19	1348.57	3643.68	3977.28	992.25	2340.82
	2.000	3975.15	3.03	3970.10	5.05	153.50	1048.93	3975.30	1764.06	1971.62
*	2.000	3975.99	3.38	3970.10	5.89	348.51	1466.24	3976.15	1631.41	1979.91
*	2.000	3977.51	3.15	3970.10	7.41	1293.78	1892.81	3977.60	1323.93	2617.70
	2.000	3978.25	3.53	3970.10	8.15	1379.65	2403.74	3978.35	1247.83	2627.48
*	3.000	3976.13	1.58	3971.50	4.63	175.24	1049.97	3976.17	1799.34	1974.59
*	3.000	3977.05	1.93	3971.50	5.55	341.87	1590.09	3977.11	1179.60	2007.70
	3.000	3978.52	3.17	3971.50	7.02	1070.59	3417.22	3978.65	1077.25	2147.86
	3.000	3979.33	3.68	3971.50	7.83	1171.63	4497.08	3979.48	1066.69	2238.31
*	4.000	3977.18	3.96	3973.50	3.68	87.14	1050.00	3977.42	2061.58	2148.72
*	4.000	3978.20	4.48	3973.50	4.70	93.57	1600.00	3978.51	2059.21	2152.78
*	4.000	3980.39	6.72	3973.50	6.89	768.66	3884.31	3981.03	1046.70	2160.79
*	4.000	3981.28	6.76	3973.50	7.78	1123.21	4541.08	3981.78	1039.35	2162.56
	5.000	3980.37	2.61	3975.10	5.27	196.46	1047.01	3980.48	1855.77	2052.23
	5.000	3981.16	2.90	3975.10	6.06	291.35	1537.14	3981.29	1825.90	2117.25
*	5.000	3983.12	2.92	3975.10	8.02	1236.70	2496.12	3983.21	1010.15	2246.85
*	5.000	3983.83	3.43	3975.10	8.73	1257.51	3339.57	3983.94	1000.00	2257.51
*	6.000	3981.80	2.34	3976.20	5.60	176.91	991.27	3981.88	1155.50	1332.41
	6.000	3982.61	2.83	3976.20	6.41	224.73	1427.13	3982.73	1142.71	1367.43
	6.000	3984.43	4.69	3976.20	8.23	348.30	3214.89	3984.71	1097.13	1445.43
*	6.000	3985.42	6.08	3976.20	9.22	413.79	4776.46	3985.86	1057.47	1471.26

	SECNO	CWSEL	VCH	ELMIN	DEPTH	TOPWID	QCH	EG	SSTA	ENDST
	7.000	3982.12	2.50	3971.60	10.52	51.15	1050.00	3982.22	1077.81	1128.97
	7.000	3983.26	3.41	3971.60	11.46	52.66	1600.00	3983.24	1077.36	1130.02
	7.000	3985.35	7.15	3971.60	13.75	56.49	4250.00	3986.15	1076.14	1132.63
*	7.000	3986.70	10.54	3971.60	15.10	61.42	7100.00	3988.43	1072.74	1134.16
	7.100	3982.14	2.51	3971.60	10.54	51.19	1050.00	3982.24	1077.80	1128.99
	7.100	3983.28	3.47	3971.60	11.48	52.70	1600.00	3983.25	1077.35	1130.05
	7.100	3985.40	7.54	3971.60	13.80	56.71	4250.00	3986.28	1075.99	1132.70
	7.100	3986.74	11.48	3971.60	15.14	61.55	7100.00	3988.78	1072.55	1134.20
	7.200	3982.20	2.50	3971.60	10.60	51.27	1050.00	3982.30	1077.78	1129.05
	7.200	3983.19	3.44	3971.60	11.58	52.86	1600.00	3983.37	1077.20	1130.15
	7.200	3985.88	7.28	3971.60	14.28	58.42	4250.00	3986.70	1074.81	1133.23
	7.200	3987.95	10.68	3971.60	16.35	69.85	7100.00	3989.72	1066.02	1135.37
	7.300	3982.30	2.88	3971.60	10.60	43.95	1050.00	3982.33	1066.55	1110.61
	7.300	3983.19	3.92	3971.60	11.58	45.31	1600.00	3983.42	1066.24	1111.56
	7.300	3985.91	7.92	3971.60	14.30	50.14	4250.00	3986.88	1064.06	1114.20
	7.300	3988.12	10.81	3971.60	16.52	61.11	7100.00	3989.93	1055.78	1116.89
*	8.000	3982.54	3.54	3977.00	5.54	82.91	1050.00	3982.73	1052.46	1135.37
*	8.000	3983.72	3.98	3977.00	6.72	95.88	1600.00	3983.96	1051.23	1147.16
	8.000	3987.42	5.20	3977.00	10.42	154.27	4168.66	3987.84	1041.28	1195.55
*	8.000	3990.54	5.51	3977.00	13.54	235.47	6306.00	3990.97	1030.15	1265.62