Regional Flood Protection Study

For

Lake Houston Watershed Flood Program

(Final Report)

for

City of Houston
Harris County Flood Control District
Montgomery County and
San Jacinto River Authority
Texas Water Development Board

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EXECUTIVE SUMMARY

Since the early 1970's to the present time, communities surrounding Lake Houston have experienced a rapid growth from a rural to a suburban settling. The proximity to Houston and the growth trend in the area significantly influenced growth in the communities situated along the lower reaches of the West Fork of the San Jacinto River. Undeveloped and agricultural land were converted to residential and commercial development, especially in the planned communities of Kingwood and Atascocita. New developments are mostly focused along the Lake Houston Parkway corridor. Several other existing subdivisions within the area include Lakeside, Riverside Oilfield, Riverside Crest, Forest Cove, Belleau Wood, Ramblewood, and Northshore. With the increased urbanization and record floods in recent years, namely the floods of October 1994 and November 1998, concerns related to the flooding problems have occurred along the West Fork channel upstream of the Lake Houston dam.

Previous studies of Lake Houston suggested that continuous sedimentation may have reduced the storage capacity of the Lake since its construction. Further more, recent floods in the area may suggest that the increased sedimentation in Lake Houston and its upstream tributaries may have aggravated flooding conditions.

In late 1997, Brown & Root was contracted by the City of Houston in conjunction with funding from the Texas Water Development Board (TWDB), the Harris County Flood Control District (HCFCD), Montgomery County and the San Jacinto River Authority (SJRA). The scope was to prepare a regional flood protection study for a Lake Houston Watershed Flood Mitigation Program. The purpose of this study is to identify the sediment problem along the upper reach of the lake and to investigate/formulate methods of controlling flood damage in the area. The study area is limited to the West Fork of the San Jacinto River between one-mile upstream of the US Highway 59 bridge and the FM 1960 bridge.

As part of the study, a topographical and hydrographic survey was commissioned between June and September 1999 to obtain updated channel cross sectional data along the West Fork of the San Jacinto River. The scope of work included orthophotography, aerial photogrammetry of the over-bank area, and a channel bottom profile survey. For comparison purposes, representative channel cross sections were selected in general accordance with the original FEMA Flood Insurance Study (mid-1970's) surveyed cross-section alignments that were taken along the original range lines established during construction of the Lake in the early 1950's.

BACKGROUND/SITE CONDITIONS

Lake Houston is a man-made lake located in northeast Harris County approximately 18 miles from downtown Houston. Completed in August 1954, Lake Houston, which was formed by placing a dam across the upper San Jacinto River near Newport, provides a large percentage of the City of Houston's municipal and industrial water supply.

The Lake Houston watershed contains approximately 2,830 square miles of drainage area. The watershed is composed of eight major stream tributaries/basins of the San Jacinto River as well as Lake Houston and Lake Conroe. These eight tributaries, connecting from generally the west side to the northeast side of Lake Houston, are: Cypress Creek, Spring Creek, Lake Creek, West Fork San Jacinto River, Caney Creek, Peach Creek, East Fork San Jacinto River, and Luce Bayou. In 1990, the land use distribution in the watershed was estimated at approximately 68% forest, 20% agriculture, 10% urban, and 2% water. Generally, the eastern, northern, and central portions of the watershed are less developed and contain large tracts of forested land. The western portion, which includes the Cypress and Spring Creek basins, has experienced rapid urban development and also contains the bulk of the watershed's agricultural activities.

During October 15 to 18, 1994, a stalled system fed by a low-level jet stream generated heavy rains over the Houston area. The rain exceeded 7.6 cm (3 inches) per hour at times. Rainfall totals ranged from 25 cm (10 inches) to 76 cm (30 inches) over much of Southeast Texas. Much of the San Jacinto River Basin received 5-day rainfall amounts in excess of 38 cm (15 inches). The effect of the rain was a catastrophic flood on the San Jacinto River. Significant scouring and erosion along the San Jacinto River channel including both the East and West Forks were observed after the flood. Above Lake Houston, flooding on the West Fork of the San Jacinto River inundated and closed Interstate 45 near Conroe and U.S. Highway 59 near Humble. Lake Houston also was inundated by floodwater. Roughly twice as much water (249,000 acre-ft) was in the lake at its maximum flood stage. For those tributaries where the 100-year flood was exceeded within (or near) the study area, the extreme flood magnitudes ranged from 1.1 to 1.8 times the 100-year flood.

PROBLEM CHARACTERIZATION

As a result of the October 1994 Flood, sedimentation in the upper reaches of Lake Houston was suspected of having an impact on flooding and resulting floodwater elevations in the West Fork of the San Jacinto River and the upper reaches of the Lake. To verify the impact of sedimentation, major sources of sediment and characteristics of the sedimentation process were analyzed in this study. The extent and rate of the sedimentation were quantitatively estimated by firstly compiling available data reported in several previous studies and then by sediment loading computations using accessible Total Suspended Solid (TSS) data. Additionally, channel profiles were compared to assess the amount of the sedimentation due to change of the cross-sectional areas between the 1999 survey and the original FEMA model (mid-1970's survey). Based on the updated channel sections (1999), hydraulic analyses of the channel and floodplain conditions were provided to evaluate the impact of the flood levels along the study area. The U.S Army Corps of Engineers (COE) Hydrologic Engineering Center's water surface profile computer program (HEC-2) was used for the analyses. The effect of obstructions to flow at bridges and the energy losses in the channel associated with these structures were also included in the analyses.

Sedimentation

Sediment loads reported from previously available studies indicated that annual sediment loads range from 102,000 to 279,000 tons with a mean at 176,000 tons in the study area. Assuming the dry weight of the submerged sediment is at approximately 52 lb/ft^3, the total annual sedimentation is equivalent to approximately 160 to 300 acre-ft/year. This finding appears consistent with the channel profile survey data as reported by the previous studies.

Among the contributing tributaries within the study area, anticipated sediment source distribution is estimated at approximately 42, 18, 15, and 25 percent for Cypress, Spring, West Fork, and others, respectively. The heavy sediment load in the Cypress Creek is primarily due to high instantaneous total suspended solid (TSS) loads and sand contents in Cypress Creek than other tributaries under similar flow conditions. The heavy sediment load is evident by the existing "sugar sand" observed along Cypress Creek (a tributary of Spring Creek). It is anticipated that similar sediment characteristics may also apply to Spring Creek. It should be recognized that very limited data and studies were available to interpret the sediment sources, especially as they may vary temporally and spatially due to variations in the sediment, flow properties, turbulence, timing, locations, and position relative to the stream bed relief. In general, the sediment load and movement is more likely to occur during major storm/flood events.

Results of the 1999 channel survey indicate that the overall volume in the study area shows a net conveyance decrease of approximately 3,100 acre-ft (144-acre-ft/year) in comparison with the FEMA model (1970's survey). This is due to the accumulation of sediment in the study area. For the amount of sedimentation within the study area, it appears that two generally distinct channel characteristics were observed. For most of the narrower channel sections (with respect to the total flood way), more channel scouring than sedimentation were observed at the upper through middle reach of the study area. In comparison, for the wider channel sections (FEMA cross sections A and B) at the lower reach of the study area approaching the confluence with the Lake Houston, significant sedimentation was observed, which accounted for approximately 15 to 20 percent of the 100-year flood conveyance area.

Minor sedimentation was observed at the US Highway 59 and the railroad bridge; whereas, channel scouring was observed at the Lake Houston Parkway bridge. At the FEMA cross sections C, D, and H, accumulation of sedimentation was observed in the over-bank areas outside of the main channel area.

Similar evaluation was provided to estimate the volume of sedimentation due to the cross-sectional changes between the mouth of the West Fork channel at the Lake and the FM 1960 bridge. Due to the limited cross-sectional data available, channel/lake bottom data along this area were supplemented by TWDB's 1994 survey. Results of the difference in cross-sectional area suggested a net volume loss of approximately 7,500 acre-ft (428 acre-ft/year) along this area. The sediment volume increase is likely caused by the accumulation of sediment behind the restricted, channel openings at the FM 1960 bridge.

There is evidence that the sediment has progressively migrated further downstream toward the confluence with the main body of the Lake. Due to the wider channel at this location, it is anticipated that significant quantities of additional sediment may be accumulated before the sediment will be transported further into the Lake. The rate of accumulation of the sediment in the lower reaches of the study area and the rate of transport into the Lake requires further evaluation.

Flood Impact

As a result of the HEC-2 analyses, the 1999 flood profiles show small increase of flood levels in comparison with the original FEMA 1970's model. In general, the updated 100-year water surface shows variations from an increase (maximum) of about 1.1 to 0.75 feet at lower half of the channel study area to a decrease (maximum) of about 2.1 feet at upper half of the channel study area. Specifically, the 1999 data suggested that flood level increases of about 0.75 to 0.5 ft are shown at FEMA cross sections C and D, upstream of the Lake Houston Parkway bridge. Flood level increases of about 1.0 to 1.1 feet are shown at FEMA cross sections A and B, downstream of the Lake Houston Parkway bridge, due to the backwater conditions from Lake Houston. For the upper section of the study area toward U.S. Highway 59, reduced flood levels were concluded in comparison with original FEMA conditions. The constriction to the flow area of the channel at the bridges results in small, localized increases (i.e., 0.5 feet or less) of flood levels (WSEL's) at all locations. The WSEL's for 100-year flood at the U.S. Highway 59 bridge area show a minor impact from –0.1 to +0.3 feet than the FEMA model. The 100-year WSEL's at the U.S. Highway 59 bridge are between 1.3 to 1.8 feet above the low chord elevation of the bridge.

Although the current analysis shows no significant increases in the flood levels, the 100-year floodplain (1999) shows a variation in top width from a maximum increase of 1,300 feet (FEMA Sections E and N) to a decrease of 2,500 feet (FEMA Section J). The basis for the variation was mainly due to the better representation and remodeling of the actual terrain data in over-bank areas that resulted from the 1999 survey.

Even with the amount of the sedimentation as noted above, only small increases (i.e., 0.5 to 0.75 feet) of the 100-year flood level was found in comparison with the original FEMA study. The impact of the sedimentation was compensated to some degree by nearby channel scouring and, in some areas, a better defined over-bank terrain data resulting from the 1999 survey. Due to the loss of a relatively small percentage of the overall available conveyance capacity, the level of the sedimentation does not pose a significant impact to the flood level at this time. However, a slightly higher 100-year flood level increase (i.e., 1.0 to 1.1 feet) is shown downstream of the Lake Houston Parkway due to the backwater conditions from the Lake. This increase of flood level may potentially affect some of the properties that were developed after the Floodplain Regulations were implemented.

FLOOD CONTOL OPTIONS

The objective of the flood control options is to evaluate potential mitigation efforts for possible improvements of the existing and, potentially, future impact of the sediment-related flooding problems. As applicable, the target solutions are to restore the effective channel conveyance so that the base 100-year flood conditions can be maintained according to the original FEMA model (1970's) condition or can be improved to achieve reduced levels of flooding in critical areas.

To achieve the project objective, a range of flood control options were identified and evaluated. These flood control options include:

- Flood protection levee;
- Hydraulic conveyance improvement such as
  - reducing friction losses through vegetation removal or surface channel lining,
  - using by-pass channel, and
  - channel enlargement by overbank excavation or channel improvement;
- Regional detention or flood control reservoir;
- Floodplain property buyout.

As a result, channel enlargement, primarily through sediment removal, was considered one of the more practical alternatives for achieving flood-level reduction in the study area. Other options, while technically possible, are generally problematic due to limited benefits, very high costs, and other unfavorable environmental issues.

Additionally, long-term sediment management and/or maintenance dredging options were evaluated to mitigate the potential impact of the continued sedimentation in the area. Evaluation of the floodplain property buyout option was also considered in order to provide comparisons with the structural alternatives. In order to prioritize the flood control options, the alternatives were screened by comparing them in various categories.

As a result of the screening process, a number of candidate alternatives were formulated and expanded with project features/configurations to achieve the project objective. Specifically, these project alternatives include:

Structural Measures

- Alternative I - Channel improvements downstream of the West Fork San Jacinto Channel (3.5 mile reach)
- Alternative II - Selected dredging for Areas A, C, and D, downstream of the West Fork San Jacinto River area
- Alternative III - On-channel sediment basins downstream of the Lake Houston Parkway Bridge (Area A) or South of Kingwood Country Club (Area D)
- Other Alternative - (to be studied) Off-channel sediment basins

Non-Structural Measure

- Alternative IV - Floodplain Buyout (Non-Structural)

IMPLEMENTATION ISSUES

Authority and Funding

Numerous public agencies are recognized as having jurisdictional authority for the West Fork of the San Jacinto River upstream of Lake Houston. These agencies include the City of Houston, Harris County, Montgomery County, the Harris County Flood Control District, and the San Jacinto River Authority. It is recognized that these agencies were created through a series of unrelated legislative acts and have differing boundaries, powers and abilities related to flood control issues. As a result, although some agencies may be seen by the public as having responsibility for flood control issues, the actual legislative authority of these agencies is generally limited to development of water resources and administration of infrastructure or floodplain policies. Additionally, the availability of funding or other financial responsibilities limit the practical capability of all of the relevant agencies to implement or support flood control measures in the study area. The City of Houston, Harris County, and Montgomery County as participants in the National Flood Insurance Program each provides a Floodplain Administrator who has authority to enforce regulations for development and construction permits for all activities within the regulatory 100-year floodplain.

For implementation of flood control measures, the authority for either dredging projects or buyout programs may be initiated by the City of Houston or Harris County. Due to the regional impact of the problem, it is anticipated that interagency coordination among the City of Houston, the Harris County Flood Control District, Harris County, Montgomery County, and the San Jacinto River Authority is also needed. Funding of any project, other than floodplain buyout efforts, will likely require predominately local funding since the benefits of the project cannot meet cost-benefit criteria for federal funding. Presently, limited public funds or potential taxing revenue have been identified to support the dredging effort.

Under the FEMA Flood Mitigation Assistance Program (FMA), federal grant funds, as administered through the TWDB, may be available to assist state and local governments in funding cost-effective projects that reduce or eliminate the long-term risk of flood damages. To be eligible for such funds, local participation and cost sharing is required. Acceptable FMA projects include: planning grants to assess flood risk and identify actions to reduce that risk; project grants to execute measures to reduce flood losses; and technical assistance grants to develop viable FMA applications and implement FMA projects. For the purpose of this study, the type of projects eligible for FMA funding include: flood protection planning studies; acquisition, relocation, modification, and demolition of insured structures to reduce flood losses (i.e., floodplain buyouts); minor physical flood mitigation projects; sediment transport studies and regional hydrologic and hydraulic studies.

For dredging projects, it is expected that authorization under Army Corps of Engineers Section 10 and Section 404 permits will likely not be required if there is no deposition of dredged materials back into the river.

Flood Control Management

The National Flood Insurance Program (NFIP) requires participating communities to adopt floodplain management ordinances intended to reduce future flood losses. As a result, relevant floodplain management policy and/or local ordinances were enacted to regulate new construction in the 100-year floodplain since the mid-1980's. Typical floodplain ordinances/policies administrated by the City of Houston, Harris County, and Montgomery County have reduced new, flood-prone development and minimized the potential flood damage to the new structures.

Typical floodplain management requires/restricts new construction to be elevated at least 12 to 18 inches above the 100-year base flood elevation or be provided with other flood proofing measures. However, even with the enactment of such floodplain regulations, flooding problems remain for development built before these regulations. In addition, new development within or near the floodplain may be threatened when 100-year flood levels are exceeded, as was the case in the October 1994 Flood. The impact may also be caused by flood level increases due to watershed development, or to a minor degree by the impact of sedimentation as illustrated in this study.

In any case, flooding remains a significant concern, especially when compounded by the rapid urbanization in the area. Implementation of flood control alternatives as identified in this study clearly indicate their limitations and costly nature of solutions to resolve the flooding concerns. In addition, adoption of floodplain management policies alone does not resolve issues affected by the increased runoff associated with new developments. To ensure an effective and more of a long-term implementation solution, a comprehensive, master drainage plan incorporating the stormwater control and the floodplain management policies should be considered.

<u>Permit Requirements</u>

Due to construction of the Lake Houston dam in the 1950's, the West Fork of the San Jacinto River along the project site is no longer navigable. Therefore, authorization under Section 10 is not required for dredging consideration. Section 404 of the Clean Water Act only regulates the placement of fill and dredged materials in waters of the United States. Since this project involves only the removal of materials by dredging from a water of the United States and not deposit them, a Section 404 permit will likely not be required. Disposal or storage areas must be screened to ensure that these sites are free from environmental constraints such as impacts to wetlands and other waters of the U. S., archeological sites or endangered species. Placement of any fill or dredged material in a water of the U. S., including a wetland, will require authorization under Section 404 of the Clean Water Act. Discharge of the return water into the receiving stream is permitted under Nationwide Permit 16, but the discharge must be approved under Section 401 of the Clean Water Act from the Texas Natural Resource Conservation Commission (TNRCC).

Correspondence from the U.S. Fish and Wildlife Service (USFWS) indicates that no federally listed threatened and endangered species are likely to occur at the project site. Correspondence with the Texas Parks and Wildlife Department (TPWD) also stated that there were no known occurrences of rare species within the project area; however, that there were some species known existence in close proximal to the project. Prior to construction, all sites to be utilized for dredging or disposal should receive final review to minimize potential disturbance for threatened or endangered species or other sensitive natural communities.

Discharges of storm water runoff from construction activities that disturb more than five acres must be covered by a Texas Pollutant Discharge Elimination System (TPDES, formerly NPDES) permit. Most construction activities can be covered under the TPDES General Permit for Storm Water Discharges from Construction Sites. Under this general permit, the state (TNRCC) requires development of a Storm Water Pollution Prevention Plan (SWPPP). If five acres will be disturbed by the proposed project then a Storm Water Pollution Prevention Plan will be required.

Application of the National Environmental Policy Act may be required if federal funds are involved in the construction of the project. Presently, there are no plans for federal funds to be used in this project. Even if no federal funds are involved, various federal permits, such as Section 404, can trigger NEPA. If application of the NEPA is required, generally, most regulatory actions would normally require only an Environmental Assessment (EA). However, if a project is controversial or is judged to have potentially significant impacts, the Corps may require that an Environmental Impact Statement (EIS) be prepared.

Environmental Impacts

Dredging activities may affect water quality through increases in turbidity and total suspended solids in the channel. Any spill of lubricants or fuels from dredging or construction equipment could adversely impact the receiving water quality. Turbidity generated by the hydraulic dredging operation is usually found in the vicinity of the pump/cutter head. The levels of turbidity are directly related to the type and quantity of material cut, but not picked up, by the suction. Average turbidity levels, as well as the occasional relatively high levels are often associated with naturally occurring storms, high wave conditions (by recreational boating), and floods. Erosion of the current channel banks or the existing sediment beds could result in greater chronic long-term impacts to water quality than those resulting from short-term construction activities. Due to the relatively large and undeveloped nature of the area, water quality impact may only be considered a limited, local or temporary effect.

Under normal conditions, the upper end of Lake Houston in the project area is characterized by shallow backwaters and sloughs interspersed with sandbars and low islands. The main channel of the West Fork of the San Jacinto River is shallow and meandering in this area. The proposed project will result in the deepening, widening and straightening of the main channel of the River. In areas adjacent to the main channel, shallow water habitat, including wetlands, will be converted to deep water habitat and terrestrial habitat, including sandbars, will be lost due to conversion to deep water habitat by dredging and excavation of these areas. However, much of the shallow water and wetland habitat consists of mud flats ringed by various herbaceous species and willows. Aquatic vegetation is likely limited due to the fluctuations in water levels and the high turbidity levels of the water. The sand bar terrestrial habitat that may be lost is likely of low quality due to the ephemeral nature of many of these areas.

CONCLUSIONS AND OPPORTUNITIES

Based on the topographic and hydraulic conditions of the West Fork channel, the impact of sedimentation to the flood levels and the floodplain conditions in the study area is considered minimal at this time. The following conclusions represent the final assessment and recommendations of the project alternatives to mitigate the flood impact. By integration of the findings and limitations as understood in this study, an outline of the opportunities for future program development is also presented.

Conclusions

1. For sedimentation concerns, improvement of the flood level is possible by utilizing a range of sediment removal or dredging efforts for the impacted channel sections. In general, the impacted areas are located along the lower reach of the West Fork channel near or upstream from the Lake Houston Parkway bridge area. Alternative sediment removal projects can only provide limited improvement for the existing 100-year flood level (i.e., less than 0.6 feet) at a relatively high cost (i.e., up to $30 million). Since the majority of flood damages involve developments built before the enactment of the floodplain regulations, alternative projects studied in this report will not improve flood conditions for those areas/structures. Options available to create this level of flood protection involve dramatic modification to the river channel of extremely large regional flood control reservoirs; consequently, these options are expected to exceed $50-$100 million in cost and are not considered reasonable.

2. A slightly larger flood increase for the 100-year flood levels (i.e., 1.1 feet) is present downstream of the Lake Houston Parkway bridge area due to backwater conditions from Lake Houston. This is likely in part caused by the accumulation of sediment since the construction of the dam in the 1950's. The increase of 100-year flood level will potentially impact some of the properties that were developed after the floodplain regulations were implemented. To address potential flood improvements in this area, further study of Lake Houston is warranted.

3. Among various sediment removal projects, Alternative II area dredging for Area C, southwest side of the Lake Houston Parkway bridge (RM 12.2), is considered the most effective by hydraulically improving the impacted flood levels in the respective area. The proposed improvements will reduce the predicted flood level approximately 0.3 to 0.4 feet near the Lake Houston Parkway bridge area and restore the flood levels upstream of FEMA cross-section D (RM 12.9±) to the original FEMA (1970's) condition. Costs for this project are estimated at approximately $10 million. It is anticipated that by extending the dredging effort through the bridge crossing, the project may reduce the flood level approximately an additional 0.1 feet near the bridge and restore flood levels to within 0.3 feet of original FEMA conditions at FEMA cross-section C (RM 12.2). By doing so, the cost of the project would increase approximately 25 percent for a total of $11-$12 million.

4. For long-term sediment management consideration, sedimentation basins, either on-channel or off-channel, are the most effective approaches to minimizing sediment buildups and maintain the life of the channel conveyance. Selected basin locations include Area A (RM 11.3), Area D (RM 12.9), or potentially other off-channel locations. The cost of on-channel sediment basins will include initial cost of area dredging and continuous maintenance dredging effort. Routine maintenance dredging at an interval of every five years is also expected. With the improved basin conditions, a sediment basin would be capable of removing (or trapping) a majority of the annual sediment load (i.e., 250,000 to 500,000 cubic yards) at the designated area. Depending on the size of the

basin, initial dredging efforts for on-channel basins is estimated between $13 to $22 million.

5. Similar to on-channel sediment basins, off-channel basins were also considered at the existing sandpits in the area. Due to the relatively small sediment loads and availability of existing sites, this option may be constructed at a lesser cost by developing them jointly with the local sandpit operators. For the purpose of this study, off-channel basins may include the existing sandpit sites by Hallett Materials located three miles upstream of the West Fork channel from the US 59 bridge or Don Schneider Materials located one mile east of the US 59 bridge. Further evaluation and analyses is required to confirm the feasibility of these sites.

6. In contrast to structural projects, the floodplain buyout option remains economically attractive to mitigate the existing and future repetitive flood damages in the area especially for those pre-FIRM properties located within the floodplain. The targets of these buyouts are mainly located along the upper reach of the West Fork channel. In fact, results of this study suggested that the area along the upper reach of the channel actually experienced a reduced 100-year flood level per the 1999 flood profile than the 1970's FEMA study. A preliminary cost estimate for total buyout effort of all repetitive, flood-prone structures is approximately $22 million.

Opportunities

The issues associated with the implementation of the flood control projects for the Lake Houston area provides some opportunities to develop future programs in an effort to mitigating flood concerns.

1. It is recognized that pre-FIRM properties within the floodplain remain vulnerable during floods. Rapid urbanization and extreme flood events may also threaten new development built after the floodplain regulations near the floodplain. Currently, the results of this study suggest that the flood impact in comparison with the original FEMA study (1970's) is relatively small (i.e., less than a one-foot increase in the 100-year flood level) in selected channel areas. Implementation of various flood control alternatives as concluded in this study indicated their related costs with limited benefits. Since backwater conditions from the Lake may be one of the contributors to the problem, further understanding of the hydraulic and hydrologic conditions in Lake Houston should be revisited. By doing so, a more up-to-date and integrated solution may be achieved to manage long-term flooding concerns in the area.

2. Considering that sediment impact to the flood levels remains relatively small and limited to a small area upstream of the Lake Houston Parkway bridge, the benefit of improving the flood levels in this area may be difficult to justify at this time. However, it is possible that sedimentation may progressively aggravate future flooding as depositional areas develop in the area downstream of the Lake Houston Parkway bridge toward Lake Houston. Sediment control along the West Fork channel can be an effective means to minimizing these continued sedimentation problems. Therefore, additional assessment

and monitoring of the sediment process and movement, especially along the lower reach of the channel should be considered. To better understand the effects on the sedimentation levels and transport, the monitoring program should be conducted at various strategic locations along the East and West Fork of the San Jacinto River as well as Spring and Cypress Creeks. The sediment monitoring should also be focused during and following major storm events to verify the dominant sediment movements and effects on the flood levels.

3. For long-term sediment management alternative, a combination of a sediment basin and the selected area dredging may be most effective in maintaining channel conveyance and mitigating future flooding conditions. To maintain its efficiency, any designated sediment basin site, once developed, will require routine maintenance dredging work. Opportunities to use existing sandpits as off-channel sediment basins should be further explored. It is possible that off-channel basins may be developed jointly with the existing sandpit operators with a resulting cost savings in construction and maintenance costs.

4. As an on-going effort to manage future flooding problems, continued efforts should be provided in educating, enforcing, and updating region-wide floodplain management and on-site stormwater control regulations to mitigate and balance the potential impact of urbanization. Floodplain buyouts should continue for those repetitive, flood-prone properties to limit potential, repeated flood losses within the floodplain.

Regional Flood Protection Study
Lake Houston Watershed Flood Program
(Final Report)

1.0 Problem Definition and Analysis

1.1 Introduction

Lake Houston is a manmade lake located in Harris County approximately 18 miles northeast from downtown Houston. Completed in August 1954, Lake Houston, which was formed by placing a dam across the upper San Jacinto River near Newport, provides a large percentage of the City of Houston's municipal and industrial water supply. The general site location is shown in Figure 1-1.

Several previous studies of Lake Houston between the 1960's to the 1990's suggested that continuous sedimentation may have reduced the storage capacity of the Lake since its construction. Recent floods, namely the floods of October 1994 and November 1998, further suggested that the increased sedimentation in Lake Houston and its upstream tributaries may have aggravated flooding conditions in the area.

In late 1997, Brown & Root was contracted by the City of Houston in conjunction with funding from the Texas Water Development Board (TWDB), the Harris County Flood Control District (HCFCD), Montgomery County and the San Jacinto River Authority (SJRA). The scope was to prepare a regional flood protection study for a Lake Houston Watershed Flood Mitigation Program. The purpose of this study was to identify the sediment problem along the upper reaches of the lake and to investigate/formulate methods of controlling flood damage in the area. Specific scope of work included:

- Problems Definition and Analysis for Sedimentation Effect on Flood Conditions,
- Formulation of Alternative Solutions for Flood Control, and
- Preliminary Screening and Project Assessment for Flood Control Alternatives.

For this project, the study area was limited to the West Fork of the San Jacinto River between the Harris County boundary line (approximately one-mile upstream of the US Highway 59 bridge) on the west and the FM 1960 bridge on the east.

1.2 Sedimentation Effect on Flood Levels

It was suggested in previous studies that the age of the reservoir, record floods in recent years, potential subsidence, and increased urbanization may have caused a number of conditions to develop in Lake Houston and the West Fork of the San Jacinto watershed that exacerbate flooding. In addition, every major rainstorm creates or re-suspends new deposits of fine silt along the channel and in the Lake. These deposits may contribute to flooding in upstream areas by reducing the flow of water into the Lake.

On October 17, 1996, the Texas Water Development Board (TWDB) authorized a planning grant to the City of Houston for a Regional Flood Protection Planning Study. The Study was jointly sponsored and locally funded by the City of Houston, the Harris County Flood Control District (HCFCD), Montgomery County and the San Jacinto River Authority. Specifically, the 1996 study was to:

> *Evaluate historic cross-section data for study area (one-mile upstream Highway US 59 to Highway FM 1960) considering subsidence and sedimentation; Conduct backwater analysis using the HEC-II model developed during the FEMA FIS project to determine variation in water surface elevation as a result of changes in channel cross-sections; Establish the 10-, 50-, 100-, and 500-year flood frequency backwater profiles.*

The purpose of this initial evaluation was to confirm expectations that sedimentation and/or subsidence are causing increased flood levels in the study area and to determine the amount and quality of relevant survey data already available for use in subsequent elements of the study. Results of this initial study identified preliminary sedimentation effects on flood levels in one reach of Lake Houston based on then available historical data. (Ref: Preliminary Hydraulic Analysis for Lake Houston Flood Study, Brown & Root, Inc., 1998).

1.2.1 Historical Studies

During the preliminary study (1998), six different sets of survey data that included cross section information for the Lake Houston area were identified. These data sets were from the following reports.

1954 *Survey for Construction of Lake Houston Dam for the City of Houston* - This survey included the establishment of reservoir monuments for 45 "range lines" to be used for future siltation measurements within the Lake Houston area. The area surveyed included the upper reaches of the Lake formed by tributaries such as Luce Bayou and the West and East Forks of the San Jacinto River.

1966 *"Report on Sedimentation of Lake Houston" prepared by Ambersen Engineering Corp. for the City of Houston* - This survey used the previously established range lines to evaluate the effects of sedimentation between 1954 to 1966.

1983 *"Sedimentation Evaluation of Lake Houston " prepared by Turner Collie & Braden, Inc. for the City of Houston* - This study re-established the range lines and updated cross sectional surveys along the range lines to establish the effects of subsidence and sedimentation on the volume of Lake Houston. This data was not used to evaluate the potential changes to the regulatory floodplain.

1985 *FEMA "Flood Insurance Study" by the U. S. Army Corps of Engineers, Galveston District* - Surveys were conducted by the District in the mid 1970s using some of the previously established range lines to develop lake and channel cross sections and adding additional cross section locations where appropriate. The study incorporating this data was first published in 1985. These cross section surveys are the basis for the current

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps in use to define the 100-year regulatory floodplain. The cross section locations are identified in alphanumeric sequence and shown on Figure 1-2.

1994 *" Volumetric Survey of Lake Houston " by the Texas Water Development Board for the City of Houston* - The City requested this latest comprehensive study to update the storage capacity of the lake. The information was gathered with GPS equipment in May 1994 and did not specifically tie into the range line monuments; however, the survey is comprehensive and covers all lake areas where water depth is sufficient for boat access. This data was used to create 1994 cross-section information for Lake Houston (range lines 1-14) and for the West Fork San Jacinto River (range lines 15-21) as shown on Figure 1-2.

1995 *West Fork San Jacinto River Survey by Survey Resources, Inc. for the Lake Houston Flood Task Force* - This limited-scope survey was conducted to evaluate the increased sedimentation in the West Fork of the San Jacinto after the flood of October, 1994. This limited survey data set provided 1995 cross section information for the West Fork only, covering range lines 15-21. An attempt was made to tie into the established range line network; however, all monuments were not successfully located.

1.2.2 Findings from Previous Studies

- **FEMA FIS** - A hydraulic backwater model (HEC-2) for the San Jacinto River was developed by U. S. Army Corps of Engineers (USACE) Galveston District for the Flood Insurance Study (FIS) initiated in the late 1970's and early 1980's. This model remains the basis for the 100-year regulatory floodplain identified in the FEMA FIS dated April 20, 2000. For computational purposes, the hydraulic model was divided into three reaches. Reach I extends from Buffalo Bayou upstream to Lake Houston Dam (approximately 28.98 river miles above the confluence with Galveston Bay). Reach II covers Lake Houston from the dam upstream for approximately 8.67 river miles. Reach III is the West Fork of the San Jacinto River and extends approximately 8.35 river miles (within the Harris County jurisdiction) from river mile 10.12 to 18.47.

- **Lake Houston Parkway** - The HCFCD has maintained the original HEC-2 model and subsequently updated it to reflect recent roadway improvements, including the new Lake Houston Parkway and U.S. Highway 59 improvements. The Lake Houston Parkway location is between FEMA cross sections B and C and is identified as Range Line 22 on Figure 1-2. Plans for both roadways were analyzed to confirm that there would be no increase in flood levels as a result of construction within the floodplain. For this updated analysis, additional cross sectional surveys were completed in 1992 in the immediate vicinity of the roadways. Revised hydraulic modeling was submitted as an Impact Analysis Study in conjunction with the Harris County and Metropolitan Transit Authority "Lake Houston Parkway" project. The surveyed cross sections were adjusted to the 1973 datum consistent with the FIS models. The models confirmed that the proposed construction would not create any increased flooding; however, the flood levels in the areas modeled were shown to increase for both models (with and without proposed bridge changes) by approximately eight tenths foot over the original FEMS HEC-2 model. The increase was apparently the result of sedimentation measured in the 1992 survey in the Lake Houston Parkway area.

- **Subsidence** - Based on information obtained from the Harris-Galveston Coastal Subsidence District, it was necessary to make adjustments to the 1994 TWDB and 1995 Task Force survey data in reference to the FEMA study (1973 datum). These adjustments were made to remove the effects of subsidence in analyzing flood levels.

  As reported, the 1954 Lake Houston spillway elevation (crest) was 43.8 ft MSL (or 44.5 ft Gage Height elevation). Accumulative subsidence between 1954 and 1995 was measured at 3.54 ft based on change of vertical control data (bench mark elevations) at the Lake Houston dam (Ref: Subsidence Data). The change in the spillway dam elevation between 1954 and 1995 due to subsidence was estimated as follows.

Spillway Elevation 1954)	+43.8 ft
Subsidence (1954-1995)	- 3.5 ft
Spillway Elev. (1995)	+40.3 ft (MSL)
1994 TWDB Spillway Elev. (Assumed)	+44.5 ft
1995 Spillway MSL	+40.3 ft
Difference (Correction)	4.2 ft

  Subsidence adjustment between 1973 to 1995 at Lake Houston dam was reported to be 0.8 feet. As a result, 1994 TWDB cross-sectional data (within lake surface) was adjusted by approximately 3.4 ft (i.e., 4.2 ft – 0.8 ft) to correlate to the 1973 base datum.

- **Flood Level Comparisons** - Of the six survey data indicated above, three were chosen for the analyses to illustrate the variation in water surface elevations that occur as a result of changes in channel cross sections. For comparison, the current FEMA cross sections were used as the "base" condition representing the regulatory 100-year floodplain. The cross sectional data provided by the TWDB (1994) and by the Lake Houston Flood Task Force (1995) were used for model updates of the West Fork San Jacinto River (Reach 3). For a comparison of the Reach 3 backwater profiles, FEMA cross section locations A through D are more reasonable. At FEMA cross section locations E and F, the limited 1995 survey data were developed through interpolation from nearby channel sections and were not direct measurements and are therefore of limited value. For Reach 2 in Lake Houston, only the TWDB 1994 survey data was available.

  A comparison was made for the different sets of data at the same cross-section locations identified in the FIS. The resultant flood profiles on the West Fork San Jacinto River for each condition are summarized in Table 1-1. The profiles for Reach 2 of Lake Houston are summarized in Table 1-2. The two recent sets of cross sectional data were adjusted to the 1973 datum consistent with the FEMA FIS. The differential subsidence within Reach 3 (the study area) was on the order of 3 inches and was therefore considered minimal. An elevation adjustment of 3.4 feet was subtracted to correlate the TWDB May 1994 Volumetric Survey data to the 1973 datum in the FIS model.

West Fork San Jacinto River between US59 and FM 1960 Bridge (Reach 3) - As a result of sediment deposits identified in the 1994 TWDB data in the vicinity of FEMA cross sections A through E; all of the profiles in Table 1-1 (10-, 50-, 100- and 500-year) show an increase in flood levels. Specifically for the 100-year flood event, the increase varied from 0.26 to 0.94 feet between locations A through E. At FEMA locations F, G, and H, the cross sections do not match the exact FEMA sections both in location and orientation; therefore, the results are not directly comparable. However, an approximate one-foot increase is shown to occur throughout this upper reach. After the October 1994 storm, the 1995 Lake Houston Task Force data indicated that the channel had accumulated additional sediment deposits in the vicinity of FEMA cross sections B and C. As a result, all of the profiles (10-, 50-, 100- and 500-year) have increased an additional 1.0 to 1.5 feet upstream. For both conditions, the floodplain top-widths were tabulated for direct comparison and are consistent with expectations. More detailed topographic data will be needed to define any changes to the actual floodplain boundaries as a result of the increased backwater profiles.

Lake Houston Area (Reach 2) - As a result of sediment deposits identified in the 1994 TWDB data, Table 1-2 shows an increase of the 100-year regulatory flood profile of approximately one-half foot in the vicinity of FM 1960 and approximately one foot at the upper end of Reach 2. This increase for the 100-year profile for Reach 2 will also affect Reach 3 starting tailwater conditions. Further analysis will be required to determine the impact of the sediment in this reach of Lake Houston on the upper reaches of the West and East Forks of the San Jacinto River.

1.3 Sedimentation Source Analysis

The Lake Houston watershed consists of approximately 2,830 square miles of drainage area. The watershed is composed of eight major stream tributaries/basins of the San Jacinto River as well as Lake Houston and Lake Conroe. These eight tributaries, connecting from generally the west side to the northeast side of Lake Houston, are: Cypress Creek, Spring Creek, Lake Creek, West Fork San Jacinto River, Caney Creek, Peach Creek, East Fork San Jacinto River, and Luce Bayou (See Figure 1-3). In 1990, the land use distribution in the watershed was estimated at approximately 68% forest, 20% agriculture, 10% urban, and 2% water. Generally, the eastern, northern, and central portions of the watershed are less developed and contain large tracts of forested land. The western portion, which includes the Cypress and Spring Creek basins, has experienced rapid urban development and also contains the bulk of the watershed's agricultural activities.

Sedimentation in the upper reaches of Lake Houston is reported as having an impact on flooding and floodwater elevations in the West Fork of the San Jacinto River and along the upper reaches of the Lake. To verify the impact of sedimentation, major sources of sediment and characteristics of the sedimentation process were analyzed as follows.

1.3.1 Previous Studies

The extent and condition of the sediment in Lake Houston and its tributaries were reported in several previous studies. Findings from these studies were evaluated and compiled as follows.

1966 Report on Sedimentation of Lake Houston, Ambersen Engineers.
In 1965, Ambersen performed a bottom profile survey of Lake Houston. The study compared survey data of 45 range lines to evaluate the effects of sedimentation by the change of storage volume between 1954 to 1966. After adjusting for subsidence, the study concluded an average sediment rate of 1,025 acre-ft per year (1954 to 1966).

1978 Sediment Yields for Selected Streams in Texas, U.S. Geological Survey (USGS).
The USGS conducted a study to determine sediment yields for numerous streams including the West Folk San Jacinto River, Spring Creek, and Caney Creek in Texas during water years 1966 to 1975. During the study, suspended sediment samples were collected by using depth-integrated samplers at one or more verticals of the stream section. As a result, 36 to 51 samples were collected and analyzed at the West Folk San Jacinto River near Conroe (USGS station 08068000), Spring Creek near Spring (USGS station 08068500) and Caney Creek near Splendora (USGS station 08070500). Specifically, sediment yield data for the related river basins are reported as follows:

Tributary	Basin Area mile^2	Susp. Sed. mg/l	TSS ton/yr	Sand (%) Bed/Susp. Sed.
Spring Creek	409	100-400	23,400	100/37
W. Folk SJ	809	100-300	36,500	90/48
Caney Creek	105	100-300	6,390	100/25

It was further indicated in the study that although the velocities at both rivers are not usually high, significant quantities of sand sediment likely are carried as bedload.

1980 Environmental Study of Lake Houston (Phase I), Bedient et al., Rice University.
During a 1979-80 study, samples collected from non-point loads after two storm events in October-December 1979 indicated that there is a much higher total suspended solids (TSS) level from Cypress Creek than the less developed watersheds. TSS loads for the Cypress Creek watershed were greater than loads from any other watersheds, including the West Fork, which has three times the drainage area. Specifically, TSS loads for Lake Houston tributaries are:

Tributary	Area(1) mile^2	TSS kg/yr x10^3 (ton/yr)	Percent Total
Cypress Creek	323	46,630 (51,400)	31%
Spring Creek	463	12,900 (14,200)	9%
W. Folk SJ	965	39,400 (43,400)	27%
Caney Creek	201	12,500 (13,800)	8%
Peach Creek	166	24,400 (26,900)	16%
E. Folk SJ	371	13,700 (15,100)	9%
TOTAL	2,489	149,530 (164,800)	100%

Note: (1) converted from hectares (1 ha = .003861 mi^2)

1982 Erosion and Sedimentation by Water in Texas. Texas Department of Water Resources (TDWR).
This report estimated average annual rates of sedimentation in 1979 for any drainage areas in excess of 100 mile^2. The study provided estimates of the gross sheet and rill (overland) erosion and gully and stream bank erosion by utilizing the Universal Soil Loss Equation. Estimated sedimentation rates for the Lake Houston basins are:

Yield Point(1)	Area(2)	Annual Sediment Load, Tons (1979)		Sed. Delivered(3)
	Mile^2	G. Land Erosion	G. Channel Erosion	Ton/Ac (Tons)
Lake Houston	615	415,396	228,347	0.59 (232,000)
Spring Creek	759	243,365	335,070	0.50 (243,000)
E. Fork SJ	989	270,196	56,953	0.11 (70,000)

Note: (1) Comparable yield points to basins are: Lake Houston is equivalent to W. Fork SJ River; Spring Creek is equivalent to Spring plus Cypress Creek; E. Fork is equivalent to E. Fork, Caney, Peach Creek, and Luce Bayou.
(2) Converted from acres (640 acres = 1 mi^2)
(3) Total sediment loads were based on delivery ratio curves established by SCS (1979).

1983 Environmental Study of Lake Houston (Phase II). Bedient et al., Rice University.
Based on data collected in the Phase I study, the land-use-load-runoff relationship was used to predict TSS loads to Lake Houston for three different development cases in 1990. Without sedimentation controls, TSS loads are expected to increase from 159 x 10^6 kg/yr (1980) to 194 x 10^6 kg/yr (1990), a 22% increase. Predicted increases in TSS loads and their distribution for Lake Houston and related tributaries are:

Tributary	TSS Loads (1980) kg/yr x10^3 (ton/yr)	TSS Loads (1990) kg/yr x10^3 (ton/yr)	Percent Total (1990)
Cypress Creek	46,800 (51,600)	53,100 (58,500)	27%
Spring Creek	13,200 (14,600)	21,700 (23,900)	12%
W. Folk SJ	36,000 (39,700)	45,400 (50,000)	23%
Caney Creek	12,700 (14,000)	17,200 (19,000)	9%
Peach Creek	25,000 (27,600)	27,400 (30,200)	14%
E. Folk SJ	13,900 (15,300)	15,900 (17,500)	8%
Luce Bayou	11,700 (12,900)	13,400 (14,800)	7%
TOTAL	159,300 (175,700)	194,100 (213,900)	100%

Water/mass balance analysis was also estimated for TSS in-lake process during the Phase II study. As concluded, TSS mass balance indicated that the majority of the suspended solids entering the lake are deposited.

TSS	TSS Loads kg/yr x10^6 (ton/yr)		
	High Flow Year	Avg. Flow Year	Low Flow Year
TSS Load	300.8 (332,000)	159 (175,000)	81.5 (90,000)
TSS Export	20.2	36.3	8.5
TSS Retained	280.6 (309,000)	122.6 (135,000)	73.0 (80,000)
% TSS Retained	93.3	77.2	89.6

Beginning in September 1981, an intensive sedimentologic investigation of Lake Houston was undertaken. A total of 87 sediment cores and numerous sediment traps were used to determine sedimentation rates in Lake Houston. The study indicated that sedimentation in the lake itself (south of FM1960 bridge) occurred at rates of 0.0 centimeters/year (cm/yr) to 3.0 cm/yr. The highest rates occurred at the mouth of the West Folk of the San Jacinto River where a delta was developing with the sedimentation rate exceeding 7 cm/yr in the deepest part of the channel. Additionally, sedimentation in the shallow (less than 3 meter deep) portions of the lake occurred at rates of 0.0 to 1.5 cm/yr, while sedimentation in the deeper areas of the lake occurred at rates of 1.5 to 3.5 cm/yr. Higher sedimentation rates at greater depths implied redistribution of sediments, which was likely related to the resuspension of the sedimentation in shallow areas and redeposition in deeper area.

1983 Sedimentation Evaluation of Lake Houston, Turner Collie & Braden.
In 1982, TC&B conducted a bottom profile survey with 45 range lines over the main Lake Houston reservoir and the East and West Fork San Jacinto River tributaries. The study was to assess the lake volume loss due to sedimentation and subsidence. Results of the study are:

(1) Summary of Lake Volume Losses

Total Volume Loss (1954-1982)	27,825 acre-ft (17.5% total)
Lake Volume Loss Rate (1954-1982)	994 acre-ft/year
Volume Loss Rate due to Sedimentation	311 acre-ft/year (352,000 ton/year)(1)
Volume Loss Rate due to Subsidence	683 acre-ft/year

Note: (1) average dry weight of sediment = 52 lbs/ft^3 (Ref: Ambersen Report)

(2) Distribution of Volume Losses

	Volume Loss			
Ranges/Location	Subsidence		Sedimentation	
	acre-feet	%	acre-feet	%
Lake Houston	10,813	58	4,911	54
W. Fork SJ River	5,644	30	3,781	42
E. Fork SJ River	2,262	12	400	4
TOTAL	18,719	100	9,092	100

(3) Comparisons were also made for sediment load per reference "Suspended-Sediment Load of Texas Streams", Report #233, Texas Department of Water Resources. Based on nine years of data prior to 1975, sediment loading rates of 218 kg/ha/yr (average) and 116 to 399 kg/ha/yr (range) were reported. Accordingly, the average sediment-loading rate can be converted to 155 acre-ft/year with a range of 82 to 283 acre-ft/year.

1993 Lake Houston Watershed Management Study (Draft Report), Espey, Huston & Associates (EH&A).

In 1991, EH&A conducted a baseline and projected water quality study for the Lake Houston watershed. Among other tasks, EH&A identified and evaluated potential water quality impacts including erosion and sedimentation due to point and nonpoint source loading for the lake and its contributing tributaries.

To assess the project water quality changes in the Lake Houston watershed, EPA's Storm Water Management Model (SWMM) was used. Data requirements for the SWMM included rainfall, hydrologic parameters such as basin size, shape and slope, land use and cover, evaporation rates, infiltration, subsurface moisture parameters, channel routing, constituent wash-off parameters, and point source flow and concentrations. The major basin SWMM models were calibrated using data at the USGS gage stations based on flow-weighted average annual values for a 5-year period between 1985 to 1989. For sediment loading, the reported average values are:

Basin	Area mile²	Avg. Flow cfs	TSS mg/l	TSS Mean kg/yrx10⁶ (ton/yr)
Cypress Crk nr Westfield	285	160	519.0	73.8 (81,000)
Spring Crk at Spring	419	226	121.0	24.6 (27,000)
W. Fork SJ nr Conroe	828	376	51.9	17.4 (19,000)
Caney Crk nr Splendora	105	70	69.5	4.3 (5,000)
Luce Bayou nr Huffman	218	209	22.4	4.2 (5,000)
E. Fork SJ nr New Caney	388	270	61.4	14.8 (16,000)
TOTAL	2,243			139.1 (155,000)

Results of the SWMM for nonpoint source sediment loading are:

Basin	TSS Load kg/yrx10⁶ (ton/yr)			
	Yr 1990	% Total	Yr 2040	50-Yr Increase
Cypress Creek	78.6	48%	93.3	19%
Spring Creek	26.5	16%	33.3	26%
W. Fork SJ	21.9	13%	24.8	13%
E. Fork SJ	15.3	9%	15.6	2%
Caney Creek	9.3	6%	10.0	7%
Peach Creek	5.7	4%	6.1	9%
Luce	4.3	3%	4.5	6%
Local Lk Houston	1.0	1%	2.1	110%
TOTAL	162.6 (179,000)	100%	189.7 (209,000)	17%

In comparison, additional means of soil/sediment delivery estimation were also calculated using the Universal Soil Loss Equation and channel erosion rates compiled/extrapolated (Greiner, 1993) from field measurements (1979) by the SCS. Two types of soil erosion were examined, assuming no use of erosion controls: (1) gross sheet and rill erosion and (2) channel and gully erosion. In general, soil erosion and sediment potential can be expected to increase rapidly due to construction activities and/or urbanization. Results of the total sediment load estimations by soil loss and erosion are:

Basin[1]	Area Mile^2	Annual Sediment Load, Tons (1990) Total Land Erosion	Tot Channel Erosion	Total Delivered[2]
Cypress Creek	324.1	95,600	143,100	42,000
Spring Creek	437.6	53,300	193,200	51,300
W. Fork SJ	587.7	88,000	218,200	58,900
E. Fork SJ	406.9	33,100	23,400	7,800
Caney Creek	216.7	17,200	12,500	4,400
Peach Creek	156.2	7,000	9,000	2,800
Luce Bayou	212.8	16,000	12,300	4,300
Local Lk Houston	43.4	1,700	16,100	4,400
TOTAL	2,385	311,900	627,800	175,900

Note: (1) Exclude the Lake Conroe basin.
(2) Total sediment load from both erosion sources using a conservatively low estimate of 25% delivery for channel erosion and smaller ratios, inversely proportional to basin size, for overland erosion.

1994 Volumetric Survey of Lake Houston, Texas Water Development Board (TWDB)
TWDB conducted a hydrographic survey on Lake Houston in May 1994 to determine the storage capacity. The survey was conducted using GPS and depth sounder and correlated with the daily lake elevation. Results from the survey indicated the lake's capacity at the assumed normal pool elevation of 44.5 feet was 133,990 acre-feet. This equates to an estimated loss of 401.3 acre-feet per year during the last 29 years.

In summary, results of the sediment loading from these studies are listed in Table 1-3.

1.3.2 Current Studies

A. TSS Analysis

To supplement the sediment data listed above, further investigation was conducted to gather and evaluate all accessible TSS data from historical measurements in related Lake Houston tributaries. The intent of using TSS data was to statistically verify sediment-loading estimates against data suggested in previous studies. Typical data sets searched include suspended sediment concentration, sediment grain size, and associated stream flow. These data, dated as recently as July 1994, are abstracted from the U. S. Geologic Survey (USGS) web site on-line database and other published water reports. Due to the limited data available, only data from two of the major tributaries, West Fork near Conroe (USGS Sta. 08068000) and Cypress Creek near Westfield (USGS Sta. 08069000), are further evaluated. These data tables are summarized in Appendices A-1 and A-2.

Sediment loading computations are analyzed by using a flow-occurrence and sediment transport curve (C.R. Miller, 1951). Sediment-transport curves showing the relation between instantaneous stream flow and suspended sediment measurement for all available sampling points are shown in Figures 1-4-1 and 1-4-2 for the West Fork San Jacinto River and Cypress

Creek, respectively. Examination of the data confirmed that instantaneous stream flow has a major impact on the level of the suspended-sediment load. To formulate the relationship, a power regression equation is calculated and illustrated for stream flow versus sediment load, both in logarithmic scales.

Also shown in Figures 1-5-1 and 1-5-2 are daily mean flow-occurrence curves in a normalized occurrence scale based on recorded flow data from related USGS stations. By integrating the equation of the sediment-transport curve with the incremental flow occurrence intervals in the flow-occurrence curve, daily mean (weighted) suspended sediment load is calculated. Sample calculations of the daily mean suspended-sediment loads for the West Fork San Jacinto River and Cypress Creek are shown in Tables 1-4-1 and 1-4-2.

As concluded in the TSS analysis, average sediment loads are estimated at 45,000 and 159,000 tons per year for the W. Fork San Jacinto River and Cypress Creek, respectively. The results suggest that sediment load is significantly higher in the Cypress Creek watershed than data reported in previous studies. The heavy sediment load in the Cypress Creek is due to two factors shown in the historical TSS measurements. First, the instantaneous TSS loads were reported at least one magnitude level higher in Cypress Creek than in the West Fork during normal and higher flows. Second, sand solids in West Fork San Jacinto River were typically 20-25 percent, or less, during most normal flow condition less than 3,000 cubic feet per second (cfs). Whereas, fine sand solids in Cypress Creek were much higher in the range of 40 to 70 percent under similar flow condition. The heavy sediment load is further evident by the existing "sugar sand" observed along Cypress Creek (a tributary of Spring Creek). However, no TSS data is available for Spring Creek. It is anticipated that the same processes causing high sediment loads in Cypress Creek may also apply in Spring Creek. For illustration, grain size distributions from the available TSS samples are shown in Figures 1-6-1 and 1-6-2 for the West Fork and Cypress Creek, respectively. It is also illustrated in Table 1-4-1 that the completion of the Lake Conroe dam had increased the sediment trapping in the upstream section of West Fork San Jacinto River by 15,000 tons/year.

The estimate of total sediment load (sum of the suspended-sediment and bed load) was not available for this study due to the complexity of the sedimentation process and budget and schedule requirements. As expected, review of the available grain-size data and stream flow conditions indicate that bed load movement in Lake Houston and tributaries can be substantial. Bed load is normally associated with coarser size sediment (fine sand and larger) that moves by gravity. Finer particles of bed load may travel in semi-suspension mode and readily return to the bed where they are a part of the bed material until re-suspended. Still larger particles remain in contact with the bed. These particles may travel in a series of random steps interrupted by periods of no motion. The bed load movement invariably deforms the bed form to ripples, sand bars, and dunes that in turn affects the bed load movement. Other studies also suggested that bed load movements vary temporally and spatially due to variations in the sediment, flow properties, turbulence, timing, locations, and position relative to the bed relief. Due to their random nature, total sediment load data are scarce and cannot be simply measured as a separate entity. Under certain conditions such as in highly turbulent flow, it may be assumed that all sediment particles are in suspension, consequently, total sediment load can be measured by sampling through the entire water column. By using the TSS analysis, as mentioned above, the total sediment load may be somewhat underestimated under normal flow conditions; however, the total suspended load may be representative of total sediment load under relatively high flow conditions.

B. Bottom Profile Survey (1999)

In this study, an updated channel cross section survey was conducted in 1999. To assess the amount of the sedimentation, direct comparisons were made between the 1999 cross sectional survey and other survey data sets from previous studies. Details of the survey work are described in Section 1.4.2.

Calculations were also made for the cross sectional area difference between the 1999 survey and the FEMA 1970's data at each cross-section location. This computation provides a rough estimate of the sectional area changes which may be attributed to scouring and/or sedimentation in the channel and over-bank area. Total volume changes were then calculated for the West Fork channel within the study area by assuming linear distribution between the cross sections. The results of this sectional change computation are shown in Table 1-5. It shall also be noted that, due to limited survey data points in the middle to upper over-bank area as shown from the FEMA model, some of the sectional change in the over-bank area may be attributed to data inadequacy.

As a result, overall volume in the study area shows a net conveyance decrease of approximately 3,100 acre-ft between the 1999 survey and the FEMA model (1970's survey). This decrease equates to approximately 144 acre-ft/year volume loss in the study area and is at the low end of the range of sediment estimate as concluded in Section 1.3.3. For the level of the sedimentation within the study area, it appears that two generally distinct channel characteristics were observed. For most of the narrower channel sections (with respect to the total flood way), more channel scouring than sedimentation were observed at the upper through middle reach of the study area. In comparison, for the wider channel sections (FEMA cross sections A and B) at the lower reach of the study area approaching the confluence with the Lake Houston, significant sedimentation was observed, which accounted for approximately 15 to 20 percent of the 100-year flood conveyance (channel) area.

In addition, it appears that minor sedimentation was observed at the U.S. Highway 59 and the railroad bridge; whereas, channel scouring was observed at the Lake Houston Parkway bridge. At the FEMA cross sections C, D, and H, accumulation of sedimentation was observed in the over-bank areas outside of the main channel area.

Similar evaluation was also provided to estimate the volume of sedimentation due to cross-sectional changes between the mouth of the West Fork channel at the Lake and the FM 1960 bridge. Due to limited cross-sectional data available, channel/lake bottom data along this area were supplemented by additional data obtained from TWDB's 1994 survey. Results of the difference in cross-sectional area suggested a net volume loss of approximately 7,500 acre-ft along this area. The sediment volume increase is likely caused by the accumulation of sediment behind the restricted, channel openings at the FM 1960 bridge. The sediment load on average is equivalent to approximately 428 acre-ft/year at this area.

1.3.3 Sediment Loads and Sources Identification

In summary, sediment loads reported from previously available studies suggested the annual sediment loads range from 102,000 to 279,000 tons. The estimated mean is 176,000 tons per year. Sedimentation figures for Lake Houston tributaries are:

Basin	Sediment Delivered (Tons/year) Previous Studies Range(1)	Previous Studies Mean(2)	This Study
Cypress Creek	42,000-87,000	68,000	158,000
Spring Creek	15,000-51,000	27,000	-
W. Fork SJ	24,000-59,000	35,000	45,000
E. Fork SJ	8,000-19,000	16,000	-
Caney Creek	5,000-14,000	10,000	-
Peach Creek	3,000-27,000	11,000	-
Luce Bayou	5,000-22,000	9,000	-
Total	102,000-279,000	176,000	-

Note: (1) Excluded TDWR data (1982)
(2) Interpolated by averaging all reported data against SWMM data

Judging by the methodologies and reliability of the available studies, as well as recent development of the basins and our understanding of the sediment process, anticipated sediment loads and sources are estimated:

Basin	Anticipated Sediment Loads (Tons/year) Range(1)	Percent Total	
Cypress Creek	70,000-160,000	39-45 %	
Spring Creek	30,000-65,000(2)	17-18 %	
W. Fork SJ	35,000-50,000	19-14 %	
E. Fork SJ	15,000-20,000	8-6 %	25%
Caney Creek	10,000-15,000	6-4%	
Peach Creek	10,000-25,000	6-7%	
Luce Bayou	10,000-20,000	5-6%	
Total	180,000-355,000	100-100 %	

Note: (1) Interpolated per mean sediment loads, ranges, and/or ratios from previous studies and the TSS analysis in this study.
(2) Assuming similar increase of sediment load due to anticipated higher sand solids in Spring Creek.

As shown above, the major source of the total sediment load, likely approximately 40% or higher, is contributed by Cypress Creek. Due to similarity in terrain traversed, similar conditions may be operating in Spring Creek that may cause the sediment loads to exceed those shown in previous studies (Table 1-3); however, no data is available to support this statement. Assuming the dry weight of the submerged sediment is approximately 52 lb/ft^3 (Ref: Ambersen Report), the total annual sediment load is equivalent to approximately 160 to 300 acre-ft/year. This data appears consistent with the bottom profile survey data as reported in the previous studies.

Due to the limited TSS data and sampling locations available for this study, the sediment load estimates presented herein may not adequately account for processes such as bed load movement, sediment mass balance, and the potential magnitude of sediment load during significant flood periods. Due to the complexity and variations of the sediment process, further delineation of sediment data would require a continuous monitoring program to obtain additional TSS data at major inflow and outflow locations of the related tributaries. The monitoring program should be conducted during and following major flood events to verify the dominant sediment movements.

1.3.4 Sediment Material Characteristics

This study further evaluated the physical and chemical characteristics of the bed-sediment materials. The purpose was to study the potential reuse of the sediment material for dredging considerations. Available references indicated that useful results were obtained by the San Jacinto River Task Force in 1995. These references included:

- Minutes of the San Jacinto River Task Force Meeting, July 19 and 26, 1995
- Initial Soil Exploration Services, West Fork San Jacinto River, May 25, 1995
- Toxicity analysis of three sediment samples, City of Houston, June 21, 1995
- Chemical analysis data from sediment core samples at three locations in Lake Houston, USGS, 1998

Results of these investigations are discussed below.

A. Physical Characteristics

HBC Engineering (HBC) conducted an initial soil investigation of the river sediment along the West Fork San Jacinto River on May 1995. The investigation included eight soil borings collected using a barge mounted drill rig between the US 59 bridge and east of the Lake Houston Parkway bridge. The depths of the borings ranged from approximately 15.5 to 22.5 feet below the water surface and were terminated below the river bed sediment. Sediment samples were obtained at various depths using a 2-inch split spoon sampler and analyzed for grain size characterization. For material utilization, grain size data from sediment samples were compared against fine concrete sand (ASTM C33) and mortar sand (ASTM C144).

In general, bed-sediment materials collected within the study area indicated that the sediments are mostly (90 percent or higher) fine to medium sand with trace silt and clay fines (size finer than No. 200 sieve) and fine gravel. There are also scattered zones in the sand strata that contain pockets of silt and clay fines. The sediment ranged from approximately 5 to 16 feet in thickness and overlaid a typical soft clay layer.

The grain size data suggested that the sediment material is generally finer than the gradation limits of either concrete sand or mortar sand. However, HBC indicated that the grain size requirements for mortar sand are frequently not met for sand used in Houston. The specification for mortar sand (ASTM C144) allows the use of aggregate not meeting the gradation limits if the mortar is prepared in compliance with compressive strength and other requirements (ASTM C270). Considering other uses of materials, the bed-sediment appears acceptable as bank sand which allows 15% or less of fines smaller than the No. 200 sieve size or as cement stabilized sand for which the use of bank sand is acceptable. HBC further indicated that the sediment sand could also be considered as dredged or hydraulic fill if proper control of placement or compaction is provided. As a result, the majority of the sediment materials should be suitable for reuse as construction materials.

B. Chemical Characteristics

As referenced in the Task Force reports, toxicity analyses were conducted on three sediment samples collected from the riverbed by the City of Houston. Results of the analyses showed virtually undetectable levels of heavy metals and total petroleum hydrocarbon (TPH) from all samples. Similar results for water quality and sediment chemistry were also reported by several previous studies (as referenced above). The chemical characteristics of the sediment material should not be of concern for material reuse or disposal.

1.3.5 Sediment Material Market Analysis

A preliminary market analysis of the sediment sand for use as building material and/or fill was performed to support potential dredging considerations. The market analysis included direct contact with local material suppliers and research of borrow material costs to assess the potential market values, demands, and supplies for sediment sand. In addition, a site visit to the Hallett Materials sandpit operation on the West Fork San Jacinto River was conducted on January 13, 1999.

Results of the market analysis suggested that the current demand for building sand is good. Hallett Materials (Mr. Frank Johnson, Site Manager), one of the several sandpit operators on the West Fork, indicated that sand production at its 450-acre riverfront site was approximately 2 million tons per year. Material composition at Hallett's sandpit was approximately 50% fine sand, 50% medium sand, and trace amounts of gravel and clay. As indicated by Hallett, demand for medium sand as "concrete sand" was sufficient; demand for fine sand as "mortar sand" or "cement stabilized sand" was approximately 40% of the supply. Among sand products, demand for bank run sand, which may contain 15% or less of fines passing a No. 200 sieve, is also believed to be good.

Typical market costs of building sand in the vicinity of Lake Houston are estimated:

Material	Retail* ($/yd^3)
Concrete Sand	$4.00
Mortar Sand	$2.00
Cement Stabilized Sand (1.5 sack or 7% cement)	$7.50
Bank Sand	$1.00-$1.50
Common Sand Fill	$1.00-$1.50

*assume 1 yd^3 = 1.4 tons (= 2,800 lbs.)

A rough estimate of the market value for dredged sediment (by its composition) is approximately $2.00 to $2.50 per cubic yard with basic screening and processing and $1.00 to $1.50 per cubic yard without screening.

1.4 Floodplain Analysis

1.4.1 Hydrologic Data of October 1994 Flood

A. Storm Meteorology

On Saturday, October 15, 1994, the remnants of Pacific Hurricane Rosa moved across the western coast of Mexico. Moving northeastward, it followed a path roughly along the south Texas coast. It brought moderate precipitation as it moved over the Houston area, creating wet antecedent moisture conditions for a second storm which would eventually develop over southeast Texas. On October 16, a disorganized convection cell moved over the Houston area and became stationary. A stationary front was fed by a low-level jet stream that pumped in tropical moisture from the Gulf of Mexico. An unusually strong trough of low pressure over the western U.S. and an unusually strong ridge of high pressure in the Gulf of Mexico remained in place for several days, just prior to the heavy rains and throughout the storm (Read, 1995). These conditions initiated the development of a supercell over the Houston area and the counties immediately to the north, causing large amounts of moist, unstable air to be pumped into the southeast Texas region. The rain caused by this stalled system began on Saturday, October 15, and was heaviest on Monday, October 17, and continued through Tuesday, October 18. At times the intensity exceeded 7.6 cm (3 inches) per hour, (Schwertz, unpublished data). Rainfall totals ranged from 25 cm (10 inches) to 76 cm (30 inches) over much of southeast Texas (Figure 1-7). Much of the San Jacinto River Basin received 5-day rainfall amounts in excess of 38 cm (15 inches). Rainfall from two gaging stations within 3 miles of the study area exceeded 23 and 41 cm (9 and 16 inches, respectively) over the period October 15 to 20 (Harris County Flood Control District, unpublished data). The total volume of water that fell within the basin over the five-day period was estimated to be approximately 4.5 billion cubic meters (m^3). The effect of the rain caused a catastrophic flood on the San Jacinto River. The meteorological circumstances that occurred to produce such a rainfall are rare, even for a humid setting such as southeast Texas.

The recurrence interval of the rainfall within the basin varied. At three gaging stations, rainfall amounts exceeded the 24-hour, 100-year rainfall of 32.26 cm (12.7 inches) by as much as 12.2 cm (4.8 inches). Nine rainfall gages in the San Jacinto Basin recorded precipitation that equaled or exceeded the 2-day, 100-year rainfall total of 34.56 cm (13.6 inches). The Conroe rain gage was 19.48 cm (7.7 in) above the 2-day, 100-year total for October 16 and 17, 1994. Rainfall at nine stations for the period from October 15 to 19, 1994 exceeded the 4-day 100-year rainfall totals (National Weather Service, 1976).

B. United States Geological Survey (USGS) Flood Data

The USGS, in cooperation with other Federal, State, and local agencies, maintains about 100 stream-flow gaging stations within the 38-county area affected by the October 1994 Flood. Numerous measurements of stream-flow and peak stage data were obtained by USGS during the flood at 43 stations in the 29 southeast Texas counties declared disaster areas. These data included flood levels (elevation) and discharge in cubic feet per second (cfs), a chronology of historical peak stages and stream flows.

Flooding spread east during Monday, October 17. Lake Conroe reached a record level of 205.58feet (MSL) and was discharging 33,400 cfs on Monday afternoon. The previous record level was 204.66 feet set May 5, 1983. The West Fork of the San Jacinto River near Conroe crested at a record-level of 32.3 feet (MSL), with an estimated flow of 115,000 cfs on Tuesday morning, October 18. The previous record was set at 30.85 feet (MSL) on November 25, 1940. Spring Creek near Spring, TX crested at a record level of 44.1 feet (MSL), with an estimated flow of 78,800 cfs on Tuesday afternoon, October 18. The previous record of 33.6 feet (MSL) was set November 25, 1940. Cypress Creek at Grant near Cypress crested at 47.38 feet (MSL) on Wednesday, October 19. The previous record was set at 43.48 feet (MSL) in 1982. Downstream near Humble the River crested at 35.86 feet (MSL) on Thursday, October 20. On the East Fork of the San Jacinto River near Cleveland, a record crest of 25.91 feet (MSL) occurred late Monday. Near New Caney, the River crested at a record 33.0 feet (MSL) by early Tuesday. The previous record was 29.6 feet (MSL) set in 1973. On Caney Creek near Splendora, a crest of 26.40 feet (MSL) was noted late Monday with Luce Bayou near Huffman cresting at a record 35.08 feet (MSL) by late Tuesday. The excessive inflow into Lake Houston produced a record rise to 52.76 feet (MSL) on Wednesday. The previous record was 49.60 feet (MSL), set on May 19, 1989. The National Weather Service estimated the peak flow to be 333,400 cfs at the dam. Below Lake Houston the San Jacinto River near Sheldon crested at 27.1 feet, with an estimated flow of 356,000 cfs by late Wednesday, October 19. This exceeds the previous record of 20.17 feet (MSL) set in June 15, 1973. A summary of the related stream flow data, where 1994 floods equaled or exceeded the 100-yr flood, is shown in Table 1-6.

Significant scouring and erosion along the San Jacinto River channel, including both the East and West Forks, were observed after the flood. Above Lake Houston, flooding on the West Fork of the San Jacinto River inundated and closed Interstate 45 near Conroe for most of Monday, October 17. U.S. Highway 59 near Humble was inundated and closed from Monday, October 17, to Friday, October 21. The magnitude of the flooding on the San Jacinto River below Lake Houston washed out the Southern Pacific Railroad Bridge over the river below Sheldon, downstream of the Lake Houston dam. The erosion along the banks of the San Jacinto River caused four fuel pipelines to rupture and spill fuel into the river. The spill and subsequent fires resulted in the closing of Interstate 10 across the San Jacinto River.

Lake Houston was also inundated by floodwater. Roughly twice as much water (249,000 acre-ft) was in the lake at its maximum flood stage than is normally in the lake when the level is at the spillway crest (134,000 acre-ft). A summary of the peak discharges for the Lake Houston tributaries is also shown on Table 1-7.

The flooding of October 1994 was an extreme and dangerous event. The 100-year flood, which is defined as the peak stream flow having a 1% chance of being equaled or exceeded in any given year, was equaled at 1 and exceeded at 18 of the 43 stations. At 25 of the 43 stations, the peak stages for the floods exceeded the historical maximums. For example, at Spring Creek at Spring (Table 1-6), the October flood produced a new record peak stage more than 10 ft above the historical peak. For those tributaries where the 100-year flood was exceeded within (or near) the study area, the magnitude of exceedances ranged from 1.1 to 1.8 times the 100-year flood (Table 1-6).

C. Flood Frequency

The USGS began the operation of a continuous streamflow gaging station on the West Fork of the San Jacinto River at U.S. Highway 59 (near Humble) in 1929. Daily stream flow data (including flood crests) were obtained until 1954 when the Lake Houston dam was constructed and backwater from the lake prevented determination of flow. From 1954 to 1990, the recorder was operated as a stage station (water levels only). After 1990, the station was turned over to Harris County Flood Control District as part of their ALERT system.

Historical flood events at the West Fork and U.S. 59 location are:

Year	Elevation (MSL, feet)	Discharge (cfs)
1900	63.2	185,000
1929	63.2	187,000
1935	57.8	68,100
1940	63.2	187,000
1945	52.1	48,700
1979	55.7	61,000
1989	55.6	60,000
1994	67.1	230,000

The October 1994 Flood of 230,000 cfs reached a level of 67.1 feet (MSL) at U.S. Highway 59 gage. This level was 3.9 feet higher than the floods of 1900, 1929, and 1940 (discharge of 187,000 cfs). Judging the 1994 flow rate on the pre-1954 rating curve indicated a water level approximately 2 feet higher than the extended rating that existed in 1940. The difference may be due to any, or all, of the following reasons:

(1) The river channel in 1940 was deeper than the current channel due to accumulative sedimentation.

(2) The commercial building, houses, and other development downstream of U.S. 59 may have restricted the flow in the flood plain.

As a result of the October 1994 Flood, two log Pearson flood frequency analyses were conducted for the West Fork of the San Jacinto River at Humble (RUST Lichliter/Jameson, 1995). The results of this study are:

Return Period (years)	1929 to 1994		1865 to 1994 (historical period)	
	Discharge (cfs)	Elev. (ft, unadj. for subsidence)	Discharge (cfs)	Elev. (ft, unadj. for subsidence)
5-year	-	53.0	-	52.5
10-year	62,100	56.0	55,700	54.5
20-year	89,600	59.0	77,700	57.8
50-year	-	62.5	-	60.5
100-year	175,000	65.0	141,000	63.0
200-year	-	67.0	-	65.0
500-year	297,000	68.0	223,000	67.0

The current FEMA 100-year base flood elevation for a 100-year flow of 167,000 cfs is 64.6 feet (1973 datum adjustment). Of the analyses above, the most conservative (higher) one utilized the actual period of record (1929 to 1994). The 100-year flood values of 175,000 cfs at an elevation of 65 feet appeared to agree closely with the current flood maps without adjustments for subsidence.

D. Flood Damage

The Houston Chronicle reported 22 flood related deaths and damage to 15,775 homes due to severe flooding of the rain-swollen bayous and creeks of southeast Texas as a result of the rainfall of October 1994. The federal government declared 35 counties disaster areas (NWS, 1995). Thirty-two million dollars in federal disaster assistance were provided to the communities of southeast Texas (April 1995). In Harris County alone, some 3,400 houses and business in 90 subdivisions were impacted by high water. The hardest hit areas were the low-lying areas adjacent to the San Jacinto River in which more than 1,300 homes and businesses were flooded. In the Spring Creek Watershed approximately 110 structures were affected. The Cypress Creek flooding damaged approximately 400 structures (Fitzgerald, 1994). Of the 3,400 structures inundated in Harris County, 50% are in the San Jacinto River Basin (Fitzgerald, 1994).

1.4.2 1999 Channel Cross-Sectional Survey

As part of the Lake Houston Flood Study, a topographical and hydrographic survey was commissioned to obtain updated channel cross sectional data along the West Fork San Jacinto River within the study area. The survey work was conducted by Landtech Consultants, Inc. and Tobin International, Ltd. during June to September 1999. The scope of work included orthophotography, aerial photogrammetry of the over-bank data, and a channel bottom profile survey. Due to the limited funding available, the survey was conducted to establish only representative cross sectional data as needed for the hydraulic analyses. For comparison purposes, the representative channel cross sections were selected in general accordance with the original FEMA (1970's) cross sections A through N and TWDB (1994) Reach III range lines 15 through 24.

During the survey work, efforts were made to recover the locations of the FEMA cross section lines or the TWDB range lines used in the previous studies. It was discovered that, although specific locations of the range lines were documented in a 1983 report (Turner Collie & Braden, Inc.) with detailed range coordinates and elevations, the current survey efforts could not physically recover or match these range lines according to the identifiable site features or survey monuments. In addition, locations of the original FEMA cross sections do not necessarily line up with the TWDB range lines. As a result, best efforts were provided to reestablish representative channel cross sections in general accordance with the locations of FEMA cross sections and along the three known bridge crossings at Lake Houston Parkway, Southern Pacific rail line, and US 59. Figure 1-2 shows the best estimate of the locations of the representative cross section lines used in this study and their relationship with other channel sections used by FEMA and TWDB.

During the survey, the coordinate values and vertical datum were established for each representative cross section line. The coordinate values are projected to surface data based on the Texas Coordinate System, South Central Zone, North American Datum of 1983 (NAD '83) with a scale factor of 0.99993016. All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD '29) and were updated to the North American Vertical Datum of 1988 (NAVD '88). For comparison purposes, all survey data were intended to adjust for the 1973 datum consistent with the current FEMA Flood Insurance Study information (April 20, 2000). However, limited bench mark data found near the study area suggested that correlation of the vertical datum between NAVD '88 and the 1973 datum varies in the study area. The difference in the vertical datum ranged from eight tenths of a foot lower at the area near Kingwood Drive and middle study area to six hundredths of a foot lower at the area near Lake Houston Parkway and Atascocita for the NAVD '88 measurements as compared to the 1973 datum. Due to the limited data available, no adjustments were made to the NAVD '88 data for the1999 survey.

To illustrate the channel cross sectional changes, direct comparisons from different survey data sets were plotted at typical cross-section locations and are shown in Exhibits 1 to 15 of Appendix B-1. The differential subsidence within the study area was verified to be in the order of three inches and was therefore disregarded. However, a subsidence adjustment of approximately 3.4 feet was required to correlate the TWDB Volumetric Survey data (1994) to the 1973 datum (see Section 1.2.2, Subsidence).

1.4.3 Hydraulic Analysis per 1999 Channel Cross Sections

Detailed analyses of the hydraulic characteristics of the West Fork San Jacinto River were computed with the updated channel cross section data within the study area for various flood frequencies. For the purpose of this study, water surface profiles were computed for the 10, 50, 100, and 500-year return frequency storms. The hydraulic analyses were conducted using ProHEC2 Plus, version 4.6.2, developed and distributed by Dodson & Associates, Inc. The HEC2 computer program for water surface profile computation was originally developed by U.S.

Army Corps of Engineers (COE) Hydrologic Engineering Center. The effect of obstructions to flow such as bridges and the energy losses in the channel associated with these structures are included in the model. The computational procedure is generally known as the "Standard Step Method".

To assist in the analyses, the River Modeling System computer program (BOSS-RMS) developed by Boss International was also used. BOSS RMS is an advanced AutoCAD based computer program designed to assist in the automation of most engineering tasks required to model/analyze water surface profiles using HEC-2 and HEC-RAS. BOSS-RMS was used to model representative channel cross sectional data and input details at bridge crossings. The HEC-2 program was then used to compute various water surface profiles and floodways. All bridge crossing data were field checked in accordance with the original FEMA model to verify the geometric data at bridges.

A. Hydraulic Parameters

The channel roughness coefficient factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations for stream and flood plain areas. The "n" values used in the study area are listed below.

Stream/Feature	Manning's "n" Value	
	Channel	Flood Plain
Main Channel	0.03	0.12
Bridge Crossing	0.015	0.015

For modeling purposes, peak flow data from the original FEMA HEC-2 model with the updated bridge sections (June 1994) were used to calculate water surface profiles. No updated hydrologic analysis was conducted for this study.

The results of TWDB's Volumetric Survey of Lake Houston (1994) suggested that the backwater effect in the Lake Houston area (Reach II) may increase the starting water surface profiles for the study area in Reach III. According to Preliminary Hydraulic Analysis for Lake Houston Flood Study (B&R, 1998), flood profile computations in the Lake Houston area (Reach II) were compared between FEMA and TWDB sections with results shown in Table 1-2. For the purpose of this study, preliminary hydraulic analysis was conducted to combine upstream sections of the Reach II to the West Fork channel based on TWDB's survey data (1994). Results suggest starting water surface elevations of 46.66, 49.57, 50.91, and 54.90 feet MSL for 10, 50, 100 and 500-year flood, respectively, should be used in our study for the first channel section (Cross Section A) at the confluence with Lake Houston. In comparison, the water elevations for the FEMA study were constant throughout all of the sections in the lake at 46.3, 48.7, 49.7 and 52.7 feet MSL for 10, 50, 100 and 500-year flood, respectively. Results of this updated HEC-2 output (Reach II) are included in Appendix B-2.

B. Findings

The results of the HEC-2 model based on the updated channel and over-bank sections (1999) are presented in Table 1-8. The water surface elevations (WSEL's) are tabulated along the channel based on general locations of the original FEMA sections and the bridge crossings. The computed WSEL's due to the updated channel and over-bank sections are compared with those WSEL's reported for the FEMA FIS (1970's) and TWDB Lake Houston Survey (1994). In comparison, the resultant flood profiles on the West Fork channel for each channel condition are summarized in Table 1-9. To illustrate the variations in water surface elevations that occur as a result of changes in channel profiles, the comparisons between the 1970's FEMA study and the 1999 flood study for 10 and 100-year flood condition are shown in Figures 1-8 and 1-9. In addition, 100-year flood profile comparisons between the 1999 survey, 1994 TWDB survey and 1970's FEMA model are shown in Exhibits 1-15 of Appendix B-1.

As a result of the HEC-2 analyses, the 1999 flood profiles in Table 1-9 show a small increase of flood levels in comparison with the original FEMA model. In general, the updated 100-year water surface shows variations from an increase (maximum) of approximately 1.1 to 0.75 feet at the lower half of the channel study area to a decrease (maximum) of approximately 2.1 feet at the upper half of the channel study area. Specifically, the 1999 data suggested that flood level increases of approximately 0.75 to 0.5 ft are shown at cross sections C and D, upstream of the Lake Houston Parkway bridge. In addition, flood level increases of approximately 1.0 to 1.1 feet are shown at cross sections A and B, downstream of the Lake Houston Parkway bridge, due to increased starting water conditions from Lake Houston. For the upper section of the study area towards US Highway 59, reduced flood levels were concluded in comparison with original FEMA conditions. The constriction to the flow area of the channel at the bridges show none to small, localized increases (i.e., 0.5 feet) of WSEL's at all locations. The WSEL's for 100-year flood at the US Highway 59 bridge show a minor change from –0.1 feet less to +0.3 feet greater than the FEMA model. The 100-year WSEL's at the US Highway 59 bridge are approximately 1.3 to 1.8 feet above the low chord elevation of the bridge. Detailed output of the updated HEC-2 analysis for the 1999 channel survey is also included in Appendix B-2.

It shall be noted that since the over-bank cross sections from the new 1999 survey data allow more flow in the over-bank areas as opposed to the 1970's FEMA data, the updated water surface elevations (1999) may better reflect the actual flow conveyance in this area. As a result, some of the potential increases in water surface profiles caused by the sedimentation are probably being compensated by the higher flow capacity in the over-bank areas.

C. Limitations

The 1999 HEC2 flood model was compared with observations and measurements of the known high water data from the 1994 (October) and 1998 (October and November) floods. Due to very limited flood gauge data available within the study area, actual flood elevation data were obtained at a few accessible locations along the West Fork channel such as at the US 59 bridge, the Lake Houston Parkway bridge, and the FM 1960 bridge. For comparison, the output of the HEC2 models from the original FEMA model and the 1999 updated model were used to evaluate actual versus modeled flood data. The data comparisons are summarized as follows.

	Water Surface Elevation (1973 Datum adjustment)			
	US 59 Bridge	Parkway Bridge	1960 Bridge	Spillway
FEMA Model ('70s)				
50-yr Flood	62.23	50.21	48.70	48.70
100-yr Flood	65.12	51.47	49.70	49.70
Updated Model (1999)				
50-yr Flood	62.16	50.64	49.04[6]	48.70
100-yr Flood	64.41	52.00	50.24[6]	49.70
HCOEM[1] Gauge Data				
Oct-94	66.8	no gauge	no gauge	52.78
Oct-98[2]	55.38	no gauge	no gauge	48.51
Nov-98[2]	60.45	no gauge	no gauge	50.55
Field Observation				
Oct-98	62.35	50.50	50.40	48.15
Nov-98	57.85	49.00	48.40	50.11
High Water Mark[3]				
Oct-1994	-	56.2[5]	-	-
Summer 1998	53.51[4]	47.53[5]	-	-
Fall 1998	59.55[4]	51.99/52.02[5]	-	-

Note:

1 Harris County Office of Emergency Management (HCOEM) gauge reading
2 Data adjusted for datum change
3 Surveyed data (1999)
4 Based on marks located d/s of US 59 Bridge at Edgewood Park
5 Based on marks located u/s of Parkway Bridge in Kingwood Country Club
6 Based on TWDB 1994 (Lake Houston) cross section data

Data comparisons suggest that correlation between the modeled water surface elevations and the actual flood data are inconclusive with variation at different locations being highly dependent on the assumed flood (flow) conditions. This variation is in part limited by the few available flood data (flow and elevation) for comparison and also potentially by the limitations of the computer model.

The updated HEC2 model (1999) was computed using cross-section data at the original FEMA section locations. It appears that some of the original FEMA section locations may not be well-suited to represent channel flow conditions. To verify the potential impact due to the change of cross-section locations, preliminary analyses were conducted by adding new cross-sections or by using relocated cross-sections based on the aerial photogrammetric survey data. Results of the modified sections suggested that the WSEL's for 100-year flood may show additional increases of approximately 1.0 to 2.0 feet greater than the current model at some critical locations. Due to the limited scope of this study, the overall impact of the revised cross-sections to the modeled water surface should be considered in future studies.

1.4.4 Floodplain and Floodway Maps

As a result of the HEC-II analyses, water surface elevations for 100-year flood were illustrated at the representative channel section lines (Exhibits 1-15 of Appendix B-1). Although it is concluded that there is no significant increase of the flood levels, the top width of the flood flow for 100-year flood show a variation from a maximum increase of 1300 feet (Section E and N) to a decrease of 2500 feet (Section J), as shown in Table 1-9. The reason for the increase was mainly due to the better representation of the actual terrain data in the over-bank areas resulting from the 1999 survey. This water surface elevation data was used to delineate the corresponding floodplain boundaries based on currently established terrain data. Results of these updated floodplain data were then plotted on the recent orthophotograph of the study area to create revised floodplain maps. For comparison, current FEMA floodplain data was also presented as the "base" condition representing the regulatory floodplain condition. The revised floodplain map is shown in Appendix C.

1.5 Jurisdictional, Authority and Management Issues

Lake Houston is a man-made reservoir created by construction of a dam and spillway across the San Jacinto River. The lake is owned by the City of Houston. It is a major water supply source for the City of Houston municipal and industrial water system. Dam construction commenced in November 1951 and was completed in December 1953. The initial storage capacity of the lake was 158,550 acre-feet at the normal pool elevation of 44.5 ft MSL (1973 datum adjusted), of which a total of 147,920 acre-feet is the conservation storage capacity. Although the City of Houston owns the lake, numerous agencies play a role in regulating and maintaining the lake and nearby portions of the San Jacinto River that feed into the lake, including Lake Conroe. For flood protection and mitigation purposes, the authority and responsibilities of the relevant agencies are summarized below.

It should be recognized that these agencies were created through a series of unrelated legislative acts and have differing boundaries, powers and abilities related to flood control. This legislative authority has been given primarily for the purpose of developing, using, protecting, and preserving water resources, with no specific mandates, funding or regulatory abilities for flood protection or mitigation measures. As a result, although some agencies may be seen by the public as having responsibility for flood control issues, the actual legislative authority of these agencies is generally limited to development of water resources and administration of infrastructure and floodplain policies. In addition, the presence or absence of available funding, or other financial mechanisms, also limit practical capability of all of the agencies to support flood control measures in this area.

As part of an agreement making flood insurance available in a community, the National Flood Insurance Program (NFIP) requires participating communities to adopt floodplain management ordinances intended to reduce future flood losses. Each participating community designates a floodplain administrator who is charged with regulating new development within the floodplain to comply with NFIP guidelines and required ordinances. For the purpose of this study, the City of Houston, Harris County, and Montgomery County are all participants of the NFIP and require development and construction permits for all activities within the regulated floodplain area of the San Jacinto River.

1.5.1 City of Houston

The City of Houston is a home-rule city meaning that it has full power of self-governance. The City of Houston has ordinances specifically related to the management and protection of Lake Houston (Chapter 23) and the floodplain areas (Chapter 19).

Chapter 23 of the city ordinances broadly regulates the uses of Lake Houston, including general requirements (Article I), water supply protection (Article IV), and dredging or excavating operations (Article V). Specifically, the City has "the right to exercise and pursue any and all legal procedures and remedies ... to protect its property rights, including ... requiring the removal of any existing structures, fill or excavation constructed or encroaching into or upon Lake Houston" (Sec. 23.4.c).

Chapter 19 of the city ordinances regulates floodplain management issues in flood-prone areas. As stated, the purpose of the code is to minimize public and private losses due to flood conditions. The code "provides a regulatory system to monitor the issuance of plats and permits to reduce the likelihood that development within this city will increase the dangers of flooding" (Sec. 19.1.b). Specific controls include land use control, flood damage protection in initial construction, maintenance, the alteration of natural floodplains, stream channels, and natural protective barriers to accommodate waterway, control of dredging and other development, and the regulations of flood insurance study/rate map (Sec. 19.1.b to e).

1.5.2 Harris County

Acting in its capacity as the governing body of Harris County and the Harris County Flood Control District, the Commissioner's Court of Harris County adopted Flood Plain Management Regulations that apply to all unincorporated areas of Harris County. The purpose of these regulations is to provide the land use controls necessary to qualify unincorporated areas of Harris County for flood insurance under the requirements of the National Flood Insurance Act. Presently, the primary role of the County Engineer is to serve as the administrator of the Flood Insurance Program in the unincorporated area of the County. The County has clear authority to plan and construct drainage improvements in conjunction with county roadways but has no specific authority for flood control projects.

1.5.3 Harris County Flood Control District (HCFCD)

The 1937 legislation which establishes the HCFCD defines its purpose as "the control, storing, preservation, and distribution of the storm and flood waters, and the waters of the rivers and streams in Harris County and their tributaries, for domestic, municipal, flood control, irrigation and other useful purposes, the reclamation and drainage of the overflow land of Harris County, the conservation of forests, and to aid in the protection of navigation on the navigable waters by regulating the flood and storm waters that flow into said navigable streams" (Acts 1937, 45th

Leg., page 714, ch. 300). The District is also empowered to cooperate with agencies within the State of Texas, including the City of Houston and Harris County, in the construction and maintenance of flood control projects.

Section 2 (Added Powers) states that the HCFCD may exercise the added right, power, privilege, and function "to devise plans and construct works to lessen and control floods; to reclaim lands in the District; to prevent the deposit of silt in navigable streams; to remove obstructions, natural or artificial, from streams and water courses; to regulate the flow of surface and flood waters ...".

Section 2 also authorizes the HCFCD "to cooperate with, or to contract with, the City of Houston or any adjacent county, or any agency or political subdivision of the State, or any city or town within Harris County in relation to surveys, the acquisition of land or right of ways, the construction or maintenance of projects or parts thereof or the financing of the same in connection with any matter within the scope of this Act."

Given no authority over land use or development along the banks of the county's waterways, the District's operations have been limited to activities directly related to the maintenance of drainage-ways. The use of dedicated easements and rights-of way, where they exist, has provided the HCFCD access to the San Jacinto River and the opportunity for limited control of the property adjacent to the channel. Where HCFCD owns rights-of way along the channel, it can control and limit development within its right-of-way, which might interfere with proper maintenance of the drainage-way. It can also alter or "improve" the channel-way with limited impact on neighboring property holders. However, with limited rights-of-way and even right of access in some areas, HCFCD's ability to maintain the drainage-way and to plan for improvements for the study area may be compromised.

HCFCD does not have permitting authority on the San Jacinto River; however, it regularly reviews permit proposals submitted by individuals and other governmental agencies (i.e., City of Houston, USCOE, etc.) to assess the impact of any proposed activity on the flood flow characteristics and on long-term maintenance implication for San Jacinto River within Harris County. The City of Houston and the USCOE generally obtain HCFCD review and concurrence prior to approving a permit.

1.5.4 San Jacinto River Authority (SJRA)

The several acts comprising the enabling legislation for the San Jacinto River Authority are compiled as Vernon's Annotated Statutes Chapter 12, Article 8280-121. Although the enabling legislation appears to grant the SJRA broad, general powers to manage the waters and flood waters in the San Jacinto River Basin, it also explicitly excludes Harris County from the SJRA's jurisdiction (Sec. 5). Therefore, SJRA is not the agency of primary jurisdiction in the area of Lake Houston and downstream.

Section 2 states that the SJRA "shall have and be recognized to exercise all the rights and powers of an independent governmental agency, body politic and corporate, to formulate any and all plans deemed essential to the operation of the District and for its administration in the control, storing, preservation, and distribution to all useful purposes of the storm and flood waters of the San Jacinto River and its tributary streams".

Section 3 states that the SJRA is responsible for "storing, controlling, and conserving storm and flood waters of the San Jacinto River and its tributaries, and the prevention of the escape of any of such waters without the maximum of public services".

Section 8 also states that "for the purpose of providing funds requisite to procure necessary engineering surveys, the collection and compilation of data ... entering into and influencing the character and extent of the improvement ..., it is hereby provided that any county lying in whole or in part within the area ..., may contribute to the fund ...".

It is apparent that these legislative mandates, taken as a whole, do not directly provide SJRA with the jurisdictional, regulatory, funding or taxing authority to engage in flood control and protection activities throughout the San Jacinto River Basin and, in particular, within the area of Lake Houston and the river basin below the confluence of the East Fork, West Fork and Spring Creek.

1.5.5 Montgomery County

Montgomery County maintains regulations for floodplain management that apply to development of all areas of special flood hazard in unincorporated areas of Montgomery County. The County Engineer administers the Flood Insurance Program in unincorporated areas of Montgomery County. Each city within the County administers the Program within its corporate limits. Almost all capital improvements for drainage and flood control in Montgomery County are provided by municipal utility districts or cities for resolution of drainage and flood problems within the jurisdictional boundaries of that particular entity.

1.5.6 Texas Water Development Board (TWDB)

The TWDB was created in 1957 to provide leadership, technical services and financial assistance to support planning, conservation and responsible development of water for the State of Texas. To accomplish its goals of planning for the state's water resources and for providing affordable water and wastewater services, the TWDB provides water planning, data collection and dissemination, financial assistance and technical assistance services to the citizens of Texas. The TWDB also represents the State to provide loans to local governments for water supply projects, water quality projects, and flood control projects.

Pursuant to Title 31 of the Texas Administrative Code (TAC) Chapter 355 – Research and Planning Fund, the TWDB may request proposals for possible contracts to develop flood protection plans for areas in Texas from political subdivisions with the legal authority to plan for and abate flooding and which participate in the National Flood Insurance Program. TAC 355.4 – Eligibility Guidelines state that any person may apply for research grants, but only political subdivisions may apply for flood control, regional planning grants, and aquifer storage and recovery planning grants. Funding of projects shall be at the discretion of the board and comes from funds in the research and planning fund. TAC 355.5 further states specific criteria for:

- Flood control planning project criteria:

  (A) degree to which proposed planning duplicates previous or ongoing flood plans;
  (B) project service area is regional versus local;
  (C) history of flooding in project area;
  (D) participation in National Flood Insurance Program;
  (E) project organization and budget; and
  (F) scope and potential benefits of project.

- Regional planning project criteria:

  (A) degree to which proposed planning duplicates previous or ongoing plans;
  (B) regional nature of project;
  (C) conformance to certified water quality management plans;
  (D) adequacy of water conservation plan and commitment to water conservation;
  (E) project organization and budget; and
  (F) scope and potential benefits of project.

The purpose of the flood protection planning grant program is to assist local governments in developing flood protection plans for entire major or minor watersheds (as opposed to local drainage areas) that provide protection from flooding through structural and non-structural measures as described in 31 TAC 355.2. Planning for flood protection includes studies and analyses to determine and describe problems resulting from or relating to flooding and the views and needs of the affected public relating to flooding problems. Potential solutions to flooding problems will be identified, and the benefits and costs of these solutions will be estimated. Feasible solutions to flooding problems will be recommended from the planning analysis. Solutions for localized drainage problems are not eligible for grant funding.

TWDB financial assistance programs are funded through state-backed bonds, a combination of state bond proceeds and federal grant funds, or limited appropriated funds. Since 1957, the Legislature and voters have approved constitutional amendments authorizing the TWDB to issue up to $2.68 billion in Texas Water Development Bonds. To date, the TWDB has sold nearly $1.55 billion of these bonds to finance the construction of water and wastewater related projects. In 1987, the TWDB added the Clean Water State Revolving Fund (CWSRF) to its portfolio of financial assistance programs. For FY 1999, up to $600,000 has been initially authorized for assistance in flood protection planning from the Board's research and planning fund.

The TWDB proposes new 31 TAC Chapter 368, concerning the Flood Mitigation Assistance Program (FMA). The new sections, as approved in August 1998, are to govern the board's administration of grants for planning and projects under the FEMA Flood Mitigation Program. The purpose of FMA is to assist state and local governments in funding cost-effective actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other insurable structures. The long-term goal of FMA is to reduce or eliminate claims under NFIP through mitigation activities. The program provides cost-shared grants for three purposes:

planning grants to assess the flood risk and identify actions to reduce that risk; project grants to execute measures to reduce flood losses; and technical assistance grants that the state may use to assist communities to develop viable FMA applications and implement FMA projects.

TAC 368.5 provides eligibility criteria for FMA. For planning grants, communities that are not on probation or suspended under the National Flood Insurance Program are eligible. Grants will not be awarded to develop new or improved floodplain maps. A community is eligible for project grants if it is not on probation or suspended under NFIP, and if it has received FEMA approval of its mitigation plan. This section specifies that projects are eligible for planning grants only if they are cost effective; are in conformance with various federal requirements including Floodplain Management and Protection of Wetlands, environmental considerations, and floodplain management regulations; and are located physically in a participating NFIP community.

TAC 368.7 specifies types of projects eligible for FMA funding, such as: acquisition of insured structures and real property and easements restricting property use; relocation of insured structures; demolition and removal of insured structures; elevation of insured structures; other activities to bring insured structures into floodplain management compliance; minor physical flood mitigation projects; and beach nourishment activities.

1.5.7 U.S. Army Corps of Engineers

Regulations pertaining to the USACE participation in flood control projects are found in Part 238 of Chapter 33 of the Code of Federal Regulations (33CFR238). This regulation provides policies and guidance for the participation of the USACE in urban flood damage reduction projects and establishes criteria to distinguish between the responsibilities of the USACE and local authorities.

Under the regulations, the USACE can participate in flood damage reduction work in urban areas provided certain conditions are met. Flood damage reduction works do not include small streams and ditches with carrying capacities typical of storm sewer pipes or a system of pipes traditionally recognized as a storm sewer system. Urban water damage problems associated with a natural stream or modified natural waterway may be addressed at a point where the flood discharge for the 10-year storm event within an urban area is 800 cfs. Flood damage reduction structures can be located above this point provided the benefits to areas which fall in the area downstream qualified for flood damage reduction works are economically justified. The Division Engineer may also grant exceptions to these criteria.

The USACE is allowed to utilize cost sharing and other provisions of local participation as long as they are in conformity with applicable regulations for structural and non-structural flood damage reduction measures.

Activities in waters of the United States are regulated by Section 404 of the Clean Water Act, and if in navigable water, by Section 10 of the Rivers and Harbors Act of 1899. Due to construction of the Lake Houston dam, the West Fork of the San Jacinto River at the project site is no longer navigable. Therefore, authorization under Section 10 is not required for this project.

Section 404 of the Clean Water Act only regulates the placement of fill and dredged materials in waters of the United States. For the purpose of this project, a Section 404 permit will likely not be required if there is only removal and not deposition of dredged materials from/to the San Jacinto River.

However, material dredged from Lake Houston will require disposal or storage. Disposal or storage areas must be screened to ensure these sites are free from environmental constraints such as impacts to wetlands and other waters of the U. S., archeological sites, or endangered species. Placement of any fill or dredged material in a water of the U. S., including a wetland, will require authorization under Section 404 of the Clean Water Act. Hydraulically dredged material stored on an upland disposal area does not require a Section 404 permit, except where runoff water from the disposal area enters a water of the U. S. The return water is considered dredged material under Section 404 of the Clean Water Act. Its return to the San Jacinto River would be considered a discharge of fill material. Discharge of the return water into the receiving stream is permitted under Nationwide Permit 16, but the discharge must receive certification under Section 401 of the Clean Water Act from the Texas Natural Resource Conservation Commission (TNRCC). Abandoned sand or gravel pits used for disposal of dredged material may become jurisdictional if the pit is not used for a lengthy period, and if wetland plants invade an abandoned pit.

Discharges of storm water runoff from construction activities that disturb more than five acres must be covered by a Texas Pollutant Discharge Elimination System (TPDES) permit. Most construction activities can be covered under the TPDES General Permit For Storm Water Discharges From Construction Sites. Under this general permit, the EPA requires development of a Stormwater Pollution Prevention Plan (SWPPP). If five acres will be disturbed by the proposed project then a draft Storm Water Pollution Prevention Plan will be required. This five-acre limit is for the entire site and cannot be circumvented by dividing the site into smaller projects or by phasing development. Future revisions to the TPDES regulations may reduce the five-acre minimum.

1.6 Conclusions

As a result of the Problem Definition and Analysis, several observations and recommendations are identified as follows.

1. Sediment deposits identified in the 1994 TWDB hydrographic survey showed a minor increase in flood levels of less than 0.18 feet for the 100-year flood at cross sections A through E in comparison with the FEMA updated model. At FEMA locations F, G, and H, the cross-sections do not match the exact FEMA sections both in location and orientation. However, an approximate plus or minus one-foot change of 100-year flood levels were shown throughout this upper reach. After the October 1994 storm, the 1995 Lake Houston Task Force data indicated that the channel had accumulated additional sediment deposits in the vicinity of FEMA cross sections B and C. As a result, the 100-year flood profile showed an increase of an additional 1.0 to 1.5 feet upstream as compared to the original FEMA model.

Results of the 1999 survey showed that a lesser amount of the sedimentation was observed at sections A, B, and C than that from the 1995 survey. As a result, no significant increase of the flood level is shown per the 1999 survey. It was not clear whether the additional sedimentation, as reported from 1995 survey, was caused by the interim, temporary effect of the sediment transport or was only a datum problem.

2. Based on information obtained from the Harris-Galveston Subsidence District, it was reported that some degree of subsidence has occurred in the area. Efforts were made to adjust historical survey data to the common datum for comparison purposes. However, no consistent correlation can be used to adjust 1999 elevation data to the 1973 datum. Based on limited data found in the study area, it was concluded that differential settlement from the subsidence is relatively small and was therefore unadjusted. More detailed data regarding the vertical datum change in the study area will be needed to assess the extent/impact of any recent subsidence.

3. Sediment loads reported from previous studies indicated that the annual sediment loads range from 102,000 to 279,000 tons with a mean of 176,000 tons in the study area. Assuming the dry weight of the submerged sediment is approximately 52 lbs/ft^3, total annual sedimentation is equivalent to approximately 160 to 300 acre-ft/year. These findings appear to be consistent with the channel profile survey data as reported in the previous studies.

4. Among the contributing tributaries within the study area, anticipated sediment source distribution is estimated at approximately 42, 18, 15, and 25 percent for Cypress, Spring, West Fork, and others, respectively. It should be recognized that very limited data and studies were available to interpret the sediment sources, especially as they may vary temporally and spatially due to variations in the sediment, flow properties, turbulence, timing, locations, and position relative to the stream bed relief. In general, it is expected that the sediment load and movement is likely to occur in accordance with major storm/flood events. Due to the complexity and variations of the sediment process, efforts should be established to provide further, continuous monitoring of the sediment data at various strategic locations along the related tributaries and the West Fork of the San Jacinto River. The monitoring program should also be focused on during and following major storm events to verify the dominant sediment movements. The local USGS office had estimated that it would cost approximately $300,000 dollars to monitor five or six locations during various storm events within a three-year period.

5. Results of the 1999 channel survey indicate that overall volume in the study area shows a net conveyance decrease of approximately 3,100 acre-ft in comparison with the FEMA model (1970's survey). This is more or less due to the sedimentation in the study area. Significant sedimentation, which accounted for approximately 15 to 20 percent of the 100-year flood cross-sectional area, was observed at the FEMA cross sections A, B, C, D, and H. In addition, minor sedimentation was observed at the US Highway 59 and the railroad bridge; whereas, channel scouring was observed at the Lake Houston Parkway bridge.

6. Even with the amount of the sedimentation as noted above, only a small increase (i.e., less than approximately one foot) of the 100-year flood level was found in comparison with the original FEMA study. The impact of the sedimentation was compensated to some degree by nearby channel scouring and, in some areas, a better defined over-bank terrain data that provided more flow conveyance area than the FEMA hydraulic model. Due to the loss of a relatively small percentage of the overall available conveyance capacity, the level of the sedimentation does not pose a significant impact to the flood level at this time.

7. There is evidence that the sediment has progressively migrated further downstream toward the confluence with the main body of the Lake. Due to the wider channel at this location, it is anticipated that significant quantities of additional sediment may be accumulated before the sediment will be transported further into the Lake. The rate of accumulation of the sediment in the lower reaches of the study area and the rate of transport into the Lake requires further evaluation. An updated volumetric (bathymetric) survey of Lake Houston is warranted to verify its current condition.

2.0 Evaluation of Alternative Flood Control Solutions

This section discusses various flood control options including:

- A general evaluation of flood control measures such as flood protection levees, hydraulic conveyance improvement, regional detention and flood control reservoir, as well as non-structural floodplain buyout solutions (Section 2.2),
- Alternative sediment removal options (Section 2.3)
- Long term floodplain management and sediment control options to minimize potential future sediment impacts (Section 2.4)

From the range of options, an initial assessment and basic screening was conducted (Section 2.5) to formulate a selected number of alternative project configurations to be considered as potential solutions to the identified flood concerns.

2.1 Objective

The objective of this study was to evaluate potential mitigation efforts for possible improvements of the existing and, potentially, future impact of the sediment-related flooding problems. As applicable, the target solutions are to restore the effective channel conveyance so that base-flood conditions can be maintained according to the original FEMA 1970's model condition, or can be improved to achieve reduced levels of flooding in critical areas.

Flood control options were developed for the area along the West Fork of the San Jacinto River between the FM 1960 bridge and US Highway 59 bridge. Historical flooding conditions within this reach primarily have been within the regulated floodplain area where large over-bank areas of approximately 6,000 to 8,000 feet in width have experienced flooding. As a result of some concentrated early pre-FIRM development (i.e., development prior to the floodplain regulations) within this existing floodplain area, many existing structures are subject to flooding during extreme events.

As concluded in Section 1.0, Problem Definition and Analysis, only a small increase of the 100-year flood levels was identified in a few channel sections in comparison with the current regulatory floodplain. The impacted channel sections are mainly located from upstream of FM 1960 bridge (river mile 7.4 from the Lake Houston Dam) to cross section A (river mile 10.1 or FEMA station mile 3.615), and from cross-section A through cross section E (river mile 13.6 or FEMA station mile 7.09). The increases are likely due to the backwater conditions from Lake Houston and from sedimentation between the FM 1960 bridge through cross section E. These increases are considered minimal since the sediment only accounted for a relatively small percentage of the effective flow capacity. However, accumulation of further sedimentation toward Lake Houston and the FM 1960 bridge may progressively aggravate future flood conditions near the downstream reach of the study area.

As indicated in Section 1, the overall area of impact due to the change of the floodplain boundaries (1999 survey versus FEMA) are shown in Appendix C. In general, the impacted areas are mainly located along the lower reach of the West Fork channel downstream from the

Lake Houston Parkway area and are the result of the better defined over-bank terrain data from the 1999 survey. The actual area of impact, resulting from the small increase of flood level (or sediment impact), is believed to be relatively small.

2.2 General Evaluation

This section outlines available measures that were considered to improve flood conditions in the study area or to mitigate the potential flood damages. As applicable, issues associated with each alternative are briefly discussed to identify the suitability of the option for further project considerations.

2.2.1 Flood Protection Levee

Flood protection can be achieved through construction of levees as a structural alternative to restrict the flood flow within a designated channel course. Considerations for flood protection levees require understanding of the floodplain topography and hydraulics, area utilization and ownership of the protected areas, as well as the degree of impact of the potential floods. Due to the large extent of the floodplain area, close proximity of the existing subdivisions to the main channel, and relatively undeveloped nature of the area, a large-scale flood protection levee is not considered a practical or cost-effective solution. Only a small portion of the marginally impacted properties near the outer band of the floodplain boundary would stand to benefit. Preliminary cost estimates for a typical 20-foot high levee construction along the channel are approximately $4 to $5 million dollars per mile of levee construction, excluding land cost. In addition, there are significant capital costs for controlling back-levee drainage usually consisting of large stormwater pumping stations to lift tributary streamflow over the levee structure. As a result, total cost would exceed $50 million dollars for a project to be effective. Finally, there is a significant long-term operating and maintenance cost associated with this option. When you combine those cost factors with the continued risk of failure associated with any levee alternative, this option becomes very undesirable and was consequently eliminated from further consideration.

2.2.2 Improvements to Hydraulic Conveyances

Potential flood levels can be reduced through enhancements to the hydraulic carrying-capacity of the river; including: 1) decreasing friction losses through removal of obstructions such as vegetation, or unfavorable topography, or constructing surface lining measures such as concrete riprap; 2) enlarging the existing channel conveyance capacity by removing material (either inside or outside of the low-flow channel); and 3) construction of additional by-pass channels or relief channels outside of the current flood channel to convey flood events downstream. Each of these options will allow flood events to be conveyed through the area either at a faster velocity or at a lower profile than existing conditions, thus reducing the resulting flood level for a given event.

Because of the extremely large flood events which are conveyed through this reach of the river, reducing friction losses will have little impact on the flood levels. Typical channelization alternatives, such as vegetation removal and concrete-lining, would be environmentally unacceptable as well as prohibitively expensive; therefore, they were not considered as a part of this study.

Channel enlargement, primarily through sediment removal, was considered one of the more practical alternatives for achieving a flood-level reduction for this study area and is discussed in more detail in subsequent sections of the report. Excavation in channel over-banks, while possible, is more problematic. Costs for material removal for this option are somewhat lower than for conventional dredging; however, a greater volume of material must be removed to obtain the same level of flood reduction and environmental damages are significantly greater. Additionally, there are secondary recreational benefits associated with restoration of channel capacity which are not obtained through over-bank excavation. For these reasons, channel enlargement options were focused on the main channel through the use of dredging.

Similarly, construction of by-pass channels is not viewed as a practical alternative in this area. There are no major meanders or favorable topography present in this area to create opportunities for achieving flood-level reductions by short-cutting or constructing new channels at a shorter distance than the existing channels. An added disadvantage for this alternative would be the requirement to purchase additional property outside of the floodplain along any possible route for a by-pass. Consequently, no further consideration of flood by-pass was deemed to be warranted.

2.2.3 Regional Detention and Flood Control Reservoirs

In a regional detention or flood mitigation reservoir option, flood control is achieved by detaining a large portion of the peak flow in a selected storage area during major storms, therefore reducing the peak flows downstream of the storage area. For the purpose of this study, the identified regional detention area must have adequate storage capacity to provide a reduced flood level for selected channel sections (i.e., sections A through E) which are impacted by sedimentation. A preliminary estimate of the required storage capacity (based on a typical 100-year frequency storm event) for the area suggests a minimum volume of approximately 50,000 acre-ft. For preliminary assessment purposes, an approximate 5,000-acre land acquisition would be required to support this option. A potential location would be in the vicinity of the Spring Creek and West Fork San Jacinto River confluence. Based on cost data developed for the Planning Report for the San Jacinto Project (Lower Lake Creek Reservoir) conducted by the Bureau of Reclamation in 1988, the estimated total cost for a similar sized reservoir, including land and other necessary structures, would be in the order of \$50 –\$100 million. Due to the magnitude and regional nature of this option, in-depth watershed planning and analysis, as well as additional environmental studies, would be required to further evaluate this option. Therefore, this option is not considered to be a cost-effective solution to mitigating the sedimentation issue in this study.

2.2.4 Floodplain Property Buyout

Purchase of property and removal of structures from the floodplain is considered a "non-structural" alternative since this option requires no construction of any levees, channel improvements, or detention facilities. Further evaluation of the floodplain buyout option was considered appropriate in order to provide comparisons with the structural alternatives. The majority of existing flooding problems in this area are associated with previous development of properties within the low-lying floodplain area prior to the existence of adequate knowledge or regulations covering development within a floodplain. As a result, many of these properties have experienced repeated flood losses and many have subsequently been vacated, bought-out, or flood-proofed. Since the 1980's, the City of Houston, Montgomery County, and Harris County, through the assistance of the HCFCD, have been actively involved in using federal and local matching funds to varying degrees for buyouts of repetitive flood prone properties. With the requirements created by current floodplain management policies, no new permits for construction located in the floodplain may be granted without prior approval of the necessary flood protection measures. Presently, buyouts of the repetitive flood prone properties that are not in compliance with the current floodplain regulations are considered by governing agencies to be an economically feasible solution to mitigating future flood damages.

2.3 Sediment Removal

Sediment removal provides a direct means to restore the flood control capacity that was changed due to the impact of sedimentation. As indicated in this study, sedimentation has accumulated mostly downstream along the West Fork channel toward the main body of Lake Houston. Results of the 1999 survey data, in comparison with the FEMA data, indicated that the cross-sectional changes due to sedimentation created a net conveyance decrease of approximately 7,500 acre-feet and 3,100 acre-feet for reaches between the FM 1960 bridge and cross section A and between cross section A and U.S. Highway 59 bridge, respectively. As a result, hydraulic modeling using the 1999 survey data indicate that flood level increases of approximately 0.75 to 0.5 feet are created at cross section C and D upstream of the Lake Houston Parkway bridge. In addition, flood level increases of 1.0 to 1.1 feet are shown at cross sections A and B, downstream of the Lake Houston Parkway bridge due to increased starting water conditions from Lake Houston. For the upper section of the study area toward U.S. Highway 59, reduced flood levels were identified in comparison with original FEMA conditions. In summary, the impacted channel sections are mainly located along a 2.7- mile reach and a 3.5-mile reach located between upstream of the FM 1960 bridge to cross section A and between cross sections A through E, respectively.

Typical channel dredging options were evaluated to achieve sediment removal. These initial evaluations included: sediment removal techniques; sediment handling and disposal options; various dredging configurations; and resulting flood level reduction/improvements. Depending on the effects of the hydraulic conveyance improvement, a number of channel and/or area dredging configurations have been identified. Figure 2-1 illustrates approximate locations of various sediment removal sites regarding this option.

2.3.1 Sediment Removal/Dredging Techniques

A number of dredging techniques were considered for sediment removal. The most favorable technique will be dependent upon several factors such as the quantity and type of material to be dredged, the selected disposal alternative, the availability of equipment and its cost of mobilization, and overall environmental impact. The following provides a discussion of several dredging techniques considered.

- Hydraulic Suction Dredging

  The hydraulic suction dredge is the most commonly used dredging technique. It removes loose materials by suction pumping and discharges dredged material via pipeline to upland areas. The dredge is typically equipped with a rotating cutter (or auger) apparatus surrounding the intake end of the suction line. The dredge is generally mounted on a barge and uses two stern spuds to hold the dredge in working position and to advance into the cut or excavation area. Dredged materials typically contain solid content of 10 to 20 percent by dry weight, depending on the material being dredged, the depth, the pump horsepower, and the pumping distance. Typical dredge production rates, under normal working conditions for dredge depths of 10 to 20 feet, range from 45 to 105, 60 to 300, and 120 to 540 cubic yards per hour (yd^3/hr) for a 8-in, 10-in, and 12-in dredge line, respectively (Ref: Dredging and Dredged Material Disposal, USACE, EM1110-2-5025). The hydraulic dredging is a continuous, closed dredging system that can operate in a maximum economical and efficient manner. This type of dredging however, has problems removing coarser materials and debris.

- Mechanical Dredging

  This type of dredge is basically a barge-mounted mechanical excavator that removes loose or compacted materials by forms of power shovel (dipper dredge), backhoe, or clamshell/dragline bucket (bucket dredge). Production rates for mechanical dredging can be comparable to hydraulic dredging. The mechanical dredge is an open dredging system that exposes dredged material through the entire water column in an open bucket. The process is usually more sensitive to spillage and turbidity unless a special, watertight bucket is used. This type of dredging can handle higher solid content and is more productive on coarse or compacted materials and debris. Transport of the dredged material is usually by barges and may require a minimum water depth of 5 to 10 feet.

- Mix-Air, Jet-Pump Dredging

  This type of dredge uses an innovative mixed-air jet pump technology that combines high-pressure jet water and air to remove loose or hard materials, including sludge and gravel, with a conventional jet pump. The dredge can remove high concentration of solid content up to 80-90%. The process of the jet-pump dredging is the same as hydraulic dredging. However, production from the jet-pump dredging can be more efficient than typical hydraulic dredging because of its higher solid content. Due to its relatively new status, jet-pump dredging should be tested to ensure the applicability for this project before selection.

- Conventional Excavation

  Sediment removal, using the conventional excavation method, may include the use of common earthwork equipment such as backhoe, dozer, gradall, clamshell, and dragline. Due to access restriction, conventional excavations to remove river sediment are applicable to limited areas where river banks or local sand bars are above normal water level. Conventional excavation can be effective in initial area clearing and excavation of materials above normal water table. To facilitate a larger area excavation, other means such as use of cofferdams or lowering the water level of Lake Houston may be further considered.

For the purpose of this study, it is expected that conventional suction dredging by barge, used in combination with conventional earthwork excavations, would be suitable for this option. The jet- pump dredging appears to be a promising alternate. Final selection of the dredging method will be determined by the overall cost factor at the time any project is funded for construction.

2.3.2 Sediment Handling and Disposal

While selection of proper dredging techniques is essential for economic considerations of sediment removal, the selection of the disposal alternative is equally important in determining the viability of the project from both an economic and environmental standpoint. Initial evaluations of the sediment handling and disposal options may include:

- Pipeline Discharge Disposal

  Discharge pipeline method is most commonly used in conjunction with hydraulic suction dredging for handling dredged materials. Using discharge pipelines, dredged slurry can be pumped for relatively long distances to an upland disposal area for further material process or productive uses. For typical dredging operations, slurries of 10 to 20 percent solids (by dry weight) can be easily handled through discharge pipelines. Typical discharge pipelines may include pontoon mounted (over-water) or regular (over-land) pipelines to transport dredged slurries. Pipeline routing through land, if required, may require the arrangement of temporary pipeline easements. For long distance pipelines above approximately 3,000 feet in length, additional booster pumps will be needed. Actual selection and routing of the discharge pipeline will depend on several factors such as the location of and distance to the disposal site, material being dredged, dredging depth, and horsepower of dredge pumps.

- Containment Area Disposal

  This option uses diked containment areas to retain dredged material solids while allowing the carrier water to be released from the containment area. Locations of the containment area are usually determined by land availability near or adjacent to the riverbanks or dredging location for immediate material disposal and dewatering. Containment area disposal and pipeline discharge are usually worked together to handle the dredged materials.

  Two key considerations for the containment area disposal include: (a) a large enough land area to provide an adequate storage capacity in accommodating dredging quantities and (b) properly sized dikes and weir to attain the highest possible efficiency in retaining solids during the dredging operation in order to meet effluent solids requirements. The disposal process involves pumping dredged material into containment areas in a slurry state. The dredged slurry then allows for sedimentation and retention of suspended solids while maintaining ponding of the excess, decant water in the containment area. The removal of the ponded water is achieved by controlling the height of the overflow weirs with acceptable effluent standards. The dredged solids are further retained to reduce additional water content for subsequent disposal or productive use.

Effective planning and design of the containment area requires a thorough understanding of the dredging process. The location, volumes, frequencies, and types of material to be dredged must be estimated. A major consideration in proper containment area design and operation is to maximize the active dewatering through continued drying and consolidation of the dredged solids. The most economic dewatering technique involves efforts to accelerate natural drying by placing the dredged material in thin lifts over large open land area and promoting surface drainage. To facilitate effective site management, a large containment area may be divided into several compartments. Each compartment can be managed separately so that some compartments are being filled, settled, or surface drained while the dredged solids in others is being dewatered.

- Disposal Sites

Preliminary site visits in the Fall of 1999 and screening of the study area suggests that several existing active and abandoned gravel pit mining areas may be available to accommodate the disposal or handling of the dredged materials. Some of these sites are now vacant lands within the floodplain and upland area of the West Fork of the San Jacinto River. These sites typically have low assessment of property values and no development potential and are either abandoned or existing sandpit sites. Specific findings during the site visits and relevant site photos regarding the potential disposal sites are shown in Appendix D. As shown in Figure 2-1, some of the potential disposal sites are:

- Hallett Materials, Porter, Texas - This site is an active 450-acre private sandpit operation located at east side of the West Fork San Jacinto River approximately three miles north of U.S. Highway 59. This site is currently leased by Hallett Materials and has an ongoing sandpit operation that was reported in its final five years of the operation. The site currently processes approximately two million tons of sand every year, of which approximately 70 percent is sold for commercial use. Hallett materials has shown interest in possibly buying the dredged materials to support the dredging effort in this study (Meeting with Frank Johnson of Hallett Materials).

- Moonshine Hill Old Sandpit Site - This site is an old sandpit location, approximately 100 acres (two operations), located approximately two miles east of U.S. Highway 59 along the south side of the West Fork San Jacinto River, just southwest of the Belleau Wood Subdivision. It appears that the site is owned by Houston Industrial Materials (HIM Inc.) and is currently leased to two sandpit operators. The site is mostly located in the floodplain. One of the operators is Genoa Materials who is currently building a new processing plant on site and is planning to dredge approximately one million cubic yards of material. Several other existing sandpits appeared to be inactive during time of the visit.

- Don Schneider Materials Sandpit – This site is registered as a farm and vacant land of approximately 200 acres located approximately one mile east of U.S. Highway 59 along the south side of the West Fork San Jacinto River, just east of the Riverside Crest Subdivision. The site is comprised of three large pits and only one pit remains active. Estimated fill quantity of the existing pits was reported at approximately one million tons from previous dredging activities.

- Barto Watson Sandpit - This site is a small 8.7 acre site located east of the US 59 and west of the railroad along south side of the main channel. Estimated fill quantity of the existing pits was not known.

The sites described above represents only a few of the potential sites in the study area which may be available for disposal site consideration. Due to the limited scope in this study, further feasibility analyses of these sites or other sites will need to be further evaluated if any project moves forward.

- Hydraulic Dredge Fills

It is likely that dredged materials may be utilized directly or indirectly (after material process) as hydraulic dredge fills for low land areas within the study area. Hydraulic dredge fills have been successfully used to prepare sites for potential productive use as commercial, residential, or recreational sites. To prepare a site for dredge fills, a similar process using diked containment areas may be utilized. Recreational use of dredge-filled sites is popular because it requires minimum planning, less foundation support, and lower cost due to its open space and light construction nature of the work as compared to other land uses. In addition, the recreational sites along the river channel are easier to be achieved and permitted to serve multiple-use site development (i.e., flood control and recreation). However, in order to locate dredged fills in the floodplain, further hydraulic analyses will be required to confirm that no impact will occur to the existing flood conditions.

For the purpose of this study, dredge fill projects may be considered at several potential sites within the study area. To ensure no negative impact to the flood plain, these potential fill sites should preferably be located outside the floodway and farther away from the main channel. As shown in Figure 2-1, the following sites may be considered for dredged fill projects. Preliminary site visits to identify potential site conditions were conducted in the Fall of 1999. Specific findings during the site visits and relevant site photos regarding the fill sites are provided in Appendix D.

- 118-Acre Private Property - This site is located near midpoint of the study area just west of the Kingwood Country Club along the north side of the main channel. The site contains approximately 118 acres of vacant land. Reportedly, the property owner is interested in obtaining approximately eight feet of dredged fill material to elevate the site for future development. However, the majority (i.e., 75 percent) of the property, except the northeast corner, is within the floodway which has limited development values. It should be noted that environmental issues, hydrologic studies, and permits will be required to use dredge fills on this property (Meeting with TC&B, September 1999).

- 187-Acre Private Property - This site is located just north of the 118-acre site indicated above, and contain two separated parcels for a total 187 acres. Reportedly, the property owner has already sought approval to utilize about 300,000 yards of borrow fill material within the property (Meeting with TC&B, September 1999). It is possible that dredged fill material may be used to supplement these fill requirements. However, the earthwork at the site is already scheduled for early next year (Year 2000), and the proposed dredging efforts will not likely be compatible with this schedule.

- Friendswood Development Site - This site is a 62.7-acre site located just east of the Lake Houston Parkway bridge along south side of the main channel. The site is owned by the Friendswood Development Corporation. Due to its prime location and land values, this site may be a potential beneficiary of the dredged fill material for future development. Further investigation and analysis is needed to determine the feasibility of this site.

- Wetland Creation and Enhancement

The use of dredged material for wetland creation and enhancement offers a potentially feasible alternative to other off-site or upland disposal options where practicable. This alternative is often attractive, especially when other disposal options are constrained by public opinion and/or regulations or limited by availability of disposal sites. In addition, this alternative may be necessary when restoration of wetland habitats or mitigation of wetland impacts is required. To attain the maximum credit for wetland creation, wetlands should be created in upland areas or other areas currently not jurisdictional under section 404 of the Clean Water Act, or by enhancement of existing low quality wetland areas. However, in order to place dredged materials in the floodplain, further hydraulic analyses will be required to ensure no impact to the existing flood conditions.

For this study, there is limited opportunity for creation of potential wetland sites due to the highly fluctuating channel flows and the unstable nature of the sediment deposits in the floodplain area. However, it is possible that some of the old, existing sand and gravel pits in the area may be considered for wetland enhancement. These pits are often deep enough to intercept groundwater and may be economically desirable to support habitat development. Placement of dredged material in these areas may transform these areas of low habitat value into areas of much greater habitat value by converting these deeply incised, relatively deep water areas into shallow water habitats more easily accessed by terrestrial organisms. Sand and gravel pits in lower elevations within the floodplain would likely be better sites for wetland creation since these would likely be in areas with shallower water tables and would receive more frequent inundation by flood events. Where no sand or gravel pits exist, dredged material could be used to create gently sloping berms that could intercept and pond water flowing down hillsides and in small drainages.

Placement of dredged material in existing wetlands, including poor quality wetlands would likely not benefit these wetlands unless this material was used to impede the flow of water through or increase the depth of water in these areas, thereby increasing their value.

- Offsite Productive Uses

In conjunction with the optional sediment handling methods described above, other considerations were given in terms of potential offsite productive use of the dredged materials. Based on a preliminary assessment of the material characteristics, the sediment to be dredged can be reused as a natural resource or construction material for a number of purposes. However, these materials will require some minimal, upfront handling efforts such as transportation, dewatering, screening, segregation, and/or storage. Potential offsite productive uses of the dredged materials may include:

- Building materials such as concrete sand, mortar sand, bank sand, etc.
- Dredge fills for agricultural land enhancement or land reclamation.
- Landfill daily cover materials.
- Inert materials for sludge treatment at wastewater treatment plants.

As a result of the physical and chemical characteristics of the materials, compatibility of the dredged materials for the above suggested productive-use is not expected to be a problem. However, feasibility of transportation, the cost of material processing and handling, and market demands must be further considered to determine the most economical offsite productive use.

2.3.3 Environmental and Regulatory Issues

The expected environmental issues associated with sediment removal and disposal operations may include:

- Impact of water quality such as increases in turbidity and resuspension of contaminated sediments due to dredging operation;
- Impact of surface water discharge and return water quality especially for upland disposal of dredged material;
- Impact of the existing wetlands, vegetation and habitats resulting from the handling and disposal of dredged materials.

In general, it is believed that water quality impact due to dredging operation may only be considered a limited, local or temporary effect. Erosion of the current channel banks or the existing sediment beds could result in greater impacts to water quality than those from dredging operations. Impact due to contaminated sediment should be non-existent since no contamination was detected from samples taken from Lake Houston. The impacts of surface water discharge and return water quality for upland disposal option will require the implementation of Storm Water Pollution Prevention Plan and an appropriate discharge permit from the Texas Natural Resource Conservation Commission. For dredged material handling and disposal, the impacts may result in the loss or disturbance of vegetation, habitat and wetlands in the area. However, it is expected that the impacts may be limited to the low-quality, shallow water and sand bar areas if only suitable sediment removal or disposal options are considered.

Under current regulations, dredging in a wetland or other water of the United States that is not navigable does not require authorization or permitting under Section 404 of the Clean Water Act and, therefore, no regulation or mitigation is expected from the U.S. Army Corps of Engineers. However, any placement of dredged material in a wetland or other water of the United States will likely trigger the permit with the Corps. The Texas Parks and Wildlife Department may require mitigation of wetlands impacted by dredging if State funds are involved in the work. Additionally, any activity on site will require reviews by related agencies for potential existence or impact of the cultural resources, threatened and endangered species, and the Texas Coastal Management Program. For this study, detailed environmental and regulatory issues are further discussed in Section 3.2.3 for the selected project alternatives.

2.3.4 Sediment Removal/Dredging Alternatives

Several different dredging alternatives were evaluated to achieve sediment removal for flood reduction. Since flood level increases were found mainly along the downstream portion of the West Fork channel, only selected dredging alternatives in the impacted area were considered. For the purpose of this study, the objective for flood reduction was to restore the restricted channel sections to their 1970's condition (the original FEMA study). As shown in Figure 2-1, the selected dredging alternatives included:

- Channel Improvement Upstream of the FM 1960 bridge

  This option evaluates a channel improvement option for a 2.7-mile reach from the FM 1960 bridge (RM 7.4) to the mouth of the West Fork of the San Jacinto River (RM 10.1). Typical channel configuration used for this option includes a uniform channel bottom with a relatively gentle side slope of 20 (H) to 1 (V) to minimize disturbance in the upper river bank area. To create a uniform channel slope toward the FM 1960 bridge, the channel bottom would be excavated to an elevation of 23 feet MSL (1973 datum adjusted) at the upstream end and decreasing to an elevation of 15 feet MSL at the downstream end. Depending on the effects of the conveyance improvement, various channel configurations (i.e., bottom width, depth, etc.) were evaluated to assess the level of sediment removal in this option.

- Channel Improvement Downstream West Fork San Jacinto River

  This option evaluates a channel improvement option for a 3.5-mile reach along the downstream portion of the West Fork channel between FEMA cross section A (RM 10.1) passing the Lake Houston Parkway (RM 11.6) to FEMA cross section E (RM 13.6) near the River Grove Park. Similar to the previous channel improvement, typical channel configuration includes a uniform channel bottom with relatively gentle side slopes at 20 (H) to 1 (V) to minimize disturbance in the upper river bank area. Two different channel bottom elevations were evaluated, one at 28 feet sloping to 26 feet and the other at 24 feet sloping to 20 feet, to match a uniform channel slope toward cross section A.

- Selected Area Dredging between Lake Houston Parkway Bridge and River Grove Park (Four Areas)

  This dredging option considers the dredging of four selected areas in the channel over-bank areas to provide additional conveyance capacity at the respective area. These selected dredging areas contain mostly low-lying sandbars that were formed by sediment buildups adjacent to the main channel. The selected area dredging included:

  - Dredging Area A - Downstream of Lake Houston Parkway Bridge (at/near FEMA cross section B, RM 11.3)
  - Dredging Area B - North Side of the Lake Houston Parkway Bridge (RM 11.6).
  - Dredging Area C – Southwest of Lake Houston Parkway Bridge (at/near FEMA cross section C, RM 12.2).
  - Dredging Area D – South of Kingwood Country Club (at/near FEMA cross section D, RM 12.9)

  Similar to channel dredging as indicated above, typical configuration in these areas includes dredging to an approximate elevation between 25 to 35 feet to remove most of the sandbars within the river banks. Side slopes of the dredged area will be no steeper than three (horizontal) to one (vertical) to maintain area stability. Depending on the effects of the conveyance improvement, various channel bottom elevations were assumed to assess the level of sediment removal.

2.3.5 Hydraulic/Conveyance Improvement

For each of the selected dredging alternatives and configurations as indicated above, the hydraulic/conveyance improvement was analyzed to determine the effect on flood levels for various levels of the sediment removal. For initial assessment, the improved flood conditions for each dredging configuration are listed in Table 2-1. Results of the hydraulic analysis suggest that:

- Sediment removal in the area upstream of the FM 1960 bridge will have, hydraulically, minimal or no effect on flood levels due to the backwater condition from the main Lake Houston itself. The maximum flood level reduction is limited to approximately 0.1 feet if the entire area is restored to the original FEMA condition (1970's).

- Sediment removal in the lower reach of the West Fork channel may provide some small flood reductions (i.e., less than 0.58 feet) at or near the Lake Houston Parkway bridge area.

- Selected area dredging at areas A through D may provide some small to minimal flood reductions (i.e., 0.11 to 0.52 feet) upstream of the dredging area.

2.4 Long-Term Sediment Maintenance Options

For all of the flood control options outlined above, long term sediment management and/or maintenance dredging are necessary to minimize the on-going and potentially accumulative impact of continued sediment build-up in the area. As concluded in earlier sections, the available data suggests that annual sediment load in the study area may be accruing at a rate of approximately 160 acre-ft/year for the reach from US Highway 59 toward FEMA cross section A and at a rate of approximately 350 acre-ft/year near the upstream reach of the FM 1960 bridge. The following are sediment maintenance options considered in this study.

2.4.1 Maintenance Dredging

Sedimentation is evident in the area near or downstream of the Lake Houston Parkway bridge, especially toward (or passing) the FM 1960 bridge area. The rate and location of the sedimentation depends on the magnitude of the storm events, configurations of the flow area, and characteristic of the sediment. For the purpose of this study, sediment rates between 160 to 350 acre-ft/year (250,000 to 500,000 yd^3/year) were estimated. At this sediment rate, there is only a minor impact in flood levels as concluded by the hydraulic modeling. However, it is conceivable that sedimentation may progressively aggravate future flooding problems as further conveyance restrictions may develop in the area downstream of the Lake Houston Parkway bridge toward Lake Houston. Upon further evaluation, maintenance dredging was considered in the following two scenarios:

- Maintenance Dredging at Bridge Crossings (Four Locations)

  Under this option, the need for maintenance dredging was evaluated at all four existing bridge crossings such as US Highway 59 (RM 17.9), the Southern Pacific Railroad (RM 17.6), Lake Houston Parkway (RM 11.6), and the FM 1960 bridge (RM 7.4). Evaluation at these bridge locations indicated that specific dredging at these bridge crossings is not required since no sediment buildup was observed at the bridge crossings. As a result, other than routine debris removals following storm events, no specific maintenance dredging is considered at the bridge crossings.

- Maintenance Dredging Upstream of FM 1960 Bridge

  Maintenance dredging was also evaluated for long-term maintenance consideration to prevent further buildup of the sediment at the FM 1960 bridge area. Based on the estimated sediment rate, it is expected that regular maintenance dredging at five to ten-year intervals may be necessary in maintaining the current channel conditions. However, our modeling analyses indicated that maintenance dredging at this location will not provide any significant flood mitigation benefit. Therefore, the value for maintenance dredging in this area will only mitigate a relatively small loss of storage capacity for Lake Houston, which would provide minimal benefit to the yield of the reservoir. Due to the high cost of maintenance dredging at this location, it is not considered an effective option and is not recommended.

2.4.2 Sediment Basin

Sedimentation basins either on- or off-channel provide an alternative in managing the inevitable sedimentation within a designated area. As a long-term maintenance solution, sedimentation basins may provide an effective solution for minimizing potential sediment buildups and prolonging the existing life of the channel conveyance. A sedimentation basin usually requires a large surface area with relatively shallow depth (i.e., 10 to 15 feet) to be effective. Depending on the size/configuration of a basin and the characteristics of the sediment loads, a sediment basin may be constructed at a reasonable cost to provide relief of the sediment loads. As a dedicated sediment trap, on-going sediment maintenance can be easily implemented at regular intervals in order to maintain the optimal condition of the channel conveyance.

Possible locations for sedimentation basins available in this area include on-channel basins such as dredging areas A and D as well as off-channel areas utilizing old sandpit sites such as Don Schneider Materials' property located east of the US Highway 59 or Hallett Materials' property located approximately 3 miles north of the study area. It is expected that some of these potential off-channel sites may be developed jointly with local business participation such as the existing sandpit operators. By utilizing the existing sandpit operation and facility, the existing channel may be diverted through the existing empty pits which can be designed to function as off-channel sediment basins while maintaining normal flow through the area. In return, the sandpit operator can dredge and process the sediment for resale purpose. As a dedicated sediment trap, the basin can be maintained via regular dredging by the sandpit operator.

For the purpose of this study, only on-channel sediment basins are evaluated due to their optimal design configurations and relatively reasonable cost for construction. For off-channel sediment basins, further investigations and studies are needed to assess the feasibility of this alternative.

2.5 Project Screening and Formulation

Qualitative screening of the flood control options were conducted to facilitate the selection of the potential project alternatives. For the initial assessment, screening criteria consisted of the general cost, flood control improvement, constructability, environmental impact, and maintenance requirements for each alternative. Results of the project screening are summarized in Table 2-2.

As a result of the initial assessment and screening of the flood control options, various alternative project configurations were identified as promising solutions to achieve the project objective. These project alternatives included:

Structural Measures

- Alternative I - Channel improvements downstream of the West Fork San Jacinto Channel (3.5 mile reach)
- Alternative II - Selected dredging for Areas A, C, and D, downstream of the mouth of the West Fork San Jacinto River area
- Alternative III - On-channel sediment basins downstream of the Lake Houston Parkway bridge (Area A) or South of Kingwood Country Club (Area D)
- Other Alternative - (to be studied) Off-channel sediment basins

Non-Structural Measure

- Alternative IV - Floodplain Buyout (Non-Structural)

Figure 2-2 shows approximate locations of these project alternatives. It should be noted that these project alternatives only address the channel areas, near or upstream of the Lake Houston Parkway bridge which experiences increases in flood level due to the sediment impact within the study area. For areas downstream of the Lake Houston Parkway bridge and upstream of the FM 1960 bridge, the flood level increases are mainly caused by backwater conditions from Lake Houston. To address potential flood improvements through this area, further study of the Lake Houston area downstream of the FM 1960 bridge is needed.

3.0 Preliminary Project Assessment

3.1 Project Features and Costs

3.1.1 Alternative I - Channel Improvement Downstream of West Fork Channel (3.5 miles)

This alternative consists of approximately 3.5 miles of channel improvement for the West Fork San Jacinto River beginning approximately 2.7 miles upstream of the FM 1960 bridge (RM 10.1 or FEMA Sta. mile 3.615) to near the River Grove Park (RM 13.6 or FEMA Sta. mile 7.09 (See Figure 3.) The objective is to reduce the flood levels along this impacted channel reach and restore conveyance to its early 1970's condition (the original FEMA study). For dredging considerations, a typical barge-mounted, hydraulic suction dredge connected with dredge pipeline or other equivalent method may be utilized. The scope of the dredging work includes:

- Approximate dredging length - 3.5 miles
- Proposed channel bottom width - 200 ft
- Proposed channel bottom elevations – 20 to 24 ft MSL, 1973 datum adjusted (depth of dredging approximately 10 ft)
- Proposed channel side slopes – 20 (H) to 1 (V) or match existing channel slopes
- Estimated dredging quantity – 3.9 million cubic yards
- Dredge material disposal options - upland hydraulic fills; pipeline discharge and material process/reuse; upland confined area material dewatering process

The channel improvement plan and typical cross-sections are illustrated in Figures 3-1, 3-2, and 3-3. The benefit of this alternative will reduce the flood level approximately 0.4 to 0.6 feet at/near the Lake Houston Parkway bridge area. However, little improvement can be achieved to reduce the flood level at the downstream channel reach (RM 10.1), since it is controlled by the backwater condition from the Lake. Specific flood level improvements at the respective channel sections are listed in Table 3-1. The preliminary construction cost estimate of this alternative, including engineering and contingencies, is approximately $29,375,000, as shown in Table 3-2. For comparison, this alternative would numerically reduce the current floodplain area by approximately 62 acres based on the reduced width of the floodplain and the length of the improved channel reach.

3.1.2 Alternative II - Selected Dredging for Areas A, C, or D, Downstream of the West Fork River Area

This alternative consists of dredging three selected channel over-bank areas to provide additional conveyance capacity at each respective area. These dredged areas were selected based on the potential for lowering the increased flood levels for a specific problem area without using extensive channel dredging. In other words, the proposed dredging areas are located in areas where there is evidence of large sediment deposit. Similar to the channel improvement alternative, area dredging may be conducted by utilizing a typical barge-mounted, hydraulic suction dredge or in combination with other traditional excavation methods. These selected dredging areas are:

Dredging Area A – Downstream of Lake Houston Parkway Bridge Area (RM 11.3).

- Approximate dredging area - 120 acres
- Proposed bottom elevations - 30 ft MSL, 1973 datum adjusted (maximum depth of dredging approximately 15 ft)
- Proposed dredging side slopes - 3 (H) to 1 (V) maximum
- Estimated dredging quantity - 2.8 million cubic yards
- Dredge material disposal options - upland hydraulic fills; pipeline discharge and material process/reuse; upland confined area material dewatering process

The dredging plan and typical cross-sections are illustrated in Figures 3-4 and 3-5. Specific flood level improvements at the respective channel sections are listed in Table 3-1. The benefit of the project will reduce the flood level approximately 0.4 to 0.5 feet in the immediate surrounding area. However, no improvement at the downstream channel area (RM 10.1) can be achieved due to its backwater conditions from the lake. The preliminary construction cost estimate of this alternative including engineering and contingencies is $21,926,000, as shown in Table 3-3. For comparison, the calculated floodplain reduction would be approximately 40 acres based on the reduced width of the floodplain and the length of the improved channel reach.

Dredging Area C – Southwest side of Lake Houston Parkway Bridge (RM 12.2).

- Approximate dredging area - 50 acres
- Proposed bottom elevations - 30 ft MSL, 1973 datum adjusted (maximum depth of dredging approximately 18 ft)
- Proposed dredging side slopes - 3 (H) to 1 (V) maximum
- Estimated dredging quantity - 1.2 million cubic yards
- Dredge material disposal options - upland hydraulic fills; pipeline discharge and material process/reuse; upland confined area material dewatering process

The dredging plan and typical cross-sections are illustrated in Figures 3-4 and 3-6. Specific flood level improvements at the respective channel sections are listed in Table 3-1. The benefit of this alternative will reduce the flood level approximately 0.3 to 0.4 feet in the immediate surrounding area. No flood improvement will be achieved for area downstream of the Lake Houston Parkway bridge. The preliminary construction cost estimate of this alternative, including engineering and contingencies, is $8,870,000, as shown in Table 3-4. For comparison, the calculated floodplain reduction would be approximately 29 acres based on the reduced width of the floodplain and the length of the improved channel reach.

Dredging Area D - Both Sides of the Channel at/near South of Kingwood Country Club (RM 12.9).

- Approximate dredging area - 80 acres
- Proposed bottom elevations - 35 ft MSL, 1973 datum adjusted (maximum depth of dredging approximately 12 ft)
- Proposed dredging side slopes - 3 (H) to 1 (V) maximum

- Estimated dredging quantity - 1.8 million cubic yards
- Dredge material disposal options - upland hydraulic fills; pipeline discharge and material process/reuse; upland confined area material dewatering process

The dredging plan and typical cross-sections are illustrated in Figures 3-4 and 3-7. Specific flood level improvements at the respective channel sections are listed in Table 3-1. This alternative will reduce the flood level between 0.2 to 0.3 feet only in the local area. Although the benefit of this alternative is minimal, this area was selected in order to also evaluate its potential as an on-channel sediment basin. The preliminary construction cost estimate of this alternative, including engineering and contingencies, is $13,244,000, as shown in Table 3-5. Further evaluation of the sediment basin alternative is discussed in the next section. For comparison, the calculated floodplain reduction would be approximately 21 acres for this alternative.

3.1.3 Alternative III – On-Channel Sediment Basins (Area A or D)

This alternative, in conjunction with the Area Dredging A and D (Alternative II), provides an additional benefit of being utilized as a designated sediment basin area to enhance the settling of the sediment in the West Fork channel prior to migrating into the Lake. Judging from the settling characteristics of the river sediment, the majority of fine to median sands in the sediment load can easily settle in the channel. Based on limited river sediment data, the coarser sand solids may account for as much as 70 to 80 percent of the total sediment load during larger storms. Once settled in the channel and without a sediment basin in place, the sediment bed load can be easily suspended and carried further downstream by larger storms. With a properly designed sediment basin, enhanced settling of the sediment load can be achieved by the reduced flow velocity. In addition, the sediment basin can be designed to trap sediment bed loads for periodic removal, as necessary.

For the purpose of this alternative, two of the previously proposed dredging areas are considered for use as on-channel sediment basins. Based on the configurations of the area dredging, sizes of the basin were evaluated to ensure optimal conditions. Typical design of the basins is illustrated in Figures 3-8. General configurations of the basins are as follows.

Area A - Downstream of the Lake Houston Parkway Bridge Area (RM 11.3)

- Basin Dimension - 2,700 ft wide and 4,000 ft long (approximate)
- Depth of Basin - 9.25 feet (average), bottom elev. 30 ft MSL, 1973 datum adjusted
- Surface Area - 13,000,000 sf (300 acres) @ water surface elev. 40 ft MSL, 1973 datum adjusted
- Basin Volume - 3.7 million cubic yards

Area D – South of Kingwood Country Club Area (RM 12.9)

- Basin Dimension - 2,500 ft wide and 3,000 ft long (approximate)
- Depth of Basin - 6.5 feet (average), bottom elev. 35 ft MSL, 1973 datum adjusted

- Surface Area - 6,000,000 sf (140 acres) @ water surface elev. 40 ft MSL, 1973 datum adjusted
- Basin Volume - 1.8 million cubic yards.

Basic design of the basins includes an improved surface area ratio of approximately 3 to 5 times the current channel/area conditions to ensure the efficiency of the settlement process. To improve a uniform flow condition, a symmetrical basin with an approximate 45-degree transitioning inlet section was used. Preliminary analyses of the basin design indicated that settling velocity in the basin could be reduced to approximately one half or one third of the unimproved condition. With the improved settling condition, the basin would be capable of removing fine solids in the sediment loads. As a result, it is estimated that the majority of the annual sediment load (i.e., 250,000 to 500,000 cubic yards) will be trapped in the basin. To maintain efficiency, maintenance dredging of the basins at an interval of every five years is also expected. The cost of the basin construction and subsequent maintenance work should be the same as the area dredging alternative as discussed above. If the basin is used in conjunction with the area dredging effort, it is expected that no additional cost will be required for this alternative.

3.1.4 Other Alternative - Off-Channel Sediment Basins (Diversion) of West Fork Channel

A selected number of smaller off-channel sediment basins may also be considered for sediment removal. This alternative considers the use of some existing upstream off-channel basins to provide intermittent sediment control for reducing sediment which may otherwise move downstream toward the study area. Due to the relatively small sediment load and the small size of these existing areas, these sediment basins may be constructed at a lesser cost. It is also possible that some of these basins can be developed jointly with the local mining businesses such as the existing sandpit operations previously discussed. By utilizing the existing sandpit operation and facilities, the existing channel may be diverted through the existing (currently empty) pits that can be modified to function as an off-channel sediment basin while maintaining the flow through the area. In return, the sandpit operator can dredge and process the sediment for resale purposes. As a dedicated off-channel sediment control point, the basin can be maintained via regular dredging by the sandpit operator.

For the purpose of this study, various potential sites were identified, including: 1) the existing Hallett Materials sandpit located approximately 3 miles upstream from U.S. Highway 59 adjacent to the West Fork of the San Jacinto River; and 2) the existing sandpits operated by Don Schneider Materials located approximately one mile east of U.S. Highway 59 along the south side of the West Fork San Jacinto River, just east of the Riverside Crest Subdivision. The feasibility of this alternative will require further analyses as well as investigation and coordination with the property owners, sandpit operators, and/or governing agencies. Although no specific cost estimates have been developed at this time, it is expected that this alternative may be cost effective if the user (sandpit operator) agrees to participate in the project initiative.

3.1.5 Alternative IV - Floodplain Buyout (Non-Structure)

For comparison purposes, a nonstructural alternative consisting of the floodplain buyout option was also considered. Floodplain buyouts do not provide any flood level reductions in the area; however, buyouts do provide an indirect solution by mitigating repeated flood losses and/or future flood damages for those flood-prone properties within the floodplain. For the purpose of this study, the floodplain buyout alternative is used to make economic comparisons to other structural measures discussed previously.

The City of Houston, Montgomery County, and Harris County, with assistance of Harris County Flood Control District have all been participating in floodplain buyouts in the study area since the early 1980's. The primary goal of the buyouts is to limit potential, repeated flood losses within the floodplain. Floodplain buyouts have now been accepted as an economically justified solution in seeking federal funding by related floodplain agencies/administrators. Floodplain buyout efforts within the study area are continuing in several subdivisions, namely Lakeside, Riverside Oilfield, Riverside Crest, Forest Cove, Belleau Wood, and Northshore. To date, the current status of the buyout situation, including locations, numbers, and costs of the buyouts, are summarized in Table 3-6. This information was derived based on various databases such as the Harris County Appraisal District (HCAD) records and relevant COH and HCFCD buyout records. To date approximately $7 to $8 million has been invested by public agencies in floodplain buyouts in this area.

Without detailed slab elevation data, it is not possible to determine the number of properties impacted by increases in flood levels due to sedimentation. For comparative analysis, the cost of this alternative was developed by assuming total purchase of all existing structures, within the floodplain, as a worst case scenario. It should be noted that estimated property value is based on current HCAD data that, in some cases, may not fully reflect the actual market values. To account for this potential disparity, as well as certain incidental charges for moving-related inconvenience costs, a 30 percent value was added to the HCAD data. The preliminary cost estimated for this alternative, including cost of demolition, appraisal, and closing costs is approximately $22 million for Harris County properties in the study area as shown in Table 3-7. It should be noted when comparing the cost of the alternatives that this cost represents eliminating all occupied properties for buyout from the floodplain; therefore, there would theoretically be no future damages in these areas if this alternative were implemented. It should also be noted that the buyout alternative will not reduce or address the potential hazards of flooding due to the accumulation of sedimentation.

3.2 Implementation Issues

General discussions of the key implementation issues are provided in the following sections regarding the alternatives for dredging, sediment basins, and flood buyouts.

3.2.1 Institutional/Governmental Agency Issues

A. Authority and Funding

As discussed in detail in Section 1.4, numerous public agencies are recognized as having jurisdictional authority for the West Fork of the San Jacinto River upstream of Lake Houston. These relevant agencies include the City of Houston, Harris County, Montgomery County, the Harris County Flood Control District, and the San Jacinto River Authority. However, it is recognized that these agencies were created through a series of unrelated legislative acts and have differing boundaries, powers and capacities related to flood control issues. As a result, although some agencies may be seen by the public as having responsibility for resolving flood control issues, the actual legislative authority of these agencies is generally limited to development of water resources and administration of infrastructure or floodplain policies. Additionally, the availability of funding or other financial responsibilities limits the practical capability of all of the relevant agencies to implement or support flood control measures in the study area.

Under the requirements to ensure availability and proper administration of National Flood Insurance Program (NFIP), participating communities designate a floodplain administrator who is charged with regulating new development within the floodplain in conformance with the NFIP guidelines with intention to reduce future flood losses. As a result, the City of Houston, Harris County, and Montgomery County all provide a floodplain administrator who has authority to enforce regulations for development and construction permits for all activities within the floodplain of the West Fork of the San Jacinto River and tributaries.

For implementation of flood control measures, the City of Houston and/or Harris County has the authority and can initiate either dredging or a buyout program. Due to the regional impact of the problem, it is anticipated that interagency coordination among the City of Houston, HCFCD, Harris County, Montgomery County, and San Jacinto River Authority is also required. Funding of any project, other than floodplain buyout efforts, will likely require predominately local funding since the benefits of the project cannot meet cost-benefit criteria for federal funding. Presently, limited public funds or potential taxing revenue has been identified to support the dredging effort.

Under the FEMA Flood Mitigation Assistance Program (FMA), federal grant funds, as administered through the TWDB, may be available to assist state and local governments in funding cost-effective actions that reduce or eliminate the long-term risk of flood damages. To be eligible for such funds, local participation and cost sharing is required. Acceptable FMA projects include: planning grants to assess flood risk and identify actions to reduce that risk; project grants to execute measures to reduce flood losses; and technical assistance grants to develop viable FMA applications and implement FMA projects. For the purpose of this study, the type of projects eligible for FMA funding include: flood protection planning studies; acquisition, relocation, modification, and demolition of insured structures to reduce flood losses (i.e., floodplain buyouts); minor physical flood mitigation projects; sediment transport studies and regional hydrologic and hydraulic studies.

For dredging projects, it is expected that authorization under the United States Army Corps of Engineers Section 10 and Section 404 permits will likely not be required if there is no deposition of dredged materials back into the river. Specific permit related issues are discussed in more detail in a later section.

B. Flood Control Management

The National Flood Insurance Program (NFIP) requires participating communities to adopt floodplain management ordinances intended to reduce future flood losses. As a result, relevant floodplain management policy and/or local ordinances were enacted to regulate new construction in the 100-year floodplain since the mid-1980s. Typical floodplain ordinances/policies such as City of Houston, Harris County, and Montgomery County have enacted now curtail new, flood-prone development and minimize potential flood damage to new structures. In general, typical floodplain management requires/restricts new construction to be elevated at least 12 to 18 inches above the 100-year base flood elevation or be provided with other flood proofing measures. However, even with the enactment of such floodplain regulations, flooding problems remain for development built before these regulations. In addition, new development within or near the floodplain may be threatened when 100-year flood levels are exceeded, such as in the October 1994 Flood. Also, impact may be caused by flood level increases as a result of watershed development, or to a minor degree by the impact of sedimentation as illustrated in this study.

In any case, flooding remains a significant concern, especially when compounded by the rapid urbanization in the area. Implementation of flood control alternatives as identified in this study clearly indicate their limitations and costly nature of solutions to resolve the flooding concerns. In addition, adoption of floodplain management alone does not resolve issues affected by the increase runoff associated with new developments. To ensure an effective, long-term solution, a Comprehensive Master Drainage Plan should be developed in conjunction with the sedimentation issues, the subsidence issues, the floodplain management issues, and the recommended plan to minimize future losses in the Lake Houston area.

3.2.2 Required Studies

Flood impacts in this study area due to sedimentation are somewhat limited to near or upstream of the Lake Houston Parkway bridge area. A larger degree of flood impact downstream of the Lake Houston Parkway bridge toward the FM 1960 bridge is created due to backwater conditions from Lake Houston. To address potential flood improvement along the downstream area, further study of Lake Houston is warranted.

It is further suggested, as a result of this study, that potential hydrologic conditions and flooding frequency upstream of the Lake Houston dam should be re-evaluated. The original FEMA cross-sectional data in the over-bank area appear to be limited due to lack of adequate ground points. As a result, conclusions of the FEMA floodplain model may not be representative of actual flooding conditions. To better understand the impact of the current floodplain conditions, hydrologic conditions surrounding Lake Houston and major tributaries should be re-evaluated. Accordingly, floodwater hydraulic analyses of Lake Houston should be further studied to evaluate potential backwater conditions. For Lake Houston and/or the West Fork channel area, there is a need to obtain additional cross-sectional data at a closer distance than was developed for the original FEMA model. This additional data may also be used to refine the reliability of the current hydraulic analysis. In addition, gaging stations at FM 1960, Lake Houston Parkway and U.S. Highway 59 would assist in calibration of the hydraulic model to that of the actual flood conditions of the West Fork channel.

3.2.3 Permit and Environmental Issues

A. Regulatory and Permit Requirements

- U. S. Army Corps of Engineers: Section 404/Section 10 Permit

  Activities in waters of the United States are regulated by Section 404 of the Clean Water Act, and if in a navigable water, by Section 10 of the Rivers and Harbors Act of 1899. Due to construction of the Lake Houston dam, the West Fork of the San Jacinto River along the study area is no longer navigable. Therefore, authorization under Section 10 is not required for this project. Section 404 of the Clean Water Act only regulates the placement of fill and dredged materials in waters of the United States. Since this project is proposed to only remove materials by dredging from a water of the United States and not deposit them, a Section 404 permit will likely not be required.

  The large amounts of material dredged from Lake Houston will require disposal or storage. Disposal or storage areas must be screened to ensure these sites are free from environmental constraints such as impacts to wetlands and other waters of the U. S., archeological sites or endangered species. Placement of any fill or dredged material in a water of the U. S., including a wetland, will require authorization under Section 404 of the Clean Water Act. Hydraulically dredged material stored on an upland disposal area does not require a Section 404 permit, except where runoff water from the disposal area enters a water of the U. S. This water is considered dredged material under Section 404 of the Clean Water Act. Its return to the San Jacinto River would be considered a discharge of fill material. Discharge of the return water into the retrieving stream is permitted under Nationwide Permit 16, but the discharge must receive certification under Section 401 of the Clean Water Act from the Texas Natural Resource Conservation Commission (TNRCC). Water quality standards for this water are sometimes difficult to attain. Therefore, consultation with the TNRCC early in project development is recommended if hydraulic dredging is likely to be employed on this project.

If an abandoned sand or gravel pit is used for disposal of dredged material, care must be exercised to ensure that these areas have not become jurisdictional with the passage of time. If a sand, gravel, or borrow pit is not used for a lengthy period, it can be considered abandoned. If wetland plants invade an abandoned pit, the Corps can claim jurisdiction over the site and a Section 404 permit will be required for placement of any fill in this area. During visits to some of the sand pit sites, no apparent wetland or Corps jurisdiction issues were observed in the study area.

- TNRCC: Public Safety – Dams, Levees, Fill, Channel Modifications, and Other Such Improvements

Section 11.144 of the Texas Water Code requires that all water right holders must obtain prior Commission approval before making any alterations, enlargements, extensions, or any other changes to a reservoir, dam, main canal, or division work. In addition, Section 16.236 of the Code provides that levee or channel modification projects, or other improvements which change the floodwater characteristics of a stream, must be approved by the Commission prior to construction. However, this section does not apply to levels and other such improvements within the political boundaries of a municipality or political subdivision which participates in the National Flood Insurance Program and has procedures and criteria equal to or more stringent than that provided under Commission rules.

- Texas Historical Commission: Archeological Sites

In accordance with the National Historic Preservation Act of 1966, whenever a federal project or a federally licensed project, activity, or program alters any terrain such that significant historical or archeological data is threatened, the Secretary of the Interior may take action necessary to recover and preserve the data prior to commencement of the project. Section 106 of the National Historic Preservation Act requires Federal agencies to consider the effects of their actions on historic properties. The State Historic Preservation Officer (SHPO) is the official in each state who consults with federal agencies during Section 106 Review. The Texas Historical Commission is the state agency that administers the national historic preservation program for Texas. In a response letter dated April 6, 1999 from the Texas Historical Commission (THC), the THC stated that, although there were no significant recorded archeological sites in the project area, the potential for their occurrence exists. The THC stated that an archeological survey should be conducted of any site impacted by excavation or fill prior to any activity at that site. Prior to authorization of the project by individual or nationwide permit, the Corps must be assured that none of the permitted activities will impact a site that is included or eligible for inclusion on the National Register of Historic Places. Once a site is selected for excavation or disposal of excavated material, it should be reviewed by the Texas Historical Commission to determine potential impacts on sensitive resources. The response letter from the THC is included in Appendix E.

- Threatened and Endangered Species

The Endangered Species Act of 1973 provides a means for conserving the ecosystems upon which endangered and threatened species are dependent, provides a program to conserve endangered and threatened species and establishes the appropriate steps to achieve the purposes of other treaties and conventions established to protect sensitive wildlife resources. Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed to be or is listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(4) requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat. If a species is subsequently listed, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may adversely affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

A federal permit such as a Section 404 or TPDES (formerly NPDES) permit constitutes a federal action that would require coordination with the USFWS under Section 7 of the Endangered Species Act. Additionally, any action that would adversely impact an endangered or threatened species would constitute a taking under the Act. To comply with the Endangered Species Act of 1973, Brown & Root contacted the U. S. Fish and Wildlife Service (USFWS). The response from the USFWS dated March 3, 1999 (See Appendix E) indicates that no federally listed threatened and endangered species are likely to occur at the project site.

Brown & Root also contacted the Texas Parks and Wildlife Department (TPWD) to request information on rare species within or near the project area. In a response letter dated March 8, 2000, the TPWD (See Appendix E) stated that there were no known occurrences of rare species within the project area; however, there is a bald eagle (*Haliaeetus leucocephalus*) territory proximal to the project. Due to this proximity, the proposed project area could be used as a foraging area by bald eagles.

Other species resident in Harris County indicated by the TPWD to have the greatest likelihood of occurrence in or near the project area included the swallow-tailed kite (*Elanoides forficatus*), creek chubsucker (*Erimyzon oblongus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), southeastern myotis (*Myotis austroriparius*), alligator snapping turtle (*Macroclemys temminckii*), and the timber/canebrake rattlesnake (*Crotalus horridus*). Species resident in Montgomery County that have the greatest likelihood of occurrence in or near the project site include the bald eagle, red-cockaded woodpecker (*Picoides borealis*), creek chubsucker, paddlefish (*Polyodon spathula*), Rafinesque's big-eared bat, southeastern myotis, alligator snapping turtle, Louisiana pine snake (*Pituophis melanoleucos ruthveni*), timber/canebrake rattlesnake, and one plant species, Correll's false dragon-head (*Phrysostegia correllii*).

Prior to construction, all sites to be utilized for dredging, disposal, or other type of impact should receive final review to assess the potential of occurrence for threatened or endangered species or other sensitive natural communities.

- Texas Coastal Management Program

The Texas Coastal Management Program's website was reviewed On February 24, 1999 to determine whether the proposed activities fall within the Coastal Management Program boundary. Based upon information obtained from this website, the proposed project is probably not within the Coastal Management Program boundary. The address of the referenced website is http://www.glo.state.tx.us/coastalpermits/harris.html. Since the project affects a river basin flowing into Trinity Bay, the Texas Coastal Conservation Council should be contacted prior to work on this project to ensure that the project conforms with the Texas Coastal Management Program even though it is located outside the Program boundary.

- TPDES (formerly NPDES)

Discharges of storm water runoff from construction activities that disturb more than five acres must be covered by a Texas Pollutant Discharge Elimination System (TPDES) permit. Most construction activities can be covered under the TPDES General Permit for Storm Water Discharges from Construction Sites. Under this general permit, the state (TNRCC) requires development of a Storm Water Pollution Prevention Plan (SWPPP). If five acres will be disturbed by the proposed project, then a draft Storm Water Pollution Prevention Plan will be required. This five-acre limit is for the entire site and cannot be circumvented by dividing the site into smaller projects or by phasing development. Future revisions to the planned Phase II TPDES regulations will likely regulate activities affecting between one and five-acre sites. The interim Phase II regulations will be effective August 7, 2001.

Prior to 48 hours before construction activities commence, the operator must file a Notice of Intent (NOI) with the TNRCC. An example of a typical NOI is contained in Appendix E. The NOI should include information about the site in question, such as location, owner and operator information, receiving water, existing TPDES number (for an industrial site where work is to be conducted, if applicable), indication of existing quantitative data, and a brief description of the project. This information is placed on a one-page form developed by the TNRCC and submitted to the central processing center. Prior to submittal of the NOI, the authorized representative must develop and certify a Storm Water Pollution Prevention Plan. The plan contains site information including soil, quality of runoff, (if available), location of surface waters on the construction site and name of receiving water; a site plan design; a description of the construction activity, and a pollution prevention site map; estimated size of area including the total site and disturbed area; runoff coefficient of the site; any state and local requirements; sediment and erosion controls; other pollutant controls; storm water management controls along with the location on the site map of each control; an Inspection and Maintenance Plan; description of all controls; and a sequence of major activities.

Construction may commence as early as two days after the NOI is postmarked. During construction, all controls mentioned in the SWPPP must be implemented. The project site must be inspected regularly to ensure that all conditions in the SWPPP are being followed. The results of the inspections must be recorded. Inspections are required every seven days or within 24 hours after a storm with rainfall amounts of 0.5 inches in depth or greater. The SWPPP, the inspection and maintenance report forms, and the Certifications must be available for review.

The SWPPP must be kept up to date and must reflect any changes to the site that have occurred since the formulation of the SWPPP. The Plan must be changed if it is not effective in minimizing pollutant discharge from the site. The SWPPP must be certified and the certifications signed by the authorized representative of each operator and any subcontractors responsible of implementing any measures contained in the SWPPP.

Once a project is substantially complete, the operator must submit a Notice of Termination (NOT) to the TNRCC. The NOT must be submitted once all soil disturbing activities are complete and a uniform perennial vegetative cover with a density of 70% has been established at the site on all unpaved areas and areas not covered with permanent stabilization measures. The SWPPP and all records regarding the SWPPP must be kept on file for three years following final stabilization. An example of a NOT is also included in Appendix E.

- National Environmental Policy Act

Application of the National Environmental Policy Act may be required if federal funds are involved in the construction of the project. Presently, there are no plans for federal funds to be used in this project. Even if no federal funds are involved, various federal permits, such as Section 404, can trigger NEPA. If triggered, most regulatory actions would normally require development of an Environmental Assessment (EA) rather than a full Environmental Impact Statement (EIS). However, if a project is controversial or is judged to have potentially significant impacts, the Corps could require that an EIS be prepared.

B. Environmental Impacts

- Water Quality

Dredging activities may affect water quality through increases in turbidity and total suspended solids in the channel. Any spill of lubricants or fuels from dredging or construction equipment could adversely impact the receiving water quality. Turbidity generated by the hydraulic dredging operation is usually found in the vicinity of the pump/cutter head. The levels of turbidity are directly related to the type and quantity of material cut, but not picked up, by the suction. In addition to the dredging equipment used and its mode of operation, turbidity may be caused by sloughing of material from the sides of vertical cuts; inefficient operational techniques; and the prop wash from the tenders (boats) used to move pipelines, anchors, etc. in the shallow water areas. Within 10 ft of the cutter head, suspended solid concentrations are highly variable but may be as high as a few tenths of parts per thousands (ppt). These concentrations decrease exponentially from the cutter to the water surface. Near-bottom suspended solid concentrations may be elevated during dredging operation to levels of a few tenths of one ppt at distances of less than 1000 ft from the cutter. If turbidity is required for environmental concerns of a dredging operation, it is important that the predicted turbidity levels are evaluated in light of background conditions.

It should be noted that average turbidity levels, as well as the occasional relatively high levels are often associated with naturally occurring storms, high wave conditions (by recreational boating), and floods. Erosion of the current channel banks or the existing sediment beds could result in greater chronic long-term impacts to water quality than those resulting from short-term construction activities. For the purpose of this study, due to the relatively large and undeveloped nature of the area, water quality impact may only be considered a limited, local or temporary effect.

- Floodplains and Floodways

Any changes to the existing channel condition resulting from dredging activities have the potential to impact erosion, sedimentation balance, or floodwater characteristics in the floodplains. For the purpose of this study, it is expected that minimal adverse impact of the floodplain or floodway would occur since construction activities are intended to improve the efficiency of the sedimentation process as well as the conveyance capacity due to the existing sedimentation levels in the channel area.

- Biotic Communities and Wetlands

Under normal conditions, the upper end of Lake Houston in the project area is characterized by shallow backwaters and sloughs interspersed with sandbars and low islands. The main channel of the West Fork of the San Jacinto River is shallow and meandering in this area. The proposed project will result in the deepening, widening and straightening of the main channel of the River. The proposed project will remove sediments from the main channel. In areas adjacent to the main channel, shallow water habitat, including wetlands, will be converted to deep water habitat. In addition, terrestrial habitat, including some sandbars, will be lost due to conversion to deep water habitat from dredging and excavation of these areas.

The removal of sediments from the main channel will result in the loss of benthic macro-invertebrates that are a primary food source of many fish species and that, upon emerging, are a food source for many bird species. The loss of shallow water habitat and wetlands from dredging will reduce the amount of foraging, spawning or breeding, and nursery areas for many species of fish, amphibians and reptiles and foraging areas for many mammals and wading birds. The loss of these shallow water areas will also result in the loss of habitat for many benthic macro-invertebrates with concomitant impacts to the aquatic and terrestrial food webs. The excavation and dredging of adjacent terrestrial habitats, including sandbars, will result in the loss of cover, nesting habitat, loafing habitat, and foraging habitat for many terrestrial species.

Much of the shallow water and wetland habitat consists of mud flats ringed by various herbaceous species and willows. Aquatic vegetation is likely limited due to the fluctuations in water levels and the high turbidity levels of the water. The sand bar terrestrial habitat that may be lost is likely of low quality due to the ephemeral nature of many of these areas. These areas are often vegetated solely with black willow (*Salix nigra*) that is of lower habitat value as opposed to higher, more permanent areas vegetated with more diverse species mix and mast producing trees like oaks.

Losses to shallow water and terrestrial habitat can be mitigated in part by placement of dredged material in some of the abandoned sand or gravel pits in the area to create replacement shallow water and terrestrial habitat, including wetlands. These created areas of habitat may not be of equivalent value to those areas lost, especially if they are too small and are isolated from similar habitat types.

- Other Environmental Concerns and Issues

Other environmental concerns in the project area include potential contaminated sediment from Lake Houston. Laboratory analyses performed on sediments taken from Lake Houston found virtually undetectable levels of heavy metals (Byers and Montgomery, 1995). Laboratory analyses showed low levels of total petroleum hydrocarbons (TPH) in these sediments. TPH levels ranged from nondetectable to 3 parts per million. Sources of TPH could include runoff from highways and other road surfaces. In addition, the Riverside Oil Field and numerous other oil wells are in proximity to the project area. Runoff from these fields could contribute to TPH levels in the sediments.

3.2.4 Construction Issues

A. Equipment and Access

Depending on the type of equipment used to support dredging activities, equipment access to the working area is generally required. Typical dredging equipment over water may include a barge mounted cutter head connected by pontoon mounted floating discharge pipelines that require minimal land access. However, access to the dredging area is generally required for operator and/or supporting equipment. Due to the mostly undeveloped nature of the area, it is expected that access to the channel bank is not a problem. For area dredging activities, initial access and clearing of the low-lying over bank areas will require access support for traditional earthwork equipment.

A potential flood risk problem is likely during construction since most of the construction must occur in the channel or low-land riverbanks. Protective measures could include working in low flood seasons or promptly removing all equipment at the threat of rain or after working hours. This additional effort likely increases the schedule and cost of construction. To minimize such access-related problems, barge-mounted equipment is preferred over the traditional earthwork equipment.

B. Dredged Material Disposal

Clearly, dredged material disposal is a key factor in determining feasibility of the proposed dredging activities. Depending on the types of disposal methods and location of disposal sites, dredged material disposal could impact the cost and complexity of the dredging effort since most activities are likely to occur in the close proximity of the low-lying over bank areas. Handling of dredged materials can be accommodated by upland confined area placement or dredge pipeline. Due to the large undeveloped nature of the channel area, availability of the upland storage area usually should not be a problem. However, most of these areas are likely within the floodplain boundary and can not be used as permanent storage. Accordingly, they must be transported to off-site disposal. To an extent possible, the existing inactive sandpit sites may be best suited for dredged material disposal. Additionally, new water quality requirements implemented by the TNRCC require more ponding area/design for better return water quality.

To effectively manage dredged material, the use of a dredge pipeline may be preferred if appropriate disposal sites or temporary material staging area can be located within a reasonable proximity. Detailed design may include flood protection, return water control, dredge pipeline protection and easement, and dewatering requirements, etc. In addition, best management practices, including silt curtains, water minimization, etc. must be provided to facilitate material handling. In any case, to ensure that dredged material is properly handled and dispositioned, a Comprehensive Dredged Material Management Plan should be prepared.

C. Reuse of Dredged Materials

Potential issues associated with the reuse of dredged materials would arise if contamination and/or suitability of the material is in question. Tests on sediment samples obtained from the West Fork indicated that contamination levels are nonexistent. Upon removal, sediment should be randomly sampled with EPA approved methodologies to ensure that no contamination is present. Entities buying or reusing the materials should be responsible for subsequent ownership, handling, or disposal of the materials to limit the liability of the project.

D. Construction Cost

In the dredging industry, construction costs are dominated by competition. Other issues impacting dredge costs include type of sediment, material disposal location, site preparation/access and volume of dredging. The recent trend of dredging projects suggests that reduced competition for dredge equipment may increase the cost of dredging in the Gulf Coast region. In general, dredging for "new" channels is more expensive than maintenance dredging. Depending on the complexity of the project, type of equipment required, and demand of the dredging capacity, total cost of dredging can vary widely.

3.2.5 Construction Schedule

Construction schedule for dredging effort will primarily depend on the type of dredging equipment, dredging volume, and material disposal. For the purpose of this project, a typical dredge production of 5,000 cubic yards per day is estimated. For a dredging project of 1 million cubic yards, construction duration of 100 days will be required. In addition, a minimum of 90 to 120 days would be required for bidding and area preparation.

3.3 Implementation Outlines for Project Alternatives

This section provides a preliminary outline for implementing the selected project alternatives regarding specific institutional or governmental agency issues, additional engineering or feasibility studies, regulatory permits, environmental studies, and expected construction schedules. Due to the similar nature of the dredging work, implementation outlines for Alternatives I, II, and III are grouped together.

3.3.1 Alternative I, II, and III - Channel Improvement, Area Dredging, or Sediment Basins

- Authority - The City of Houston or Harris County with interagency support by HCFCD, Montgomery County, and SJRA
- Funding - Predominately local funding which may be from public funds or establishing new financial mechanism such as tax or usage/service fee
- Additional Studies - Project-specific dredge material handling and disposal study
- Regulatory Requirements - Flood Plain Ordinance (City of Houston) or Flood Plain Management Policy (Harris County)
  Section 11.144 of Texas Water Code for Commission approval of channel modification work (TNRCC)
  Section 401 Certification for return water quality (TNRCC)

Section 106 of National Historic Preservation Act review of archeological sites (THC)
Endangered Species (USFWS and TPWD)
Texas Coastal Management Program
TPDES (formerly NPDES) for construction activities affecting more than five acres. (Note: Under Phase II of the TPDES, activities affecting between 1 and 5 acres will be regulated. The interim Phase II regulations will be effective August 7, 2001.)

- Environmental Studies - None expected; however, if application of the NEPA is required (due to federal funding or Section 404 permit), Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required.

- Cost - $29.4 million for Alternative I Channel Improvement d/s West Fork
  $21.3 million for Alternative IIA Dredging Area A
  $8.9 million for Alternative IIB Dredging Area C
  $13.3 million for Alternative IIC Dredging Area D
  $13-$22 million for Alternative III On-Channel Sediment Basin (Area A or D)

- Construction Schedule - 13 months for Alternative I
  10 months for Alternative IIA
  4 months for Alternative IIB
  6 months for Alternative IIC
  6 to 10 months for Alternative III
  Each alternative also requires a minimum of 3 to 4 months for bidding and area preparation

- Long-Term Maintenance - All alternatives will require maintenance dredging to manage the continuing sediment load

3.3.2 Other Alternative - Off-Channel Sediment Basins (Diversion) of West Fork Channel

- Authority - The City of Houston, Harris County, and Montgomery County with assistance of HCFCD

- Funding - Local funding and joint participation by local sandpit operators

- Additional Studies - Feasibility study for site-specific basin utilization and channel division
  Preliminary engineering design for off-channel sediment basin

- Regulatory Requirements - Sand and Gravel Pit Permit (TPWD)
  Flood Plain Ordinance (City of Houston) or Flood Plain Management Policy (Harris County)
  Section 11.144 of Texas Water Code for Commission approval of channel diversion work (TNRCC)
  Section 401 Certification for return water quality (TNRCC)
  Section 404 Permit for placement of fills or dredged material in a waterway (USCOE)
  Section 106 of National Historic Preservation Act review of archeological sites (THC)
  Endangered Species (USFWS and TPWD)
  Texas Coastal Management Program
  TPDES (formerly NPDES) for construction activities more than five-acre area (Note: Under Phase II of the TPDES, activities affecting between 1 and 5 acres will be regulated. The interim Phase II regulations will be effective August 7, 2001.)

- Environmental Studies - None expected; however, channel diversion and/or off-channel sandpit site may require delineation of wetland issues

- Cost - To be determined

- Construction Schedule - To be determined

- Long-Term Maintenance - Can be achieved by regular dredging by the sandpit operator

3.3.3 Alternative IV - Floodplain Buyout (Non-Structural)

- Authority - The City of Houston, Harris County, and Montgomery County with assistance of HCFCD

- Funding - May be initiated by federal funding with local cost sharing and be implemented in phases based on availability of funds and priority of buyouts; local public funds will be required for final demolition and future maintenance

- Additional Studies - Overall implementation plan for floodplain buyouts; target buyout subdivisions include Lakeside, Riverside Oilfield, Riverside Crest, Forest Cove, Belleau Wood, and Northshore

- Regulatory Requirements - National Flood Insurance Program
- Environmental Studies - None required
- Cost - $22 million for total purchase of all existing structures within the floodplain
- Schedule - In phases based on funding availability
- Long-Term Maintenance - Buyout area may be converted to natural setting or recreation/parkland facilities

3.4 Conclusions and Opportunities

Since the early 1970's to the present time, communities surrounding Lake Houston have experienced a rapid growth from a rural to a suburban setting. The proximity to Houston and the growth trend in the area significantly influenced growth in the communities situated along the lower reaches of the West Fork of the San Jacinto River. Undeveloped and agricultural land were converted to residential and commercial development, especially in the planned communities of Kingwood and Atascocita. New developments are mostly located along the Lake Houston Parkway corridor. Several other existing subdivisions within the area include Lakeside, Riverside Oilfield, Riverside Crest, Forest Cove, Belleau Wood, Ramblewood, and Northshore. With the increased urbanization and a number of extreme flood events, namely the floods of October 1994 and November 1998, significant concerns related to the flooding problems have occurred along the West Fork channel upstream of the Lake Houston dam.

For the purpose of mitigating the flood concerns of the area, a number of project alternative are formulated to define effective solutions for improving the existing (or future) flood problems. The following conclusions represent the final assessment and recommendations of the project alternatives. The conclusions are generally measured by the technical evaluations of geologic, historic, environmental and hydraulic conditions to improve the flood impact due to the potential sedimentation problem in the area. By integration of the findings and limitations as understood in this study, an outline of the opportunities for future program development is also presented.

3.4.1 Conclusions

Based on the topographic and hydraulic conditions of the West Fork channel, the impact of sedimentation to the flood levels and the floodplain conditions in the study area are considered minimal at this time. Recent 1999 survey data suggested that 100-year flood level increases caused by sediment impact are limited to approximately 0.75 to 0.5 feet at/near upstream of the Lake Houston Parkway area. However, a slightly higher flood level increase of approximately 1.0 to 1.1 feet is shown downstream of the Lake Houston Parkway due to backwater conditions from the Lake. No increase in the 100-year flood levels or actually improved channel section is found at the upper section of the West Fork channel. As a result of the better over-bank terrain data obtained from the 1999 surveys, the impacted areas resulting from the change of floodplain boundaries are mainly located along the lower reach of the West Fork channel downstream from the Lake Houston Parkway area.

Potential project alternatives were evaluated which suggest the following actions to mitigate the flood increases.

1. For sedimentation concerns, improvement of the flood level is possible by utilizing a range of sediment removal or dredging efforts for the impacted channel sections. In general, the impacted areas are located along the lower reach of the West Fork channel near or downstream from the Lake Houston Parkway bridge. Unfortunately, sediment removal can only provide limited improvement for the existing 100-year flood level (i.e., less than 0.6 feet) and at a relatively high cost (i.e., up to $29.4 million). Since the majority of flood damages involve developments built before the enactment of the floodplain regulations, alternative projects studied in this report will not improve flood conditions for those areas/structures. Options available to create this level of flood protection involve dramatic modification to the river channel by providing extremely large regional flood control reservoirs; consequently, these options are expected to exceed $50-$100 million in cost and are considered cost prohibitive.

2. A slightly larger flood increase for the 100-year flood levels (i.e., 1.1 feet) is present downstream of the Lake Houston Parkway bridge area due to backwater conditions from Lake Houston. This is likely in part caused by the accumulation of sediment since the construction of the dam in the 1950's. The increase of 100-year flood level will potentially impact some of the properties that were developed after the floodplain regulations were implemented. To address potential flood improvements in this area, further study of Lake Houston is warranted.

3. Among various sediment removal projects, Alternative II area dredging for Area C, southwest side of the Lake Houston Parkway bridge (RM 12.2), is considered the most effective by hydraulically improving the impacted flood levels in the respective area. The proposed improvements will reduce the predicted flood level approximately 0.3 to 0.4 feet near the Lake Houston Parkway bridge area and restore the flood levels upstream of FEMA cross-section D (RM 12.9±) to the original FEMA (1970's) condition. Costs for this project are estimated at approximately $10 million. It is anticipated that by extending the dredging effort through the bridge crossing, the project may reduce the flood level approximately an additional 0.1 feet near the bridge and restore flood levels to within 0.3 feet of original FEMA conditions at FEMA cross-section C (RM 12.2). By doing so, the cost of the project would increase approximately 25 percent for a total of $11-$12 million.

4. For long-term sediment management consideration, sedimentation basins, either on-channel or off-channel, are the most effective approaches to minimizing sediment buildups and maintain the life of the channel conveyance. Selected basin locations include Area A (RM 11.3), Area D (RM 12.9), or potentially other off-channel locations. The cost of on-channel sediment basins will include initial cost of area dredging and

continuous maintenance dredging effort. Routine maintenance dredging at an interval of every five years is also expected. With the improved basin conditions, a sediment basin would be capable of removing (or trapping) a majority of the annual sediment load (i.e., 250,000 to 500,000 cubic yards) at the designated area. Depending on the size of the basin, initial dredging efforts for on-channel basins is estimated between $13 to $22 million.

5. Similar to on-channel sediment basins, off-channel basins were also considered at the existing sandpits in the area. Due to the relatively small sediment loads and availability of existing sites, this option may be constructed at a lesser cost by developing them jointly with the local sandpit operators. For the purpose of this study, off-channel basins may include the existing sandpit sites by Hallett Materials located three miles upstream of the West Fork channel from the US 59 bridge or Don Schneider Materials located one mile east of the US 59 bridge. Further evaluation and analyses is required to confirm the feasibility of these sites.

6. In contrast to structural projects, the floodplain buyout option remains economically attractive to mitigate the existing and future repetitive flood damages in the area especially for those pre-FIRM properties located within the floodplain. The targets of these buyouts are mainly located along the upper reach of the West Fork channel. In fact, results of this study suggested that the area along the upper reach of the channel actually experienced a reduced 100-year flood level (per the 1999 flood profile) as compared to the 1970's FEMA study. A preliminary cost estimate for total buyout effort of all repetitive, flood-prone structures is approximately $22 million.

3.4.2 Opportunities

The issues associated with the implementation of the flood control projects for the Lake Houston area provide some opportunities to develop future programs in an effort to mitigat flood concerns.

1. Clearly, the public and governing agencies understand the potential flooding problems in the Lake Houston area. It is recognized that pre-FIRM properties within the floodplain remain vulnerable during floods. Rapid urbanization and extreme flood events may also threaten new development built near the floodplain after the floodplain regulations were enforced. Currently, the results of this study suggest that the flood impact in comparison with the original FEMA study (1970's) is relatively small (i.e., less than a one-foot increase in the 100-year flood level) in selected channel areas. Furthermore, the cost of various flood control alternatives as concluded in this study are relatively high compared to their limited benefits. Since backwater conditions from the Lake may be one of the contributors to the problem, further understanding of the hydraulic and hydrologic conditions in Lake Houston should be developed. By doing so, a more up-to-date and integrated solution may be achieved to manage long-term flooding concerns in the area.

2. Considering that sediment impact to the flood levels remains relatively small and limited to a small area upstream of the Lake Houston Parkway bridge, the benefit of improving

the flood levels in this area may be difficult to justify at this time. However, it is possible that sedimentation may progressively aggravate future flooding as depositional areas develop in the area downstream of the Lake Houston Parkway bridge toward Lake Houston. Sediment control along the West Fork channel can be an effective means to minimizing these continued sedimentation problems. Therefore, additional assessment and monitoring of the sediment process and movement, especially along the lower reach of the channel should be considered. To better understand the effects on the sedimentation levels and transport, the monitoring program should be conducted at various strategic locations along the East and West Fork of the San Jacinto River as well as Spring and Cypress Creeks. The sediment monitoring should also be focused on during and following major storm events to verify the dominant sediment movements and effects on the flood levels.

3. For long-term sediment management alternative, a combination of a sediment basin and the selected area dredging may be most effective in maintaining channel conveyance and mitigating future flooding conditions. To maintain its efficiency, any designated sediment basin site, once developed, will require routine maintenance dredging work. Opportunities to use existing sandpits as off-channel sediment basins should be further explored. It is possible that off-channel basins may be developed jointly with the existing sandpit operators with a resulting cost savings in construction and maintenance costs.

4. As an on-going effort to manage future flooding problems, continued efforts should be provided in educating, enforcing, and updating region-wide floodplain management and on-site stormwater control regulations to mitigate and balance the potential impact of urbanization. Floodplain buyouts should continue for those repetitive, flood-prone properties to limit potential, repeated flood losses within the floodplain.

4.0 Public/Agency Participation

During the course of this study, three public meetings were held to discuss various aspects and findings of the study and to provide a forum for comments by interested individuals and organizations. The public meetings were held at the Kingwood College on August 28, 1997, April 8, 1998, and June 13, 2000. These meetings were scheduled in accordance with three key project phases such as upon initial project startup, at the completion of the problem analysis, and at the completion of the study. Copies of the public meeting records, comment letters received from the public, and responses to key issues raised at the meetings or during the study are included in Appendix F.

Upon completion of the study, a draft executive summary was also prepared and distributed to the key local officials and/or the interested state and U.S. congressional representatives for information and comment. These public officials include:

Houston Council Member Rob Todd (District E)
Houston Council Member Carroll Robinson (At Large Position 5)
Harris County Commissioner El Franco Lee (Precinct 1)
Harris County Commissioner Jerry Eversole (Precinct 4)
State Senator Jon Lindsay
State Senator David Bernson
State Representative Joe Crabb
State Representative Ruben W. Hope
U.S. Congress Member Kevin Brady

It shall also be noted that during the study, valuable assistance, information, and input were received from the project sponsors, namely the City of Houston, the Texas Water Development Board, the Harris County Flood Control District, Montgomery County, and the San Jacinto River Authority. During the study, two interim draft reports were issued upon completion of the phase I problem analysis and the phase II project alternatives for review and comment by the project sponsors. As a result, various verbal and written comments were received. All comments received were considered in the preparation of this final report. For reference, Appendix G provides specific responses to written comments received from the project sponsors.

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Table 1-1. Flood Profile Comparison – West Fork San Jacinto River (Reach III)

(Reference: Preliminary Hydraulic Analysis for Lake Houston Flood Study, B&R, 1998)

1	2	3	4	5	6	7	8	9	10	11	12
LOCATION	**MILES**	**FLOOD FREQ.**	**HEC-2 (1)**	**HEC-2(2)**	**Diff**	**HEC-2 (3)**	**Diff(1)**	**Diff(2)**	**HEC-2 (4)**	**Diff(1)**	**Diff(2)**
FEMA	**Above Dam**	**YRS**	**Base**	**Updated Base**	**(5)-(4)**	**TWDB**	**(7)-(4)**	**(7)-(5)**	**SRI Data**	**(10)-(4)**	**(10)-(5)**
@B		10	46.75	46.76	0.01	46.94	0.19	0.18	47.91	1.16	1.15
4.745 miles	11.25	50	49.56	49.48	-0.08	49.7	0.14	0.22	50.97	1.41	1.49
Range Line 16		100	50.68	50.76	0.08	50.94	0.26	0.18	52.14	1.46	1.38
		500	54.38	54.39	0.01	54.54	0.16	0.15	56.02	1.64	1.63
@C		10	47.39	48.15	0.76	48.23	0.84	0.08	49.09	1.70	0.94
5.585 miles	12.09	50	50.69	51.44	0.75	51.54	0.85	0.10	52.56	1.87	1.12
Range Line 17		100	51.93	52.76	0.83	52.84	0.91	0.08	53.91	1.98	1.15
		500	56.24	57.91	1.67	57.95	1.71	0.04	59.38	3.14	1.47
@D		10	48.01	48.62	0.61	48.58	0.57	-0.04	50.15	2.14	1.53
6.42 miles	12.925	50	51.53	52.11	0.58	52.04	0.51	-0.07	53.69	2.16	1.58
Range Line 18		100	52.81	53.46	0.65	53.38	0.57	-0.08	55.01	2.20	1.55
		500	57.24	58.62	1.38	58.52	1.28	-0.10	60.27	3.03	1.65
@E		10	48.66	49.14	0.48	49.09	0.43	-0.05	51.00	2.34	1.86
7.09 miles	13.595	50	52.34	52.80	0.46	52.71	0.37	-0.09	54.61	2.27	1.81
Range Line 19		100	53.66	54.17	0.51	54.07	0.41	-0.10	55.95	2.29	1.78
		500	58.18	59.32	1.14	59.2	1.02	-0.12	61.08	2.90	1.76
@F		10	49.42	49.79	0.37	50.63	1.21	0.84	51.41	1.99	1.62
7.47 miles	13.975	50	53.49	53.81	0.32	54.48	0.99	0.67	55.16	1.67	1.35
Range Line 19		100	54.94	55.25	0.31	55.88	0.94	0.63	56.52	1.58	1.27
		500	59.39	60.22	0.83	60.64	1.25	0.42	61.57	2.18	1.35
@G		10	53.50	53.56	0.06	52.98	-0.52	-0.58	53.65	0.15	0.09
8.49 miles	14.99	50	57.88	57.88	0.00	57.27	-0.61	-0.61	57.95	0.07	0.07
Range Line 20		100	59.44	59.47	0.03	58.83	-0.61	-0.64	59.52	0.08	0.05
		500	64.19	64.34	0.15	63.77	-0.42	-0.57	64.66	0.47	0.32

(NOTE: FEMA Location A @ River Mile 3.615, Range Line 15, is not shown due to constant backwater conditions.)

(1) HEC-2 (A) Base Condition FEMA (1977-1978 Survey)

(2) HEC-2 Updated Base FEMA Model w/Lake Houston Parkway (1992 Survey)

(3) HEC-2 TWDB Data (1994 Survey)

(4) HEC-2 Post Flood Conditions (1995 Survey after Oct. 1994 Flood)

Table 1-2. Flood Profile Comparison – Lake Houston (Reach II)

(Reference: Preliminary Hydraulic Analysis for Lake Houston Flood Study, B&R, 1998)

LOCATION FEMA	2 Miles Above Dam	3 Flood Frequency YRS	4 HEC-2 FEMA (1977-1978) CWSEL Ft.	Area Sq. Ft.	5 HEC-2 TWDB (1994) CWSEL Ft.	Area Sq. Ft.
		10	46.30	237,348	46.30	237,465
@A	0.47 miles	50	48.70	260,263	48.71	260,613
Range Line 1		100	49.70	269,882	49.71	270,306
		500	52.70	299,130	52.72	299,678
		10	46.30	173,350	46.3	204,454
@B	1.11 miles	50	48.70	193,567	48.71	224,740
Range Line 2		100	49.70	202,028	49.72	233,285
		500	52.70	230,275	52.74	261,830
		10	46.30	160,066	46.31	175,184
@C	1.99 miles	50	48.70	177,520	48.73	192,957
Range Line 3		100	49.70	184,870	49.75	200,469
		500	52.70	207,316	52.79	223,248
		10	46.30	163,455	46.31	168,544
@D	2.40 miles	50	48.70	180,588	48.74	186,149
Range Line 4		100	49.70	187,768	49.77	193,617
		500	52.70	209,437	52.83	216,071
		10	46.30	96,688	46.31	109,376
@E	2.65 miles	50	48.70	111,902	48.74	125,036
Range Line 5		100	49.70	118,279	49.76	131,687
		500	52.70	137,596	52.83	151,612
		10	46.30	144,242	46.34	140,325
@F	3.95 miles	50	48.70	158,141	48.82	154,888
Range Line 6		100	49.70	163,961	49.89	161,230
		500	52.70	181,575	53.06	180,085
		10	46.30	119,823	46.34	144,933
@G	4.39 miles	50	48.70	137,119	48.84	163,297
Range Line 7		100	49.70	144,357	49.92	171,325
		500	52.70	166,361	53.12	195,170
		10	46.30	114,550	46.36	108,276
@H	5.32 miles	50	48.70	127,099	48.88	121,849
Range Line 8		100	49.70	132,408	49.99	127,868
		500	52.70	148,749	53.24	145,891
		10	46.30	102,936	46.37	85,793
@I	5.78 miles	50	48.70	112,702	48.91	96,825
Range Line 9		100	49.70	116,826	50.04	101,691
		500	52.70	129,515	53.31	116,091
		10	46.30	132,656	46.40	142,096
*@K	6.35 miles	50	48.70	153,285	49.01	165,161
Range Line 10		100	49.70	161,935	50.20	175,778
		500	52.70	188,138	53.75	207,589
		10	46.30	146,767	46.41	142,311
@L	6.99 miles	50	48.70	166,510	49.04	164,578
Range Line 11		100	49.70	174,929	50.25	174,891
		500	52.70	201,556	53.83	207,489
		10	46.30	56,497	46.41	45,666
**@M	7.40 miles	50	48.70	62,363	49.04	51,844
Range Line 12		100	49.70	64,829	50.24	54,719
		500	52.70	72,803	53.80	64,451
		10	46.30	153,515	46.49	115,037
@O	8.67 miles	50	48.70	174,302	49.29	139,736
Range Line 13		100	49.70	183,051	50.62	151,568
		500	52.70	209,937	54.54	187,041

*Union Pacific RR Bridge Located 2,576 ft. Downstream of This Location (Downstream Face).

**FM 1960 Bridge Located 126 ft. Downstream of This Location (Downstream Face).

Table 1-3. Sediment Loading Estimates (Previous Studies)

Basin	Area $Mile^2$	Annual Sediment Load, Tons/Year							
		USGS	Bedient	TDWR	Bedient	TC&B, 1983		EH&A, 1993 (Draft)	
		1978	1980 (Phase I)	1982	1983 (Phase II)	Soil Loss (1980)	Lk. Bot. Profile[(1) (2)]	WMM (1990)	Soil Loss (1990)
Cypress Creek	324	-	51,400	243,000 total	51,600	51,900	-	87,000	42,000
Spring Creek	438	23,400	14,200		14,600	22,100	148,000 downstream near Lake	29,000	51,300
W. Fork SJ	588	36,500	43,400	232,000	39,700	47,700		24,000	58,900
E. Fork SJ	407	-	15,100	70,000 total	15,300	18,700	16,000	17,000	7,800
Caney Creek	217	6,390	13,800		14,000	11,200	-	10,000	4,400
Peach Creek	156	-	26,900		27,600	10,000	-	6,000	2,800
Luce Bayou	213	-	-		12,900	21,800	-	5,000	4,300
Local Lk Houston	43	-	-	-	-	-	-	1,000	4,400
TOTAL	2,385 mi^2	-	165,000 tons/year	545,000 tons/year	176,000 tons/year	184,000 tons/year (or range of 93,000 to 320,000 tons/year)	-	179,000 tons/year	176,000 tons/year

Note: (1) Assume average dry weight of submerged sediment material = 52 lbs/ft^3 (as applicable).
(2) Rough comparison with equivalent basin area per coverage of survey range lines.

Table 1-4-1. Computation of Estimated Daily Mean Suspended-Sediment Load for W. Fork San Jacinto River

Normalized Occurrence %			Daily Discharge per Occurrence (cfs)	Suspended-Sediment Load (tons/day)			
Occurrence Range	Occurrence Increment	Avg. Occurrence		Load[1] per Occurrence Flow (Pre 1974 data)	Load[2] per Occurrence Flow (Post 1974 data)	Increment of Load per Occurrence (Pre 1974 Cond.)	Increment of Load per Occurrence (Post 1974 Cond.)
0.0-0.1	0.1	0.05	17,500	9,300	7,300	9.3	7.3
0.1-0.3	0.2	0.2	11,000	5,200	4,000	10.4	8.0
0.3-0.5	0.2	0.4	8,300	3,600	2,800	7.2	5.6
0.5-1.0	0.5	0.75	6,600	2,700	2,100	13.5	10.5
1-2	1	1.5	4,800	1,800	1,400	18.0	14.0
2-4	2	3	3,600	1,300	1,000	26.0	20.0
4-8	4	6	2,360	800	600	32.0	24.0
8-15	7	11.5	1,280	330	240	23.1	16.8
15-25	10	20	575	120	90	12.0	9.0
25-35	10	30	245	50	30	5.0	3.0
35-45	10	40	150	30	20	3.0	2.0
45-55	10	50	95	20	10	2.0	1.0
55-65	10	60	70	10	6	1.0	0.6
65-75	10	70	49	5	4	0.5	0.4
75-85	10	80	34	3.2	2.0	0.3	0.2
85-95	10	90	24	2.1	1.2	0.2	0.1
95-100	5	97.5	19	1.5	0.9	0.1	0.0
					Total Sediment Load (tons/day) --->	163.6	122.6
					(tons/year) --->	59,722	44,738

[1] Sediment, t/day = 0.036 * (Flow, cfs)^1.2749 (pre 1974 data)
[2] Sediment, t/day = 0.0192 * (Flow, cfs)^1.314 (post 1974 data)

Table 1-4-2. Computation of Estimated Daily Mean Suspended-Sediment Load for Cypress Creek

Normalized Occurrence %			Daily Discharge per Occurrence (cfs)	Suspended-Sediment Load (tons/day)	
Occurrence Range	Occurrence Increment	Avg. Occurrence		Load per Occurrence Flow (1) (1976-1990)	Increment of Load per Occurrence (1976-1990)
0.00-0.1	0.1	0.05	8,000	43,037	43.0
0.1-0.3	0.2	0.2	4,400	17,427	34.9
0.3-0.5	0.2	0.4	3,500	12,329	24.7
0.5-1.0	0.5	0.75	3,000	9,765	48.8
1-2	1	1.5	2,300	6,534	65.3
2-4	2	3	1,700	4,137	82.7
4-8	4	6	1,000	1,854	74.2
8-15	7	11.5	430	518	36.2
15-25	10	20	180	139	13.9
25-35	10	30	90	49	4.9
35-45	10	40	54	22	2.2
45-55	10	50	40	14	1.4
55-65	10	60	30	9	0.9
65-75	10	70	25	7	0.7
75-85	10	80	22	6	0.6
85-95	10	90	18	4	0.4
95-100	5	97.5	10	2	0.1
			Total Sediment Load (tons/day) --->	95,853	435.0
				(tons/year) --->	158,765

(1) Sediment, tons/day = 0.0539 * (Flow, cfs)^1.5122

Table 1-5. Cross Sectional Area/Volume Change
1999 Survey vs FEMA
West Fork San Jacinto River

Cross Section	HEC-2 River Sta.	Cross Sectional Area Change* (sqft)			Total Cross Section Area per FEMA WSELs (sqft)		Channel Length (ft)	Accumul. Volume Change* (Acre-ft)
FEMA	Miles	LOB	CH	ROB	1999 Survey	FEMA		
A	3.615	1,300	-9,000	2,200	59,400	65,000	0	0
B	4.745	-500	1,800	1,300 (1)	52,400	49,800	5,966	-200
Lk Hou Br	5.045	0	8,000	0	42,000	34,600	1,584	0
C	5.585	-23,400	4,200	-3,500	47,600	70,300	2,851	-500
D	6.42	5,100 (1)	500	-5,900	64,400	64,700	4,409	-1,700
E	7.09	-1,400 (1)	12,900	11,200 (1)	81,200	58,500	3,538	-800
F	7.47	-14,100 (1)	1,700	6,700 (1)	50,500	56,200	2,006	-400
G	8.49	800 (1)	2,300	-7,400 (1)	52,900	57,200	5,386	-1,000
H	9.41	-9,300	200	-12,000	77,700	98,800	4,858	-2,400
I	10.58	-9,300 (1)	2,100	7,700 (1)	96,900	96,300	6,178	-3,900
J	10.86	2,600 (1)	6,000	-12,100 (1)	81,100	84,500	1,478	-3,900
K	11.09	-3,900 (1)	3,400	2,400 (1)	62,800	61,000	1,214	-3,900
L	11.35	16,800 (1)	-2,400	42,900 (1)	78,400	**	1,373	-3,900
RR Br	11.38	0	0	0	21,300	21,300	158	-3,900
M	11.48	-2,400 (1)	7,200	-16,800 (1)	89,100	101,000	528	-4,000
US 59	11.569	0	-1,500	0	28,200	31,900	470	-4,100
N	11.97	6,300 (1)	2,500	35,000 (1)	114,500	70,800	2,117	-3,100

* Cross sectional area (or volume) change between 1999 suvey and FEMA model. Negative values indicate area (or volume) loss and positive values indicated area (or volume) gain since FEMA data.

** Restricted cross section at bridge

(1) Area change mainly due to change of terrain data in the overbank areas.

Table 1-6. Streamflow stations where floods of October 1994 equaled or exceeded the 100-yr flood.
(Reference: USGS October 1994 Flood Fact Sheet)

Station No.	Streamflow station name	Year flood records began	Previous known maximum			October 1994 maximum		
			Year	Stage (ft. above datum)	Stream-flow[1] (cfp)	Stage (ft. above datum)	Stream-flow[1] (cfp)	Ratio of Stream-flow to 100-yr flood
08068000	West Fork San Jacinto River near Conroe	1940	1940	30.9	110,000	32.3	115,000	1.3
08068520	Spring Creek at Spring	1878	1940	33.6	42,700	44.1	78,800	1.7
08068800	Cypress Creek at Grant Rd. near Cypress	1982	1982	43.5	3,550	47.4	10,500	1.8
08068900	Cypress Creek at Stuebner-Airline Near Westfield	1982	1984	37.9	6,910	39.6	11,300	1.2
08070200	East Fork San Jacinto River near New Caney	1973	1973	29.6	unknown	33.0	86,000	1.1
08070500	Caney Creek near Splendora	1885	1940	27.0	unknown	26.4	33,000	1.5
08072050	San Jacinto River near Sheldon (at US90)	1875	1940	31.5	unknown	27.1	360,000	1.6

Note: [1] Instantaneous maximum corresponding to maximum stage.

Table 1-7. Summary of Peak Discharges (Lake Houston Tributaries)

Major Tributaries	Drainage Area (sq. miles)	Peak Discharges (cfs)				
		10-year	50-year	100-year	500-year	1994 Flood
West Fork San Jacinto River At entry to Lake Houston	1,769	66,800	143,000	174,000	333,600	-
At U.S. Hwy 59	1,141	62,300	127,200	167,500	306,900	230,000
W. Fork (upstream of Spring Creek)	962	-	-	90,000± (estimated)	-	115,000 (nr Conroe)
Spring Creek (upstream of Cypress Creek)	438	13,900	36,300	51,600	101,000	78,800 (at Spring)
Cypress Creek (upstream of Spring Creek)	325.8	15,100	20,800	24,400	33,400	10,500 (nr Westfield)
East Fork San Jacinto River At entry to Lake Houston	1,002	41,400	85,200	109,500	185,000	-
E. Fork (upstream of Caney Creek)	396	11,000	25,500	35,200	66,600	-
Caney Creek (upstream of E. Fork)	370	22,200	52,000	72,400	133,000	
Luce Creek (upstream of E. Fork)	227	4,050	10,100	16,100	37,400	
Lake Houston near Dam	2,828	82,400	182,200	246,100	409,900	360,000 (nr Sheldon, blw Dam)

Table 1-8. HEC-2 MODEL SUMMARY (1999 SURVEY)

River Sta. (HEC-2)	Flood Freq.	Discharge (cfs)	WSEL	vel in left bank	vel in right bank	vel in channel	c/s area	top width	% flow in L bank	% flow in R bank	% flow in channel
SECNO	Yrs	Q	CWSEL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QROBP	QCHP
@A	10	66,800	46.66	0.3	0.2	1.9	39,694	5,842	0.3	1.3	98.4
3.615	50	143,300	49.57	0.4	0.4	3.0	57,840	6,976	0.6	2.7	96.7
3.615	100	174,300	50.91	0.4	0.5	3.2	67,335	7,174	0.9	3.3	95.8
3.615	500	333,600	54.9	0.7	0.8	4.6	97,118	8,730	1.7	4.9	93.4
@B	B	66,160	47.18	0.0	0.0	2.0	33,894	4,324	0.0	0.0	100.0
4.745	50	140,750	50.39	0.0	0.3	2.9	49,663	5,218	0.0	0.4	99.7
4.745	100	173,330	51.74	0.1	0.4	3.2	56,844	5,552	0.0	0.6	99.4
4.745	500	329,800	56.04	0.4	0.7	4.5	86,899	7,485	0.9	1.5	97.6
LK HOU BR	10	65,990	47.35	0.0	0.0	2.4	27,163	3,418	0.0	0.0	100.0
5.026	50	140,170	50.62	0.0	0.0	3.7	38,415	3,466	0.0	0.0	100.0
5.026	100	173,080	51.97	0.0	0.0	4.0	43,120	3,486	0.0	0.0	100.0
5.026	500	328,820	56.33	0.7	0.0	5.3	90,262	9,977	6.6	0.0	93.5
LK HOU BR	10	65,990	47.37	0.0	0.0	2.3	29,018	3,294	0.0	0.0	100.0
5.027	50	140,170	50.64	0.0	0.0	3.5	39,844	3,326	0.0	0.0	100.0
5.027	100	173,080	51.99	0.0	0.0	3.9	44,353	3,340	0.0	0.0	100.0
5.027	500	328,820	56.13	0.0	0.0	7.1	46,083	3,468	0.0	0.0	100.0
LK HOU BR	10	65,990	47.37	0.0	0.0	2.3	29,064	3,294	0.0	0.0	100.0
5.034	50	140,170	50.65	0.0	0.0	3.5	39,910	3,326	0.0	0.0	100.0
5.034	100	173,080	52	0.0	0.0	3.9	44,420	3,340	0.0	0.0	100.0
5.034	500	328,820	56.32	0.8	0.0	6.9	60,055	10,475	3.5	0.0	96.5
LK HOU BR	10	65,990	47.37	0.0	0.0	2.4	27,236	3,419	0.0	0.0	100.0
5.035	50	140,170	50.64	0.0	0.0	3.6	38,520	3,466	0.0	0.0	100.0
5.035	100	173,080	52	0.0	0.0	4.0	43,225	3,486	0.0	0.0	100.0
5.035	500	328,820	56.75	0.7	0.0	5.1	94,555	10,251	7.0	0.0	93.0
LK HOU BR	10	65,990	47.37	0.0	0.0	2.4	27,221	3,419	0.0	0.0	100.0
5.037	50	140,170	50.64	0.0	0.0	3.6	38,501	3,466	0.0	0.0	100.0
5.037	100	173,080	52	0.0	0.0	4.0	43,208	3,486	0.0	0.0	100.0
5.037	500	328,820	56.75	0.7	0.0	5.1	94,623	10,255	7.0	0.0	93.0
LK HOU BR	10	65,990	47.38	0.0	0.0	2.3	29,074	3,294	0.0	0.0	100.0
5.038	50	140,170	50.66	0.0	0.0	3.5	39,926	3,326	0.0	0.0	100.0
5.038	100	173,080	52.02	0.0	0.0	3.9	44,437	3,340	0.0	0.0	100.0
5.038	500	328,820	56.59	0.8	0.0	6.9	60,055	10,615	3.5	0.0	96.5

Table 1-8. HEC-2 MODEL SUMMARY (1999 SURVEY)

River Sta. (HEC-2) SECNO	Flood Freq. Yrs	Discharge (cfs) Q	WSEL CWSEL	vel in left bank VLOB	vel in right bank VROB	vel in channel VCH	c/s area AREA	top width TOPWID	% flow in L bank QLOBP	% flow in R bank QROBP	% flow in channel QCHP
LK HOU BR	10	65,990	47.39	0.0	0.0	2.3	29,120	3,294	0.0	0.0	100.0
5.045	50	140,170	50.67	0.0	0.0	3.5	39,991	3,327	0.0	0.0	100.0
5.045	100	173,080	52.03	0.0	0.0	3.9	44,503	3,340	0.0	0.0	100.0
5.045	500	328,820	56.66	0.8	0.0	6.9	60,055	10,653	3.5	0.0	96.5
LK HOU BR	10	65,990	47.38	0.0	0.0	2.4	27,294	3,419	0.0	0.0	100.0
5.046	50	140,170	50.66	0.0	0.0	3.6	38,605	3,467	0.0	0.0	100.0
5.046	100	173,080	52.02	0.0	0.0	4.0	43,312	3,486	0.0	0.0	100.0
5.046	500	328,820	57.05	0.7	0.0	5.0	97,640	10,444	7.4	0.0	92.6
@C	10	65,680	47.97	0.0	0.0	7.4	8,864	610	0.0	0.0	100.0
5.585	50	139,080	51.35	1.8	0.2	4.4	61,632	9,773	64.9	0.0	35.1
5.585	100	172,610	52.75	1.8	0.2	4.6	75,559	10,056	67.4	0.0	32.6
5.585	500	326,970	57.86	2.1	0.5	5.4	128,718	10,852	72.9	0.2	26.9
@D	10	65,210	49.68	1.7	1.2	2.9	36,717	7,043	48.9	19.6	31.6
6.42	50	137,410	51.99	2.6	1.8	4.0	53,471	7,373	55.7	19.2	25.2
6.42	100	171,900	53.35	2.8	1.9	4.1	63,568	7,515	58.3	18.9	22.8
6.42	500	324,160	58.36	3.3	2.1	4.5	103,255	8,701	64.1	18.1	17.8
@E	10	64,830	50.16	0.5	0.9	2.5	47,351	7,381	3.8	35.8	60.4
7.09	50	136,080	52.72	0.7	1.3	3.9	66,810	7,846	4.9	36.2	58.9
7.09	100	171,320	54.04	0.7	1.5	4.3	79,784	11,264	5.6	36.3	58.1
7.09	500	321,910	58.93	0.8	1.7	5.2	147,195	16,555	11.6	35.1	53.4
@F	10	64,610	50.42	0.9	1.8	4.3	35,913	7,474	24.7	30.2	45.1
7.47	50	135,320	53.16	1.3	2.6	6.1	58,463	8,607	34.1	29.6	36.3
7.47	100	171,000	54.51	1.5	2.9	6.5	70,702	9,319	37.7	29.2	33.1
7.47	500	320,030	59.41	1.8	2.5	7.4	129,914	13,549	45.2	29.8	25.1
NEW	10	64,610	51.11	0.7	0.6	4.8	33,892	6,580	9.2	14.8	75.9
8.07	50	135,320	54.21	1.2	1.1	6.9	54,917	7,065	12.2	21.8	66.0
8.07	100	171,000	55.59	1.3	1.2	7.6	64,976	7,307	13.1	24.2	62.7
8.07	500	320,030	60.36	1.8	1.7	9.6	101,223	8,225	14.9	30.2	54.9
@G	10	63,800	52.38	1.4	0.8	7.3	20,020	2,848	28.1	1.7	70.2
8.49	50	132,480	55.89	2.2	1.0	10.5	33,894	6,164	30.8	5.1	64.1
8.49	100	169,770	57.33	2.4	1.2	11.6	42,793	6,190	30.7	8.5	60.7

Table 1-8. HEC-2 MODEL SUMMARY (1999 SURVEY)

River Sta. (HEC-2)	Flood Freq.	Discharge (cfs)	WSEL	vel in left bank	vel in right bank	vel in channel	c/s area	top width	% flow in L bank	% flow in R bank	% flow in channel
SECNO	Yrs	Q	CWSEL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QROBP	QCHP
8.49	500	315,820	62.11	3.1	1.9	14.1	72,656	6,329	29.4	18.8	51.8
@H	10	63,510	54.4	1.4	1.1	4.3	35,925	5,247	8.4	42.7	48.9
9.41	50	131,460	58.74	1.6	1.5	5.5	62,229	7,089	12.7	47.7	39.6
9.41	100	169,330	60.48	1.6	1.7	6.1	74,608	7,129	14.7	48.4	36.9
9.41	500	314,100	65.82	2.1	2.1	7.6	117,229	9,116	19.7	49.2	31.1
@I	10	62,850	55.41	0.3	0.6	4.5	39,048	7,357	0.7	27.1	72.1
10.58	50	129,130	59.84	0.7	0.9	5.8	73,596	8,822	6.4	35.6	58.0
10.58	100	168,330	61.63	0.9	1.1	6.4	89,822	9,130	8.5	37.8	53.7
10.58	500	309,220	67.04	1.4	1.4	7.7	144,446	10,628	12.8	42.8	44.5
@J	10	62,690	55.72	0.5	0.6	3.6	39,809	4,440	4.8	20.7	74.5
10.86	50	128,570	60.15	0.9	0.9	5.2	62,747	6,831	8.8	24.3	66.9
10.86	100	168,090	61.96	1.1	1.0	6.0	75,226	7,027	10.0	26.1	64.0
10.86	500	310,160	67.36	1.6	1.2	7.7	127,798	10,118	11.9	32.9	55.3
@K	10	62,560	55.61	0.8	0.0	7.5	13,087	2,973	6.3	0.0	93.7
11.09	50	128,120	60.38	1.5	1.1	7.6	46,537	6,000	20.5	15.5	64.0
11.09	100	167,890	62.25	1.8	1.2	8.2	57,872	6,101	23.5	17.8	58.7
11.09	500	308,450	67.78	2.4	1.4	9.4	109,540	10,645	27.7	25.4	46.9
@L	10	62,410	56.79	0.4	0.7	3.4	41,354	4,148	1.5	27.4	71.1
11.35	50	127,600	61.23	0.5	1.0	5.0	65,251	5,914	4.8	29.7	65.5
11.35	100	167,670	63.13	0.7	1.2	5.7	76,575	6,011	6.6	30.1	63.3
11.35	500	307,570	68.55	1.1	1.4	7.6	124,445	11,057	10.9	32.1	57.0
RR BR	10	62,410	56.94	0.0	0.0	4.2	14,833	958	0.0	0.0	100.0
11.38	50	127,600	61.4	0.0	0.0	6.7	19,150	987	0.0	0.0	100.0
11.38	100	167,670	63.29	0.0	0.0	8.0	21,052	1,032	0.0	0.0	100.0
11.38	500	307,570	69.01	1.0	1.2	7.4	121,278	10,602	8.6	25.7	65.7
RR BR	10	62,410	56.97	0.0	0.0	4.2	14,854	958	0.0	0.0	100.0
11.39	50	127,600	61.46	0.0	0.0	6.6	19,206	988	0.0	0.0	100.0
11.39	100	167,670	63.37	0.0	0.0	7.9	21,139	1,035	0.0	0.0	100.0
11.39	500	307,570	69.19	1.0	1.2	7.3	123,211	10,611	8.7	26.0	65.4
RR BR	10	62,410	57.17	0.4	0.7	3.3	42,945	4,162	1.7	27.7	70.6
11.4	50	127,600	62.07	0.5	1.0	4.7	70,205	5,957	5.6	29.9	64.5

Table 1-8. HEC-2 MODEL SUMMARY (1999 SURVEY)

River Sta. (HEC-2)	Flood Freq.	Discharge (cfs)	WSEL	vel in left bank	vel in right bank	vel in channel	c/s area	top width	% flow in L bank	% flow in R bank	% flow in channel
SECNO	Yrs	Q	CWSEL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QROBP	QCHP
11.4	100	167,670	64.29	0.7	1.1	5.3	83,611	6,207	7.6	30.3	62.0
11.4	500	307,570	69.32	1.1	1.3	7.3	132,883	11,083	11.4	32.7	56.0
@M	10	62,340	57.2	0.4	0.4	3.4	44,988	6,350	5.3	14.6	80.2
11.48	50	127,340	62.11	0.6	0.7	4.8	79,672	7,727	9.3	22.7	68.0
11.48	100	167,560	64.35	0.8	0.8	5.5	99,095	9,517	10.8	25.8	63.4
11.48	500	307,140	69.43	1.1	1.1	7.3	150,502	10,368	13.5	32.1	54.4
US 59	10	62,300	57.23	0.4	0.5	3.6	43,564	5,992	4.6	18.3	77.1
11.55	50	127,200	62.16	0.6	0.8	5.0	77,304	7,459	9.0	25.5	65.6
11.55	100	167,500	64.41	0.8	0.9	5.6	95,357	8,872	10.7	28.1	61.3
11.55	500	306,900	69.51	1.1	1.2	7.4	145,941	10,311	13.5	33.6	52.8
US 59	10	62,300	57.23	0.0	0.0	3.6	17,358	1,470	0.0	0.0	100.0
11.569	50	127,200	62.15	0.0	0.0	5.2	24,625	1,490	0.0	0.0	100.0
11.569	100	167,500	64.38	0.0	0.0	6.0	27,963	1,501	0.0	0.0	100.0
11.569	500	306,900	69.57	1.1	1.1	6.3	111,539	9,464	7.1	20.0	72.9
US 59	10	62,300	57.23	0.0	0.0	3.2	19,442	1,640	0.0	0.0	100.0
11.66	50	127,200	62.15	0.0	0.0	4.6	27,589	1,660	0.0	0.0	100.0
11.66	100	167,500	64.92	0.0	0.0	5.2	32,119	1,666	0.0	0.0	100.0
11.66	500	306,900	70.47	1.1	1.0	5.5	120,177	9,292	7.6	18.8	73.6
US 59	10	62,300	57.32	0.5	0.5	3.4	44,092	6,030	5.2	20.7	74.1
11.679	50	127,200	62.42	0.7	0.8	4.6	79,185	7,699	10.1	28.4	61.5
11.679	100	167,500	65.2	0.8	0.9	5.0	102,612	9,432	12.2	31.7	56.1
11.679	500	306,900	70.52	1.2	1.2	6.5	156,274	10,397	15.1	37.3	47.6
@N	10	62,060	57.63	0.6	0.6	3.7	51,180	6,398	11.5	25.1	63.5
11.97	50	126,360	62.86	0.8	0.8	5.0	87,700	7,325	14.1	33.2	52.7
11.97	100	167,140	65.66	0.9	0.9	5.4	109,214	7,961	15.1	36.4	48.6
11.97	500	305,490	71.15	1.3	1.3	7.2	155,194	8,671	16.5	40.9	42.6

TABLE 1-9.
FLOOD PROFILE COMPARISON -
WEST FORK SAN JACINTO RIVER
WITH REVISED STARTING CONDITIONS FROM REACH 2

1	1	2	3	4	6	7	8	9	10
LOCATION FEMA	MILES Above Dam	FLOOD FREQUENCY YRS	HEC-2 (1) Base	HEC-2(2) Updated	HEC-2 1999 Survey	WSELs Difference 1999 - FEMA	Top Width FEMA	Top Width 1999 Survey	Difference 1999 - FEMA
@A									
3.62 miles	10.12	100	49.80	49.80	50.91	1.11	6,071	7,174	1,104
Range Line 15		500	52.70	52.70	54.90	2.20	7,216	8,730	1,514
@B									
4.75 miles	11.25	100	50.76	50.76	51.74	0.98	4,610	5,552	941
Range Line 16		500	54.38	54.39	56.04	1.66	6,844	7,485	640
@C									
5.59 miles	12.09	100	52.00	52.76	52.75	0.75	9,344	10,056	712
Range Line 17		500	56.24	57.91	57.86	1.62	10,077	10,852	775
@D									
6.42 miles	12.925	100	52.86	53.46	53.35	0.49	7,549	7,515	-34
Range Line 18		500	57.24	58.62	58.36	1.12	9,163	8,701	-461
@E									
7.09 miles	13.595	100	53.70	54.17	54.04	0.34	9,935	11,264	1,329
Range Line 19		500	58.18	59.32	58.93	0.75	14,891	16,555	1,664
@F									
7.47 miles	13.975	100	54.94	55.25	54.51	-0.43	8,284	9,319	1,035
Range Line 19		500	59.39	60.22	59.41	0.02	10,211	13,549	3,338
@G									
8.49 miles	14.99	100	59.44	59.47	57.33	-2.11	6,302	6,190	-112
Range Line 20		500	64.19	64.34	62.11	-2.08	6,856	6,329	-527
@H									
9.41 miles	15.91	100	61.7	61.72	60.48	-1.22	8,124	7,129	-996
Range Line 21		500	67.11	67.20	65.82	-1.29	9,797	9,116	-681

TABLE 1-9.
FLOOD PROFILE COMPARISON -
WEST FORK SAN JACINTO RIVER
WITH REVISED STARTING CONDITIONS FROM REACH 2

1	1	2	3	4	6	7	8	9	10
LOCATION FEMA	**MILES Above Dam**	**FLOOD FREQUENCY YRS**	**HEC-2 (1) Base**	**HEC-2(2) Updated**	**HEC-2 1999 Survey**	**WSELs Difference 1999 - FEMA**	**Top Width FEMA**	**Top Width 1999 Survey**	**Difference 1999 - FEMA**
@I									
10.58	17.08	100	62.37	62.39	61.63	-0.74	8,445	9,130	685
Range Line 22		500	67.9	67.97	67.04	-0.86	10,458	10,628	170
@J									
10.86	17.36	100	62.66	62.67	61.96	-0.70	9,540	7,027	-2,513
Range Line 23		500	68.21	68.29	67.36	-0.85	10,234	10,118	-116
@K									
11.09	17.59	100	63.05	63.06	62.25	-0.80	5,092	6,101	1,009
Range Line 23		500	68.58	68.65	67.78	-0.80	8,096	10,645	2,549
@L									
11.35	17.85	100	63.43	63.44	63.13	-0.30	**	6,011	--
		500	69.46	69.51	68.55	-0.91	10,624	11,057	433
@M									
11.48	17.98	100	64.45	64.46	64.35	-0.10	9,463	9,517	54
		500	69.87	69.91	69.43	-0.44	10,193	10,368	175
@N									
11.97	18.47	100	65.38	65.71	65.66	0.28	6,590	7,961	1,371
Range Line 24		500	70.73	71.36	71.15	0.42	8,372	8,671	298

(1) HEC-2 (A) Base Condition FEMA
(2) HEC-2 Updated Base FEMA Model w/Lake Houston Parkway
** Questionable data - using water surface width at bridge crossing

Table 2-1 – Summary of Hydraulic Conveyance Improvements

Sediment Removal Configurations/Options	Channel Configurations	Level of Sediment Removal (10^6 yd^3)	Flood Level Reduction (max) (feet)	Floodplain TopWidth Reduction (max) (feet)	Floodplain Reduction[1] (acres)
Channel Improvement u/s of 1960 Bridge (2.7 miles)	800 ft channel bottom with flowline elev. at 15 to 23 ft	5.0	0.04	-	-
Channel Improvement d/s West Fork (3.5 miles)	200 ft channel bottom with flowline elev at 26 to 28 ft	1.9	0.24 @ Sec. D	350	28
	200 ft channel bottom with flowline elev at 20 to 24 ft	3.9	0.58 @ Sec. D	830	62
Area Dredging A – d/s Lake Houston Pkwy Bridge (RM 11.3)	Bottom elev. at 30 ft	2.8	0.52 @ Bridge	400	40
Area Dredging B – Lake Houston Pkwy Bridge Crossing (RM 11.6)	Bottom elev. at 26 ft	0.3	0.11 @ Sec.C[2]	110	7
Area Dredging C – SW of Lake Houston Pkwy Bridge (RM 12.2)	Bottom elev. at 30 ft	1.2	0.43 @ Sec.D[2]	510	29
	new 200 ft channel bottom with flowline elev. at 27 ft	1.0	0.26 @ Sec. D[2]	320	18
Area Dredging D – both sides of channel (RM 12.9)	Bottom elev. at 35 ft	1.8	0.29 @ Sec. E[2]	460	21

1 Represent only a rough estimate by numerically calculating the reduced flood water surface (average reduction in top width multiply by the length of the improved channel reach).

2 No improvement to area downstream of the Lake Houston Parkway Bridge.

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Table 2-2 – Summary of Initial Screening of Flood Control Options

Flood Control Options	Flood Control Improvement[1]	General Cost[2]	Construct-ability[3]	Environmental Impact	Maintenance Requirement	Screening Summary
Flood protection levee	good	high	complex	high potential	yes	Cost; Not an effective option
Channel Conveyance Improvement	minimal	moderate-high	complex	high potential	yes	Not a feasible option
Regional Detention	good	high	complex	high potential	yes	Cost; Not an effective option
Floodplain Buyout (Non-structural Alternative)	no	low	n/a	no	no	Economical in mitigating flood damage; No flood improvement
Sediment Removal[4]						
Channel Improvement u/s of 1960 Bridge (2.7 miles)	none-minimal	mod.-high	good	minimal	yes	Non-effective;
Channel Improvement d/s West Fork (3.5 miles)	fair-minimal	moderate	good	minimal	yes	Fair improvement; To be further considered
Area Dredging A – u/s Lk Houston Pkwy (RM 11.3)	fair	moderate	good	minimal	yes	Fair improvement; Combined with other dredging effort
Area Dredging B – Lk Houston Pkwy (RM 11.6)	minimal	low	good	minimal	yes	Minimal improvement; Not an effective option
Area Dredging C – SW Lk Houston Pkwy (RM 12.2)	fair	low-mod.	good	minimal	yes	Fair improvement; Combined with other dredging effort
Area Dredging D – both sides of channel (RM 12.9)	fair-minimal	moderate	good	minimal	yes	Minimal improvement; Combined with other dredging effort
Maintenance Dredging						
Upstream of 1960 Bridge	minimal	low	good	minimal	continual	Minimal impact
All Bridge Crossings	minimal	low	good	minimal	continual	Minimal impact
Sediment Basin	fair (long-term)	low-moderate	fair-good	minimal	continual	Cost effective to maintain long-term control

1 Reduction on based flood levels at selected channel area: minimal – less than 6"; fair – 6" to 12"; good – greater than 12".

2 General cost estimate: high – greater than \$25 million; moderate - \$5 to \$25 million; low – less than \$5 million.

3 Constraints or other factors may impact design or construction: good – easily constructed; fair – constructable under most conditions; complex – time consuming or potential constraints.

4 Costs of flood control options and degree of flood improvements depend on the amount of sediment removal.

Table 3-1 – Summary of Flood Level Improvements

FEMA HEC-2 Section No.	River Mile	100-Yr Flood Elevation (feet)		Flood[2] Level Impact	Flood Level Reduction, feet			
		Base FEMA	1999 Survey	1999 vs FEMA	Alt I - Channel Improvement	Alt II- Dredging Area A	Alt II- Dredging Area C	Alt II- Dredging Area D
A	10.1	49.8	50.91[1]	+1.11[1]	0.13	None	None	None
B	11.3	50.76	51.74	+0.98[1]	0.38	0.35	None	None
Lake Houston Pkwy	11.6	-	52.02	-	0.43	0.51	None	None
C	12.2	52	52.75	+0.75	0.5	0.41	0.29	None
D	12.9	52.86	53.35	+0.49	0.58	0.33	0.43	0.18
E	13.6	53.70	54.04	+0.34	0.53	0.25	0.32	0.29
F	14.0	54.94	54.51	-0.43	0.45	0.22	0.28	0.25

1 Raised starting water elevation due to backwater condition from Lake Houston.

2 Plus values indicate flood level increase; minus values indicate flood level decrease.

Table 3-2 - Preliminary Project Cost Estimate for Channel Improvement Alternative

Work Item	Quantity	Unit	Unit Price	Amount
Channel dredging (including clearing, area restoration, hydraulic discharge pipeline 1/2 mile and dump)	3,900,000	yd^3	$4.00	$15,600,000
Dredged material disposal*				
material hauling and handling (extra, avg. 3 miles RT)	3,900,000	yd^3	$3.50	$13,650,000
material reuse (deduct)	3,900,000	yd^3	($1.25)	($4,875,000)
Site Access	1	LS		$50,000
Bridge crossing	1	LS		$50,000
SUBTOTAL				$24,475,000
Contingencies (10%)				$2,450,000
Engineering (10%)				$2,450,000
TOTAL ESTIMATED COST				**$29,375,000**

* assume no additional cost for dredged material disposal

Table 3-3 - Preliminary Project Cost Estimate for Area Dredging Alternative (Area A – d/s of Lake Houston Parkway Bridge)

Work Item	Quantity	Unit	Unit Price	Amount
Site clearing (60% area, light)	120	acre	$800.00	$96,000
Conventional Excavation (top 5 ft)	500,000	yd^3	$3.00	$1,500,000
Area dredging (incl. hydraulic discharge pipeline 1/2 mile and dump)	2,300,000	yd^3	$4.00	$9,200,000
Dredged material disposal*				
material hauling and handling (extra, avg. 4 miles RT)	2,800,000	yd^3	$3.90	$10,920,000
material reuse (deduct)	2,800,000	yd^3	($1.25)	($3,500,000)
Site Access	1	LS		$50,000
SUBTOTAL				$18,266,000
Contingencies (10%)				$1,830,000
Engineering (10%)				$1,830,000
TOTAL ESTIMATED COST				**$21,926,000**

* assume no additional cost for dredged material disposal

Table 3-4 - Preliminary Project Cost Estimate for Area Dredging Alternative (Area C – u/s of Lake Houston Parkway Bridge)

Work Item	Quantity	Unit	Unit Price	Amount
Site clearing (60% area, light)	50	Acre	$800.00	$40,000
Conventional Excavation (top 5 ft)	200,000	yd^3	$3.00	$600,000
Area dredging (incl. hydraulic discharge pipeline 1/2 mile and dump)	1,000,000	yd^3	$4.00	$4,000,000
Dredged material disposal				
material hauling and handling (extra, avg. 3 miles RT)	1,200,000	yd^3	$3.50	$4,200,000
material reuse (deduct)	1,200,000	yd^3	($1.25)	($1,500,000)
Site Access	1	LS		$50,000
SUBTOTAL				$7,390,000
Contingencies (10%)				$740,000
Engineering (10%)				$740,000
TOTAL ESTIMATED COST				**$8,870,000**

* assume no additional cost for dredged material disposal

Table 3-5 - Preliminary Project Cost Estimate for Area Dredging Alternative (Area D – S of Kingwood Country Club)

Work Item	Quantity	Unit	Unit Price	Amount
Site clearing (60% area, light)	80	acre	$800.00	$64,000
Conventional Excavation (top 5 ft)	320,000	yd^3	$3.00	$960,000
Area dredging (incl. Hydraulic discharge pipeline 1/2 mile and dump)	1,480,000	yd^3	$4.00	$5,920,000
Dredged material disposal*				
material hauling and handling (extra, avg. 3 miles RT)	1,800,000	yd^3	$3.50	$6,300,000
material reuse (deduct)	1,800,000	yd^3	($1.25)	($2,250,000)
Site Access	1	LS		$50,000
SUBTOTAL				$11,044,000
Contingencies (10%)				$1,100,000
Engineering (10%)				$1,100,000
TOTAL ESTIMATED COST				**$13,244,000**

* assume no additional cost for dredged material disposal

Table 3-6 - Summary Buyout Status

Subdivision	**Total # Lot**[1]	**# Lot Bought**	**# Known Vac. Lot**	**# Remaining**	**Avg. Appraisal Value**[2]
Belleau Wood	90	45	5	40	$75,000
Riverside Crest	41	17	10	14	$33,000
Lake Side	31	15	9	7	$15,000
Northshore	78	19	14	45	$44,000
Forest Cove					
Home	158	78	22	58	$75,000
Town House	133	51	0	82	$23,000
Vacant Lot for Reg. Home	-	-	-	-	$6,000

1 Based on total number of lots with valid street address within the existing floodplain

2 Based on range of current appraisal values and number of properties per HCAD records

Table 3-7 - Preliminary Project Cost Estimate for Floodplain Buyout Alternative (all existing structures in floodplain)

Work Item	Quantity	Unit	Unit Price	Amount
Floodplain buyout (remaining lots)				
Belleau Wood	40	lot	$75,000	$3,000,000
Riverside Crest	14	lot	$33,000	$462,000
Lake Side	7	lot	$15,000	$105,000
Northshore	45	lot	$44,000	$1,980,000
Forest Cove – Home	58	lot	$75,000	$4,350,000
Forest Cove – Town House	82	lot	$23,000	$1,886,000
Vacant Land (assumed)	100	lot	$6,000	$600,000
SUBTOTAL				$12,383,000
Market Value Adjustment (30%)				$3,715,000
Cost of Appraisal, Title, Survey, and Closing	246	lot	$2,500	$615,000
Moving and Relocation Costs	246	unit	$10,000	$2,460,000
Cost of Demolition; Cleanup	246	lot	$10,000	$2,460,000
TOTAL ESTIMATED COST				**$21,633,000**

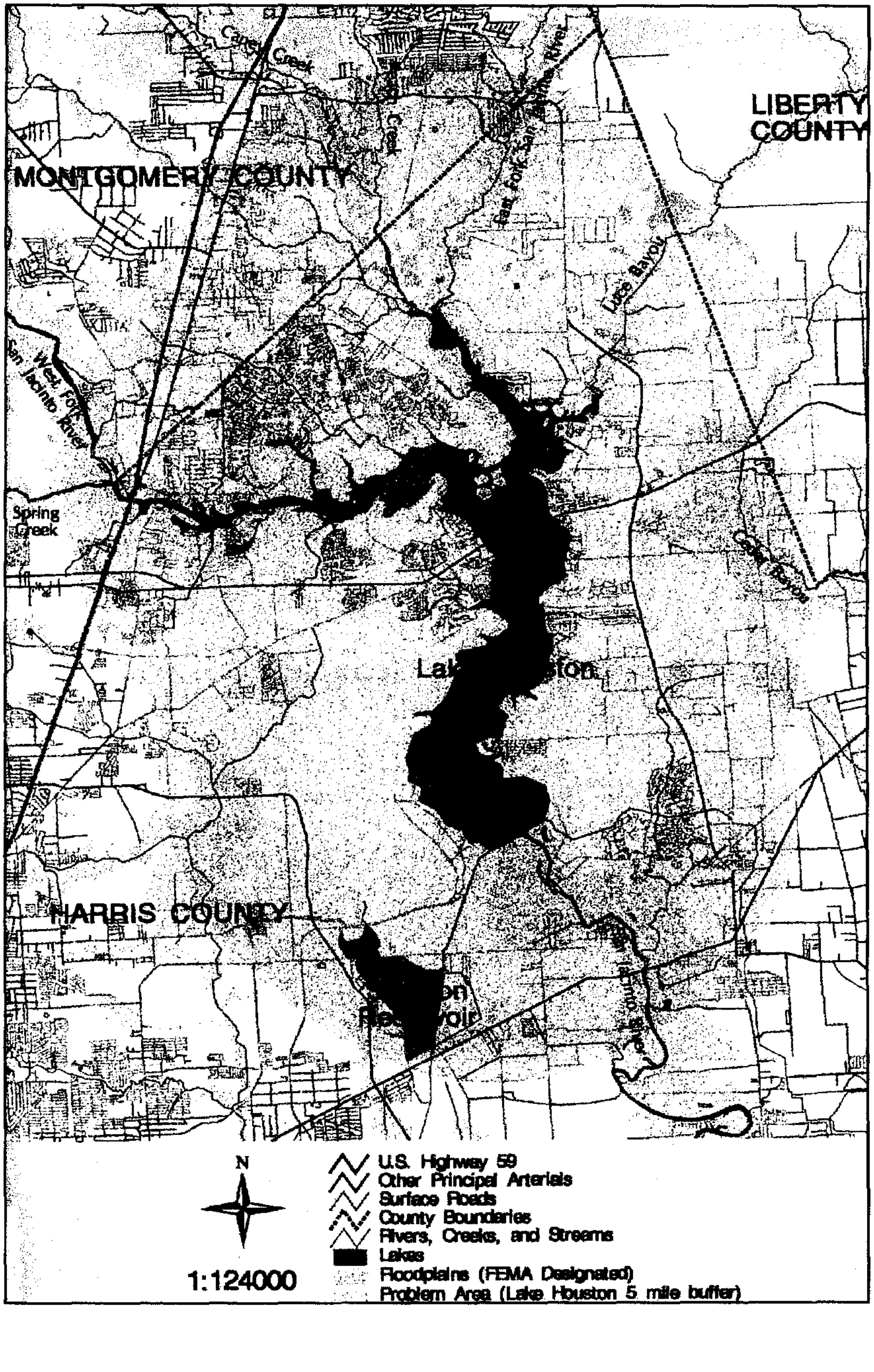


Figure 1-1. Project Location

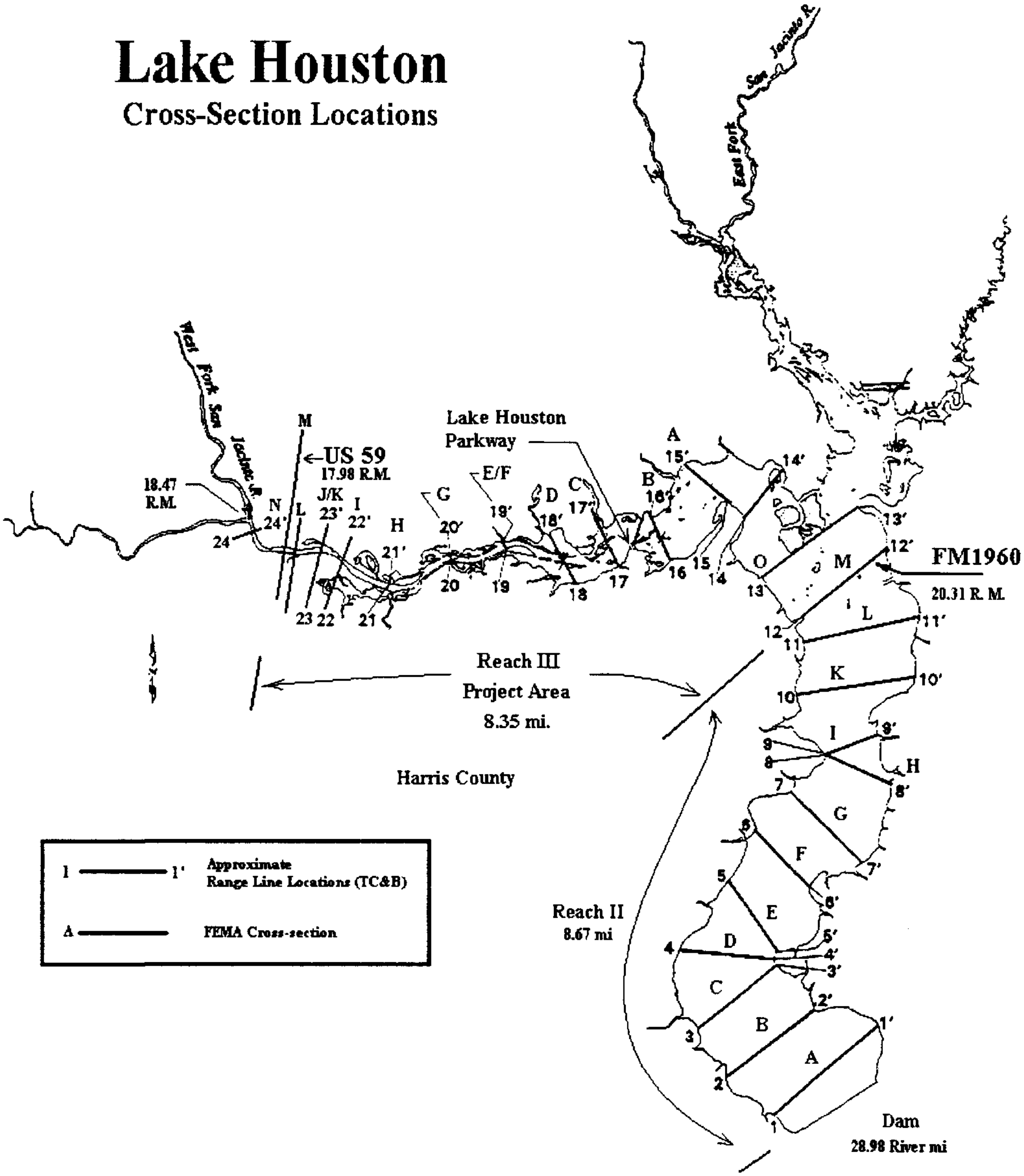


Figure 1-2. Floodplain Cross-Section Locations

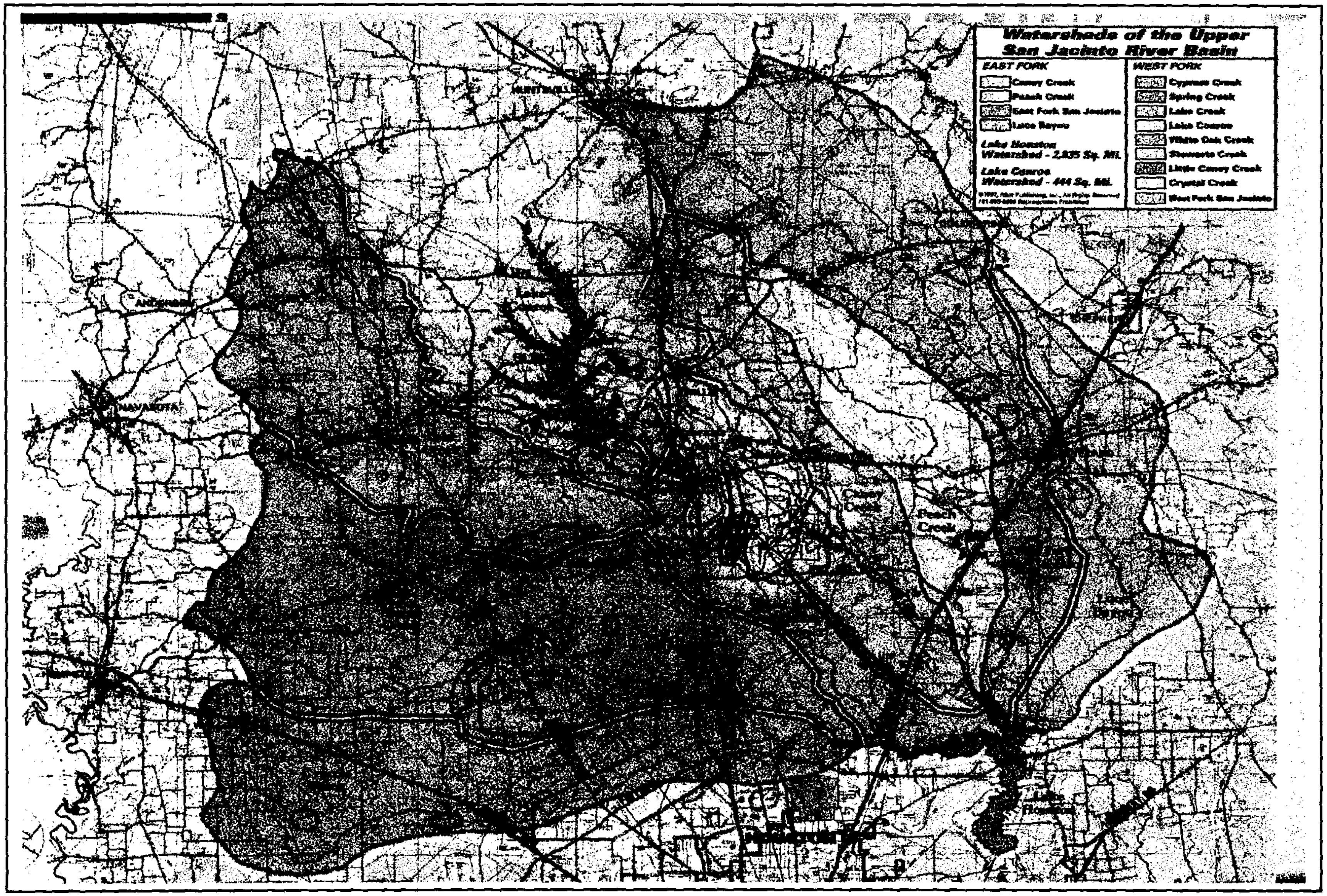
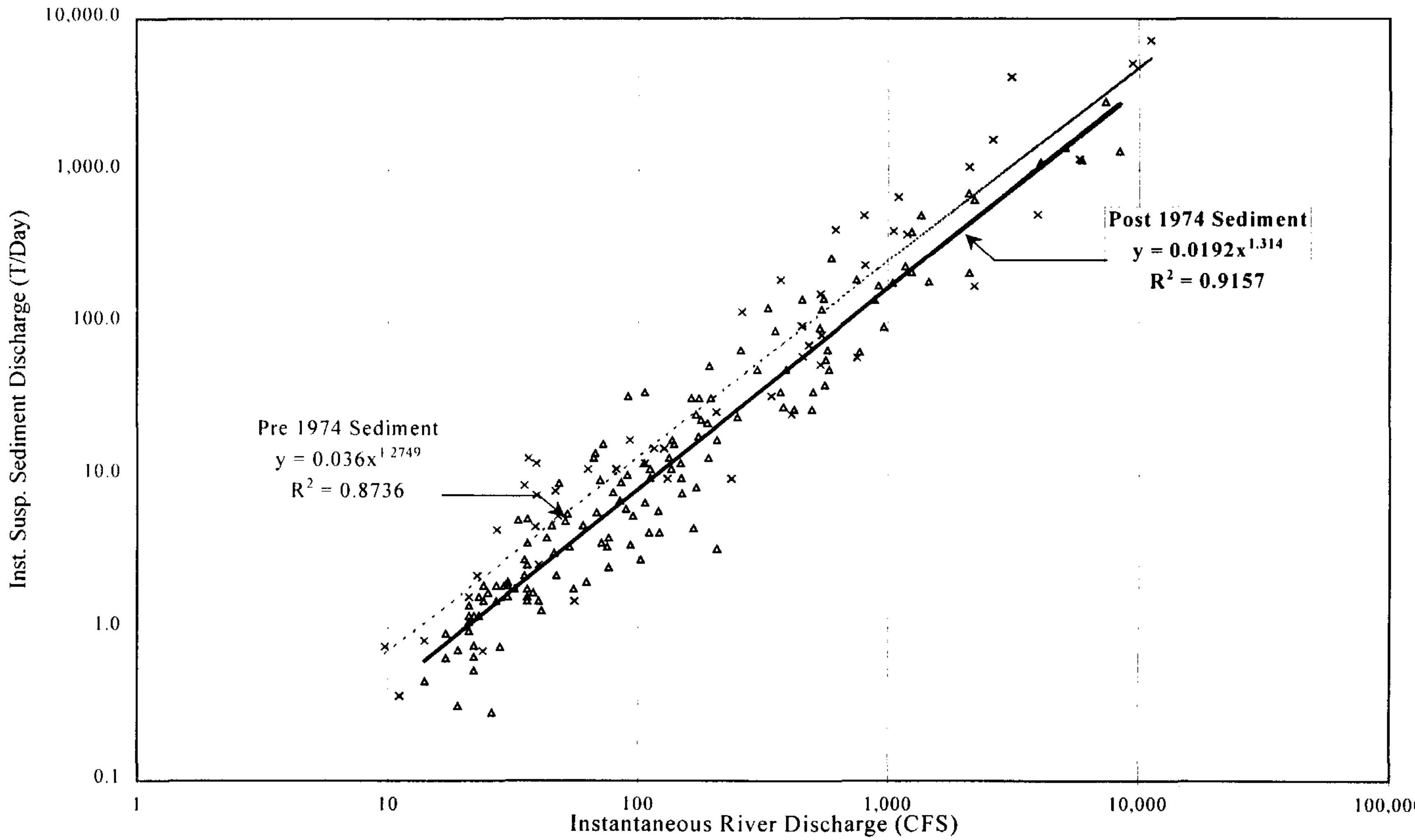


Figure 1-3. Watersheds of the Upper San Jacinto River Basin

Figure 1-4-1. Suspended-Sediment Transport Curve – West Fork San Jacinto River near Conroe, TX. (USGS 08068000)



Note: Two sediment transport curves, one for pre-1974 and another for post-1974, are used to reflect the construction of Lake Conroe in 1973.

Figure 1-4-2. Suspended Sediment Transport Curve - Cypress Creek near Westfield, TX (USGS 08069000)

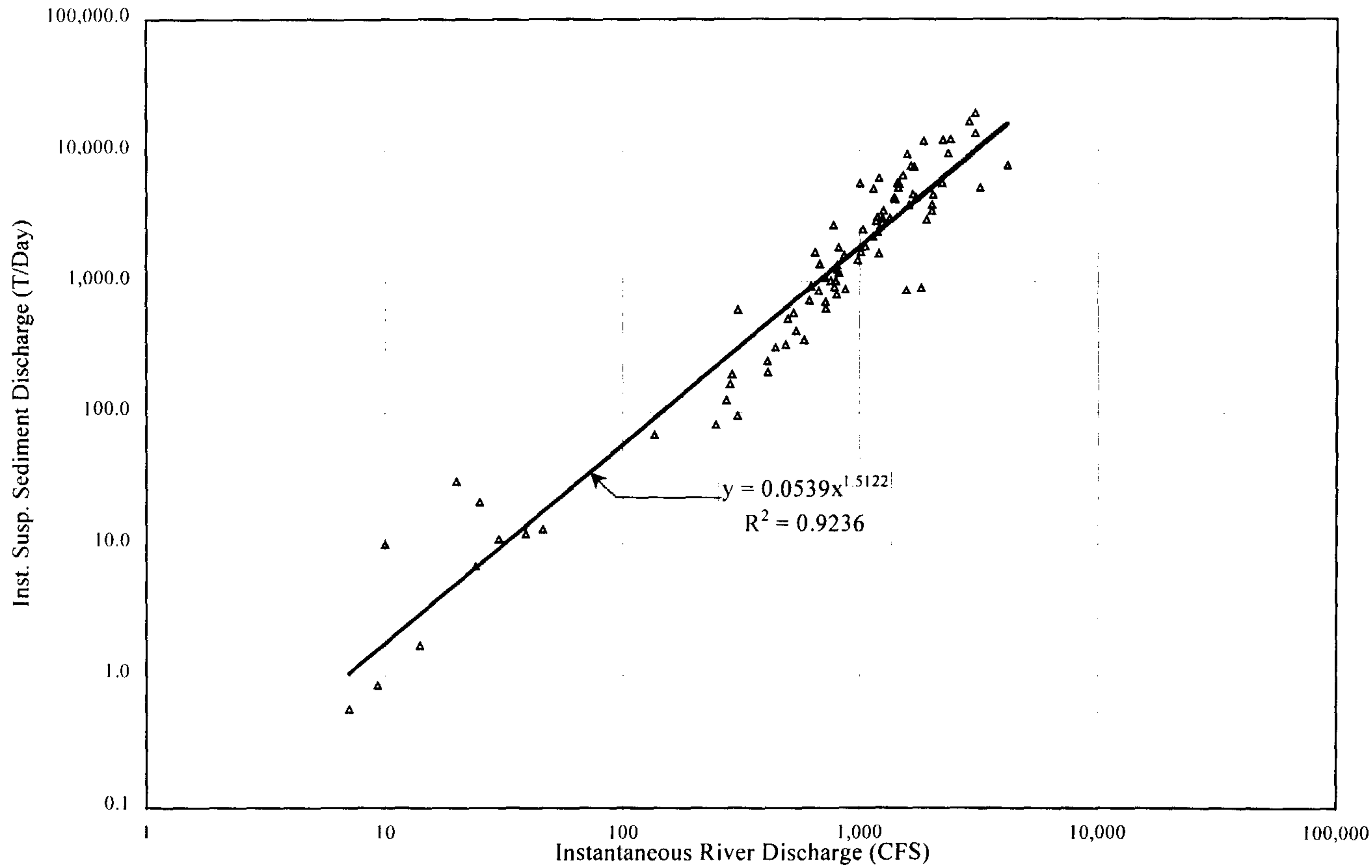


Figure 1-5-1. Flow Occurrence Curve, West Fork San Jacinto River near Conroe, TX

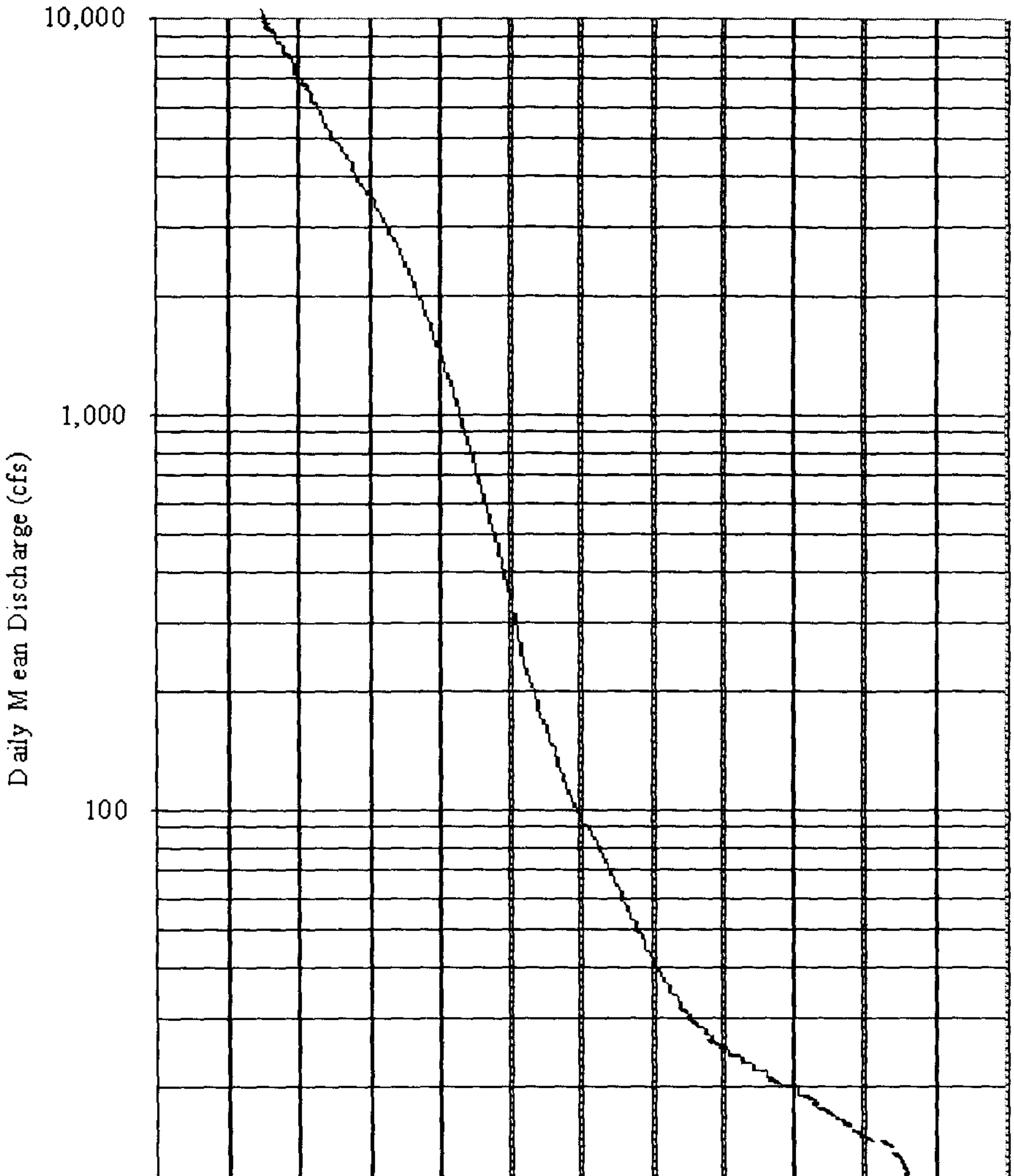


Figure 1-5-2. Flow Occurrence Curve, Cypress Creek, near Westfield, Tx

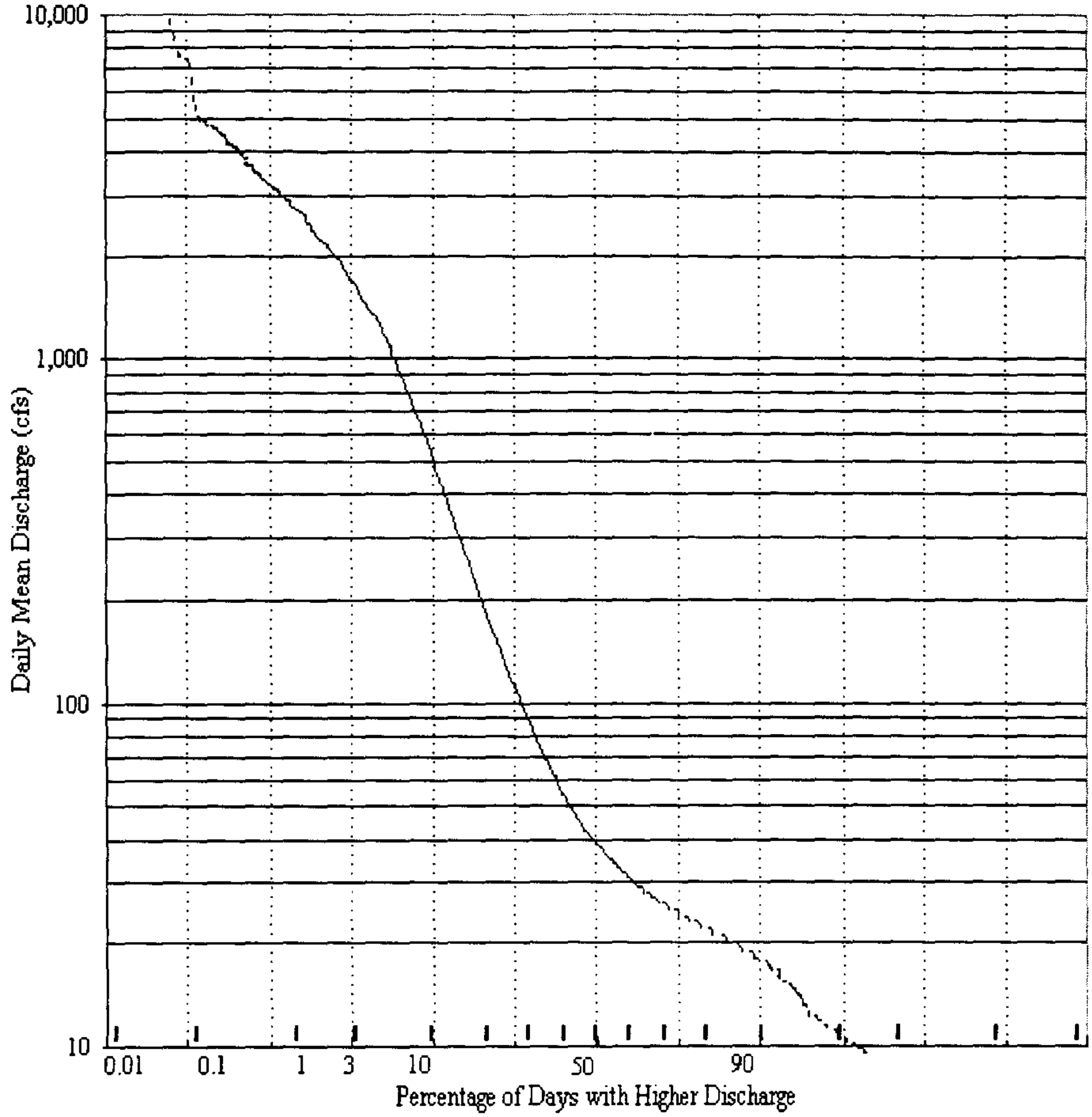
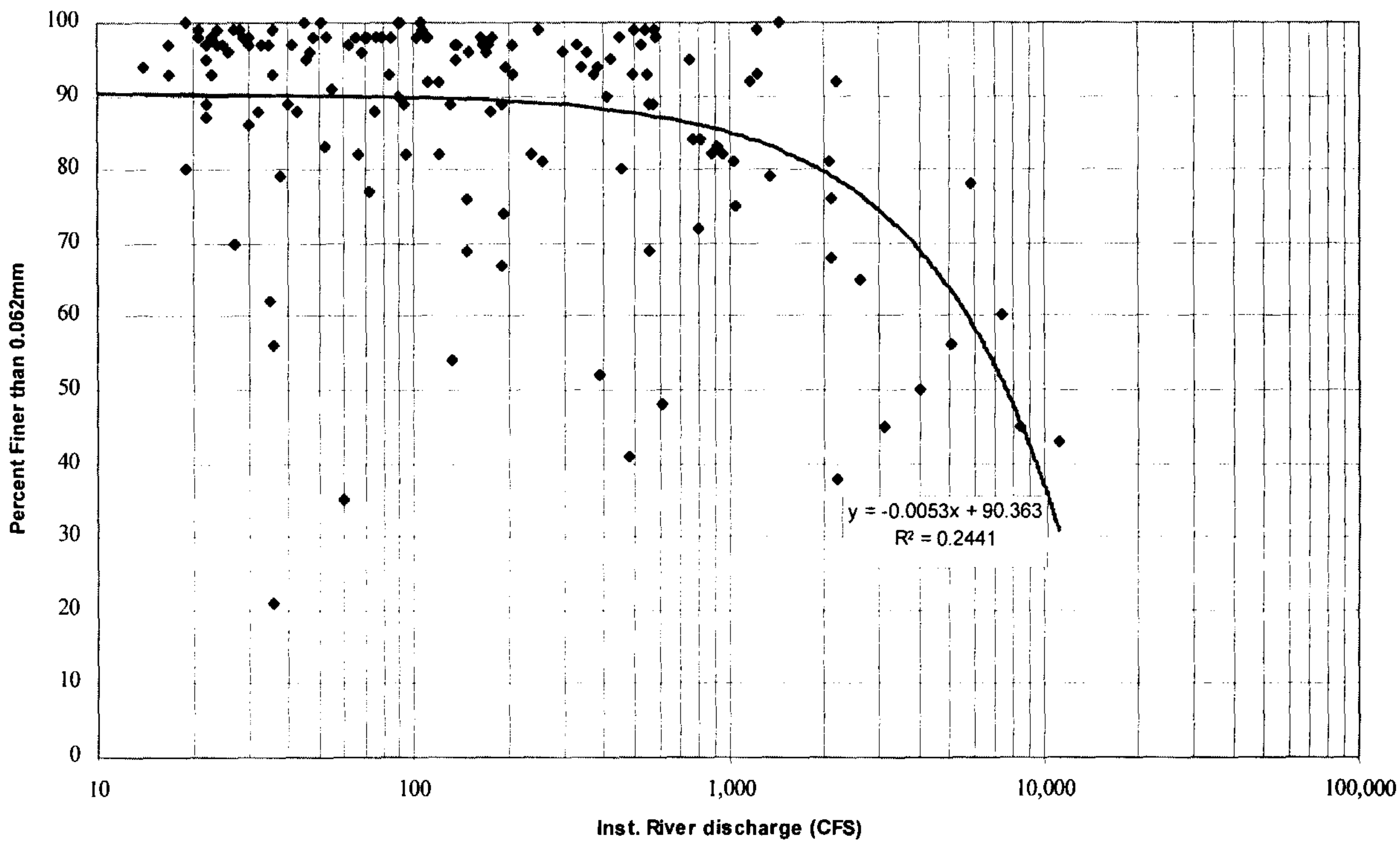
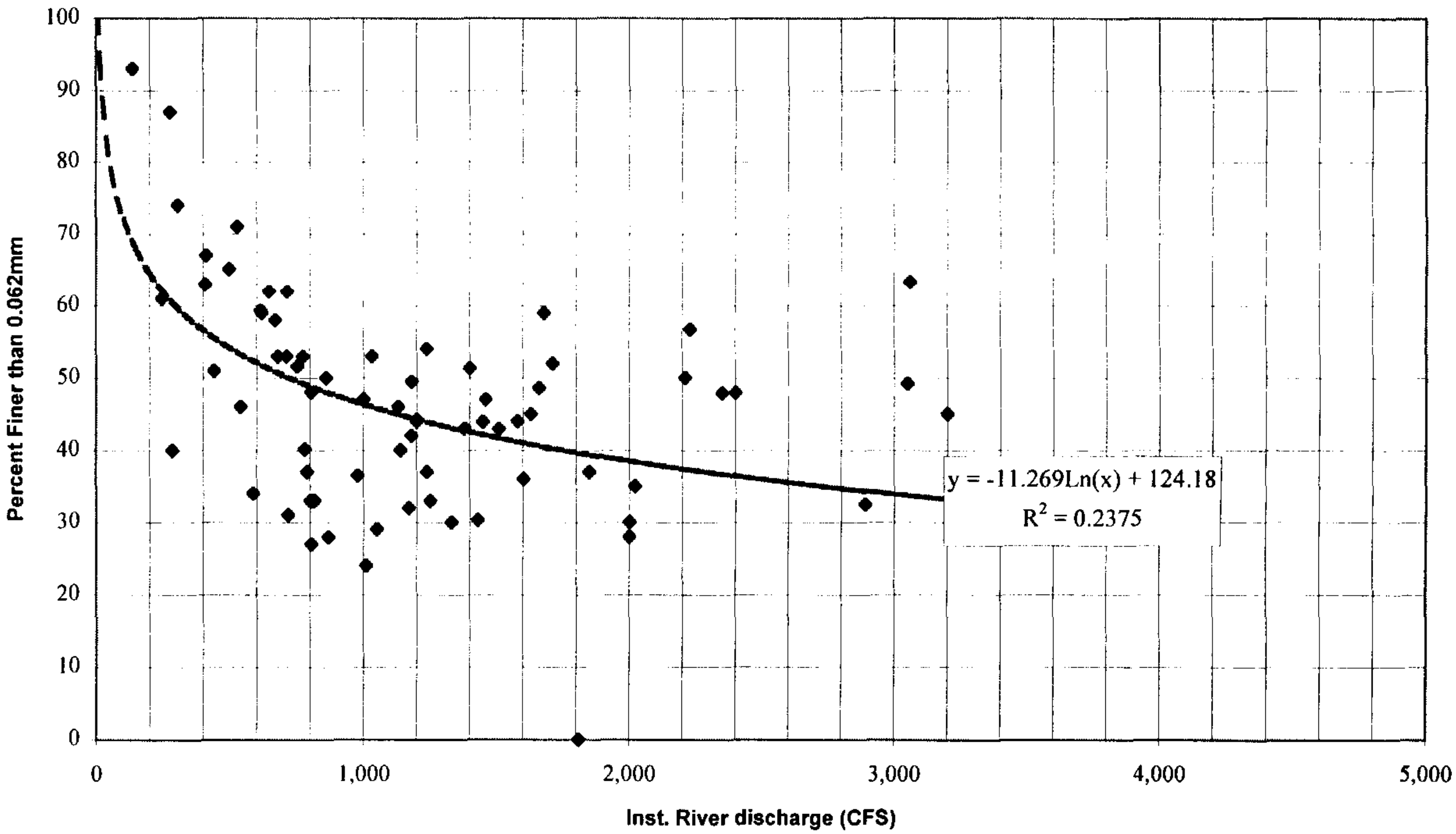


Figure 1-6-1. Percent of Fines in Suspended Sediment, West Fork San Jacinto River near Conroe,Tx



Note: Percent of fines is defined as fraction of fine-grained soil particles less than 0.062 mm diameter size.

Figure 1-6-2. Percent of Fines in Suspended Sediment, Cypress Creek near Westfield, Tx



Note: Percent of fines is defined as fraction of fine-grained soil particles less than 0.062 mm diameter size.

Figure 1-7. Rainfall Isohyets, October 1994 Flood

Southeast Texas and San Jacinto River Basin Isohyets
October 1994 flood

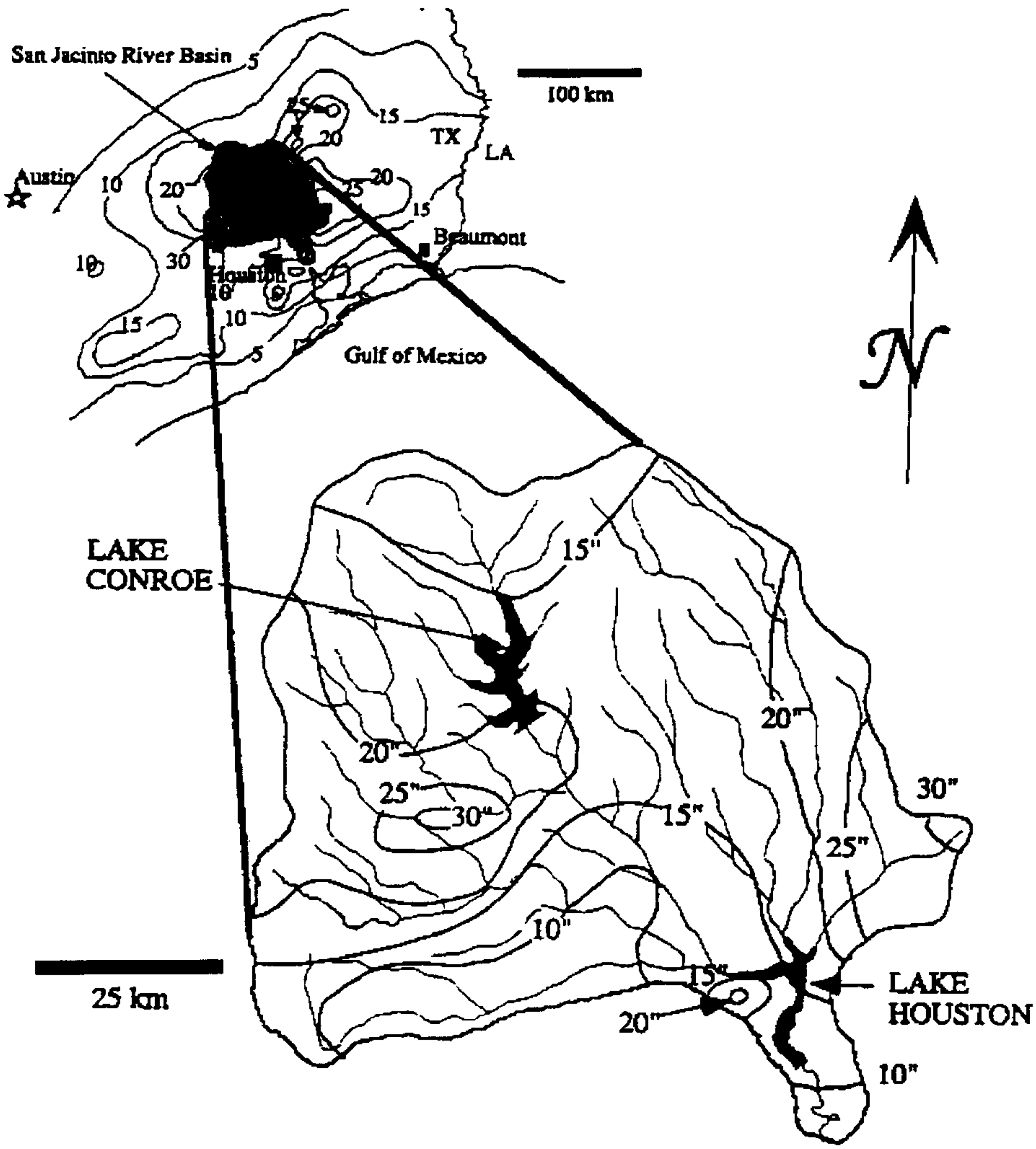


Figure 1-8. 10-Yr Flood Profiles (FEMA vs 1999 Survey)
West Fork San Jacinto River

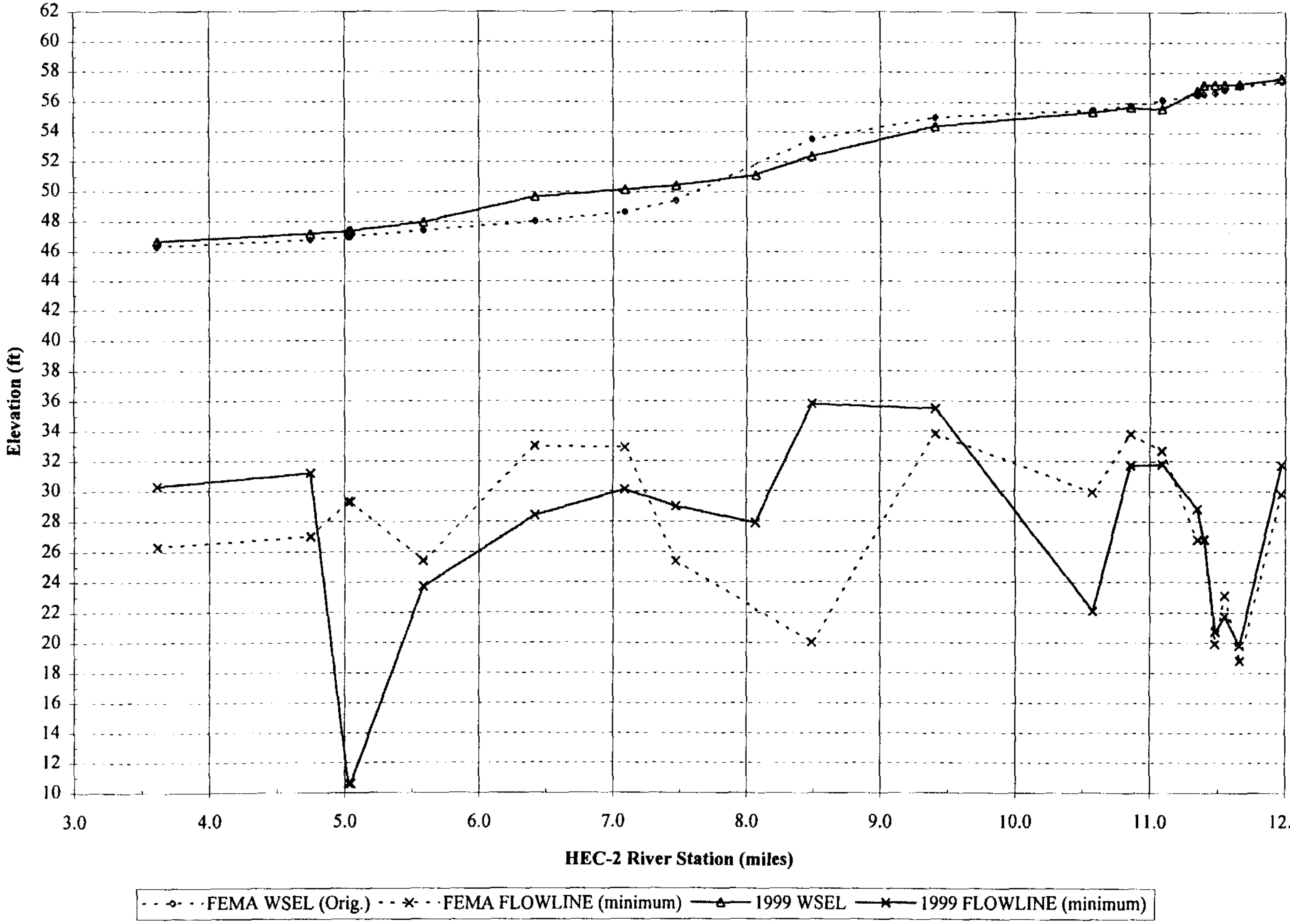


Figure 1-9. 100-Yr Flood Profiles (FEMA vs 1999 Survey)
West Fork San Jacinto River

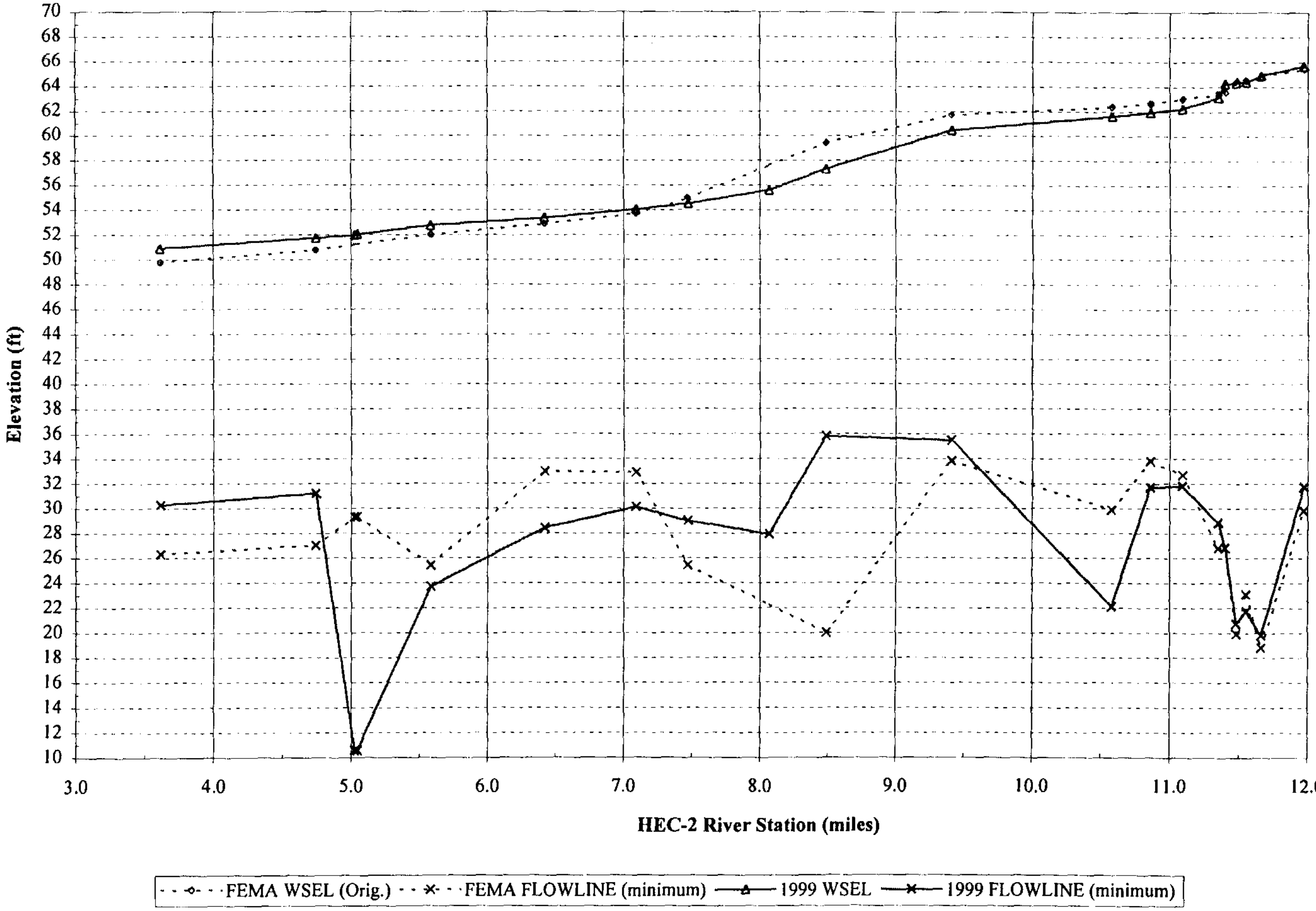


Figure 1-10. 100-Yr Flood Profile (Water Surface) Comparison (1999 Survey, FEMA, & TWDB)
West Fork San Jacinto River

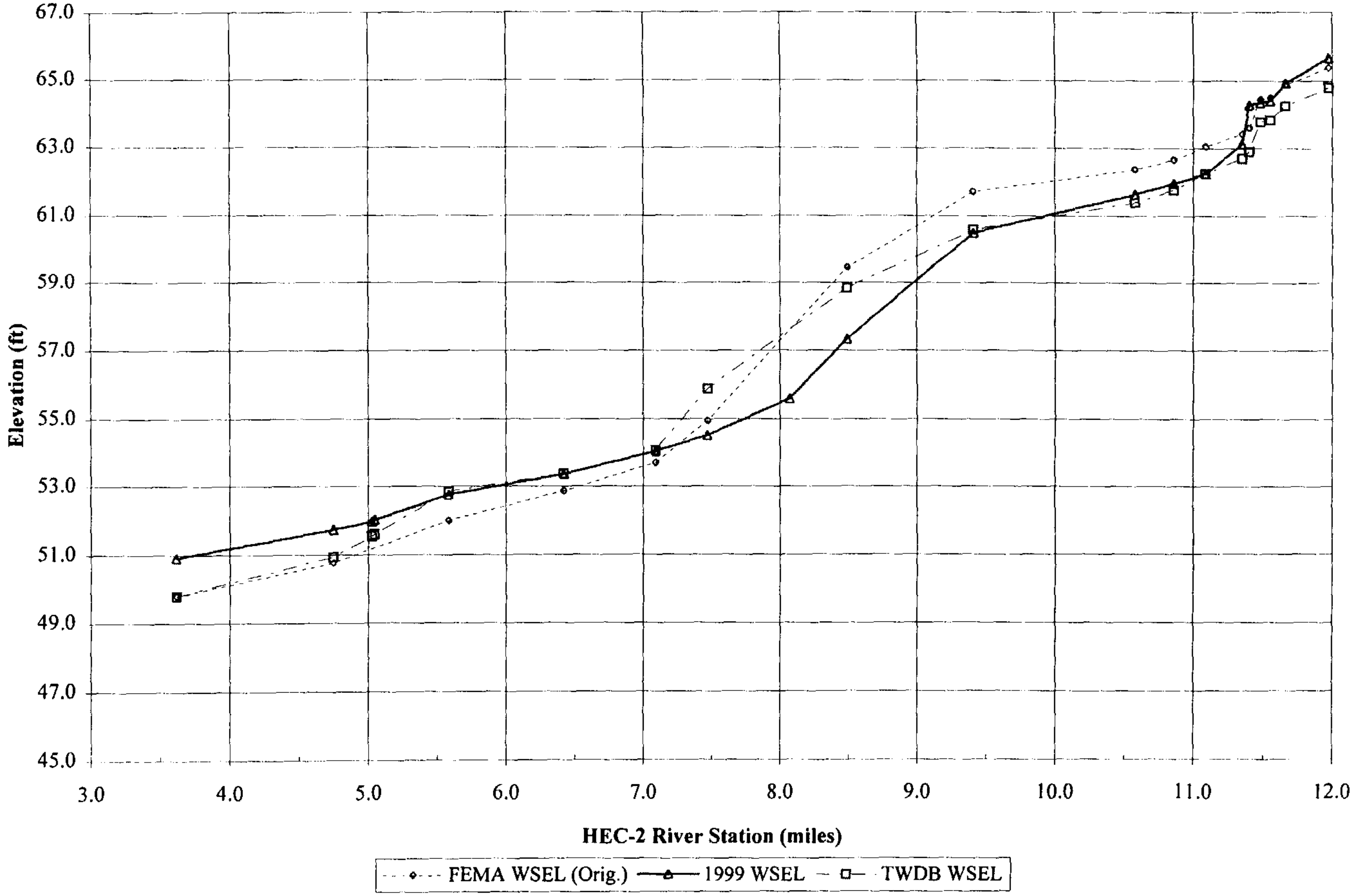


Figure 2-1 - General Site Plan for Various Sediment Removal Options

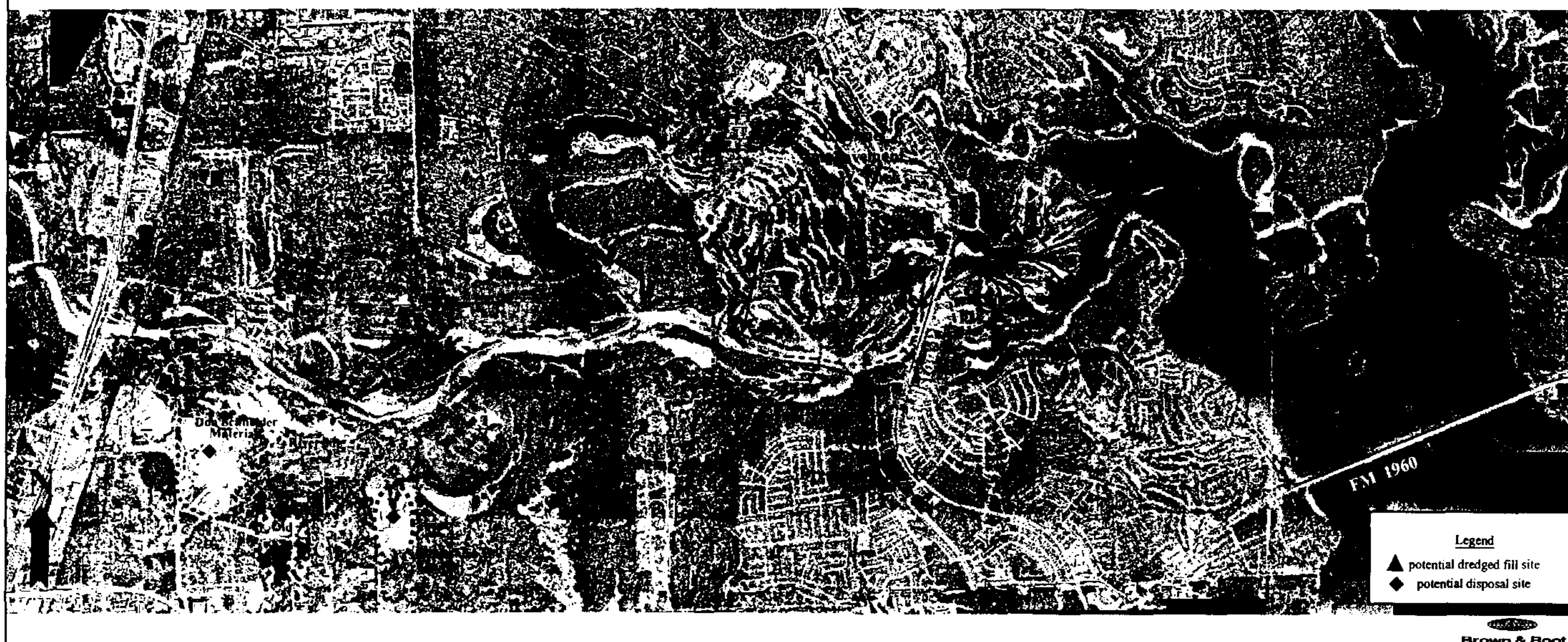
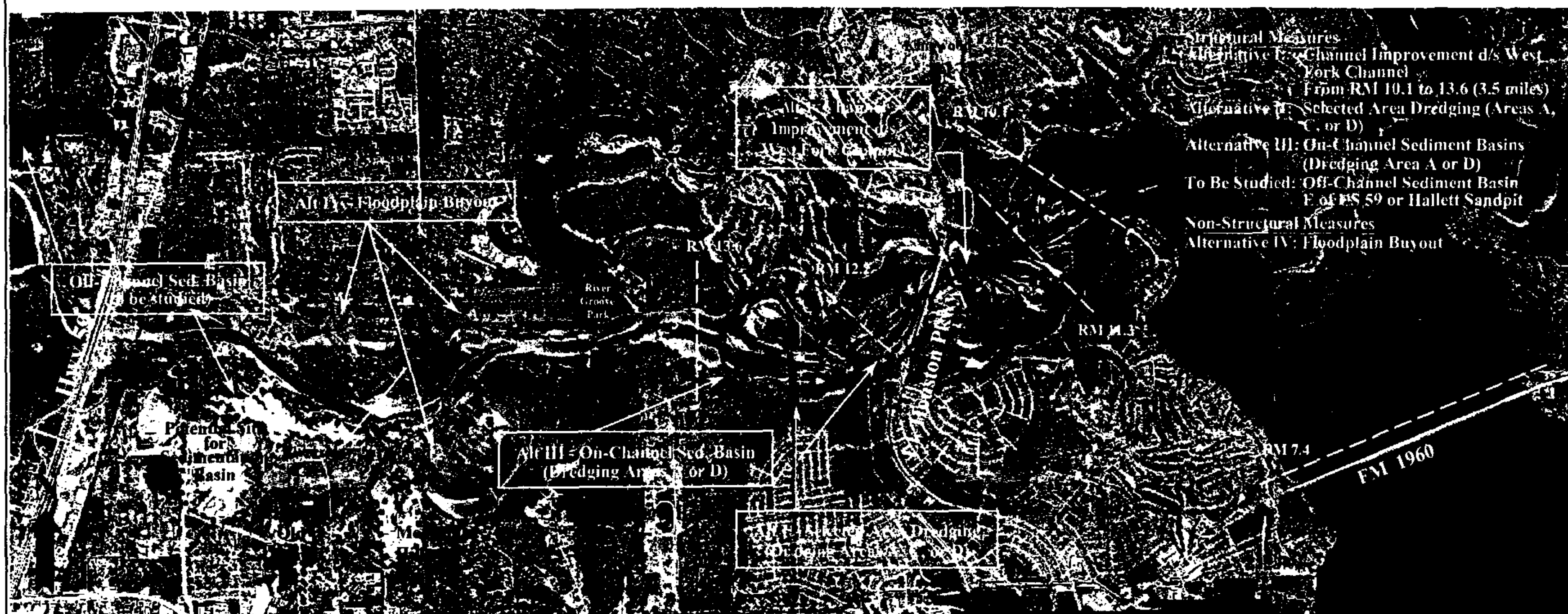


Figure 2-2 - General Site Plan for Selected Project Alternatives



Brown & Root

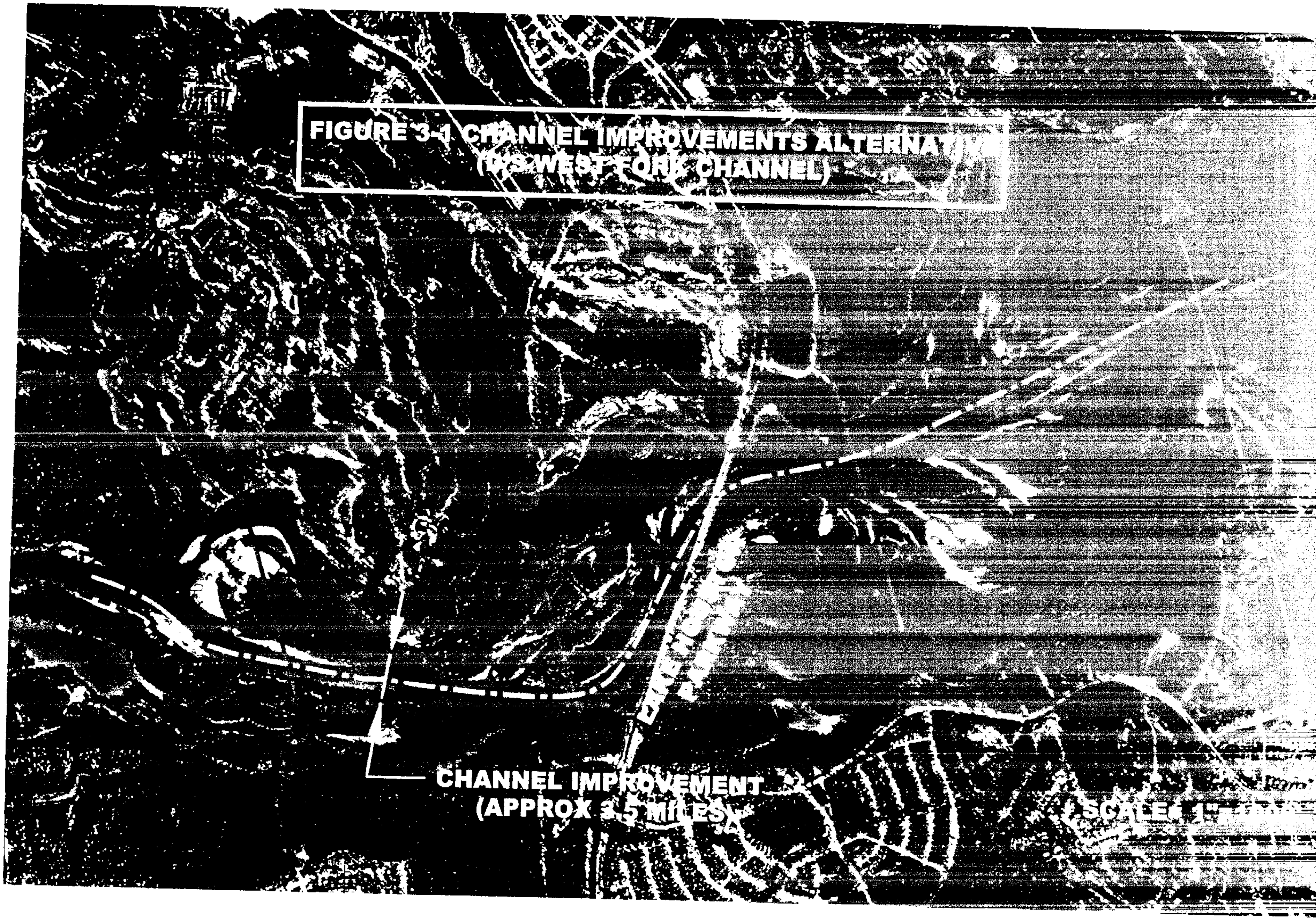


FIGURE 3-1 CHANNEL IMPROVEMENTS ALTERNATIVE
(D/S WEST FORK CHANNEL)

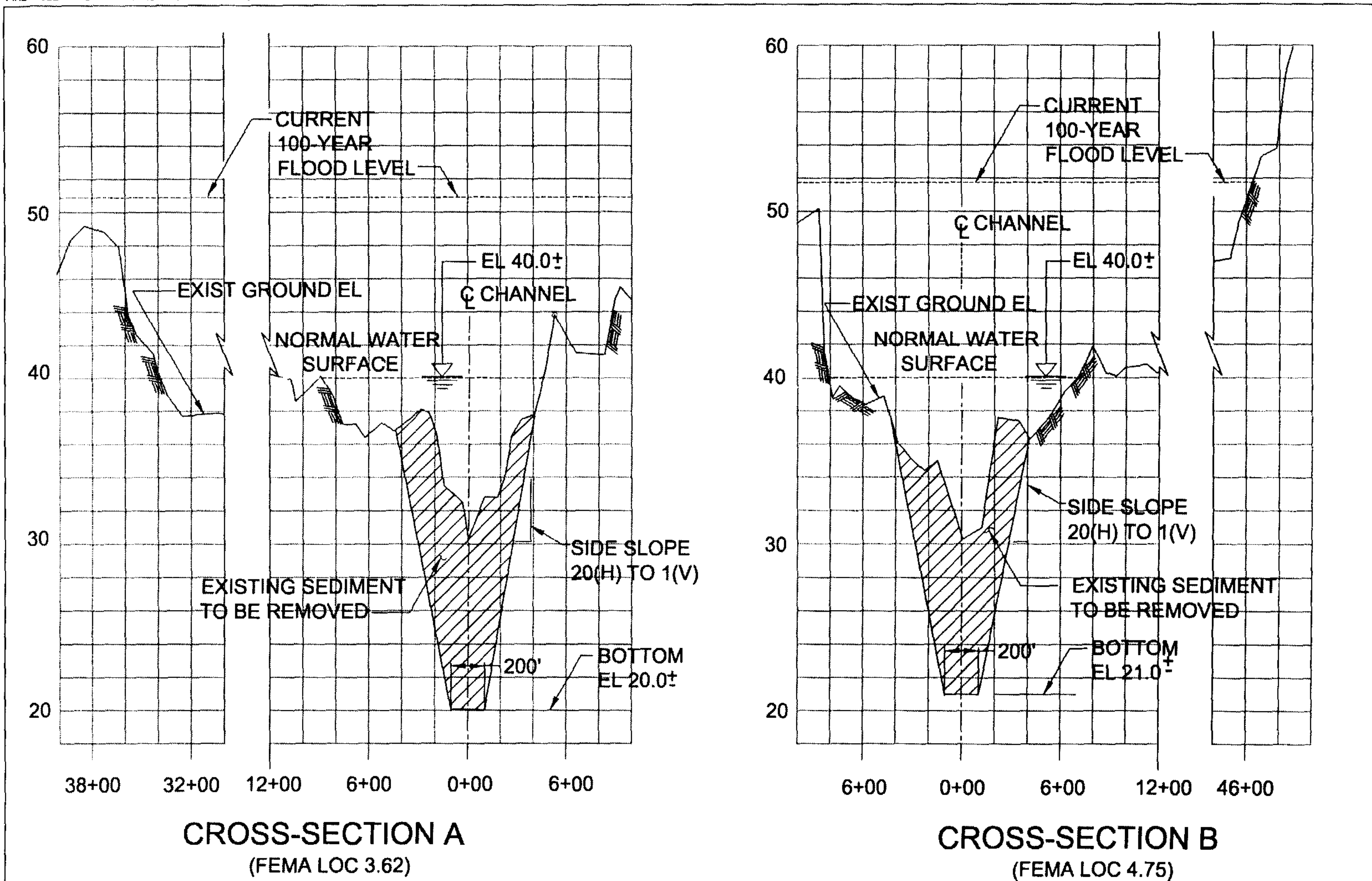
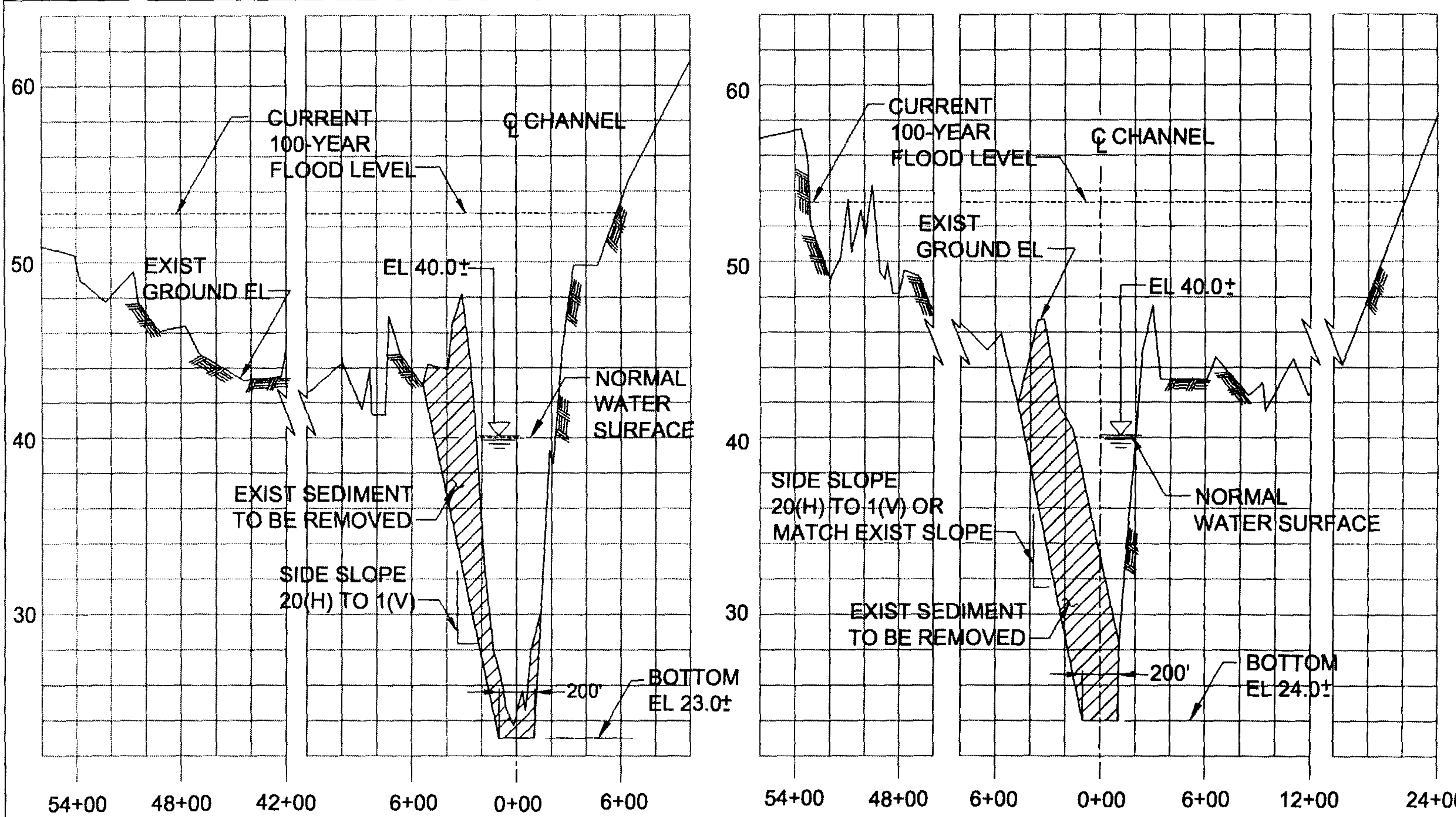


FIGURE 3-2- CHANNEL IMPROVEMENT ALTERNATIVE

SCALE= 1"=800' (H)
1"=8' (V)

DOWNSTREAM WEST FORK

\\HOUFILE23\HCIVIL CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\TCIC&D



CROSS-SECTION C
(FEMA LOC 5.585)

CROSS-SECTION D
(FEMA LOC 6.42)

FIGURE 3-3 -CHANNEL IMPROVEMENT ALTERNATIVE

SCALE= 1"=800' (H)
1"=8' (V)

DOWNSTREAM WEST FORK

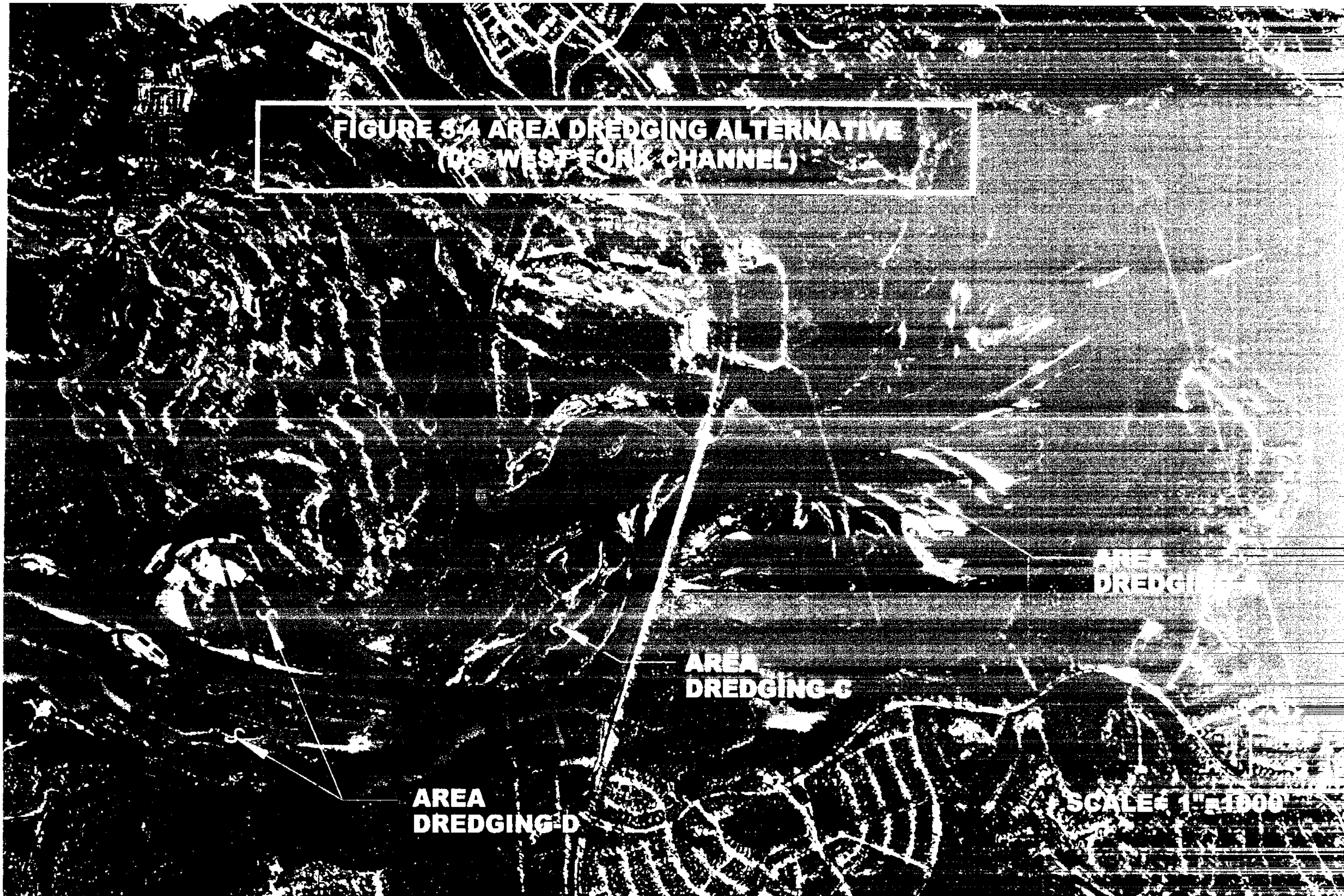


FIGURE 3-4 AREA DREDGING ALTERNATIVE
(D/S WEST FORK CHANNEL)

\\HOUFILE23\HCIVIL$\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\DredArea A

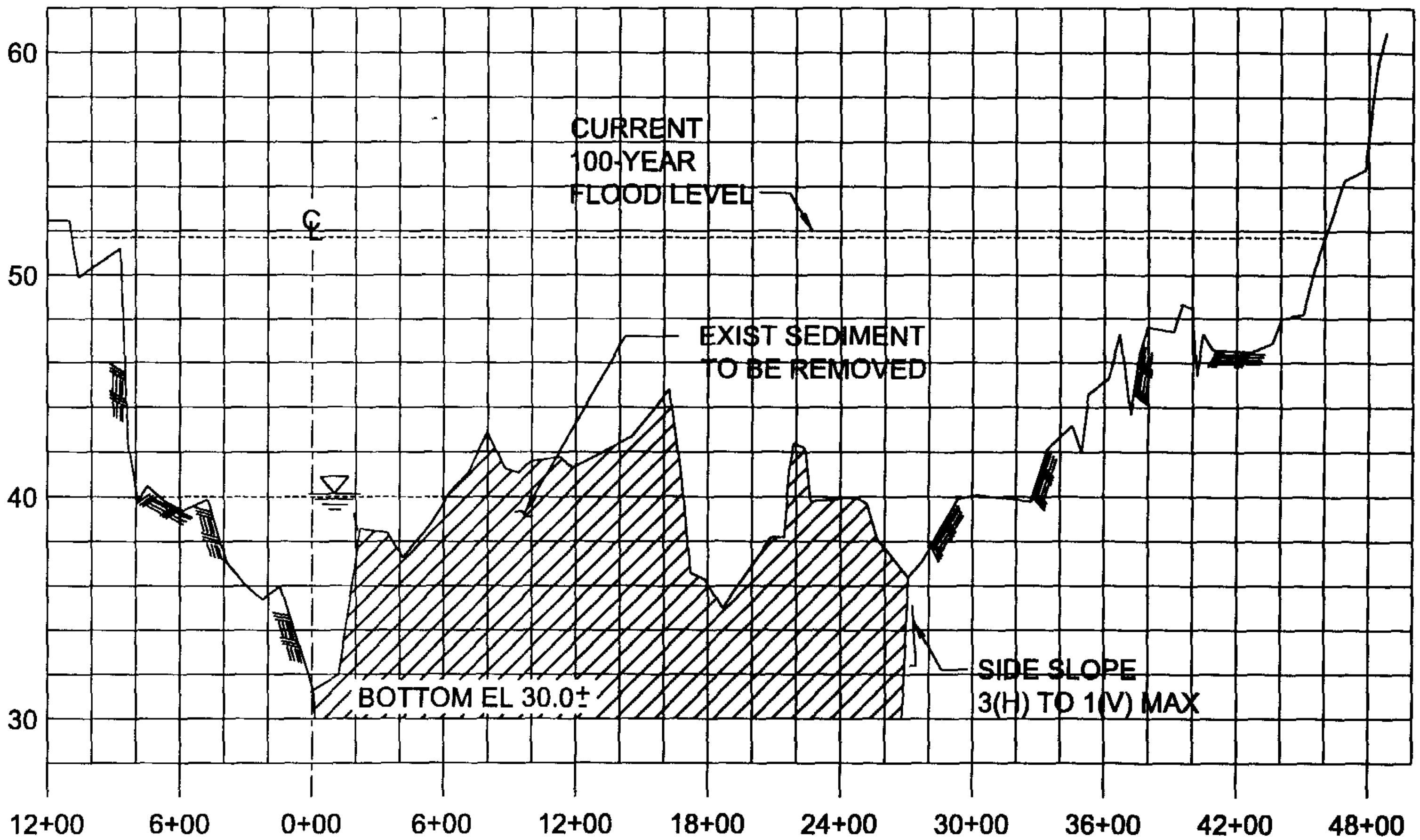


FIGURE 3-5 -AREA DREDGING A @ CROSS-SECTION B

SCALE= 1"=800'(H)
1"=8'(V)

(D/S LAKE HOUSTON PARKWAY, RM 11.3)

\\HOUFILE23\HCIVILS\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\DreadAreaC

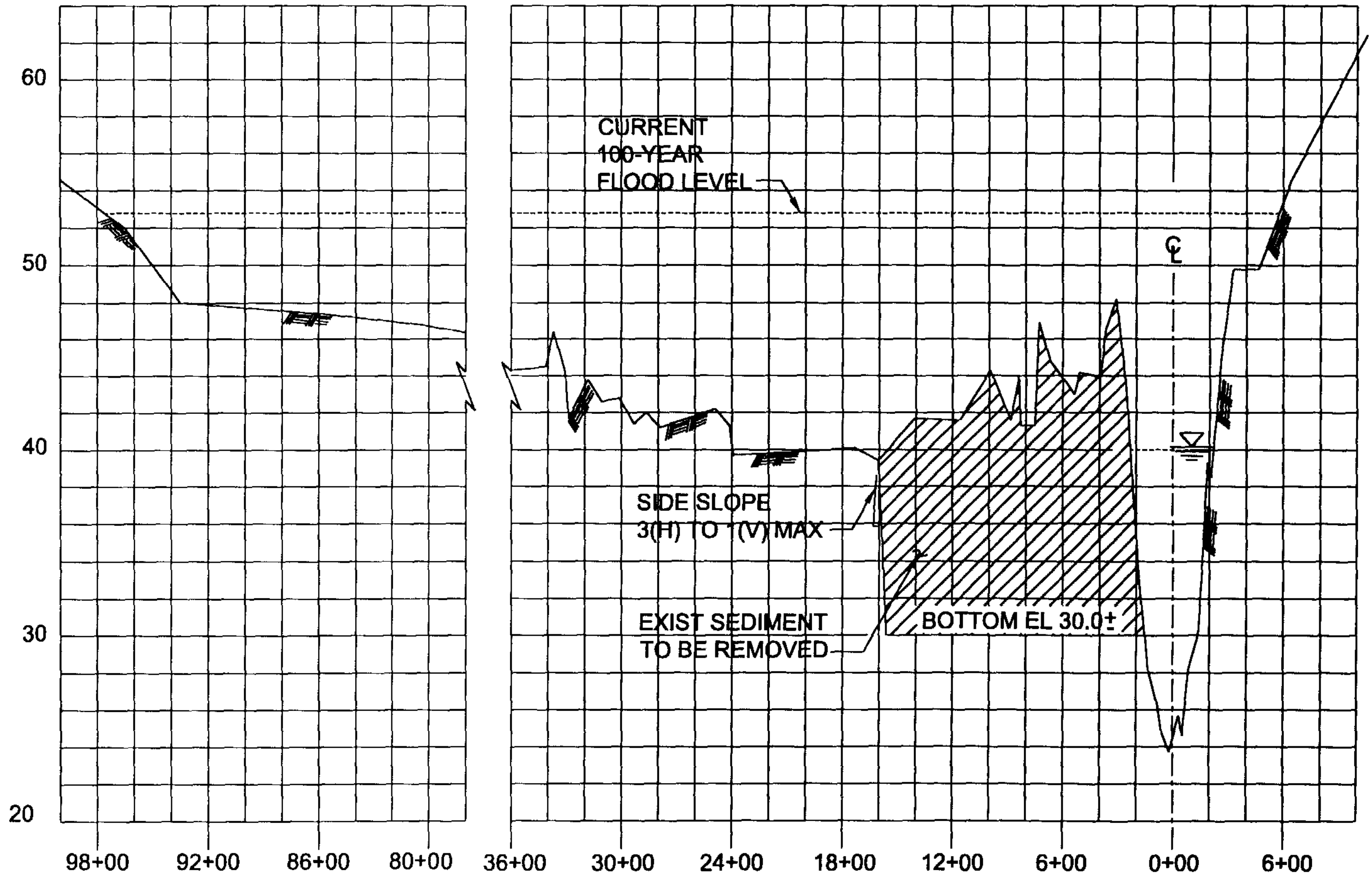


FIGURE 3-6 -AREA DREDGING C @ CROSS-SECTION C

SCALE= 1"=800'(H)
1"=8'(V)

(SW OF LAKE HOUSTON PARKWAY BRIDGE, RM 12.2)

\\HOUFILE23\HCIVILS\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\DredAreaD

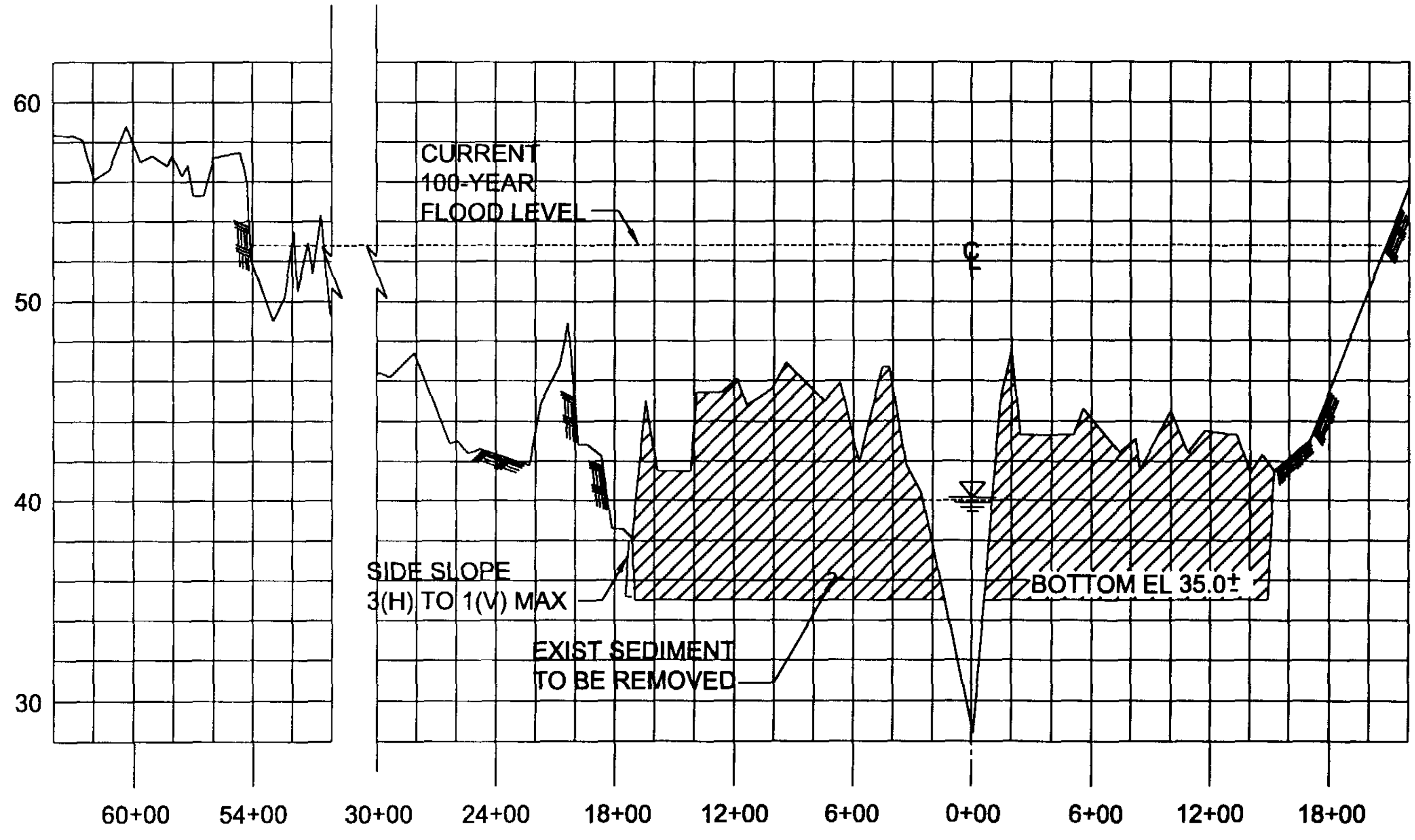


FIGURE 3-7 -AREA DREDGING D @ CROSS-SECTION D

SCALE= 1"=800' (H) 1"=8'(V)

(S OF KINGWOOD COUNTRY CLUB, RM 12.9)

\\HOUFILE23\HCIVIL$\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\TYPSEDB.DWG

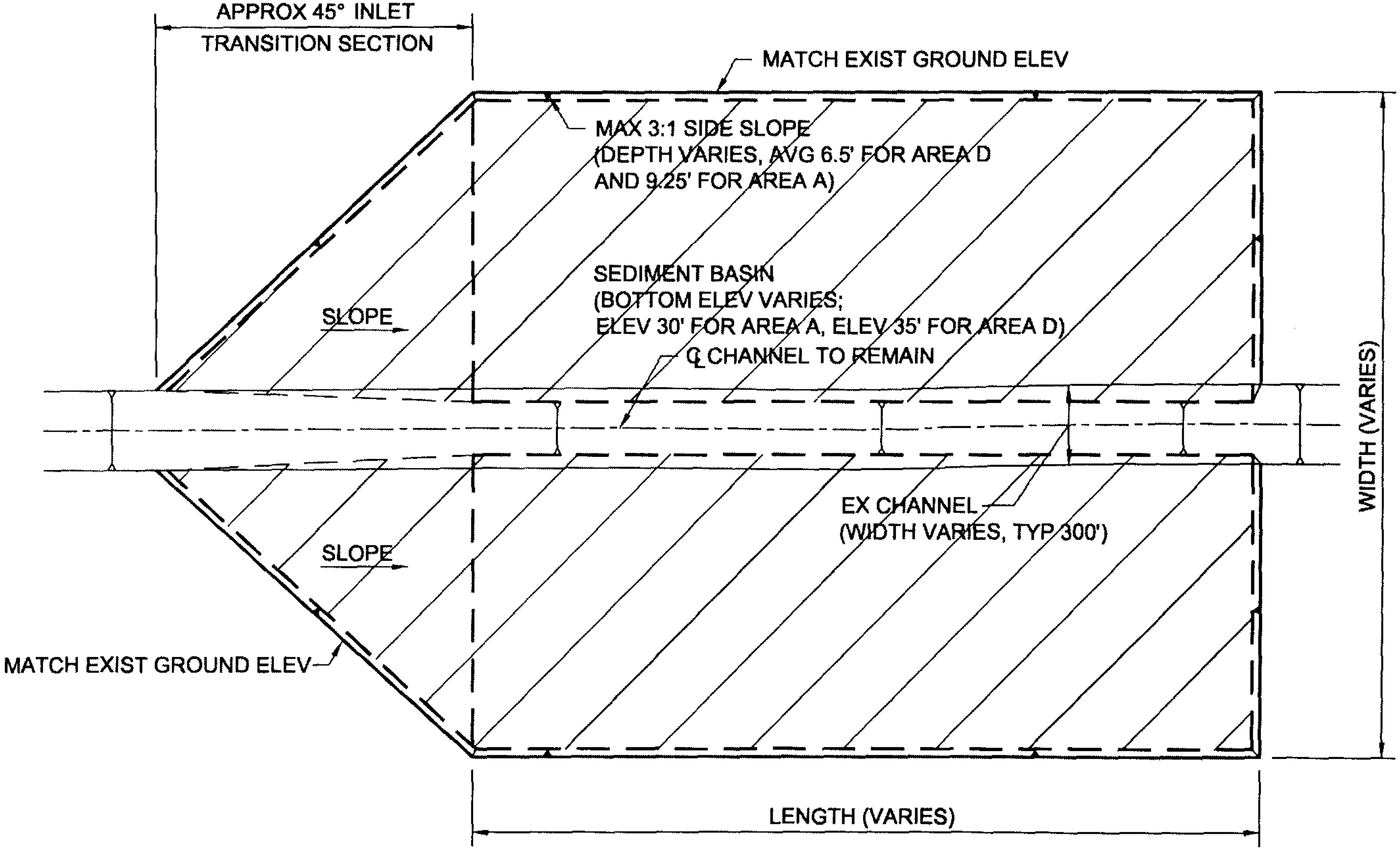


FIGURE 3-8 -TYPICAL ON-CHANNEL SEDIMENT BASIN

SCALE= 1"=600' (Approx.)

Appendices

A USGS Historical Sediment Data (TSS)

- A-1 USGS Historical Sediment Data (TSS) at West Fork San Jacinto River near Conroe
- A-2 USGS Historical Sediment Data (TSS) at Cypress Creek near Westfield

B Technical Analyses/Calculations

- B-1 Analysis of Sedimentation Effects on FEMA 100-Yr Flood Level and Channel Cross-Sections (Exhibits 1 to 15)
- B-2 HEC-2 Model Output (1999 Survey)
- B-3 HEC-2 Model Output (Sediment Removal Options)

C Revised Floodplain Maps and Aerial Photo Maps

D Site Visit Information for Potential Dredged Fills or Dredged Material Disposal

E Correspondences and Information for Permit Issues

F Public Participation Records

G Response to Written Comments provided by Project Sponsors

Appendix A - USGS Historical Sediment Data (TSS)

Appendix A-1

USGS Historical Sediment Data (TSS) at West Fork San Jacinto River near Conroe

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

SAMPLE DATE	DISCHARGE AVG. (CFS)	DISCHARGE INST. (CFS)	SED. SIEVE DIAM. % FINER THAN .062mm	SED. SIEVE DAIM. % FINDER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM % FINER THAN 0.5mm	SEDIMENT SUSPENDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDED (T/DAY)
09/14/61	9,460	11,200	43	60	89	98	238	7,200
09/21/61	127	340	94	98	99	100	36	33
01/29/62	2,640	3,100	45	54	82	99	491	4,110
01/31/62	1,860	2,100	68	73	92	99	186	1,050
02/01/62	406	1,050	75	80	95	100	140	397
05/03/62	675	810	84	88	100		108	236
10/29/62	27	800	72	75	85	99	233	503
12/27/65	208	205					47	26
02/01/66	451	453	80	82	94	100	49	60
02/11/66	2,650	2,605	65	71	85	99	226	1,590
03/09/66	131	130	89	91	97	100	27	10
04/07/66	105	106					42	12
05/17/66	129	126					44	15
06/20/66	51	48					42	5
08/24/66	24	23					36	2
09/26/66	38	39					114	12
11/01/66	27	27					60	4
12/05/66	24	24					11	1
01/10/67	42	39					70	7
02/13/67	55	56					10	2
03/17/67	35	36					133	13
04/24/67	60	63					65	11
05/26/67	35	35					91	9
07/07/67	14	14					22	1
08/03/67	10	10					29	1
09/13/67	11	11					12	0
03/09/70	1,100	1,099					224	665
06/06/72	44	39					44	5
11/07/72	394	370					189	189
12/19/72	620	450					78	95
01/24/73	258	259					168	117
04/04/73	115	115					48	15
04/18/73	9,120	9,380					200	5,070
05/10/73	1,180	1,190					117	376
07/19/73	40	40					24	3
10/29/73	557	535					37	53
11/29/73	529	541					57	83
01/09/74	796	750					29	59
01/29/74	5,640	5,770					76	1,180
02/21/74	544	534					106	153
04/03/74	77	81					50	11
05/16/74	85	92					69	17
06/25/74	20	21					29	2
08/07/74	43	47					63	8
09/18/74	4,010	3,930					48	509
10/10/74	476	480	41				55	71
10/22/74	225	235	82				15	10
11/14/74	2,100	2,200	92				29	172
12/05/74	366	410	90				23	25
12/06/74	594	616	48				244	406

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

01/09/75	408	420	95				24	27
01/16/75	373	389	52				47	49
02/25/75	117	120	82				18	6
02/26/75	103	95	82				21	5
03/19/75	1,340	1,450	100				47	184
04/07/75	60	55	91				12	2
04/24/75	218	189	67				44	22
05/05/75	943	880	82				101	140
06/09/75	99	135	95				29	11
07/01/75	670	550	93				96	143
08/26/75	195	175	88				68	32
09/04/75	71	68	96				31	6
10/01/75	36	36	21				54	5
11/05/75	450	494	93				20	27
12/09/75	58	60	35				29	5
01/06/76	109	132	54				37	13
02/19/76	319	380	94				27	28
03/09/76	513	570	89				43	66
05/11/76	2,050	2,200	38				107	636
06/09/76	1,800	2,100	76				37	210
07/06/76	58	66	98				75	13
08/23/76	20	24	97				30	2
09/07/76	124		99				62	
10/05/76	149	170	97				18	8
11/16/76	72	75	88				17	3
01/11/77	573	580	99				31	49
02/23/77	172	190	89				25	13
03/08/77	940	960	82				36	93
04/05/77	309	370	93				35	35
05/03/77	490	500	99				26	35
06/07/77	40	46	95				25	3
07/19/77	22	22	89				21	1
08/02/77	20	21	99				20	1
09/14/77	115	48	98				69	9
10/19/77	94	93	89				14	4
11/28/77	113	110	98				14	4
12/27/77	35	35	62				23	2
01/24/78	483	540	99				83	121
02/06/78	571	560	69				38	57
03/22/78	58	62	97				12	2
04/19/78	35	40	89				14	2
05/15/78	21	21	98				22	1
06/12/78	130	138	97				44	16
07/26/78	24	45	100				39	5
08/01/78	19	17	97				14	1
09/12/78	196	205	97				31	17
10/18/78	166	166	97				10	5
11/06/78	221	256	81				96	66
12/11/78	184	178	98				48	23
01/17/79	173	173	97				39	18
02/08/79	7,020	7,320	60				143	2,830
03/12/79	161	148	76				24	10
04/23/79	8,240	8,370	45				59	1,330
05/07/79	6,010	5,890	78				73	1,160

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

06/25/79	96	85	98				39	9
07/24/79	68	70	98				49	9
08/14/79	86	72	77				83	16
09/19/79	1,010	329	97				140	124
10/16/79	41	41	97				12	1
11/23/79	1,170	1,170	92				73	231
12/12/79	516	91	100				133	33
01/23/80	1,330	1,350	79				138	503
02/06/80	106	106	99				23	7
03/05/80	105	105	100				42	12
04/08/80	554	557	89				26	39
05/20/80	4,900	5,050	56				103	1,400
06/17/80	30	29	98				24	2
07/09/80	111	111	98				32	10
08/20/80	90	90	100				41	10
09/23/80	147	147	69				30	12
10/15/80	150	149	96				19	8
11/05/80	22	22	97				11	1
12/10/80	53	51	100				36	5
01/07/81	38	36	99				16	2
02/18/81	36	36	99				15	2
03/11/81	36	35	97				30	3
04/08/81	22	21	98				24	1
05/19/81	117	106	99				121	35
06/09/81	454	451	98				116	141
07/21/81	44	43	88				34	4
08/10/81	14	14	94				12	0
09/02/81	579	591	98				165	263
11/10/81	2,100	2,090	81				124	700
01/04/82	79	79	98				36	8
03/31/82	1,250	1,240	99				63	211
05/10/82	70	67	82				77	14
08/04/82	19	19	80				14	1
09/02/82	19	19	100				6	0
12/01/82	1,230	1,240	93				117	392
03/07/83	1,080	1,040	81				64	180
05/17/83	754	746	95				94	189
08/03/83	37	36	99				19	2
11/29/83	91	89	90				25	6
01/19/84	102	102	98				10	3
03/05/84	489	530	97				64	92
05/08/84	31	27	99				21	2
08/21/84	31	30	97				23	2
11/27/84	241	195	94				60	32
01/15/85	121	121	92				13	4
05/22/85	48	47	96				17	2
07/30/85	26	26	96				4	0
11/06/85	169	170	96				54	25
02/12/86	366	352	96				93	88
05/07/86	193	192	74				100	52
08/06/86	30	33	97				57	5
11/12/86	109	111	92				38	11
02/18/87	813	915	83				70	173
05/19/87	53	52	83				40	6

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

08/17/87	24	24	99				23	2
11/10/87	35	36	93				27	3
02/17/88	77	76	98				12	3
05/24/88	34	32	88				21	2
08/23/88	20	21	98				17	1
11/29/88	206	206	93				6	3
02/14/89	82	84	93				30	7
05/03/89	44	30	98				20	2
08/09/89	53	53	98				24	3
11/28/89	27	27	70				26	2
03/13/90	273	298	96				61	49
07/18/90	26	25	97				25	2
08/15/90	18	17	93				20	1
11/27/90	23	22	87				9	1
02/27/91	791	769	84				31	64
06/03/91	196	136	97				45	17
08/19/91	24	23	93				26	2
02/20/92	245	249	99				35	24
05/26/92	153	163	98				72	32
07/15/92	38	38	79				17	2
08/26/92	29	30	86				25	2
01/13/93	3,920	4,040	50				103	1,120
06/07/93	37	36	56				37	4
08/17/93	24	22	95				13	1
09/09/93	28	28	99				10	1
12/13/93	85	76	98				19	4
05/24/94	23	71	98				19	4
07/20/94	24	23	98				19	1

Appendix A-2

USGS Historical Sediment Data (TSS) at Cypress Creek near Westfield

Appendix A-2 - Total Suspended Solid Data at Cypress Creek near Westfield, Texas
(Reference: USGS Station 08069000)

SAMPLE DATE	DISCHARGE AVG. (CFS)	DISCHARGE INST. (CFS)	SED. SIEVE DIAM. % FINER THAN .062mm	SED. SIEVE DAIM. % FINDER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM % FINER THAN 0.5mm	SEDIMENT SUSPENDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDED (T/DAY)
12/16/76	984	10					386	10
12/21/76	1,970	20					560	30
03/10/77	15	14					44	2
04/26/77	319	290					250	196
07/14/77	31	30					140	11
10/20/77	7	7					29	1
12/01/77	25	25					309	21
01/12/78	294	306					736	608
01/19/78	1,740	1,900					583	2,990
02/22/78	47	46					108	13
04/10/78	11	9					34	1
05/05/78	22	24					105	7
06/07/78	3,860	4,160					691	7,760
01/10/79	1,630	1,570					201	852
04/25/79	628	486					251	329
06/06/79	1,800	1,810					183	894
07/11/79	38	39					114	12
12/15/86	1,592	2,400	48	71	98	100	1,890	12,200
12/15/86	1,592	1,600	36	65	96	100	884	3,820
12/16/86	1,449	1,170	32	57	97	100	917	2,897
12/17/86	1,198	1,050	29	57	94	100	653	1,852
12/18/86	1,196	1,240	37	63	97	100	840	2,813
12/19/86	1,012	815	33	50	95	100	530	1,166
12/21/86	660	585	34	59	92	100	225	355
01/17/87	624	1,000	47	75	97	100	2,100	5,671
01/18/87	842	670	58	82	98	100	470	850
01/18/87	842	710	53	74	96	100	564	1,081
01/20/87	899	800	33	34	94	100	367	793
01/22/87	266	285	40	53	79	100	214	165
06/09/87	1,000	1,460	47	73	99	100	1,420	5,599
06/10/87	950	810	33	73	98	100	832	1,820
06/11/87	1,580	805	27	59	96	100	566	1,230
06/11/87	1,580	1,850	37	56	96	100	2,380	11,890
06/11/87	1,580	2,020	35	56	98	100	854	4,659
06/12/87	2,930	3,200	45	68	96	100	602	5,202
06/13/87	2,710	2,000	28	59	94	100	648	3,500
06/14/87	2,210	2,000	30	57	96	100	721	3,894
06/20/87	708	410	67	82	97	100	183	203
07/07/87	887	620	59	80	98	100	551	923
07/08/87	633	440	51	66	94	100	262	311
07/09/87	1,170	1,140	40	66	95	100	1,660	5,110
07/09/87	1,170	1,380	43	67	96	100	1,180	4,398
07/09/87	1,170	1,180	42	70	98	100	753	2,400
07/09/87	1,170	790	37	59	96	100	474	1,011
07/10/87	596	540	46	67	96	100	283	413
07/11/87	255	247	61	69	90	100	122	81
11/16/87	437	646	62	85	98	100	964	1,682
11/16/87	437	772	53	72	91	100	1,290	2,689
11/16/87	437	525	71	86	97	100	405	574
11/17/87	157	136	93	97	99	100	184	68
12/21/87	1,140	1,250	33	58	97	100	1,040	3,511
12/21/87	1,140	1,330	30	45	97	100	855	3,071
12/22/87	1,010	1,010	24	34	90	100	622	1,697
12/23/87	857	869	28	41	93	100	371	871
12/24/87	701	718	31	46	94	100	320	620
12/26/87	366	306	74	81	97	100	115	95
01/29/89	886	1,200	44	64	95	100	1,920	6,222
01/29/89	886	1,710	52	68	98	99	954	4,405
01/29/89	886	1,130	46	55	96	100	723	2,206
01/30/89	668	678	53	66	96	100	748	1,370
01/31/89	309	274	87	91	99	100	168	124
03/29/89	884	1,580	44	65	98	100	2,190	9,344
03/29/89	884	1,680	59	76	98	100	1,670	7,577
03/29/89	884	1,630	45	57	95	100	1,730	7,615

Appendix A-2 - Total Suspended Solid Data at Cypress Creek near Westfield, Texas
(Reference: USGS Station 08069000)

03/29/89	884	1,240	54	72	98	100	916	3,067
03/29/89	884	803	48	61	97	100	615	1,334
05/05/89	594	859	50	71	96	100	685	1,589
05/05/89	594	1,030	53	70	96	100	909	2,528
05/05/89	594	714	62	84	88	99	363	700
05/05/89	594	408	63	73	97	100	223	246
02/21/90	1,350	2,890	33	73	97	100	2,140	16,700
02/21/90	1,350	3,060	63	86	98	100	2,350	19,400
02/21/90	1,350	3,050	49	77	98	100	1,640	13,500
02/22/90	1,310	1,660	49	71	95	100	1,040	4,660
02/22/90	1,310	1,400	51	75	97	100	1,140	4,310
02/22/90	1,310	1,180	50	71	95	100	979	3,120
03/29/90	450	1,430	30	81	99	100	1,480	5,710
03/29/90	450	1,510	43	78	98	99	1,610	6,560
03/29/90	450	1,450	44	86	99	100	1,340	5,250
03/30/90	529	751	52	81	98	99	500	1,010
03/30/90	529	615	59	83	97	100	430	714
03/30/90	529	497	65	83	98	99	386	518
04/26/90	743	2,230	57	76	97	100	1,990	12,000
04/26/90	743	2,350	48	74	98	100	1,500	9,520
04/26/90	743	2,210	50	76	98	100	943	5,630
04/27/90	868	1,200	44	71	97	100	505	1,640
04/27/90	868	979	37	65	97	99	558	1,470
04/27/90	868	780	40	69	95	100	428	901

Appendix B - Technical Analyses/Calculations

Appendix B-1

Analysis of Sedimentation Effects on FEMA 100-Yr Flood Level and Channel Cross-Sections (Exhibits 1 to 15)

EXHIBIT 1

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 3.62 MI, Line A

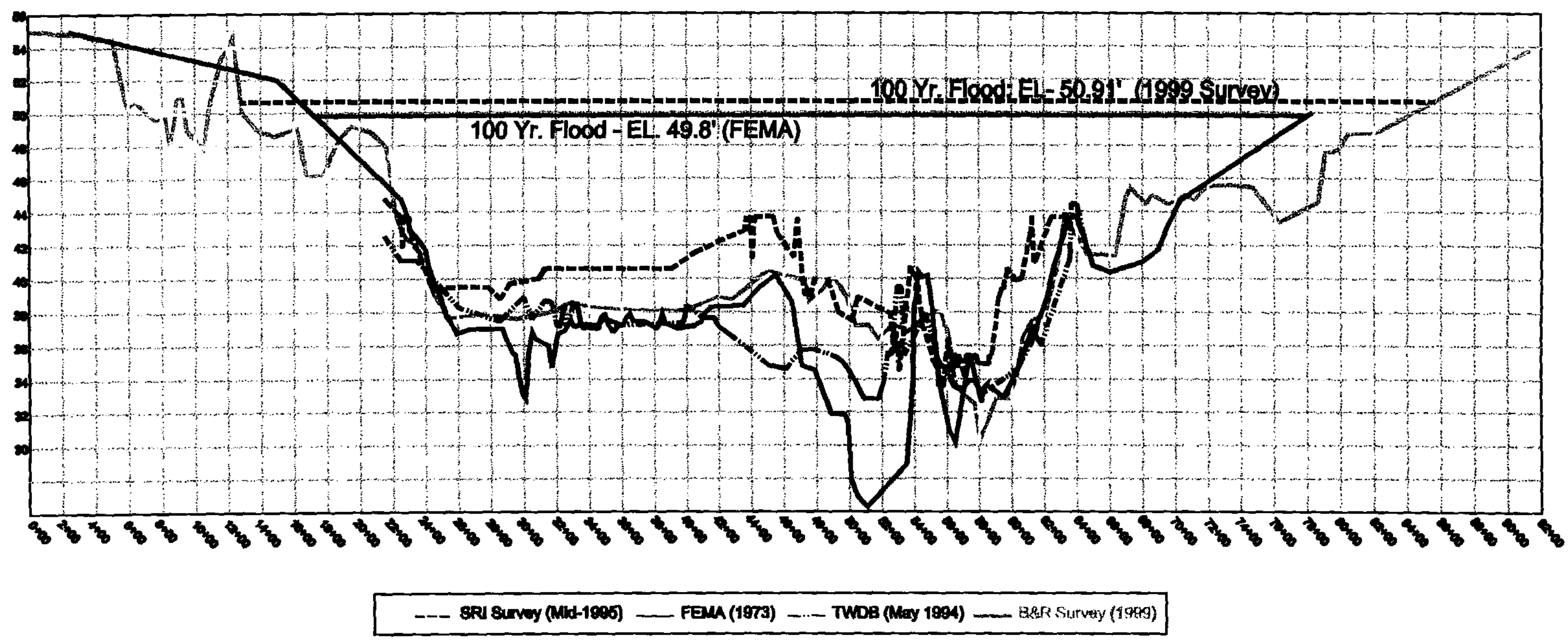


EXHIBIT 2

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 4.75 MI, Line B

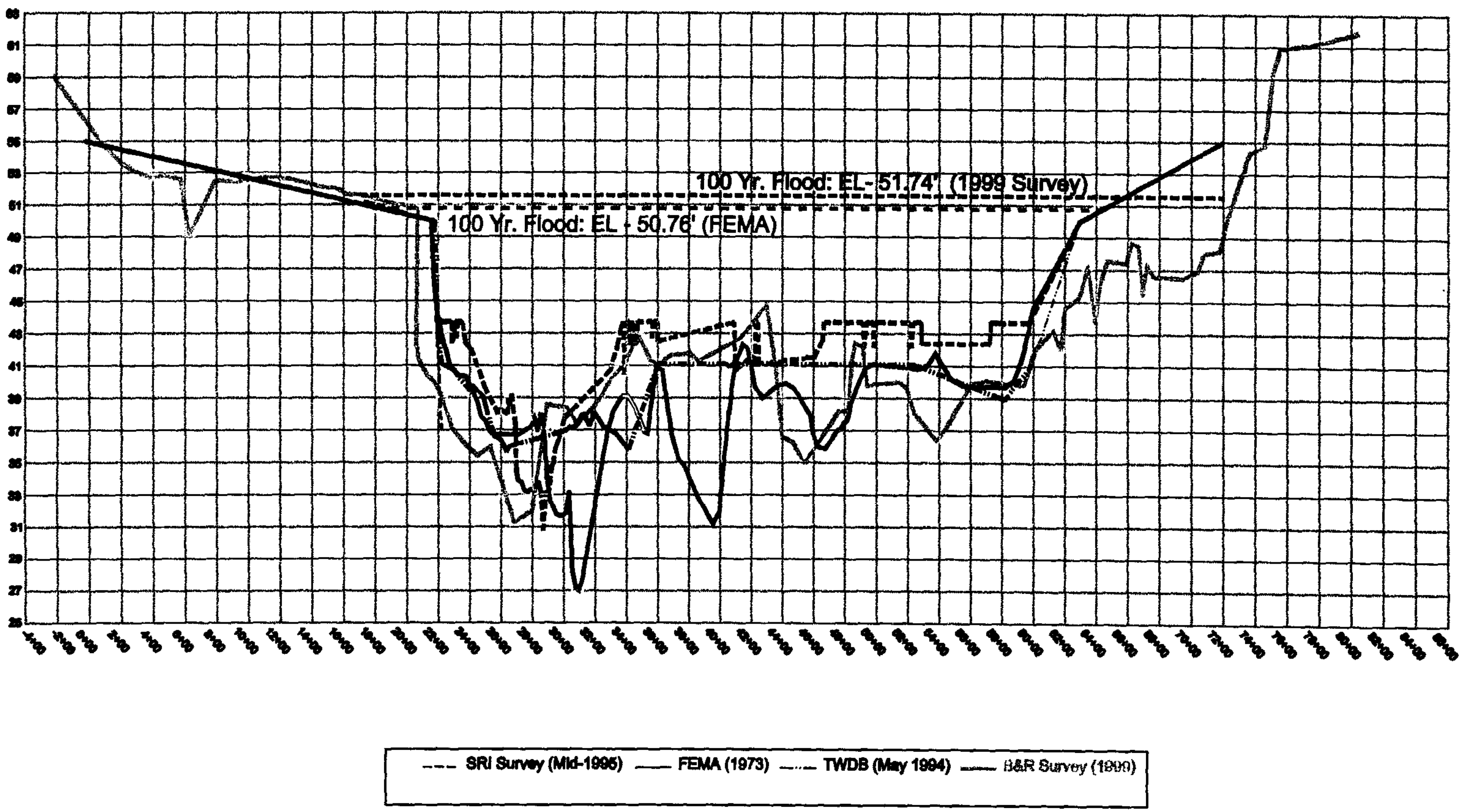


EXHIBIT 3

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 5.037 MI, Bridge Lake Houston Parkway

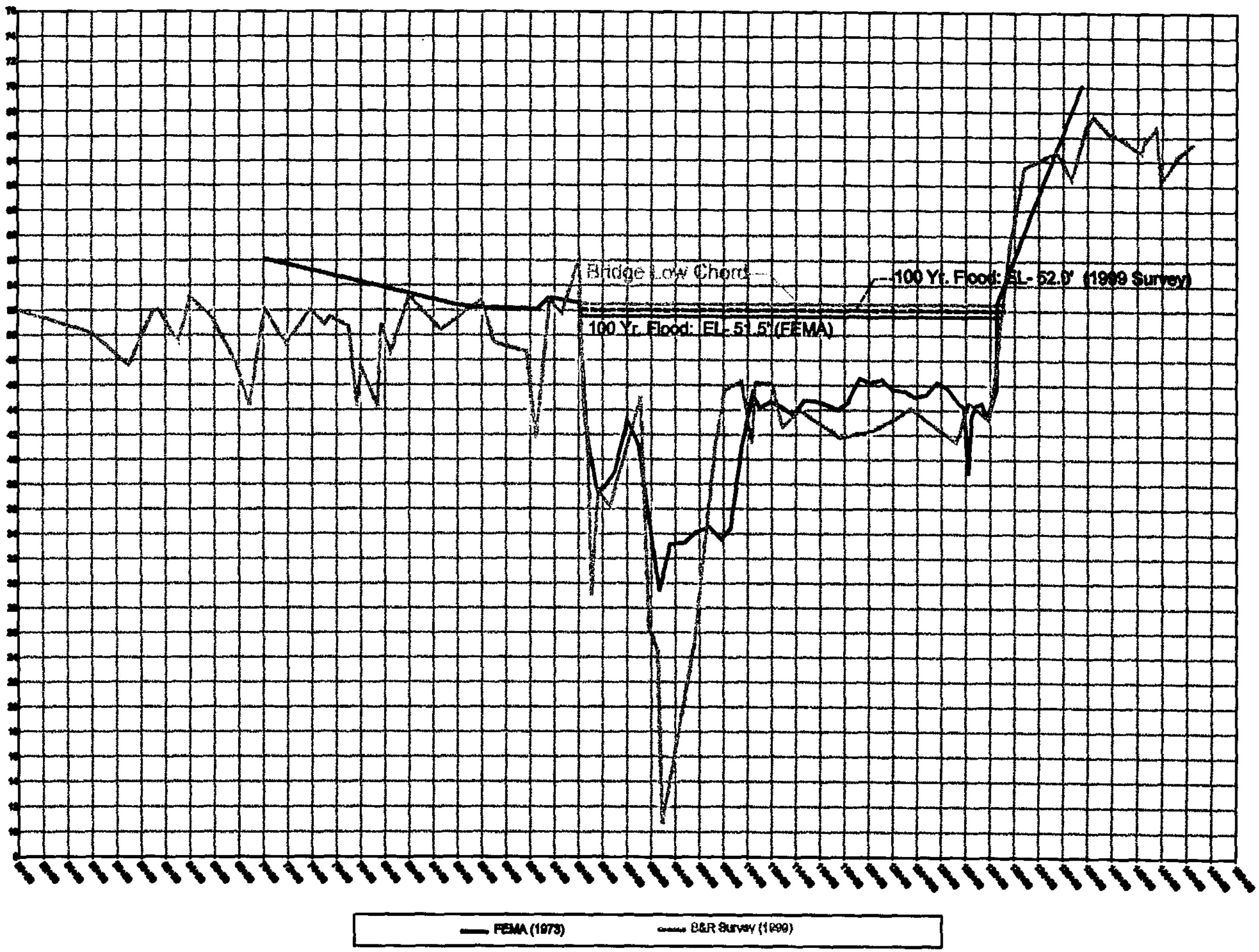


EXHIBIT 4

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 5.585 MI, Line C

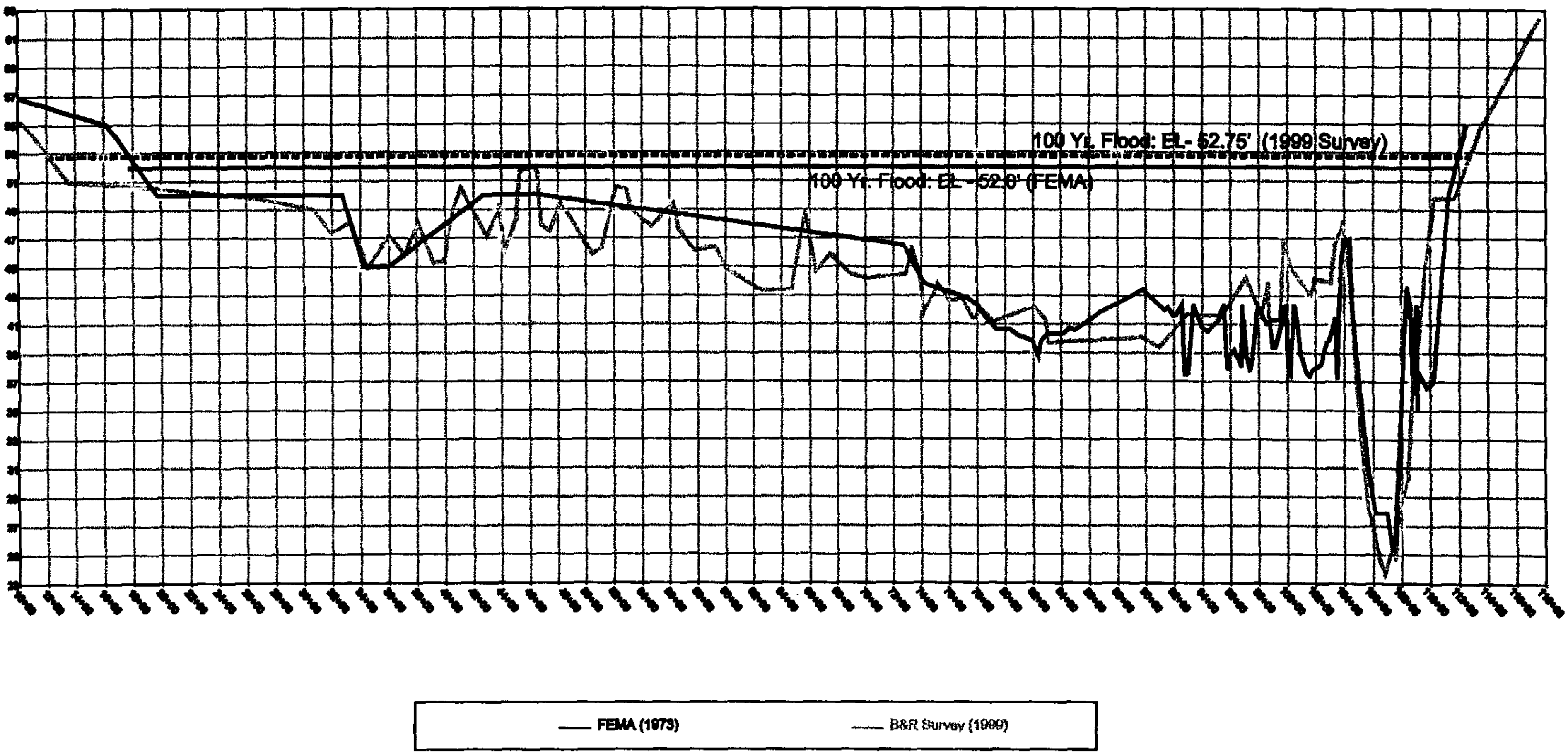


EXHIBIT 5

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 6.42 MI, Line D

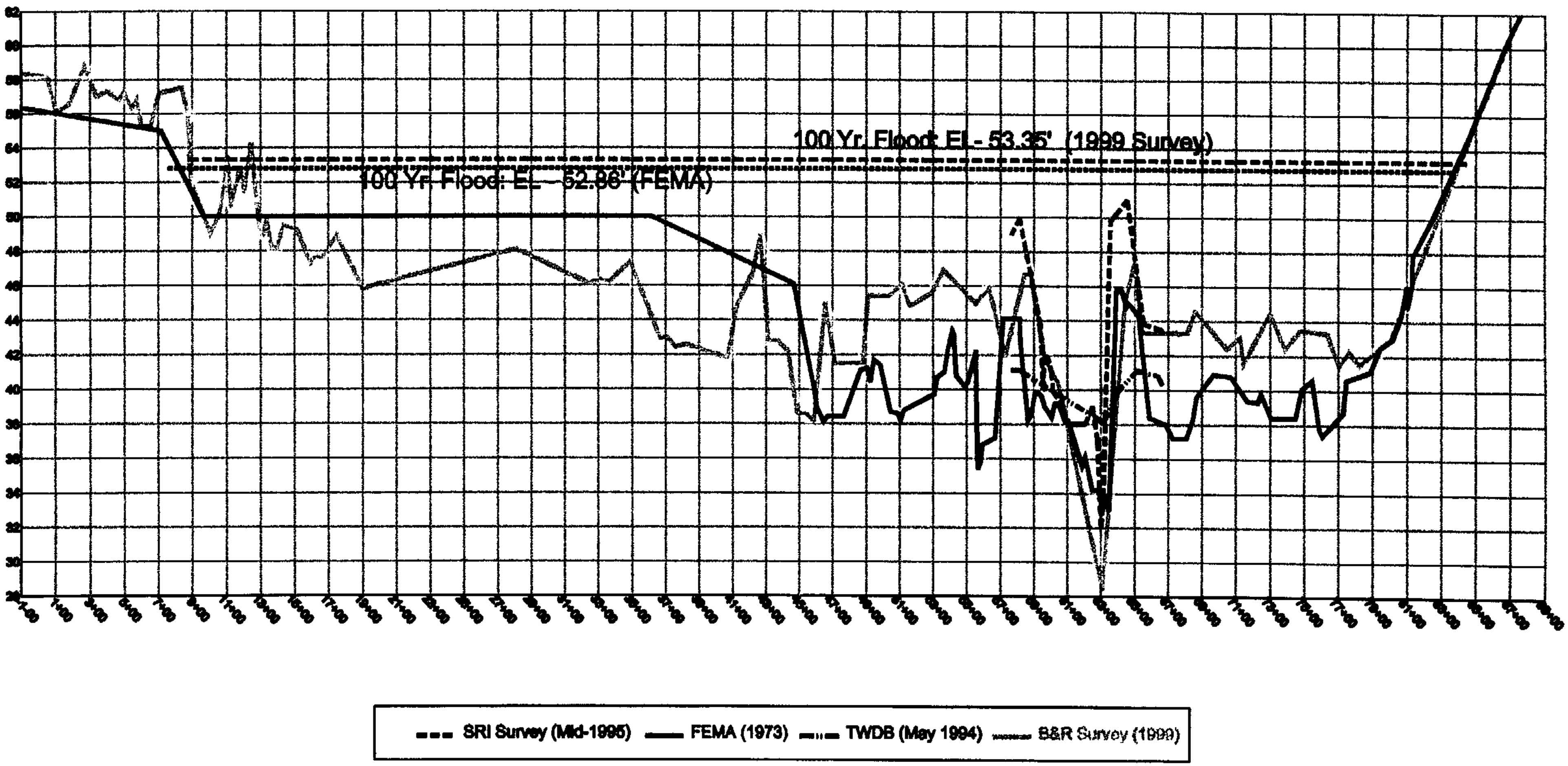


EXHIBIT 6
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 7.09 MI, Line E

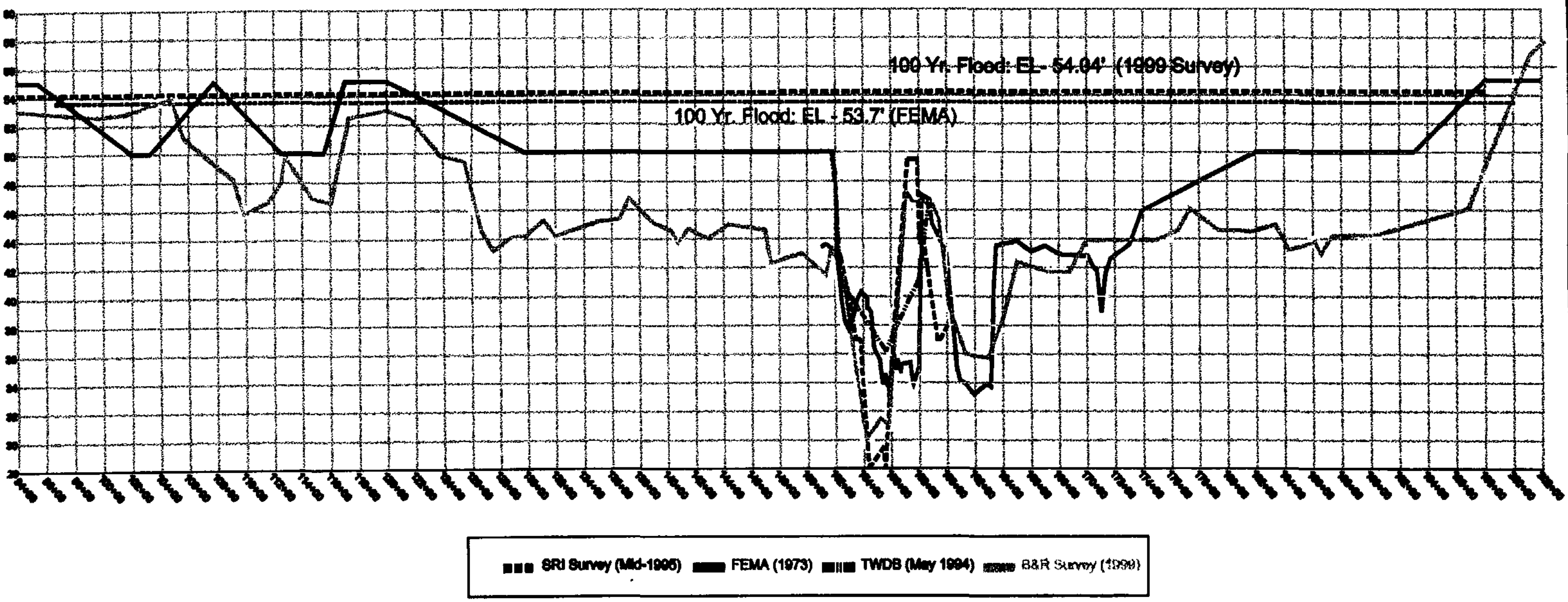


EXHIBIT 7

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 7.47 MI, Line F

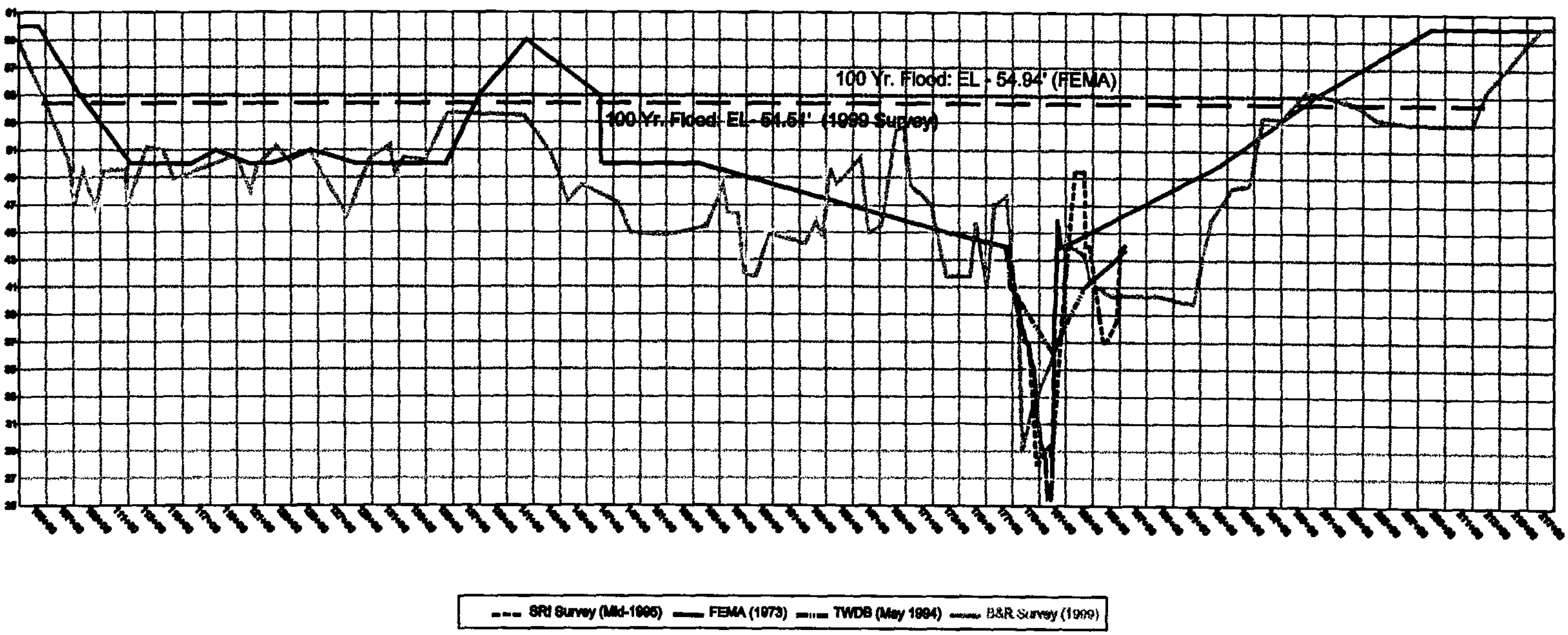


EXHIBIT 8

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 8.49 MI, Line G

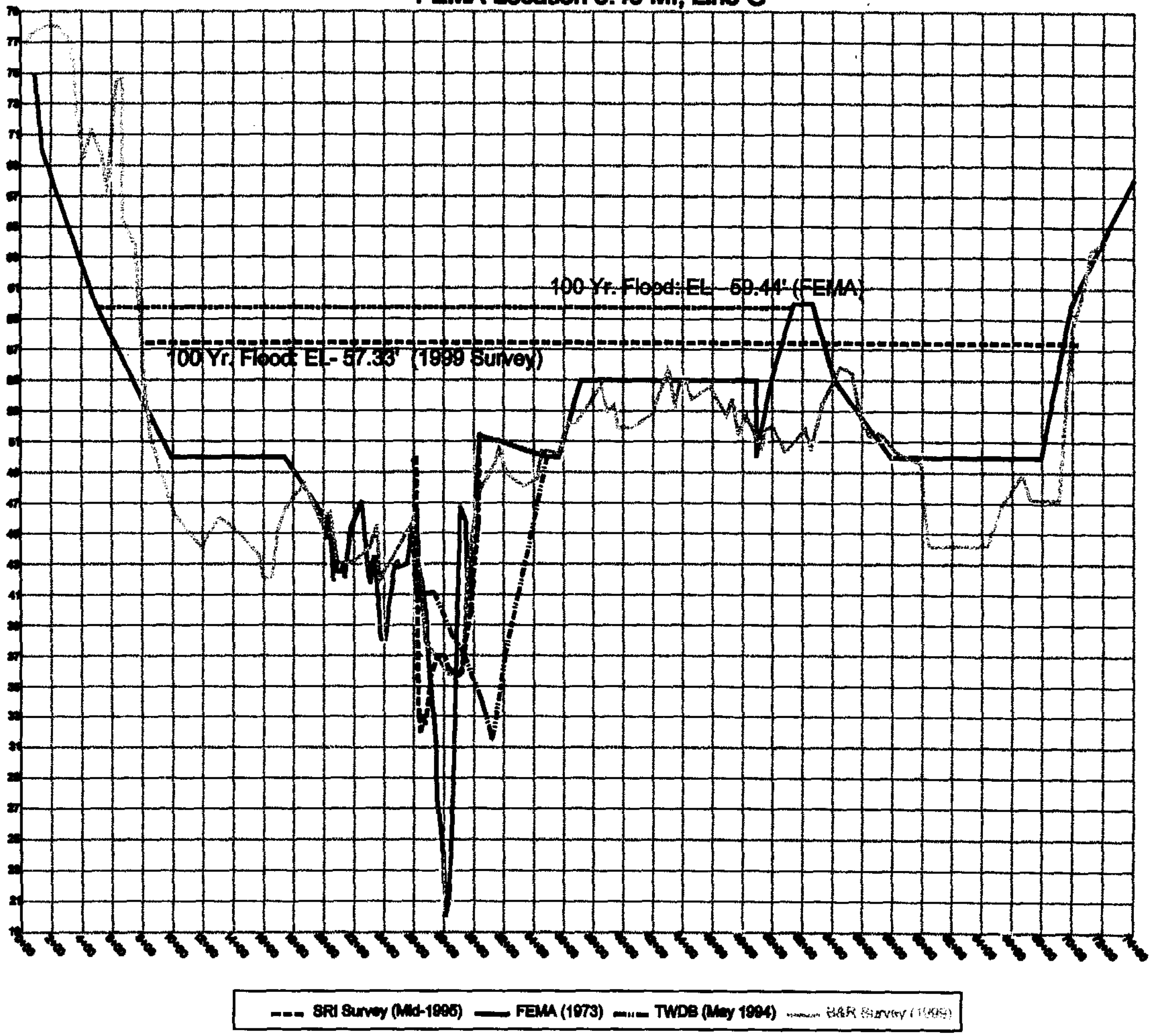


EXHIBIT 9
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 9.410 MI, Line H

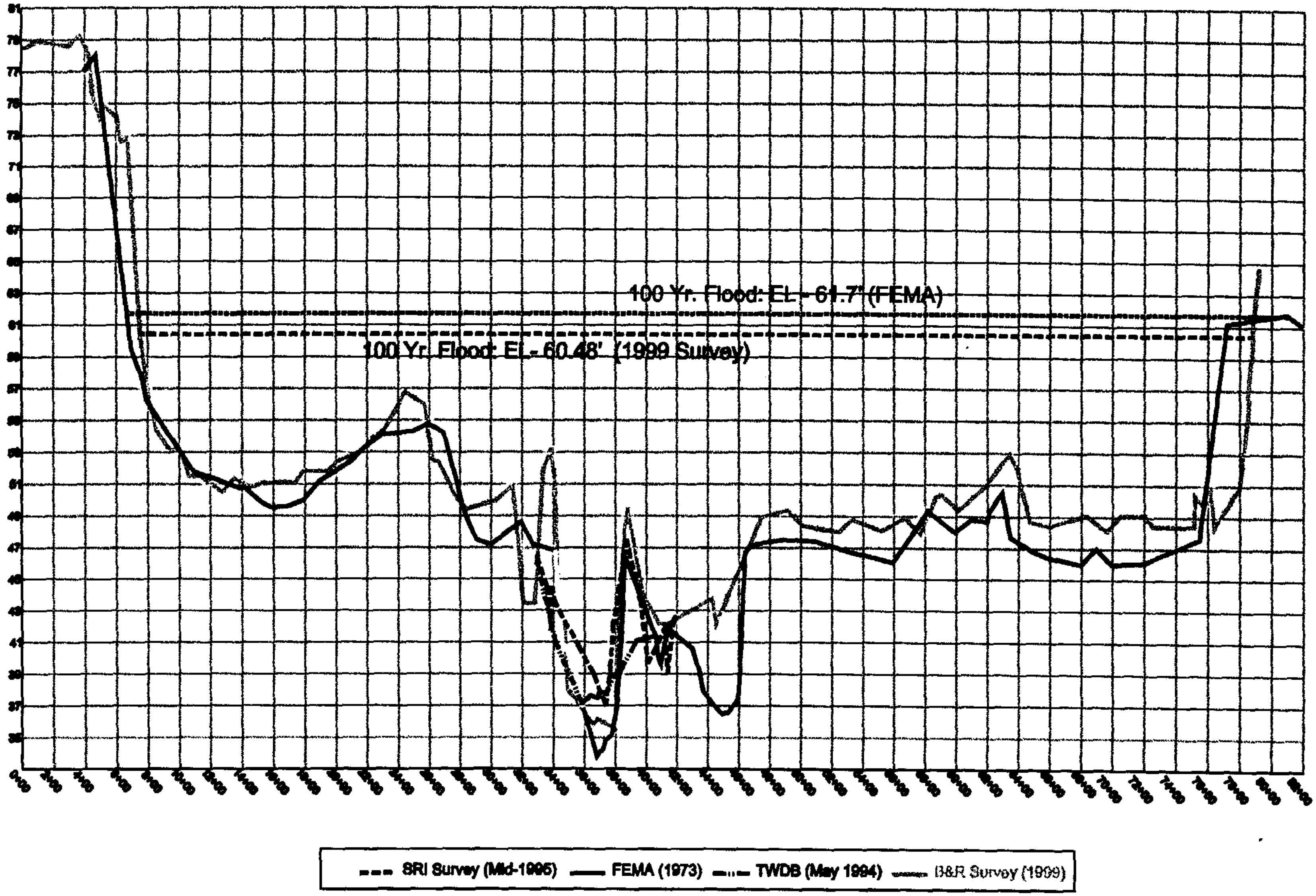


EXHIBIT 10
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 10.58 MI, Line I

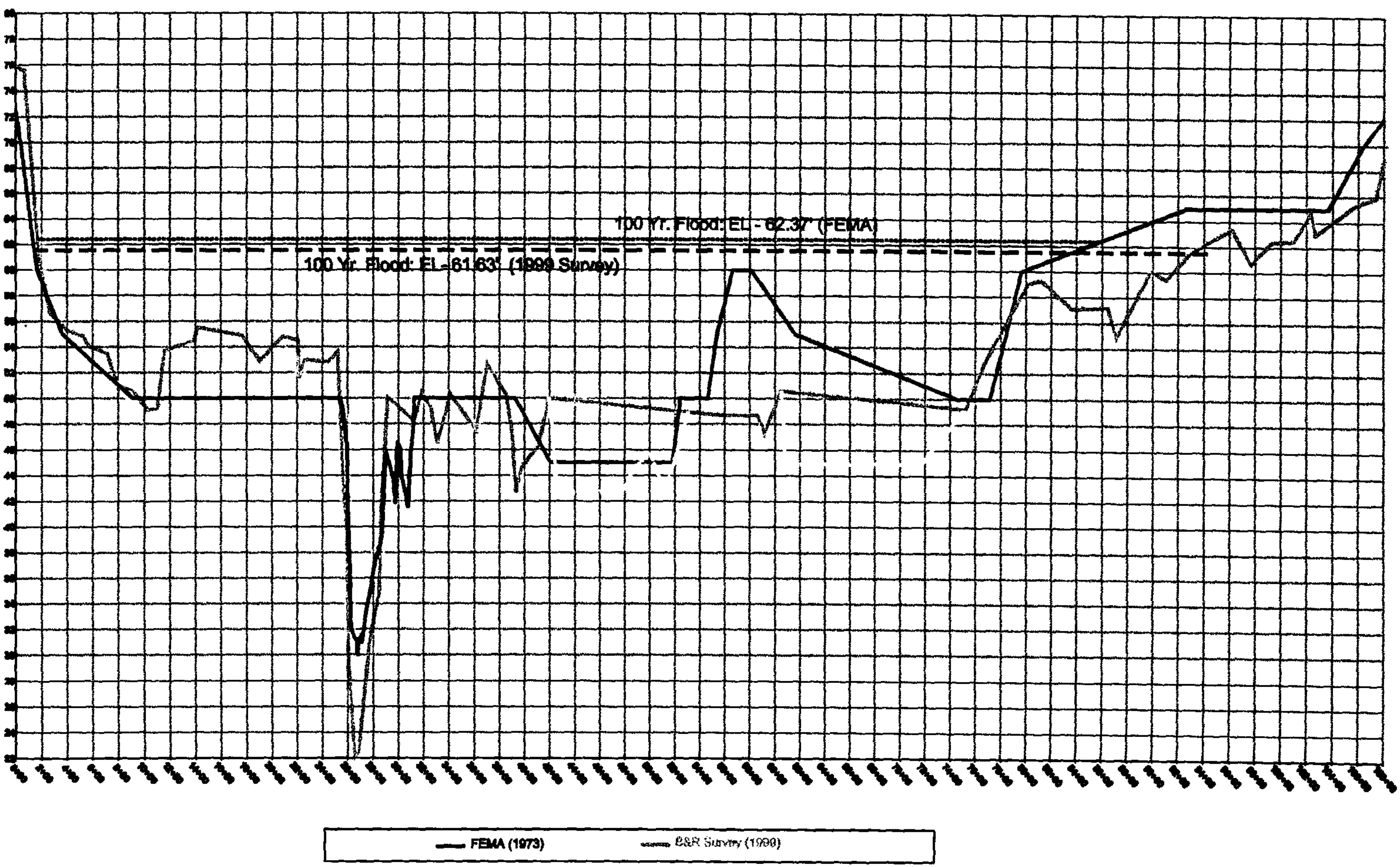


EXHIBIT 11

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 10.86 MI, Line J

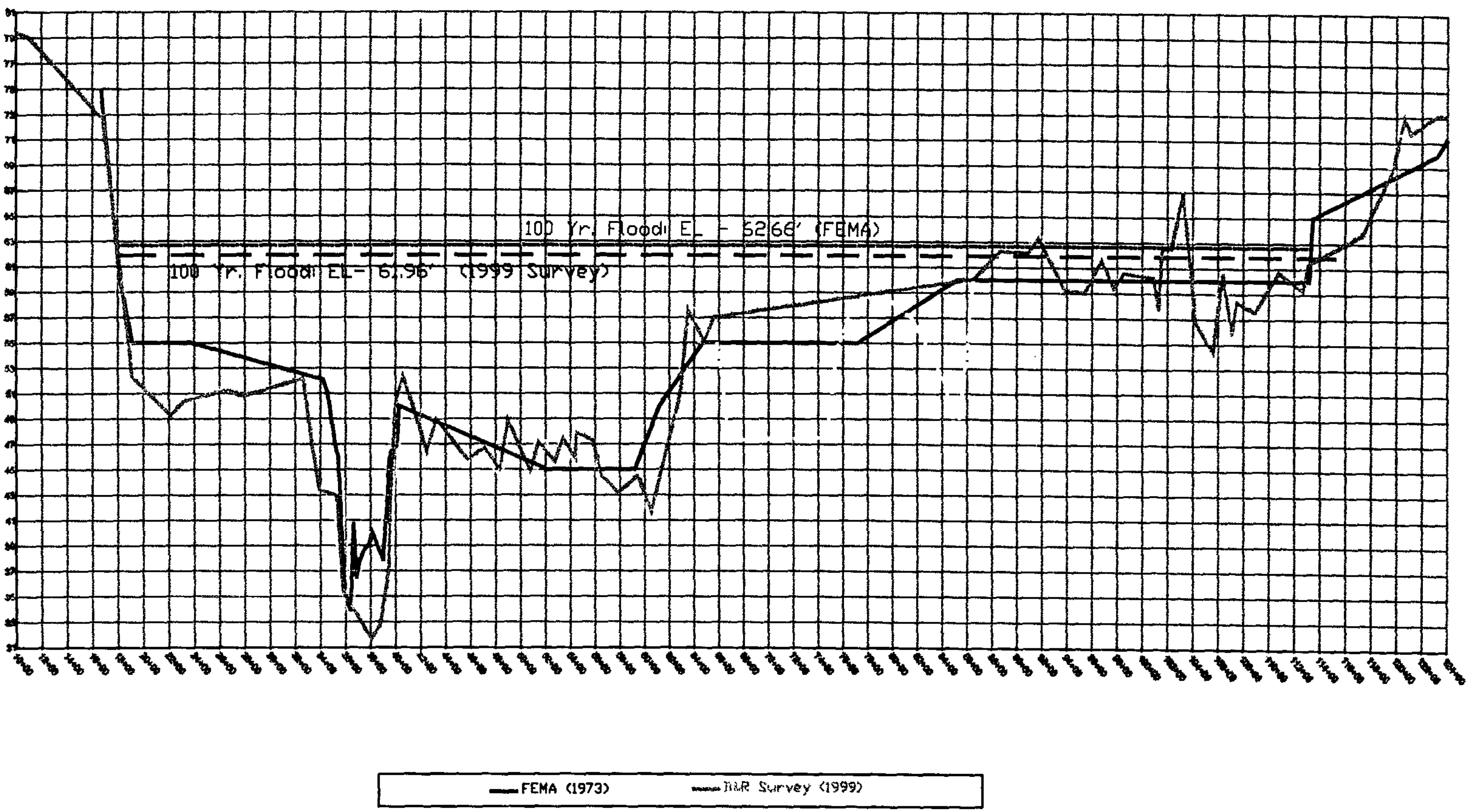


EXHIBIT 12
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 11.09 MI, Line K

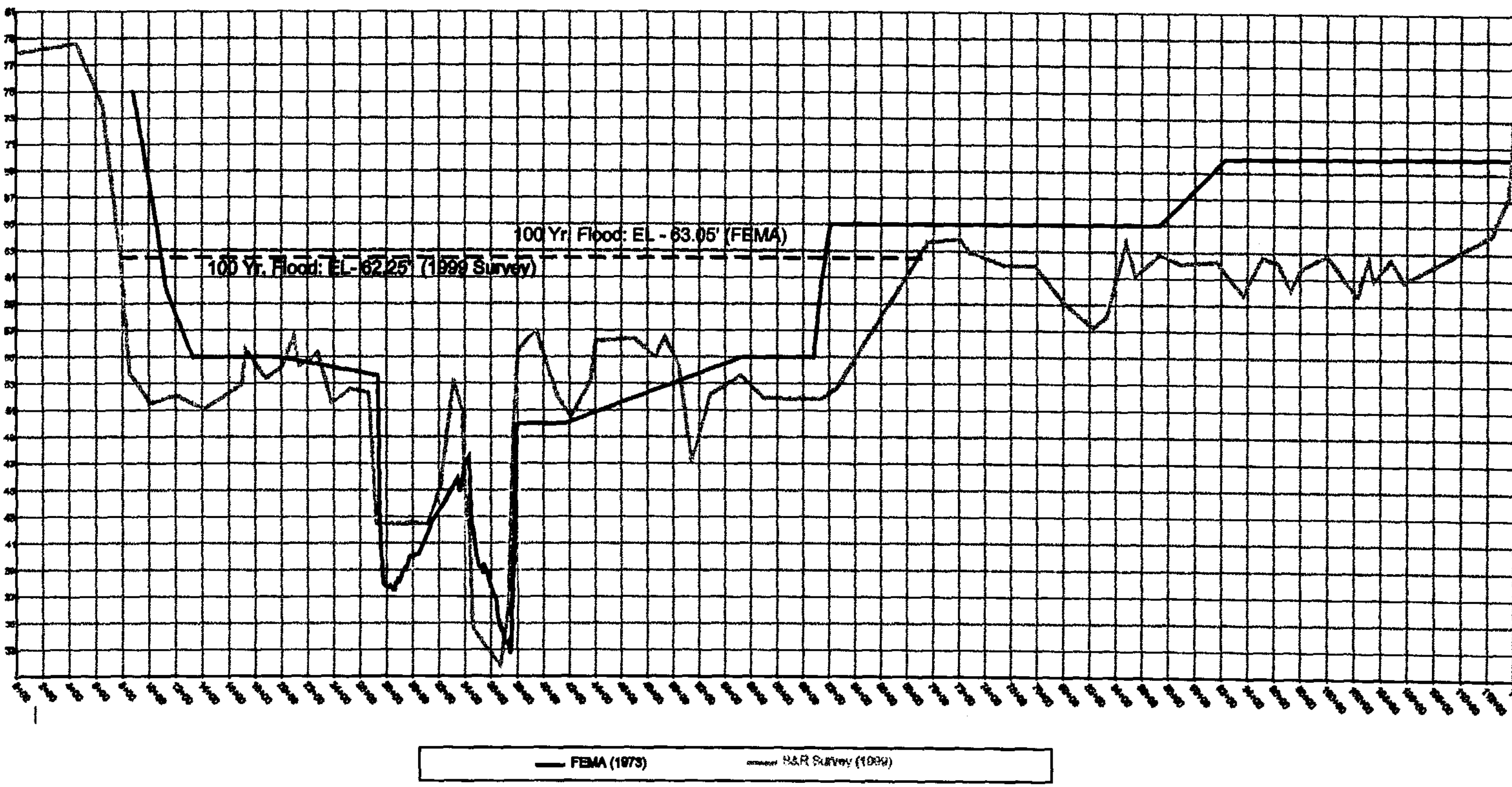


EXHIBIT 13

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.35 MI, Line L

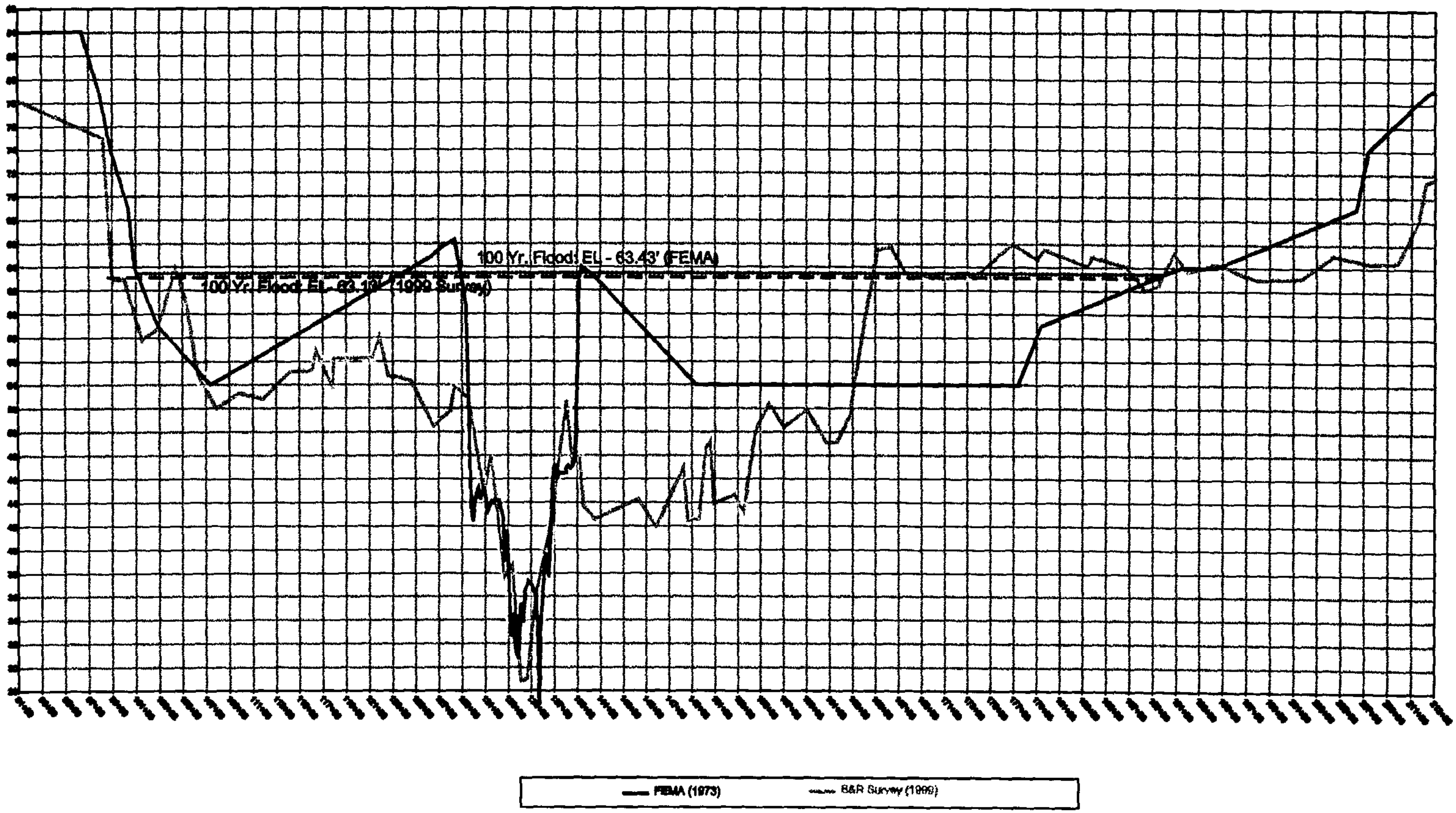


EXHIBIT 14

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.48 MI, Line M

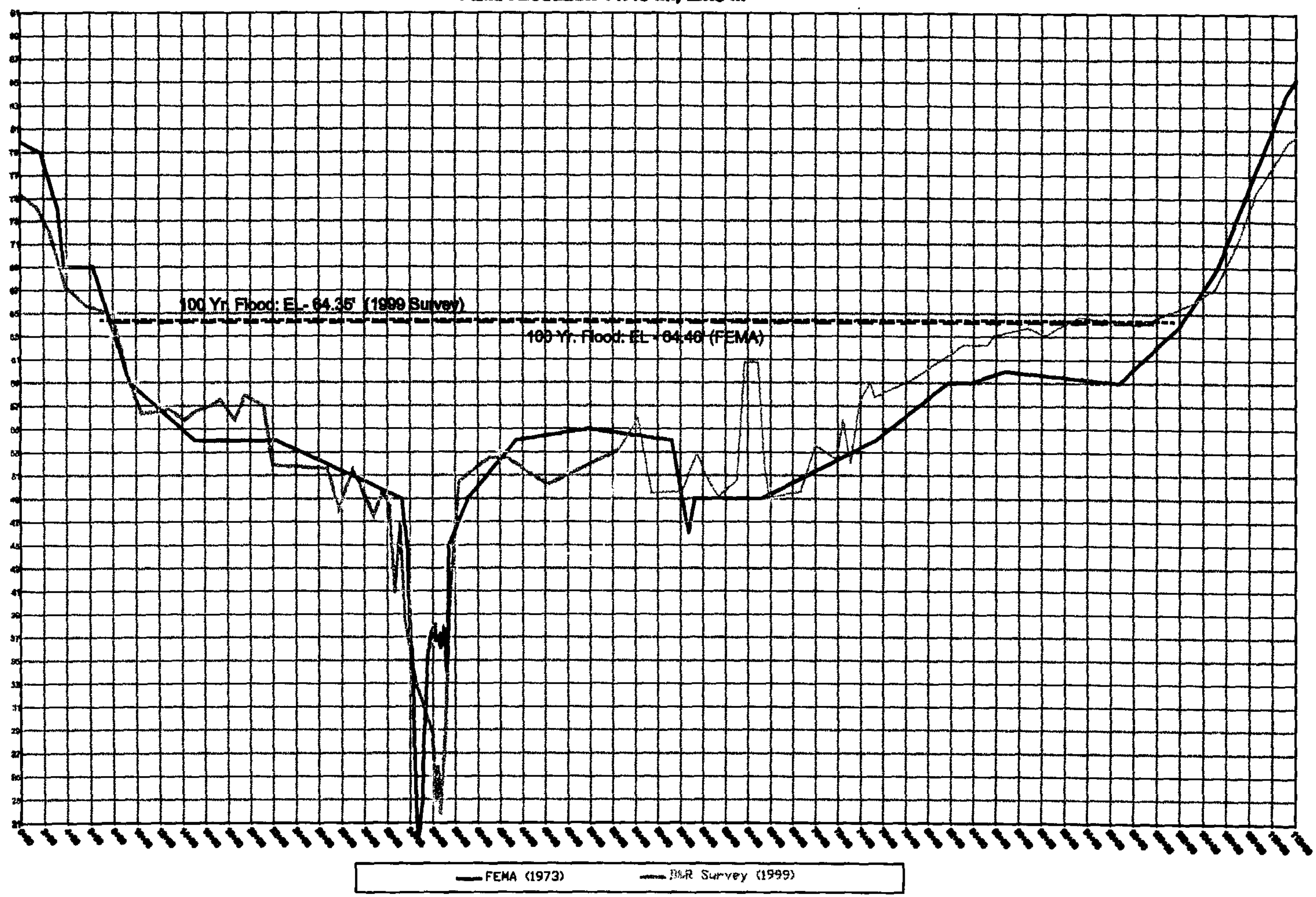
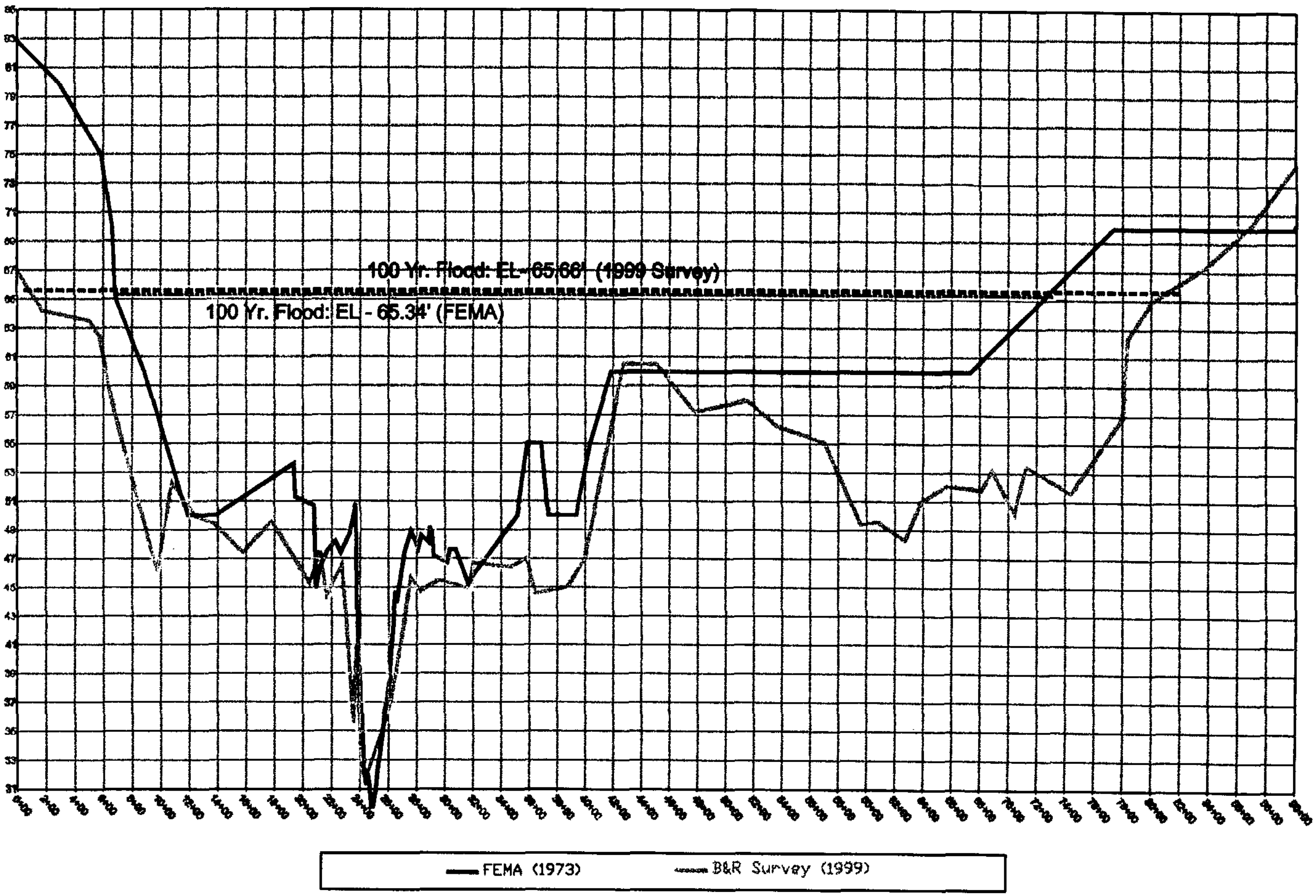


EXHIBIT 15

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 11.97 MI, Line N



Appendix B-2 HEC-2 Model Output (1999 Survey)

HEC-2 Output

West Fork Channel (FEMA Reach 3; 1999 B&R Survey)

```
1*********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES               *          * U.S. ARMY CORPS OF ENGINEERS         *
*                                            *          * HYDROLOGIC ENGINEERING CENTER        *
* Version  4.6.2;  May 1991                  *          * 609 SECOND STREET, SUITE D           *
*                                            *          * DAVIS, CALIFORNIA 95616-4687         *
* RUN DATE   14MAR00   TIME   19:02:53       *          *       (916) 756-1104                 *
*********************************************          ****************************************




                     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
1
  14MAR00    19:02:53                                                  PAGE   1



                                        THIS RUN EXECUTED 14MAR00    19:02:53
 ***********************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
 ***********************************
1999 B&R Survey -- West Fork (FEMA Reach 3)
Using Higher Starting Water Elev. than FEMA Orig. Pool WSELs from Result of Reach 2 (Lake Houston)
File: BRSREVR.OH2

T1    CF-0033 BROWN & ROOT SERVICES,  Revised X3 Encrochments 02/25/2000
T2    Lake Houston HEC-2 MODEL, REACH 3 (1999 Survey)
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1  ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS    Q     WSEL    FQ

      0       2       0                               46.66

J2  NPROF    IPLOT   PRFVS   XSECV   XSECH    FN     ALLDC    IBW    CHNIM   ITRACE

      1       0      -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150      7      55      56      26      25       4      35      60      59

J6  IHLEQ    ICOPY   SUBDIV  STRTDS   RMILE

      1


QT      4     66800    143300    174300    333600
NC   0.12      0.12      0.03        .1        .3
X1  3.615        89   2366.85   6330.06
X3     10               1232.04      54.7
GR   55.6         0      55.2        90      54.9    161.12      54.8    318.29      54.5       400
GR   54.5    505.44      50.4     590.1      50.7    644.14      49.6    763.76      49.8    821.19
GR   47.9    853.74      50.9    895.11        51    927.61        49    951.75      47.9    1054.3
GR   50.3   1085.94      53.3   1160.37      54.7   1232.04      50.1   1287.74        49   1373.79
GR   48.6   1482.72      49.1   1622.28      46.2   1678.02      46.3   1781.82      48.3   1866.53
GR   49.2    1949.4      48.8   2075.16      47.9   2163.11      43.8   2220.71      42.6   2269.24
GR   41.6   2366.85      40.6   2391.75        39   2452.47      37.7   2548.87      37.9   2765.45
```

```
GR   37.6  2952.69     38  3157.81    38.6  3299.81    38.3  3413.04    38.1  3746.92
GR   38.1  3993.99   38.9  4185.79    38.8  4286.36    40.5  4499.72    39.9   4728.9
GR   38.6  4754.82   40.1   4907.5 40.4627 4943.023    38.9  4984.51    37.2  5041.95
GR   37.2  5119.68   36.4  5177.29    37.3  5277.11    36.8  5355.15    38.1  5518.64
GR   37.9  5567.34   36.5  5613.59    33.5   5655.2    32.5   5769.5    30.3  5803.47
GR   32.8  5902.24   32.8   5982.5    34.2  6030.84    36.5  6067.52    37.5   6124.9
GR   37.8  6207.91   40.5  6273.13    43.8  6330.06    41.5  6462.94    41.4  6636.96
GR   44.8  6697.83   45.5  6728.93    44.5  6819.63      45  6861.77    44.5  6960.04
GR   44.8  7029.56  45.05     7060    44.7  7115.34    45.4  7181.81    45.6     7240
GR   45.6     7360   45.5   7468.6    43.4  7632.04    44.6  7864.56    47.6  7908.88
GR   47.7  7982.52   48.7  8044.72    48.8     8220    55.8     8990
1
 14MAR00    19:02:53                                                 PAGE   2


QT      4    66160   140750   173330   329800
X1  4.745       84   2373.4  6703.71     3600     4500     5966
X3     10               1973.39     52  6985.59     48.6
GR  60.92        0     54.6      450    53.45      570    53.05      630     52.6      740
GR   52.7      830     52.5      930       52   989.14    52.45     1150     52.3  1284.73
GR   52.6  1434.66     52.6     1560    52.45     1730     52.3  1836.38    52.05     1940
GR     52  1973.39     51.1   2373.4     43.3     2385     39.8  2559.76       37  2645.83
GR     36  2728.22     35.3  2809.02     35.9  2887.92     31.2  3041.01     31.9  3156.16
GR   38.5  3253.79     38.3  3378.72     37.2  3446.92     38.7  3576.68     40.1  3661.26
GR     41   3745.2     42.8  3831.04     41.2  3910.34       41  3973.54     41.5  4029.61
GR   41.7   4160.5     41.2  4216.44     42.6   4487.7     44.7  4656.69     40.7  4714.42
GR   36.5     4755     36.2     4820     34.9     4900     38.1     5120     38.1     5180
GR   41.1     5200     42.3     5222     42.1     5272     39.7     5300     39.9     5500
GR   39.6     5550       38     5600     36.3     5740       37     5800     39.8  5962.55
GR     40  6057.51     39.7  6300.58       42  6371.11     43.1  6486.54       44  6532.85
GR   44.5  6559.55     45.2  6653.68     47.2  6703.71       47  6753.55     47.1  6787.33
GR   47.5  6829.55     47.3  6947.51     48.6  6985.59     48.4  7027.77     47.3  7052.29
GR   47.2  7079.78     46.5  7122.32     46.4  7303.07     46.8  7395.37     47.9  7436.05
GR   48.1   7535.6     50.2  7585.83     54.2  7722.58     54.7  7816.27     59.2  7868.73
GR   60.8  7911.42       61   8096.6     61.5     8298     61.8     8402

QT      4    65990   140170   173080   328820
NC   0.12     0.12     0.03      0.3      0.5
X1  5.026       82    10508    14400     1030     4150     1482   0.9135
X3     10
GR   70.3        0     60.1      847     55.1     4325     50.1     6125     47.5     6457
GR   51.9     6672       52     6723     49.3     6899       53     7002     51.3     7207
GR   47.8     7406     44.3     7535     50.7     7643       52     7675     49.2     7860
GR   50.7     7983       52     8074     50.8     8207     51.4     8253     50.6     8427
GR   44.2     8495     47.4     8539     44.2     8686     50.9     8716     48.5     8805
GR   53.1     8968     50.3     9257     52.8     9627     49.3     9739     48.6    10032
GR   41.6    10121     52.8    10240     51.6    10351     56.2    10508     49.2    10531
GR   44.1    10549     41.8    10584     28.9    10622     37.4    10682     36.1    10792
GR   37.9    10846     41.3    10953       45    11066     26.5    11142     24.4    11222
GR   17.9    11240     14.8    11250     10.6    11262     21.6    11486     24.9    11552
GR   41.3    11749     45.5    11830     46.2    11981     44.7    12010     41.2    12077
GR   46.2    12110       46    12265     42.6    12356     43.9    12514     41.7    12874
GR   42.3    13169     43.2    13369     44.1    13509     41.3    13921     44.5    14033
GR   43.9    14119     43.1    14221     47.6    14283       57    14400     63.4    14532
GR   64.7    14822     62.5    14960     66.5    15076     67.6    15152     66.1    15301
GR   65.8    15393     64.6    15581     65.5    15601     66.7    15706     62.2    15750
GR   64.2    15886     65.4    16039

NC    .12      .12    0.030
X1  5.027      100    10508    14300        1        1        1   0.9135
X3     10
X2      0        0        0     52.5    58.25
GR   70.3        0     60.1      847     50.1     6125     40.8     6399       52     6703
GR     53     6993     43.8     7631       52     7675     50.6     8427     44.2     8495
GR   53.1     8968     50.3     9257     52.8     9627     49.3     9739     48.6    10032
GR   41.6    10121     56.2    10508     28.9    10622     37.4    10682     52.5    10683
GR   52.5    10689     37.4    10689     36.1    10792     37.9    10846     41.3    10953
GR   52.5    10953     52.5    10959     41.3    10959       45    11066     26.5    11142
1
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GR   24.4   11222   17.9   11240   50.4   11240   52.5   11241   52.5   11250
GR   10.6   11262   21.3   11480   52.5   11480   52.5   11486   21.6   11486
GR   24.9   11552   24.4   11708   52.5   11708   52.5   11714   24.4   11714
GR   24.4   11732   45.5   11830   46.2   11981     45   12004   52.5   12004
GR   52.5   12010   44.7   12010   41.2   12077   46.2   12110   46.1   12162
GR   52.5   12163   52.5   12169   46.1   12169   42.6   12356   43.5   12463
GR   52.5   12463   52.5   12469   43.5   12469   43.9   12514   41.2   12621
GR   41.3   12663   52.5   12663   52.5   12669   41.3   12669   41.7   12863
GR   52.5   12863   52.5   12869   41.7   12869   42.3   13163   52.5   13163
GR   52.5   13169   42.3   13169   43.2   13363   52.5   13363   52.5   13369
GR   43.2   13369   44.1   13509   41.3   13581   41.3   13663   52.5   13663
GR   52.5   13669   41.3   13669   41.3   13863   52.5   13863   52.5   13869
GR   41.3   13869   41.3   13921   44.5   14033   43.9   14113   52.5   14113
GR   52.5   14119   43.9   14119   43.1   14221     56   14300   66.8   14676

X1  5.034      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03
X1  5.035     82  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.037     82  10508  14400      8      8      8  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
1
```



```
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.038    100  10508  14300      1      1      1  0.9135
X3     10
X2      0      0      0   52.5  58.25
```

```
GR   70.3      0   60.1    847    50.1   6125    40.8   6399     52    6703
GR     53   6993   43.8   7631     52    7675    50.6   8427   44.2    8495
GR   53.1   8968   50.3   9257   52.8    9627    49.3   9739   48.6   10032
GR   41.6  10121   56.2  10508   28.9   10622    37.4  10682   52.5   10683
GR   52.5  10689   37.4  10689   36.1   10792    37.9  10846   41.3   10953
GR   52.5  10953   52.5  10959   41.3   10959     45   11066   26.5   11142
GR   24.4  11222   17.9  11240   50.4   11240    52.5  11241   52.5   11250
GR   10.6  11262   21.3  11480   52.5   11480    52.5  11486   21.6   11486
GR   24.9  11552   24.4  11708   52.5   11708    52.5  11714   24.4   11714
GR   24.4  11732   45.5  11830   46.2   11981     45   12004   52.5   12004
GR   52.5  12010   44.7  12010   41.2   12077    46.2  12110   46.1   12162
GR   52.5  12163   52.5  12169   46.1   12169    42.6  12356   43.5   12463
GR   52.5  12463   52.5  12469   43.5   12469    43.9  12514   41.2   12621
GR   41.3  12663   52.5  12663   52.5   12669    41.3  12669   41.7   12863
GR   52.5  12863   52.5  12869   41.7   12869    42.3  13163   52.5   13163
GR   52.5  13169   42.3  13169   43.2   13363    52.5  13363   52.5   13369
GR   43.2  13369   44.1  13509   41.3   13581    41.3  13663   52.5   13663
GR   52.5  13669   41.3  13669   41.3   13863    52.5  13863   52.5   13869
GR   41.3  13869   41.3  13921   44.5   14033    43.9  14113   52.5   14113
GR   52.5  14119   43.9  14119   43.1   14221     56   14300   66.8   14676

X1  5.045      0      0      0     47      47      47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03    0.1    0.3
X1  5.046     82  10508  14400      1       1       1  0.9135
X3     10
GR   70.3      0   60.1    847    55.1   4325    50.1   6125   47.5    6457
GR   51.9   6672     52   6723    49.3   6899     53    7002   51.3    7207
GR   47.8   7406   44.3   7535    50.7   7643     52    7675   49.2    7860
GR   50.7   7983     52   8074    50.8   8207    51.4   8253   50.6    8427
GR   44.2   8495   47.4   8539    44.2   8686    50.9   8716   48.5    8805
GR   53.1   8968   50.3   9257    52.8   9627    49.3   9739   48.6   10032
GR   41.6  10121   52.8  10240    51.6  10351    56.2  10508   49.2   10531
GR   44.1  10549   41.8  10584    28.9  10622    37.4  10682   36.1   10792
GR   37.9  10846   41.3  10953     45   11066    26.5  11142   24.4   11222
GR   17.9  11240   14.8  11250    10.6  11262    21.6  11486   24.9   11552
GR   41.3  11749   45.5  11830    46.2  11981    44.7  12010   41.2   12077
GR   46.2  12110     46  12265    42.6  12356    43.9  12514   41.7   12874
GR   42.3  13169   43.2  13369    44.1  13509    41.3  13921   44.5   14033
GR   43.9  14119   43.1  14221    47.6  14283     57   14400   63.4   14532
GR   64.7  14822   62.5  14960    66.5  15076    67.6  15152   66.1   15301
GR   65.8  15393   64.6  15581    65.5  15601    66.7  15706   62.2   15750
GR   64.2  15886   65.4  16039
1
  14MAR00    19:02:53                                          PAGE   5


QT      4   65680   139080   172610   326970
NC   0.12    0.12     0.03      0.1      0.3
NH      4    0.12   6565.8     0.04  10389.97    0.03  11165.02    0.12  11754.54
X1  5.585      92  10389.97  11165.02     2664     1744     2847
X3     10
GR  62.75        0      55      1050      51     1350     50.4     2130    49.8     2670
GR   49.3     2940      49   3070.97    47.4  3189.37     48.1  3332.69    44.9  3448.15
GR   47.2  3606.21    45.8   3712.03    48.1   3809.2     45.3  3910.28    45.4   3992.9
GR   48.9  4050.05    50.5   4111.66    47.1  4292.93      49  4377.98    46.2  4426.95
GR   48.4  4503.41    51.7   4528.08      52   4646.6     47.9  4680.17    47.5  4744.32
GR   49.6  4816.31    45.9   5042.82    46.4  5114.46     50.6  5214.31    50.4  5290.11
GR     49   5321.9    47.8   5469.67    49.5  5630.79     47.7  5658.97    46.1  5777.87
GR   46.4  5924.67    44.8   6004.29    43.3  6258.57     43.5  6470.87    48.9   6565.8
GR   44.7  6646.34    45.9   6743.32    44.5  6892.24     44.2  7009.22    44.5  7289.15
GR   46.4  7330.53    44.3   7392.93    41.7  7412.88     43.8   7516.5    42.6  7594.69
GR   42.8  7688.63    41.4   7768.32      42  7833.49     41.2  7910.79    42.2  8209.01
GR   41.3  8286.36    39.7   8308.22    39.9     8702     40.1   8964.4    39.4  9095.69
GR   41.7  9292.52    41.6   9541.35    44.3  9703.77     41.6   9816.3    43.9  9860.54
GR   41.3  9871.29    41.3   9948.37    46.9  9970.67     44.8 10033.63      43 10162.63
GR   44.2 10190.96    43.9  10305.76    46.5 10332.73     48.2 10389.97    44.7 10430.72
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GR   41.3  10459.1   32.9  10514.53     28  10567.09    26.4  10611.42    24.7  10640.77
GR   23.7  10681.82   25.7  10731.87   24.6  10751.83     28  10782.41    30.2  10840.35
GR   39.3  10888.46   38.5  10909.12     45  10961.37    49.8  11027.75    49.8  11165.02
GR   54.6  11343.95  62.4385  11754.54

QT     4   65210   137410   171900   324160
NC   0.08    .12    0.03     .1      .3
NH     5    0.12    2500    0.08   10000    0.03   17143    0.08   19000    0.12
NH  23560
X1  6.420    59    15845   16499    2300    2800    4409
X3    10
GR    75      0     75    2500     70    3400     70    6000     60    7000
GR   58.3  10000   56.1   10103   56.6   10179   57.3   10497   56.3   10543
GR   55.3  10654   57.2   10704   55.9   10873   52.1   10891     49   11004
GR   50.2  11061   53.5   11106   49.4   11290   48.2   11399   47.9   11517
GR   47.7  11625   48.9   11747   45.8   11900     46   11965   46.6   12181
GR   47.9  12699   48.1   12807   46.6   13068   46.2   13367   47.4   13489
GR   42.4  13758   41.8   14068   44.9   14127   46.8   14222   48.9   14266
GR   42.2  14433   38.1   14587     45   14654   41.5   14714   46.1   15114
GR   44.8  15161   46.9   15361   41.9   15727   46.7   15845   40.4   16043
GR   28.4  16309   44.9   16440   47.5   16499   43.3   16544   44.6   16859
GR   41.5  17143   44.5   17299   43.5   17474   41.4   17702   41.5   17822
GR     43  18004     61   18708     70   19600     70   23560

QT     4   64830   136080   171320   321910
NC   0.12   0.12    0.03     0.1     0.3
NH     4    .12    13568    0.03   15555    0.08   18896    .12   24402
X1   7.09    67    13568   15555    2000    3600    3538
X3    10                   11840    53.1   20069    57.9
GR   75.1      0   70.1    2300   60.1    3500   59.1    5310   55.1    7000
GR   52.9   9998   51.2   10405   48.3   10760   46.7   11002   48.1   11096
GR     50  11122     47   11313   46.7   11451   52.6   11572   53.1   11840
GR   52.5  12008   49.5   12394   44.7   12513   43.3   12597   44.3   12738
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1
14MAR00   19:02:53   PAGE   6

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GR   45.4  12956   46.9   13568   45.2   13743   44.7   13868   43.8   13920
GR   44.8  13990   45.1   14281   44.7   14544   42.4   14583   43.1   14804
GR   41.6  14978   43.4   15013   42.2   15090   30.1   15260   31.6   15364
GR   47.4  15555   46.7   15598   45.5   15789   39.5   15858   36.1   15974
GR   35.8  16133   38.4   16239   42.5   16348   41.8   16564     44   16840
GR   44.7  17493   46.2   17579   44.6   18028   45.1   18178   43.3   18276
GR   43.9  18459     43   18497   44.4   18896   46.2   19531   56.9   19962
GR   57.9  20069   52.9   20275   53.4   20406   49.7   20651   51.5   20718
GR   54.8  21004   54.1   21070   54.3   21465     55   21585   53.8   21703
GR   60.1  22202     65   24402

QT     4   64610   135320   171000   320030
NC    .12    .12     .03     0.1     0.3
NH     5    .12    12000    0.05   14153    0.03   14598    0.05   16383    .12
NH  23100
X1   7.47    66    14153   14598    1500    1500    2006
X3    10                           16383    55.4
GR    75      0     75    4460   64.2    6000     70    6150   61.6    6693
GR   50.3   7163   46.9    7208   49.6    7585   46.7    7595     51    7861
GR   48.9   7931   50.6    8391     48    8503   49.8    8546   51.3    8691
GR   46.2   9217   50.4    9383   51.4    9536   49.2    9569   50.3    9803
GR   53.7  10039   53.5   10532   47.3   10859   48.5   10964   47.2   11235
GR     45  11328   45.5   11905   48.6   12029   46.4   12059     42   12180
GR   41.8  12274   44.9   12369   44.2   12639   45.9   12724   44.5   12772
GR   49.7  12832   48.5   12877   50.5   13056     45   13117   45.6   13218
GR   52.7  13383   48.5   13434     47   13591   41.8   13880   45.8   13922
GR   40.9  14010     47   14062   47.7   14153     29   14273     38   14585
GR   44.3  14598   43.4   14737   41.4   14777   40.4   14933   39.8   15545
GR   45.9  15676   48.5   15964   53.4   16211   55.4   16383     53   17600
GR     54  18600     55   18800     60   20560     70   21150     75   22400
GR     75  23100

NC    .12    .12    0.03
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X1   8.07     90  5637.46  6519.38   2619.28   3201.18   2891.14
X3    10               3455.36     61.13
GR   73.6      0      71   207.3     67.1   340.91     61.2   454.82     59.8   605.74
GR   63.3   903.8    58.3 1086.61      54  1321.33     54.2  1487.54     47.9  1600.81
GR   55.2 1766.53    53.5 1879.14    56.5  2066.56     53.1  2164.16     54.1  2425.57
GR   56.8 2597.07    52.7 2847.29    53.3  2923.49     50.4  3066.89     51.6   3182.9
GR   58.2  3240.1   61.15    3360    59.6   3625.8     56.1  3784.39       48  3837.18
GR     47 3910.62    41.7 3954.78    48.8   4041.7     47.3   4372.4       43  4430.63
GR     48 4823.38    45.7 5084.92    47.1   5209.7     44.3  5637.46     44.9  5883.73
GR   38.8 5971.26    41.9 6088.05    27.9  6099.51     32.1  6158.61     38.5  6417.39
GR   41.9  6498.6    46.7 6519.38    44.4  6698.82     44.6  6871.35     49.1  7166.61
GR   45.8 7214.35    48.7 7269.55    49.1  7385.35     46.4  7650.65     49.5  7758.86
GR   48.8 7837.12      53  8005.6    54.3  8165.26     54.2  8385.85     47.8  8751.03
GR   48.9 8956.83    47.3 9151.02    48.7  9234.09     48.6  9464.92     47.2   9691.7
GR   44.3 9845.44    44.3 10352.59   48.4 10497.67     48.7 10744.17     46.9 10944.93
GR   53.3 11073.35   58.8 11124.29   58.3 11461.72     60.5 11629.21     59.8 11752.03
GR   66.4 11793.39   67.5 11924.83  70.95    12100     69.2 12409.61     71.8 12474.39
GR   70.4 12728.04   74.2 12870.91   71.6 12991.35     74.9 13090.92     73.1 13188.25
GR   74.6 13307.27   72.3 13497.82   74.7 13757.58     73.4 13964.96     74.3 14201.59
GR   74.4  14577.6   73.6 14996.08   75.1 15169.17     73.7  15240.5     74.4 15481.47
1
  14MAR00    19:02:53                                                PAGE   7


QT      4   63800  132480   169770   315820
NC    .12     .12     .03       .1       .3
X1   8.49      91 2606.42  3168.51   2635.7   1605.14  2374.28
X3     10                            3851.71     54.7
GR   75.9       0    77.6       60    78.05      160    78.05      240       77    331.6
GR   72.3  368.12    69.4   412.95    71.35      460     69.7   534.73     67.2   564.85
GR   74.5     630    74.7      670     65.5   670.12     64.5      720     63.8   753.26
GR     55  814.19    51.2   856.53     46.4  1006.41     44.1  1184.02     46.1   1306.2
GR   45.1 1439.48    43.6  1567.36     42.1  1599.68     42.1  1656.52     45.3  1696.13
GR   46.6 1738.87    48.3  1871.15     45.8  1974.15     46.4  2040.15     43.1  2089.69
GR   43.2 2200.98    44.1  2303.81     45.6  2353.39       42  2371.86       46  2606.42
GR   37.9 2677.54    35.8  2837.08     35.9  2927.48    42.72  2959.44     47.7  3034.05
GR   49.5 3138.67    50.6  3168.51     48.9  3220.17     48.1  3328.05     48.6   3423.1
GR   50.4 3455.47    50.3  3565.82     52.2  3627.93     52.2  3679.39     54.7  3851.71
GR     53  3892.8    53.4     3940     51.9  3961.68       52  4079.34     52.9  4194.97
GR   55.8    4300    53.2  4350.46     54.7  4373.98     54.9  4425.24     53.8  4458.24
GR   54.6 4581.48    52.7  4690.43     53.9     4730     51.5  4768.99     52.7  4822.83
GR   50.7 4928.57    51.9   4949.8       52  5005.14     50.3  5083.53     51.9  5220.22
GR   50.4 5255.77    53.4  5329.85     55.9  5449.87     55.5  5530.76     52.5  5591.67
GR   51.4 5649.44    51.6  5719.53     50.4  5823.06     49.6  5989.14     44.2  6040.25
GR   44.2 6435.82    46.9  6530.15     48.9  6665.49     47.3  6720.92     47.2  6911.52
GR   55.6 6971.41    58.5  6998.91     61.3  7081.43     63.5  7116.99    66.48  7723.78
GR     71    8000

QT      4   63510  131460   169330   314100
NH      5      .1 2567.98      .05  3385.13     0.03  3879.38     0.05     5000      .12
NH  10500
X1   9.41      94 3385.13  3879.38     2500     5500     4858
X3     10            2460.63    56.91
GR   78.4       0    78.9    96.63     78.6   295.76     79.3   365.11     78.2    423.8
GR   75.8  443.45    74.1   492.25     74.8   526.38    74.15      600     72.6      630
GR   72.8     670    65.3   721.32     60.2   753.27       56   813.24     54.4   854.41
GR   53.3  926.96      53  1014.31     51.5  1058.06     51.5  1133.33     50.5  1273.69
GR   51.4  1346.4    50.8  1454.34     51.1  1532.43     51.1  1736.18     51.8  1783.17
GR   51.8 1941.56    52.4  2003.11       53  2145.32     54.5  2316.56     56.8  2442.42
GR     56 2567.98    52.5  2621.33     52.4  2659.43     50.1  2775.83     49.4  2837.01
GR     50  3033.7    50.9  3141.06     43.5  3205.33     43.5  3281.17     51.8  3332.56
GR   53.3 3385.13    50.4  3417.41     45.2  3426.19     42.2  3442.41       42  3470.88
GR   38.1  3486.5    35.8  3658.23     36.2  3685.31     35.5  3798.17    42.72  3824.76
GR   48.2 3859.77    49.5  3879.38     44.1  3976.38     42.2  4082.27     42.2  4146.99
GR   43.8 4423.62    42.2  4450.81     48.9  4745.31     49.4  4914.17     48.4  5008.36
GR     48 5245.57    48.8   5332.6     48.1   5518.1     48.9  5669.75     47.9  5765.59
GR   50.2 5868.37    50.4  5903.32     49.4     6014       51  6193.43       53  6341.86
GR   52.1  6387.7    48.7  6470.08     48.4  6596.07     49.1  6831.48     48.1     6961
GR   49.1 7045.17    49.1  7203.02     48.4  7256.07     48.4     7513     50.4  7516.71
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GR   49.7  7570.46    50.7  7615.19    48.4  7638.95    50.9  7797.35    55.4  7851.87
GR  57.57  7854.93   59.40     7877   61.45  7882.66      63     8000      64     8500
GR   64.3     8700      62     9300      67    10000      75    10500
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QT      4    62850   129130   168330   309220
NC     .1      .12     0.03       .1       .3
X1  10.58       76  2518.22  3181.69     2700     3200     6177
X3     10                    1431.19    55.17     8020    59.05
GR   75.8        0    75.6     63.6    60.9   180.78    56.7   260.63    55.3      400
GR  54.85      520      54   579.97    53.5   709.98    51.1   790.94    50.6   912.57
GR   49.1   1025.2    49.2  1101.07    53.7  1157.02    54.5     1384    55.5  1418.21
GR   54.9  1763.41    52.9  1902.66    54.8  2083.95    54.5  2206.57      53   2255.4
GR   52.8  2438.35    53.6  2518.22    42.4  2566.64    40.3  2590.99    29.8  2603.35
GR   22.1  2654.44    22.5  2685.55    31.1  2771.89    34.7  2844.63    41.9  2867.55
GR   50.1  2913.09    48.2  3126.19    50.5  3181.69    49.3  3252.87    46.5  3306.48
GR   50.3  3409.33    47.5  3613.61    52.7   3701.6    50.2  3854.05    47.2   3900.8
GR   42.7  3930.19    44.6  3976.89    46.3  4107.08      50  4195.39    48.7  5535.67
GR   48.7  5863.58      49  5916.48    50.6  6045.31    49.2  7520.57    53.5  7702.66
GR  59.05     8020    59.3     8120    57.1  8360.19    57.2  8644.55    54.9  8710.45
GR   60.1  8984.95    59.4  9100.32    61.6     9300    63.4  9619.42    62.4  9928.89
GR   62.5 10100.96    64.8 10231.72      63 10264.23    65.3 10573.06    65.9 10735.19
GR  71.55    10860    72.2    10980   74.25    11110    73.2    11255    73.3 11458.81
GR   74.9 11812.08    74.7 12055.58    76.1  12161.3   75.45    12360   76.75    12560
GR   78.5 12699.89

QT      4    62690   128570   168090   310160
NC     .1      .12      .03       .1       .3
NH      3       .1     3262      .03     4059      .12    13987
X1  10.86       43     3262     4059     1300     1100     1478
X3     10                                8865     62.3
GR   79.8        0    77.6      161    79.4      259    77.6      579    79.7      955
GR   78.9     1110    72.6     1684    52.3     1914    49.3     2212    50.4     2314
GR   52.2     3262    35.4     3575    31.7     3805    32.7     3875    52.4     4059
GR   46.4     4251      49     4323      45     4835    48.9     4896    44.9     5078
GR   47.3     5583    44.5     5654    43.2     5785    44.5     5945    41.7     6053
GR   57.6     6350    59.1     7698    60.1     8650    62.3     8865    59.2     9382
GR   61.6     9677    59.4     9772    60.6     9852    57.7    10128    56.7    10420
GR   54.4    10557    55.8    10709    60.7    11077    63.7    11730    72.9    12060
GR   74.4    13267    75.8    13671    79.7    13987

QT      4    62560   128120   167890   308450
NH      4      .12  2522.57      .05  3311.71      .03  3943.85      .12 13549.31
X1  11.09       82  3311.71  3943.85     1400     1600     1214
X3     10                    3311.71     53.3  6949.97     63.7
GR   77.9        0    78.6   449.85      74   650.88    61.2   796.99    53.8   853.81
GR   51.5  1009.93    52.1  1209.82    51.1  1415.55    52.9  1698.13    53.4  1881.01
GR   54.3  2005.52    54.3  2131.11    52.6  2522.57    52.3  2664.39    42.5  2721.63
GR   42.5  3112.03    45.4   3215.1    53.3  3311.71      51  3378.76      45     3400
GR   42.5  3427.89    34.6  3459.26    31.8  3669.22      36  3729.17      42  3745.04
GR   50.1  3767.43    55.5  3802.55      57  3943.85      52  4107.84    50.5   4209.1
GR   53.1  4359.76    56.2  4405.38    56.4  4699.98      55  4860.97    56.5  4932.99
GR   54.4  5041.53    50.1     5150    52.2  5287.22    53.6  5519.22    51.9  5703.27
GR     52     5900    51.8     6040      52     6160    53.2     6300    54.5     6450
GR   57.8     6690    63.7  6949.97    63.9  7208.78    62.9  7282.45    61.9  7559.06
GR   59.2  7996.95    57.3     8229    58.1     8331    63.7     8477    61.2   8548.1
GR   62.8  8733.88    62.1  8893.69    62.3  9162.78    59.8  9368.39   62.65     9510
GR   62.2     9630    60.2  9723.91    61.8  9807.54    62.8 10002.69    59.7 10225.58
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GR   62.6 10311.07    60.9 10350.09    62.5 10478.43    60.8 10575.85    64.4 11234.07
GR   67.3 11355.29    71.8 11460.13    75.3 11489.48   75.05    11790    74.1 11874.14
GR   74.1 12095.62    75.2 12273.93    75.5 12508.24    74.6 12649.39      76 13085.66
GR   74.3  13286.4    79.6 13549.31
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QT     4    62410    127600    167670    307570
NC    .12      .12      .03       .3        .5
X1  11.35       89  2958.98   3804.94      1000      2300      1373
X3     10               2199        58   6519.75      65.5
GR  75.43        0       66    155.36      64.3    287.39      63.9    438.76      60.9    535.19
GR   54.9   626.91       52    787.68      53.3    980.78      52.8   1186.05      55.1   1413.79
GR   55.2  1604.36     56.9   1641.25        57   1786.87     56.25      1790      56.3   2127.54
GR   58.1  2185.43     54.8   2259.37      54.4   2456.59      50.5   2653.09      51.8   2802.23
GR   53.9  2832.46     52.8   2958.98      44.7   3090.28      48.1   3150.77     37.64   3267.77
GR  38.74  3336.43    28.84   3406.43     29.04   3461.55     36.14      3538      42.5   3671.55
GR   52.6  3804.94     47.4   3855.04      47.9   3919.98      43.7   3952.95      42.6   4050.14
GR   44.3  4431.03     41.9   4584.19        47    4826.5      42.5   4859.87      42.6   4957.91
GR   48.7  5021.15     49.2   5059.55      43.9    5090.8      44.7   5266.47      43.2   5349.68
GR   50.2  5459.53     52.4   5575.87      50.4   5703.12      51.9   5904.76      49.1   6073.64
GR   49.1  6167.73     51.3   6273.19      59.7   6409.59      65.5   6519.75      65.7   6635.31
GR   63.6  6757.16       63   7060.24      63.3   7375.88        66      7690      64.7   7907.84
GR   65.5   7969.4     64.1    8340.7      64.9   8381.19      64.1   8668.42        62   8835.44
GR   62.5  8946.12     65.3   9083.61      63.6   9200.98     64.35      9450        63   9781.97
GR   63.1  10165.1     65.1  10443.04      64.4  10755.85      64.5  10988.16      68.1  11162.12
GR  71.35    11220     71.9  11348.07      74.6  11434.99      75.9  11601.85     78.45     11650
GR   79.6    11960     81.1  12067.18      79.5  12180.83      80.3  12422.88      84.2  12477.71
GR  85.05    12580     83.5  12625.42      84.2     12770      82.9   13330.5

X1  11.38       85    19900     21000      1000      2300      1373      0.00        -1         0
X3     10      0.0      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
GR  85.00  14899.0    85.00   14900.0     85.00   16700.0     80.00   16850.0     75.00   16950.0
GR  70.00  17099.0    70.00   17100.0     65.00   17150.0     60.00   17350.0     55.00   17800.0
GR  65.90  19700.0    66.80   19800.0     67.30   19900.0     61.80   20000.0     60.70   20001.0
GR  55.60  20014.9    49.10   20030.0     44.10   20045.4     43.40   20060.3     45.20   20075.3
GR  45.80  20090.3    46.20   20105.3     45.30   20120.1     45.90   20136.6     46.00   20153.3
GR  45.30  20169.6    44.30   20186.2     44.70   20202.8     45.10   20219.6     45.00   20236.2
GR  45.30  20252.7    45.20   20269.3     45.20   20286.0     44.30   20302.6     43.70   20319.4
GR  40.00  20335.8    42.60   20352.5     38.10   20368.8     33.60   20385.4     35.50   20402.0
GR  33.20  20416.3    32.40   20430.0     31.70   20450.0     36.40   20470.0     34.80   20492.0
GR  37.60  20510.0    38.00   20527.2     38.30   20535.0     38.00   20565.0     37.40   20590.0
GR  37.00  20600.3    34.80   20615.0     27.80   20630.0     34.80   20645.0     36.30   20655.1
GR  39.20  20674.3    40.60   20693.3     38.60   20712.1     42.40   20731.4     43.50   20735.0
GR  47.40  20750.7    48.20   20769.8     47.20   20789.0     47.50   20808.0     47.50   20865.1
GR  47.80  20865.2    48.10   20884.2     47.90   20903.3     48.10   20922.3     48.70   20941.3
GR  54.90  20960.4    63.70   20978.7     63.90   20979.5     65.00   21000.0     64.30   21100.0
GR  55.00  22000.0    55.00   24800.0     60.00   25000.0     65.00   26200.0     65.00   26500.0
GR  70.00  27700.0    75.00   27800.0     80.00   28300.0     85.00   29700.0     90.00   30100.0

SB   1.25     1.50     2.60       0.0     189.0      20.4   22729.0     10.20     27.80     27.80
ET                                          9.1                        19900     21000
1
 14MAR00    19:02:53                                                   PAGE  10


X1  11.39        0      0.0       0.0      50.0      50.0      50.0      0.00      0.00         0
X2      0     0.00        1     67.20     68.30      0.00         0      0.00      0.00         0
X3     10      0.0      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
BT     33  14899.0     87.0       0.0   16700.0      87.0       0.0   17000.0      85.0       0.0
BT  17560     80.0      0.0   18100.0      75.0       0.0   19200.0      70.0       0.0   19201.0
BT   70.0      0.0  20000.0      68.3       0.0   20000.1      68.3      65.7   20120.1      69.1
BT   66.7  20201.2     69.1      66.0   20416.3      69.8      67.1   20416.4      69.8      66.5
BT  20492     69.8     66.8   20492.1      69.8      65.1   20655.1      69.8      65.1   20655.2
BT   69.8     67.2  20978.7      68.8      65.6   20978.8      68.8       0.0   21000.0      68.0
BT    0.0  21100.0     67.3       0.0   21200.0      66.3       0.0   21201.0      66.3       0.0
BT  23250     62.0      0.0   25100.0      65.0       0.0   26200.0      65.0       0.0   26400.0
BT   65.0      0.0  26700.0      70.0       0.0   27650.0      75.0       0.0   28150.0      82.0
BT    0.0  28750.0     87.0       0.0   29000.0      92.0       0.0   30300.0      92.0       0.0

ET                                         8.41
X1   11.4       89  2958.98   3804.94      50.0      50.0      50.0      0.00      0.00         0
X3     10               2199        58   6519.75      65.5
GR  75.43        0       66    155.36      64.3    287.39      63.9    438.76      60.9    535.19
GR   54.9   626.91       52    787.68      53.3    980.78      52.8   1186.05      55.1   1413.79
GR   55.2  1604.36     56.9   1641.25        57   1786.87     56.25      1790      56.3   2127.54
GR   58.1  2185.43     54.8   2259.37      54.4   2456.59      50.5   2653.09      51.8   2802.23
```

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GR   53.9  2832.46   52.8  2958.98   44.7  3090.28   48.1  3150.77   37.64  3267.77
GR  38.74  3336.43  28.84  3406.43  29.04  3461.55  36.14     3538    42.5  3671.55
GR   52.6  3804.94   47.4  3855.04   47.9  3919.98   43.7  3952.95    42.6  4050.14
GR   44.3  4431.03   41.9  4584.19     47   4826.5   42.5  4859.87    42.6  4957.91
GR   48.7  5021.15   49.2  5059.55   43.9   5090.8   44.7  5266.47    43.2  5349.68
GR   50.2  5459.53   52.4  5575.87   50.4  5703.12   51.9  5904.76    49.1  6073.64
GR   49.1  6167.73   51.3  6273.19   59.7  6409.59   65.5  6519.75    65.7  6635.31
GR   63.6  6757.16     63  7060.24   63.3  7375.88     66     7690    64.7  7907.84
GR   65.5   7969.4   64.1   8340.7   64.9  8381.19   64.1  8668.42      62  8835.44
GR   62.5  8946.12   65.3  9083.61   63.6  9200.98  64.35     9450      63  9781.97
GR   63.1  10165.1   65.1 10443.04   64.4 10755.85   64.5 10988.16    68.1 11162.12
GR  71.35    11220   71.9 11348.07   74.6 11434.99   75.9 11601.85   78.45    11650
GR   79.6    11960   81.1 12067.18   79.5 12180.83   80.3 12422.88    84.2 12477.71
GR  85.05    12580   83.5 12625.42   84.2    12770   82.9  13330.5

QT      4    62340  127340   167560   307140       0       0       0       0
NC    .12     .12     .03       .1      .3
NH      3    .120  3153.07    .030  3834.77    .120  14239.64
X1  11.48      83  3153.07  3834.77      400     700     370              -1
X3     10                  1998.35    56.86
GR  76.29       0    74.2   141.74     72.1  251.69    67.3   387.98    65.6   572.84
GR   64.9  799.64    56.3  1051.78     56.7  1284.7    55.8  1423.54    57.5  1735.27
GR   55.8 1865.38    57.9  1950.43       57 2115.34    51.9  2192.24    51.6  2676.44
GR   48.1 2772.19    51.5   2897.5     47.5 3079.27    49.6  3153.07    48.4  3217.84
GR   40.8 3263.45    46.8  3312.88    38.33 3352.99   32.93   3453.9   28.63  3598.06
GR  22.83 3619.02   25.93  3642.69    21.73 3663.26   28.63  3710.06   40.09  3750.18
GR   50.5 3834.77    52.5  4098.58     52.5 4266.28    50.2  4616.96    53.2  5256.55
GR   55.8 5417.16    49.5  5542.31     49.6 5811.88    52.8  5944.08    50.5  6026.29
GR   49.2 6139.42    50.6  6300.68     60.8 6368.78    60.8  6489.41    52.1  6544.58
GR   49.1 6582.93    49.6  6866.77     53.6 6999.45    52.4  7192.35    55.8  7242.29
GR   52.1 7310.92    57.4   7392.7     58.9 7486.54    57.8   7527.2    59.3  7858.55
GR   62.3 8313.45    62.3   8520.5     63.1 8579.97    63.8  8874.31    63.1  9022.65
GR   64.7 9319.75      64  9847.05       66 10324.86   67.2 10502.28    70.9 10689.92
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GR   75.6 10862.29     80 11138.46   81.4 11329.98   82.6 11935.13    82.6 12152.77
GR     84 12494.73   86.9 12751.65     91 12961.31   96.3 13165.82    98.2 13409.92
GR   97.1 13499.57   82.3 13562.28   82.6 13710.72   93.2 13739.27    91.2 13843.55
GR   84.7 14008.62   85.8 14187.33   84.3 14239.64

QT      4   62300   127200   167500   306900
NC    .12     .12     .03       .6      .8
X1  11.55      73    3153     3835    400.0   400.0   370.0    0.00       0
X3     10     0.0     0.0     1950       57     0.0     0.0     0.0
GR   75.4       0    74.2      142     67.3     388    65.6     573    64.9     800
GR   51.7     898    56.3     1052     56.7    1285    55.8    1424    51.7    1438
GR   51.7    1636    57.5     1735     57.9    1950      57    2115    51.9    2192
GR   51.6    2676    48.1     2772     51.5    2898    47.5    3079    49.6    3153
GR   48.4    3218    46.8     3313    38.33    3353   28.63    3598   22.83    3619
GR  25.93    3643   21.73     3663    28.63    3710   40.09    3750    50.5    3835
GR   52.5    4099    52.5     4266     50.2    4617    44.2    4679    44.3    5110
GR   53.2    5257    55.8     5417     49.5    5542    49.6    5812    52.8    5944
GR   50.5    6026    49.2     6139     50.6    6301    60.8    6369    60.8    6489
GR   52.1    6545    49.1     6583     49.6    6867    53.6    6999    52.4    7192
GR   52.1    7311    58.9     7487     59.3    7859    62.3    8313    62.3    8521
GR   63.1    8580    63.8     8874     63.1    9023    64.7    9320      64    9847
GR     66   10325    67.2    10502     70.9   10690    75.6   10862      80   11138
GR   81.4   11330    82.6    11935     82.6   12153      84   12495    86.9   12752
GR     91   12961    96.3    13166     98.2   13410

NH      4    .100  18850.0    .100  20250.0    .030  21748.6    .120  28900.0   0.000
X1 11.569      83    20250  21768.7      100     100     100    0.00    0.00       0
X3     10     0.0      0.0      0.0      0.0     0.0     0.0     0.0     0.0     0.0
GR  84.00 16850.0   80.00  17250.0    80.00 17251.0   80.00 17252.0   75.00 18025.0
GR  70.00 18075.0   65.00  18125.0    60.00 18200.0   60.00 18201.0   60.00 18202.0
GR  60.00 18450.0   60.00  18500.0    60.00 18600.0   60.00 18850.0   55.00 19350.0
GR  55.00 19351.0   68.70  20250.0    49.80 20287.0   49.30 20323.0   48.30 20340.0
GR  49.80 20360.4   48.40  20389.0    50.50 20396.9   48.10 20458.0   44.50 20495.0
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GR   44.20  20506.1   45.40  20560.0   44.50  20600.0   45.00  20650.0   47.20  20711.0
GR   44.00  20721.0   42.80  20746.0   43.30  20770.0   35.50  20800.0   33.50  20820.0
GR   26.50  20920.0   24.10  20930.0   31.40  20940.0   25.40  20944.1   29.70  20960.0
GR   30.60  20970.0   33.20  20980.0   33.20  20981.0   35.00  20990.0   35.90  21000.0
GR   38.40  21010.0   38.40  21017.3   43.43  21039.0   45.80  21089.5   46.80  21162.7
GR   46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR   49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR   51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR   64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00   22500.
GR   55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00   24950.
GR   60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00   28150.
GR   85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00     0.0

SB    1.25    2.31    2.60     0.0      50      46   32375      20    24.1    24.1
NC    .120    .120    .035      .3      .5
X1  11.660      91 20226.0 21910.0     480     480     480    0.00       0
X2     0.0     0.0       1   63.08   69.07     0.0     0.0     0.0     0.0     0.0
X3      10     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT      27 16200.0   68.99     0.0 17200.0   64.77     0.0 17500.0   63.51     0.0
BT  18300.   67.62     0.0 18301.0   67.63     0.0 18669.0   72.15     0.0 19195.0
BT   71.42     0.0 20000.0   67.97     0.0 20100.0   68.42     0.0   20200   68.87
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BT     0.0 20235.8   69.04   69.04 20242.8   69.07   63.08 20573.0   70.56   64.57
BT  20903.   72.04   66.05 21141.3   72.66   66.67 21563.0   71.21   65.22 21893.1
BT   69.73   63.74 21900.0   69.70   69.70 22000.0   69.24     0.0 22274.7   68.01
BT     0.0 22700.0   66.10     0.0 23449.7   65.50     0.0 24374.7   69.44     0.0
BT  26274.   85.80     0.0 28000.0   85.80     0.0 28300.0   85.80     0.0 28900.0
BT    90.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
GR   85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR   60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR   64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR   49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR   44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR   48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR   45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR   37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR   33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR   27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR   24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR   43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR   48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR   49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR   47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR   51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR   64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR   65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
GR   90.50  28900.0    0.00     0.0    0.00     0.0    0.00     0.0    0.00     0.0

X1  11.679      73    3153    3835     100     100     100    0.00    0.00       0
X3      10     0.0     0.0    1950      57     0.0     0.0     0.0
GR    75.4       0    74.2     142    67.3     388    65.6     573    64.9     800
GR    51.7     898    56.3    1052    56.7    1285    55.8    1424    51.7    1438
GR    51.7    1636    57.5    1735    57.9    1950      57    2115    51.9    2192
GR    51.6    2676    48.1    2772    51.5    2898    47.5    3079    49.6    3153
GR    48.4    3218    46.8    3313   38.33    3353   28.63    3598   22.83    3619
GR   25.93    3643   21.73    3663   28.63    3710   40.09    3750    50.5    3835
GR    52.5    4099    52.5    4266    50.2    4617    44.2    4679    44.3    5110
GR    53.2    5257    55.8    5417    49.5    5542    49.6    5812    52.8    5944
GR    50.5    6026    49.2    6139    50.6    6301    60.8    6369    60.8    6489
GR    52.1    6545    49.1    6583    49.6    6867    53.6    6999    52.4    7192
GR    52.1    7311    58.9    7487    59.3    7859    62.3    8313    62.3    8521
GR    63.1    8580    63.8    8874    63.1    9023    64.7    9320      64    9847
GR      66   10325    67.2   10502    70.9   10690    75.6   10862      80   11138
GR    81.4   11330    82.6   11935    82.6   12153      84   12495    86.9   12752
GR      91   12961    96.3   13166    98.2   13410

QT       4   62060  126360  167140  305490       0       0       0       0
```

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NC    .120     .120     .030      .1        .3
X1   11.97      84  2273.46  2827.03      802     5043     2118
X3     10               1105.39     52.5     9060     74.8
GR   78.23       0     64.2   174.04     63.5   501.47     62.4   571.34     57.3   671.03
GR    46.1   969.8     52.3  1075.96     49.9  1240.38     49.5   1362.1     47.4  1575.32
GR    49.6  1774.8     45.3  2044.49     47.5  2118.35     44.4  2165.58     46.6  2273.46
GR   35.52 2351.83    41.02  2371.83    32.22  2411.83    31.72  2441.83    37.12  2621.82
GR    45.7 2759.78     44.7  2827.03     45.5  2960.44     44.9  3171.29     46.7     3200
GR    46.4 3463.72       47  3583.97     44.6  3643.28       45  3872.88       47  3996.03
```



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GR    53.2  4123.35    60.5   4270.1    60.5  4509.54    57.2  4775.48      58  5148.72
GR    56.2  5363.59    55.1   5699.3    49.4  5956.27    49.6  6073.28    48.3  6272.85
GR      51  6381.63    52.1  6574.09    51.8  6814.08    53.2  6887.03    50.2  7041.29
GR    53.5  7127.14    51.6  7442.96    56.9  7800.49    62.4  7837.71    64.9  7999.27
GR    67.4  8385.92    67.1  8424.35    74.8     9060    66.9     9130   66.35     9190
GR    65.8   9282.6    53.6   9356.5    55.7  9527.42    58.8  9587.89    70.2  9638.17
GR    72.9  9884.04      75 10154.89    75.2 10427.45    76.1 10520.96    76.1  10769.8
GR    90.2    10830    91.8 11098.11    89.8 11321.02    86.3 11634.53    85.4 11757.32
GR    86.8 11952.18    85.2 12112.75    87.5 12345.14    83.2 12384.16    89.1 12447.67
GR    85.9 12555.51    90.4    12650    84.7 12970.55    83.1 13224.85      84 13312.97
GR      83 13508.04    84.5  13657.9    83.9 13887.88    86.8 14077.83
```



```
 SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
 Q      QLOB   QCH    QROB   ALOB    ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME   VLOB   VCH    VROB   XNL     XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE  XLOBL  XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR TOPWID ENDST
```

*PROF 1

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.

0

CCHV= .100 CEHV= .300
*SECNO 3.615

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS= 1232.0 8990.0 TYPE= 1 TARGET= -1232.040
ELENCL= 54.70 ELENCR= 100000.00

```
   3.615   16.36   46.66    .00   46.66   46.71     .05     .00     .00   41.60
 66800.0   186.3 65737.7  876.0   717.8 35129.5  3846.5      .0      .0   43.80
     .00     .26    1.87    .23    .120    .030    .120    .000   30.30 1669.18
 .000078      0.      0.     0.       0       0       0     .00 5842.35 7894.99
```

*SECNO 4.745

3470 ENCROACHMENT STATIONS= 1973.4 6985.6 TYPE= 1 TARGET= 5012.200
ELENCL= 52.00 ELENCR= 48.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 51.10 ELREA= 47.20

```
   4.745   15.98   47.18    .00     .00   47.24     .06     .53     .00   51.10
 66160.0      .0 66160.0     .0      .0 33894.3      .0  4955.1   661.3   47.20
     .85     .00    1.95    .00    .000    .030    .000    .000   31.20 2379.22
 .000100   3600.   5966.  4500.       2       0       0     .00 4324.09 6703.32
```

CCHV= .300 CEHV= .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
   5.026   36.75   47.35    .00     .00   47.44    .09    .18     .02   56.20
 65990.0      .0 65990.0     .0      .0 27163.0     .0 5993.8   793.0   57.00
    1.02     .00    2.43    .00    .000    .030   .000   .000   10.60 9626.03
 .000152   1030.   1482.  4150.       2       0      0    .00 3418.36 13044.39
```

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```
 SECNO  DEPTH   CWSEL  CRIWS  WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
 Q      QLOB    QCH    QROB   ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME   VLOB    VCH    VROB   XNL     XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE  XLOBL   XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST
```

*SECNO 5.027

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
   5.027   36.77   47.37    .00     .00   47.45    .08    .00     .00   56.20
 65990.0      .0 65990.0     .0      .0 29018.0     .0 5994.4   793.1   56.00
    1.02     .00    2.27    .00    .000    .030   .000   .000   10.60 9632.79
 .000129      1.      1.     1.       1       0      0    .00 3293.66 13014.71
```

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
   5.034   36.77   47.37    .00     .00   47.45    .08    .01     .00   56.20
 65990.0      .0 65990.0     .0      .0 29064.4     .0 6025.7   796.7   56.00
    1.02     .00    2.27    .00    .000    .030   .000   .000   10.60 9632.73
 .000129     47.     47.    47.       0       0      0    .00 3293.80 13014.79
```

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
   5.035   36.77   47.37    .00     .00   47.46    .09    .00     .01   56.20
 65990.0      .0 65990.0     .0      .0 27236.2     .0 6026.4   796.7   57.00
    1.02     .00    2.42    .00    .000    .030   .000   .000   10.60 9625.96
 .000151      1.      1.     1.       0       0      0    .00 3418.70 13044.66
```

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```
 SECNO  DEPTH   CWSEL  CRIWS  WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
 Q      QLOB    QCH    QROB   ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME   VLOB    VCH    VROB   XNL     XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE  XLOBL   XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST
```

*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.037   36.77   47.37    .00    .00   47.46    .09    .00    .00   56.20
 65990.0     .0 65990.0     .0     .0 27221.0     .0  6031.4  797.4   57.00
   1.02     .00    2.42    .00   .000    .030   .000   .000  10.60  9625.97
 .000151     8.      8.     8.      0       0      0    .00 3418.63 13044.60
```

*SECNO 5.038

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.038   36.78   47.38    .00    .00   47.46    .08    .00    .00   56.20
 65990.0     .0 65990.0     .0     .0 29074.0     .0  6032.0  797.5   56.00
   1.02     .00    2.27    .00   .000    .030   .000   .000  10.60  9632.72
 .000129     1.      1.     1.      1       0      0    .00 3293.83 13014.80
```

*SECNO 5.045

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.045   36.79   47.39    .00    .00   47.47    .08    .01    .00   56.20
 65990.0     .0 65990.0     .0     .0 29120.0     .0  6063.4  801.0   56.00
   1.03     .00    2.27    .00   .000    .030   .000   .000  10.60  9632.67
 .000128    47.     47.    47.      0       0      0    .00 3293.97 13014.88
```



```
SECNO  DEPTH  CWSEL  CRIWS  WSELK  EG     HV     HL     OLOSS  L-BANK ELEV
Q      QLOB   QCH    QROB   ALOB   ACH    AROB   VOL    TWA    R-BANK ELEV
TIME   VLOB   VCH    VROB   XNL    XNCH   XNR    WTN    ELMIN  SSTA
SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC    ICONT  CORAR  TOPWID ENDST
```

CCHV= .100 CEHV= .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.046   36.78   47.38    .00    .00   47.47    .09    .00    .00   56.20
 65990.0     .0 65990.0     .0     .0 27293.9     .0  6064.1  801.1   57.00
   1.03     .00    2.42    .00   .000    .030   .000   .000  10.60  9625.91
 .000150     1.      1.     1.      0       0      0    .00 3418.96 13044.87
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 5.585

3301 HV CHANGED MORE THAN HVINS

```
3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .48


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      48.20 ELREA=       49.80

   5.585    24.27    47.97      .00      .00    48.82      .85     1.12      .23    48.20
 65680.0       .0  65680.0       .0       .0   8863.8       .0   7245.7    932.7    49.80
   1.14      .00     7.41      .00     .000     .030     .000     .000    23.70 10392.70
 .000635    2664.    2847.    1744.        2        0        0      .00   609.67 11002.38


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO = 2.13

   6.420    21.28    49.68      .00      .00    49.74      .07      .85      .08    46.70
 65210.0  31856.8  20605.9  12747.3  18773.3   7184.0  10760.0   8899.3   1175.5    47.50
   1.66     1.70     2.87     1.18     .030     .030     .051     .000    28.40 10979.57
 .000138    2300.    4409.    2800.        2        0        0      .00  7043.26 18264.88


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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL     TWA      R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN     ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID   ENDST


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=    11840.0  20069.0  TYPE=     1  TARGET=     8229.000
 ELENCL=    53.10 ELENCR=    57.90
   7.090    20.06    50.16      .00      .00    50.22      .06      .48      .00    46.90
 64830.0   2459.3  39178.1  23192.5   5413.1  15494.8  26442.8  11912.8   1661.6    47.40
   2.13      .45     2.53      .88     .120     .030     .083     .000    30.10 12309.59
 .000169    2000.    3538.    3600.        2        0        0      .00  7380.76 19690.35


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 7.470

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=         .0  16383.0  TYPE=     1  TARGET=    16383.000
   7.470    21.42    50.42      .00      .00    50.57      .14      .32      .02    47.70
 64610.0  15956.5  29154.6  19498.8  18025.3   6846.2  11041.2  13476.2   1931.5    44.30
   2.32      .89     4.26     1.77     .063     .030     .050     .000    29.00  7158.17
 .000195    1500.    2006.    1500.        0        0        0      .00  7474.41 16060.59


*SECNO 8.070

3265 DIVIDED FLOW
```

```
3470 ENCROACHMENT STATIONS=   3455.4  15481.5  TYPE=    1  TARGET=  -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
   8.070    23.21    51.11     .00     .00    51.38     .27     .77     .04    44.30
  64610.0   5964.1  49060.0   9585.9   8680.9  10221.6  14990.0  15802.0   2393.9    46.70
    2.53      .69     4.80     .64    .120    .030    .120    .000    27.90  3816.92
  .000362    2619.    2891.    3201.      2       0       0     .00  6579.98 11029.38


CCHV=   .100 CEHV=    .300
*SECNO 8.490
1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST



3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .63


3470 ENCROACHMENT STATIONS=       .0   3851.7  TYPE=    1  TARGET=   3851.709
   8.490    16.58    52.38     .00     .00    52.97     .59    1.49     .10    46.00
  63800.0  17915.1  44810.5   1074.4  12554.9   6130.6   1334.5  17190.9   2622.7    50.60
    2.65     1.43     7.31     .81    .120    .030    .120    .000    35.80   843.40
  .000903    2636.    2374.    1605.      3       0       0     .00  2848.30  3691.69


1490 NH CARD USED
*SECNO 9.410

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.09


3470 ENCROACHMENT STATIONS=   2460.6  10500.0  TYPE=    1  TARGET=  -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
   9.410    18.90    54.40     .00     .00    54.55     .15    1.53     .04    53.30
  63510.0   5324.4  31054.0  27131.6   3826.6   7299.8  24798.7  20059.7   3038.0    49.50
    3.13     1.39     4.25    1.09    .050    .030    .071    .000    35.50  2592.53
  .000206    2500.    4858.    5500.      2       0       0     .00  5247.10  7839.63


CCHV=   .100 CEHV=    .300
*SECNO 10.580

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=   1431.2   8020.0  TYPE=    1  TARGET=   6588.810
 ELENCL=    55.17  ELENCR=    59.05
  10.580    33.31    55.41     .00     .00    55.63     .23    1.06     .02    53.60
  62850.0    465.5  45332.6  17051.9   1599.2  10083.2  27365.4  23376.4   3524.2    50.50
    3.53      .29     4.50     .62    .100    .030    .120    .000    22.10   389.56
  .000222    2700.    6177.    3200.      2       0       0     .00  7357.44  7811.58


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 10.860
1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
```

```
 SLOPE    XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR   TOPWID  ENDST


3470 ENCROACHMENT STATIONS=       .0  8865.0  TYPE=    1  TARGET=   8864.999
  10.860   24.02   55.72    .00     .00   55.87    .15     .23     .01   52.20
 62690.0  2983.9 46712.6 12993.5  6316.3 12896.9 20595.8 24489.9  3687.4   52.40
   3.67     .47    3.62    .63    .100    .030    .120    .000   31.70 1875.29
 .000131   1300.   1478.   1100.      2       0       0     .00 4439.52 6314.82


1490 NH CARD USED
*SECNO 11.090

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .47


3470 ENCROACHMENT STATIONS=   3311.7  6950.0  TYPE=    1  TARGET=   3638.260
 ELENCL=   53.30 ELENCR=   63.70

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      53.30 ELREA=      57.00

  11.090   23.81   55.61    .00     .00   56.42    .81     .35     .20   53.30
 62560.0  3968.9 58591.1      .0  5245.6  7841.8      .0 25343.0  3808.9   57.00
   3.72     .76    7.47    .00    .080    .030    .000    .000   31.80  839.93
 .000589   1400.   1214.   1600.      2       0       0     .00 2972.72 3812.65


CCHV=    .300 CEHV=    .500
*SECNO 11.350

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO = 2.21


3470 ENCROACHMENT STATIONS=   2199.0  6519.8  TYPE=    1  TARGET=   4320.750
 ELENCL=   58.00 ELENCR=   65.50
  11.350   27.95   56.79    .00     .00   56.92    .13     .30     .21   52.80
 62410.0   949.2 44357.9 17102.9  2725.9 13152.1 25475.8 26437.9  3934.6   52.60
   3.88     .35    3.37    .67    .120    .030    .120    .000   28.84 2214.74
 .000120   1000.   1373.   2300.      2       0       0     .00 4147.62 6362.37
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID ENDST


*SECNO 11.380

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=      64.00

  11.380   30.14   56.94    .00     .00   57.22    .27     .23     .07   66.30
 62410.0      .0 62410.0      .0      .0 14833.4      .0 27582.8  4039.0   64.00
   3.97     .00    4.21    .00    .000    .030    .000    .000   26.80 20008.51
 .000190   1000.   1373.   2300.      2       0       0     .00  958.22 20966.73
```

```
SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP      BAREA    SS      ELCHU    ELCHD
   1.25   1.50    2.60     .00    189.00   20.40 22729.00   10.20   27.80    27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=    56.92 BRIDGE VELOCITY=     4.60    CALCULATED CHANNEL AREA=    13557.

 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA  TRAPEZOID     ELLC    ELTRD    WEIRLN
                                   AREA
    .00   57.24    .02       0.   62410.   22729.   22477.     67.20    68.30      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

   11.390   30.17    56.97     .00      .00    57.24      .27      .02      .00    66.30
  62410.0      .0  62410.0      .0       .0  14854.0       .0  27599.9   4040.1    64.00
    3.98     .00     4.20     .00     .000     .030     .000     .000    26.80 20008.45
  .000189     50.     50.     50.        0        0        0      .00   958.33 20966.78


*SECNO 11.400

3470 ENCROACHMENT STATIONS=    2199.0    6519.8  TYPE=      1  TARGET=     4320.750
 ELENCL=     58.00  ELENCR=     65.50
   11.400   28.33    57.17     .00      .00    57.29      .12      .01      .05    52.80
  62410.0  1053.5  44068.5 17288.0   3012.6  13476.2  26456.5  27633.0   4043.1    52.60
    3.98     .35     3.27     .65     .120     .030     .120     .000    28.84  2206.16
  .000109     50.     50.     50.        2        0        0      .00  4162.42  6368.58


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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 11.480

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1998.3   14239.6  TYPE=      1  TARGET=    -1998.350
 ELENCL=     56.86  ELENCR= 100000.00
   11.480   36.47    57.20     .00      .00    57.34      .15      .04      .01    48.60
  62340.0  3283.0  49968.4  9088.7   7973.9  14564.6  22450.0  28195.5   4111.9    49.50
    4.03     .41     3.43     .40     .120     .030     .120     .000    20.73  1039.73
  .000082    400.    370.    700.        2        0        0      .00  6350.49  7614.77


CCHV=    .600 CEHV=     .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0   13410.0  TYPE=      1  TARGET=    -1950.000
 ELENCL=     57.00  ELENCR= 100000.00
   11.550   35.50    57.23     .00      .00    57.38      .15      .03      .01    49.60
```

```
 62300.0   2865.1  48050.2  11384.7   6739.5  13411.2  23413.5  28592.5   4168.1    50.50
   4.06      .43     3.58      .49     .120     .030     .120     .000    21.73   895.10
 .000100    400.     370.     400.       0        0        0      .00  5992.14  7443.87


1490 NH CARD USED
*SECNO 11.569

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569    33.13    57.23      .00      .00    57.43      .20      .01      .04    68.70
 62300.0       .0  62300.0       .0       .0  17358.3       .0  28662.4   4176.7    67.10
   4.07      .00     3.59      .00     .000     .030     .000     .000    24.10 20272.44
 .000198    100.     100.     100.       0        0        0      .00  1470.10 21742.54
```

1


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC      BWP     BAREA     SS     ELCHU    ELCHD
   1.25     2.31    2.60     .00    50.00    46.00 32375.00    20.00    24.10    24.10

CCHV=    .300 CEHV=    .500
*SECNO 11.660
CLASS A LOW FLOW

3420 BRIDGE W.S.=     57.22 BRIDGE VELOCITY=     2.82    CALCULATED CHANNEL AREA=    22076.

 EGPRS    EGLWC     H3     QWEIR    QLOW    BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                                   AREA
    .00    57.43     .02       0.   62300.   32375.   30545.    63.08    69.07       0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

  11.660    37.43    57.23      .00      .00    57.43      .16      .00      .00    68.90
 62300.0       .0  62300.0       .0       .0  19442.5       .0  28865.1   4193.8    68.20
   4.11      .00     3.20      .00     .000     .035     .000     .000    19.80 20248.85
 .000214    480.     480.     480.       0        0        0      .00  1639.63 21888.48


*SECNO 11.679

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=     1 TARGET=   -1950.000
 ELENCL=    57.00 ELENCR= 100000.00
  11.679    35.59    57.32      .00      .00    57.46      .14      .02      .01    49.60
 62300.0   3263.6  46134.8  12901.6   6905.1  13471.1  23716.1  28938.1   4202.6    50.50
   4.12      .47     3.42      .54     .120     .035     .120     .000    21.73   894.01
 .000123    100.     100.     100.       2        0        0      .00  6030.15  7446.14


CCHV=    .100 CEHV=    .300
*SECNO 11.970

3265 DIVIDED FLOW
```

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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


3470 ENCROACHMENT STATIONS=   1105.4   9060.0  TYPE=    1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=    74.80
  11.970   25.91   57.63    .00    .00   57.77    .14    .31    .00   46.60
 62060.0  7104.6 39394.2 15561.2 12607.5 10549.2 28023.8 32696.7  4709.6   44.70
   4.41     .56    3.73    .56    .120    .030    .120    .000   31.72  664.51
 .000112    802.   2118.   5043.      2      0       0     .00 6398.18 7805.45


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  14MAR00    19:02:53                                                        PAGE  25


T1     CF-0033 BROWN & ROOT SERVICES,  11/1/99
T2     Lake Houston HEC-2 MODEL, REACH 3
T3     Starting form river mile 3.615 u/s of Lake Houston Dam

J1  ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS    Q      WSEL    FQ

      0       3                                 0    49.57

J2  NPROF    IPLOT   PRFVS   XSECV   XSECH    FN     ALLDC    IBW    CHNIM   ITRACE

      2       0       -1

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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*PROF 2

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=    .100  CEHV=    .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=   1232.0   8990.0  TYPE=    1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
   3.615   19.27   49.57    .00   49.57   49.70    .13    .00    .00   41.60
143300.0   862.7 138555.0  3882.3  2340.5 46662.4  8837.3     .0     .0   43.80
    .00     .37    2.97    .44    .120    .030    .120    .000   30.30 1329.20
 .000134      0.      0.      0.      0      0       0     .00 6975.50 8304.70


*SECNO 4.745

3470 ENCROACHMENT STATIONS=   1973.4   6985.6  TYPE=    1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      51.10  ELREA=      47.20
```

```
  4.745   19.19   50.39    .00    .00   50.53    .13    .82    .00   51.10
140750.0      .0 140261.4  488.6     .0 47773.7  1889.6  7117.8  758.6   47.20
   .56     .00    2.94     .26   .000    .030    .120    .000   31.20 2374.45
 .000143   3600.   5966.   4500.     2      0       0     .00 5217.94 7592.40
```

CCHV= .300 CEHV= .500

*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.026   40.02   50.62    .00    .00   50.83    .21    .26    .04   56.20
140170.0      .0 140170.0     .0     .0 38415.3     .0  8674.0  933.6   57.00
   .68     .00    3.65     .00   .000    .030   .000    .000   10.60 9615.81
 .000221   1030.   1482.   4150.     2      0       0     .00 3466.05 13081.86
```

1


```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

*SECNO 5.027

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.027   40.04   50.64    .00    .00   50.83    .19    .00    .00   56.20
140170.0      .0 140170.0     .0     .0 39843.6     .0  8674.9  933.7   56.00
   .68     .00    3.52     .00   .000    .030   .000    .000   10.60 9620.31
 .000213      1.      1.      1.     1      0       0     .00 3326.05 13033.00
```

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.034   40.05   50.65    .00    .00   50.84    .19    .01    .00   56.20
140170.0      .0 140170.0     .0     .0 39909.6     .0  8717.9  937.3   56.00
   .68     .00    3.51     .00   .000    .030   .000    .000   10.60 9620.23
 .000212     47.     47.     47.     0      0       0     .00 3326.26 13033.12
```

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.035   40.04   50.64    .00    .00   50.85    .21    .00    .01   56.20
140170.0      .0 140170.0     .0     .0 38519.8     .0  8718.8  937.3   57.00
   .68     .00    3.64     .00   .000    .030   .000    .000   10.60 9615.72
 .000219      1.      1.      1.     0      0       0     .00 3466.48 13082.20
```

1

```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT  CORAR TOPWID ENDST
```

*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.037   40.04   50.64    .00    .00   50.85    .21    .00    .00   56.20
 140170.0    .0 140170.0    .0     .0 38501.4     .0  8725.9  938.0  57.00
   .68    .00    3.64    .00   .000    .030   .000   .000  10.60 9615.73
 .000219    8.      8.      8.     0      0      0     .00 3466.41 13082.14
```

*SECNO 5.038

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.038   40.06   50.66    .00    .00   50.86    .19    .00    .00   56.20
 140170.0    .0 140170.0    .0     .0 39925.8     .0  8726.8  938.0  56.00
   .68    .00    3.51    .00   .000    .030   .000   .000  10.60 9620.21
 .000211    1.      1.      1.     1      0      0     .00 3326.31 13033.14
```

*SECNO 5.045

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.045   40.07   50.67    .00    .00   50.87    .19    .01    .00   56.20
 140170.0    .0 140170.0    .0     .0 39991.3     .0  8769.9  941.6  56.00
   .68    .00    3.51    .00   .000    .030   .000   .000  10.60 9620.14
 .000210   47.     47.     47.     0      0      0     .00 3326.51 13033.25
```

1


```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT  CORAR TOPWID ENDST
```


CCHV= .100 CEHV= .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.046   40.06   50.66    .00    .00   50.87    .20    .00    .00   56.20
 140170.0    .0 140170.0    .0     .0 38604.8     .0  8770.8  941.7  57.00
   .68    .00    3.63    .00   .000    .030   .000   .000  10.60 9615.64
 .000217    1.      1.      1.     0      0      0     .00 3466.84 13082.48
```

```
 135320.0  16544.6  89327.3  29448.1   14349.7  12952.6  27615.1  25866.7   3173.4     46.70
    1.88     1.15     6.90     1.07     .120      .030      .120      .000    27.90  3796.74
 .000545    2619.    2891.    3201.        2        0         0       .00  7065.01  11081.74


CCHV=    .100 CEHV=     .300
*SECNO 8.490

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .64


3470 ENCROACHMENT STATIONS=       .0   3851.7  TYPE=      1  TARGET=     3851.709
   8.490    20.09    55.89      .00      .00    57.01     1.12     2.12      .19    46.00
 132480.0  40821.8  84915.3   6742.9  18816.9   8105.6   6971.2  28081.3   3473.0     50.60
    1.97     2.17    10.48      .97     .120     .030      .120     .000    35.80   808.01
 .001278    2636.    2374.    1605.        3        0         0      .00  6163.83  6974.18


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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA      R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID   ENDST


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.27


3470 ENCROACHMENT STATIONS=    2460.6   10500.0  TYPE=      1  TARGET=    -2460.630
 ELENCL=     56.91  ELENCR= 100000.00
   9.410    23.24    58.74      .00      .00    58.95      .21     1.85      .09    53.30
 131460.0  16659.1  52080.4  62720.5  10673.5   9451.8  42104.1  33004.8   4150.2     49.50
    2.38     1.56     5.51     1.49     .053     .030     .077     .000    35.50   779.82
 .000244    2500.    4858.    5500.        3        0        0      .00  7089.26  7869.08


CCHV=    .100 CEHV=     .300
*SECNO 10.580

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1431.2    8020.0  TYPE=      1  TARGET=     6588.810
 ELENCL=     55.17  ELENCR=     59.05
  10.580    37.74    59.84      .00      .00    60.14      .30     1.16      .03    53.60
 129130.0   8292.4  74879.3  45958.3  11592.4  13018.1  48985.9  38633.8   4746.0     50.50
    2.72      .72     5.75      .94     .100     .030     .120     .000    22.10   201.15
 .000259    2700.    6177.    3200.        2        0        0      .00  8822.32  9139.21


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=       .0    8865.0  TYPE=      1  TARGET=     8864.999
```

```
  10.860    28.45    60.15      .00      .00    60.44      .29      .30      .00    52.20
 128570.0  11325.6  85997.8  31246.6  12590.7  16438.7  33717.9  40538.6  4958.6    52.40
    2.82      .90     5.23      .93     .100     .030     .120     .000    31.70  1824.94
  .000198    1300.    1478.    1100.       0        0        0      .00  6830.96  8655.90
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


1490 NH CARD USED
*SECNO 11.090

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .60


3470 ENCROACHMENT STATIONS=   3311.7   6950.0 TYPE=    1 TARGET=    3638.260
 ELENCL=    53.30 ELENCR=    63.70
  11.090    28.58    60.38      .00      .00    60.96      .59      .43      .09    53.30
 128120.0  26229.3  81988.1  19902.6  17126.1  10766.5  18644.0  42356.9  5178.8    57.00
    2.89     1.53     7.62     1.07     .082     .030     .120     .000    31.80   803.30
  .000545    1400.    1214.    1600.       2        0        0      .00  6000.31  6803.61


CCHV=    .300 CEHV=    .500
*SECNO 11.350

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.71


3470 ENCROACHMENT STATIONS=   2199.0   6519.8 TYPE=    1 TARGET=    4320.750
 ELENCL=    58.00 ELENCR=    65.50
  11.350    32.39    61.23      .00      .00    61.49      .25      .42      .10    52.80
 127600.0   6092.1  83621.8  37886.2  11341.7  16909.9  36999.3  44588.9  5403.9    52.60
    3.01      .54     4.95     1.02     .120     .030     .120     .000    28.84   524.46
  .000184    1000.    1373.    2300.       2        0        0      .00  5914.26  6438.72


*SECNO 11.380

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=      64.00

  11.380    34.60    61.40      .00      .00    62.09      .69      .38      .22    66.30
 127600.0       .0 127600.0       .0       .0  19150.3       .0  46264.2   5530.3    64.00
    3.07      .00     6.66      .00     .000     .030     .000     .000    26.80 19989.10
  .000354    1000.    1373.    2300.       2        0        0      .00   986.90 20976.00
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP    BAREA     SS      ELCHU    ELCHD
    1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80    27.80
```

```
*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=     61.33 BRIDGE VELOCITY=     7.45   CALCULATED CHANNEL AREA=    17122.

 EGPRS    EGLWC      H3     QWEIR     QLOW     BAREA   TRAPEZOID     ELLC     ELTRD    WEIRLN
                                        AREA
    .00   62.14     .06       0.  127600.   22729.   22477.      67.20    68.30       0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=       64.00

   11.390    34.66    61.46      .00      .00    62.14      .69      .05      .00    66.30
 127600.0       .0 127600.0       .0       .0  19206.1       .0  46286.2   5531.4    64.00
     3.07      .00     6.64      .00     .000     .030     .000     .000    26.80 19988.07
  .000351      50.      50.      50.        0        0        0      .00   988.04 20976.11


*SECNO 11.400

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.50


3470 ENCROACHMENT STATIONS=    2199.0    6519.8  TYPE=     1  TARGET=     4320.750
 ELENCL=     58.00 ELENCR=     65.50
   11.400    33.23    62.07      .00      .00    62.29      .22      .01      .14    52.80
 127600.0   7113.5  82321.5  38165.0  13384.6  17615.9  39204.0  46337.5   5535.4    52.60
     3.07      .53     4.67      .97     .120     .030     .120     .000    28.84   497.64
  .000156      50.      50.      50.        2        0        0      .00  5956.93  6454.57


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3265 DIVIDED FLOW

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  14MAR00    19:02:53                                                PAGE  34


   SECNO    DEPTH    CWSEL    CRIWS    WSELK       EG       HV       HL    OLOSS  L-BANK ELEV
   Q         QLOB      QCH     QROB     ALOB      ACH     AROB      VOL      TWA  R-BANK ELEV
   TIME      VLOB      VCH     VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
   SLOPE    XLOBL     XLCH    XLOBR   ITRIAL      IDC    ICONT    CORAR   TOPWID    ENDST


3470 ENCROACHMENT STATIONS=    1998.3   14239.6  TYPE=     1  TARGET=    -1998.350
 ELENCL=     56.86 ELENCR= 100000.00
   11.480    41.38    62.11      .00      .00    62.36      .25      .06      .01    48.60
 127340.0  11798.3  86644.3  28897.3  18796.3  17916.0  42959.3  47296.3   5623.2    49.50
     3.11      .63     4.84      .67     .120     .030     .120     .000    20.73   863.65
  .000123     400.     370.     700.        2        0        0      .00  7726.66  9025.00


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3470 ENCROACHMENT STATIONS=    1950.0   13410.0  TYPE=     1  TARGET=    -1950.000
 ELENCL=     57.00 ELENCR= 100000.00
   11.550    40.43    62.16      .00      .00    62.42      .25      .05      .00    49.60
 127200.0  11392.7  83424.6  32382.8  17881.7  16775.8  42646.2  48005.1   5692.4    50.50
     3.14      .64     4.97      .76     .120     .030     .120     .000    21.73   833.90
  .000142     400.     370.     400.        0        0        0      .00  7458.99  8292.89


1490 NH CARD USED
*SECNO 11.569
```

```
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

   11.569    38.05    62.15     .00      .00    62.56      .41      .02      .13    68.70
 127200.0       .0 127200.0       .0       .0  24625.1       .0  48122.1   5702.7    67.10
     3.15      .00     5.17      .00     .000     .030     .000     .000    24.10 20262.82
  .000269     100.     100.     100.        2        0        0      .00  1489.83 21752.65


SPECIAL BRIDGE

SB XK      XKOR     COFQ     RDLEN    BWC      BWP      BAREA     SS       ELCHU     ELCHD
     1.25     2.31     2.60      .00    50.00    46.00 32375.00    20.00    24.10    24.10

CCHV=     .300 CEHV=     .500
*SECNO 11.660
CLASS A LOW FLOW

3420 BRIDGE W.S.=     62.13 BRIDGE VELOCITY=      4.37     CALCULATED CHANNEL AREA=     29075.
1
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   SECNO     DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS   L-BANK ELEV
   Q        QLOB      QCH      QROB     ALOB      ACH      AROB     VOL      TWA     R-BANK ELEV
   TIME     VLOB      VCH      VROB     XNL       XNCH     XNR      WTN      ELMIN    SSTA
   SLOPE    XLOBL     XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID   ENDST



  EGPRS     EGLWC      H3      QWEIR     QLOW     BAREA   TRAPEZOID   ELLC     ELTRD    WEIRLN
                                                           AREA
      .00    62.56      .04        0.   127200.   32375.    30545.     63.08    69.07       0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

   11.660    42.35    62.15     .00      .00    62.56      .33      .00      .00    68.90
 127200.0       .0 127200.0       .0       .0  27588.6       .0  48409.8   5720.1    68.20
     3.18      .00     4.61      .00     .000     .035     .000     .000    19.80 20238.45
  .000282     480.     480.     480.        0        0        0      .00  1659.92 21898.37


*SECNO 11.679

3470 ENCROACHMENT STATIONS=     1950.0   13410.0  TYPE=      1  TARGET=    -1950.000
 ELENCL=     57.00  ELENCR= 100000.00
   11.679    40.69    62.42     .00      .00    62.62      .21      .02      .04    49.60
 127200.0  12845.0  78231.2  36123.8  18458.0  16945.2  43781.5  48532.3   5730.8     50.50
     3.18      .70     4.62      .83     .120     .035     .120     .000    21.73   830.82
  .000165     100.     100.     100.        2        0        0      .00  7698.69  8529.51


CCHV=     .100 CEHV=     .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=     1105.4    9060.0  TYPE=      1  TARGET=     7954.610
 ELENCL=     52.50  ELENCR=     74.80
   11.970    31.14    62.86     .00      .00    63.06      .21      .44      .00    46.60
 126360.0  17864.5  66543.1  41952.5  21280.4  13439.9  52979.9  55238.0   6361.7     44.70
     3.45      .84     4.95      .79     .120     .030     .120     .000    31.72   542.41
  .000143     802.    2118.    5043.        2        0        0      .00  7324.74  7867.15

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T1    CF-0033 BROWN & ROOT SERVICES, 11/1/99
T2    Lake Houston HEC-2 MODEL, REACH 3
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ    NINV   IDIR   STRT   METRIC  HVINS   Q     WSEL   FQ

    0     4                              0   50.91

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH   FN    ALLDC   IBW    CHNIM   ITRACE

    3     0     -1

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   SECNO  DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
   TIME   VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
   SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*PROF 3

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=   .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=   1232.0   8990.0  TYPE=    1  TARGET=   -1232.040
 ELENCL=   54.70  ELENCR= 100000.00
   3.615    20.61    50.91     .00    50.91    51.06     .15     .00     .00    41.60
  174300.0   1521.8  167008.7   5769.5   3779.5  51973.1  11582.1      .0      .0    43.80
     .00      .40     3.21      .50     .120     .030     .120    .000    30.30  1277.93
   .000136     0.      0.      0.       0       0       0      .00  7174.17  8452.10


*SECNO 4.745

3470 ENCROACHMENT STATIONS=   1973.4   6985.6  TYPE=    1  TARGET=    5012.200
 ELENCL=   52.00  ELENCR=    48.60
   4.745    20.54    51.74     .00      .00    51.90     .16     .84     .00    51.10
  173330.0      6.5  172233.1   1090.4     92.3  53629.3   3122.6   8151.2   782.7    47.20
     .52      .07     3.21      .35     .120     .030     .120    .000    31.20  2087.00
   .000147   3600.   5966.   4500.       2       0       0      .00  5551.63  7638.63


CCHV=   .300 CEHV=   .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.026    41.37    51.97     .00      .00    52.22     .25     .27     .05    56.20
  173080.0       .0  173080.0       .0       .0  43119.8       .0   9946.9   963.6    57.00
     .62      .00     4.01      .00     .000     .030     .000    .000    10.60  9611.74
   .000231   1030.   1482.   4150.       2       0       0      .00  3485.50 13097.25


*SECNO 5.027

3265 DIVIDED FLOW

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SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       56.00

   5.027   41.39   51.99     .00     .00   52.23     .24     .00     .00   56.20
173080.0      .0 173080.0     .0      .0 44353.1      .0  9947.9   963.6   56.00
     .62     .00    3.90     .00    .000    .030    .000    .000   10.60 9615.15
 .000231      1.      1.      1.       1       0       0     .00 3340.00 13040.57

*SECNO 5.034

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       56.00

   5.034   41.40   52.00     .00     .00   52.24     .24     .01     .00   56.20
173080.0      .0 173080.0     .0      .0 44419.9      .0  9995.7   967.2   56.00
     .62     .00    3.90     .00    .000    .030    .000    .000   10.60 9615.07
 .000230     47.     47.     47.       0       0       0     .00 3340.21 13040.69

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       57.00

   5.035   41.40   52.00     .00     .00   52.25     .25     .00     .01   56.20
173080.0      .0 173080.0     .0      .0 43224.7      .0  9996.8   967.3   57.00
     .62     .00    4.00     .00    .000    .030    .000    .000   10.60 9611.65
 .000229      1.      1.      1.       0       0       0     .00 3485.93 13097.59

*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       57.00

   5.037   41.40   52.00     .00     .00   52.25     .25     .00     .00   56.20
173080.0      .0 173080.0     .0      .0 43208.0      .0 10004.7   968.0   57.00
     .62     .00    4.01     .00    .000    .030    .000    .000   10.60 9611.67
 .000229      8.      8.      8.       0       0       0     .00 3485.87 13097.54
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SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST

*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50
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3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038    41.42    52.02     .00      .00    52.25      .24      .00      .00    56.20
 173080.0       .0  173080.0      .0       .0  44437.1       .0  10005.7    968.0    56.00
    .62      .00     3.89      .00     .000     .030     .000     .000    10.60  9615.05
  .000230       1.       1.       1.       1        0        0      .00  3340.26 13040.71


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045    41.43    52.03     .00      .00    52.26      .23      .01      .00    56.20
 173080.0       .0  173080.0      .0       .0  44503.3       .0  10053.7    971.6    56.00
    .63      .00     3.89      .00     .000     .030     .000     .000    10.60  9614.98
  .000229      47.      47.      47.       0        0        0      .00  3340.47 13040.83


CCHV=     .100 CEHV=     .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046    41.42    52.02     .00      .00    52.27      .25      .00      .00    56.20
 173080.0       .0  173080.0      .0       .0  43311.6       .0  10054.7    971.7    57.00
    .63      .00     4.00      .00     .000     .030     .000     .000    10.60  9611.58
  .000227       1.       1.       1.       0        0        0      .00  3486.29 13097.87


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  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL    OLOSS  L-BANK ELEV
  Q         QLOB     QCH     QROB     ALOB     ACH     AROB      VOL      TWA   R-BANK ELEV
  TIME     VLOB     VCH     VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
  SLOPE    XLOBL    XLCH    XLOBR   ITRIAL     IDC    ICONT    CORAR   TOPWID    ENDST


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 5.585
   5.585    29.05    52.75     .00      .00    52.89      .14      .62      .01    48.20
 172610.0 116272.6  56299.2     38.2  63098.1  12298.4    162.4  13804.7   1393.6    49.80
    .91     1.84     4.58      .24     .049     .030     .120     .000    23.70  1218.60
  .000215    2664.    2847.    1744.       2        0        0      .00 10056.46 11275.06


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW

   6.420    24.95    53.35     .00      .00    53.49      .14      .59      .00    46.70
 171900.0 100239.8  39187.8  32472.4  36458.4   9589.6  17520.0  18109.0   1903.7    47.50
   1.19     2.75     4.09     1.85     .030     .030     .050     .000    28.40 10885.09
  .000190    2300.    4409.    2800.       2        0        0      .00  7514.78 18408.74


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
```

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*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0 TYPE=    1 TARGET=    8229.000
 ELENCL=    53.10  ELENCR=    57.90
    7.090    23.94    54.04     .00     .00    54.22     .18     .72     .01    46.90
  171320.0   9670.2  99466.2  62183.6  13739.7  23219.8  42824.7  23087.4   2495.3    47.40
     1.47      .70     4.28    1.45    .120    .030    .084    .000   30.10  8583.20
   .000282    2000.    3538.   3600.      2       0       0     .00 11263.75 19846.95


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=       .0  16383.0 TYPE=    1 TARGET=   16383.000
    7.470    25.51    54.51     .00     .00    54.78     .27     .53     .03    47.70
  171000.0  64398.1  56614.6  49987.3  44556.5   8668.9  17476.8  25863.6   2863.8    44.30
     1.61     1.45     6.53    2.86    .071    .030    .050    .000   29.00  6987.81
   .000335    1500.    2006.   1500.      2       0       0     .00  9318.83 16306.64


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   SECNO    DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL      TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN    SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID   ENDST


*SECNO 8.070

3470 ENCROACHMENT STATIONS=    3455.4  15481.5 TYPE=    1 TARGET=   -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
    8.070    27.69    55.59     .00     .00    56.15     .57    1.28     .09    44.30
  171000.0  22345.2 107280.0  41374.8  16896.3  14169.7  33910.1  30357.3   3409.8    46.70
     1.76     1.32     7.57    1.22    .120    .030    .120    .000   27.90  3787.74
   .000583    2619.    2891.   3201.      2       0       0     .00  7306.78 11094.52


CCHV=    .100 CEHV=    .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=       .0   3851.7 TYPE=    1 TARGET=    3851.709
    8.490    21.53    57.33     .00     .00    58.62    1.29    2.25     .22    46.00
  169770.0  52152.7 103123.1  14494.1  21414.7   8915.3  12463.2  32999.9   3714.5    50.60
     1.84     2.44    11.57    1.16    .120    .030    .120    .000   35.80   798.04
   .001373    2636.    2374.   1605.      3       0       0     .00  6189.80  6987.84


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.28


3470 ENCROACHMENT STATIONS=    2460.6  10500.0 TYPE=    1 TARGET=   -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
    9.410    24.98    60.48     .00     .00    60.72     .24    1.99     .11    53.30
  169330.0  24942.7  62517.1  81870.2  15235.0  10312.0  49060.6  39007.9   4394.5    49.50
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```
   2.22     1.64    6.06    1.67    .057    .030    .079    .000   35.50   751.49
 .000263   2500.   4858.   5500.      3       0       0      .00  7128.50  7879.99
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  SECNO  DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL    OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=   .100 CEHV=    .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=   1431.2   8020.0  TYPE=    1  TARGET=    6588.810
 ELENCL=    55.17 ELENCR=    59.05
  10.580   39.53   61.63    .00     .00    61.98    .35    1.22     .03    53.60
 168330.0  14289.7  90446.5  63593.7  15785.4  14210.8  59826.3  45707.5  5002.7   50.50
   2.54     .91    6.36    1.06    .100    .030    .120    .000    22.10   174.99
 .000282   2700.   6177.   3200.      2       0       0      .00  9129.64  9304.63


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=       .0   8865.0  TYPE=    1  TARGET=    8864.999
  10.860   30.26   61.96    .00     .00    62.33    .37     .34     .01    52.20
 168090.0  16721.5 107526.7  43841.8  15197.0  17874.0  42154.9  48001.7  5221.8   52.40
   2.63    1.10    6.02    1.04    .100    .030    .120    .000    31.70  1804.54
 .000234   1300.   1478.   1100.      2       0       0      .00  7027.36  8831.89


1490 NH CARD USED
*SECNO 11.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=   3311.7   6950.0  TYPE=    1  TARGET=    3638.260
 ELENCL=    53.30 ELENCR=    63.70
  11.090   30.45   62.25    .00     .00    62.89    .64     .48     .08    53.30
 167890.0  39461.7  98501.5  29926.8  21841.4  11950.9  24079.4  50229.0  5447.4   57.00
   2.70    1.81    8.24    1.24    .082    .030    .120    .000    31.80   784.98
 .000556   1400.   1214.   1600.      2       0       0      .00  6101.18  6886.17


CCHV=   .300 CEHV=    .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=    1  TARGET=    4320.750
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  SECNO  DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL    OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


 ELENCL=    58.00 ELENCR=    65.50
  11.350   34.29   63.13    .00     .00    63.46    .33     .48     .09    52.80
 167670.0  11026.1 106110.8  50533.1  16023.1  18516.5  42035.4  52889.2  5676.5   52.60
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  2.80     .69    5.73    1.20    .120    .030    .120    .000   28.84  463.42
 .000219   1000.   1373.   2300.      2      0       0     .00  6011.37  6474.79


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=      64.00

  11.380   36.49   63.29     .00     .00   64.27     .98     .48     .33   66.30
 167670.0      .0 167670.0     .0      .0  21052.2      .0  54806.5  5805.2   64.00
   2.86     .00    7.96     .00    .000    .030    .000    .000   26.80 19954.75
 .000473   1000.   1373.   2300.      2      0       0     .00  1031.99 20986.74



SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80   27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=     63.19 BRIDGE VELOCITY=     8.95    CALCULATED CHANNEL AREA=     18743.

 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA   TRAPEZOID     ELLC     ELTRD    WEIRLN
                                                     AREA
    .00   64.35     .08      0.  167670.   22729.   22477.     67.20   68.30      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=      64.00

  11.390   36.57   63.37     .00     .00   64.35     .98     .08     .00   66.30
 167670.0      .0 167670.0     .0      .0  21139.5      .0  54830.7  5806.4   64.00
   2.86     .00    7.93     .00    .000    .030    .000    .000   26.80 19953.22
 .000468     50.     50.     50.      0       0       0     .00  1035.10 20988.32


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH     AROB     VOL     TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.62


3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=     4320.750
 ELENCL=    58.00 ELENCR=    65.50
  11.400   35.45   64.29     .00     .00   64.57     .28     .01     .21   52.80
 167670.0 12788.1 104014.7 50867.3 18966.9 19498.0 45145.8 54890.8  5810.6    52.60
   2.86     .67    5.33    1.13    .120    .030    .120    .000   28.84  290.01
 .000177     50.     50.     50.      2       0       0     .00  6206.81  6496.83
```

```
CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=   1998.3  14239.6 TYPE=    1 TARGET=  -1998.350
 ELENCL=   56.86  ELENCR= 100000.00
  11.480   43.62   64.35    .00    .00   64.65    .30    .07    .01   48.60
 167560.0  18075.6 106257.1  43227.3  24043.6  19442.9  55608.7  56063.2   5913.3    49.50
   2.90    .75    5.47    .78   .120   .030   .120   .000   20.73  653.03
  .000141   400.    370.    700.     2      0      0    .00  9517.14 10170.17


CCHV=   .600 CEHV=   .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=   1950.0  13410.0 TYPE=    1 TARGET=  -1950.000
 ELENCL=   57.00  ELENCR= 100000.00
  11.550   42.68   64.41    .00    .00   64.71    .30    .06    .00   49.60
 167500.0  17836.8 102620.2  47042.9  23125.3  18308.6  53923.5  56943.0   5997.3    50.50
   2.92    .77    5.61    .87   .120   .030   .120   .000   21.73  806.02
  .000161   400.    370.    400.     0      0      0    .00  8872.30  9946.10
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     68.70 ELREA=     67.10

  11.569   40.28   64.38    .00    .00   64.94    .56    .02    .20   68.70
 167500.0      .0 167500.0     .0     .0  27962.9     .0  57084.6   6009.2   67.10
   2.93    .00    5.99    .00   .000   .031   .000   .000   24.10 20258.45
  .000323   100.    100.    100.     2      0      0    .00  1501.44 21759.89


SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA     SS     ELCHU   ELCHD
   1.25    2.31    2.60     .00    50.00   46.00  32375.00   20.00   24.10   24.10

CCHV=   .300 CEHV=   .500
*SECNO 11.660
PRESSURE FLOW


 EGPRS   EGLWC    H3    QWEIR    QPR     BAREA  TRAPEZOID   ELLC    ELTRD   WEIRLN
                                  AREA
   65.34   64.94   .06     0.  167500.  32375.   30545.    63.08   69.07     0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     68.90 ELREA=     68.20

  11.660   45.12   64.92    .00    .00   65.34    .42    .40    .00   68.90
 167500.0      .0 167500.0     .0     .0  32119.4     .0  57415.6   6026.6   68.20
```

```
  2.95     .00    5.21     .00    .000    .035    .000     .000    19.80  20235.84
 .000297    480.    480.    480.      2       0       0     .00  1665.64  21901.48


*SECNO 11.679

3470 ENCROACHMENT STATIONS=   1950.0  13410.0  TYPE=    1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.679    43.47    65.20     .00     .00    65.42     .22     .02     .06    49.60
 167500.0  20445.1  93952.1  53102.8  24992.3  18845.9  58773.5  57570.3   6039.4    50.50
   2.96     .82     4.99     .90    .120    .035    .120     .000    21.73   701.93
 .000167    100.    100.    100.      2       0       0     .00  9432.45  10134.38


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL    XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=   1105.4   9060.0  TYPE=    1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=    74.80
  11.970    33.94    65.66     .00     .00    65.89     .23     .46     .00    46.60
 167140.0  25191.3  81139.9  60808.9  26838.4  14991.3  67384.4  66172.8   6782.3    44.70
   3.23     .94     5.41     .90    .120    .030    .120     .000    31.72   155.95
 .000148    802.   2118.   5043.      2       0       0     .00  7960.55  8116.50


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T1    CF-0033 BROWN & ROOT SERVICES,  11/1/99
T2    Lake Houston HEC-2 MODEL, REACH 3
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS    Q      WSEL    FQ

    0     5                                 0    54.9

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH    FN    ALLDC    IBW    CHNIM   ITRACE

   15     0     -1




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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL    XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*PROF 4

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0
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CCHV=   .100 CEHV=   .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=    1232.0    8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
   3.615    24.60    54.90      .00    54.90    55.21      .31      .00      .00    41.60
 333600.0   5663.8 311703.2  16233.1   8406.9  67786.4  20924.6       .0       .0    43.80
     .00      .67     4.60      .78     .120     .030     .120     .000    30.30   161.12
  .000196       0.       0.       0.        0        0        0      .00  8729.88  8891.00


*SECNO 4.745

3470 ENCROACHMENT STATIONS=    1973.4    6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60
   4.745    24.84    56.04      .00      .00    56.34      .30     1.14      .00    51.10
 329800.0   2905.3 322008.5   4886.2   7107.0  72235.3   7556.9  11700.9    933.4    47.20
     .37      .41     4.46      .65     .120     .030     .120     .000    31.20   347.39
  .000190    3600.    5966.    4500.        2        0        0      .00  7484.51  7831.90


CCHV=   .300 CEHV=   .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.026    45.73    56.33      .00      .00    56.73      .40      .34      .05    56.20
 328820.0  21532.4 307287.6       .0  31825.8  58436.4       .0  14744.1   1221.1    57.00
     .46      .68     5.26      .00     .120     .030     .000     .000    10.60  3170.15
  .000270    1030.    1482.    4150.        2        0        0      .00  9976.62 13146.77


*SECNO 5.027

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .40

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL    OLOSS  L-BANK ELEV
   Q       QLOB      QCH     QROB     ALOB      ACH     AROB      VOL      TWA  R-BANK ELEV
   TIME     VLOB      VCH     VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
   SLOPE   XLOBL     XLCH    XLOBR   ITRIAL      IDC    ICONT    CORAR   TOPWID    ENDST


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.027    45.53    56.13      .00      .00    56.93      .79      .00      .19    56.20
 328820.0       .0 328820.0       .0       .0  46083.5       .0  14745.6   1221.2    56.00
     .46      .00     7.14      .00     .000     .030     .000     .000    10.60  9599.31
  .001723       1.       1.       1.        4        0        0-12531.31  3468.03 13067.34


*SECNO 5.034

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

   5.034    45.72    56.32      .00      .00    57.03      .71      .08      .02    56.20
 328820.0  11423.7 317396.3       .0  13971.3  46083.5       .0  14802.9   1228.8    56.00
     .46      .82     6.89      .00     .120     .030     .000     .000    10.60  2598.16
  .001605      47.      47.      47.       12        0        0-36125.11 10474.94 13073.10


*SECNO 5.035
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3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.55


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.035   46.15   56.75     .00     .00   57.13     .38     .00     .10   56.20
 328820.0  23094.2 305725.8      .0  34612.0  59943.4      .0  14804.7   1229.0   57.00
     .46     .67    5.10     .00    .120    .030    .000    .000   10.60  2900.42
  .000246      1.      1.      1.       2       0       0     .00 10251.18 13151.59


*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037   46.15   56.75     .00     .00   57.13     .38     .00     .00   56.20
 328820.0  23118.6 305701.5      .0  34656.3  59966.9      .0  14822.0   1230.9   57.00
     .46     .67    5.10     .00    .120    .030    .000    .000   10.60  2896.21
  .000246      8.      8.      8.       0       0       0     .00 10255.46 13151.67


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   SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 5.038

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .39


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

   5.038   45.99   56.59     .00     .00   57.30     .71     .00     .17   56.20
 328820.0  11423.7 317396.3      .0  13971.3  46083.5      .0  14823.8   1231.1   56.00
     .46     .82    6.89     .00    .120    .030    .000    .000   10.60  2467.21
  .001605      1.      1.      1.       2       0       0 -38988.96 10614.53 13081.74


*SECNO 5.045

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

   5.045   46.06   56.66     .00     .00   57.37     .71     .08     .00   56.20
 328820.0  11423.7 317396.3      .0  13971.3  46083.5      .0  14888.6   1242.6   56.00
     .46     .82    6.89     .00    .120    .030    .000    .000   10.60  2430.83
  .001605     47.     47.     47.       2       0       0 -39791.34 10653.30 13084.14


CCHV=   .100 CEHV=    .300
*SECNO 5.046

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.64

   5.046   46.45   57.05     .00     .00   57.41     .36     .00     .04   56.20
 328820.0  24187.0 304633.0      .0  36637.3  61003.0      .0  14890.4   1242.8   57.00
     .46     .66    4.99     .00    .120    .030    .000    .000   10.60  2710.97
  .000231      1.      1.      1.       2       0       0     .00 10444.39 13155.37


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 5.585
   5.585   34.16   57.86     .00     .00   58.03     .17     .60     .02   48.20
```

```
 326970.0 238436.8  87891.6    641.6 111169.5  16257.2   1291.0  21960.8   1899.4    49.80
    .72     2.14     5.41      .50     .054     .030     .120     .000    23.70   662.54
 .000207    2664.    2847.    1744.       2        0        0      .00 10852.17 11514.70
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 6.420
   6.420   29.96    58.36      .00      .00    58.53      .18      .50      .00    46.70
 324160.0 207766.6  57664.8  58728.6  62820.2  12863.8  27571.1  28955.6   2464.3    47.50
    .95     3.31     4.48     2.13     .030     .030     .050     .000    28.40  9903.25
 .000155    2300.    4409.    2800.       2        0        0      .00  8701.29 18604.54


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0  TYPE=     1  TARGET=     8229.000
 ELENCL=    53.10  ELENCR=    57.90
   7.090   28.83    58.93      .00      .00    59.17      .24      .62      .02    46.90
 321910.0  37170.9 171781.7 112957.4  48099.9  32929.9  66164.7  37235.0   3246.7    47.40
   1.19      .77     5.22     1.71     .120     .030     .085     .000    30.10  5381.56
 .000263    2000.    3538.    3600.       2        0        0      .00 16555.20 21936.76


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=        .0  16383.0  TYPE=     1  TARGET=    16383.000
   7.470   30.41    59.41      .00      .00    59.67      .26      .49      .01    47.70
 320030.0 144484.2  80332.4  95213.4  80128.9  10847.2  38937.6  42260.4   3779.1    44.30
   1.33     1.80     7.41     2.45     .075     .030     .055     .000    29.00  6784.21
 .000319    1500.    2006.    1500.       2        0        0      .00 13548.95 20333.16


*SECNO 8.070

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .70
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST


3470 ENCROACHMENT STATIONS=    3455.4  15481.5  TYPE=     1  TARGET=    -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
```

```
  8.070   32.46   60.36    .00    .00   61.16    .80   1.33    .16   44.30
 320030.0  47714.7  175714.5  96600.7  26191.3  18380.8  56651.2  49939.3   4510.9    46.70
   1.46    1.82    9.56    1.71   .120   .030   .120   .000   27.90  3495.39
  .000657   2619.   2891.   3201.     2     0     0    .00  8225.06 11755.54


CCHV=   .100 CEHV=   .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .67


3470 ENCROACHMENT STATIONS=      .0   3851.7  TYPE=    1  TARGET=   3851.709
  8.490   26.31   62.11    .00    .00   63.76   1.65   2.35    .26   46.00
 315820.0  92814.7  163497.7  59507.6  30126.8  11598.7  30930.3  54073.8   4839.0    50.60
   1.54    3.08   14.10    1.92   .120   .030   .120   .000   35.80   764.98
  .001435   2636.   2374.   1605.     2     0     0    .00  6329.49  7094.47


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.17


3470 ENCROACHMENT STATIONS=   2460.6   10500.0  TYPE=    1  TARGET=   -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
  9.410   30.32   65.82    .00    .00   66.14    .32   2.24    .13   53.30
 314100.0  61746.7  97784.3  154569.0  29360.4  12946.2  74922.0  63832.1   5651.0    49.50
   1.87    2.10    7.55    2.06   .065   .030   .082   .000   35.50   717.81
  .000302   2500.   4858.   5500.     2     0     0    .00  9116.08  9833.89


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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG     HV     HL     OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=   .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=   1431.2   8020.0  TYPE=    1  TARGET=   6588.810
 ELENCL=    55.17  ELENCR=    59.05
  10.580   44.94   67.04    .00    .00   67.47    .43   1.29    .03   53.60
 309220.0  39430.8  137453.0  132336.2  28565.4  17796.4  98084.4  74161.7   6386.8    50.50
   2.15    1.38    7.72    1.35   .100   .030   .120   .000   22.10   131.91
  .000308   2700.   6177.   3200.     2     0     0    .00 10628.25 10760.16


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=      .0   8865.0  TYPE=    1  TARGET=   8864.999
  10.860   35.66   67.36    .00    .00   67.89    .52    .39    .03   52.20
 310160.0  36892.7  171366.3  101900.9  23232.9  22178.0  82387.5  77891.5   6664.0    52.40
   2.22    1.59    7.73    1.24   .100   .030   .120   .000   31.70  1743.35
  .000289   1300.   1478.   1100.     2     0     0    .00 10117.98 11861.34
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1490 NH CARD USED
*SECNO 11.090

3470 ENCROACHMENT STATIONS=   3311.7  6950.0 TYPE=   1 TARGET=   3638.260
 ELENCL=   53.30 ELENCR=   63.70
  11.090   35.98   67.78    .00    .00   68.45    .67    .52    .04   53.30
 308450.0  85459.7 144752.4  78237.9  35985.6  15445.8  58108.8  81947.7  7029.6   57.00
   2.29    2.37    9.37   1.35   .083   .030   .120   .000   31.80  721.87
  .000510   1400.   1214.   1600.     0      0      0    .00 10644.62 11366.49


CCHV=   .300 CEHV=   .500
*SECNO 11.350

3470 ENCROACHMENT STATIONS=   2199.0  6519.8 TYPE=   1 TARGET=   4320.750
 ELENCL=   58.00 ELENCR=   65.50
  11.350   39.71   68.55    .00    .00   69.07    .52    .57    .05   52.80
 307570.0  33645.4 175179.8  98744.9  30851.6  23102.0  70491.5  86717.5  7505.7   52.60
   2.38    1.09    7.58   1.40   .120   .030   .120   .000   28.84  113.29
  .000286   1000.   1373.   2300.     2      0      0    .00 11056.90 11170.19


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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*SECNO 11.380
  11.380   42.21   69.01    .00    .00   69.58    .57    .48    .02   66.30
 307570.0  26325.9 202088.7  79155.4  26088.1  27260.5  67929.1  91819.1  7972.5   64.00
   2.47    1.01    7.41   1.17   .120   .030   .120   .000   26.80 17098.65
  .000316   1000.   1373.   2300.     2      0      0    .00 10601.59 27700.24



SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS     ELCHU    ELCHD
    1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80   27.80

*SECNO 11.390
PRESSURE AND WEIR FLOW,  Weir Submergence Based on TRAPEZOIDAL Shape


 EGPRS    EGLWC     H3    QWEIR    QPR     BAREA  TRAPEZOID   ELLC    ELTRD    WEIRLN
                                   AREA
   73.28    69.62    .04  180916.  127405.  22729.  22477.     67.20   68.30   7089.


  11.390   42.39   69.19    .00    .00   69.74    .55    .16    .00   66.30
 307570.0  26688.1 201070.8  79811.1  26599.2  27461.0  69150.8  91959.4  7984.7   64.00
   2.47    1.00    7.32   1.15   .120   .030   .120   .000   26.80 17093.22
  .000305     50.     50.     50.     2      0      4    .00 10610.67 27703.88


*SECNO 11.400

3470 ENCROACHMENT STATIONS=   2199.0  6519.8 TYPE=   1 TARGET=   4320.750
 ELENCL=   58.00 ELENCR=   65.50
  11.400   40.48   69.32    .00    .00   69.78    .47    .01    .03   52.80
 307570.0  35077.8 172084.8 100407.3  33025.5  23746.8  76110.8  92106.4  7997.1   52.60
   2.47    1.06    7.25   1.32   .120   .030   .120   .000   28.84  100.74
  .000252     50.     50.     50.     2      0      0    .00 11083.03 11183.77
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CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=    1998.3  14239.6  TYPE=     1  TARGET=   -1998.350
 ELENCL=    56.86  ELENCR= 100000.00
   11.480    48.70    69.43      .00      .00    69.89      .46      .11      .00    48.60
  307140.0  41546.0 167150.3  98443.7  38046.1  22912.9  89543.3  93961.9   8144.0    49.50
     2.50     1.09     7.30     1.10     .120     .030     .120     .000    20.73   298.75
   .000202    400.     370.     700.        1        0        0      .00 10367.99 10666.73

1
  14MAR00     19:02:53                                                    PAGE  55

   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST

CCHV=   .600 CEHV=    .800
*SECNO 11.550

3470 ENCROACHMENT STATIONS=    1950.0  13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
   11.550    47.78    69.51      .00      .00    69.98      .46      .08      .00    49.60
  306900.0  41485.1 162177.1 103237.8  36766.4  21791.6  87383.1  95307.6   8238.5    50.50
     2.53     1.13     7.44     1.18     .120     .030     .120     .000    21.73   308.79
   .000225    400.     370.     400.        0        0        0      .00 10311.17 10619.96

1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED
   11.569    45.47    69.57      .00      .00    70.01      .45      .02      .01    68.70
  306900.0  21761.0 223800.2  61338.8  19835.8  35804.6  55898.8  95603.1   8261.2    67.10
     2.53     1.10     6.25     1.10     .100     .032     .120     .000    24.10 18079.34
   .000270    100.     100.     100.        2        0        0      .00  9464.33 27543.67

SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
    1.25    2.31    2.60     .00    50.00   46.00 32375.00   20.00   24.10    24.10

CCHV=   .300 CEHV=    .500
*SECNO 11.660
PRESSURE AND WEIR FLOW,  Weir Submergence Based on TRAPEZOIDAL Shape

 EGPRS    EGLWC     H3    QWEIR     QPR     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                                      AREA
   72.79    70.01     .04  113900.  191068.  32375.   30545.     63.08    69.07    6537.

   11.660    50.67    70.47      .00      .00    70.82      .34      .80      .00    68.90
  306900.0  23180.1 225885.7  57834.2  21901.7  41433.2  56842.0  96879.8   8364.5    68.20
     2.56     1.06     5.45     1.02     .120     .035     .120     .000    19.80 18417.93
   .000235    480.     480.     480.        2        0        2      .00  9291.50 27709.43

*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0  13410.0  TYPE=     1  TARGET=   -1950.000
1
  14MAR00     19:02:53                                                    PAGE  56
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SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


ELENCL=    57.00 ELENCR= 100000.00
 11.679   48.79   70.52    .00     .00   70.84    .32    .02    .01   49.60
306900.0 46265.2 146128.8 114506.0 39622.4 22472.1 94179.2 97197.1 8387.1   50.50
  2.57    1.17    6.50    1.22    .120    .035   .120   .000   21.73  273.22
.000224   100.    100.    100.      2       0      0     .00 10397.45 10670.67


CCHV=   .100 CEHV=   .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4   9060.0 TYPE=    1 TARGET=    7954.610
 ELENCL=    52.50 ELENCR=    74.80
 11.970   39.43   71.15    .00     .00   71.51    .36    .65    .01   46.60
305490.0 50471.3 130046.1 124972.5 38655.2 18031.6 98507.0 110056.2 9202.9   44.70
  2.80    1.31    7.21    1.27    .120    .030   .120   .000   31.72   87.82
.000205   802.    2118.   5043.     2       0      0     .00  8670.87  8758.70
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14MAR00   19:02:53   PAGE 57

THIS RUN EXECUTED 14MAR00   19:02:54

****
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

Starting form river mile

SUMMARY PRINTOUT

	VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
	.000	.26	.23	1.87	39693.85	5842.35	.28	98.41	1.31
	.000	.37	.44	2.97	57840.25	6975.50	.60	96.69	2.71
	.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
	.000	.67	.78	4.60	97117.93	8729.88	1.70	93.44	4.87
	4955.114	.00	.00	1.95	33894.29	4324.09	.00	100.00	.00
	7117.799	.00	.26	2.94	49663.25	5217.94	.00	99.65	.35
	8151.214	.07	.35	3.21	56844.21	5551.63	.00	99.37	.63
	11700.950	.41	.65	4.46	86899.22	7484.51	.88	97.64	1.48
	5993.760	.00	.00	2.43	27162.98	3418.36	.00	100.00	.00
	8673.972	.00	.00	3.65	38415.29	3466.05	.00	100.00	.00
	9946.853	.00	.00	4.01	43119.80	3485.50	.00	100.00	.00
	14744.070	.68	.00	5.26	90262.13	9976.62	6.55	93.45	.00
	5994.405	.00	.00	2.27	29018.00	3293.66	.00	100.00	.00
	8674.870	.00	.00	3.52	39843.62	3326.05	.00	100.00	.00
	9947.856	.00	.00	3.90	44353.10	3340.00	.00	100.00	.00
*	14745.640	.00	.00	7.14	46083.49	3468.03	.00	100.00	.00

6025.740	.00	.00	2.27	29064.39	3293.80	.00	100.00	.00
8717.896	.00	.00	3.51	39909.65	3326.26	.00	100.00	.00
9995.748	.00	.00	3.90	44419.91	3340.21	.00	100.00	.00
14802.900	.82	.00	6.89	60054.81	10474.94	3.47	96.53	.00
6026.386	.00	.00	2.42	27236.19	3418.70	.00	100.00	.00
8718.796	.00	.00	3.64	38519.84	3466.48	.00	100.00	.00
9996.754	.00	.00	4.00	43224.65	3485.93	.00	100.00	.00
* 14804.670	.67	.00	5.10	94555.36	10251.18	7.02	92.98	.00
6031.387	.00	.00	2.42	27221.04	3418.63	.00	100.00	.00
8725.868	.00	.00	3.64	38501.41	3466.41	.00	100.00	.00
10004.690	.00	.00	4.01	43208.01	3485.87	.00	100.00	.00
14822.040	.67	.00	5.10	94623.19	10255.46	7.03	92.97	.00

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
6032.033	.00	.00	2.27	29073.98	3293.83	.00	100.00	.00
8726.769	.00	.00	3.51	39925.80	3326.31	.00	100.00	.00
10005.700	.00	.00	3.89	44437.07	3340.26	.00	100.00	.00
* 14823.820	.82	.00	6.89	60054.81	10614.53	3.47	96.53	.00
6063.428	.00	.00	2.27	29120.01	3293.97	.00	100.00	.00
8769.883	.00	.00	3.51	39991.27	3326.51	.00	100.00	.00
10053.680	.00	.00	3.89	44503.28	3340.47	.00	100.00	.00
14888.620	.82	.00	6.89	60054.81	10653.30	3.47	96.53	.00
6064.075	.00	.00	2.42	27293.89	3418.96	.00	100.00	.00
8770.785	.00	.00	3.63	38604.85	3466.84	.00	100.00	.00
10054.690	.00	.00	4.00	43311.63	3486.29	.00	100.00	.00
* 14890.430	.66	.00	4.99	97640.33	10444.39	7.36	92.64	.00
* 7245.673	.00	.00	7.41	8863.75	609.67	.00	100.00	.00
11940.060	1.79	.16	4.35	61632.32	9772.60	64.90	35.10	.00
13804.670	1.84	.24	4.58	75558.88	10056.46	67.36	32.62	.02
21960.780	2.14	.50	5.41	128717.80	10852.17	72.92	26.88	.20
* 8899.271	1.70	1.18	2.87	36717.37	7043.26	48.85	31.60	19.55
15547.070	2.57	1.76	3.98	53470.95	7372.54	55.67	25.18	19.15
18109.020	2.75	1.85	4.09	63568.08	7514.78	58.31	22.80	18.89
28955.550	3.31	2.13	4.48	103255.10	8701.29	64.09	17.79	18.12
11912.820	.45	.88	2.53	47350.68	7380.76	3.79	60.43	35.77
19782.750	.73	1.33	3.89	66809.60	7846.24	4.89	58.89	36.22
23087.400	.70	1.45	4.28	79784.26	11263.75	5.64	58.06	36.30
37235.020	.77	1.71	5.22	147194.50	16555.20	11.55	53.36	35.09
13476.180	.89	1.77	4.26	35912.72	7474.41	24.70	45.12	30.18
22106.050	1.31	2.63	6.09	58462.90	8606.81	34.09	36.31	29.60
25863.640	1.45	2.86	6.53	70702.23	9318.83	37.66	33.11	29.23
42260.430	1.80	2.45	7.41	129913.60	13548.95	45.15	25.10	29.75
15802.020	.69	.64	4.80	33892.48	6579.98	9.23	75.93	14.84
25866.740	1.15	1.07	6.90	54917.43	7065.01	12.23	66.01	21.76
30357.330	1.32	1.22	7.57	64976.06	7306.78	13.07	62.74	24.20
* 49939.270	1.82	1.71	9.56	101223.30	8225.06	14.91	54.91	30.18
* 17190.890	1.43	.81	7.31	20020.04	2848.30	28.08	70.24	1.68
* 28081.290	2.17	.97	10.48	33893.66	6163.83	30.81	64.10	5.09
* 32999.910	2.44	1.16	11.57	42793.20	6189.80	30.72	60.74	8.54
* 54073.780	3.08	1.92	14.10	72655.89	6329.49	29.39	51.77	18.84
* 20059.710	1.39	1.09	4.25	35925.05	5247.10	8.38	48.90	42.72
* 33004.770	1.56	1.49	5.51	62229.36	7089.26	12.67	39.62	47.71
* 39007.850	1.64	1.67	6.06	74607.59	7128.50	14.73	36.92	48.35
* 63832.100	2.10	2.06	7.55	117228.60	9116.08	19.66	31.13	49.21

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
23376.390	.29	.62	4.50	39047.84	7357.44	.74	72.13	27.13
38633.800	.72	.94	5.75	73596.31	8822.32	6.42	57.99	35.59
45707.460	.91	1.06	6.36	89822.48	9129.64	8.49	53.73	37.78
74161.720	1.38	1.35	7.72	144446.10	10628.25	12.75	44.45	42.80
24489.940	.47	.63	3.62	39808.99	4439.52	4.76	74.51	20.73
40538.640	.90	.93	5.23	62747.29	6830.96	8.81	66.89	24.30
48001.750	1.10	1.04	6.02	75225.93	7027.36	9.95	63.97	26.08
77891.510	1.59	1.24	7.73	127798.40	10117.98	11.89	55.25	32.85
* 25342.970	.76	.00	7.47	13087.38	2972.72	6.34	93.66	.00
* 42356.930	1.53	1.07	7.62	46536.60	6000.31	20.47	63.99	15.53
* 50228.970	1.81	1.24	8.24	57871.67	6101.18	23.50	58.67	17.83
81947.700	2.37	1.35	9.37	109540.20	10644.62	27.71	46.93	25.36
* 26437.910	.35	.67	3.37	41353.79	4147.62	1.52	71.08	27.40
* 44588.880	.54	1.02	4.95	65250.98	5914.26	4.77	65.53	29.69
* 52889.210	.69	1.20	5.73	76574.88	6011.37	6.58	63.29	30.14
86717.480	1.09	1.40	7.58	124445.10	11056.90	10.94	56.96	32.10
27582.810	.00	.00	4.21	14833.43	958.22	.00	100.00	.00
46264.160	.00	.00	6.66	19150.31	986.90	.00	100.00	.00
* 54806.480	.00	.00	7.96	21052.18	1031.99	.00	100.00	.00
91819.130	1.01	1.17	7.41	121277.70	10601.59	8.56	65.70	25.74
27599.850	.00	.00	4.20	14854.04	958.33	.00	100.00	.00
46286.180	.00	.00	6.64	19206.13	988.04	.00	100.00	.00
54830.690	.00	.00	7.93	21139.46	1035.10	.00	100.00	.00
91959.450	1.00	1.15	7.32	123211.10	10610.67	8.68	65.37	25.95
27633.030	.35	.65	3.27	42945.25	4162.42	1.69	70.61	27.70
* 46337.490	.53	.97	4.67	70204.51	5956.93	5.57	64.52	29.91
* 54890.810	.67	1.13	5.33	83610.66	6206.81	7.63	62.04	30.34
92106.420	1.06	1.32	7.25	132883.20	11083.03	11.40	55.95	32.65
28195.520	.41	.40	3.43	44988.41	6350.49	5.27	80.15	14.58
47296.320	.63	.67	4.84	79671.61	7726.66	9.27	68.04	22.69
56063.220	.75	.78	5.47	99095.23	9517.14	10.79	63.41	25.80
93961.910	1.09	1.10	7.30	150502.30	10367.99	13.53	54.42	32.05
28592.460	.43	.49	3.58	43564.19	5992.14	4.60	77.13	18.27
48005.110	.64	.76	4.97	77303.70	7458.99	8.96	65.59	25.46
56943.020	.77	.87	5.61	95357.38	8872.30	10.65	61.27	28.09
95307.600	1.13	1.18	7.44	145941.00	10311.17	13.52	52.84	33.64
28662.390	.00	.00	3.59	17358.28	1470.10	.00	100.00	.00
48122.110	.00	.00	5.17	24625.06	1489.83	.00	100.00	.00
57084.570	.00	.00	5.99	27962.86	1501.44	.00	100.00	.00
95603.150	1.10	1.10	6.25	111539.20	9464.33	7.09	72.92	19.99

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
28865.150	.00	.00	3.20	19442.47	1639.63	.00	100.00	.00
48409.790	.00	.00	4.61	27588.59	1659.92	.00	100.00	.00
57415.610	.00	.00	5.21	32119.42	1665.64	.00	100.00	.00
96879.820	1.06	1.02	5.45	120177.00	9291.50	7.55	73.60	18.84
28938.080	.47	.54	3.42	44092.23	6030.15	5.24	74.05	20.71
48532.350	.70	.83	4.62	79184.65	7698.69	10.10	61.50	28.40

57570.250	.82	.90	4.99	102611.70	9432.45	12.21	56.09	31.70
97197.140	1.17	1.22	6.50	156273.80	10397.45	15.08	47.61	37.31
32696.660	.56	.56	3.73	51180.45	6398.18	11.45	63.48	25.07
55237.960	.84	.79	4.95	87700.20	7324.74	14.14	52.66	33.20
66172.750	.94	.90	5.41	109214.00	7960.55	15.07	48.55	36.38
110056.200	1.31	1.27	7.21	155193.70	8670.87	16.52	42.57	40.91

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	66800.00	46.66	.00	46.71	.78	1.87	39693.85	75729.41
3.615	.00	.00	.00	30.30	143300.00	49.57	.00	49.70	1.34	2.97	57840.25	123715.20
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
3.615	.00	.00	.00	30.30	333600.00	54.90	.00	55.21	1.96	4.60	97117.93	238550.70
4.745	5966.00	.00	.00	31.20	66160.00	47.18	.00	47.24	1.00	1.95	33894.29	66227.09
4.745	5966.00	.00	.00	31.20	140750.00	50.39	.00	50.53	1.43	2.94	49663.25	117646.00
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21	143031.00
4.745	5966.00	.00	.00	31.20	329800.00	56.04	.00	56.34	1.90	4.46	86899.22	239133.10
5.026	1482.00	.00	.00	10.60	65990.00	47.35	.00	47.44	1.52	2.43	27162.98	53468.23
5.026	1482.00	.00	.00	10.60	140170.00	50.62	.00	50.83	2.21	3.65	38415.29	94389.82
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80	114001.30
5.026	1482.00	.00	.00	10.60	328820.00	56.33	.00	56.73	2.70	5.26	90262.13	200060.90
5.027	1.00	58.25	52.50	10.60	65990.00	47.37	.00	47.45	1.29	2.27	29018.00	58007.03
5.027	1.00	58.25	52.50	10.60	140170.00	50.64	.00	50.83	2.13	3.52	39843.62	96085.80
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10	113789.00
* 5.027	1.00	58.25	52.50	10.60	328820.00	56.13	.00	56.93	17.23	7.14	46083.49	79215.25
5.034	47.00	58.25	52.50	10.60	65990.00	47.37	.00	47.45	1.29	2.27	29064.39	58155.61
5.034	47.00	58.25	52.50	10.60	140170.00	50.65	.00	50.84	2.12	3.51	39909.65	96337.66
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91	114058.80
5.034	47.00	58.25	52.50	10.60	328820.00	56.32	.00	57.03	16.05	6.89	60054.81	82066.36
5.035	1.00	.00	.00	10.60	65990.00	47.37	.00	47.46	1.51	2.42	27236.19	53705.04
5.035	1.00	.00	.00	10.60	140170.00	50.64	.00	50.85	2.19	3.64	38519.84	94810.41
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65	114454.10
* 5.035	1.00	.00	.00	10.60	328820.00	56.75	.00	57.13	2.46	5.10	94555.36	209609.70
5.037	8.00	.00	.00	10.60	65990.00	47.37	.00	47.46	1.51	2.42	27221.04	53656.03
5.037	8.00	.00	.00	10.60	140170.00	50.64	.00	50.85	2.19	3.64	38501.41	94736.23
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01	114382.20
5.037	8.00	.00	.00	10.60	328820.00	56.75	.00	57.13	2.46	5.10	94623.19	209760.40
5.038	1.00	58.25	52.50	10.60	65990.00	47.38	.00	47.46	1.29	2.27	29073.98	58186.32
5.038	1.00	58.25	52.50	10.60	140170.00	50.66	.00	50.86	2.11	3.51	39925.80	96399.34
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07	114128.10
* 5.038	1.00	58.25	52.50	10.60	328820.00	56.59	.00	57.30	16.05	6.89	60054.81	82066.34
5.045	47.00	58.25	52.50	10.60	65990.00	47.39	.00	47.47	1.28	2.27	29120.01	58333.93
5.045	47.00	58.25	52.50	10.60	140170.00	50.67	.00	50.87	2.10	3.51	39991.27	96649.34
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28	114395.70
5.045	47.00	58.25	52.50	10.60	328820.00	56.66	.00	57.37	16.05	6.89	60054.81	82066.34

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K

	5.046	1.00	.00	.00	10.60	65990.00	47.38	.00	47.47	1.50	2.42	27293.89	53892.00
	5.046	1.00	.00	.00	10.60	140170.00	50.66	.00	50.87	2.17	3.63	38604.85	95152.86
	5.046	1.00	.00	.00	10.60	173080.00	52.02	.00	52.27	2.27	4.00	43311.63	114830.20
*	5.046	1.00	.00	.00	10.60	328820.00	57.05	.00	57.41	2.31	4.99	97640.33	216481.70
*	5.585	2847.00	.00	.00	23.70	65680.00	47.97	.00	48.82	6.35	7.41	8863.75	26071.16
	5.585	2847.00	.00	.00	23.70	139080.00	51.35	.00	51.49	2.20	4.35	61632.32	93702.27
	5.585	2847.00	.00	.00	23.70	172610.00	52.75	.00	52.89	2.15	4.58	75558.88	117640.60
	5.585	2847.00	.00	.00	23.70	326970.00	57.86	.00	58.03	2.07	5.41	128717.80	227276.30
*	6.420	4409.00	.00	.00	28.40	65210.00	49.68	.00	49.74	1.38	2.87	36717.37	55569.43
	6.420	4409.00	.00	.00	28.40	137410.00	51.99	.00	52.12	2.05	3.98	53470.95	95997.91
	6.420	4409.00	.00	.00	28.40	171900.00	53.35	.00	53.49	1.90	4.09	63568.08	124651.70
	6.420	4409.00	.00	.00	28.40	324160.00	58.36	.00	58.53	1.55	4.48	103255.10	260639.20
	7.090	3538.00	.00	.00	30.10	64830.00	50.16	.00	50.22	1.69	2.53	47350.68	49925.34
	7.090	3538.00	.00	.00	30.10	136080.00	52.72	.00	52.87	2.74	3.89	66809.60	82239.73
	7.090	3538.00	.00	.00	30.10	171320.00	54.04	.00	54.22	2.82	4.28	79784.26	101980.40
	7.090	3538.00	.00	.00	30.10	321910.00	58.93	.00	59.17	2.63	5.22	147194.50	198624.20
	7.470	2006.00	.00	.00	29.00	64610.00	50.42	.00	50.57	1.95	4.26	35912.72	46282.00
	7.470	2006.00	.00	.00	29.00	135320.00	53.16	.00	53.41	3.20	6.09	58462.90	75633.51
	7.470	2006.00	.00	.00	29.00	171000.00	54.51	.00	54.78	3.35	6.53	70702.23	93486.55
	7.470	2006.00	.00	.00	29.00	320030.00	59.41	.00	59.67	3.19	7.41	129913.60	179159.60
	8.070	2891.14	.00	.00	27.90	64610.00	51.11	.00	51.38	3.62	4.80	33892.48	33953.98
	8.070	2891.14	.00	.00	27.90	135320.00	54.21	.00	54.70	5.45	6.90	54917.43	57955.69
	8.070	2891.14	.00	.00	27.90	171000.00	55.59	.00	56.15	5.83	7.57	64976.06	70827.95
*	8.070	2891.14	.00	.00	27.90	320030.00	60.36	.00	61.16	6.57	9.56	101223.30	124868.10
*	8.490	2374.28	.00	.00	35.80	63800.00	52.38	.00	52.97	9.03	7.31	20020.04	21230.17
*	8.490	2374.28	.00	.00	35.80	132480.00	55.89	.00	57.01	12.78	10.48	33893.66	37052.96
*	8.490	2374.28	.00	.00	35.80	169770.00	57.33	.00	58.62	13.73	11.57	42793.20	45822.95
*	8.490	2374.28	.00	.00	35.80	315820.00	62.11	.00	63.76	14.35	14.10	72655.89	83361.55
*	9.410	4858.00	.00	.00	35.50	63510.00	54.40	.00	54.55	2.06	4.25	35925.05	44294.69
*	9.410	4858.00	.00	.00	35.50	131460.00	58.74	.00	58.95	2.44	5.51	62229.36	84092.19
*	9.410	4858.00	.00	.00	35.50	169330.00	60.48	.00	60.72	2.63	6.06	74607.59	104332.60
*	9.410	4858.00	.00	.00	35.50	314100.00	65.82	.00	66.14	3.02	7.55	117228.60	180780.60
	10.580	6177.00	.00	.00	22.10	62850.00	55.41	.00	55.63	2.22	4.50	39047.84	42142.05
	10.580	6177.00	.00	.00	22.10	129130.00	59.84	.00	60.14	2.59	5.75	73596.31	80242.95
	10.580	6177.00	.00	.00	22.10	168330.00	61.63	.00	61.98	2.82	6.36	89822.48	100222.00
	10.580	6177.00	.00	.00	22.10	309220.00	67.04	.00	67.47	3.08	7.72	144446.10	176265.10
	10.860	1478.00	.00	.00	31.70	62690.00	55.72	.00	55.87	1.31	3.62	39808.99	54782.84
	10.860	1478.00	.00	.00	31.70	128570.00	60.15	.00	60.44	1.98	5.23	62747.29	91448.34
	10.860	1478.00	.00	.00	31.70	168090.00	61.96	.00	62.33	2.34	6.02	75225.93	109936.30
	10.860	1478.00	.00	.00	31.70	310160.00	67.36	.00	67.89	2.89	7.73	127798.40	182367.10

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	11.090	1214.00	.00	.00	31.80	62560.00	55.61	.00	56.42	5.89	7.47	13087.38	25782.81
*	11.090	1214.00	.00	.00	31.80	128120.00	60.38	.00	60.96	5.45	7.62	46536.60	54879.27
*	11.090	1214.00	.00	.00	31.80	167890.00	62.25	.00	62.89	5.56	8.24	57871.67	71230.84
	11.090	1214.00	.00	.00	31.80	308450.00	67.78	.00	68.45	5.10	9.37	109540.20	136563.60
*	11.350	1373.00	.00	.00	28.84	62410.00	56.79	.00	56.92	1.20	3.37	41353.79	56994.77
*	11.350	1373.00	.00	.00	28.84	127600.00	61.23	.00	61.49	1.84	4.95	65250.98	93971.19
*	11.350	1373.00	.00	.00	28.84	167670.00	63.13	.00	63.46	2.19	5.73	76574.88	113202.20
	11.350	1373.00	.00	.00	28.84	307570.00	68.55	.00	69.07	2.86	7.58	124445.10	181875.80
	11.380	1373.00	.00	.00	26.80	62410.00	56.94	.00	57.22	1.90	4.21	14833.43	45247.98
	11.380	1373.00	.00	.00	26.80	127600.00	61.40	.00	62.09	3.54	6.66	19150.31	67839.56
*	11.380	1373.00	.00	.00	26.80	167670.00	63.29	.00	64.27	4.73	7.96	21052.18	77118.96
	11.380	1373.00	.00	.00	26.80	307570.00	69.01	.00	69.58	3.16	7.41	121277.70	173132.60

11.390	50.00	68.30	67.20	26.80	62410.00	56.97	.00	57.24	1.89	4.20	14854.04	45349.30
11.390	50.00	68.30	67.20	26.80	127600.00	61.46	.00	62.14	3.51	6.64	19206.13	68116.86
11.390	50.00	68.30	67.20	26.80	167670.00	63.37	.00	64.35	4.68	7.93	21139.46	77498.98
11.390	50.00	68.30	67.20	26.80	307570.00	69.19	.00	69.74	3.05	7.32	123211.10	176147.50
11.400	50.00	.00	.00	28.84	62410.00	57.17	.00	57.29	1.09	3.27	42945.25	59743.99
* 11.400	50.00	.00	.00	28.84	127600.00	62.07	.00	62.29	1.56	4.67	70204.51	102189.70
* 11.400	50.00	.00	.00	28.84	167670.00	64.29	.00	64.57	1.77	5.33	83610.66	125865.50
11.400	50.00	.00	.00	28.84	307570.00	69.32	.00	69.78	2.52	7.25	132883.20	193840.00
11.480	370.00	.00	.00	20.73	62340.00	57.20	.00	57.34	.82	3.43	44988.41	68886.51
11.480	370.00	.00	.00	20.73	127340.00	62.11	.00	62.36	1.23	4.84	79671.61	114602.60
11.480	370.00	.00	.00	20.73	167560.00	64.35	.00	64.65	1.41	5.47	99095.23	140923.70
11.480	370.00	.00	.00	20.73	307140.00	69.43	.00	69.89	2.02	7.30	150502.30	215908.40
11.550	370.00	.00	.00	21.73	62300.00	57.23	.00	57.38	1.00	3.58	43564.19	62434.55
11.550	370.00	.00	.00	21.73	127200.00	62.16	.00	62.42	1.42	4.97	77303.70	106624.10
11.550	370.00	.00	.00	21.73	167500.00	64.41	.00	64.71	1.61	5.61	95357.38	132048.30
11.550	370.00	.00	.00	21.73	306900.00	69.51	.00	69.98	2.25	7.44	145941.00	204651.80
11.569	100.00	.00	.00	24.10	62300.00	57.23	.00	57.43	1.98	3.59	17358.28	44310.69
11.569	100.00	.00	.00	24.10	127200.00	62.15	.00	62.56	2.69	5.17	24625.06	77570.56
11.569	100.00	.00	.00	24.10	167500.00	64.38	.00	64.94	3.23	5.99	27962.86	93243.44
11.569	100.00	.00	.00	24.10	306900.00	69.57	.00	70.01	2.70	6.25	111539.20	186644.10
11.660	480.00	69.07	63.08	19.80	62300.00	57.23	.00	57.43	2.14	3.20	19442.47	42631.10
11.660	480.00	69.07	63.08	19.80	127200.00	62.15	.00	62.56	2.82	4.61	27588.59	75702.29
11.660	480.00	69.07	63.08	19.80	167500.00	64.92	.00	65.34	2.97	5.21	32119.42	97224.14
11.660	480.00	69.07	63.08	19.80	306900.00	70.47	.00	70.82	2.35	5.45	120177.00	200363.50
11.679	100.00	.00	.00	21.73	62300.00	57.32	.00	57.46	1.23	3.42	44092.23	56152.73
11.679	100.00	.00	.00	21.73	127200.00	62.42	.00	62.62	1.65	4.62	79184.65	99104.58
11.679	100.00	.00	.00	21.73	167500.00	65.20	.00	65.42	1.67	4.99	102611.70	129732.20
11.679	100.00	.00	.00	21.73	306900.00	70.52	.00	70.84	2.24	6.50	156273.80	204919.40

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
11.970	2118.00	.00	.00	31.72	62060.00	57.63	.00	57.77	1.12	3.73	51180.45	58535.73
11.970	2118.00	.00	.00	31.72	126360.00	62.86	.00	63.06	1.43	4.95	87700.20	105644.70
11.970	2118.00	.00	.00	31.72	167140.00	65.66	.00	65.89	1.48	5.41	109214.00	137486.30
11.970	2118.00	.00	.00	31.72	305490.00	71.15	.00	71.51	2.05	7.21	155193.70	213291.70

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
3.615	66800.00	46.66	.00	.00	.00	5842.35	.00
3.615	143300.00	49.57	2.91	.00	.00	6975.50	.00
3.615	174300.00	50.91	1.34	.00	.00	7174.17	.00
3.615	333600.00	54.90	3.99	.00	.00	8729.88	.00
4.745	66160.00	47.18	.00	.52	.00	4324.09	5966.00
4.745	140750.00	50.39	3.21	.82	.00	5217.94	5966.00
4.745	173330.00	51.74	1.35	.83	.00	5551.63	5966.00
4.745	329800.00	56.04	4.30	1.14	.00	7484.51	5966.00
5.026	65990.00	47.35	.00	.17	.00	3418.36	1482.00
5.026	140170.00	50.62	3.27	.23	.00	3466.05	1482.00

	5.026	173080.00	51.97	1.35	.23	.00	3485.50	1482.00
	5.026	328820.00	56.33	4.36	.29	.00	9976.62	1482.00
	5.027	65990.00	47.37	.00	.01	.00	3293.66	1.00
	5.027	140170.00	50.64	3.27	.02	.00	3326.05	1.00
	5.027	173080.00	51.99	1.35	.02	.00	3340.00	1.00
*	5.027	328820.00	56.13	4.14	-.19	.00	3468.03	1.00
	5.034	65990.00	47.37	.00	.01	.00	3293.80	47.00
	5.034	140170.00	50.65	3.28	.01	.00	3326.26	47.00
	5.034	173080.00	52.00	1.35	.01	.00	3340.21	47.00
	5.034	328820.00	56.32	4.31	.18	.00	10474.94	47.00
	5.035	65990.00	47.37	.00	-.01	.00	3418.70	1.00
	5.035	140170.00	50.64	3.28	-.01	.00	3466.48	1.00
	5.035	173080.00	52.00	1.35	-.01	.00	3485.93	1.00
*	5.035	328820.00	56.75	4.76	.44	.00	10251.18	1.00
	5.037	65990.00	47.37	.00	.00	.00	3418.63	8.00
	5.037	140170.00	50.64	3.28	.00	.00	3466.41	8.00
	5.037	173080.00	52.00	1.35	.00	.00	3485.87	8.00
	5.037	328820.00	56.75	4.76	.00	.00	10255.46	8.00
	5.038	65990.00	47.38	.00	.01	.00	3293.83	1.00
	5.038	140170.00	50.66	3.28	.02	.00	3326.31	1.00
	5.038	173080.00	52.02	1.35	.02	.00	3340.26	1.00
*	5.038	328820.00	56.59	4.57	-.17	.00	10614.53	1.00
	5.045	65990.00	47.39	.00	.01	.00	3293.97	47.00
	5.045	140170.00	50.67	3.29	.01	.00	3326.51	47.00
	5.045	173080.00	52.03	1.35	.01	.00	3340.47	47.00
	5.045	328820.00	56.66	4.63	.08	.00	10653.30	47.00

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	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	5.046	65990.00	47.38	.00	-.01	.00	3418.96	1.00
	5.046	140170.00	50.66	3.28	-.01	.00	3466.84	1.00
	5.046	173080.00	52.02	1.35	-.01	.00	3486.29	1.00
*	5.046	328820.00	57.05	5.03	.39	.00	10444.39	1.00
*	5.585	65680.00	47.97	.00	.58	.00	609.67	2847.00
	5.585	139080.00	51.35	3.38	.69	.00	9772.60	2847.00
	5.585	172610.00	52.75	1.40	.73	.00	10056.46	2847.00
	5.585	326970.00	57.86	5.11	.81	.00	10852.17	2847.00
*	6.420	65210.00	49.68	.00	1.71	.00	7043.26	4409.00
	6.420	137410.00	51.99	2.32	.64	.00	7372.54	4409.00
	6.420	171900.00	53.35	1.36	.60	.00	7514.78	4409.00
	6.420	324160.00	58.36	5.01	.50	.00	8701.29	4409.00
	7.090	64830.00	50.16	.00	.48	.00	7380.76	3538.00
	7.090	136080.00	52.72	2.56	.72	.00	7846.24	3538.00
	7.090	171320.00	54.04	1.33	.70	.00	11263.75	3538.00
	7.090	321910.00	58.93	4.89	.57	.00	16555.20	3538.00
	7.470	64610.00	50.42	.00	.26	.00	7474.41	2006.00
	7.470	135320.00	53.16	2.74	.44	.00	8606.81	2006.00
	7.470	171000.00	54.51	1.35	.47	.00	9318.83	2006.00
	7.470	320030.00	59.41	4.90	.48	.00	13548.95	2006.00
	8.070	64610.00	51.11	.00	.68	.00	6579.98	2891.14
	8.070	135320.00	54.21	3.10	1.04	.00	7065.01	2891.14
	8.070	171000.00	55.59	1.38	1.07	.00	7306.78	2891.14
*	8.070	320030.00	60.36	4.77	.95	.00	8225.06	2891.14
*	8.490	63800.00	52.38	.00	1.27	.00	2848.30	2374.28

*	8.490	132480.00	55.89	3.51	1.69	.00	6163.83	2374.28
*	8.490	169770.00	57.33	1.44	1.75	.00	6189.80	2374.28
*	8.490	315820.00	62.11	4.78	1.75	.00	6329.49	2374.28
*	9.410	63510.00	54.40	.00	2.02	.00	5247.10	4858.00
*	9.410	131460.00	58.74	4.35	2.85	.00	7089.26	4858.00
*	9.410	169330.00	60.48	1.74	3.15	.00	7128.50	4858.00
*	9.410	314100.00	65.82	5.33	3.71	.00	9116.08	4858.00
	10.580	62850.00	55.41	.00	1.01	.00	7357.44	6177.00
	10.580	129130.00	59.84	4.43	1.09	.00	8822.32	6177.00
	10.580	168330.00	61.63	1.80	1.15	.00	9129.64	6177.00
	10.580	309220.00	67.04	5.41	1.22	.00	10628.25	6177.00
	10.860	62690.00	55.72	.00	.31	.00	4439.52	1478.00
	10.860	128570.00	60.15	4.44	.32	.00	6830.96	1478.00
	10.860	168090.00	61.96	1.81	.33	.00	7027.36	1478.00
	10.860	310160.00	67.36	5.40	.32	.00	10117.98	1478.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	11.090	62560.00	55.61	.00	-.11	.00	2972.72	1214.00
*	11.090	128120.00	60.38	4.77	.22	.00	6000.31	1214.00
*	11.090	167890.00	62.25	1.87	.29	.00	6101.18	1214.00
	11.090	308450.00	67.78	5.53	.42	.00	10644.62	1214.00
*	11.350	62410.00	56.79	.00	1.19	.00	4147.62	1373.00
*	11.350	127600.00	61.23	4.44	.86	.00	5914.26	1373.00
*	11.350	167670.00	63.13	1.90	.88	.00	6011.37	1373.00
	11.350	307570.00	68.55	5.42	.77	.00	11056.90	1373.00
	11.380	62410.00	56.94	.00	.15	.00	958.22	1373.00
	11.380	127600.00	61.40	4.45	.17	.00	986.90	1373.00
*	11.380	167670.00	63.29	1.89	.16	.00	1031.99	1373.00
	11.380	307570.00	69.01	5.72	.46	.00	10601.59	1373.00
	11.390	62410.00	56.97	.00	.02	.00	958.33	50.00
	11.390	127600.00	61.46	4.49	.06	.00	988.04	50.00
	11.390	167670.00	63.37	1.92	.08	.00	1035.10	50.00
	11.390	307570.00	69.19	5.82	.18	.00	10610.67	50.00
	11.400	62410.00	57.17	.00	.21	.00	4162.42	50.00
*	11.400	127600.00	62.07	4.89	.61	.00	5956.93	50.00
*	11.400	167670.00	64.29	2.22	.92	.00	6206.81	50.00
	11.400	307570.00	69.32	5.02	.12	.00	11083.03	50.00
	11.480	62340.00	57.20	.00	.02	.00	6350.49	370.00
	11.480	127340.00	62.11	4.92	.05	.00	7726.66	370.00
	11.480	167560.00	64.35	2.24	.06	.00	9517.14	370.00
	11.480	307140.00	69.43	5.08	.12	.00	10367.99	370.00
	11.550	62300.00	57.23	.00	.03	.00	5992.14	370.00
	11.550	127200.00	62.16	4.93	.05	.00	7458.99	370.00
	11.550	167500.00	64.41	2.25	.06	.00	8872.30	370.00
	11.550	306900.00	69.51	5.10	.08	.00	10311.17	370.00
	11.569	62300.00	57.23	.00	.01	.00	1470.10	100.00
	11.569	127200.00	62.15	4.92	-.01	.00	1489.83	100.00
	11.569	167500.00	64.38	2.23	-.03	.00	1501.44	100.00
	11.569	306900.00	69.57	5.18	.05	.00	9464.33	100.00
	11.660	62300.00	57.23	.00	.00	.00	1639.63	480.00
	11.660	127200.00	62.15	4.92	.00	.00	1659.92	480.00
	11.660	167500.00	64.92	2.77	.54	.00	1665.64	480.00
	11.660	306900.00	70.47	5.55	.91	.00	9291.50	480.00

11.679	62300.00	57.32	.00	.09	.00	6030.15	100.00
11.679	127200.00	62.42	5.09	.26	.00	7698.69	100.00
11.679	167500.00	65.20	2.79	.28	.00	9432.45	100.00
11.679	306900.00	70.52	5.32	.05	.00	10397.45	100.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
11.970	62060.00	57.63	.00	.31	.00	6398.18	2118.00
11.970	126360.00	62.86	5.22	.44	.00	7324.74	2118.00
11.970	167140.00	65.66	2.80	.46	.00	7960.55	2118.00
11.970	305490.00	71.15	5.49	.63	.00	8670.87	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 5.027 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.035 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.038 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.046 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.585 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.420 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.070 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 8.490 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 8.490 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 8.490 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 9.410 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 9.410 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 9.410 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.090 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.090 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.350 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.350 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.400 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Lake Houston (FEMA Reach 2; TWDB 1995 Lake Survey)

```
1*********************************************                    ****************************************
 * HEC-2 WATER SURFACE PROFILES         *                         * U.S. ARMY CORPS OF
ENGINEERS    *
 *                              *                        * HYDROLOGIC ENGINEERING CENTER    *
 * Version  4.6.2;  May 1991           *                         * 609 SECOND STREET, SUITE D
*
 *                              *                        * DAVIS, CALIFORNIA 95616-4687     *
 * RUN DATE   28FEB00   TIME   09:37:31 *                          *       (916) 756-1104
*
 *********************************************                    ****************************************
```

LKHOUR2.oh2 for Reach 2 – Lake Houston (TWDB 1995 Data; with add'tl section data u/s 1960 from TWDB lake survey database via internet)

```
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
```

```
1
  28FEB00    09:37:31                                                  PAGE   1
```

THIS RUN EXECUTED 28FEB00   09:37:31

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

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

T1 LAKE HOUSTON.........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2 G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
T3 FILENAME:G1030FH2.IH2............10 YR FREQUENCY........JJS.....12/10/96

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2					46.3			

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1		-1							

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

```
   38       7      25       1
```

```
J6 IHLEQ    ICOPY    SUBDIV   STRTDS    RMILE

    1


NC    .12      .12      .03      .1       .3
QT     6     82400   180200   246100    409900    246100    246100
X1   .0102     62    20000    29500       0        0        0        0        0        0
GR    55     19790     50     19900     40.6     20000     24.6     20300     20.6     20560
GR   25.6    21050    23.1    21460     24.1     21625     19.7     21875     21.3     23075
GR   18.3    23500    19.6    23750     15.9     24000     18.6     24125     16.6     24250
GR   18.8    24450    12.4    24670     15.1     24760     16.6     24771     14.1     24875
GR   11.6    25000    12.4    25250     14.4     25271     14.1     25437     16.1     25469
GR   18.1    25563    20.1    25688     22.1     25793      21      25803     19.6     25876
GR   25.6    25938    10.6    26001      8.6     26063     -3.2     26299    13.85     26438
GR   15.6    26493    16.1    26563     18.6     26750     12.6     26938     19.1     27000
GR   22.9    27063    23.1    27125     24.9     27188     26.1     27375      25      27500
GR   23.9    27625    24.4    27730     24.4     27813     23.6     27938     24.6     28095
GR   29.9    28313    30.1    28433     29.9     28501     29.6     28563     30.1     28751
GR   29.9    28876    30.6    29013     31.6     29063     31.4     29113     40.6     29500
GR   52.3    29600     55     34310

QT     6     82402   180199   246099    409897    246099    246099
X1   .0196     62    20000    29500      50       50       50
GR    55     19790     50     19900     40.6     20000     24.6     20300     20.6     20560
GR   25.6    21050    23.1    21460     24.1     21625     19.7     21875     21.3     23075
GR   18.3    23500    19.6    23750     15.9     24000     18.6     24125     16.6     24250
GR   18.8    24450    12.4    24670     15.1     24760     16.6     24771     14.1     24875
GR   11.6    25000    12.4    25250     14.4     25271     14.1     25437     16.1     25469
GR   18.1    25563    20.1    25688     22.1     25793      21      25803     19.6     25876
GR   25.6    25938    10.6    26001      8.6     26063     -3.2     26299    13.85     26438
```



```
GR   15.6    26493    16.1    26563     18.6     26750     12.6     26938     19.1     27000
GR   22.9    27063    23.1    27125     24.9     27188     26.1     27375      25      27500
GR   23.9    27625    24.4    27730     24.4     27813     23.6     27938     24.6     28095
GR   29.9    28313    30.1    28433     29.9     28501     29.6     28563     30.1     28751
GR   29.9    28876    30.6    29013     31.6     29063     31.4     29113     40.6     29500
GR   52.3    29600     55     34310

NC    .12      .12      .03      .1       .3
QT     6     82516   180193   246064    409784    246064    246064
X1    .47      62    20000    29500     2000      1000      2428
GR    55     19790     50     19900     40.6     20000     24.6     20300     20.6     20560
GR   25.6    21050    23.1    21460     24.1     21625     19.7     21875     21.3     23075
GR   18.3    23500    19.6    23750     15.9     24000     18.6     24125     16.6     24250
GR   18.8    24450    12.4    24670     15.1     24760     16.6     24771     14.1     24875
GR   11.6    25000    12.4    25250     14.4     25271     14.1     25437     16.1     25469
GR   18.1    25563    20.1    25688     22.1     25793      21      25803     19.6     25876
GR   25.6    25938    10.6    26001      8.6     26063     -3.2     26299    13.85     26438
GR   15.6    26493    16.1    26563     18.6     26750     12.6     26938     19.1     27000
GR   22.9    27063    23.1    27125     24.9     27188     26.1     27375      25      27500
GR   23.9    27625    24.4    27730     24.4     27813     23.6     27938     24.6     28095
GR   29.9    28313    30.1    28433     29.9     28501     29.6     28563     30.1     28751
```

Figure 2-1 - General Site Plan for Various Sediment Removal Options

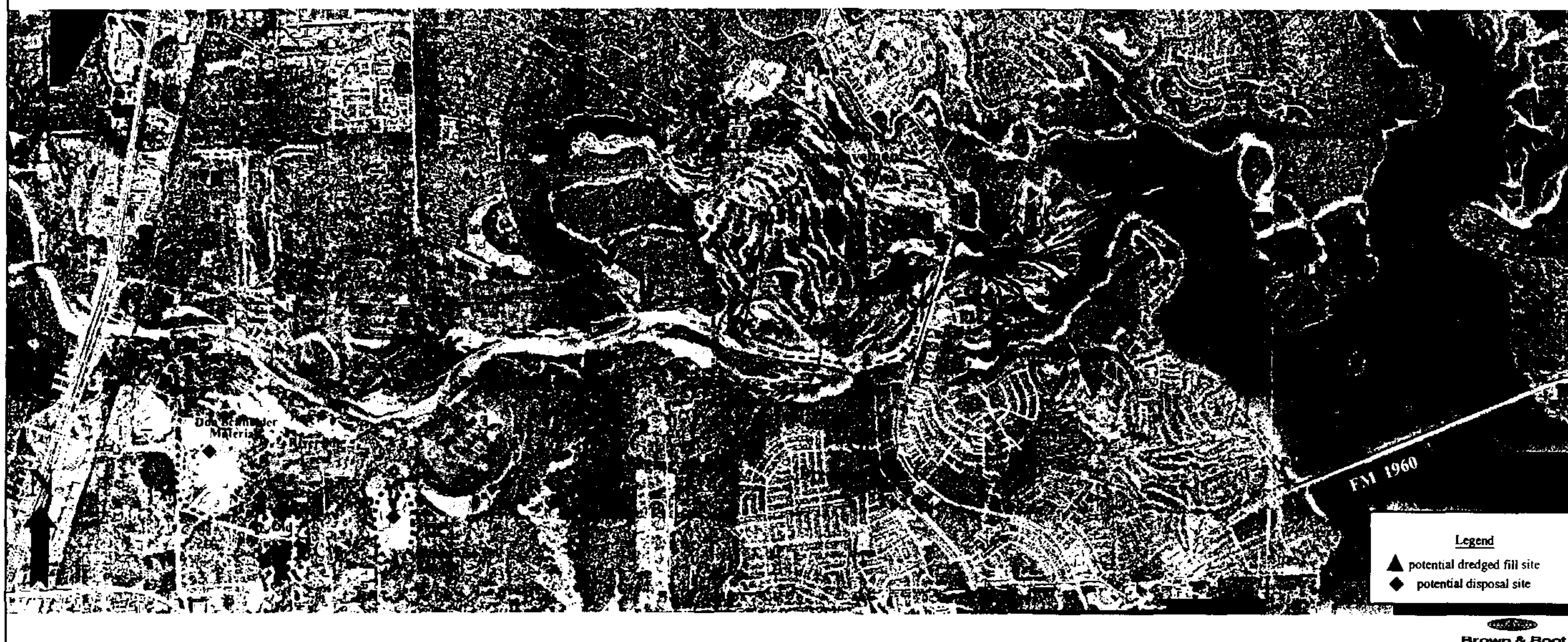
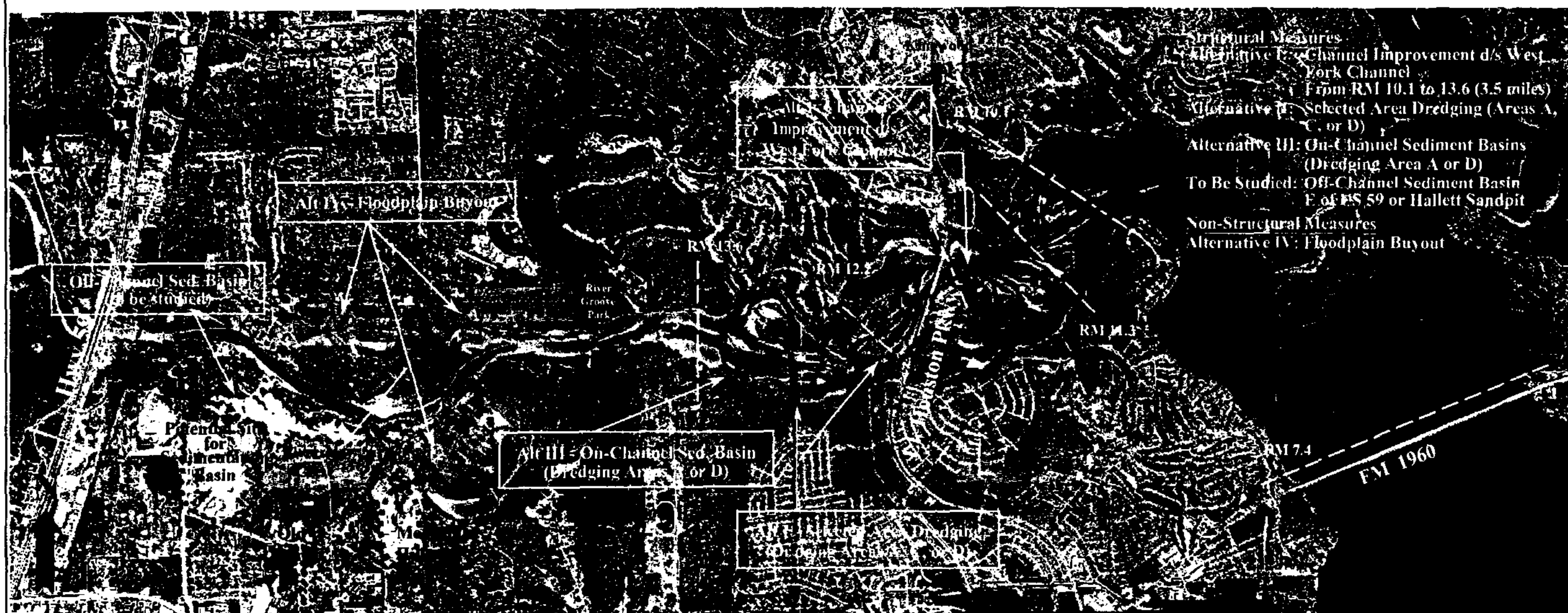


Figure 2-2 - General Site Plan for Selected Project Alternatives



Brown & Root

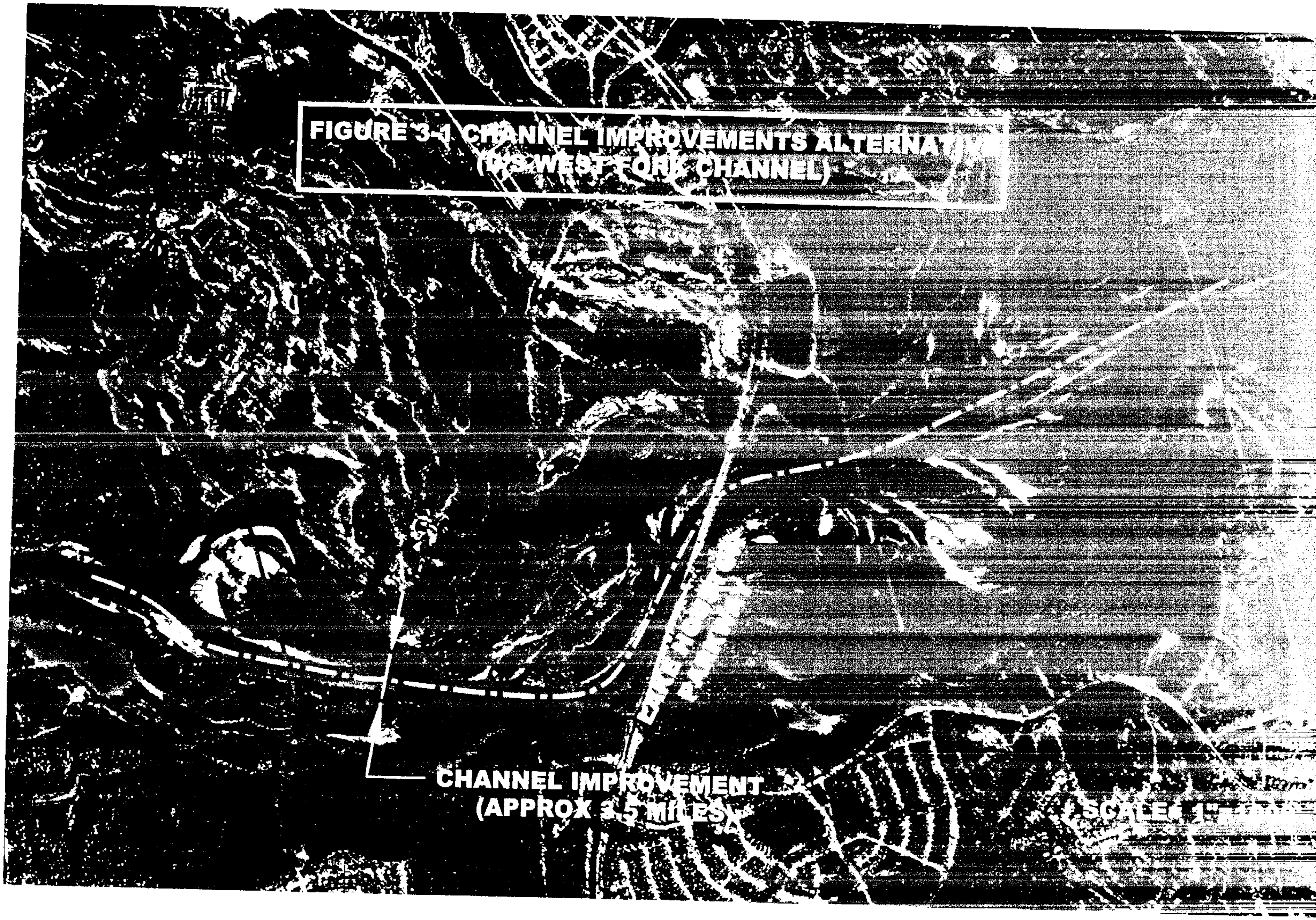
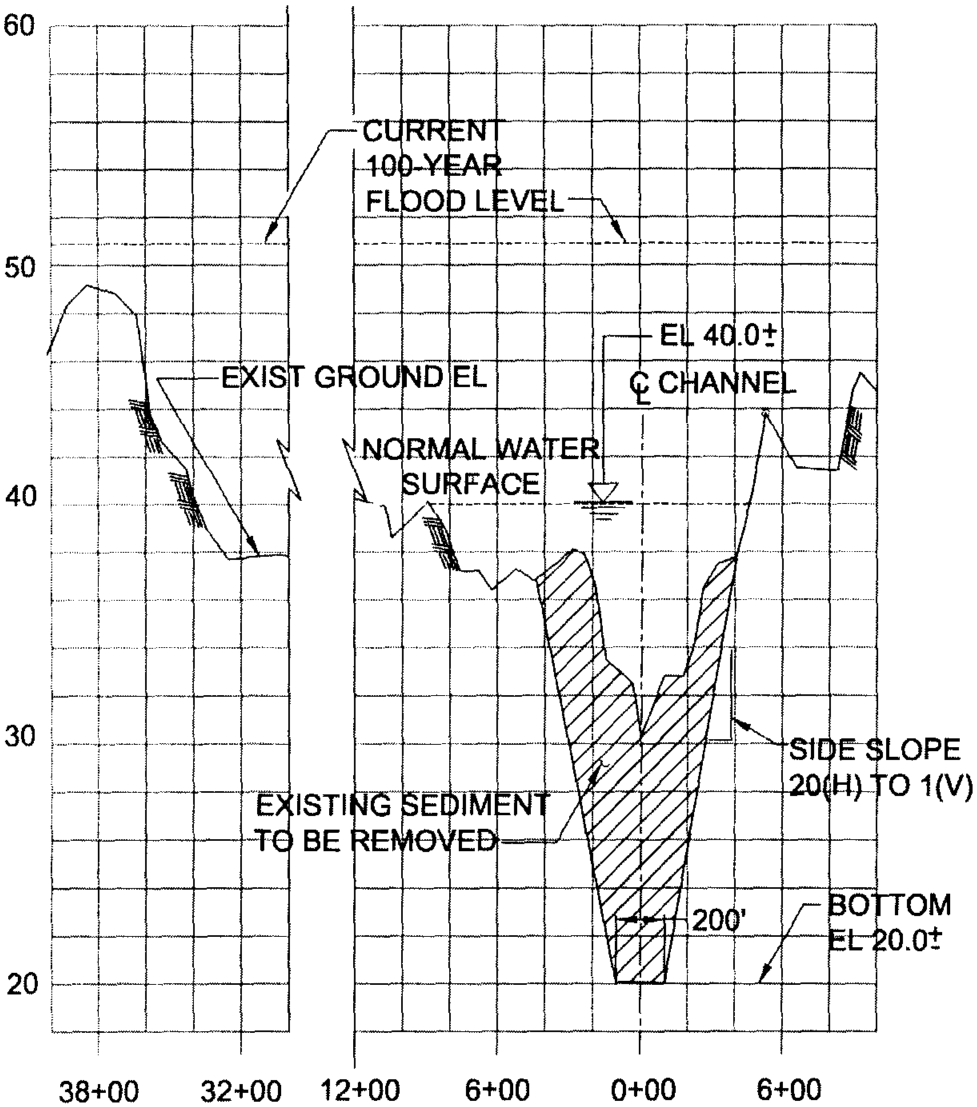
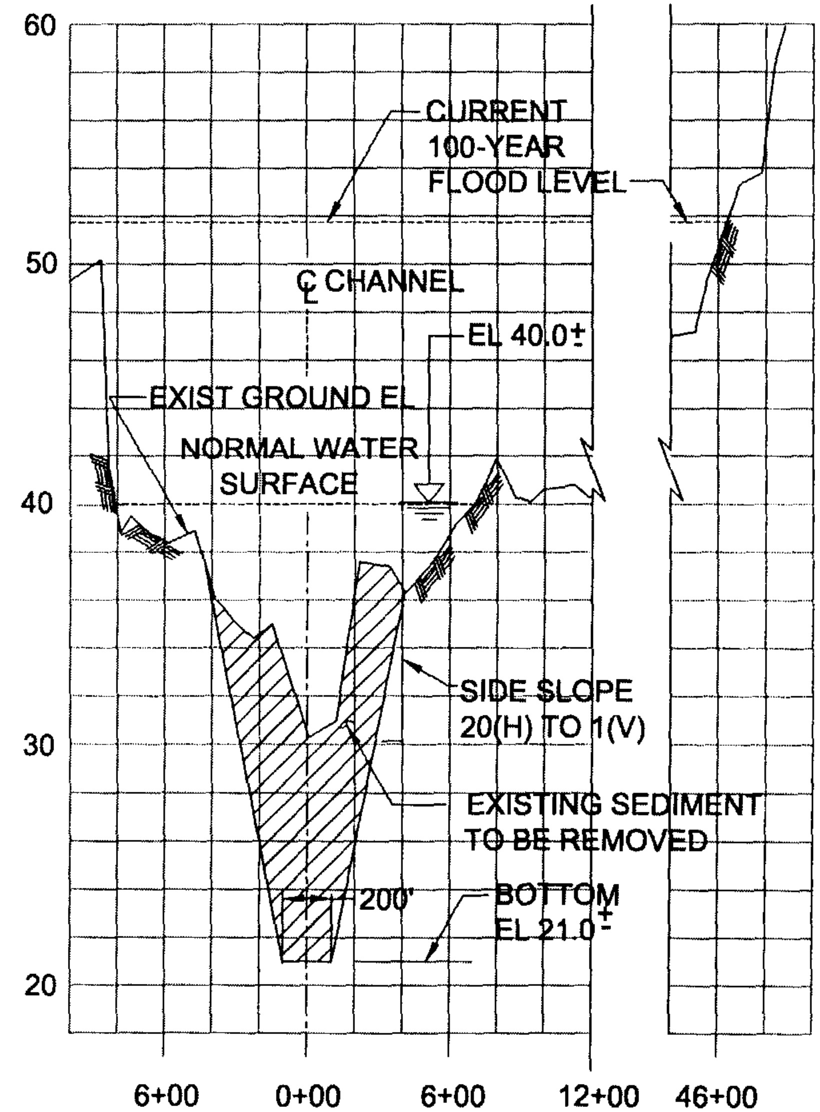


FIGURE 3-1 CHANNEL IMPROVEMENTS ALTERNATIVE
(D/S WEST FORK CHANNEL)
CHANNEL IMPROVEMENT
(APPROX 3.5 MILES)
SCALE:



CROSS-SECTION A
(FEMA LOC 3.62)



CROSS-SECTION B
(FEMA LOC 4.75)

FIGURE 3-2- CHANNEL IMPROVEMENT ALTERNATIVE

SCALE= 1"=800' (H)
1"=8' (V)

DOWNSTREAM WEST FORK

\\HOUFILE23\HCIVIL CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\TCIC&D

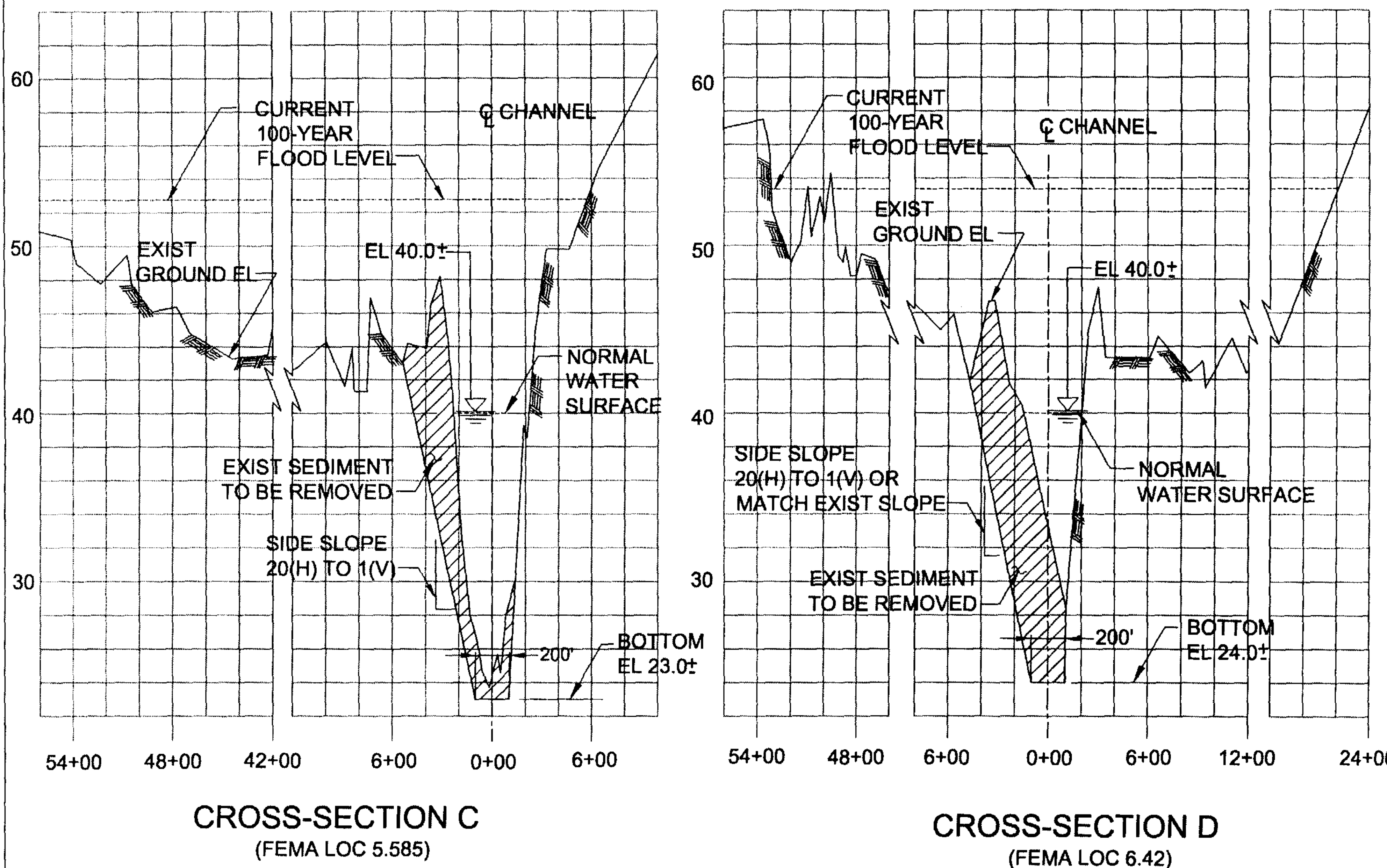


FIGURE 3-3 -CHANNEL IMPROVEMENT ALTERNATIVE

SCALE= 1"=800' (H)
1"=8' (V)

DOWNSTREAM WEST FORK

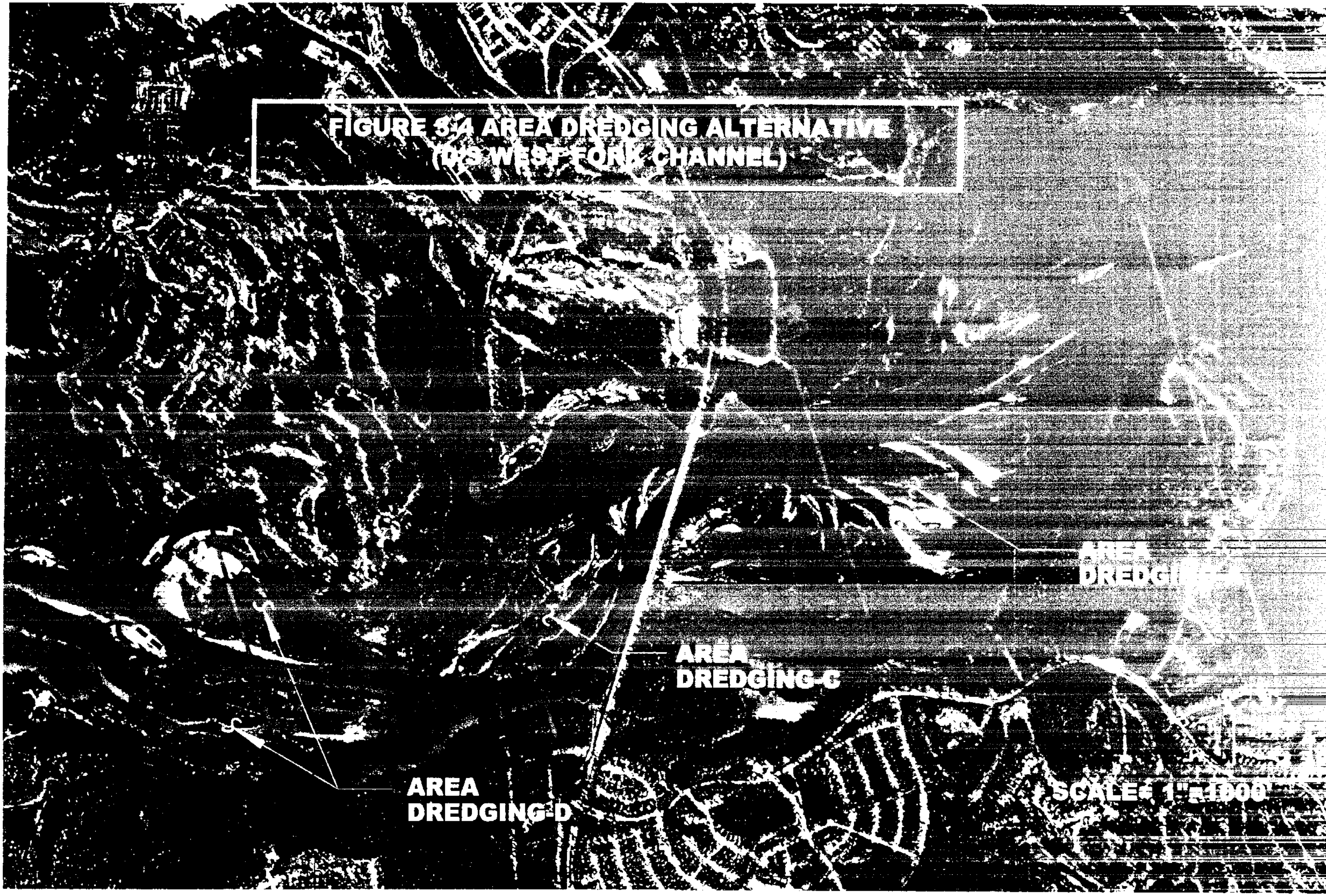


FIGURE 3-4 AREA DREDGING ALTERNATIVE
(D/S WEST FORK CHANNEL)

\\HOUFILE23\HCIVIL$\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\DredArea A

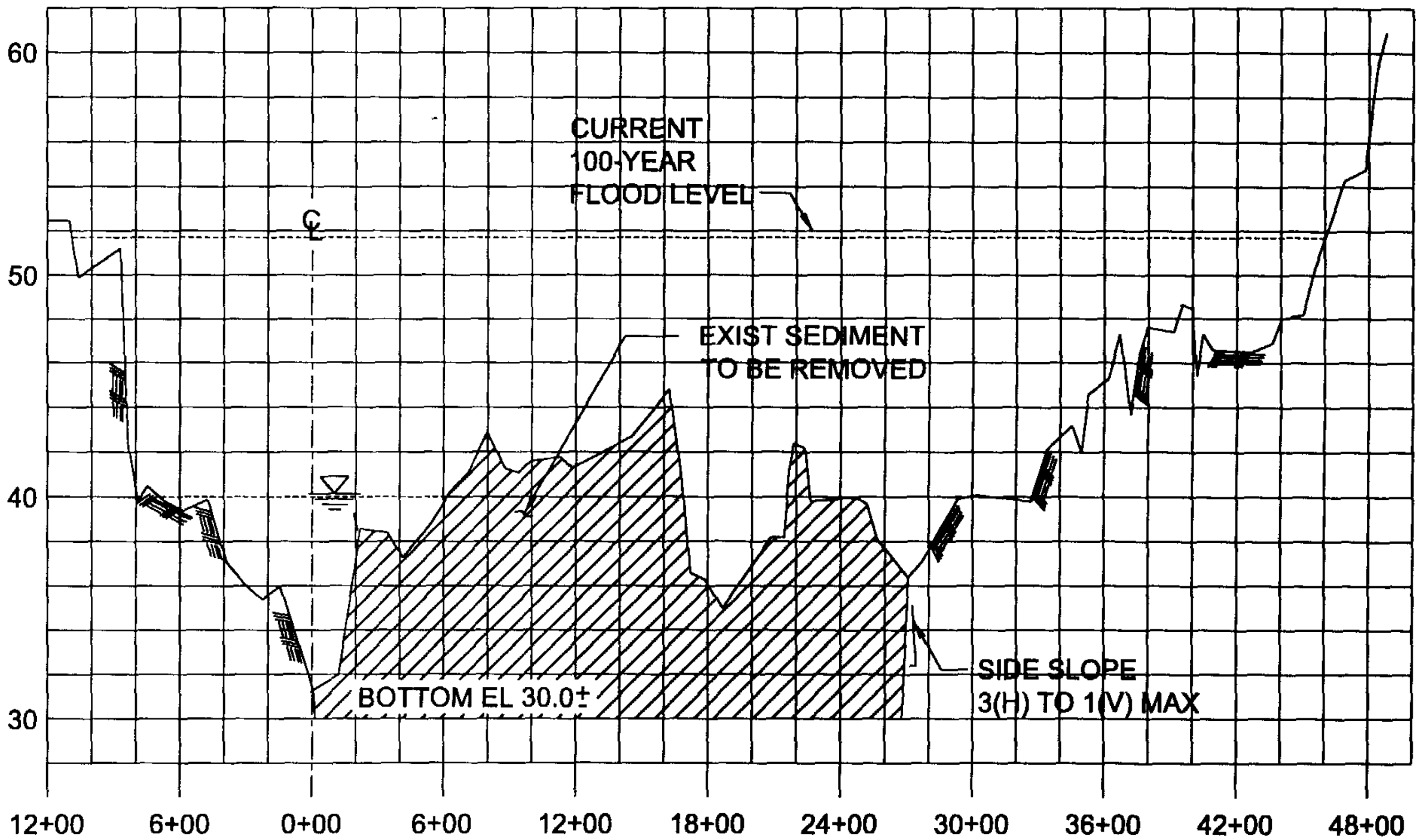


FIGURE 3-5 -AREA DREDGING A @ CROSS-SECTION B

SCALE= 1"=800'(H)
1"=8'(V)

(D/S LAKE HOUSTON PARKWAY, RM 11.3)

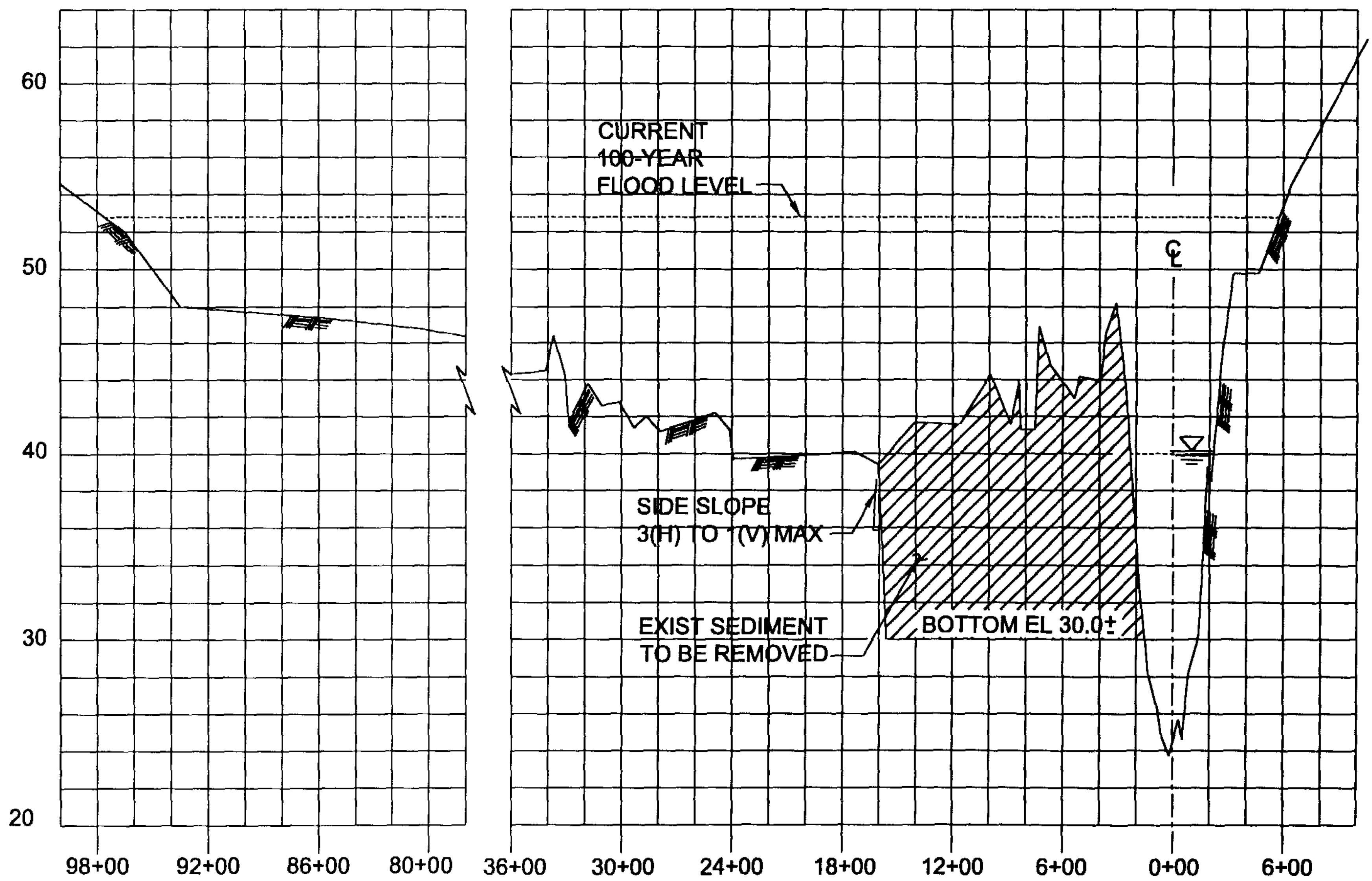


FIGURE 3-6 -AREA DREDGING C @ CROSS-SECTION C

SCALE= 1"=800'(H)
1"=8'(V)

(SW OF LAKE HOUSTON PARKWAY BRIDGE, RM 12.2)

\\HOUFILE23\HCIVIL$\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\DredAreaD

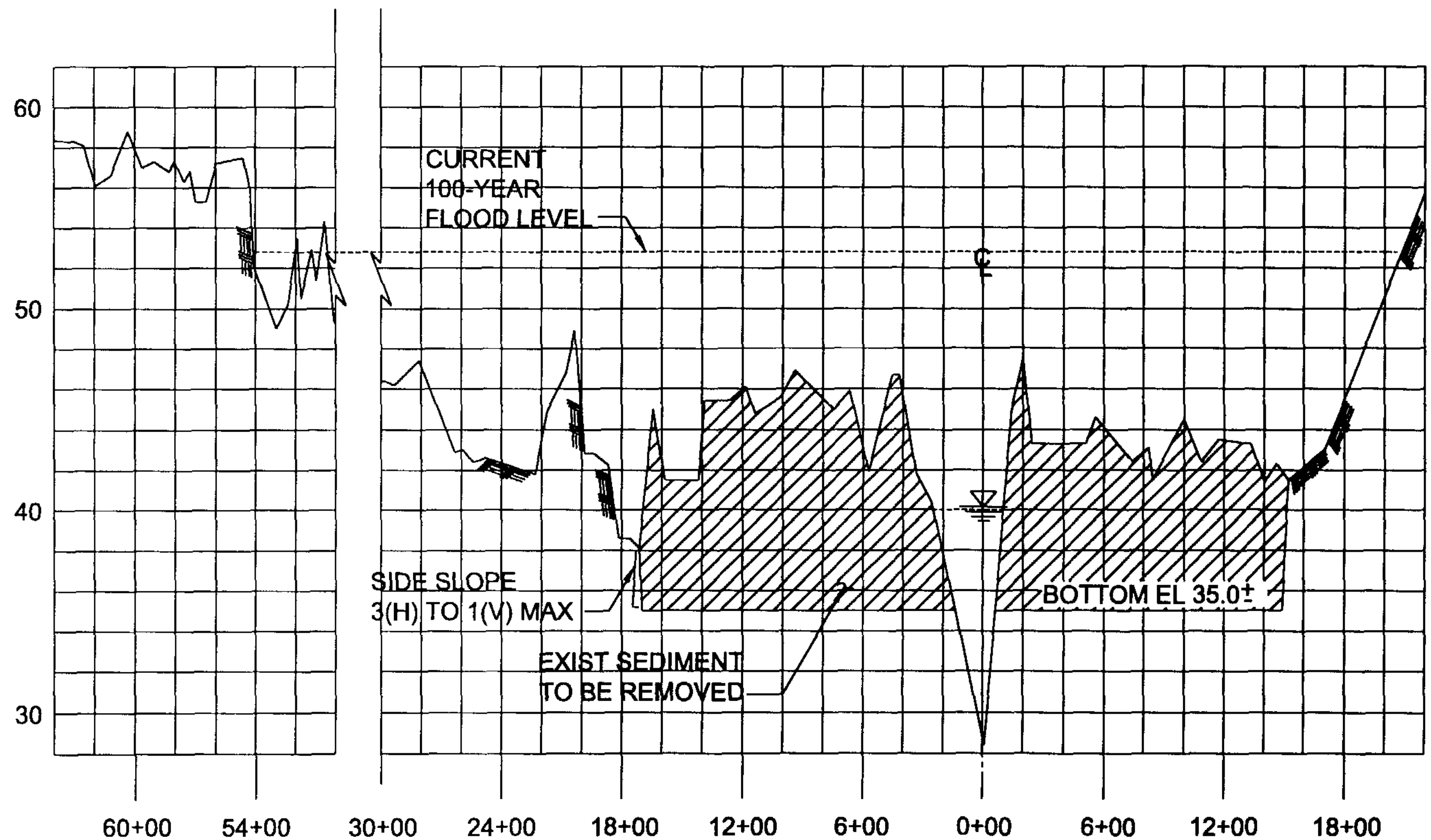


FIGURE 3-7 -AREA DREDGING D @ CROSS-SECTION D

SCALE= 1"=800' (H)
1"=8'(V)

(S OF KINGWOOD COUNTRY CLUB, RM 12.9)

\\HOUFILE23\HCIVIL$\O: \CIVIL\ENGINEER\DIANE\LAKEHO\XSEC#3\TYPSEDB.DWG

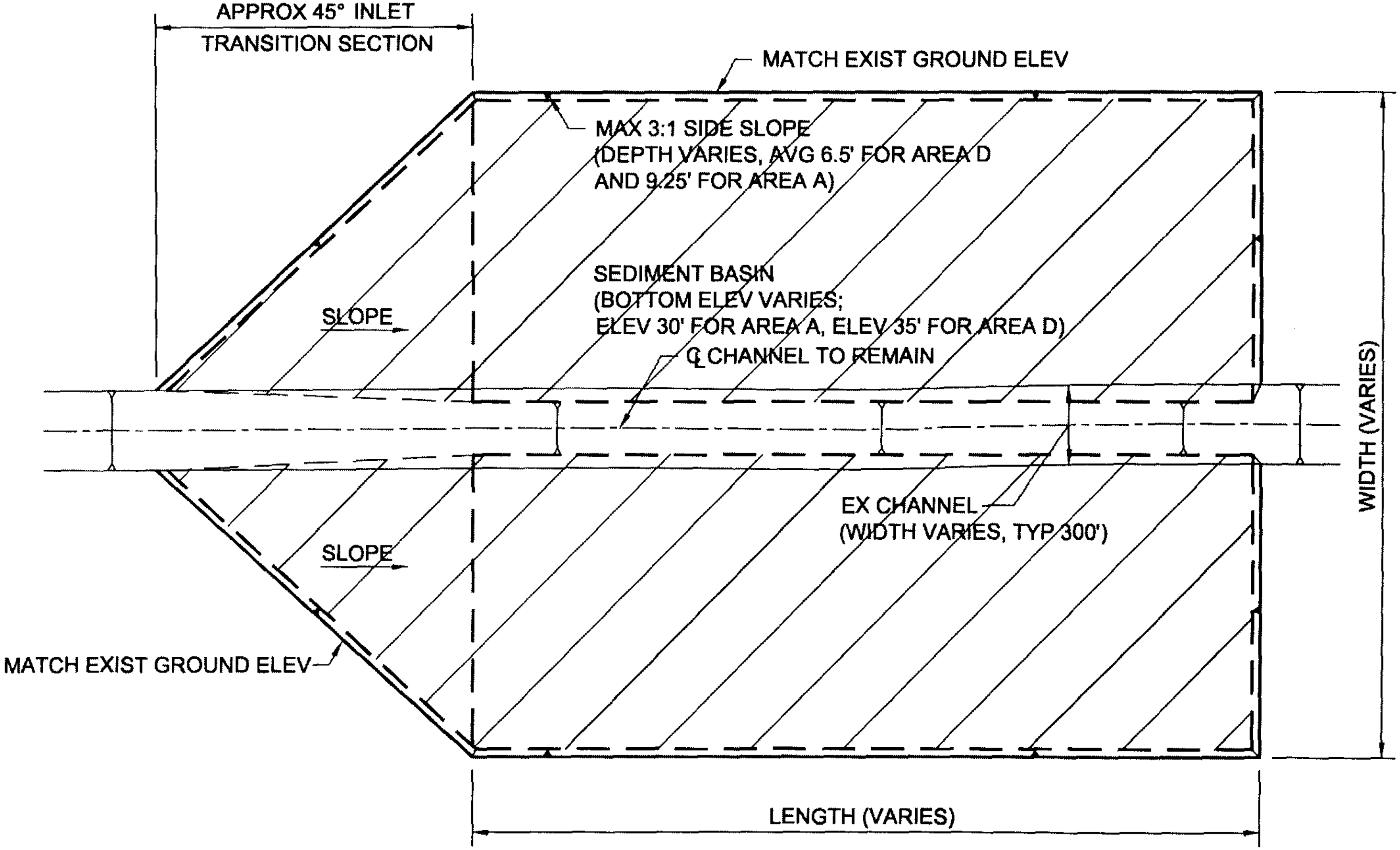


FIGURE 3-8 -TYPICAL ON-CHANNEL SEDIMENT BASIN

SCALE= 1"=600' (Approx.)

Appendices

A USGS Historical Sediment Data (TSS)

- A-1 USGS Historical Sediment Data (TSS) at West Fork San Jacinto River near Conroe
- A-2 USGS Historical Sediment Data (TSS) at Cypress Creek near Westfield

B Technical Analyses/Calculations

- B-1 Analysis of Sedimentation Effects on FEMA 100-Yr Flood Level and Channel Cross-Sections (Exhibits 1 to 15)
- B-2 HEC-2 Model Output (1999 Survey)
- B-3 HEC-2 Model Output (Sediment Removal Options)

C Revised Floodplain Maps and Aerial Photo Maps

D Site Visit Information for Potential Dredged Fills or Dredged Material Disposal

E Correspondences and Information for Permit Issues

F Public Participation Records

G Response to Written Comments provided by Project Sponsors

Appendix A - USGS Historical Sediment Data (TSS)

Appendix A-1

USGS Historical Sediment Data (TSS) at West Fork San Jacinto River near Conroe

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

SAMPLE DATE	DISCHARGE AVG. (CFS)	DISCHARGE INST. (CFS)	SED. SIEVE DIAM. % FINER THAN .062mm	SED. SIEVE DAIM. % FINDER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM % FINER THAN 0.5mm	SEDIMENT SUSPENDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDED (T/DAY)
09/14/61	9,460	11,200	43	60	89	98	238	7,200
09/21/61	127	340	94	98	99	100	36	33
01/29/62	2,640	3,100	45	54	82	99	491	4,110
01/31/62	1,860	2,100	68	73	92	99	186	1,050
02/01/62	406	1,050	75	80	95	100	140	397
05/03/62	675	810	84	88	100		108	236
10/29/62	27	800	72	75	85	99	233	503
12/27/65	208	205					47	26
02/01/66	451	453	80	82	94	100	49	60
02/11/66	2,650	2,605	65	71	85	99	226	1,590
03/09/66	131	130	89	91	97	100	27	10
04/07/66	105	106					42	12
05/17/66	129	126					44	15
06/20/66	51	48					42	5
08/24/66	24	23					36	2
09/26/66	38	39					114	12
11/01/66	27	27					60	4
12/05/66	24	24					11	1
01/10/67	42	39					70	7
02/13/67	55	56					10	2
03/17/67	35	36					133	13
04/24/67	60	63					65	11
05/26/67	35	35					91	9
07/07/67	14	14					22	1
08/03/67	10	10					29	1
09/13/67	11	11					12	0
03/09/70	1,100	1,099					224	665
06/06/72	44	39					44	5
11/07/72	394	370					189	189
12/19/72	620	450					78	95
01/24/73	258	259					168	117
04/04/73	115	115					48	15
04/18/73	9,120	9,380					200	5,070
05/10/73	1,180	1,190					117	376
07/19/73	40	40					24	3
10/29/73	557	535					37	53
11/29/73	529	541					57	83
01/09/74	796	750					29	59
01/29/74	5,640	5,770					76	1,180
02/21/74	544	534					106	153
04/03/74	77	81					50	11
05/16/74	85	92					69	17
06/25/74	20	21					29	2
08/07/74	43	47					63	8
09/18/74	4,010	3,930					48	509
10/10/74	476	480	41				55	71
10/22/74	225	235	82				15	10
11/14/74	2,100	2,200	92				29	172
12/05/74	366	410	90				23	25
12/06/74	594	616	48				244	406

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

01/09/75	408	420	95				24	27
01/16/75	373	389	52				47	49
02/25/75	117	120	82				18	6
02/26/75	103	95	82				21	5
03/19/75	1,340	1,450	100				47	184
04/07/75	60	55	91				12	2
04/24/75	218	189	67				44	22
05/05/75	943	880	82				101	140
06/09/75	99	135	95				29	11
07/01/75	670	550	93				96	143
08/26/75	195	175	88				68	32
09/04/75	71	68	96				31	6
10/01/75	36	36	21				54	5
11/05/75	450	494	93				20	27
12/09/75	58	60	35				29	5
01/06/76	109	132	54				37	13
02/19/76	319	380	94				27	28
03/09/76	513	570	89				43	66
05/11/76	2,050	2,200	38				107	636
06/09/76	1,800	2,100	76				37	210
07/06/76	58	66	98				75	13
08/23/76	20	24	97				30	2
09/07/76	124		99				62	
10/05/76	149	170	97				18	8
11/16/76	72	75	88				17	3
01/11/77	573	580	99				31	49
02/23/77	172	190	89				25	13
03/08/77	940	960	82				36	93
04/05/77	309	370	93				35	35
05/03/77	490	500	99				26	35
06/07/77	40	46	95				25	3
07/19/77	22	22	89				21	1
08/02/77	20	21	99				20	1
09/14/77	115	48	98				69	9
10/19/77	94	93	89				14	4
11/28/77	113	110	98				14	4
12/27/77	35	35	62				23	2
01/24/78	483	540	99				83	121
02/06/78	571	560	69				38	57
03/22/78	58	62	97				12	2
04/19/78	35	40	89				14	2
05/15/78	21	21	98				22	1
06/12/78	130	138	97				44	16
07/26/78	24	45	100				39	5
08/01/78	19	17	97				14	1
09/12/78	196	205	97				31	17
10/18/78	166	166	97				10	5
11/06/78	221	256	81				96	66
12/11/78	184	178	98				48	23
01/17/79	173	173	97				39	18
02/08/79	7,020	7,320	60				143	2,830
03/12/79	161	148	76				24	10
04/23/79	8,240	8,370	45				59	1,330
05/07/79	6,010	5,890	78				73	1,160

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

06/25/79	96	85	98				39	9
07/24/79	68	70	98				49	9
08/14/79	86	72	77				83	16
09/19/79	1,010	329	97				140	124
10/16/79	41	41	97				12	1
11/23/79	1,170	1,170	92				73	231
12/12/79	516	91	100				133	33
01/23/80	1,330	1,350	79				138	503
02/06/80	106	106	99				23	7
03/05/80	105	105	100				42	12
04/08/80	554	557	89				26	39
05/20/80	4,900	5,050	56				103	1,400
06/17/80	30	29	98				24	2
07/09/80	111	111	98				32	10
08/20/80	90	90	100				41	10
09/23/80	147	147	69				30	12
10/15/80	150	149	96				19	8
11/05/80	22	22	97				11	1
12/10/80	53	51	100				36	5
01/07/81	38	36	99				16	2
02/18/81	36	36	99				15	2
03/11/81	36	35	97				30	3
04/08/81	22	21	98				24	1
05/19/81	117	106	99				121	35
06/09/81	454	451	98				116	141
07/21/81	44	43	88				34	4
08/10/81	14	14	94				12	0
09/02/81	579	591	98				165	263
11/10/81	2,100	2,090	81				124	700
01/04/82	79	79	98				36	8
03/31/82	1,250	1,240	99				63	211
05/10/82	70	67	82				77	14
08/04/82	19	19	80				14	1
09/02/82	19	19	100				6	0
12/01/82	1,230	1,240	93				117	392
03/07/83	1,080	1,040	81				64	180
05/17/83	754	746	95				94	189
08/03/83	37	36	99				19	2
11/29/83	91	89	90				25	6
01/19/84	102	102	98				10	3
03/05/84	489	530	97				64	92
05/08/84	31	27	99				21	2
08/21/84	31	30	97				23	2
11/27/84	241	195	94				60	32
01/15/85	121	121	92				13	4
05/22/85	48	47	96				17	2
07/30/85	26	26	96				4	0
11/06/85	169	170	96				54	25
02/12/86	366	352	96				93	88
05/07/86	193	192	74				100	52
08/06/86	30	33	97				57	5
11/12/86	109	111	92				38	11
02/18/87	813	915	83				70	173
05/19/87	53	52	83				40	6

Appendix A-1 - Total Suspended Solid Data at West Folk San Jacinto River near Conroe, Texas
(Reference: USGS Station 08068000)

08/17/87	24	24	99				23	2
11/10/87	35	36	93				27	3
02/17/88	77	76	98				12	3
05/24/88	34	32	88				21	2
08/23/88	20	21	98				17	1
11/29/88	206	206	93				6	3
02/14/89	82	84	93				30	7
05/03/89	44	30	98				20	2
08/09/89	53	53	98				24	3
11/28/89	27	27	70				26	2
03/13/90	273	298	96				61	49
07/18/90	26	25	97				25	2
08/15/90	18	17	93				20	1
11/27/90	23	22	87				9	1
02/27/91	791	769	84				31	64
06/03/91	196	136	97				45	17
08/19/91	24	23	93				26	2
02/20/92	245	249	99				35	24
05/26/92	153	163	98				72	32
07/15/92	38	38	79				17	2
08/26/92	29	30	86				25	2
01/13/93	3,920	4,040	50				103	1,120
06/07/93	37	36	56				37	4
08/17/93	24	22	95				13	1
09/09/93	28	28	99				10	1
12/13/93	85	76	98				19	4
05/24/94	23	71	98				19	4
07/20/94	24	23	98				19	1

Appendix A-2

USGS Historical Sediment Data (TSS) at Cypress Creek near Westfield

Appendix A-2 - Total Suspended Solid Data at Cypress Creek near Westfield, Texas
(Reference: USGS Station 08069000)

SAMPLE DATE	DISCHARGE AVG. (CFS)	DISCHARGE INST. (CFS)	SED. SIEVE DIAM. % FINER THAN .062mm	SED. SIEVE DAIM. % FINDER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM % FINER THAN 0.5mm	SEDIMENT SUSPENDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDED (T/DAY)
12/16/76	984	10					386	10
12/21/76	1,970	20					560	30
03/10/77	15	14					44	2
04/26/77	319	290					250	196
07/14/77	31	30					140	11
10/20/77	7	7					29	1
12/01/77	25	25					309	21
01/12/78	294	306					736	608
01/19/78	1,740	1,900					583	2,990
02/22/78	47	46					108	13
04/10/78	11	9					34	1
05/05/78	22	24					105	7
06/07/78	3,860	4,160					691	7,760
01/10/79	1,630	1,570					201	852
04/25/79	628	486					251	329
06/06/79	1,800	1,810					183	894
07/11/79	38	39					114	12
12/15/86	1,592	2,400	48	71	98	100	1,890	12,200
12/15/86	1,592	1,600	36	65	96	100	884	3,820
12/16/86	1,449	1,170	32	57	97	100	917	2,897
12/17/86	1,198	1,050	29	57	94	100	653	1,852
12/18/86	1,196	1,240	37	63	97	100	840	2,813
12/19/86	1,012	815	33	50	95	100	530	1,166
12/21/86	660	585	34	59	92	100	225	355
01/17/87	624	1,000	47	75	97	100	2,100	5,671
01/18/87	842	670	58	82	98	100	470	850
01/18/87	842	710	53	74	96	100	564	1,081
01/20/87	899	800	33	34	94	100	367	793
01/22/87	266	285	40	53	79	100	214	165
06/09/87	1,000	1,460	47	73	99	100	1,420	5,599
06/10/87	950	810	33	73	98	100	832	1,820
06/11/87	1,580	805	27	59	96	100	566	1,230
06/11/87	1,580	1,850	37	56	96	100	2,380	11,890
06/11/87	1,580	2,020	35	56	98	100	854	4,659
06/12/87	2,930	3,200	45	68	96	100	602	5,202
06/13/87	2,710	2,000	28	59	94	100	648	3,500
06/14/87	2,210	2,000	30	57	96	100	721	3,894
06/20/87	708	410	67	82	97	100	183	203
07/07/87	887	620	59	80	98	100	551	923
07/08/87	633	440	51	66	94	100	262	311
07/09/87	1,170	1,140	40	66	95	100	1,660	5,110
07/09/87	1,170	1,380	43	67	96	100	1,180	4,398
07/09/87	1,170	1,180	42	70	98	100	753	2,400
07/09/87	1,170	790	37	59	96	100	474	1,011
07/10/87	596	540	46	67	96	100	283	413
07/11/87	255	247	61	69	90	100	122	81
11/16/87	437	646	62	85	98	100	964	1,682
11/16/87	437	772	53	72	91	100	1,290	2,689
11/16/87	437	525	71	86	97	100	405	574
11/17/87	157	136	93	97	99	100	184	68
12/21/87	1,140	1,250	33	58	97	100	1,040	3,511
12/21/87	1,140	1,330	30	45	97	100	855	3,071
12/22/87	1,010	1,010	24	34	90	100	622	1,697
12/23/87	857	869	28	41	93	100	371	871
12/24/87	701	718	31	46	94	100	320	620
12/26/87	366	306	74	81	97	100	115	95
01/29/89	886	1,200	44	64	95	100	1,920	6,222
01/29/89	886	1,710	52	68	98	99	954	4,405
01/29/89	886	1,130	46	55	96	100	723	2,206
01/30/89	668	678	53	66	96	100	748	1,370
01/31/89	309	274	87	91	99	100	168	124
03/29/89	884	1,580	44	65	98	100	2,190	9,344
03/29/89	884	1,680	59	76	98	100	1,670	7,577
03/29/89	884	1,630	45	57	95	100	1,730	7,615

Appendix A-2 - Total Suspended Solid Data at Cypress Creek near Westfield, Texas
(Reference: USGS Station 08069000)

03/29/89	884	1,240	54	72	98	100	916	3,067
03/29/89	884	803	48	61	97	100	615	1,334
05/05/89	594	859	50	71	96	100	685	1,589
05/05/89	594	1,030	53	70	96	100	909	2,528
05/05/89	594	714	62	84	88	99	363	700
05/05/89	594	408	63	73	97	100	223	246
02/21/90	1,350	2,890	33	73	97	100	2,140	16,700
02/21/90	1,350	3,060	63	86	98	100	2,350	19,400
02/21/90	1,350	3,050	49	77	98	100	1,640	13,500
02/22/90	1,310	1,660	49	71	95	100	1,040	4,660
02/22/90	1,310	1,400	51	75	97	100	1,140	4,310
02/22/90	1,310	1,180	50	71	95	100	979	3,120
03/29/90	450	1,430	30	81	99	100	1,480	5,710
03/29/90	450	1,510	43	78	98	99	1,610	6,560
03/29/90	450	1,450	44	86	99	100	1,340	5,250
03/30/90	529	751	52	81	98	99	500	1,010
03/30/90	529	615	59	83	97	100	430	714
03/30/90	529	497	65	83	98	99	386	518
04/26/90	743	2,230	57	76	97	100	1,990	12,000
04/26/90	743	2,350	48	74	98	100	1,500	9,520
04/26/90	743	2,210	50	76	98	100	943	5,630
04/27/90	868	1,200	44	71	97	100	505	1,640
04/27/90	868	979	37	65	97	99	558	1,470
04/27/90	868	780	40	69	95	100	428	901

Appendix B - Technical Analyses/Calculations

Appendix B-1

Analysis of Sedimentation Effects on FEMA 100-Yr Flood Level and Channel Cross-Sections (Exhibits 1 to 15)

EXHIBIT 1

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 3.62 MI, Line A

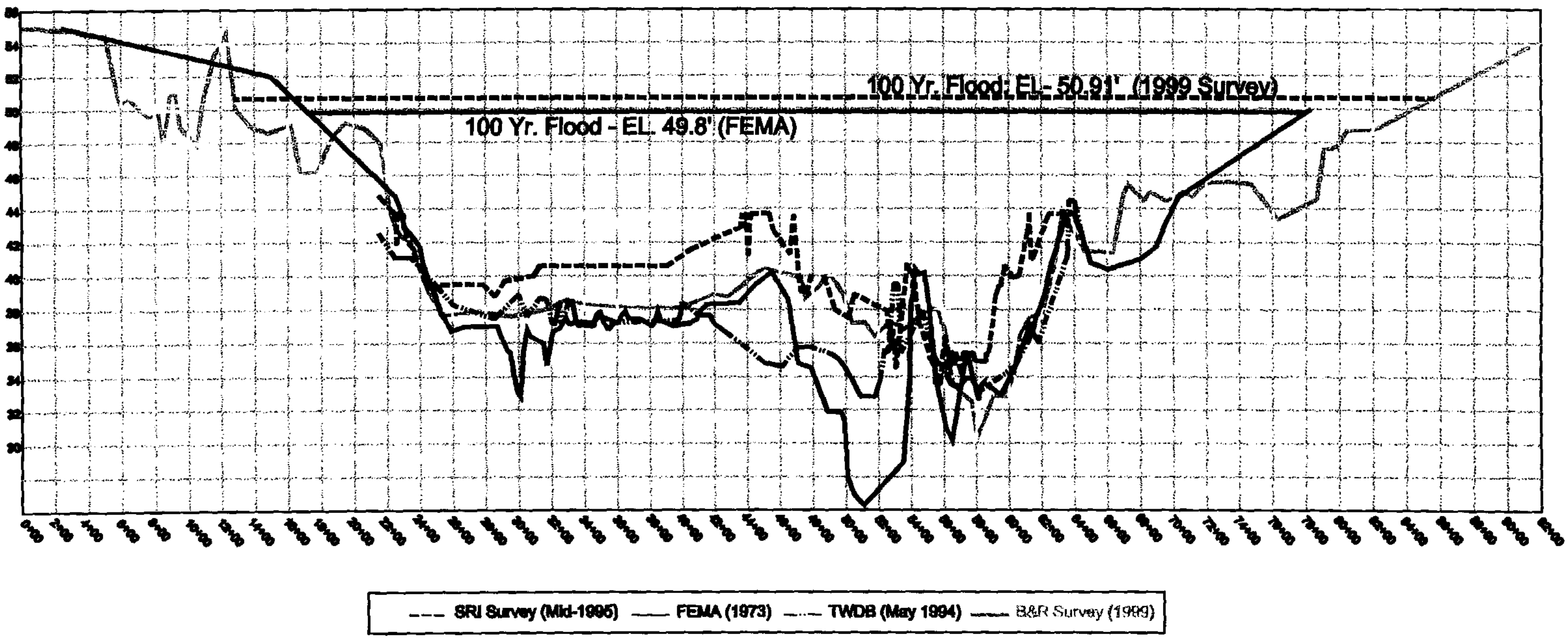


EXHIBIT 2

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 4.75 MI, Line B

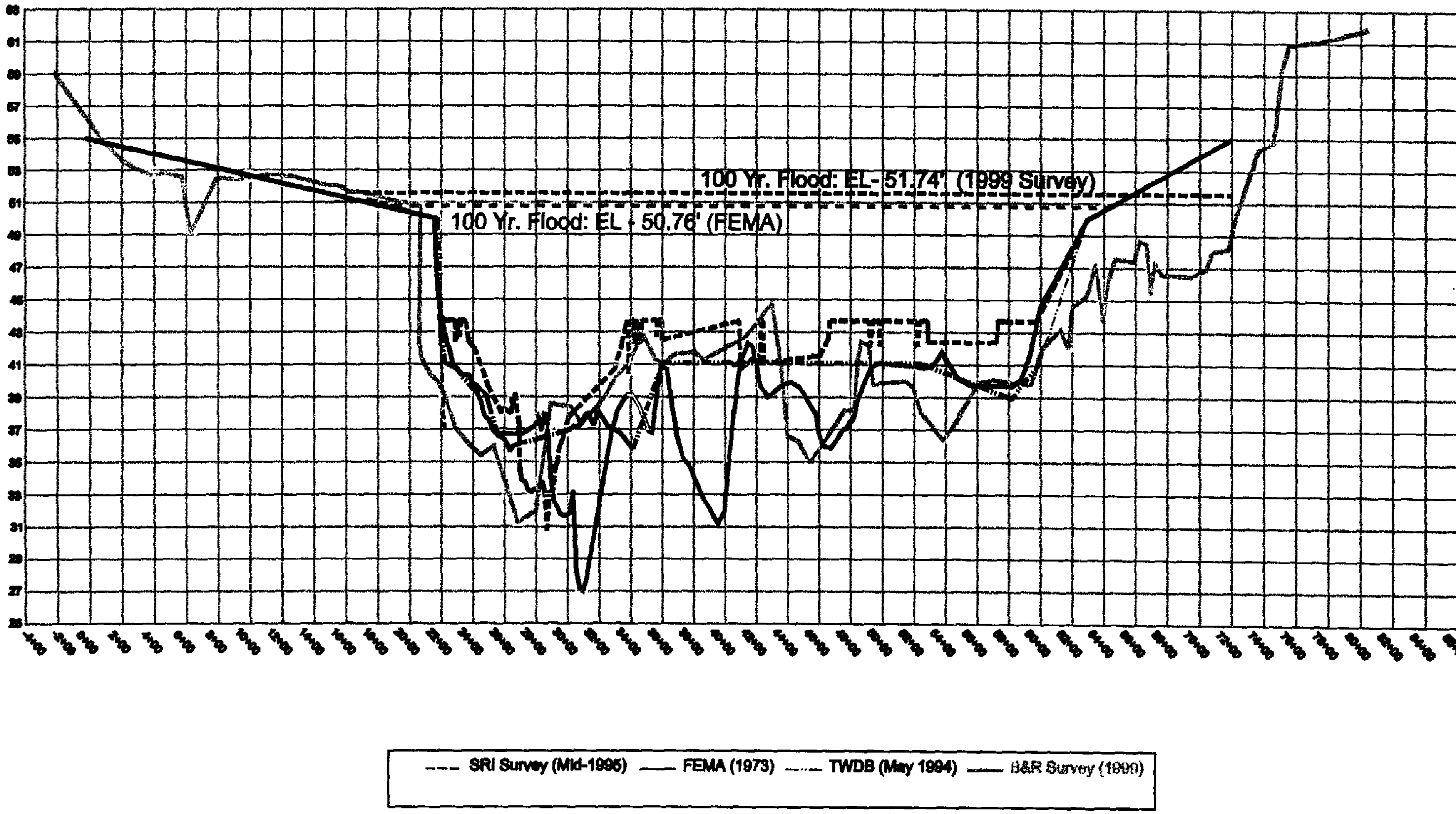


EXHIBIT 3

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 5.037 MI, Bridge Lake Houston Parkway

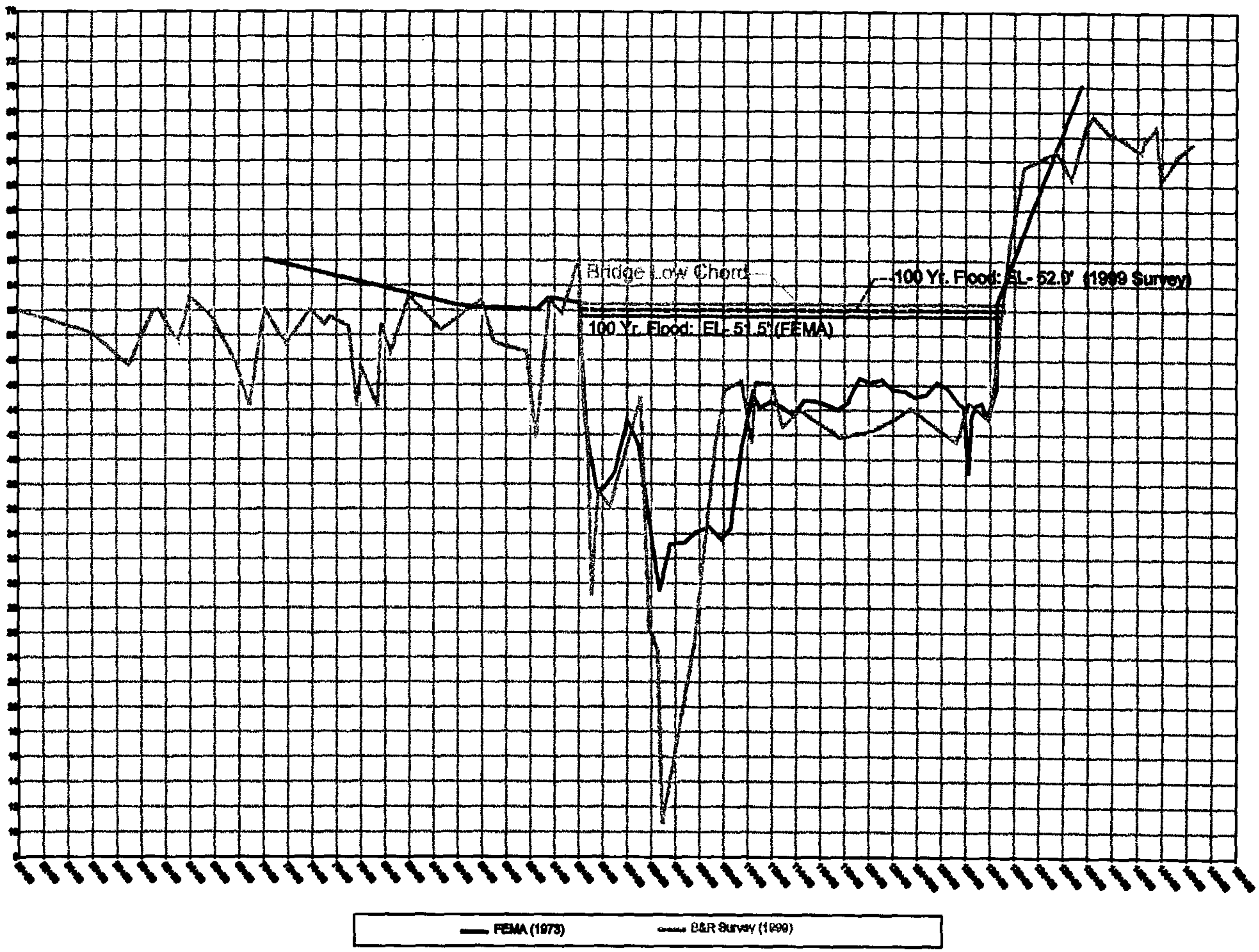


EXHIBIT 4

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 5.585 MI, Line C

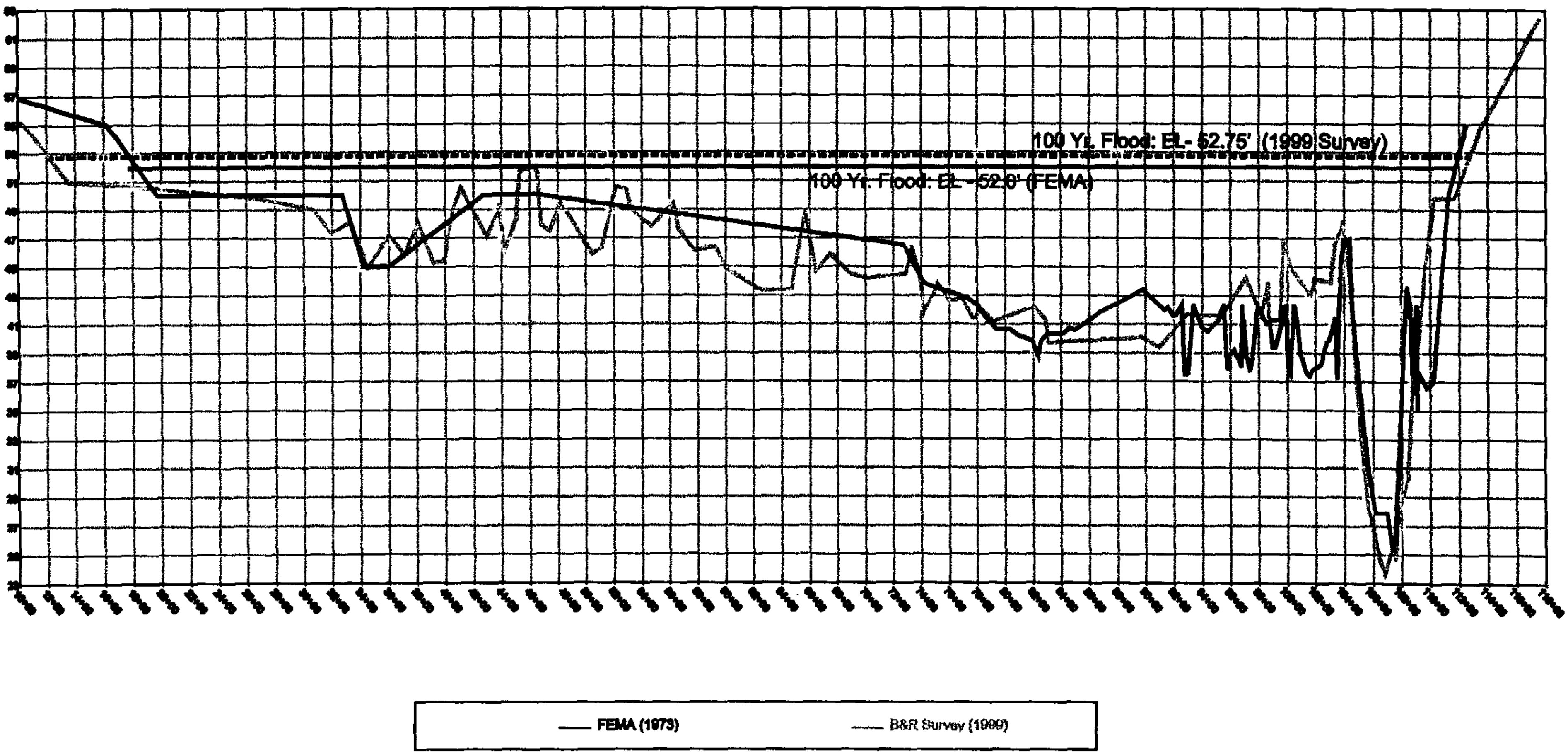


EXHIBIT 5

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 6.42 MI, Line D

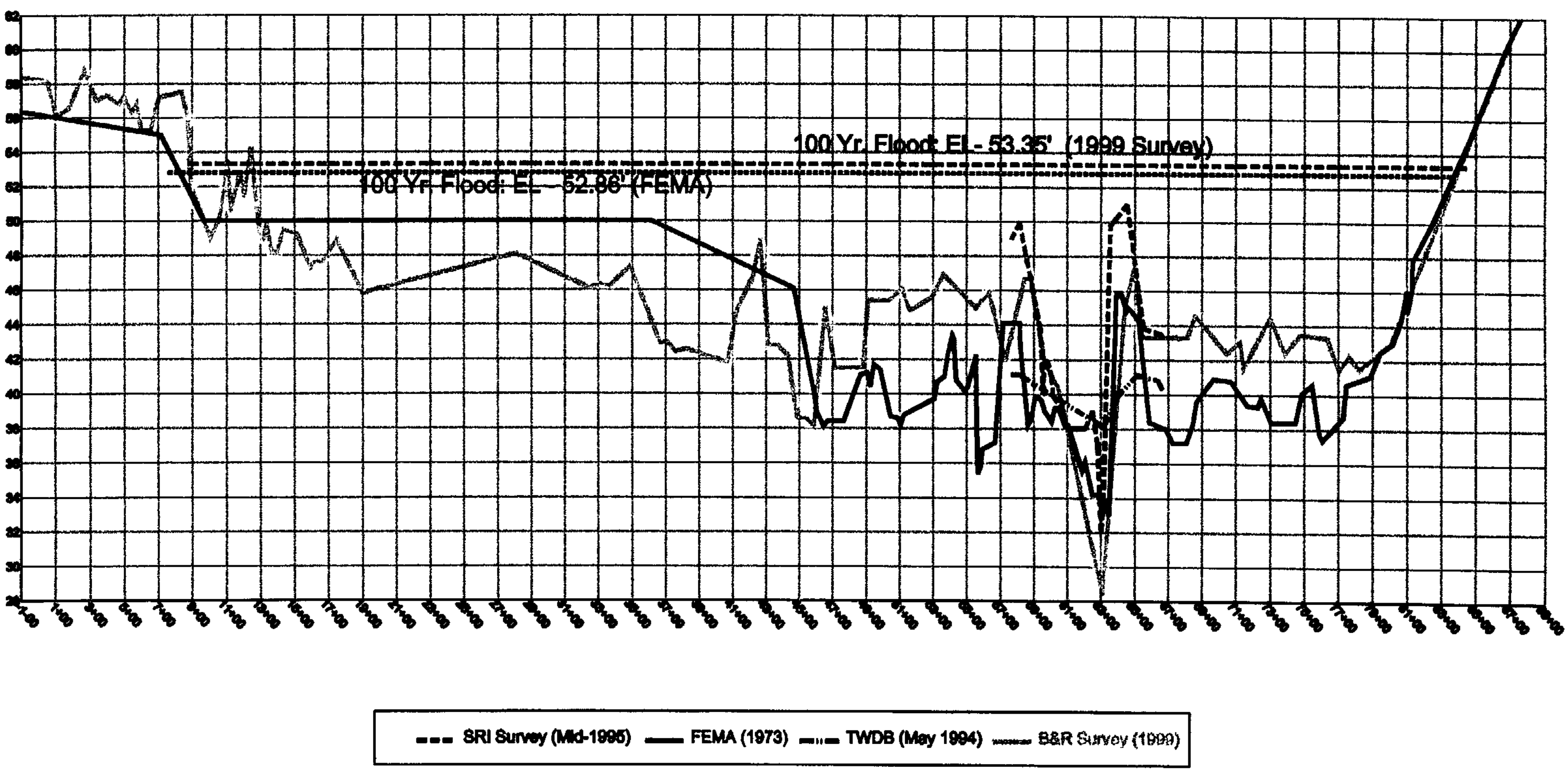


EXHIBIT 6
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 7.09 MI, Line E

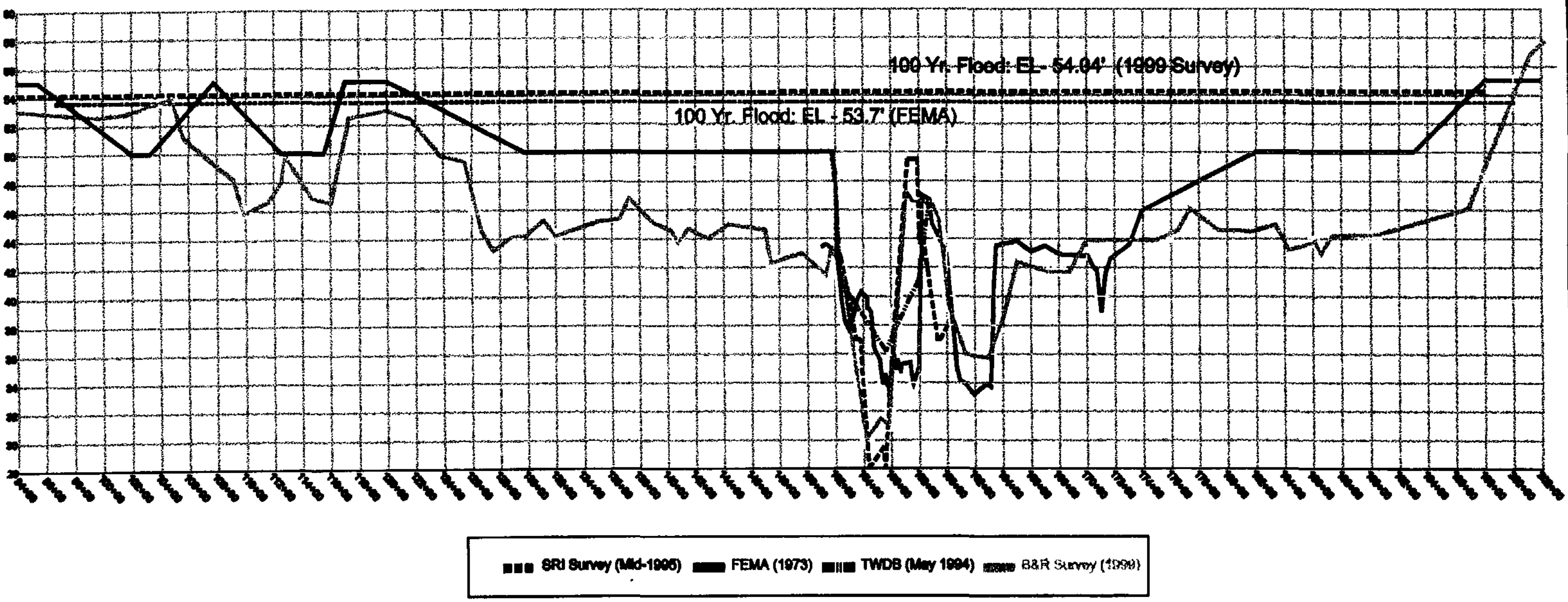


EXHIBIT 7

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 7.47 MI, Line F

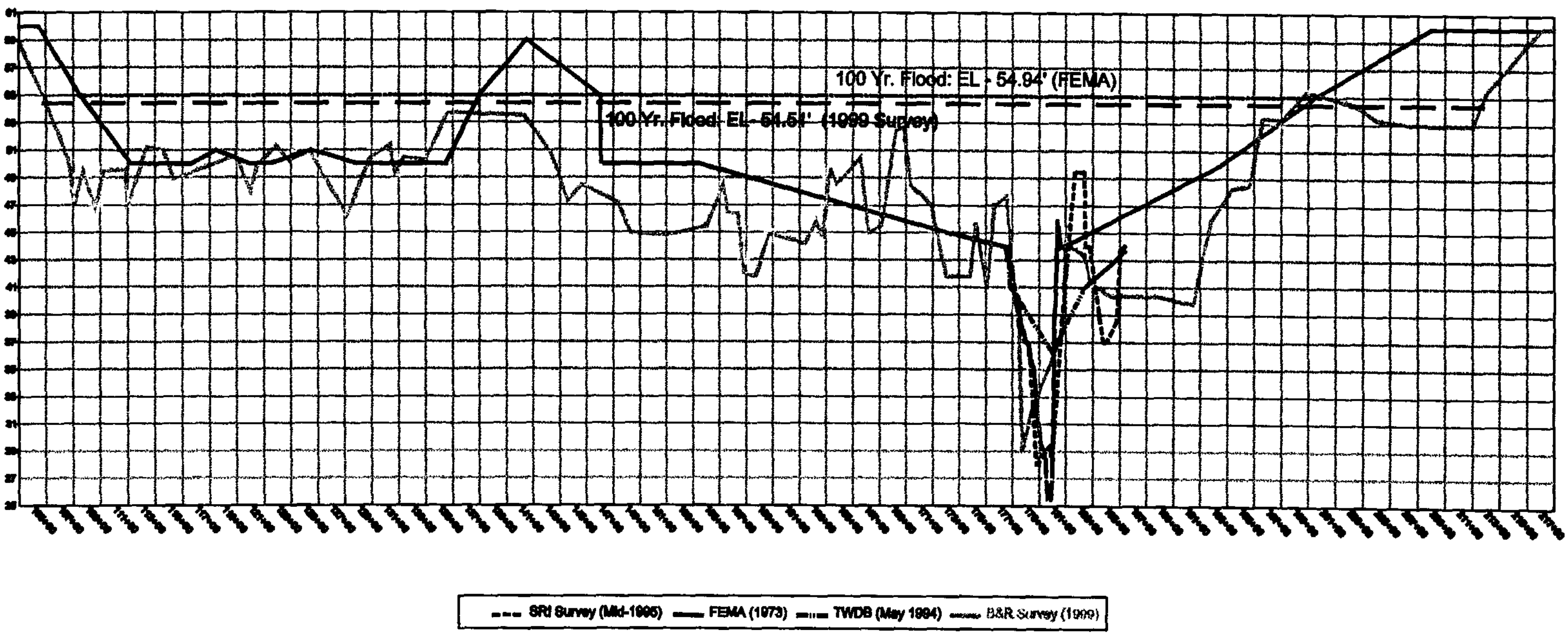


EXHIBIT 8

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 8.49 MI, Line G

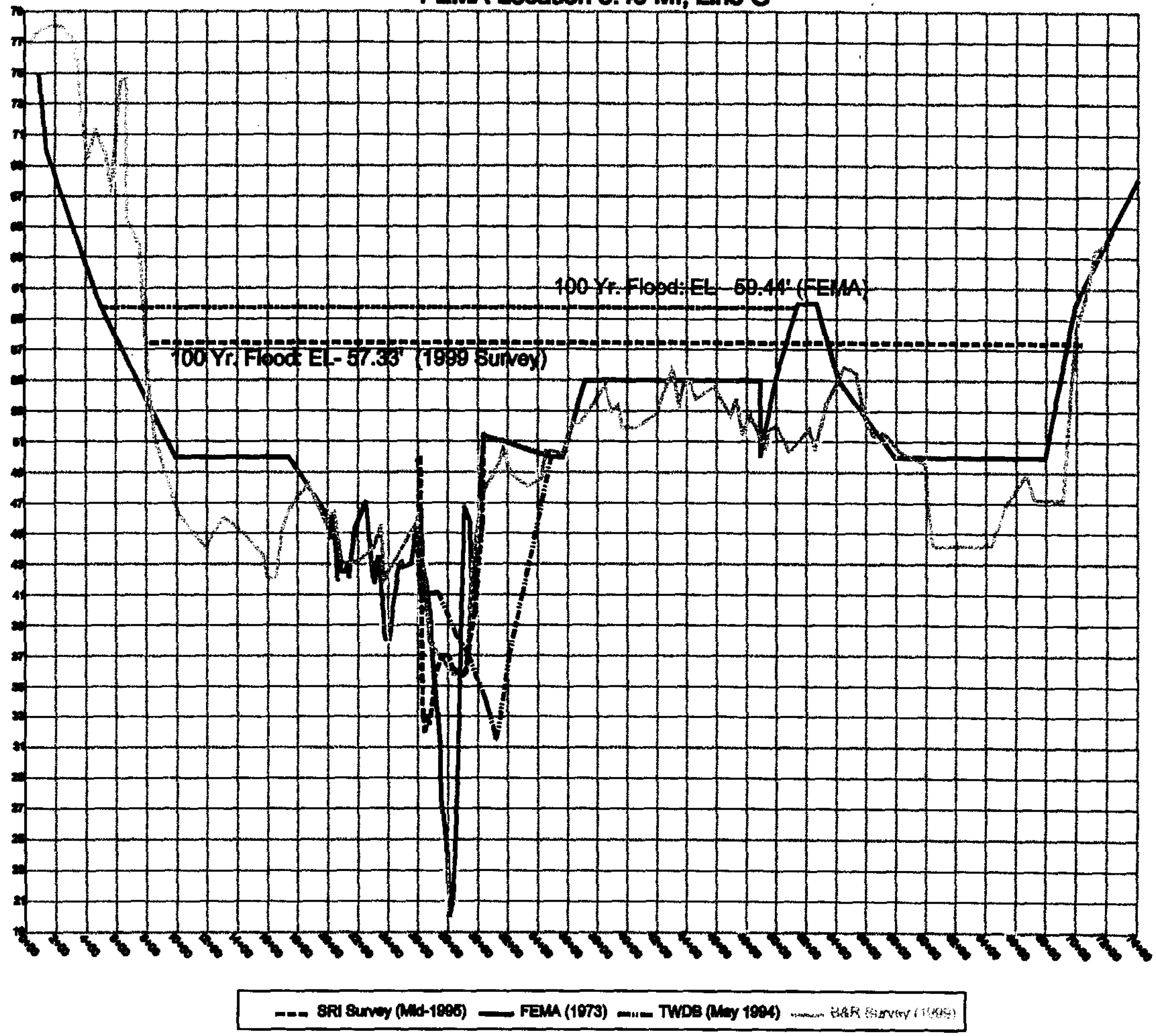


EXHIBIT 9
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 9.410 MI, Line H

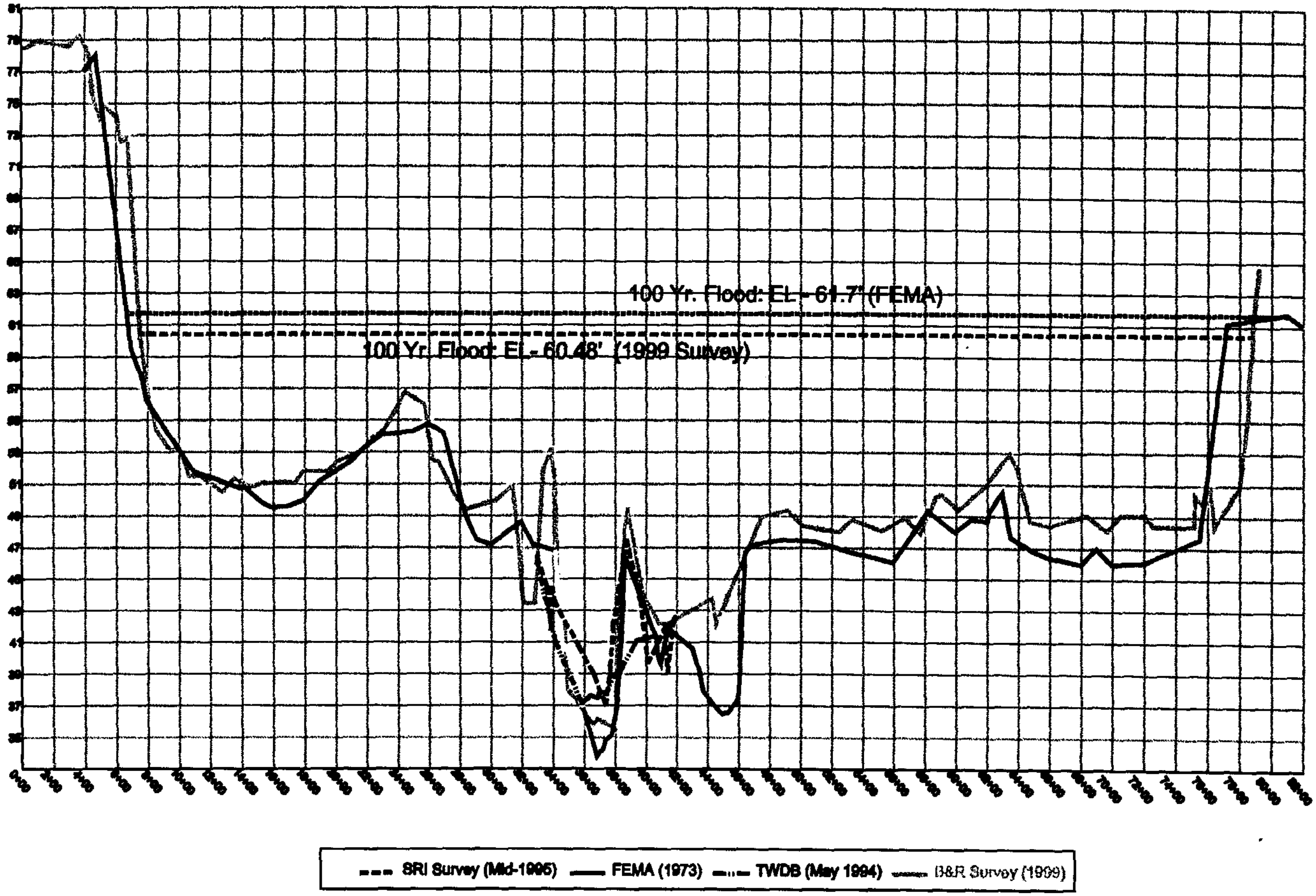


EXHIBIT 10
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 10.58 MI, Line I

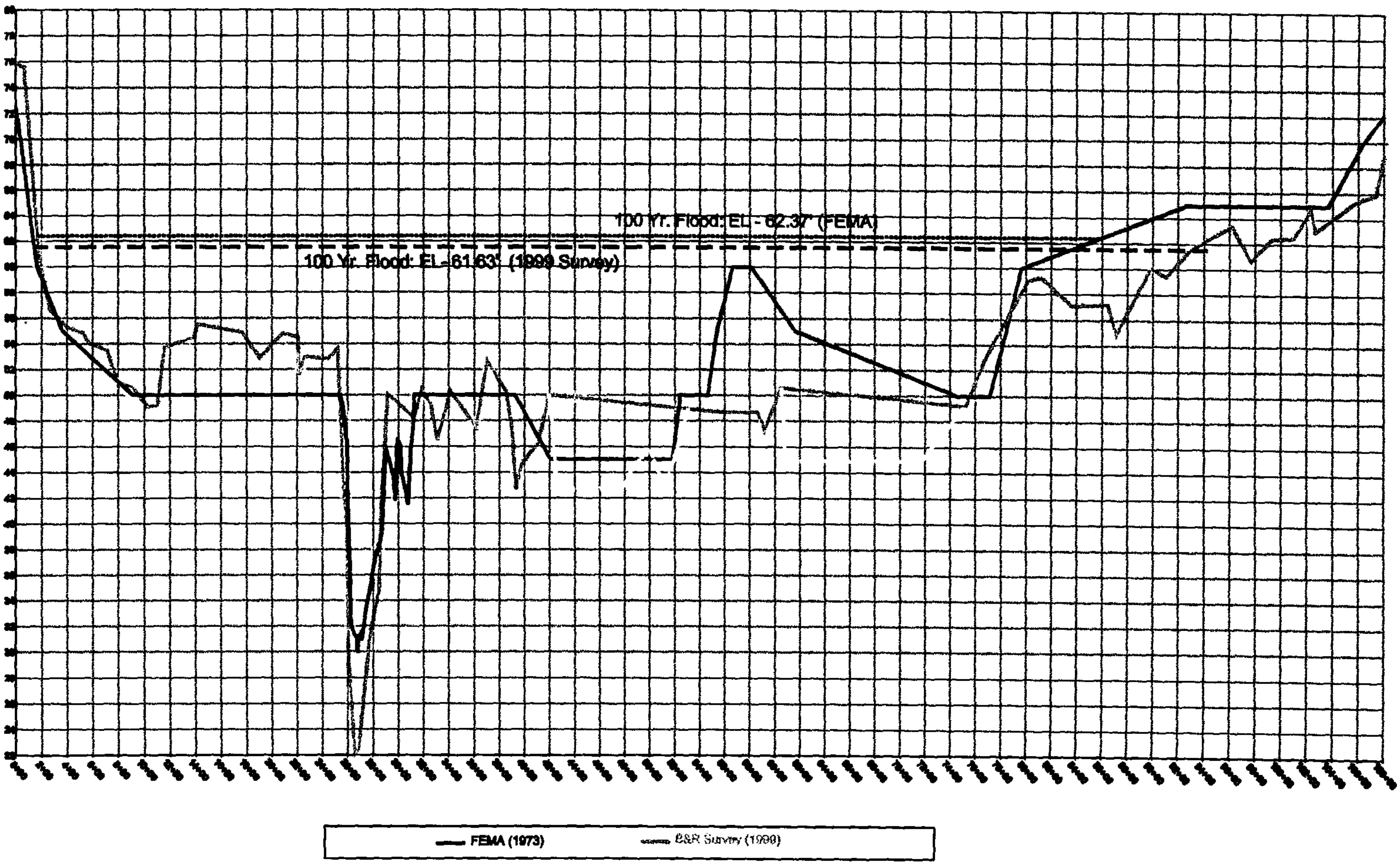


EXHIBIT 11

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 10.86 MI, Line J

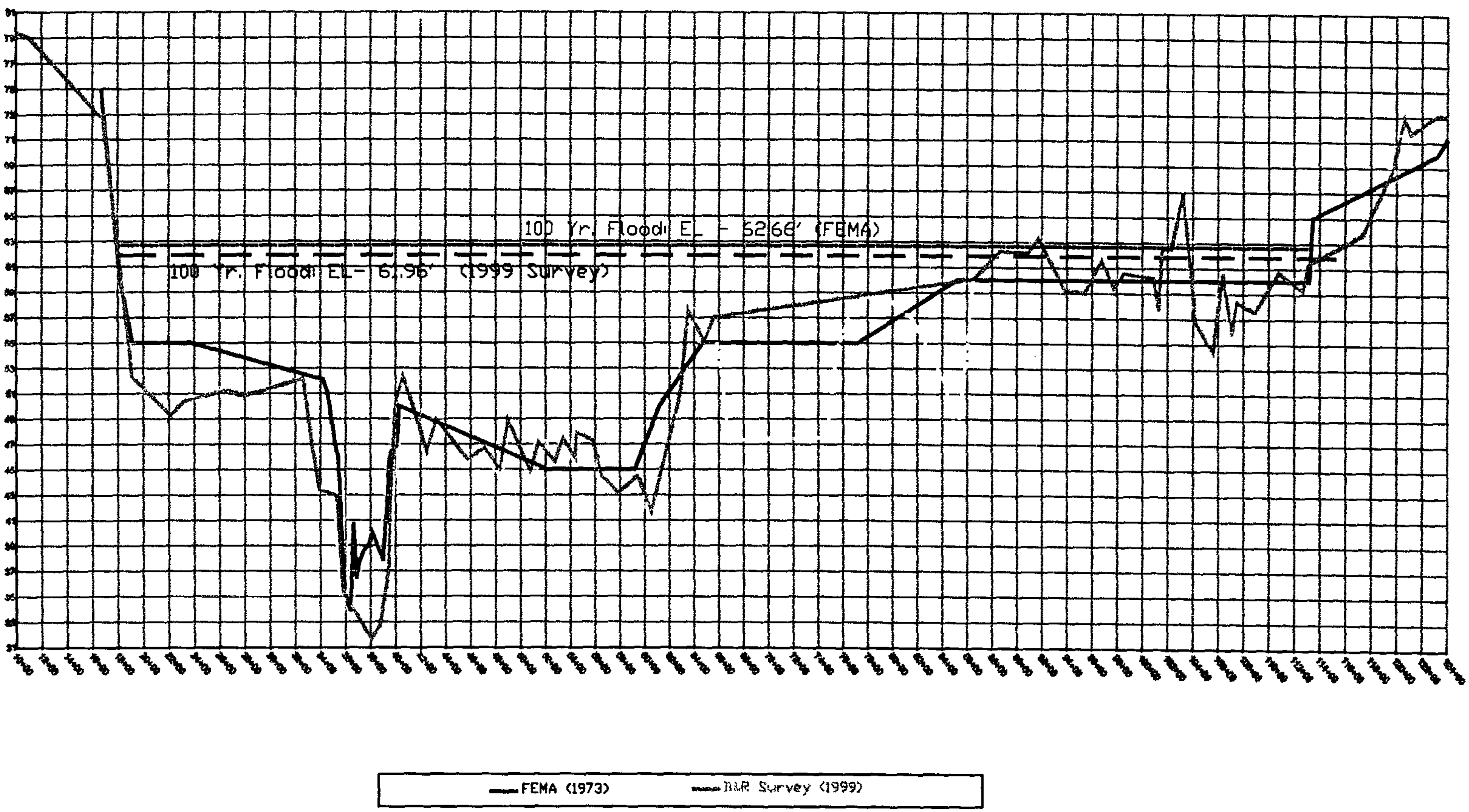


EXHIBIT 12

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.09 MI, Line K

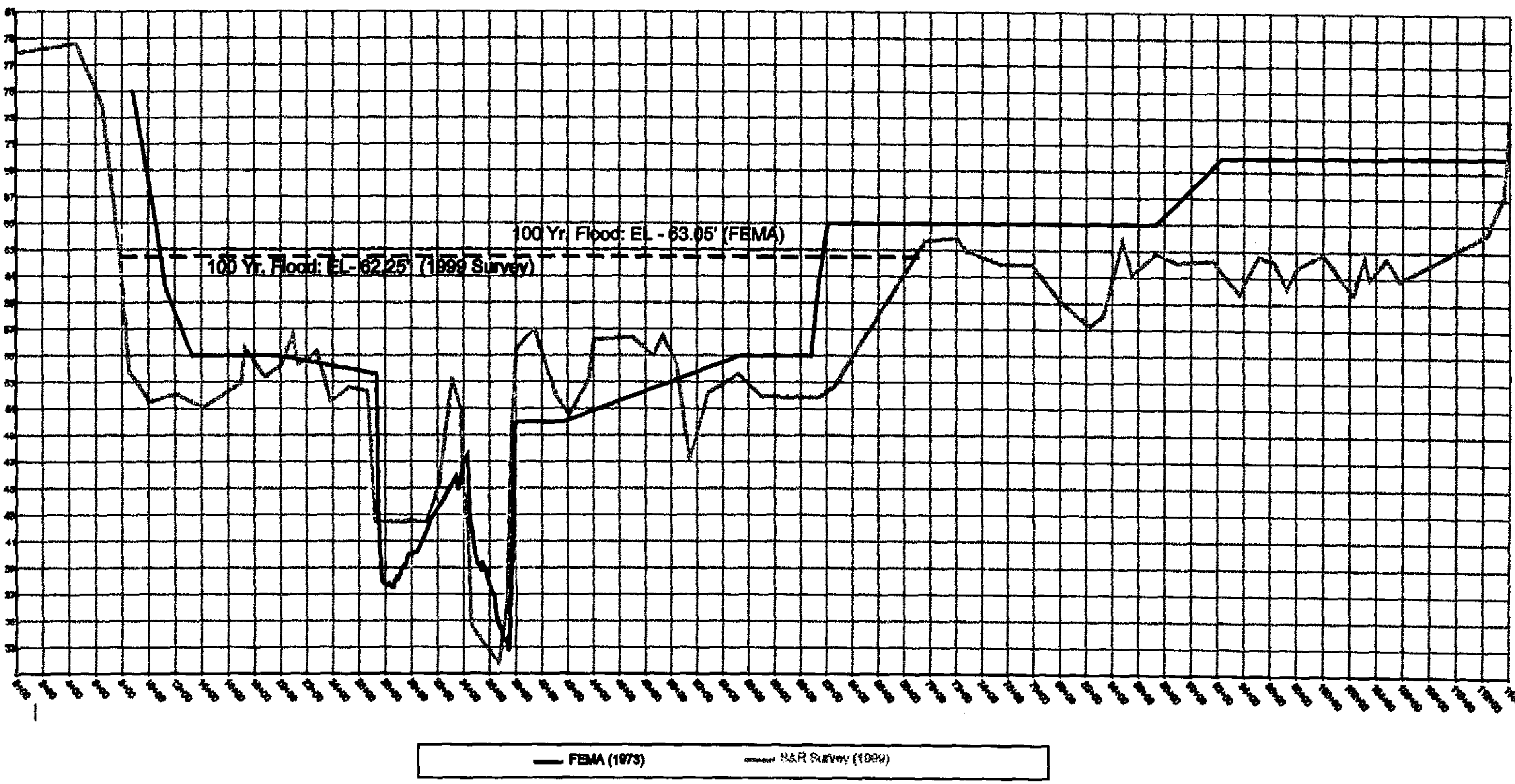


EXHIBIT 13

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.35 MI, Line L

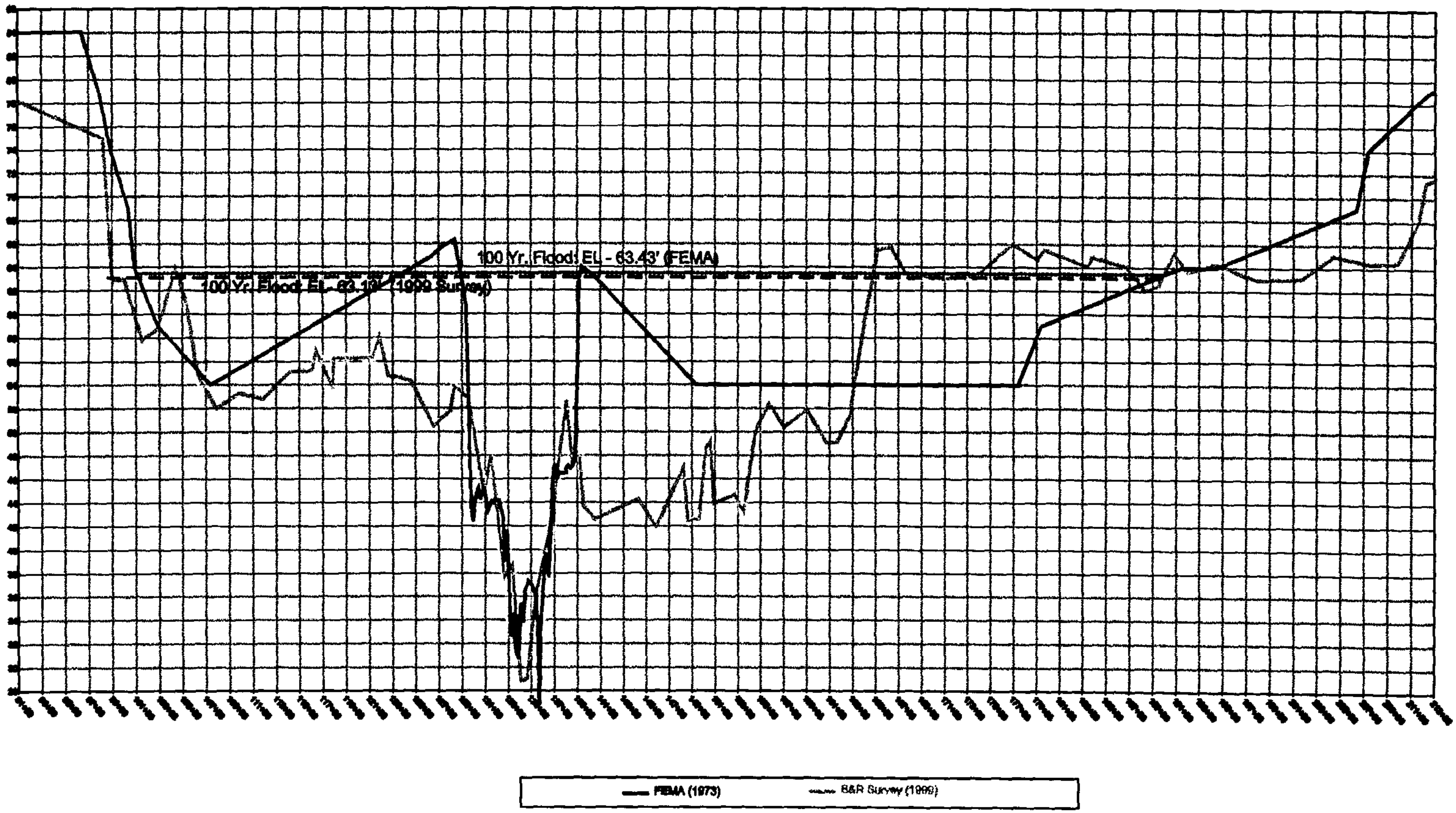


EXHIBIT 14

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.48 MI, Line M

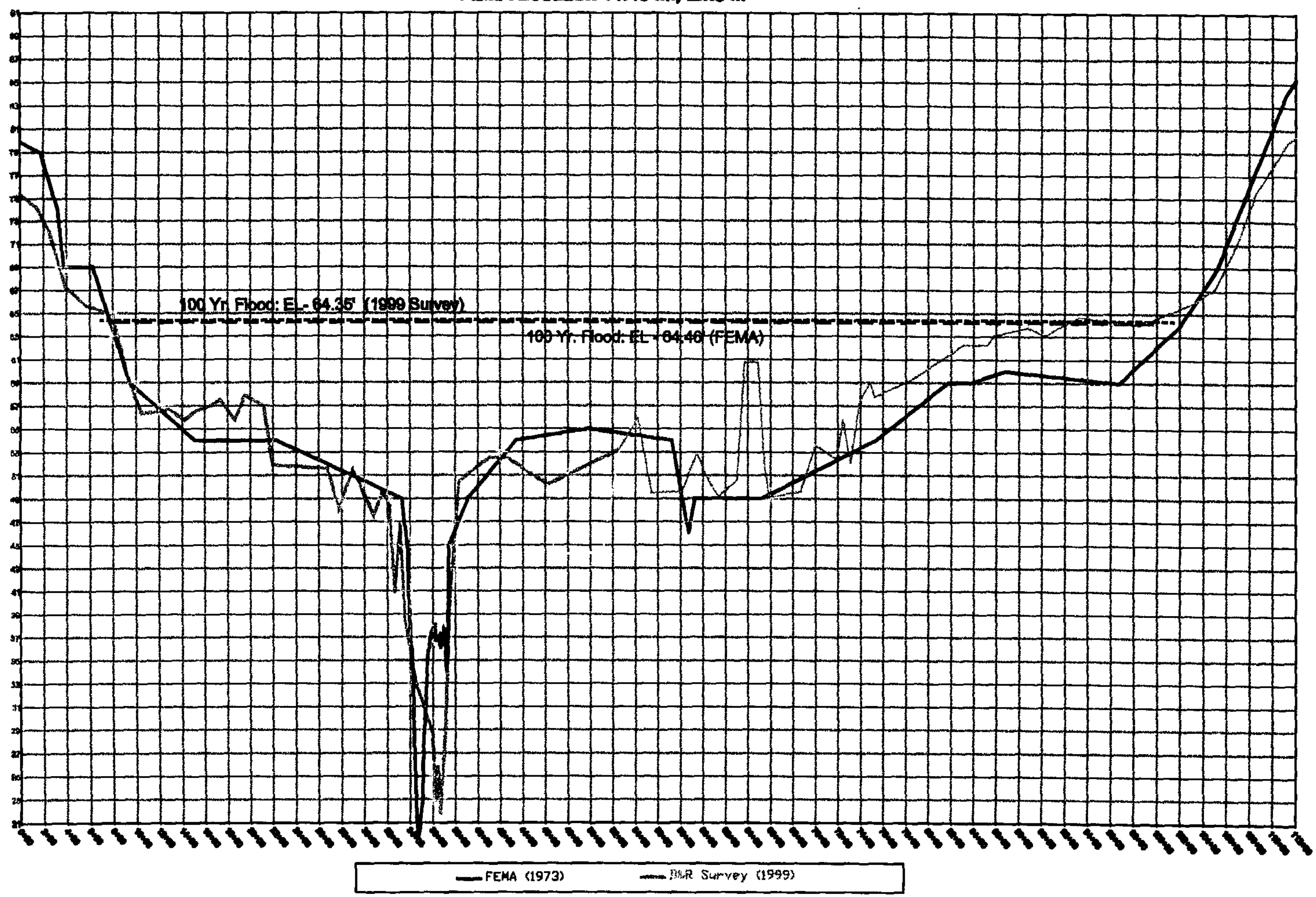
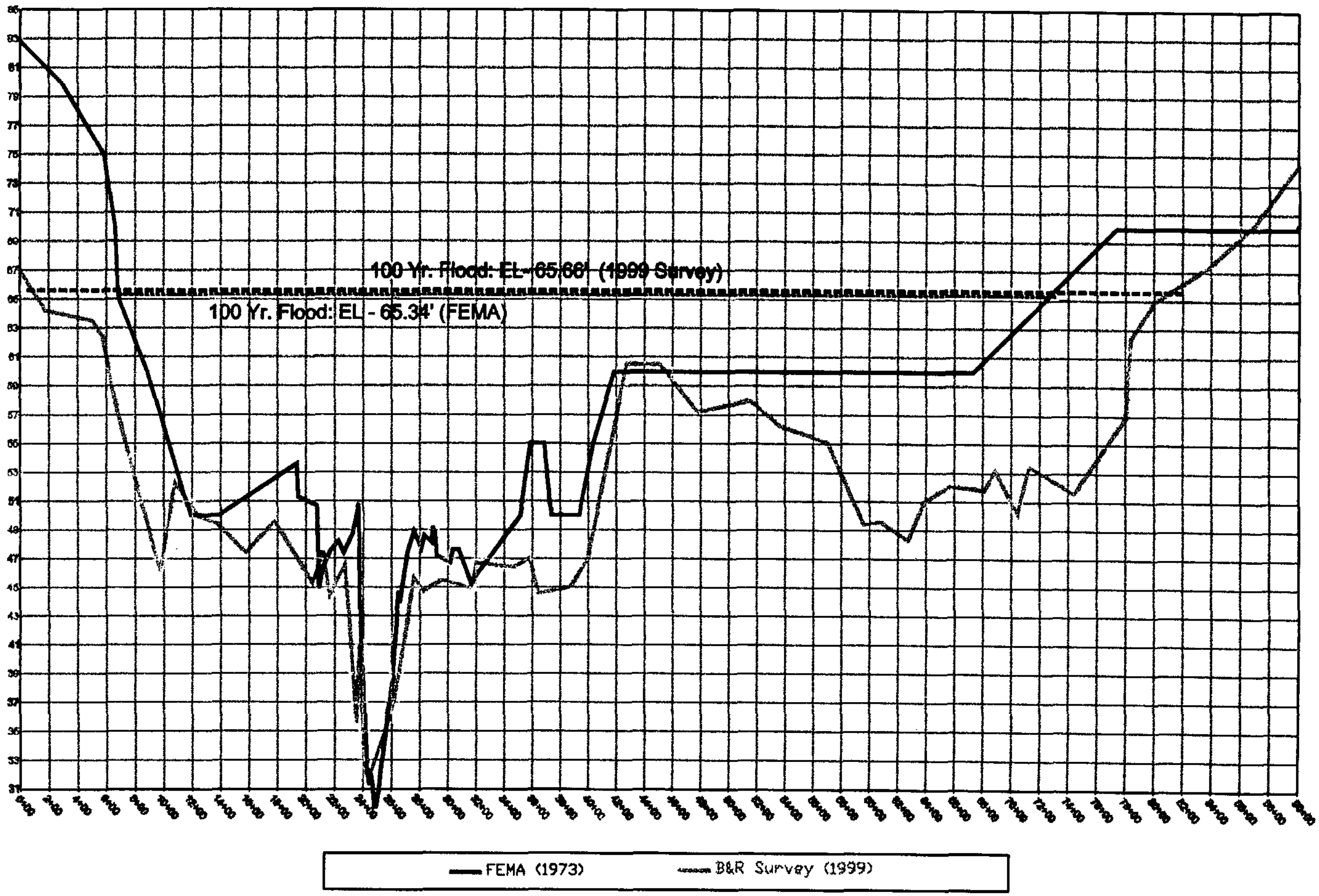


EXHIBIT 15

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 11.97 MI, Line N



Appendix B-2 HEC-2 Model Output (1999 Survey)

HEC-2 Output

West Fork Channel (FEMA Reach 3; 1999 B&R Survey)

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1**********************************************                ****************************************
* HEC-2 WATER SURFACE PROFILES          *                        * U.S. ARMY CORPS OF ENGINEERS      *
*                                      *                 * HYDROLOGIC ENGINEERING CENTER    *
* Version  4.6.2; May 1991            *                         * 609 SECOND STREET, SUITE D      *
*                                      *                 * DAVIS, CALIFORNIA 95616-4687     *
* RUN DATE   14MAR00   TIME  19:02:53 *                          *        (916) 756-1104         *
**********************************************                ****************************************
```

```
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
```

1
  14MAR00   19:02:53   PAGE 1

THIS RUN EXECUTED 14MAR00   19:02:53

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

Version  4.6.2; May 1991
**************************************
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1999 B&R Survey - West Fork (FEMA Reach 3)
Using Higher Starting Water Elev. than FEMA Orig. Pool WSELs from Result of Reach 2 (Lake Houston)
File: BRSREVR.OH2

```
T1     CF-0033 BROWN & ROOT SERVICES,  Revised X3 Encrochments 02/25/2000
T2     Lake Houston HEC-2 MODEL, REACH 3 (1999 Survey)
T3     Starting form river mile 3.615 u/s of Lake Houston Dam

J1  ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS    Q      WSEL    FQ

      0       2       0                              46.66

J2  NPROF   IPLOT   PRFVS   XSECV   XSECH    FN     ALLDC    IBW    CHNIM   ITRACE

      1       0      -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150       7      55      56      26      25       4      35      60      59

J6  IHLEQ   ICOPY   SUBDIV  STRTDS   RMILE

      1


QT      4    66800    143300    174300    333600
NC   0.12     0.12      0.03        .1        .3
X1  3.615       89   2366.85   6330.06
X3     10              1232.04      54.7
GR   55.6        0      55.2        90      54.9    161.12      54.8    318.29      54.5       400
GR   54.5   505.44      50.4     590.1      50.7    644.14      49.6    763.76      49.8    821.19
GR   47.9   853.74      50.9    895.11        51    927.61        49    951.75      47.9    1054.3
GR   50.3  1085.94      53.3   1160.37      54.7   1232.04      50.1   1287.74        49   1373.79
GR   48.6  1482.72      49.1   1622.28      46.2   1678.02      46.3   1781.82      48.3   1866.53
GR   49.2   1949.4      48.8   2075.16      47.9   2163.11      43.8   2220.71      42.6   2269.24
GR   41.6  2366.85      40.6   2391.75        39   2452.47      37.7   2548.87      37.9   2765.45
```

GR	37.6	2952.69	38	3157.81	38.6	3299.81	38.3	3413.04	38.1	3746.92
GR	38.1	3993.99	38.9	4185.79	38.8	4286.36	40.5	4499.72	39.9	4728.9
GR	38.6	4754.82	40.1	4907.5	40.4627	4943.023	38.9	4984.51	37.2	5041.95
GR	37.2	5119.68	36.4	5177.29	37.3	5277.11	36.8	5355.15	38.1	5518.64
GR	37.9	5567.34	36.5	5613.59	33.5	5655.2	32.5	5769.5	30.3	5803.47
GR	32.8	5902.24	32.8	5982.5	34.2	6030.84	36.5	6067.52	37.5	6124.9
GR	37.8	6207.91	40.5	6273.13	43.8	6330.06	41.5	6462.94	41.4	6636.96
GR	44.8	6697.83	45.5	6728.93	44.5	6819.63	45	6861.77	44.5	6960.04
GR	44.8	7029.56	45.05	7060	44.7	7115.34	45.4	7181.81	45.6	7240
GR	45.6	7360	45.5	7468.6	43.4	7632.04	44.6	7864.56	47.6	7908.88
GR	47.7	7982.52	48.7	8044.72	48.8	8220	55.8	8990		

1

QT	4	66160	140750	173330	329800					
X1	4.745	84	2373.4	6703.71	3600	4500	5966			
X3	10		1973.39	52	6985.59	48.6				
GR	60.92	0	54.6	450	53.45	570	53.05	630	52.6	740
GR	52.7	830	52.5	930	52	989.14	52.45	1150	52.3	1284.73
GR	52.6	1434.66	52.6	1560	52.45	1730	52.3	1836.38	52.05	1940
GR	52	1973.39	51.1	2373.4	43.3	2385	39.8	2559.76	37	2645.83
GR	36	2728.22	35.3	2809.02	35.9	2887.92	31.2	3041.01	31.9	3156.16
GR	38.5	3253.79	38.3	3378.72	37.2	3446.92	38.7	3576.68	40.1	3661.26
GR	41	3745.2	42.8	3831.04	41.2	3910.34	41	3973.54	41.5	4029.61
GR	41.7	4160.5	41.2	4216.44	42.6	4487.7	44.7	4656.69	40.7	4714.42
GR	36.5	4755	36.2	4820	34.9	4900	38.1	5120	38.1	5180
GR	41.1	5200	42.3	5222	42.1	5272	39.7	5300	39.9	5500
GR	39.6	5550	38	5600	36.3	5740	37	5800	39.8	5962.55
GR	40	6057.51	39.7	6300.58	42	6371.11	43.1	6486.54	44	6532.85
GR	44.5	6559.55	45.2	6653.68	47.2	6703.71	47	6753.55	47.1	6787.33
GR	47.5	6829.55	47.3	6947.51	48.6	6985.59	48.4	7027.77	47.3	7052.29
GR	47.2	7079.78	46.5	7122.32	46.4	7303.07	46.8	7395.37	47.9	7436.05
GR	48.1	7535.6	50.2	7585.83	54.2	7722.58	54.7	7816.27	59.2	7868.73
GR	60.8	7911.42	61	8096.6	61.5	8298	61.8	8402		

QT	4	65990	140170	173080	328820					
NC	0.12	0.12	0.03	0.3	0.5					
X1	5.026	82	10508	14400	1030	4150	1482	0.9135		
X3	10									
GR	70.3	0	60.1	847	55.1	4325	50.1	6125	47.5	6457
GR	51.9	6672	52	6723	49.3	6899	53	7002	51.3	7207
GR	47.8	7406	44.3	7535	50.7	7643	52	7675	49.2	7860
GR	50.7	7983	52	8074	50.8	8207	51.4	8253	50.6	8427
GR	44.2	8495	47.4	8539	44.2	8686	50.9	8716	48.5	8805
GR	53.1	8968	50.3	9257	52.8	9627	49.3	9739	48.6	10032
GR	41.6	10121	52.8	10240	51.6	10351	56.2	10508	49.2	10531
GR	44.1	10549	41.8	10584	28.9	10622	37.4	10682	36.1	10792
GR	37.9	10846	41.3	10953	45	11066	26.5	11142	24.4	11222
GR	17.9	11240	14.8	11250	10.6	11262	21.6	11486	24.9	11552
GR	41.3	11749	45.5	11830	46.2	11981	44.7	12010	41.2	12077
GR	46.2	12110	46	12265	42.6	12356	43.9	12514	41.7	12874
GR	42.3	13169	43.2	13369	44.1	13509	41.3	13921	44.5	14033
GR	43.9	14119	43.1	14221	47.6	14283	57	14400	63.4	14532
GR	64.7	14822	62.5	14960	66.5	15076	67.6	15152	66.1	15301
GR	65.8	15393	64.6	15581	65.5	15601	66.7	15706	62.2	15750
GR	64.2	15886	65.4	16039						

NC	.12	.12	0.030							
X1	5.027	100	10508	14300	1	1	1	0.9135		
X3	10									
X2	0	0	0	52.5	58.25					
GR	70.3	0	60.1	847	50.1	6125	40.8	6399	52	6703
GR	53	6993	43.8	7631	52	7675	50.6	8427	44.2	8495
GR	53.1	8968	50.3	9257	52.8	9627	49.3	9739	48.6	10032
GR	41.6	10121	56.2	10508	28.9	10622	37.4	10682	52.5	10683
GR	52.5	10689	37.4	10689	36.1	10792	37.9	10846	41.3	10953
GR	52.5	10953	52.5	10959	41.3	10959	45	11066	26.5	11142

1

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GR   24.4   11222   17.9   11240   50.4   11240   52.5   11241   52.5   11250
GR   10.6   11262   21.3   11480   52.5   11480   52.5   11486   21.6   11486
GR   24.9   11552   24.4   11708   52.5   11708   52.5   11714   24.4   11714
GR   24.4   11732   45.5   11830   46.2   11981     45   12004   52.5   12004
GR   52.5   12010   44.7   12010   41.2   12077   46.2   12110   46.1   12162
GR   52.5   12163   52.5   12169   46.1   12169   42.6   12356   43.5   12463
GR   52.5   12463   52.5   12469   43.5   12469   43.9   12514   41.2   12621
GR   41.3   12663   52.5   12663   52.5   12669   41.3   12669   41.7   12863
GR   52.5   12863   52.5   12869   41.7   12869   42.3   13163   52.5   13163
GR   52.5   13169   42.3   13169   43.2   13363   52.5   13363   52.5   13369
GR   43.2   13369   44.1   13509   41.3   13581   41.3   13663   52.5   13663
GR   52.5   13669   41.3   13669   41.3   13863   52.5   13863   52.5   13869
GR   41.3   13869   41.3   13921   44.5   14033   43.9   14113   52.5   14113
GR   52.5   14119   43.9   14119   43.1   14221     56   14300   66.8   14676

X1  5.034      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03
X1  5.035     82  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.037     82  10508  14400      8      8      8  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
1
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GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.038    100  10508  14300      1      1      1  0.9135
X3     10
X2      0      0      0   52.5  58.25
```

```
GR   70.3      0   60.1    847   50.1   6125   40.8   6399     52   6703
GR     53   6993   43.8   7631     52   7675   50.6   8427   44.2   8495
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   56.2  10508   28.9  10622   37.4  10682   52.5  10683
GR   52.5  10689   37.4  10689   36.1  10792   37.9  10846   41.3  10953
GR   52.5  10953   52.5  10959   41.3  10959     45  11066   26.5  11142
GR   24.4  11222   17.9  11240   50.4  11240   52.5  11241   52.5  11250
GR   10.6  11262   21.3  11480   52.5  11480   52.5  11486   21.6  11486
GR   24.9  11552   24.4  11708   52.5  11708   52.5  11714   24.4  11714
GR   24.4  11732   45.5  11830   46.2  11981     45  12004   52.5  12004
GR   52.5  12010   44.7  12010   41.2  12077   46.2  12110   46.1  12162
GR   52.5  12163   52.5  12169   46.1  12169   42.6  12356   43.5  12463
GR   52.5  12463   52.5  12469   43.5  12469   43.9  12514   41.2  12621
GR   41.3  12663   52.5  12663   52.5  12669   41.3  12669   41.7  12863
GR   52.5  12863   52.5  12869   41.7  12869   42.3  13163   52.5  13163
GR   52.5  13169   42.3  13169   43.2  13363   52.5  13363   52.5  13369
GR   43.2  13369   44.1  13509   41.3  13581   41.3  13663   52.5  13663
GR   52.5  13669   41.3  13669   41.3  13863   52.5  13863   52.5  13869
GR   41.3  13869   41.3  13921   44.5  14033   43.9  14113   52.5  14113
GR   52.5  14119   43.9  14119   43.1  14221     56  14300   66.8  14676

X1  5.045      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03    0.1    0.3
X1  5.046     82  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039
1
  14MAR00    19:02:53                                        PAGE   5


QT      4  65680  139080  172610  326970
NC   0.12   0.12   0.03    0.1    0.3
NH      4   0.12  6565.8   0.04  10389.97   0.03  11165.02   0.12  11754.54
X1  5.585     92  10389.97  11165.02   2664   1744   2847
X3     10
GR  62.75      0     55   1050     51   1350   50.4   2130   49.8   2670
GR   49.3   2940     49  3070.97   47.4  3189.37   48.1  3332.69   44.9  3448.15
GR   47.2  3606.21   45.8  3712.03   48.1  3809.2   45.3  3910.28   45.4  3992.9
GR   48.9  4050.05   50.5  4111.66   47.1  4292.93     49  4377.98   46.2  4426.95
GR   48.4  4503.41   51.7  4528.08     52  4646.6   47.9  4680.17   47.5  4744.32
GR   49.6  4816.31   45.9  5042.82   46.4  5114.46   50.6  5214.31   50.4  5290.11
GR     49  5321.9   47.8  5469.67   49.5  5630.79   47.7  5658.97   46.1  5777.87
GR   46.4  5924.67   44.8  6004.29   43.3  6258.57   43.5  6470.87   48.9  6565.8
GR   44.7  6646.34   45.9  6743.32   44.5  6892.24   44.2  7009.22   44.5  7289.15
GR   46.4  7330.53   44.3  7392.93   41.7  7412.88   43.8  7516.5   42.6  7594.69
GR   42.8  7688.63   41.4  7768.32     42  7833.49   41.2  7910.79   42.2  8209.01
GR   41.3  8286.36   39.7  8308.22   39.9   8702   40.1  8964.4   39.4  9095.69
GR   41.7  9292.52   41.6  9541.35   44.3  9703.77   41.6  9816.3   43.9  9860.54
GR   41.3  9871.29   41.3  9948.37   46.9  9970.67   44.8  10033.63     43  10162.63
GR   44.2  10190.96   43.9  10305.76   46.5  10332.73   48.2  10389.97   44.7  10430.72
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GR   41.3   10459.1   32.9  10514.53     28   10567.09     26.4   10611.42     24.7   10640.77
GR   23.7   10681.82   25.7  10731.87    24.6   10751.83     28   10782.41     30.2   10840.35
GR   39.3   10888.46   38.5  10909.12     45   10961.37     49.8   11027.75     49.8   11165.02
GR   54.6   11343.95   62.4385  11754.54

QT     4    65210    137410    171900    324160
NC   0.08    .12     0.03      .1       .3
NH     5    0.12     2500     0.08     10000     0.03    17143     0.08     19000     0.12
NH   23560
X1   6.420     59    15845    16499     2300     2800     4409
X3     10
GR     75      0     75     2500     70     3400     70     6000     60     7000
GR   58.3   10000   56.1   10103   56.6   10179   57.3   10497   56.3   10543
GR   55.3   10654   57.2   10704   55.9   10873   52.1   10891    49    11004
GR   50.2   11061   53.5   11106   49.4   11290   48.2   11399   47.9   11517
GR   47.7   11625   48.9   11747   45.8   11900    46    11965   46.6   12181
GR   47.9   12699   48.1   12807   46.6   13068   46.2   13367   47.4   13489
GR   42.4   13758   41.8   14068   44.9   14127   46.8   14222   48.9   14266
GR   42.2   14433   38.1   14587    45    14654   41.5   14714   46.1   15114
GR   44.8   15161   46.9   15361   41.9   15727   46.7   15845   40.4   16043
GR   28.4   16309   44.9   16440   47.5   16499   43.3   16544   44.6   16859
GR   41.5   17143   44.5   17299   43.5   17474   41.4   17702   41.5   17822
GR     43   18004     61   18708     70   19600     70   23560

QT     4    64830    136080    171320    321910
NC   0.12    0.12    0.03      0.1      0.3
NH     4    .12    13568     0.03    15555     0.08    18896     .12    24402
X1   7.09     67    13568    15555     2000     3600     3538
X3     10                 11840    53.1    20069    57.9
GR   75.1      0    70.1    2300    60.1    3500    59.1    5310    55.1    7000
GR   52.9    9998   51.2   10405   48.3   10760   46.7   11002   48.1   11096
GR     50   11122     47   11313   46.7   11451   52.6   11572   53.1   11840
GR   52.5   12008   49.5   12394   44.7   12513   43.3   12597   44.3   12738
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GR   45.4   12956   46.9   13568   45.2   13743   44.7   13868   43.8   13920
GR   44.8   13990   45.1   14281   44.7   14544   42.4   14583   43.1   14804
GR   41.6   14978   43.4   15013   42.2   15090   30.1   15260   31.6   15364
GR   47.4   15555   46.7   15598   45.5   15789   39.5   15858   36.1   15974
GR   35.8   16133   38.4   16239   42.5   16348   41.8   16564    44    16840
GR   44.7   17493   46.2   17579   44.6   18028   45.1   18178   43.3   18276
GR   43.9   18459     43   18497   44.4   18896   46.2   19531   56.9   19962
GR   57.9   20069   52.9   20275   53.4   20406   49.7   20651   51.5   20718
GR   54.8   21004   54.1   21070   54.3   21465    55    21585   53.8   21703
GR   60.1   22202     65   24402

QT     4    64610    135320    171000    320030
NC    .12    .12     .03       0.1      0.3
NH     5    .12    12000     0.05    14153     0.03    14598     0.05    16383     .12
NH   23100
X1   7.47     66    14153    14598     1500     1500     2006
X3     10                              16383    55.4
GR     75      0     75     4460    64.2    6000     70     6150    61.6    6693
GR   50.3    7163   46.9    7208   49.6    7585   46.7    7595     51    7861
GR   48.9    7931   50.6    8391     48    8503   49.8    8546   51.3    8691
GR   46.2    9217   50.4    9383   51.4    9536   49.2    9569   50.3    9803
GR   53.7   10039   53.5   10532   47.3   10859   48.5   10964   47.2   11235
GR     45   11328   45.5   11905   48.6   12029   46.4   12059     42   12180
GR   41.8   12274   44.9   12369   44.2   12639   45.9   12724   44.5   12772
GR   49.7   12832   48.5   12877   50.5   13056     45   13117   45.6   13218
GR   52.7   13383   48.5   13434     47   13591   41.8   13880   45.8   13922
GR   40.9   14010     47   14062   47.7   14153     29   14273     38   14585
GR   44.3   14598   43.4   14737   41.4   14777   40.4   14933   39.8   15545
GR   45.9   15676   48.5   15964   53.4   16211   55.4   16383     53   17600
GR     54   18600     55   18800     60   20560     70   21150     75   22400
GR     75   23100

NC    .12    .12    0.03
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X1   8.07      90  5637.46  6519.38  2619.28  3201.18  2891.14
X3   10                 3455.36    61.13
GR   73.6       0     71   207.3    67.1   340.91    61.2   454.82    59.8   605.74
GR   63.3   903.8   58.3 1086.61      54  1321.33    54.2  1487.54    47.9  1600.81
GR   55.2 1766.53   53.5 1879.14    56.5  2066.56    53.1  2164.16    54.1  2425.57
GR   56.8 2597.07   52.7 2847.29    53.3  2923.49    50.4  3066.89    51.6   3182.9
GR   58.2  3240.1  61.15    3360    59.6   3625.8    56.1  3784.39      48  3837.18
GR     47 3910.62   41.7 3954.78    48.8   4041.7    47.3   4372.4      43  4430.63
GR     48 4823.38   45.7 5084.92    47.1   5209.7    44.3  5637.46    44.9  5883.73
GR   38.8 5971.26   41.9 6088.05    27.9  6099.51    32.1  6158.61    38.5  6417.39
GR   41.9  6498.6   46.7 6519.38    44.4  6698.82    44.6  6871.35    49.1  7166.61
GR   45.8 7214.35   48.7 7269.55    49.1  7385.35    46.4  7650.65    49.5  7758.86
GR   48.8 7837.12     53  8005.6    54.3  8165.26    54.2  8385.85    47.8  8751.03
GR   48.9 8956.83   47.3 9151.02    48.7  9234.09    48.6  9464.92    47.2   9691.7
GR   44.3 9845.44   44.3 10352.59   48.4 10497.67    48.7 10744.17    46.9 10944.93
GR   53.3 11073.35  58.8 11124.29   58.3 11461.72    60.5 11629.21    59.8 11752.03
GR   66.4 11793.39  67.5 11924.83  70.95    12100    69.2 12409.61    71.8 12474.39
GR   70.4 12728.04  74.2 12870.91   71.6 12991.35    74.9 13090.92    73.1 13188.25
GR   74.6 13307.27  72.3 13497.82   74.7 13757.58    73.4 13964.96    74.3 14201.59
GR   74.4  14577.6  73.6 14996.08   75.1 15169.17    73.7  15240.5    74.4 15481.47
1
  14MAR00    19:02:53                                               PAGE    7


QT      4    63800   132480   169770   315820
NC    .12      .12      .03       .1       .3
X1   8.49       91  2606.42  3168.51   2635.7  1605.14  2374.28
X3     10                            3851.71     54.7
GR   75.9        0   77.6       60   78.05      160   78.05      240      77    331.6
GR   72.3   368.12   69.4   412.95   71.35      460    69.7   534.73    67.2   564.85
GR   74.5      630   74.7      670    65.5   670.12    64.5      720    63.8   753.26
GR     55   814.19   51.2   856.53    46.4  1006.41    44.1  1184.02    46.1   1306.2
GR   45.1  1439.48   43.6  1567.36    42.1  1599.68    42.1  1656.52    45.3  1696.13
GR   46.6  1738.87   48.3  1871.15    45.8  1974.15    46.4  2040.15    43.1  2089.69
GR   43.2  2200.98   44.1  2303.81    45.6  2353.39      42  2371.86      46  2606.42
GR   37.9  2677.54   35.8  2837.08    35.9  2927.48   42.72  2959.44    47.7  3034.05
GR   49.5  3138.67   50.6  3168.51    48.9  3220.17    48.1  3328.05    48.6   3423.1
GR   50.4  3455.47   50.3  3565.82    52.2  3627.93    52.2  3679.39    54.7  3851.71
GR     53   3892.8   53.4     3940    51.9  3961.68      52  4079.34    52.9  4194.97
GR   55.8     4300   53.2  4350.46    54.7  4373.98    54.9  4425.24    53.8  4458.24
GR   54.6  4581.48   52.7  4690.43    53.9     4730    51.5  4768.99    52.7  4822.83
GR   50.7  4928.57   51.9   4949.8      52  5005.14    50.3  5083.53    51.9  5220.22
GR   50.4  5255.77   53.4  5329.85    55.9  5449.87    55.5  5530.76    52.5  5591.67
GR   51.4  5649.44   51.6  5719.53    50.4  5823.06    49.6  5989.14    44.2  6040.25
GR   44.2  6435.82   46.9  6530.15    48.9  6665.49    47.3  6720.92    47.2  6911.52
GR   55.6  6971.41   58.5  6998.91    61.3  7081.43    63.5  7116.99   66.48  7723.78
GR     71     8000

QT      4    63510   131460   169330   314100
NH      5       .1  2567.98      .05  3385.13     0.03  3879.38     0.05     5000      .12
NH  10500
X1   9.41       94  3385.13  3879.38     2500     5500     4858
X3     10               2460.63    56.91
GR   78.4        0   78.9    96.63    78.6   295.76    79.3   365.11    78.2    423.8
GR   75.8   443.45   74.1   492.25    74.8   526.38   74.15      600    72.6      630
GR   72.8      670   65.3   721.32    60.2   753.27      56   813.24    54.4   854.41
GR   53.3   926.96     53  1014.31    51.5  1058.06    51.5  1133.33    50.5  1273.69
GR   51.4   1346.4   50.8  1454.34    51.1  1532.43    51.1  1736.18    51.8  1783.17
GR   51.8  1941.56   52.4  2003.11      53  2145.32    54.5  2316.56    56.8  2442.42
GR     56  2567.98   52.5  2621.33    52.4  2659.43    50.1  2775.83    49.4  2837.01
GR     50   3033.7   50.9  3141.06    43.5  3205.33    43.5  3281.17    51.8  3332.56
GR   53.3  3385.13   50.4  3417.41    45.2  3426.19    42.2  3442.41      42  3470.88
GR   38.1   3486.5   35.8  3658.23    36.2  3685.31    35.5  3798.17   42.72  3824.76
GR   48.2  3859.77   49.5  3879.38    44.1  3976.38    42.2  4082.27    42.2  4146.99
GR   43.8  4423.62   42.2  4450.81    48.9  4745.31    49.4  4914.17    48.4  5008.36
GR     48  5245.57   48.8   5332.6    48.1   5518.1    48.9  5669.75    47.9  5765.59
GR   50.2  5868.37   50.4  5903.32    49.4     6014      51  6193.43      53  6341.86
GR   52.1   6387.7   48.7  6470.08    48.4  6596.07    49.1  6831.48    48.1     6961
GR   49.1  7045.17   49.1  7203.02    48.4  7256.07    48.4     7513    50.4  7516.71
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GR   49.7  7570.46    50.7  7615.19    48.4  7638.95    50.9  7797.35    55.4  7851.87
GR  57.57  7854.93   59.40     7877   61.45  7882.66      63     8000      64     8500
GR   64.3     8700      62     9300      67    10000      75    10500
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QT      4    62850  129130  168330  309220
NC     .1      .12    0.03      .1      .3
X1  10.58       76  2518.22  3181.69    2700    3200    6177
X3     10                    1431.19   55.17    8020   59.05
GR   75.8        0    75.6    63.6    60.9  180.78    56.7  260.63    55.3     400
GR  54.85      520      54  579.97    53.5  709.98    51.1  790.94    50.6  912.57
GR   49.1   1025.2    49.2  1101.07   53.7  1157.02   54.5    1384    55.5  1418.21
GR   54.9  1763.41    52.9  1902.66   54.8  2083.95   54.5  2206.57     53   2255.4
GR   52.8  2438.35    53.6  2518.22   42.4  2566.64   40.3  2590.99   29.8  2603.35
GR   22.1  2654.44    22.5  2685.55   31.1  2771.89   34.7  2844.63   41.9  2867.55
GR   50.1  2913.09    48.2  3126.19   50.5  3181.69   49.3  3252.87   46.5  3306.48
GR   50.3  3409.33    47.5  3613.61   52.7   3701.6   50.2  3854.05   47.2   3900.8
GR   42.7  3930.19    44.6  3976.89   46.3  4107.08     50  4195.39   48.7  5535.67
GR   48.7  5863.58      49  5916.48   50.6  6045.31   49.2  7520.57   53.5  7702.66
GR  59.05     8020    59.3     8120   57.1  8360.19   57.2  8644.55   54.9  8710.45
GR   60.1  8984.95    59.4  9100.32   61.6     9300   63.4  9619.42   62.4  9928.89
GR   62.5 10100.96    64.8 10231.72     63 10264.23   65.3 10573.06   65.9 10735.19
GR  71.55    10860    72.2    10980  74.25    11110   73.2    11255   73.3 11458.81
GR   74.9 11812.08    74.7 12055.58   76.1  12161.3  75.45    12360  76.75    12560
GR   78.5 12699.89

QT      4    62690  128570  168090  310160
NC     .1      .12     .03      .1      .3
NH      3       .1    3262     .03    4059     .12   13987
X1  10.86       43    3262    4059    1300    1100    1478
X3     10                             8865    62.3
GR   79.8        0    77.6     161    79.4     259    77.6     579    79.7     955
GR   78.9     1110    72.6    1684    52.3    1914    49.3    2212    50.4    2314
GR   52.2     3262    35.4    3575    31.7    3805    32.7    3875    52.4    4059
GR   46.4     4251      49    4323      45    4835    48.9    4896    44.9    5078
GR   47.3     5583    44.5    5654    43.2    5785    44.5    5945    41.7    6053
GR   57.6     6350    59.1    7698    60.1    8650    62.3    8865    59.2    9382
GR   61.6     9677    59.4    9772    60.6    9852    57.7   10128    56.7   10420
GR   54.4    10557    55.8   10709    60.7   11077    63.7   11730    72.9   12060
GR   74.4    13267    75.8   13671    79.7   13987

QT      4    62560  128120  167890  308450
NH      4      .12  2522.57    .05  3311.71    .03  3943.85    .12  13549.31
X1  11.09       82  3311.71  3943.85   1400    1600    1214
X3     10                    3311.71   53.3  6949.97   63.7
GR   77.9        0    78.6  449.85      74  650.88    61.2  796.99    53.8  853.81
GR   51.5  1009.93    52.1  1209.82   51.1  1415.55   52.9  1698.13   53.4  1881.01
GR   54.3  2005.52    54.3  2131.11   52.6  2522.57   52.3  2664.39   42.5  2721.63
GR   42.5  3112.03    45.4   3215.1   53.3  3311.71     51  3378.76     45     3400
GR   42.5  3427.89    34.6  3459.26   31.8  3669.22     36  3729.17     42  3745.04
GR   50.1  3767.43    55.5  3802.55     57  3943.85     52  4107.84   50.5   4209.1
GR   53.1  4359.76    56.2  4405.38   56.4  4699.98     55  4860.97   56.5  4932.99
GR   54.4  5041.53    50.1     5150   52.2  5287.22   53.6  5519.22   51.9  5703.27
GR     52     5900    51.8     6040     52     6160   53.2     6300   54.5     6450
GR   57.8     6690    63.7  6949.97   63.9  7208.78   62.9  7282.45   61.9  7559.06
GR   59.2  7996.95    57.3     8229   58.1     8331   63.7     8477   61.2   8548.1
GR   62.8  8733.88    62.1  8893.69   62.3  9162.78   59.8  9368.39  62.65     9510
GR   62.2     9630    60.2  9723.91   61.8  9807.54   62.8 10002.69   59.7 10225.58
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GR   62.6 10311.07    60.9 10350.09   62.5 10478.43   60.8 10575.85   64.4 11234.07
GR   67.3 11355.29    71.8 11460.13   75.3 11489.48  75.05    11790   74.1 11874.14
GR   74.1 12095.62    75.2 12273.93   75.5 12508.24   74.6 12649.39     76 13085.66
GR   74.3  13286.4    79.6 13549.31
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QT    4    62410    127600    167670    307570
NC   .12    .12    .03    .3    .5
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X3   10              2199    58   6519.75    65.5
GR   75.43     0    66   155.36    64.3   287.39    63.9   438.76    60.9   535.19
GR   54.9   626.91    52   787.68    53.3   980.78    52.8   1186.05    55.1   1413.79
GR   55.2   1604.36    56.9   1641.25    57   1786.87    56.25    1790    56.3   2127.54
GR   58.1   2185.43    54.8   2259.37    54.4   2456.59    50.5   2653.09    51.8   2802.23
GR   53.9   2832.46    52.8   2958.98    44.7   3090.28    48.1   3150.77    37.64   3267.77
GR   38.74   3336.43    28.84   3406.43    29.04   3461.55    36.14    3538    42.5   3671.55
GR   52.6   3804.94    47.4   3855.04    47.9   3919.98    43.7   3952.95    42.6   4050.14
GR   44.3   4431.03    41.9   4584.19    47   4826.5    42.5   4859.87    42.6   4957.91
GR   48.7   5021.15    49.2   5059.55    43.9   5090.8    44.7   5266.47    43.2   5349.68
GR   50.2   5459.53    52.4   5575.87    50.4   5703.12    51.9   5904.76    49.1   6073.64
GR   49.1   6167.73    51.3   6273.19    59.7   6409.59    65.5   6519.75    65.7   6635.31
GR   63.6   6757.16    63   7060.24    63.3   7375.88    66    7690    64.7   7907.84
GR   65.5   7969.4    64.1   8340.7    64.9   8381.19    64.1   8668.42    62   8835.44
GR   62.5   8946.12    65.3   9083.61    63.6   9200.98    64.35    9450    63   9781.97
GR   63.1   10165.1    65.1   10443.04    64.4   10755.85    64.5   10988.16    68.1   11162.12
GR   71.35    11220    71.9   11348.07    74.6   11434.99    75.9   11601.85    78.45    11650
GR   79.6    11960    81.1   12067.18    79.5   12180.83    80.3   12422.88    84.2   12477.71
GR   85.05    12580    83.5   12625.42    84.2    12770    82.9   13330.5

X1   11.38    85    19900    21000    1000    2300    1373    0.00    -1    0
X3   10    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
GR   85.00   14899.0   85.00   14900.0   85.00   16700.0   80.00   16850.0   75.00   16950.0
GR   70.00   17099.0   70.00   17100.0   65.00   17150.0   60.00   17350.0   55.00   17800.0
GR   65.90   19700.0   66.80   19800.0   67.30   19900.0   61.80   20000.0   60.70   20001.0
GR   55.60   20014.9   49.10   20030.0   44.10   20045.4   43.40   20060.3   45.20   20075.3
GR   45.80   20090.3   46.20   20105.3   45.30   20120.1   45.90   20136.6   46.00   20153.3
GR   45.30   20169.6   44.30   20186.2   44.70   20202.8   45.10   20219.6   45.00   20236.2
GR   45.30   20252.7   45.20   20269.3   45.20   20286.0   44.30   20302.6   43.70   20319.4
GR   40.00   20335.8   42.60   20352.5   38.10   20368.8   33.60   20385.4   35.50   20402.0
GR   33.20   20416.3   32.40   20430.0   31.70   20450.0   36.40   20470.0   34.80   20492.0
GR   37.60   20510.0   38.00   20527.2   38.30   20535.0   38.00   20565.0   37.40   20590.0
GR   37.00   20600.3   34.80   20615.0   27.80   20630.0   34.80   20645.0   36.30   20655.1
GR   39.20   20674.3   40.60   20693.3   38.60   20712.1   42.40   20731.4   43.50   20735.0
GR   47.40   20750.7   48.20   20769.8   47.20   20789.0   47.50   20808.0   47.50   20865.1
GR   47.80   20865.2   48.10   20884.2   47.90   20903.3   48.10   20922.3   48.70   20941.3
GR   54.90   20960.4   63.70   20978.7   63.90   20979.5   65.00   21000.0   64.30   21100.0
GR   55.00   22000.0   55.00   24800.0   60.00   25000.0   65.00   26200.0   65.00   26500.0
GR   70.00   27700.0   75.00   27800.0   80.00   28300.0   85.00   29700.0   90.00   30100.0

SB   1.25    1.50    2.60    0.0    189.0    20.4   22729.0    10.20    27.80    27.80
ET                                  9.1                   19900    21000
1
  14MAR00    19:02:53                                              PAGE  10


X1   11.39     0    0.0    0.0    50.0    50.0    50.0    0.00    0.00    0
X2    0    0.00     1   67.20    68.30    0.00     0    0.00    0.00    0
X3   10    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
BT    33   14899.0    87.0    0.0   16700.0    87.0    0.0   17000.0    85.0    0.0
BT   17560    80.0    0.0   18100.0    75.0    0.0   19200.0    70.0    0.0   19201.0
BT   70.0    0.0   20000.0    68.3    0.0   20000.1    68.3    65.7   20120.1    69.1
BT   66.7   20201.2    69.1    66.0   20416.3    69.8    67.1   20416.4    69.8    66.5
BT   20492    69.8    66.8   20492.1    69.8    65.1   20655.1    69.8    65.1   20655.2
BT   69.8    67.2   20978.7    68.8    65.6   20978.8    68.8    0.0   21000.0    68.0
BT   0.0   21100.0    67.3    0.0   21200.0    66.3    0.0   21201.0    66.3    0.0
BT   23250    62.0    0.0   25100.0    65.0    0.0   26200.0    65.0    0.0   26400.0
BT   65.0    0.0   26700.0    70.0    0.0   27650.0    75.0    0.0   28150.0    82.0
BT   0.0   28750.0    87.0    0.0   29000.0    92.0    0.0   30300.0    92.0    0.0

ET                                 8.41
X1   11.4    89   2958.98   3804.94    50.0    50.0    50.0    0.00    0.00    0
X3   10              2199    58   6519.75    65.5
GR   75.43     0    66   155.36    64.3   287.39    63.9   438.76    60.9   535.19
GR   54.9   626.91    52   787.68    53.3   980.78    52.8   1186.05    55.1   1413.79
GR   55.2   1604.36    56.9   1641.25    57   1786.87    56.25    1790    56.3   2127.54
GR   58.1   2185.43    54.8   2259.37    54.4   2456.59    50.5   2653.09    51.8   2802.23
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GR    53.9   2832.46    52.8   2958.98    44.7   3090.28    48.1   3150.77    37.64   3267.77
GR   38.74   3336.43   28.84   3406.43   29.04   3461.55   36.14      3538     42.5   3671.55
GR    52.6   3804.94    47.4   3855.04    47.9   3919.98    43.7   3952.95     42.6   4050.14
GR    44.3   4431.03    41.9   4584.19      47    4826.5    42.5   4859.87     42.6   4957.91
GR    48.7   5021.15    49.2   5059.55    43.9    5090.8    44.7   5266.47     43.2   5349.68
GR    50.2   5459.53    52.4   5575.87    50.4   5703.12    51.9   5904.76     49.1   6073.64
GR    49.1   6167.73    51.3   6273.19    59.7   6409.59    65.5   6519.75     65.7   6635.31
GR    63.6   6757.16      63   7060.24    63.3   7375.88      66      7690     64.7   7907.84
GR    65.5    7969.4    64.1    8340.7    64.9   8381.19    64.1   8668.42       62   8835.44
GR    62.5   8946.12    65.3   9083.61    63.6   9200.98   64.35      9450       63   9781.97
GR    63.1   10165.1    65.1  10443.04    64.4  10755.85    64.5  10988.16     68.1  11162.12
GR   71.35     11220    71.9  11348.07    74.6  11434.99    75.9  11601.85    78.45     11650
GR    79.6     11960    81.1  12067.18    79.5  12180.83    80.3  12422.88     84.2  12477.71
GR   85.05     12580    83.5  12625.42    84.2     12770    82.9   13330.5

QT       4     62340  127340   167560   307140        0        0        0        0
NC     .12       .12     .03       .1       .3
NH       3      .120  3153.07     .030  3834.77     .120  14239.64
X1   11.48        83  3153.07  3834.77      400      700      370                -1
X3      10                    1998.35    56.86
GR   76.29         0    74.2   141.74     72.1   251.69     67.3   387.98     65.6   572.84
GR    64.9    799.64    56.3  1051.78     56.7   1284.7     55.8  1423.54     57.5  1735.27
GR    55.8   1865.38    57.9  1950.43       57  2115.34     51.9  2192.24     51.6  2676.44
GR    48.1   2772.19    51.5   2897.5     47.5  3079.27     49.6  3153.07     48.4  3217.84
GR    40.8   3263.45    46.8  3312.88    38.33  3352.99    32.93   3453.9    28.63  3598.06
GR   22.83   3619.02   25.93  3642.69    21.73  3663.26    28.63  3710.06    40.09  3750.18
GR    50.5   3834.77    52.5  4098.58     52.5  4266.28     50.2  4616.96     53.2  5256.55
GR    55.8   5417.16    49.5  5542.31     49.6  5811.88     52.8  5944.08     50.5  6026.29
GR    49.2   6139.42    50.6  6300.68     60.8  6368.78     60.8  6489.41     52.1  6544.58
GR    49.1   6582.93    49.6  6866.77     53.6  6999.45     52.4  7192.35     55.8  7242.29
GR    52.1   7310.92    57.4   7392.7     58.9  7486.54     57.8   7527.2     59.3  7858.55
GR    62.3   8313.45    62.3   8520.5     63.1  8579.97     63.8  8874.31     63.1  9022.65
GR    64.7   9319.75      64  9847.05       66  10324.86    67.2  10502.28    70.9  10689.92
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GR    75.6  10862.29      80  11138.46    81.4  11329.98    82.6  11935.13    82.6  12152.77
GR      84  12494.73    86.9  12751.65      91  12961.31    96.3  13165.82    98.2  13409.92
GR    97.1  13499.57    82.3  13562.28    82.6  13710.72    93.2  13739.27    91.2  13843.55
GR    84.7  14008.62    85.8  14187.33    84.3  14239.64

QT       4     62300  127200   167500   306900
NC     .12       .12     .03       .6       .8
X1   11.55        73    3153     3835    400.0    400.0    370.0     0.00        0
X3      10       0.0     0.0     1950       57      0.0      0.0      0.0
GR    75.4         0    74.2      142     67.3      388     65.6      573     64.9      800
GR    51.7       898    56.3     1052     56.7     1285     55.8     1424     51.7     1438
GR    51.7      1636    57.5     1735     57.9     1950       57     2115     51.9     2192
GR    51.6      2676    48.1     2772     51.5     2898     47.5     3079     49.6     3153
GR    48.4      3218    46.8     3313    38.33     3353    28.63     3598    22.83     3619
GR   25.93      3643   21.73     3663    28.63     3710    40.09     3750     50.5     3835
GR    52.5      4099    52.5     4266     50.2     4617     44.2     4679     44.3     5110
GR    53.2      5257    55.8     5417     49.5     5542     49.6     5812     52.8     5944
GR    50.5      6026    49.2     6139     50.6     6301     60.8     6369     60.8     6489
GR    52.1      6545    49.1     6583     49.6     6867     53.6     6999     52.4     7192
GR    52.1      7311    58.9     7487     59.3     7859     62.3     8313     62.3     8521
GR    63.1      8580    63.8     8874     63.1     9023     64.7     9320       64     9847
GR      66     10325    67.2    10502     70.9    10690     75.6    10862       80    11138
GR    81.4     11330    82.6    11935     82.6    12153       84    12495     86.9    12752
GR      91     12961    96.3    13166     98.2    13410

NH       4      .100  18850.0     .100  20250.0     .030  21748.6     .120  28900.0    0.000
X1  11.569        83    20250  21768.7      100      100      100     0.00     0.00        0
X3      10       0.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR   84.00   16850.0   80.00  17250.0    80.00  17251.0    80.00  17252.0    75.00  18025.0
GR   70.00   18075.0   65.00  18125.0    60.00  18200.0    60.00  18201.0    60.00  18202.0
GR   60.00   18450.0   60.00  18500.0    60.00  18600.0    60.00  18850.0    55.00  19350.0
GR   55.00   19351.0   68.70  20250.0    49.80  20287.0    49.30  20323.0    48.30  20340.0
GR   49.80   20360.4   48.40  20389.0    50.50  20396.9    48.10  20458.0    44.50  20495.0
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GR   44.20   20506.1    45.40   20560.0    44.50   20600.0    45.00   20650.0    47.20   20711.0
GR   44.00   20721.0    42.80   20746.0    43.30   20770.0    35.50   20800.0    33.50   20820.0
GR   26.50   20920.0    24.10   20930.0    31.40   20940.0    25.40   20944.1    29.70   20960.0
GR   30.60   20970.0    33.20   20980.0    33.20   20981.0    35.00   20990.0    35.90   21000.0
GR   38.40   21010.0    38.40   21017.3    43.43   21039.0    45.80   21089.5    46.80   21162.7
GR   46.40   21176.0    51.80   21206.0    51.90   21232.0    49.40   21259.0    50.00   21273.8
GR   49.20   21310.3    50.70   21494.0    49.40   21530.9    49.60   21603.9    49.10   21640.4
GR   51.49   21677.0    51.80   21707.0    55.10   21739.0    60.90   21748.6    67.10   21768.7
GR   64.20   21850.0    63.70   21970.0    61.00   22199.0    61.00   22200.0    60.00    22500.
GR   55.00   23000.0    50.00   23400.0    50.00   23450.0    55.00   23700.0    55.00    24950.
GR   60.00   25700.0    65.00   25900.0    70.00   27700.0    75.00   27900.0    80.00    28150.
GR   85.00   28450.0    90.00   28700.0    90.50   28900.0     0.00      0.0

SB   1.25     2.31     2.60     0.0      50       46     32375      20      24.1      24.1
NC   .120     .120     .035     .3       .5
X1  11.660      91   20226.0  21910.0     480      480      480     0.00       0
X2    0.0      0.0       1    63.08    69.07     0.0      0.0      0.0      0.0      0.0
X3    10       0.0      0.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0
BT    27   16200.0    68.99     0.0   17200.0    64.77     0.0   17500.0    63.51     0.0
BT  18300.   67.62      0.0   18301.0   67.63     0.0    18669.0   72.15      0.0   19195.0
BT  71.42      0.0   20000.0   67.97     0.0    20100.0   68.42      0.0     20200    68.87
1
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BT    0.0  20235.8    69.04    69.04   20242.8    69.07    63.08   20573.0    70.56    64.57
BT  20903.   72.04    66.05   21141.3   72.66    66.67   21563.0    71.21    65.22   21893.1
BT   69.73   63.74   21900.0   69.70    69.70   22000.0   69.24      0.0   22274.7    68.01
BT    0.0  22700.0    66.10     0.0    23449.7   65.50     0.0    24374.7   69.44      0.0
BT  26274.   85.80     0.0    28000.0   85.80     0.0    28300.0   85.80     0.0    28900.0
BT   90.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR   85.00   16200.0    85.00   16500.0    80.00   18100.0    75.00   18350.0    65.00   18500.0
GR   60.00   18800.0    55.00   19200.0    50.00   19600.0    50.00   19601.0    68.90   20226.0
GR   64.97   20235.8    62.60   20237.6    48.40   20267.5    48.30   20295.5    49.00   20308.0
GR   49.20   20362.0    46.80   20375.5    45.60   20394.0    43.70   20400.0    42.60   20435.5
GR   44.30   20466.0    44.80   20492.0    45.80   20495.5    47.70   20555.5    47.60   20616.0
GR   48.00   20676.0    47.00   20736.0    45.70   20796.1    46.30   20877.7    46.70   20877.7
GR   45.70   20909.0    43.90   20924.0    42.90   20935.0    39.10   20940.0    37.20   20955.0
GR   37.50   20958.3    38.40   20970.0    37.40   20980.0    36.10   20990.0    34.80   21010.0
GR   33.80   21020.0    29.40   21030.0    30.40   21039.6    27.20   21050.0    28.80   21060.0
GR   27.60   21065.8    26.10   21080.0    22.00   21100.0    19.80   21110.0    20.40   21120.7
GR   24.20   21130.0    28.20   21140.0    29.90   21155.0    37.00   21160.0    41.00   21170.0
GR   43.40   21179.0    45.10   21181.0    45.70   21183.0    46.30   21210.0    49.10   21232.0
GR   48.40   21241.0    51.90   21258.0    52.00   21286.0    50.30   21301.0    49.90   21421.0
GR   49.40   21481.0    49.70   21541.0    49.00   21600.7    48.80   21625.0    44.60   21680.0
GR   47.20   21703.0    46.40   21721.2    47.30   21781.2    49.50   21800.0    49.10   21841.0
GR   51.60   21877.0    62.10   21898.3    64.35   21900.0    68.20   21910.0    64.00   22000.0
GR   64.40   22100.0    60.00   22700.0    50.00   23500.0    55.00   24100.0    60.00   25600.0
GR   65.00   26000.0    70.00   27700.0    75.00   27800.0    85.00   28400.0    90.00   28700.0
GR   90.50   28900.0     0.00     0.0      0.00     0.0      0.00     0.0      0.00     0.0

X1  11.679      73     3153     3835      100      100      100     0.00     0.00       0
X3    10      0.0      0.0     1950       57      0.0      0.0      0.0
GR   75.4       0     74.2      142     67.3      388     65.6      573     64.9      800
GR   51.7     898     56.3     1052     56.7     1285     55.8     1424     51.7     1438
GR   51.7    1636     57.5     1735     57.9     1950       57     2115     51.9     2192
GR   51.6    2676     48.1     2772     51.5     2898     47.5     3079     49.6     3153
GR   48.4    3218     46.8     3313    38.33     3353    28.63     3598    22.83     3619
GR  25.93    3643    21.73     3663    28.63     3710    40.09     3750     50.5     3835
GR   52.5    4099     52.5     4266     50.2     4617     44.2     4679     44.3     5110
GR   53.2    5257     55.8     5417     49.5     5542     49.6     5812     52.8     5944
GR   50.5    6026     49.2     6139     50.6     6301     60.8     6369     60.8     6489
GR   52.1    6545     49.1     6583     49.6     6867     53.6     6999     52.4     7192
GR   52.1    7311     58.9     7487     59.3     7859     62.3     8313     62.3     8521
GR   63.1    8580     63.8     8874     63.1     9023     64.7     9320       64     9847
GR     66   10325     67.2    10502     70.9    10690     75.6    10862       80    11138
GR   81.4   11330     82.6    11935     82.6    12153       84    12495     86.9    12752
GR     91   12961     96.3    13166     98.2    13410

QT     4   62060   126360   167140   305490        0        0        0        0
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```
NC   .120    .120    .030     .1      .3
X1  11.97     84  2273.46  2827.03     802    5043    2118
X3    10              1105.39     52.5    9060    74.8
GR  78.23      0   64.2  174.04    63.5  501.47    62.4  571.34    57.3  671.03
GR   46.1  969.8   52.3 1075.96    49.9 1240.38    49.5  1362.1    47.4 1575.32
GR   49.6 1774.8   45.3 2044.49    47.5 2118.35    44.4 2165.58    46.6 2273.46
GR  35.52 2351.83 41.02 2371.83   32.22 2411.83   31.72 2441.83   37.12 2621.82
GR   45.7 2759.78  44.7 2827.03    45.5 2960.44    44.9 3171.29    46.7    3200
GR   46.4 3463.72    47 3583.97    44.6 3643.28      45 3872.88      47 3996.03
1
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GR   53.2 4123.35  60.5  4270.1    60.5 4509.54    57.2 4775.48      58 5148.72
GR   56.2 5363.59  55.1  5699.3    49.4 5956.27    49.6 6073.28    48.3 6272.85
GR     51 6381.63  52.1 6574.09    51.8 6814.08    53.2 6887.03    50.2 7041.29
GR   53.5 7127.14  51.6 7442.96    56.9 7800.49    62.4 7837.71    64.9 7999.27
GR   67.4 8385.92  67.1 8424.35    74.8    9060    66.9    9130   66.35    9190
GR   65.8  9282.6  53.6  9356.5    55.7 9527.42    58.8 9587.89    70.2 9638.17
GR   72.9 9884.04    75 10154.89   75.2 10427.45   76.1 10520.96   76.1 10769.8
GR   90.2   10830  91.8 11098.11   89.8 11321.02   86.3 11634.53   85.4 11757.32
GR   86.8 11952.18 85.2 12112.75   87.5 12345.14   83.2 12384.16   89.1 12447.67
GR   85.9 12555.51 90.4    12650   84.7 12970.55   83.1 13224.85     84 13312.97
GR     83 13508.04 84.5  13657.9   83.9 13887.88   86.8 14077.83
1
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   SECNO  DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME   VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE  XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=    .300
*SECNO 3.615

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1232.0   8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
    3.615    16.36    46.66     .00    46.66    46.71     .05     .00     .00    41.60
  66800.0    186.3  65737.7   876.0    717.8  35129.5  3846.5      .0      .0    43.80
      .00      .26     1.87     .23     .120     .030    .120    .000   30.30  1669.18
  .000078       0.       0.      0.        0        0       0     .00 5842.35  7894.99


*SECNO 4.745

3470 ENCROACHMENT STATIONS=    1973.4   6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      51.10 ELREA=       47.20

    4.745    15.98    47.18     .00      .00    47.24     .06     .53     .00    51.10
  66160.0       .0  66160.0      .0       .0  33894.3      .0  4955.1   661.3    47.20
      .85      .00     1.95     .00     .000     .030    .000    .000   31.20  2379.22
  .000100    3600.    5966.   4500.        2        0       0     .00 4324.09  6703.32


CCHV=   .300 CEHV=    .500
*SECNO 5.026
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

  5.026    36.75    47.35     .00     .00    47.44     .09     .18     .02   56.20
 65990.0      .0  65990.0      .0      .0  27163.0      .0   5993.8   793.0   57.00
   1.02      .00     2.43     .00    .000     .030    .000     .000   10.60  9626.03
 .000152   1030.    1482.   4150.       2        0       0      .00  3418.36 13044.39

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 14MAR00    19:02:53                                                PAGE  15

  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID ENDST

*SECNO 5.027

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

  5.027    36.77    47.37     .00     .00    47.45     .08     .00     .00   56.20
 65990.0      .0  65990.0      .0      .0  29018.0      .0   5994.4   793.1   56.00
   1.02      .00     2.27     .00    .000     .030    .000     .000   10.60  9632.79
 .000129      1.       1.      1.       1        0       0      .00  3293.66 13014.71

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

  5.034    36.77    47.37     .00     .00    47.45     .08     .01     .00   56.20
 65990.0      .0  65990.0      .0      .0  29064.4      .0   6025.7   796.7   56.00
   1.02      .00     2.27     .00    .000     .030    .000     .000   10.60  9632.73
 .000129     47.      47.     47.       0        0       0      .00  3293.80 13014.79

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

  5.035    36.77    47.37     .00     .00    47.46     .09     .00     .01   56.20
 65990.0      .0  65990.0      .0      .0  27236.2      .0   6026.4   796.7   57.00
   1.02      .00     2.42     .00    .000     .030    .000     .000   10.60  9625.96
 .000151      1.       1.      1.       0        0       0      .00  3418.70 13044.66

1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID ENDST
```

```
*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037   36.77   47.37     .00     .00   47.46     .09     .00     .00   56.20
 65990.0      .0 65990.0      .0      .0 27221.0      .0  6031.4   797.4   57.00
    1.02     .00    2.42     .00    .000    .030    .000    .000   10.60 9625.97
 .000151      8.      8.      8.       0       0       0     .00 3418.63 13044.60


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038   36.78   47.38     .00     .00   47.46     .08     .00     .00   56.20
 65990.0      .0 65990.0      .0      .0 29074.0      .0  6032.0   797.5   56.00
    1.02     .00    2.27     .00    .000    .030    .000    .000   10.60 9632.72
 .000129      1.      1.      1.       1       0       0     .00 3293.83 13014.80


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045   36.79   47.39     .00     .00   47.47     .08     .01     .00   56.20
 65990.0      .0 65990.0      .0      .0 29120.0      .0  6063.4   801.0   56.00
    1.03     .00    2.27     .00    .000    .030    .000    .000   10.60 9632.67
 .000128     47.     47.     47.       0       0       0     .00 3293.97 13014.88


1
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN  SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID ENDST


CCHV=    .100 CEHV=     .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046   36.78   47.38     .00     .00   47.47     .09     .00     .00   56.20
 65990.0      .0 65990.0      .0      .0 27293.9      .0  6064.1   801.1   57.00
    1.03     .00    2.42     .00    .000    .030    .000    .000   10.60 9625.91
 .000150      1.      1.      1.       0       0       0     .00 3418.96 13044.87


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 5.585

3301 HV CHANGED MORE THAN HVINS
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .48

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 48.20 ELREA= 49.80

5.585	24.27	47.97	.00	.00	48.82	.85	1.12	.23	48.20	
65680.0	.0	65680.0	.0	.0	8863.8	.0	7245.7	932.7	49.80	
1.14	.00	7.41	.00	.000	.030	.000	.000	23.70	10392.70	
.000635	2664.	2847.	1744.	2	0	0	.00	609.67	11002.38	

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.13

6.420	21.28	49.68	.00	.00	49.74	.07	.85	.08	46.70	
65210.0	31856.8	20605.9	12747.3	18773.3	7184.0	10760.0	8899.3	1175.5	47.50	
1.66	1.70	2.87	1.18	.030	.030	.051	.000	28.40	10979.57	
.000138	2300.	4409.	2800.	2	0	0	.00	7043.26	18264.88	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS= 11840.0 20069.0 TYPE= 1 TARGET= 8229.000
ELENCL= 53.10 ELENCR= 57.90

7.090	20.06	50.16	.00	.00	50.22	.06	.48	.00	46.90
64830.0	2459.3	39178.1	23192.5	5413.1	15494.8	26442.8	11912.8	1661.6	47.40
2.13	.45	2.53	.88	.120	.030	.083	.000	30.10	12309.59
.000169	2000.	3538.	3600.	2	0	0	.00	7380.76	19690.35

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 7.470

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS= .0 16383.0 TYPE= 1 TARGET= 16383.000

7.470	21.42	50.42	.00	.00	50.57	.14	.32	.02	47.70
64610.0	15956.5	29154.6	19498.8	18025.3	6846.2	11041.2	13476.2	1931.5	44.30
2.32	.89	4.26	1.77	.063	.030	.050	.000	29.00	7158.17
.000195	1500.	2006.	1500.	0	0	0	.00	7474.41	16060.59

*SECNO 8.070

3265 DIVIDED FLOW

```
3470 ENCROACHMENT STATIONS=   3455.4  15481.5 TYPE=    1 TARGET=  -3455.360
 ELENCL=   61.13 ELENCR= 100000.00
   8.070    23.21    51.11     .00     .00    51.38     .27     .77     .04    44.30
  64610.0   5964.1  49060.0   9585.9   8680.9  10221.6  14990.0  15802.0   2393.9    46.70
    2.53     .69     4.80     .64     .120     .030     .120     .000    27.90  3816.92
  .000362    2619.    2891.    3201.      2       0       0      .00  6579.98 11029.38


CCHV=   .100 CEHV=   .300
*SECNO 8.490
1
  14MAR00    19:02:53                                                  PAGE  19


   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST



3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .63


3470 ENCROACHMENT STATIONS=        .0   3851.7 TYPE=    1 TARGET=   3851.709
   8.490    16.58    52.38     .00     .00    52.97     .59    1.49     .10    46.00
  63800.0  17915.1  44810.5   1074.4  12554.9   6130.6   1334.5  17190.9   2622.7    50.60
    2.65     1.43    7.31     .81     .120     .030     .120     .000    35.80   843.40
  .000903    2636.    2374.    1605.      3       0       0      .00  2848.30  3691.69


1490 NH CARD USED
*SECNO 9.410

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.09


3470 ENCROACHMENT STATIONS=   2460.6  10500.0 TYPE=    1 TARGET=  -2460.630
 ELENCL=   56.91 ELENCR= 100000.00
   9.410    18.90    54.40     .00     .00    54.55     .15    1.53     .04    53.30
  63510.0   5324.4  31054.0  27131.6   3826.6   7299.8  24798.7  20059.7   3038.0    49.50
    3.13     1.39    4.25    1.09     .050     .030     .071     .000    35.50  2592.53
  .000206    2500.    4858.    5500.      2       0       0      .00  5247.10  7839.63


CCHV=   .100 CEHV=   .300
*SECNO 10.580

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=   1431.2   8020.0 TYPE=    1 TARGET=   6588.810
 ELENCL=   55.17 ELENCR=   59.05
  10.580    33.31    55.41     .00     .00    55.63     .23    1.06     .02    53.60
  62850.0    465.5  45332.6  17051.9   1599.2  10083.2  27365.4  23376.4   3524.2    50.50
    3.53      .29    4.50     .62     .100     .030     .120     .000    22.10   389.56
  .000222    2700.    6177.    3200.      2       0       0      .00  7357.44  7811.58


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 10.860
1
  14MAR00    19:02:53                                                  PAGE  20


   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
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 SLOPE   XLOBL   XLCH   XLOBR   ITRIAL   IDC    ICONT   CORAR   TOPWID   ENDST


3470 ENCROACHMENT STATIONS=      .0   8865.0  TYPE=     1  TARGET=     8864.999
   10.860    24.02    55.72     .00      .00     55.87     .15      .23      .01    52.20
  62690.0   2983.9  46712.6  12993.5   6316.3  12896.9  20595.8  24489.9   3687.4    52.40
    3.67      .47     3.62      .63     .100     .030     .120     .000    31.70  1875.29
  .000131    1300.    1478.    1100.       2        0        0      .00  4439.52  6314.82


1490 NH CARD USED
*SECNO 11.090

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .47


3470 ENCROACHMENT STATIONS=   3311.7   6950.0  TYPE=     1  TARGET=     3638.260
 ELENCL=    53.30  ELENCR=    63.70

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       53.30  ELREA=       57.00

   11.090    23.81    55.61     .00      .00     56.42     .81      .35      .20    53.30
  62560.0   3968.9  58591.1      .0   5245.6   7841.8       .0  25343.0   3808.9    57.00
    3.72      .76     7.47      .00     .080     .030     .000     .000    31.80   839.93
  .000589    1400.    1214.    1600.       2        0        0      .00  2972.72  3812.65


CCHV=    .300  CEHV=    .500
*SECNO 11.350

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.21


3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=     1  TARGET=     4320.750
 ELENCL=    58.00  ELENCR=    65.50
   11.350    27.95    56.79     .00      .00     56.92     .13      .30      .21    52.80
  62410.0    949.2  44357.9  17102.9   2725.9  13152.1  25475.8  26437.9   3934.6    52.60
    3.88      .35     3.37      .67     .120     .030     .120     .000    28.84  2214.74
  .000120    1000.    1373.    2300.       2        0        0      .00  4147.62  6362.37
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 11.380

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30  ELREA=       64.00

   11.380    30.14    56.94     .00      .00     57.22     .27      .23      .07    66.30
  62410.0       .0  62410.0      .0       .0  14833.4       .0  27582.8   4039.0    64.00
    3.97      .00     4.21      .00     .000     .030     .000     .000    26.80  20008.51
  .000190    1000.    1373.    2300.       2        0        0      .00   958.22  20966.73
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SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS     ELCHU   ELCHD
   1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80   27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=    56.92 BRIDGE VELOCITY=     4.60   CALCULATED CHANNEL AREA=    13557.

 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                    AREA
    .00   57.24     .02      0.   62410.   22729.   22477.     67.20   68.30      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

   11.390    30.17    56.97     .00      .00    57.24      .27     .02      .00    66.30
  62410.0       .0  62410.0      .0       .0  14854.0       .0  27599.9   4040.1    64.00
     3.98      .00     4.20     .00     .000     .030     .000     .000    26.80 20008.45
  .000189      50.      50.     50.        0        0        0      .00   958.33 20966.78


*SECNO 11.400

3470 ENCROACHMENT STATIONS=    2199.0    6519.8  TYPE=      1  TARGET=     4320.750
 ELENCL=    58.00  ELENCR=    65.50
   11.400    28.33    57.17     .00      .00    57.29      .12     .01      .05    52.80
  62410.0   1053.5  44068.5  17288.0   3012.6  13476.2  26456.5  27633.0   4043.1    52.60
     3.98      .35     3.27     .65     .120     .030     .120     .000    28.84  2206.16
  .000109      50.      50.     50.        2        0        0      .00  4162.42  6368.58
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1998.3   14239.6  TYPE=      1  TARGET=    -1998.350
 ELENCL=    56.86  ELENCR= 100000.00
   11.480    36.47    57.20     .00      .00    57.34      .15     .04      .01    48.60
  62340.0   3283.0  49968.4   9088.7   7973.9  14564.6  22450.0  28195.5   4111.9    49.50
     4.03      .41     3.43     .40     .120     .030     .120     .000    20.73  1039.73
  .000082     400.     370.    700.        2        0        0      .00  6350.49  7614.77


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0   13410.0  TYPE=      1  TARGET=    -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
   11.550    35.50    57.23     .00      .00    57.38      .15     .03      .01    49.60
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 62300.0   2865.1  48050.2  11384.7   6739.5  13411.2  23413.5  28592.5   4168.1    50.50
    4.06      .43     3.58      .49     .120     .030     .120     .000    21.73   895.10
 .000100     400.     370.     400.        0        0        0      .00  5992.14  7443.87


1490 NH CARD USED
*SECNO 11.569

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569    33.13    57.23      .00      .00    57.43      .20      .01      .04    68.70
 62300.0       .0  62300.0       .0       .0  17358.3       .0  28662.4   4176.7    67.10
    4.07      .00     3.59      .00     .000     .030     .000     .000    24.10 20272.44
 .000198     100.     100.     100.        0        0        0      .00  1470.10 21742.54
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1


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST


SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN     BWC      BWP     BAREA     SS    ELCHU    ELCHD
    1.25     2.31    2.60     .00   50.00    46.00 32375.00   20.00   24.10    24.10

CCHV=   .300 CEHV=   .500
*SECNO 11.660
CLASS A LOW FLOW

3420 BRIDGE W.S.=    57.22 BRIDGE VELOCITY=     2.82   CALCULATED CHANNEL AREA=    22076.

 EGPRS    EGLWC     H3    QWEIR    QLOW    BAREA  TRAPEZOID   ELLC    ELTRD   WEIRLN
                                           AREA
    .00   57.43    .02      0.   62300.   32375.    30545.   63.08   69.07       0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

  11.660    37.43    57.23      .00      .00    57.43      .16      .00      .00    68.90
 62300.0       .0  62300.0       .0       .0  19442.5       .0  28865.1   4193.8    68.20
    4.11      .00     3.20      .00     .000     .035     .000     .000    19.80 20248.85
 .000214     480.     480.     480.        0        0        0      .00  1639.63 21888.48


*SECNO 11.679

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=     1 TARGET=   -1950.000
 ELENCL=    57.00 ELENCR= 100000.00
  11.679    35.59    57.32      .00      .00    57.46      .14      .02      .01    49.60
 62300.0   3263.6  46134.8  12901.6   6905.1  13471.1  23716.1  28938.1   4202.6    50.50
    4.12      .47     3.42      .54     .120     .035     .120     .000    21.73   894.01
 .000123     100.     100.     100.        2        0        0      .00  6030.15  7446.14


CCHV=   .100 CEHV=   .300
*SECNO 11.970

3265 DIVIDED FLOW
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1
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   SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
   Q      QLOB   QCH    QROB   ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
   TIME   VLOB   VCH    VROB   XNL     XNCH   XNR    WTN    ELMIN  SSTA
   SLOPE  XLOBL  XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST


3470 ENCROACHMENT STATIONS=   1105.4   9060.0  TYPE=     1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=    74.80
  11.970    25.91    57.63      .00      .00    57.77      .14      .31      .00    46.60
 62060.0   7104.6  39394.2  15561.2  12607.5  10549.2  28023.8  32696.7   4709.6    44.70
    4.41      .56     3.73      .56     .120     .030     .120     .000    31.72   664.51
 .000112     802.    2118.    5043.       2        0        0      .00  6398.18  7805.45


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  14MAR00    19:02:53                                                  PAGE  25

T1    CF-0033 BROWN & ROOT SERVICES, 11/1/99
T2    Lake Houston HEC-2 MODEL, REACH 3
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ     NINV    IDIR    STRT    METRIC  HVINS   Q       WSEL    FQ

    0        3                                0     49.57

J2 NPROF    IPLOT   PRFVS   XSECV   XSECH   FN      ALLDC   IBW     CHNIM   ITRACE

    2        0       -1

1
  14MAR00    19:02:53                                                  PAGE  26

   SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
   Q      QLOB   QCH    QROB   ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
   TIME   VLOB   VCH    VROB   XNL     XNCH   XNR    WTN    ELMIN  SSTA
   SLOPE  XLOBL  XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST


*PROF 2

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=     .100  CEHV=     .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=   1232.0   8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
   3.615    19.27    49.57      .00    49.57    49.70      .13      .00      .00    41.60
143300.0    862.7 138555.0   3882.3   2340.5  46662.4   8837.3       .0       .0    43.80
     .00      .37     2.97      .44     .120     .030     .120     .000    30.30  1329.20
 .000134       0.       0.       0.       0        0        0      .00  6975.50  8304.70


*SECNO 4.745

3470 ENCROACHMENT STATIONS=   1973.4   6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      51.10  ELREA=      47.20
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  4.745   19.19   50.39    .00    .00   50.53    .13    .82    .00   51.10
 140750.0      .0 140261.4   488.6      .0 47773.7  1889.6  7117.8   758.6   47.20
    .56     .00    2.94     .26    .000    .030    .120    .000   31.20  2374.45
 .000143   3600.   5966.   4500.      2       0       0     .00  5217.94  7592.40


CCHV=    .300 CEHV=    .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       57.00

  5.026   40.02   50.62    .00    .00   50.83    .21    .26    .04   56.20
 140170.0      .0 140170.0      .0      .0 38415.3      .0  8674.0   933.6   57.00
    .68     .00    3.65     .00    .000    .030    .000    .000   10.60  9615.81
 .000221   1030.   1482.   4150.      2       0       0     .00  3466.05 13081.86
```



```
 SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
 Q        QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME     VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE    XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 5.027

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       56.00

  5.027   40.04   50.64    .00    .00   50.83    .19    .00    .00   56.20
 140170.0      .0 140170.0      .0      .0 39843.6      .0  8674.9   933.7   56.00
    .68     .00    3.52     .00    .000    .030    .000    .000   10.60  9620.31
 .000213      1.      1.      1.      1       0       0     .00  3326.05 13033.00


*SECNO 5.034

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       56.00

  5.034   40.05   50.65    .00    .00   50.84    .19    .01    .00   56.20
 140170.0      .0 140170.0      .0      .0 39909.6      .0  8717.9   937.3   56.00
    .68     .00    3.51     .00    .000    .030    .000    .000   10.60  9620.23
 .000212     47.     47.     47.      0       0       0     .00  3326.26 13033.12


*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       57.00

  5.035   40.04   50.64    .00    .00   50.85    .21    .00    .01   56.20
 140170.0      .0 140170.0      .0      .0 38519.8      .0  8718.8   937.3   57.00
    .68     .00    3.64     .00    .000    .030    .000    .000   10.60  9615.72
 .000219      1.      1.      1.      0       0       0     .00  3466.48 13082.20
```

```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST
```

*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
   5.037   40.04   50.64    .00    .00   50.85    .21    .00    .00   56.20
 140170.0     .0 140170.0     .0     .0 38501.4     .0  8725.9  938.0  57.00
    .68     .00    3.64    .00   .000   .030   .000   .000  10.60 9615.73
 .000219     8.      8.     8.      0      0      0    .00 3466.41 13082.14
```

*SECNO 5.038

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
   5.038   40.06   50.66    .00    .00   50.86    .19    .00    .00   56.20
 140170.0     .0 140170.0     .0     .0 39925.8     .0  8726.8  938.0  56.00
    .68     .00    3.51    .00   .000   .030   .000   .000  10.60 9620.21
 .000211     1.      1.     1.      1      0      0    .00 3326.31 13033.14
```

*SECNO 5.045

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
   5.045   40.07   50.67    .00    .00   50.87    .19    .01    .00   56.20
 140170.0     .0 140170.0     .0     .0 39991.3     .0  8769.9  941.6  56.00
    .68     .00    3.51    .00   .000   .030   .000   .000  10.60 9620.14
 .000210    47.     47.    47.      0      0      0    .00 3326.51 13033.25
```

1


```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST
```

CCHV= .100 CEHV= .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
   5.046   40.06   50.66    .00    .00   50.87    .20    .00    .00   56.20
 140170.0     .0 140170.0     .0     .0 38604.8     .0  8770.8  941.7  57.00
    .68     .00    3.63    .00   .000   .030   .000   .000  10.60 9615.64
 .000217     1.      1.     1.      0      0      0    .00 3466.84 13082.48
```

```
 135320.0  16544.6  89327.3  29448.1   14349.7  12952.6  27615.1  25866.7   3173.4    46.70
    1.88     1.15     6.90    1.07    .120    .030    .120    .000   27.90  3796.74
  .000545    2619.    2891.    3201.       2       0       0     .00  7065.01  11081.74


CCHV=    .100 CEHV=    .300
*SECNO 8.490

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .64


3470 ENCROACHMENT STATIONS=       .0   3851.7  TYPE=     1  TARGET=     3851.709
    8.490    20.09    55.89     .00     .00    57.01     1.12     2.12     .19    46.00
 132480.0  40821.8  84915.3   6742.9  18816.9   8105.6   6971.2  28081.3   3473.0    50.60
    1.97     2.17    10.48     .97    .120    .030    .120    .000   35.80   808.01
  .001278    2636.    2374.    1605.       3       0       0     .00  6163.83  6974.18


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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL      OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB    VOL      TWA    R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR     WTN      ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT   CORAR    TOPWID   ENDST


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.27


3470 ENCROACHMENT STATIONS=    2460.6  10500.0  TYPE=     1  TARGET=    -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
    9.410    23.24    58.74     .00     .00    58.95     .21     1.85     .09    53.30
 131460.0  16659.1  52080.4  62720.5  10673.5   9451.8  42104.1  33004.8   4150.2    49.50
    2.38     1.56     5.51    1.49    .053    .030    .077    .000   35.50   779.82
  .000244    2500.    4858.    5500.       3       0       0     .00  7089.26  7869.08


CCHV=    .100 CEHV=    .300
*SECNO 10.580

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1431.2   8020.0  TYPE=     1  TARGET=     6588.810
 ELENCL=    55.17  ELENCR=    59.05
   10.580    37.74    59.84     .00     .00    60.14     .30     1.16     .03    53.60
 129130.0   8292.4  74879.3  45958.3  11592.4  13018.1  48985.9  38633.8   4746.0    50.50
    2.72      .72     5.75     .94    .100    .030    .120    .000   22.10   201.15
  .000259    2700.    6177.    3200.       2       0       0     .00  8822.32  9139.21


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=       .0   8865.0  TYPE=     1  TARGET=     8864.999
```

```
  10.860    28.45    60.15      .00      .00    60.44      .29      .30      .00    52.20
 128570.0  11325.6  85997.8  31246.6  12590.7  16438.7  33717.9  40538.6   4958.6    52.40
    2.82      .90     5.23      .93     .100     .030     .120     .000    31.70  1824.94
  .000198    1300.    1478.    1100.       0        0        0      .00  6830.96  8655.90
```



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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


1490 NH CARD USED
*SECNO 11.090

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .60


3470 ENCROACHMENT STATIONS=   3311.7   6950.0 TYPE=    1 TARGET=    3638.260
 ELENCL=   53.30 ELENCR=   63.70
  11.090    28.58    60.38      .00      .00    60.96      .59      .43      .09    53.30
 128120.0  26229.3  81988.1  19902.6  17126.1  10766.5  18644.0  42356.9   5178.8    57.00
    2.89     1.53     7.62     1.07     .082     .030     .120     .000    31.80   803.30
  .000545    1400.    1214.    1600.       2        0        0      .00  6000.31  6803.61


CCHV=    .300 CEHV=    .500
*SECNO 11.350

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.71


3470 ENCROACHMENT STATIONS=   2199.0   6519.8 TYPE=    1 TARGET=    4320.750
 ELENCL=   58.00 ELENCR=   65.50
  11.350    32.39    61.23      .00      .00    61.49      .25      .42      .10    52.80
 127600.0   6092.1  83621.8  37886.2  11341.7  16909.9  36999.3  44588.9   5403.9    52.60
    3.01      .54     4.95     1.02     .120     .030     .120     .000    28.84   524.46
  .000184    1000.    1373.    2300.       2        0        0      .00  5914.26  6438.72


*SECNO 11.380

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=      64.00

  11.380    34.60    61.40      .00      .00    62.09      .69      .38      .22    66.30
 127600.0       .0 127600.0       .0       .0  19150.3       .0  46264.2   5530.3    64.00
    3.07      .00     6.66      .00     .000     .030     .000     .000    26.80 19989.10
  .000354    1000.    1373.    2300.       2        0        0      .00   986.90 20976.00
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


 SPECIAL BRIDGE

SB XK     XKOR   COFQ    RDLEN   BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80    27.80
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```
*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=     61.33 BRIDGE VELOCITY=     7.45   CALCULATED CHANNEL AREA=    17122.

 EGPRS    EGLWC     H3     QWEIR    QLOW    BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                   AREA
    .00   62.14    .06      0.  127600.  22729.  22477.    67.20   68.30      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     66.30 ELREA=     64.00

   11.390   34.66   61.46     .00     .00   62.14     .69     .05     .00   66.30
 127600.0      .0 127600.0      .0      .0  19206.1      .0  46286.2  5531.4   64.00
    3.07     .00    6.64     .00    .000    .030    .000    .000   26.80 19988.07
  .000351     50.     50.     50.      0       0       0     .00  988.04 20976.11


*SECNO 11.400

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.50


3470 ENCROACHMENT STATIONS=    2199.0   6519.8 TYPE=     1 TARGET=    4320.750
 ELENCL=     58.00 ELENCR=     65.50
   11.400   33.23   62.07     .00     .00   62.29     .22     .01     .14   52.80
 127600.0  7113.5  82321.5  38165.0  13384.6  17615.9  39204.0  46337.5  5535.4    52.60
    3.07     .53    4.67     .97    .120    .030    .120    .000   28.84   497.64
  .000156     50.     50.     50.      2       0       0     .00  5956.93  6454.57


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3265 DIVIDED FLOW

1
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   SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q      QLOB     QCH     QROB    ALOB     ACH     AROB     VOL     TWA    R-BANK ELEV
   TIME    VLOB     VCH     VROB    XNL     XNCH     XNR     WTN    ELMIN    SSTA
   SLOPE   XLOBL    XLCH   XLOBR   ITRIAL   IDC    ICONT   CORAR   TOPWID   ENDST


3470 ENCROACHMENT STATIONS=    1998.3  14239.6 TYPE=     1 TARGET=   -1998.350
 ELENCL=     56.86 ELENCR= 100000.00
   11.480   41.38   62.11     .00     .00   62.36     .25     .06     .01   48.60
 127340.0 11798.3  86644.3  28897.3  18796.3  17916.0  42959.3  47296.3  5623.2    49.50
    3.11     .63    4.84     .67    .120    .030    .120    .000   20.73   863.65
  .000123    400.    370.    700.      2       0       0     .00  7726.66  9025.00


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=     1 TARGET=   -1950.000
 ELENCL=     57.00 ELENCR= 100000.00
   11.550   40.43   62.16     .00     .00   62.42     .25     .05     .00   49.60
 127200.0 11392.7  83424.6  32382.8  17881.7  16775.8  42646.2  48005.1  5692.4    50.50
    3.14     .64    4.97     .76    .120    .030    .120    .000   21.73   833.90
  .000142    400.    370.    400.      0       0       0     .00  7458.99  8292.89


1490 NH CARD USED
*SECNO 11.569
```

```
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569   38.05   62.15     .00     .00   62.56     .41     .02     .13   68.70
 127200.0      .0 127200.0      .0      .0 24625.1      .0 48122.1  5702.7   67.10
   3.15     .00    5.17     .00    .000    .030    .000    .000   24.10 20262.82
  .000269    100.    100.    100.       2       0       0     .00 1489.83 21752.65


SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    2.31    2.60     .00    50.00   46.00 32375.00   20.00   24.10    24.10

CCHV=    .300 CEHV=    .500
*SECNO 11.660
CLASS A LOW FLOW

3420 BRIDGE W.S.=    62.13 BRIDGE VELOCITY=     4.37    CALCULATED CHANNEL AREA=   29075.
1
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST



 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                              AREA
    .00    62.56     .04       0.  127200.   32375.   30545.     63.08    69.07      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

  11.660   42.35   62.15     .00     .00   62.56     .33     .00     .00   68.90
 127200.0      .0 127200.0      .0      .0 27588.6      .0 48409.8  5720.1   68.20
   3.18     .00    4.61     .00    .000    .035    .000    .000   19.80 20238.45
  .000282    480.    480.    480.       0       0       0     .00 1659.92 21898.37


*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0   13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.679   40.69   62.42     .00     .00   62.62     .21     .02     .04   49.60
 127200.0 12845.0 78231.2 36123.8 18458.0 16945.2 43781.5 48532.3  5730.8    50.50
   3.18     .70    4.62     .83    .120    .035    .120    .000   21.73   830.82
  .000165    100.    100.    100.       2       0       0     .00 7698.69  8529.51


CCHV=    .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4    9060.0  TYPE=     1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=    74.80
  11.970   31.14   62.86     .00     .00   63.06     .21     .44     .00   46.60
 126360.0 17864.5 66543.1 41952.5 21280.4 13439.9 52979.9 55238.0  6361.7    44.70
   3.45     .84    4.95     .79    .120    .030    .120    .000   31.72   542.41
  .000143    802.   2118.   5043.       2       0       0     .00 7324.74  7867.15

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T1    CF-0033 BROWN & ROOT SERVICES, 11/1/99
T2    Lake Houston HEC-2 MODEL, REACH 3
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK  INQ    NINV   IDIR   STRT   METRIC  HVINS  Q     WSEL   FQ

    0      4                            0   50.91

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH   FN    ALLDC   IBW    CHNIM    ITRACE

    3      0     -1

1
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR    WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*PROF 3

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=   .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=   1232.0   8990.0 TYPE=    1 TARGET=   -1232.040
 ELENCL=   54.70 ELENCR= 100000.00
   3.615   20.61   50.91     .00   50.91   51.06    .15    .00     .00   41.60
 174300.0   1521.8 167008.7  5769.5  3779.5 51973.1 11582.1     .0      .0    43.80
     .00     .40    3.21     .50    .120    .030    .120    .000   30.30  1277.93
  .000136      0.      0.      0.       0       0       0     .00  7174.17  8452.10


*SECNO 4.745

3470 ENCROACHMENT STATIONS=   1973.4   6985.6 TYPE=    1 TARGET=    5012.200
 ELENCL=   52.00 ELENCR=   48.60
   4.745   20.54   51.74     .00     .00   51.90    .16    .84     .00   51.10
 173330.0     6.5 172233.1  1090.4    92.3 53629.3  3122.6  8151.2   782.7   47.20
     .52     .07    3.21     .35    .120    .030    .120    .000   31.20  2087.00
  .000147   3600.   5966.   4500.       2       0       0     .00  5551.63  7638.63


CCHV=   .300 CEHV=   .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     57.00

   5.026   41.37   51.97     .00     .00   52.22    .25    .27     .05   56.20
 173080.0      .0 173080.0     .0      .0 43119.8     .0  9946.9   963.6   57.00
     .62     .00    4.01     .00    .000    .030    .000    .000   10.60  9611.74
  .000231   1030.   1482.   4150.       2       0       0     .00  3485.50 13097.25


*SECNO 5.027

3265 DIVIDED FLOW
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SECNO DEPTH CWSEL CRIWS WSELK EG HV HL OLOSS L-BANK ELEV
Q QLOB QCH QROB ALOB ACH AROB VOL TWA R-BANK ELEV
TIME VLOB VCH VROB XNL XNCH XNR WTN ELMIN SSTA
SLOPE XLOBL XLCH XLOBR ITRIAL IDC ICONT CORAR TOPWID ENDST

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

5.027 41.39 51.99 .00 .00 52.23 .24 .00 .00 56.20
173080.0 .0 173080.0 .0 .0 44353.1 .0 9947.9 963.6 56.00
.62 .00 3.90 .00 .000 .030 .000 .000 10.60 9615.15
.000231 1. 1. 1. 1 0 0 .00 3340.00 13040.57

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

5.034 41.40 52.00 .00 .00 52.24 .24 .01 .00 56.20
173080.0 .0 173080.0 .0 .0 44419.9 .0 9995.7 967.2 56.00
.62 .00 3.90 .00 .000 .030 .000 .000 10.60 9615.07
.000230 47. 47. 47. 0 0 0 .00 3340.21 13040.69

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

5.035 41.40 52.00 .00 .00 52.25 .25 .00 .01 56.20
173080.0 .0 173080.0 .0 .0 43224.7 .0 9996.8 967.3 57.00
.62 .00 4.00 .00 .000 .030 .000 .000 10.60 9611.65
.000229 1. 1. 1. 0 0 0 .00 3485.93 13097.59

*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

5.037 41.40 52.00 .00 .00 52.25 .25 .00 .00 56.20
173080.0 .0 173080.0 .0 .0 43208.0 .0 10004.7 968.0 57.00
.62 .00 4.01 .00 .000 .030 .000 .000 10.60 9611.67
.000229 8. 8. 8. 0 0 0 .00 3485.87 13097.54

SECNO DEPTH CWSEL CRIWS WSELK EG HV HL OLOSS L-BANK ELEV
Q QLOB QCH QROB ALOB ACH AROB VOL TWA R-BANK ELEV
TIME VLOB VCH VROB XNL XNCH XNR WTN ELMIN SSTA
SLOPE XLOBL XLCH XLOBR ITRIAL IDC ICONT CORAR TOPWID ENDST

*SECNO 5.038

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038   41.42   52.02    .00    .00   52.25    .24    .00    .00   56.20
 173080.0     .0 173080.0     .0     .0  44437.1     .0  10005.7   968.0   56.00
    .62    .00    3.89    .00   .000    .030   .000    .000   10.60  9615.05
  .000230     1.     1.     1.      1      0      0    .00  3340.26  13040.71


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045   41.43   52.03    .00    .00   52.26    .23    .01    .00   56.20
 173080.0     .0 173080.0     .0     .0  44503.3     .0  10053.7   971.6   56.00
    .63    .00    3.89    .00   .000    .030   .000    .000   10.60  9614.98
  .000229    47.    47.    47.      0      0      0    .00  3340.47  13040.83


CCHV=   .100 CEHV=   .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046   41.42   52.02    .00    .00   52.27    .25    .00    .00   56.20
 173080.0     .0 173080.0     .0     .0  43311.6     .0  10054.7   971.7   57.00
    .63    .00    4.00    .00   .000    .030   .000    .000   10.60  9611.58
  .000227     1.     1.     1.      0      0      0    .00  3486.29  13097.87


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  SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB     QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB     VCH     VROB    XNL     XNCH    XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL    XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 5.585
   5.585   29.05   52.75    .00    .00   52.89    .14    .62    .01   48.20
 172610.0 116272.6  56299.2    38.2  63098.1  12298.4   162.4  13804.7  1393.6   49.80
    .91    1.84    4.58    .24   .049    .030   .120    .000   23.70  1218.60
  .000215   2664.   2847.   1744.      2      0      0    .00 10056.46  11275.06


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW

   6.420   24.95   53.35    .00    .00   53.49    .14    .59    .00   46.70
 171900.0 100239.8  39187.8  32472.4  36458.4   9589.6  17520.0  18109.0  1903.7   47.50
   1.19    2.75    4.09    1.85   .030    .030   .050    .000   28.40 10885.09
  .000190   2300.   4409.   2800.      2      0      0    .00  7514.78  18408.74


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
```

```
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0 TYPE=    1 TARGET=    8229.000
 ELENCL=   53.10 ELENCR=   57.90
   7.090   23.94   54.04    .00    .00   54.22    .18    .72    .01   46.90
 171320.0   9670.2  99466.2  62183.6  13739.7  23219.8  42824.7  23087.4   2495.3    47.40
    1.47     .70    4.28    1.45    .120    .030    .084    .000   30.10  8583.20
  .000282   2000.   3538.   3600.      2      0      0     .00 11263.75 19846.95


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=       .0  16383.0 TYPE=    1 TARGET=   16383.000
   7.470   25.51   54.51    .00    .00   54.78    .27    .53    .03   47.70
 171000.0  64398.1  56614.6  49987.3  44556.5   8668.9  17476.8  25863.6   2863.8    44.30
    1.61    1.45    6.53    2.86    .071    .030    .050    .000   29.00  6987.81
  .000335   1500.   2006.   1500.      2      0      0     .00  9318.83 16306.64


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST


*SECNO 8.070

3470 ENCROACHMENT STATIONS=    3455.4  15481.5 TYPE=    1 TARGET=   -3455.360
 ELENCL=   61.13 ELENCR= 100000.00
   8.070   27.69   55.59    .00    .00   56.15    .57   1.28    .09   44.30
 171000.0  22345.2 107280.0  41374.8  16896.3  14169.7  33910.1  30357.3   3409.8    46.70
    1.76    1.32    7.57    1.22    .120    .030    .120    .000   27.90  3787.74
  .000583   2619.   2891.   3201.      2      0      0     .00  7306.78 11094.52


CCHV=   .100 CEHV=    .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=       .0   3851.7 TYPE=    1 TARGET=    3851.709
   8.490   21.53   57.33    .00    .00   58.62   1.29   2.25    .22   46.00
 169770.0  52152.7 103123.1  14494.1  21414.7   8915.3  12463.2  32999.9   3714.5    50.60
    1.84    2.44   11.57    1.16    .120    .030    .120    .000   35.80   798.04
  .001373   2636.   2374.   1605.      3      0      0     .00  6189.80  6987.84


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.28


3470 ENCROACHMENT STATIONS=    2460.6  10500.0 TYPE=    1 TARGET=   -2460.630
 ELENCL=   56.91 ELENCR= 100000.00
   9.410   24.98   60.48    .00    .00   60.72    .24   1.99    .11   53.30
 169330.0  24942.7  62517.1  81870.2  15235.0  10312.0  49060.6  39007.9   4394.5    49.50
```

```
  2.22    1.64    6.06    1.67    .057    .030    .079    .000   35.50   751.49
 .000263   2500.   4858.   5500.      3      0      0     .00  7128.50  7879.99
```

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1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST

CCHV=   .100 CEHV=    .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=    1431.2   8020.0  TYPE=     1  TARGET=    6588.810
 ELENCL=    55.17 ELENCR=    59.05
  10.580   39.53   61.63     .00     .00   61.98     .35    1.22     .03   53.60
 168330.0  14289.7  90446.5  63593.7  15785.4  14210.8  59826.3  45707.5  5002.7    50.50
   2.54     .91    6.36    1.06    .100    .030    .120    .000   22.10   174.99
 .000282   2700.   6177.   3200.      2      0      0     .00  9129.64  9304.63

CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=        .0   8865.0  TYPE=     1  TARGET=    8864.999
  10.860   30.26   61.96     .00     .00   62.33     .37     .34     .01   52.20
 168090.0  16721.5 107526.7  43841.8  15197.0  17874.0  42154.9  48001.7  5221.8    52.40
   2.63    1.10    6.02    1.04    .100    .030    .120    .000   31.70  1804.54
 .000234   1300.   1478.   1100.      2      0      0     .00  7027.36  8831.89

1490 NH CARD USED
*SECNO 11.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

3470 ENCROACHMENT STATIONS=    3311.7   6950.0  TYPE=     1  TARGET=    3638.260
 ELENCL=    53.30 ELENCR=    63.70
  11.090   30.45   62.25     .00     .00   62.89     .64     .48     .08   53.30
 167890.0  39461.7  98501.5  29926.8  21841.4  11950.9  24079.4  50229.0  5447.4    57.00
   2.70    1.81    8.24    1.24    .082    .030    .120    .000   31.80   784.98
 .000556   1400.   1214.   1600.      2      0      0     .00  6101.18  6886.17

CCHV=   .300 CEHV=    .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59

3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=    4320.750
1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST

 ELENCL=    58.00 ELENCR=    65.50
  11.350   34.29   63.13     .00     .00   63.46     .33     .48     .09   52.80
 167670.0  11026.1 106110.8  50533.1  16023.1  18516.5  42035.4  52889.2  5676.5    52.60
```

```
   2.80     .69    5.73    1.20    .120    .030    .120    .000   28.84  463.42
 .000219   1000.   1373.   2300.      2      0       0      .00  6011.37  6474.79

*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .68

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=       64.00

  11.380   36.49   63.29    .00     .00   64.27    .98    .48    .33   66.30
 167670.0     .0 167670.0     .0      .0  21052.2     .0  54806.5  5805.2   64.00
   2.86     .00    7.96    .00    .000    .030    .000    .000   26.80 19954.75
 .000473   1000.   1373.   2300.      2      0       0      .00  1031.99 20986.74


SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80   27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=     63.19 BRIDGE VELOCITY=      8.95     CALCULATED CHANNEL AREA=    18743.

 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA   TRAPEZOID    ELLC    ELTRD    WEIRLN
                                             AREA
    .00    64.35     .08      0.  167670.  22729.  22477.     67.20   68.30      0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=       64.00

  11.390   36.57   63.37    .00     .00   64.35    .98    .08    .00   66.30
 167670.0     .0 167670.0     .0      .0  21139.5     .0  54830.7  5806.4   64.00
   2.86     .00    7.93    .00    .000    .030    .000    .000   26.80 19953.22
 .000468     50.     50.     50.      0      0       0      .00  1035.10 20988.32
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.62

3470 ENCROACHMENT STATIONS=    2199.0    6519.8 TYPE=     1  TARGET=    4320.750
 ELENCL=    58.00 ELENCR=    65.50
  11.400   35.45   64.29    .00     .00   64.57    .28    .01    .21   52.80
 167670.0  12788.1 104014.7  50867.3  18966.9  19498.0  45145.8  54890.8  5810.6   52.60
   2.86     .67    5.33    1.13    .120    .030    .120    .000   28.84  290.01
 .000177     50.     50.     50.      2      0       0      .00  6206.81  6496.83
```

```
CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=   1998.3  14239.6 TYPE=    1 TARGET=   -1998.350
 ELENCL=   56.86 ELENCR= 100000.00
  11.480   43.62   64.35    .00    .00   64.65    .30    .07    .01   48.60
 167560.0  18075.6 106257.1  43227.3  24043.6  19442.9  55608.7  56063.2  5913.3    49.50
   2.90    .75    5.47    .78   .120   .030   .120   .000   20.73  653.03
  .000141   400.   370.   700.     2     0     0    .00  9517.14  10170.17

CCHV=   .600 CEHV=   .800
*SECNO 11.550

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS=   1950.0  13410.0 TYPE=    1 TARGET=   -1950.000
 ELENCL=   57.00 ELENCR= 100000.00
  11.550   42.68   64.41    .00    .00   64.71    .30    .06    .00   49.60
 167500.0  17836.8 102620.2  47042.9  23125.3  18308.6  53923.5  56943.0  5997.3    50.50
   2.92    .77    5.61    .87   .120   .030   .120   .000   21.73  806.02
  .000161   400.   370.   400.     0     0     0    .00  8872.30  9946.10
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST

1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569   40.28   64.38    .00    .00   64.94    .56    .02    .20   68.70
 167500.0      .0 167500.0     .0     .0  27962.9     .0  57084.6  6009.2   67.10
   2.93    .00    5.99    .00   .000   .031   .000   .000   24.10 20258.45
  .000323   100.   100.   100.     2     0     0    .00  1501.44 21759.89

SPECIAL BRIDGE

SB XK      XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS     ELCHU   ELCHD
   1.25    2.31    2.60     .00    50.00   46.00 32375.00   20.00   24.10   24.10

CCHV=   .300 CEHV=   .500
*SECNO 11.660
PRESSURE FLOW

 EGPRS   EGLWC    H3    QWEIR    QPR     BAREA  TRAPEZOID   ELLC   ELTRD   WEIRLN
                                 AREA
   65.34   64.94   .06     0.  167500.  32375.   30545.    63.08   69.07     0.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

  11.660   45.12   64.92    .00    .00   65.34    .42    .40    .00   68.90
 167500.0      .0 167500.0     .0     .0  32119.4     .0  57415.6  6026.6   68.20
```

```
   2.95     .00    5.21     .00    .000    .035    .000     .000    19.80  20235.84
 .000297    480.    480.    480.      2       0       0      .00  1665.64  21901.48


*SECNO 11.679

3470 ENCROACHMENT STATIONS=   1950.0  13410.0  TYPE=    1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.679   43.47   65.20     .00     .00   65.42     .22     .02     .06   49.60
 167500.0  20445.1  93952.1  53102.8  24992.3  18845.9  58773.5  57570.3  6039.4    50.50
   2.96     .82    4.99     .90    .120    .035    .120     .000    21.73   701.93
 .000167    100.    100.    100.      2       0       0      .00  9432.45  10134.38


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=   1105.4   9060.0  TYPE=    1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=    74.80
  11.970   33.94   65.66     .00     .00   65.89     .23     .46     .00   46.60
 167140.0  25191.3  81139.9  60808.9  26838.4  14991.3  67384.4  66172.8  6782.3    44.70
   3.23     .94    5.41     .90    .120    .030    .120     .000    31.72   155.95
 .000148    802.   2118.   5043.      2       0       0      .00  7960.55   8116.50


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T1    CF-0033 BROWN & ROOT SERVICES,  11/1/99
T2    Lake Houston HEC-2 MODEL, REACH 3
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ     NINV    IDIR    STRT    METRIC  HVINS    Q      WSEL    FQ

    0      5                                  0    54.9

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH    FN    ALLDC    IBW    CHNIM   ITRACE

   15      0     -1



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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


*PROF 4

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0
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```
CCHV=   .100 CEHV=   .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=   1232.0   8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
   3.615    24.60    54.90      .00    54.90    55.21      .31      .00      .00    41.60
 333600.0   5663.8 311703.2  16233.1   8406.9  67786.4  20924.6       .0       .0    43.80
     .00      .67     4.60      .78     .120     .030     .120     .000    30.30   161.12
  .000196       0.       0.       0.        0        0        0      .00  8729.88  8891.00


*SECNO 4.745

3470 ENCROACHMENT STATIONS=   1973.4   6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60
   4.745    24.84    56.04      .00      .00    56.34      .30     1.14      .00    51.10
 329800.0   2905.3 322008.5   4886.2   7107.0  72235.3   7556.9  11700.9    933.4    47.20
     .37      .41     4.46      .65     .120     .030     .120     .000    31.20   347.39
  .000190    3600.    5966.    4500.        2        0        0      .00  7484.51  7831.90


CCHV=   .300 CEHV=   .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     57.00

   5.026    45.73    56.33      .00      .00    56.73      .40      .34      .05    56.20
 328820.0  21532.4 307287.6       .0  31825.8  58436.4       .0  14744.1   1221.1    57.00
     .46      .68     5.26      .00     .120     .030     .000     .000    10.60  3170.15
  .000270    1030.    1482.    4150.        2        0        0      .00  9976.62 13146.77


*SECNO 5.027

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .40

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL    OLOSS  L-BANK ELEV
   Q         QLOB      QCH     QROB     ALOB      ACH     AROB      VOL      TWA  R-BANK ELEV
   TIME     VLOB      VCH     VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
   SLOPE   XLOBL     XLCH    XLOBR   ITRIAL      IDC    ICONT    CORAR   TOPWID    ENDST


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     56.00

   5.027    45.53    56.13      .00      .00    56.93      .79      .00      .19    56.20
 328820.0       .0 328820.0       .0       .0  46083.5       .0  14745.6   1221.2    56.00
     .46      .00     7.14      .00     .000     .030     .000     .000    10.60  9599.31
  .001723       1.       1.       1.        4        0        0 -12531.31  3468.03 13067.34


*SECNO 5.034

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

   5.034    45.72    56.32      .00      .00    57.03      .71      .08      .02    56.20
 328820.0  11423.7 317396.3       .0  13971.3  46083.5       .0  14802.9   1228.8    56.00
     .46      .82     6.89      .00     .120     .030     .000     .000    10.60  2598.16
  .001605      47.      47.      47.       12        0        0 -36125.11 10474.94 13073.10


*SECNO 5.035
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.55

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.035   46.15   56.75    .00    .00   57.13    .38    .00    .10   56.20
 328820.0 23094.2 305725.8    .0 34612.0 59943.4     .0 14804.7  1229.0   57.00
   .46     .67    5.10    .00   .120    .030   .000    .000   10.60 2900.42
  .000246    1.     1.     1.     2      0      0     .00 10251.18 13151.59
```

*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.037   46.15   56.75    .00    .00   57.13    .38    .00    .00   56.20
 328820.0 23118.6 305701.5    .0 34656.3 59966.9     .0 14822.0  1230.9   57.00
   .46     .67    5.10    .00   .120    .030   .000    .000   10.60 2896.21
  .000246    8.     8.     8.     0      0      0     .00 10255.46 13151.67
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR TOPWID ENDST
```

*SECNO 5.038

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .39

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

```
  5.038   45.99   56.59    .00    .00   57.30    .71    .00    .17   56.20
 328820.0 11423.7 317396.3    .0 13971.3 46083.5     .0 14823.8  1231.1   56.00
   .46     .82    6.89    .00   .120    .030   .000    .000   10.60 2467.21
  .001605    1.     1.     1.     2      0      0 -38988.96 10614.53 13081.74
```

*SECNO 5.045

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

```
  5.045   46.06   56.66    .00    .00   57.37    .71    .08    .00   56.20
 328820.0 11423.7 317396.3    .0 13971.3 46083.5     .0 14888.6  1242.6   56.00
   .46     .82    6.89    .00   .120    .030   .000    .000   10.60 2430.83
  .001605   47.    47.    47.     2      0      0 -39791.34 10653.30 13084.14
```

CCHV= .100 CEHV= .300
*SECNO 5.046

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.64

```
  5.046   46.45   57.05    .00    .00   57.41    .36    .00    .04   56.20
 328820.0 24187.0 304633.0    .0 36637.3 61003.0     .0 14890.4  1242.8   57.00
   .46     .66    4.99    .00   .120    .030   .000    .000   10.60 2710.97
  .000231    1.     1.     1.     2      0      0     .00 10444.39 13155.37
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 5.585

```
  5.585   34.16   57.86    .00    .00   58.03    .17    .60    .02   48.20
```

```
 326970.0 238436.8  87891.6    641.6 111169.5  16257.2   1291.0  21960.8   1899.4    49.80
     .72     2.14     5.41      .50     .054     .030     .120     .000    23.70   662.54
 .000207    2664.    2847.    1744.       2        0        0      .00 10852.17 11514.70
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 6.420
   6.420    29.96    58.36      .00      .00    58.53      .18      .50      .00    46.70
 324160.0 207766.6  57664.8  58728.6  62820.2  12863.8  27571.1  28955.6   2464.3    47.50
     .95     3.31     4.48     2.13     .030     .030     .050     .000    28.40  9903.25
 .000155    2300.    4409.    2800.       2        0        0      .00  8701.29 18604.54


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0  TYPE=    1  TARGET=    8229.000
 ELENCL=    53.10  ELENCR=    57.90
   7.090    28.83    58.93      .00      .00    59.17      .24      .62      .02    46.90
 321910.0  37170.9 171781.7 112957.4  48099.9  32929.9  66164.7  37235.0   3246.7    47.40
    1.19      .77     5.22     1.71     .120     .030     .085     .000    30.10  5381.56
 .000263    2000.    3538.    3600.       2        0        0      .00 16555.20 21936.76


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=        .0  16383.0  TYPE=    1  TARGET=   16383.000
   7.470    30.41    59.41      .00      .00    59.67      .26      .49      .01    47.70
 320030.0 144484.2  80332.4  95213.4  80128.9  10847.2  38937.6  42260.4   3779.1    44.30
    1.33     1.80     7.41     2.45     .075     .030     .055     .000    29.00  6784.21
 .000319    1500.    2006.    1500.       2        0        0      .00 13548.95 20333.16


*SECNO 8.070

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .70
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST


3470 ENCROACHMENT STATIONS=    3455.4  15481.5  TYPE=    1  TARGET=   -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
```

```
 8.070   32.46   60.36    .00    .00   61.16    .80   1.33    .16   44.30
320030.0 47714.7 175714.5 96600.7 26191.3 18380.8 56651.2 49939.3 4510.9   46.70
  1.46    1.82    9.56   1.71   .120   .030   .120   .000   27.90 3495.39
.000657   2619.   2891.   3201.     2     0     0    .00  8225.06 11755.54


CCHV=   .100 CEHV=   .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .67


3470 ENCROACHMENT STATIONS=       .0   3851.7  TYPE=    1  TARGET=    3851.709
 8.490   26.31   62.11    .00    .00   63.76   1.65   2.35    .26   46.00
315820.0 92814.7 163497.7 59507.6 30126.8 11598.7 30930.3 54073.8 4839.0   50.60
  1.54    3.08   14.10   1.92   .120   .030   .120   .000   35.80  764.98
.001435   2636.   2374.   1605.     2     0     0    .00  6329.49  7094.47


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.17


3470 ENCROACHMENT STATIONS=   2460.6   10500.0  TYPE=    1  TARGET=   -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
 9.410   30.32   65.82    .00    .00   66.14    .32   2.24    .13   53.30
314100.0 61746.7 97784.3 154569.0 29360.4 12946.2 74922.0 63832.1 5651.0   49.50
  1.87    2.10    7.55   2.06   .065   .030   .082   .000   35.50  717.81
.000302   2500.   4858.   5500.     2     0     0    .00  9116.08  9833.89


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL    XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR  ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=   .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=   1431.2   8020.0  TYPE=    1  TARGET=    6588.810
 ELENCL=    55.17  ELENCR=    59.05
 10.580   44.94   67.04    .00    .00   67.47    .43   1.29    .03   53.60
309220.0 39430.8 137453.0 132336.2 28565.4 17796.4 98084.4 74161.7 6386.8   50.50
  2.15    1.38    7.72   1.35   .100   .030   .120   .000   22.10  131.91
.000308   2700.   6177.   3200.     2     0     0    .00 10628.25 10760.16


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=       .0   8865.0  TYPE=    1  TARGET=    8864.999
 10.860   35.66   67.36    .00    .00   67.89    .52    .39    .03   52.20
310160.0 36892.7 171366.3 101900.9 23232.9 22178.0 82387.5 77891.5 6664.0   52.40
  2.22    1.59    7.73   1.24   .100   .030   .120   .000   31.70 1743.35
.000289   1300.   1478.   1100.     2     0     0    .00 10117.98 11861.34
```

```
1490 NH CARD USED
*SECNO 11.090

3470 ENCROACHMENT STATIONS=   3311.7   6950.0  TYPE=     1  TARGET=    3638.260
 ELENCL=   53.30  ELENCR=    63.70
  11.090    35.98    67.78      .00      .00    68.45      .67      .52      .04    53.30
 308450.0  85459.7 144752.4  78237.9  35985.6  15445.8  58108.8  81947.7   7029.6    57.00
    2.29     2.37     9.37     1.35     .083     .030     .120     .000    31.80   721.87
  .000510    1400.    1214.    1600.       0        0        0      .00 10644.62 11366.49


CCHV=    .300 CEHV=    .500
*SECNO 11.350

3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=   58.00  ELENCR=    65.50
  11.350    39.71    68.55      .00      .00    69.07      .52      .57      .05    52.80
 307570.0  33645.4 175179.8  98744.9  30851.6  23102.0  70491.5  86717.5   7505.7    52.60
    2.38     1.09     7.58     1.40     .120     .030     .120     .000    28.84   113.29
  .000286    1000.    1373.    2300.       2        0        0      .00 11056.90 11170.19


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   SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB     QCH      QROB    ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME     VLOB     VCH     VROB     XNL     XNCH     XNR     WTN     ELMIN    SSTA
   SLOPE    XLOBL    XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID   ENDST


*SECNO 11.380
  11.380    42.21    69.01      .00      .00    69.58      .57      .48      .02    66.30
 307570.0  26325.9 202088.7  79155.4  26088.1  27260.5  67929.1  91819.1   7972.5    64.00
    2.47     1.01     7.41     1.17     .120     .030     .120     .000    26.80 17098.65
  .000316    1000.    1373.    2300.       2        0        0      .00 10601.59 27700.24



SPECIAL BRIDGE

SB XK      XKOR     COFQ     RDLEN     BWC       BWP      BAREA      SS      ELCHU     ELCHD
    1.25     1.50     2.60      .00    189.00    20.40  22729.00    10.20    27.80     27.80

*SECNO 11.390
PRESSURE AND WEIR FLOW,  Weir Submergence Based on TRAPEZOIDAL Shape


 EGPRS    EGLWC     H3     QWEIR     QPR      BAREA   TRAPEZOID    ELLC    ELTRD    WEIRLN
                                                        AREA
   73.28    69.62     .04  180916.  127405.   22729.   22477.     67.20    68.30     7089.


  11.390    42.39    69.19      .00      .00    69.74      .55      .16      .00    66.30
 307570.0  26688.1 201070.8  79811.1  26599.2  27461.0  69150.8  91959.4   7984.7    64.00
    2.47     1.00     7.32     1.15     .120     .030     .120     .000    26.80 17093.22
  .000305      50.      50.      50.       2        0        4      .00 10610.67 27703.88


*SECNO 11.400

3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=   58.00  ELENCR=    65.50
  11.400    40.48    69.32      .00      .00    69.78      .47      .01      .03    52.80
 307570.0  35077.8 172084.8 100407.3  33025.5  23746.8  76110.8  92106.4   7997.1    52.60
    2.47     1.06     7.25     1.32     .120     .030     .120     .000    28.84   100.74
  .000252      50.      50.      50.       2        0        0      .00 11083.03 11183.77
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS= 1998.3 14239.6 TYPE= 1 TARGET= -1998.350
ELENCL= 56.86 ELENCR= 100000.00
11.480 48.70 69.43 .00 .00 69.89 .46 .11 .00 48.60
307140.0 41546.0 167150.3 98443.7 38046.1 22912.9 89543.3 93961.9 8144.0 49.50
2.50 1.09 7.30 1.10 .120 .030 .120 .000 20.73 298.75
.000202 400. 370. 700. 1 0 0 .00 10367.99 10666.73

SECNO DEPTH CWSEL CRIWS WSELK EG HV HL OLOSS L-BANK ELEV
Q QLOB QCH QROB ALOB ACH AROB VOL TWA R-BANK ELEV
TIME VLOB VCH VROB XNL XNCH XNR WTN ELMIN SSTA
SLOPE XLOBL XLCH XLOBR ITRIAL IDC ICONT CORAR TOPWID ENDST

CCHV= .600 CEHV= .800
*SECNO 11.550

3470 ENCROACHMENT STATIONS= 1950.0 13410.0 TYPE= 1 TARGET= -1950.000
ELENCL= 57.00 ELENCR= 100000.00
11.550 47.78 69.51 .00 .00 69.98 .46 .08 .00 49.60
306900.0 41485.1 162177.1 103237.8 36766.4 21791.6 87383.1 95307.6 8238.5 50.50
2.53 1.13 7.44 1.18 .120 .030 .120 .000 21.73 308.79
.000225 400. 370. 400. 0 0 0 .00 10311.17 10619.96

1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED
11.569 45.47 69.57 .00 .00 70.01 .45 .02 .01 68.70
306900.0 21761.0 223800.2 61338.8 19835.8 35804.6 55898.8 95603.1 8261.2 67.10
2.53 1.10 6.25 1.10 .100 .032 .120 .000 24.10 18079.34
.000270 100. 100. 100. 2 0 0 .00 9464.33 27543.67

SPECIAL BRIDGE

SB XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
1.25	2.31	2.60	.00	50.00	46.00	32375.00	20.00	24.10	24.10

CCHV= .300 CEHV= .500
*SECNO 11.660
PRESSURE AND WEIR FLOW, Weir Submergence Based on TRAPEZOIDAL Shape

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
72.79	70.01	.04	113900.	191068.	32375.	30545.	63.08	69.07	6537.

11.660 50.67 70.47 .00 .00 70.82 .34 .80 .00 68.90
306900.0 23180.1 225885.7 57834.2 21901.7 41433.2 56842.0 96879.8 8364.5 68.20
2.56 1.06 5.45 1.02 .120 .035 .120 .000 19.80 18417.93
.000235 480. 480. 480. 2 0 2 .00 9291.50 27709.43

*SECNO 11.679

3470 ENCROACHMENT STATIONS= 1950.0 13410.0 TYPE= 1 TARGET= -1950.000

```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


ELENCL=    57.00 ELENCR= 100000.00
 11.679   48.79   70.52    .00     .00   70.84    .32     .02     .01    49.60
306900.0 46265.2 146128.8 114506.0 39622.4 22472.1 94179.2 97197.1  8387.1   50.50
  2.57    1.17    6.50    1.22    .120    .035    .120    .000   21.73  273.22
.000224    100.    100.    100.      2       0       0     .00 10397.45 10670.67


CCHV=   .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4   9060.0 TYPE=     1 TARGET=    7954.610
ELENCL=    52.50 ELENCR=    74.80
 11.970   39.43   71.15    .00     .00   71.51    .36     .65     .01    46.60
305490.0 50471.3 130046.1 124972.5 38655.2 18031.6 98507.0 110056.2  9202.9   44.70
  2.80    1.31    7.21    1.27    .120    .030    .120    .000   31.72   87.82
.000205    802.   2118.   5043.      2       0       0     .00  8670.87  8758.70
```


THIS RUN EXECUTED 14MAR00   19:02:54

****

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

Starting form river mile

SUMMARY PRINTOUT

```
     VOL      VLOB    VROB     VCH     AREA    TOPWID    QLOBP    QCHP    QROBP

     .000      .26     .23    1.87  39693.85  5842.35    .28    98.41    1.31
     .000      .37     .44    2.97  57840.25  6975.50    .60    96.69    2.71
     .000      .40     .50    3.21  67334.71  7174.17    .87    95.82    3.31
     .000      .67     .78    4.60  97117.93  8729.88   1.70    93.44    4.87

  4955.114     .00     .00    1.95  33894.29  4324.09    .00   100.00     .00
  7117.799     .00     .26    2.94  49663.25  5217.94    .00    99.65     .35
  8151.214     .07     .35    3.21  56844.21  5551.63    .00    99.37     .63
 11700.950     .41     .65    4.46  86899.22  7484.51    .88    97.64    1.48

  5993.760     .00     .00    2.43  27162.98  3418.36    .00   100.00     .00
  8673.972     .00     .00    3.65  38415.29  3466.05    .00   100.00     .00
  9946.853     .00     .00    4.01  43119.80  3485.50    .00   100.00     .00
 14744.070     .68     .00    5.26  90262.13  9976.62   6.55    93.45     .00

  5994.405     .00     .00    2.27  29018.00  3293.66    .00   100.00     .00
  8674.870     .00     .00    3.52  39843.62  3326.05    .00   100.00     .00
  9947.856     .00     .00    3.90  44353.10  3340.00    .00   100.00     .00
* 14745.640    .00     .00    7.14  46083.49  3468.03    .00   100.00     .00
```

6025.740	.00	.00	2.27	29064.39	3293.80	.00	100.00	.00
8717.896	.00	.00	3.51	39909.65	3326.26	.00	100.00	.00
9995.748	.00	.00	3.90	44419.91	3340.21	.00	100.00	.00
14802.900	.82	.00	6.89	60054.81	10474.94	3.47	96.53	.00
6026.386	.00	.00	2.42	27236.19	3418.70	.00	100.00	.00
8718.796	.00	.00	3.64	38519.84	3466.48	.00	100.00	.00
9996.754	.00	.00	4.00	43224.65	3485.93	.00	100.00	.00
* 14804.670	.67	.00	5.10	94555.36	10251.18	7.02	92.98	.00
6031.387	.00	.00	2.42	27221.04	3418.63	.00	100.00	.00
8725.868	.00	.00	3.64	38501.41	3466.41	.00	100.00	.00
10004.690	.00	.00	4.01	43208.01	3485.87	.00	100.00	.00
14822.040	.67	.00	5.10	94623.19	10255.46	7.03	92.97	.00

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
6032.033	.00	.00	2.27	29073.98	3293.83	.00	100.00	.00
8726.769	.00	.00	3.51	39925.80	3326.31	.00	100.00	.00
10005.700	.00	.00	3.89	44437.07	3340.26	.00	100.00	.00
* 14823.820	.82	.00	6.89	60054.81	10614.53	3.47	96.53	.00
6063.428	.00	.00	2.27	29120.01	3293.97	.00	100.00	.00
8769.883	.00	.00	3.51	39991.27	3326.51	.00	100.00	.00
10053.680	.00	.00	3.89	44503.28	3340.47	.00	100.00	.00
14888.620	.82	.00	6.89	60054.81	10653.30	3.47	96.53	.00
6064.075	.00	.00	2.42	27293.89	3418.96	.00	100.00	.00
8770.785	.00	.00	3.63	38604.85	3466.84	.00	100.00	.00
10054.690	.00	.00	4.00	43311.63	3486.29	.00	100.00	.00
* 14890.430	.66	.00	4.99	97640.33	10444.39	7.36	92.64	.00
* 7245.673	.00	.00	7.41	8863.75	609.67	.00	100.00	.00
11940.060	1.79	.16	4.35	61632.32	9772.60	64.90	35.10	.00
13804.670	1.84	.24	4.58	75558.88	10056.46	67.36	32.62	.02
21960.780	2.14	.50	5.41	128717.80	10852.17	72.92	26.88	.20
* 8899.271	1.70	1.18	2.87	36717.37	7043.26	48.85	31.60	19.55
15547.070	2.57	1.76	3.98	53470.95	7372.54	55.67	25.18	19.15
18109.020	2.75	1.85	4.09	63568.08	7514.78	58.31	22.80	18.89
28955.550	3.31	2.13	4.48	103255.10	8701.29	64.09	17.79	18.12
11912.820	.45	.88	2.53	47350.68	7380.76	3.79	60.43	35.77
19782.750	.73	1.33	3.89	66809.60	7846.24	4.89	58.89	36.22
23087.400	.70	1.45	4.28	79784.26	11263.75	5.64	58.06	36.30
37235.020	.77	1.71	5.22	147194.50	16555.20	11.55	53.36	35.09
13476.180	.89	1.77	4.26	35912.72	7474.41	24.70	45.12	30.18
22106.050	1.31	2.63	6.09	58462.90	8606.81	34.09	36.31	29.60
25863.640	1.45	2.86	6.53	70702.23	9318.83	37.66	33.11	29.23
42260.430	1.80	2.45	7.41	129913.60	13548.95	45.15	25.10	29.75
15802.020	.69	.64	4.80	33892.48	6579.98	9.23	75.93	14.84
25866.740	1.15	1.07	6.90	54917.43	7065.01	12.23	66.01	21.76
30357.330	1.32	1.22	7.57	64976.06	7306.78	13.07	62.74	24.20
* 49939.270	1.82	1.71	9.56	101223.30	8225.06	14.91	54.91	30.18
* 17190.890	1.43	.81	7.31	20020.04	2848.30	28.08	70.24	1.68
* 28081.290	2.17	.97	10.48	33893.66	6163.83	30.81	64.10	5.09
* 32999.910	2.44	1.16	11.57	42793.20	6189.80	30.72	60.74	8.54
* 54073.780	3.08	1.92	14.10	72655.89	6329.49	29.39	51.77	18.84
* 20059.710	1.39	1.09	4.25	35925.05	5247.10	8.38	48.90	42.72
* 33004.770	1.56	1.49	5.51	62229.36	7089.26	12.67	39.62	47.71
* 39007.850	1.64	1.67	6.06	74607.59	7128.50	14.73	36.92	48.35
* 63832.100	2.10	2.06	7.55	117228.60	9116.08	19.66	31.13	49.21

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
23376.390	.29	.62	4.50	39047.84	7357.44	.74	72.13	27.13
38633.800	.72	.94	5.75	73596.31	8822.32	6.42	57.99	35.59
45707.460	.91	1.06	6.36	89822.48	9129.64	8.49	53.73	37.78
74161.720	1.38	1.35	7.72	144446.10	10628.25	12.75	44.45	42.80
24489.940	.47	.63	3.62	39808.99	4439.52	4.76	74.51	20.73
40538.640	.90	.93	5.23	62747.29	6830.96	8.81	66.89	24.30
48001.750	1.10	1.04	6.02	75225.93	7027.36	9.95	63.97	26.08
77891.510	1.59	1.24	7.73	127798.40	10117.98	11.89	55.25	32.85
* 25342.970	.76	.00	7.47	13087.38	2972.72	6.34	93.66	.00
* 42356.930	1.53	1.07	7.62	46536.60	6000.31	20.47	63.99	15.53
* 50228.970	1.81	1.24	8.24	57871.67	6101.18	23.50	58.67	17.83
81947.700	2.37	1.35	9.37	109540.20	10644.62	27.71	46.93	25.36
* 26437.910	.35	.67	3.37	41353.79	4147.62	1.52	71.08	27.40
* 44588.880	.54	1.02	4.95	65250.98	5914.26	4.77	65.53	29.69
* 52889.210	.69	1.20	5.73	76574.88	6011.37	6.58	63.29	30.14
86717.480	1.09	1.40	7.58	124445.10	11056.90	10.94	56.96	32.10
27582.810	.00	.00	4.21	14833.43	958.22	.00	100.00	.00
46264.160	.00	.00	6.66	19150.31	986.90	.00	100.00	.00
* 54806.480	.00	.00	7.96	21052.18	1031.99	.00	100.00	.00
91819.130	1.01	1.17	7.41	121277.70	10601.59	8.56	65.70	25.74
27599.850	.00	.00	4.20	14854.04	958.33	.00	100.00	.00
46286.180	.00	.00	6.64	19206.13	988.04	.00	100.00	.00
54830.690	.00	.00	7.93	21139.46	1035.10	.00	100.00	.00
91959.450	1.00	1.15	7.32	123211.10	10610.67	8.68	65.37	25.95
27633.030	.35	.65	3.27	42945.25	4162.42	1.69	70.61	27.70
* 46337.490	.53	.97	4.67	70204.51	5956.93	5.57	64.52	29.91
* 54890.810	.67	1.13	5.33	83610.66	6206.81	7.63	62.04	30.34
92106.420	1.06	1.32	7.25	132883.20	11083.03	11.40	55.95	32.65
28195.520	.41	.40	3.43	44988.41	6350.49	5.27	80.15	14.58
47296.320	.63	.67	4.84	79671.61	7726.66	9.27	68.04	22.69
56063.220	.75	.78	5.47	99095.23	9517.14	10.79	63.41	25.80
93961.910	1.09	1.10	7.30	150502.30	10367.99	13.53	54.42	32.05
28592.460	.43	.49	3.58	43564.19	5992.14	4.60	77.13	18.27
48005.110	.64	.76	4.97	77303.70	7458.99	8.96	65.59	25.46
56943.020	.77	.87	5.61	95357.38	8872.30	10.65	61.27	28.09
95307.600	1.13	1.18	7.44	145941.00	10311.17	13.52	52.84	33.64
28662.390	.00	.00	3.59	17358.28	1470.10	.00	100.00	.00
48122.110	.00	.00	5.17	24625.06	1489.83	.00	100.00	.00
57084.570	.00	.00	5.99	27962.86	1501.44	.00	100.00	.00
95603.150	1.10	1.10	6.25	111539.20	9464.33	7.09	72.92	19.99

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
28865.150	.00	.00	3.20	19442.47	1639.63	.00	100.00	.00
48409.790	.00	.00	4.61	27588.59	1659.92	.00	100.00	.00
57415.610	.00	.00	5.21	32119.42	1665.64	.00	100.00	.00
96879.820	1.06	1.02	5.45	120177.00	9291.50	7.55	73.60	18.84
28938.080	.47	.54	3.42	44092.23	6030.15	5.24	74.05	20.71
48532.350	.70	.83	4.62	79184.65	7698.69	10.10	61.50	28.40

57570.250	.82	.90	4.99	102611.70	9432.45	12.21	56.09	31.70
97197.140	1.17	1.22	6.50	156273.80	10397.45	15.08	47.61	37.31
32696.660	.56	.56	3.73	51180.45	6398.18	11.45	63.48	25.07
55237.960	.84	.79	4.95	87700.20	7324.74	14.14	52.66	33.20
66172.750	.94	.90	5.41	109214.00	7960.55	15.07	48.55	36.38
110056.200	1.31	1.27	7.21	155193.70	8670.87	16.52	42.57	40.91

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	66800.00	46.66	.00	46.71	.78	1.87	39693.85	75729.41
3.615	.00	.00	.00	30.30	143300.00	49.57	.00	49.70	1.34	2.97	57840.25	123715.20
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
3.615	.00	.00	.00	30.30	333600.00	54.90	.00	55.21	1.96	4.60	97117.93	238550.70
4.745	5966.00	.00	.00	31.20	66160.00	47.18	.00	47.24	1.00	1.95	33894.29	66227.09
4.745	5966.00	.00	.00	31.20	140750.00	50.39	.00	50.53	1.43	2.94	49663.25	117646.00
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21	143031.00
4.745	5966.00	.00	.00	31.20	329800.00	56.04	.00	56.34	1.90	4.46	86899.22	239133.10
5.026	1482.00	.00	.00	10.60	65990.00	47.35	.00	47.44	1.52	2.43	27162.98	53468.23
5.026	1482.00	.00	.00	10.60	140170.00	50.62	.00	50.83	2.21	3.65	38415.29	94389.82
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80	114001.30
5.026	1482.00	.00	.00	10.60	328820.00	56.33	.00	56.73	2.70	5.26	90262.13	200060.90
5.027	1.00	58.25	52.50	10.60	65990.00	47.37	.00	47.45	1.29	2.27	29018.00	58007.03
5.027	1.00	58.25	52.50	10.60	140170.00	50.64	.00	50.83	2.13	3.52	39843.62	96085.80
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10	113789.00
* 5.027	1.00	58.25	52.50	10.60	328820.00	56.13	.00	56.93	17.23	7.14	46083.49	79215.25
5.034	47.00	58.25	52.50	10.60	65990.00	47.37	.00	47.45	1.29	2.27	29064.39	58155.61
5.034	47.00	58.25	52.50	10.60	140170.00	50.65	.00	50.84	2.12	3.51	39909.65	96337.66
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91	114058.80
5.034	47.00	58.25	52.50	10.60	328820.00	56.32	.00	57.03	16.05	6.89	60054.81	82066.36
5.035	1.00	.00	.00	10.60	65990.00	47.37	.00	47.46	1.51	2.42	27236.19	53705.04
5.035	1.00	.00	.00	10.60	140170.00	50.64	.00	50.85	2.19	3.64	38519.84	94810.41
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65	114454.10
* 5.035	1.00	.00	.00	10.60	328820.00	56.75	.00	57.13	2.46	5.10	94555.36	209609.70
5.037	8.00	.00	.00	10.60	65990.00	47.37	.00	47.46	1.51	2.42	27221.04	53656.03
5.037	8.00	.00	.00	10.60	140170.00	50.64	.00	50.85	2.19	3.64	38501.41	94736.23
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01	114382.20
5.037	8.00	.00	.00	10.60	328820.00	56.75	.00	57.13	2.46	5.10	94623.19	209760.40
5.038	1.00	58.25	52.50	10.60	65990.00	47.38	.00	47.46	1.29	2.27	29073.98	58186.32
5.038	1.00	58.25	52.50	10.60	140170.00	50.66	.00	50.86	2.11	3.51	39925.80	96399.34
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07	114128.10
* 5.038	1.00	58.25	52.50	10.60	328820.00	56.59	.00	57.30	16.05	6.89	60054.81	82066.34
5.045	47.00	58.25	52.50	10.60	65990.00	47.39	.00	47.47	1.28	2.27	29120.01	58333.93
5.045	47.00	58.25	52.50	10.60	140170.00	50.67	.00	50.87	2.10	3.51	39991.27	96649.34
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28	114395.70
5.045	47.00	58.25	52.50	10.60	328820.00	56.66	.00	57.37	16.05	6.89	60054.81	82066.34

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K

	5.046	1.00	.00	.00	10.60	65990.00	47.38	.00	47.47	1.50	2.42	27293.89	53892.00
	5.046	1.00	.00	.00	10.60	140170.00	50.66	.00	50.87	2.17	3.63	38604.85	95152.86
	5.046	1.00	.00	.00	10.60	173080.00	52.02	.00	52.27	2.27	4.00	43311.63	114830.20
*	5.046	1.00	.00	.00	10.60	328820.00	57.05	.00	57.41	2.31	4.99	97640.33	216481.70
*	5.585	2847.00	.00	.00	23.70	65680.00	47.97	.00	48.82	6.35	7.41	8863.75	26071.16
	5.585	2847.00	.00	.00	23.70	139080.00	51.35	.00	51.49	2.20	4.35	61632.32	93702.27
	5.585	2847.00	.00	.00	23.70	172610.00	52.75	.00	52.89	2.15	4.58	75558.88	117640.60
	5.585	2847.00	.00	.00	23.70	326970.00	57.86	.00	58.03	2.07	5.41	128717.80	227276.30
*	6.420	4409.00	.00	.00	28.40	65210.00	49.68	.00	49.74	1.38	2.87	36717.37	55569.43
	6.420	4409.00	.00	.00	28.40	137410.00	51.99	.00	52.12	2.05	3.98	53470.95	95997.91
	6.420	4409.00	.00	.00	28.40	171900.00	53.35	.00	53.49	1.90	4.09	63568.08	124651.70
	6.420	4409.00	.00	.00	28.40	324160.00	58.36	.00	58.53	1.55	4.48	103255.10	260639.20
	7.090	3538.00	.00	.00	30.10	64830.00	50.16	.00	50.22	1.69	2.53	47350.68	49925.34
	7.090	3538.00	.00	.00	30.10	136080.00	52.72	.00	52.87	2.74	3.89	66809.60	82239.73
	7.090	3538.00	.00	.00	30.10	171320.00	54.04	.00	54.22	2.82	4.28	79784.26	101980.40
	7.090	3538.00	.00	.00	30.10	321910.00	58.93	.00	59.17	2.63	5.22	147194.50	198624.20
	7.470	2006.00	.00	.00	29.00	64610.00	50.42	.00	50.57	1.95	4.26	35912.72	46282.00
	7.470	2006.00	.00	.00	29.00	135320.00	53.16	.00	53.41	3.20	6.09	58462.90	75633.51
	7.470	2006.00	.00	.00	29.00	171000.00	54.51	.00	54.78	3.35	6.53	70702.23	93486.55
	7.470	2006.00	.00	.00	29.00	320030.00	59.41	.00	59.67	3.19	7.41	129913.60	179159.60
	8.070	2891.14	.00	.00	27.90	64610.00	51.11	.00	51.38	3.62	4.80	33892.48	33953.98
	8.070	2891.14	.00	.00	27.90	135320.00	54.21	.00	54.70	5.45	6.90	54917.43	57955.69
	8.070	2891.14	.00	.00	27.90	171000.00	55.59	.00	56.15	5.83	7.57	64976.06	70827.95
*	8.070	2891.14	.00	.00	27.90	320030.00	60.36	.00	61.16	6.57	9.56	101223.30	124868.10
*	8.490	2374.28	.00	.00	35.80	63800.00	52.38	.00	52.97	9.03	7.31	20020.04	21230.17
*	8.490	2374.28	.00	.00	35.80	132480.00	55.89	.00	57.01	12.78	10.48	33893.66	37052.96
*	8.490	2374.28	.00	.00	35.80	169770.00	57.33	.00	58.62	13.73	11.57	42793.20	45822.95
*	8.490	2374.28	.00	.00	35.80	315820.00	62.11	.00	63.76	14.35	14.10	72655.89	83361.55
*	9.410	4858.00	.00	.00	35.50	63510.00	54.40	.00	54.55	2.06	4.25	35925.05	44294.69
*	9.410	4858.00	.00	.00	35.50	131460.00	58.74	.00	58.95	2.44	5.51	62229.36	84092.19
*	9.410	4858.00	.00	.00	35.50	169330.00	60.48	.00	60.72	2.63	6.06	74607.59	104332.60
*	9.410	4858.00	.00	.00	35.50	314100.00	65.82	.00	66.14	3.02	7.55	117228.60	180780.60
	10.580	6177.00	.00	.00	22.10	62850.00	55.41	.00	55.63	2.22	4.50	39047.84	42142.05
	10.580	6177.00	.00	.00	22.10	129130.00	59.84	.00	60.14	2.59	5.75	73596.31	80242.95
	10.580	6177.00	.00	.00	22.10	168330.00	61.63	.00	61.98	2.82	6.36	89822.48	100222.00
	10.580	6177.00	.00	.00	22.10	309220.00	67.04	.00	67.47	3.08	7.72	144446.10	176265.10
	10.860	1478.00	.00	.00	31.70	62690.00	55.72	.00	55.87	1.31	3.62	39808.99	54782.84
	10.860	1478.00	.00	.00	31.70	128570.00	60.15	.00	60.44	1.98	5.23	62747.29	91448.34
	10.860	1478.00	.00	.00	31.70	168090.00	61.96	.00	62.33	2.34	6.02	75225.93	109936.30
	10.860	1478.00	.00	.00	31.70	310160.00	67.36	.00	67.89	2.89	7.73	127798.40	182367.10

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	11.090	1214.00	.00	.00	31.80	62560.00	55.61	.00	56.42	5.89	7.47	13087.38	25782.81
*	11.090	1214.00	.00	.00	31.80	128120.00	60.38	.00	60.96	5.45	7.62	46536.60	54879.27
*	11.090	1214.00	.00	.00	31.80	167890.00	62.25	.00	62.89	5.56	8.24	57871.67	71230.84
	11.090	1214.00	.00	.00	31.80	308450.00	67.78	.00	68.45	5.10	9.37	109540.20	136563.60
*	11.350	1373.00	.00	.00	28.84	62410.00	56.79	.00	56.92	1.20	3.37	41353.79	56994.77
*	11.350	1373.00	.00	.00	28.84	127600.00	61.23	.00	61.49	1.84	4.95	65250.98	93971.19
*	11.350	1373.00	.00	.00	28.84	167670.00	63.13	.00	63.46	2.19	5.73	76574.88	113202.20
	11.350	1373.00	.00	.00	28.84	307570.00	68.55	.00	69.07	2.86	7.58	124445.10	181875.80
	11.380	1373.00	.00	.00	26.80	62410.00	56.94	.00	57.22	1.90	4.21	14833.43	45247.98
	11.380	1373.00	.00	.00	26.80	127600.00	61.40	.00	62.09	3.54	6.66	19150.31	67839.56
*	11.380	1373.00	.00	.00	26.80	167670.00	63.29	.00	64.27	4.73	7.96	21052.18	77118.96
	11.380	1373.00	.00	.00	26.80	307570.00	69.01	.00	69.58	3.16	7.41	121277.70	173132.60

11.390	50.00	68.30	67.20	26.80	62410.00	56.97	.00	57.24	1.89	4.20	14854.04	45349.30
11.390	50.00	68.30	67.20	26.80	127600.00	61.46	.00	62.14	3.51	6.64	19206.13	68116.86
11.390	50.00	68.30	67.20	26.80	167670.00	63.37	.00	64.35	4.68	7.93	21139.46	77498.98
11.390	50.00	68.30	67.20	26.80	307570.00	69.19	.00	69.74	3.05	7.32	123211.10	176147.50
11.400	50.00	.00	.00	28.84	62410.00	57.17	.00	57.29	1.09	3.27	42945.25	59743.99
* 11.400	50.00	.00	.00	28.84	127600.00	62.07	.00	62.29	1.56	4.67	70204.51	102189.70
* 11.400	50.00	.00	.00	28.84	167670.00	64.29	.00	64.57	1.77	5.33	83610.66	125865.50
11.400	50.00	.00	.00	28.84	307570.00	69.32	.00	69.78	2.52	7.25	132883.20	193840.00
11.480	370.00	.00	.00	20.73	62340.00	57.20	.00	57.34	.82	3.43	44988.41	68886.51
11.480	370.00	.00	.00	20.73	127340.00	62.11	.00	62.36	1.23	4.84	79671.61	114602.60
11.480	370.00	.00	.00	20.73	167560.00	64.35	.00	64.65	1.41	5.47	99095.23	140923.70
11.480	370.00	.00	.00	20.73	307140.00	69.43	.00	69.89	2.02	7.30	150502.30	215908.40
11.550	370.00	.00	.00	21.73	62300.00	57.23	.00	57.38	1.00	3.58	43564.19	62434.55
11.550	370.00	.00	.00	21.73	127200.00	62.16	.00	62.42	1.42	4.97	77303.70	106624.10
11.550	370.00	.00	.00	21.73	167500.00	64.41	.00	64.71	1.61	5.61	95357.38	132048.30
11.550	370.00	.00	.00	21.73	306900.00	69.51	.00	69.98	2.25	7.44	145941.00	204651.80
11.569	100.00	.00	.00	24.10	62300.00	57.23	.00	57.43	1.98	3.59	17358.28	44310.69
11.569	100.00	.00	.00	24.10	127200.00	62.15	.00	62.56	2.69	5.17	24625.06	77570.56
11.569	100.00	.00	.00	24.10	167500.00	64.38	.00	64.94	3.23	5.99	27962.86	93243.44
11.569	100.00	.00	.00	24.10	306900.00	69.57	.00	70.01	2.70	6.25	111539.20	186644.10
11.660	480.00	69.07	63.08	19.80	62300.00	57.23	.00	57.43	2.14	3.20	19442.47	42631.10
11.660	480.00	69.07	63.08	19.80	127200.00	62.15	.00	62.56	2.82	4.61	27588.59	75702.29
11.660	480.00	69.07	63.08	19.80	167500.00	64.92	.00	65.34	2.97	5.21	32119.42	97224.14
11.660	480.00	69.07	63.08	19.80	306900.00	70.47	.00	70.82	2.35	5.45	120177.00	200363.50
11.679	100.00	.00	.00	21.73	62300.00	57.32	.00	57.46	1.23	3.42	44092.23	56152.73
11.679	100.00	.00	.00	21.73	127200.00	62.42	.00	62.62	1.65	4.62	79184.65	99104.58
11.679	100.00	.00	.00	21.73	167500.00	65.20	.00	65.42	1.67	4.99	102611.70	129732.20
11.679	100.00	.00	.00	21.73	306900.00	70.52	.00	70.84	2.24	6.50	156273.80	204919.40

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
11.970	2118.00	.00	.00	31.72	62060.00	57.63	.00	57.77	1.12	3.73	51180.45	58535.73
11.970	2118.00	.00	.00	31.72	126360.00	62.86	.00	63.06	1.43	4.95	87700.20	105644.70
11.970	2118.00	.00	.00	31.72	167140.00	65.66	.00	65.89	1.48	5.41	109214.00	137486.30
11.970	2118.00	.00	.00	31.72	305490.00	71.15	.00	71.51	2.05	7.21	155193.70	213291.70

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
3.615	66800.00	46.66	.00	.00	.00	5842.35	.00
3.615	143300.00	49.57	2.91	.00	.00	6975.50	.00
3.615	174300.00	50.91	1.34	.00	.00	7174.17	.00
3.615	333600.00	54.90	3.99	.00	.00	8729.88	.00
4.745	66160.00	47.18	.00	.52	.00	4324.09	5966.00
4.745	140750.00	50.39	3.21	.82	.00	5217.94	5966.00
4.745	173330.00	51.74	1.35	.83	.00	5551.63	5966.00
4.745	329800.00	56.04	4.30	1.14	.00	7484.51	5966.00
5.026	65990.00	47.35	.00	.17	.00	3418.36	1482.00
5.026	140170.00	50.62	3.27	.23	.00	3466.05	1482.00

	5.026	173080.00	51.97	1.35	.23	.00	3485.50	1482.00
	5.026	328820.00	56.33	4.36	.29	.00	9976.62	1482.00
	5.027	65990.00	47.37	.00	.01	.00	3293.66	1.00
	5.027	140170.00	50.64	3.27	.02	.00	3326.05	1.00
	5.027	173080.00	51.99	1.35	.02	.00	3340.00	1.00
*	5.027	328820.00	56.13	4.14	-.19	.00	3468.03	1.00
	5.034	65990.00	47.37	.00	.01	.00	3293.80	47.00
	5.034	140170.00	50.65	3.28	.01	.00	3326.26	47.00
	5.034	173080.00	52.00	1.35	.01	.00	3340.21	47.00
	5.034	328820.00	56.32	4.31	.18	.00	10474.94	47.00
	5.035	65990.00	47.37	.00	-.01	.00	3418.70	1.00
	5.035	140170.00	50.64	3.28	-.01	.00	3466.48	1.00
	5.035	173080.00	52.00	1.35	-.01	.00	3485.93	1.00
*	5.035	328820.00	56.75	4.76	.44	.00	10251.18	1.00
	5.037	65990.00	47.37	.00	.00	.00	3418.63	8.00
	5.037	140170.00	50.64	3.28	.00	.00	3466.41	8.00
	5.037	173080.00	52.00	1.35	.00	.00	3485.87	8.00
	5.037	328820.00	56.75	4.76	.00	.00	10255.46	8.00
	5.038	65990.00	47.38	.00	.01	.00	3293.83	1.00
	5.038	140170.00	50.66	3.28	.02	.00	3326.31	1.00
	5.038	173080.00	52.02	1.35	.02	.00	3340.26	1.00
*	5.038	328820.00	56.59	4.57	-.17	.00	10614.53	1.00
	5.045	65990.00	47.39	.00	.01	.00	3293.97	47.00
	5.045	140170.00	50.67	3.29	.01	.00	3326.51	47.00
	5.045	173080.00	52.03	1.35	.01	.00	3340.47	47.00
	5.045	328820.00	56.66	4.63	.08	.00	10653.30	47.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	5.046	65990.00	47.38	.00	-.01	.00	3418.96	1.00
	5.046	140170.00	50.66	3.28	-.01	.00	3466.84	1.00
	5.046	173080.00	52.02	1.35	-.01	.00	3486.29	1.00
*	5.046	328820.00	57.05	5.03	.39	.00	10444.39	1.00
*	5.585	65680.00	47.97	.00	.58	.00	609.67	2847.00
	5.585	139080.00	51.35	3.38	.69	.00	9772.60	2847.00
	5.585	172610.00	52.75	1.40	.73	.00	10056.46	2847.00
	5.585	326970.00	57.86	5.11	.81	.00	10852.17	2847.00
*	6.420	65210.00	49.68	.00	1.71	.00	7043.26	4409.00
	6.420	137410.00	51.99	2.32	.64	.00	7372.54	4409.00
	6.420	171900.00	53.35	1.36	.60	.00	7514.78	4409.00
	6.420	324160.00	58.36	5.01	.50	.00	8701.29	4409.00
	7.090	64830.00	50.16	.00	.48	.00	7380.76	3538.00
	7.090	136080.00	52.72	2.56	.72	.00	7846.24	3538.00
	7.090	171320.00	54.04	1.33	.70	.00	11263.75	3538.00
	7.090	321910.00	58.93	4.89	.57	.00	16555.20	3538.00
	7.470	64610.00	50.42	.00	.26	.00	7474.41	2006.00
	7.470	135320.00	53.16	2.74	.44	.00	8606.81	2006.00
	7.470	171000.00	54.51	1.35	.47	.00	9318.83	2006.00
	7.470	320030.00	59.41	4.90	.48	.00	13548.95	2006.00
	8.070	64610.00	51.11	.00	.68	.00	6579.98	2891.14
	8.070	135320.00	54.21	3.10	1.04	.00	7065.01	2891.14
	8.070	171000.00	55.59	1.38	1.07	.00	7306.78	2891.14
*	8.070	320030.00	60.36	4.77	.95	.00	8225.06	2891.14
*	8.490	63800.00	52.38	.00	1.27	.00	2848.30	2374.28

*	8.490	132480.00	55.89	3.51	1.69	.00	6163.83	2374.28
*	8.490	169770.00	57.33	1.44	1.75	.00	6189.80	2374.28
*	8.490	315820.00	62.11	4.78	1.75	.00	6329.49	2374.28
*	9.410	63510.00	54.40	.00	2.02	.00	5247.10	4858.00
*	9.410	131460.00	58.74	4.35	2.85	.00	7089.26	4858.00
*	9.410	169330.00	60.48	1.74	3.15	.00	7128.50	4858.00
*	9.410	314100.00	65.82	5.33	3.71	.00	9116.08	4858.00
	10.580	62850.00	55.41	.00	1.01	.00	7357.44	6177.00
	10.580	129130.00	59.84	4.43	1.09	.00	8822.32	6177.00
	10.580	168330.00	61.63	1.80	1.15	.00	9129.64	6177.00
	10.580	309220.00	67.04	5.41	1.22	.00	10628.25	6177.00
	10.860	62690.00	55.72	.00	.31	.00	4439.52	1478.00
	10.860	128570.00	60.15	4.44	.32	.00	6830.96	1478.00
	10.860	168090.00	61.96	1.81	.33	.00	7027.36	1478.00
	10.860	310160.00	67.36	5.40	.32	.00	10117.98	1478.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	11.090	62560.00	55.61	.00	-.11	.00	2972.72	1214.00	
*	11.090	128120.00	60.38	4.77	.22	.00	6000.31	1214.00	
*	11.090	167890.00	62.25	1.87	.29	.00	6101.18	1214.00	
	11.090	308450.00	67.78	5.53	.42	.00	10644.62	1214.00	
*	11.350	62410.00	56.79	.00	1.19	.00	4147.62	1373.00	
*	11.350	127600.00	61.23	4.44	.86	.00	5914.26	1373.00	
*	11.350	167670.00	63.13	1.90	.88	.00	6011.37	1373.00	
	11.350	307570.00	68.55	5.42	.77	.00	11056.90	1373.00	
	11.380	62410.00	56.94	.00	.15	.00	958.22	1373.00	
	11.380	127600.00	61.40	4.45	.17	.00	986.90	1373.00	
*	11.380	167670.00	63.29	1.89	.16	.00	1031.99	1373.00	
	11.380	307570.00	69.01	5.72	.46	.00	10601.59	1373.00	
	11.390	62410.00	56.97	.00	.02	.00	958.33	50.00	
	11.390	127600.00	61.46	4.49	.06	.00	988.04	50.00	
	11.390	167670.00	63.37	1.92	.08	.00	1035.10	50.00	
	11.390	307570.00	69.19	5.82	.18	.00	10610.67	50.00	
	11.400	62410.00	57.17	.00	.21	.00	4162.42	50.00	
*	11.400	127600.00	62.07	4.89	.61	.00	5956.93	50.00	
*	11.400	167670.00	64.29	2.22	.92	.00	6206.81	50.00	
	11.400	307570.00	69.32	5.02	.12	.00	11083.03	50.00	
	11.480	62340.00	57.20	.00	.02	.00	6350.49	370.00	
	11.480	127340.00	62.11	4.92	.05	.00	7726.66	370.00	
	11.480	167560.00	64.35	2.24	.06	.00	9517.14	370.00	
	11.480	307140.00	69.43	5.08	.12	.00	10367.99	370.00	
	11.550	62300.00	57.23	.00	.03	.00	5992.14	370.00	
	11.550	127200.00	62.16	4.93	.05	.00	7458.99	370.00	
	11.550	167500.00	64.41	2.25	.06	.00	8872.30	370.00	
	11.550	306900.00	69.51	5.10	.08	.00	10311.17	370.00	
	11.569	62300.00	57.23	.00	.01	.00	1470.10	100.00	
	11.569	127200.00	62.15	4.92	-.01	.00	1489.83	100.00	
	11.569	167500.00	64.38	2.23	-.03	.00	1501.44	100.00	
	11.569	306900.00	69.57	5.18	.05	.00	9464.33	100.00	
	11.660	62300.00	57.23	.00	.00	.00	1639.63	480.00	
	11.660	127200.00	62.15	4.92	.00	.00	1659.92	480.00	
	11.660	167500.00	64.92	2.77	.54	.00	1665.64	480.00	
	11.660	306900.00	70.47	5.55	.91	.00	9291.50	480.00	

11.679	62300.00	57.32	.00	.09	.00	6030.15	100.00
11.679	127200.00	62.42	5.09	.26	.00	7698.69	100.00
11.679	167500.00	65.20	2.79	.28	.00	9432.45	100.00
11.679	306900.00	70.52	5.32	.05	.00	10397.45	100.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
11.970	62060.00	57.63	.00	.31	.00	6398.18	2118.00
11.970	126360.00	62.86	5.22	.44	.00	7324.74	2118.00
11.970	167140.00	65.66	2.80	.46	.00	7960.55	2118.00
11.970	305490.00	71.15	5.49	.63	.00	8670.87	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 5.027 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.035 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.038 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.046 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.585 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.420 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.070 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 8.490 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 8.490 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 8.490 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 9.410 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 9.410 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 9.410 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.090 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.090 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.350 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.350 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 11.400 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Lake Houston (FEMA Reach 2; TWDB 1995 Lake Survey)

```
1*********************************************                        ***************************************
 * HEC-2 WATER SURFACE PROFILES        *                                   * U.S. ARMY CORPS OF
ENGINEERS    *
 *                              *                          * HYDROLOGIC ENGINEERING CENTER    *
 * Version  4.6.2;  May 1991          *                                * 609 SECOND STREET, SUITE D
 *
 *                              *                          * DAVIS, CALIFORNIA 95616-4687     *
 * RUN DATE   28FEB00   TIME   09:37:31  *                          *        (916) 756-1104
 *
 *********************************************                        ***************************************
```

LKHOUR2.oh2 for Reach 2 – Lake Houston (TWDB 199[illegible] Data; with add'tl section data u/s 1960 from TWDB lake survey database via internet)

```
                    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
1
  28FEB00     09:37:31                                                PAGE   1
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                                                     THIS RUN EXECUTED 28FEB00    09:37:31
 ***************************************
  HEC-2 WATER SURFACE PROFILES

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


 T1     LAKE HOUSTON..........................HARRIS COUNTY FLOOD INSURANCE STUDY
 T2     G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
 T3     FILENAME:G1030FH2.IH2............10 YR FREQUENCY........JJS.....12/10/96

 J1 ICHECK   INQ     NINV    IDIR    STRT    METRIC   HVINS    Q      WSEL    FQ

      0       2                                 46.3

 J2 NPROF    IPLOT    PRFVS    XSECV    XSECH    FN     ALLDC    IBW     CHNIM    ITRACE

     1           -1


 J3 VARIABLE CODES FOR SUMMARY PRINTOUT

    38        7       25        1
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J6 IHLEQ    ICOPY    SUBDIV   STRTDS    RMILE

    1


NC     .12      .12      .03      .1       .3
QT      6     82400   180200   246100    409900    246100    246100
X1   .0102      62    20000    29500       0         0         0         0         0         0
GR     55     19790      50    19900     40.6     20000      24.6     20300     20.6     20560
GR    25.6    21050     23.1    21460     24.1     21625      19.7     21875     21.3     23075
GR    18.3    23500     19.6    23750     15.9     24000      18.6     24125     16.6     24250
GR    18.8    24450     12.4    24670     15.1     24760      16.6     24771     14.1     24875
GR    11.6    25000     12.4    25250     14.4     25271      14.1     25437     16.1     25469
GR    18.1    25563     20.1    25688     22.1     25793       21      25803     19.6     25876
GR    25.6    25938     10.6    26001      8.6     26063      -3.2     26299    13.85     26438
GR    15.6    26493     16.1    26563     18.6     26750      12.6     26938     19.1     27000
GR    22.9    27063     23.1    27125     24.9     27188      26.1     27375      25      27500
GR    23.9    27625     24.4    27730     24.4     27813      23.6     27938     24.6     28095
GR    29.9    28313     30.1    28433     29.9     28501      29.6     28563     30.1     28751
GR    29.9    28876     30.6    29013     31.6     29063      31.4     29113     40.6     29500
GR    52.3    29600      55     34310

QT      6     82402   180199   246099    409897    246099    246099
X1   .0196      62    20000    29500      50        50        50
GR     55     19790      50    19900     40.6     20000      24.6     20300     20.6     20560
GR    25.6    21050     23.1    21460     24.1     21625      19.7     21875     21.3     23075
GR    18.3    23500     19.6    23750     15.9     24000      18.6     24125     16.6     24250
GR    18.8    24450     12.4    24670     15.1     24760      16.6     24771     14.1     24875
GR    11.6    25000     12.4    25250     14.4     25271      14.1     25437     16.1     25469
GR    18.1    25563     20.1    25688     22.1     25793       21      25803     19.6     25876
GR    25.6    25938     10.6    26001      8.6     26063      -3.2     26299    13.85     26438
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GR    15.6    26493     16.1    26563     18.6     26750      12.6     26938     19.1     27000
GR    22.9    27063     23.1    27125     24.9     27188      26.1     27375      25      27500
GR    23.9    27625     24.4    27730     24.4     27813      23.6     27938     24.6     28095
GR    29.9    28313     30.1    28433     29.9     28501      29.6     28563     30.1     28751
GR    29.9    28876     30.6    29013     31.6     29063      31.4     29113     40.6     29500
GR    52.3    29600      55     34310

NC     .12      .12      .03      .1       .3
QT      6     82516   180193   246064    409784    246064    246064
X1     .47      62    20000    29500     2000      1000      2428
GR     55     19790      50    19900     40.6     20000      24.6     20300     20.6     20560
GR    25.6    21050     23.1    21460     24.1     21625      19.7     21875     21.3     23075
GR    18.3    23500     19.6    23750     15.9     24000      18.6     24125     16.6     24250
GR    18.8    24450     12.4    24670     15.1     24760      16.6     24771     14.1     24875
GR    11.6    25000     12.4    25250     14.4     25271      14.1     25437     16.1     25469
GR    18.1    25563     20.1    25688     22.1     25793       21      25803     19.6     25876
GR    25.6    25938     10.6    26001      8.6     26063      -3.2     26299    13.85     26438
GR    15.6    26493     16.1    26563     18.6     26750      12.6     26938     19.1     27000
GR    22.9    27063     23.1    27125     24.9     27188      26.1     27375      25      27500
GR    23.9    27625     24.4    27730     24.4     27813      23.6     27938     24.6     28095
GR    29.9    28313     30.1    28433     29.9     28501      29.6     28563     30.1     28751
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GR   29.9   28876   30.6   29013   31.6   29063   31.4   29113   40.6   29500
GR   52.3   29600   55     34310

NC   .11    .11     .03    .1      .3
QT   6      82678   180183 246013  409622 246013  246013
X1   1.11   69      20000  27900   3200   3000    3379
GR   55     19900   50.9   20000   38.6   20100   14.6   20200   10.6   20300
GR   9      20400   10.6   20480   10.5   20510   12.4   20750   8.6    20900
GR   7.6    21030   9      21050   8.3    21130   3.6    21250   8.6    21300
GR   21.6   21400   16.6   21500   17.1   21550   14.6   21600   11.6   21800
GR   18.6   22100   20.6   22140   22.1   22200   22.8   22330   21.6   22500
GR   21.4   22700   20.4   22830   19.6   23000   17     23200   17     23300
GR   17     23430   16.3   23590   16     23720   15.6   23800   16.1   23900
GR   16.6   24000   16.4   24100   14.8   24230   15.6   24280   15.6   24320
GR   14.8   24330   16.1   24340   16.5   24500   20.6   24750   21.8   24820
GR   23.3   24990   21.8   25000   20.1   25140   21.8   25300   20.6   25400
GR   21.3   25610   20.6   25990   21.1   26100   22.3   26150   21.6   26300
GR   22.5   26400   32.1   26740   32.1   26900   31.6   26920   33.1   27120
GR   35.5   27400   35.5   27500   38.6   27700   40.8   27900   42.1   28360
GR   43.4   28363   44.2   28375   50     28500   55     32250

NC   .11    .11     .03    .1      .3
QT   6      82900   180169 245944  409400 245944  245944
X1   1.99   56      20000  27198   3850   6150    4646
GR   55     19610   50     19850   40.6   20000   38.6   20040   22.3   20150
GR   21.1   20500   19.1   20590   17.1   20700   15.3   20790   15.6   20820
GR   14.8   20900   14.8   20990   15.6   21050   15.6   21150   10.6   21350
GR   8.6    21500   7.6    21590   4.4    21750   8.6    21790   18.6   21800
GR   22.6   21840   24.4   21870   24.4   21980   22.6   21990   18.7   22100
GR   22.6   22190   26.1   22250   26.1   22350   24.6   22480   23.6   22590
GR   23.6   22610   24.4   22790   24.6   22830   27.8   23390   29.1   23430
GR   27.8   23590   27.1   23600   27.8   23620   25.2   23990   22.6   24150
GR   22.6   24380   23.2   24880   23.5   24990   22.4   25380   19.8   25500
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GR   20.6   25640   19.6   25790   19.5   25990   21.8   26590   20.5   26700
GR   22.4   26750   22.4   26800   30.6   26980   40.6   27198   50     27250
GR   55     27350

QT   6      83003   180162 245912  409297 245912  245912
X1   2.40   50      20000  27114   400    5000    2165
GR   55     19810   50     19900   40.6   20000   36.6   20100   30.6   20200
GR   29.8   20250   30.6   20300   31.5   20350   31.5   20575   30.0   20675
GR   30.8   20775   30.6   20800   31.8   21000   32.5   21120   30.6   21200
GR   26.8   21400   24.1   21520   16.6   21630   14.6   21800   16.1   21950
GR   15.6   22000   16.1   22050   14.6   22090   13.1   22200   13.6   22400
GR   13.6   22700   11.6   22800   16.1   22850   14.8   22880   15.4   23000
GR   9      23200   4.6    23400   14.6   23550   16.9   23590   20.8   23600
GR   25.1   23650   20.1   24200   24.5   24650   23.1   24775   23.8   24800
GR   23.8   24950   22.8   25000   21.8   25800   22.8   26200   23.6   26400
GR   24.6   26565   34.0   26800   38.6   26950   40.6   27114   55     27250

NC   .11    .11     .03    .1      .3
QT   6      83066   180158 245892  409234 245892  245892
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X1   2.65     33   20000   26332     400    1650    1320
GR     55  19800      50   19900    40.6   20000    32.6   20250     7.6   20450
GR    5.5  20490    14.6   21100    17.1   21120    16.8   21180    28.4   21300
GR   28.4  21650    24.4   22150    24.5   22250    28.6   22400    31.6   22850
GR   33.1  23200    34.1   23600    31.6   23890    33.6   24050    33.1   24160
GR     32  24250    32.6   24375    34.6   24490    31.6   24650    34.1   24760
GR   33.6  25000    31.6   25120    31.5   25420    32.6   25470    32.6   25700
GR   36.6  25850      41   26332      55   26410

NC    .11    .11     .03      .1      .3
QT      6  83394  180138  245789  408906  245789  245789
X1   3.95     51   20000   25799    5700    7500    6864
GR     60  19850      55   19900      50   19950    40.6   20000    23.1   20490
GR   24.8  20550    27.6   20790    21.8   20960    17.6   21120    20.2   21175
GR   21.8  21275    19.1   21350    20.2   21475    13.1   21575    17.9   21650
GR   12.6  21850     8.3   21950    12.6   22150    24.1   22290    23.6   22490
GR   20.2  22550      22   22640    17.6   22750      24   22900      24   23150
GR     25  23250      25   23550    22.6   23600    23.6   23690      24   23850
GR   20.6  23930    20.5   24000    22.5   24100    22.5   24150    21.6   24200
GR   21.6  24250      24   24300     8.6   24450     5.6   24590    16.6   24750
GR    9.6  24900    21.6   25000    21.6   25050    20.9   25100    28.6   25240
GR     24  25290    26.1   25350    34.6   25500    41.1   25799      55   25900
GR     60  26100

QT      6  83505  180131  245755  408795  245755  245755
X1   4.39     31   20000   27221    1000    3350    2323
GR     60  19550      55   19800      50   19950    40.6   20000    32.6   20200
GR   27.6  20340    25.6   20450    26.6   20630    25.6   21000    28.9   22400
GR   22.1  22650    26.3   23200    24.8   23310    28.1   23680    26.4   23930
GR   29.6  24500    18.5   24820    24.6   25150    14.6   25250     5.6   25475
GR   28.8  25650    28.6   25840    25.2   26000    20.8   26050    22.8   26120
GR   21.8  26200    26.6   26300    27.6   26600    40.6   27221      55   27400
GR     60  29600
1
  28FEB00   09:37:31                                           PAGE   4


QT      6  83740  180116  245681  408560  245681  245681
X1   5.32     48   20000   25209    6850    4500    4910
GR     60  18390      55   19500      50   19800    40.6   20000    28.6   20225
GR   27.8  20300   28.50   20450    25.6   20600    22.4   20635    22.4   20665
GR   25.6  20700      23   20800    25.4   20825    25.4   20875    22.6   21100
GR     23  21350    21.6   21400    23.4   21440    21.4   21450    22.9   21840
GR   25.6  21890    25.6   22060    24.4   22070    22.6   22180    23.6   22200
GR   17.6  22230    22.6   22340    22.1   22440    20.1   22450    16.6   22660
GR   17.1  22775    15.6   22800     9.4   23040    25.6   23200    29.6   23400
GR   29.6  23675    30.5   23750    27.4   23900    26.4   24120    24.1   24275
GR   28.6  24545    26.1   24575    30.6   24700    35.6   24775      36   24865
GR   41.6  25209      55   25250      60   25300

NC    .11    .11     .03      .1      .3
QT      6  83856  180109  245645  408444  245645  245645
X1   5.78     35   20000   24218    7000    4000    2429
GR     60  19600      55   19800    40.8   20000    31.6   20300    30.1   20450
GR     28  20500      31   20725      31   20850      28   20950    24.7   21025
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GR   18.1   21050   18.6   21300   15.2   21340   18.6   21375   12.9   21450
GR   11.3   21550   12.6   21575   12.6   21610   13.9   21640   25.1   21775
GR   21.6   21860   21.3   22125   21.6   22175   21.1   22325   17.4   22400
GR   17.5   22450   29.6   22650   27.4   23150   25.6   23200   20.8   23300
GR   22.8   23350   23.6   23450   41.1   24218     55   24250     60   24330

QT      6   83876  180108  245639  408424  245639  245639
X1   5.86      50   20000   23920    4500     500     422
GR     55   18900   56.3   20000   56.1   20001   52.6   20019   51.9   20023
GR   48.8   20038   46.3   20057   42.9   20067   41.9   20076   41.4   20095
GR   40.4   20114   39.4   20138   38.4   20162   35.5   20186   33.5   20210
GR   26.9   20234   24.4   20255   23.9   20275   22.9   20295   31.6   20300
GR   30.1   20450     28   20500     31   20725     31   20850     28   20950
GR   24.7   21025   18.1   21050   18.6   21300   15.2   21340   18.6   21375
GR   12.9   21450   11.3   21550   12.6   21575   12.6   21610   13.9   21640
GR   25.1   21775   21.6   21860   21.3   22125   21.6   22175   21.1   22325
GR   17.4   22400   17.5   22450   29.6   22650   27.4   23150   25.6   23200
GR   20.8   23300   22.8   23350   23.6   23450   56.3   23920     55   24090

NC    .11     .11     .03      .3      .5
QT      6   83881  180107  245637  408419  245637  245637
X1   5.88       0   20000   23920     100     100     100
X3     10                                    56.3    56.3

SB   1.05     1.5     2.5          716.60  323.41  100542   31.77     1.5     1.5
QT      6   83883  180107  245637  408417  245637  245637
X1  5.887       0   20000   23920      37      37      37
X2                      1    51.9    56.3
X3     10                                    56.3    56.3
BT      6   18900      55      55   20000    56.3    56.3   20023    56.3    51.9
BT  23900    56.3    51.9   23920    56.3    56.3   24090      55      55
1
  28FEB00    09:37:31                                           PAGE    5


NC    .11     .11     .03      .1      .3
QT      6   83888  180106  245635  408411  245635  245635
X1  5.907       0   20000   23920     100     100     100

QT      6   84000  180100  245600  408300  245600  245600
X1   6.35      32   20000   28695    1900    3800    2339
GR     60   19810     55   19999   41.1   20000   29.6   20700   30.6   21150
GR   34.4   21700   26.6   21950   34.4   22250     37   22420   32.6   23000
GR   29.6   23500   20.6   23720   19.5   23940   20.3   24000   14.6   24083
GR   12.8   24200   21.5   24450   19.1   24500   22.3   24580   21.5   24667
GR   26.6   24975   28.6   26050   35.6   26563   36.4   27030   33.8   27250
GR   34.4   27558   30.6   28000   31.1   28070   29.6   28695     50   28750
GR     55   28900     60   29350

QT      6   79457  170236  229864  388397  229864  229864
X1   6.99      51   20050   28300    3500    3400    3379
GR     65   18650     60   19600     55   19800     50   19950   46.1   20000
GR     45   20030   41.1   20050   34.6   20500   31.6   20900   29.6   21300
GR   30.9   21850   30.6   22120     13   22280   22.2   22400     22   22450
GR   24.1   22475     23   22600   28.3   22800   27.1   22900   29.5   23090
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GR   29.4   23095   31.9   23520   29.6   23650   31.4   24050   29.6   24400
GR   30.3   24880   28.6   24890   29.9   24900   17.5   25080   15.2   25400
GR   30.1   25900   28.6   25920     30   25950   27.8   26100   28.6   26200
GR   31.6   26350   30.1   26500   31.3   26550   28.1   26625   29.9   26825
GR   28.1   26900   28.6   27000   31.6   27200   31.1   27300   32.3   27400
GR   30.1   27900   40.2   28300     50   28500     55   29700     60   30000
GR     65   32700

QT      6   76760  164380  220520  376580  220520  220520
X1   7.37      36   19650   27850    3500    1400    2006
GR     65   18310     60   19650     50   19900   58.6   20000   57.6   20000
GR   37.6   20100   38.3   20140   28.7   20290   31.5   20330   23.5   20510
GR     15   20712   24.9   20790     23   21000   24.6   21120   24.3   21180
GR   25.1   21200   24.6   21290   57.1   21308   57.1   21326   58.6   21326
GR   58.6   21350   58.6   25650   58.6   25700   57.6   25700   56.8   25725
GR     15   26412   28.8   26650     26   26700   25.6   26750   26.6   26770
GR   18.6   26900   57.6   27026   58.6   27026     50   27800     55   27850
GR     60   28000     65   28800

NC    .11     .11    .03      .3      .5
X1  7.379       0   20000   27026      50      50      50
X3     10                                              58.6    58.6

X1 7.3791      42   20000   27026       1       1       1
X2
X3     10                                              58.6    58.6
BT     12   18310     65      65   19650      60      60   19900      50      50
BT  20000    58.6   57.6   21326    58.6    57.6   25650    58.6    58.6   25700
BT   58.6    57.6  27026    58.6    57.6   27800      50      50   27850      55
BT     55   28000     60      60   28800      65      65
GR     65   18310     60   19650     50   19900   58.6   20000   57.6   20000
GR   37.6   20100   38.3   20140   28.7   20290   31.5   20330   23.5   20510
GR     15   20712   57.6   20712   57.6   20724     15   20724   24.9   20790
1
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GR     23   21000   24.6   21120   24.3   21180   25.1   21200   24.6   21290
GR   57.1   21308   57.6   21326   58.6   21326   58.6   25650   58.6   25700
GR   57.6   25700   58.6   25725     15   26412   57.6   26412   57.6   26424
GR     15   26424   28.8   26650     26   26700   25.6   26750   26.6   26770
GR   18.6   26900   57.6   27026   58.6   27026     50   27800     55   27850
GR     60   28000     65   28800

X1 7.3838       0   20000   27026      25      25      25
X2
X3     10                                              58.6    58.6
BT     12   18310     65      65   19650      60      60   19900      50      50
BT  20000    58.6   57.6   21326    58.6    57.6   25650    58.6    58.6   25700
BT   58.6    57.6  27026    58.6    57.6   27800      50      50   27850      55
BT     55   28000     60      60   28800      65      65

NC    .11     .11    .03      .1      .3
X1 7.3932      36   20000   27026      50      50      50
X3     10                                              58.6    58.6
GR     65   18310     60   19650     50   19900   58.6   20000   57.6   20000
```

```
GR   37.6   20100   38.3   20140   28.7   20290   31.5   20330   23.5   20510
GR     15   20712   24.9   20790     23   21000   24.6   21120   24.3   21180
GR   25.1   21200   24.6   21290   57.1   21308   57.1   21326   58.6   21326
GR   58.6   21350   58.6   25650   58.6   25700   57.6   25700   58.6   25725
GR     15   26412   28.8   26650     26   26700   25.6   26750   26.6   26770
GR   18.6   26900   57.6   27026   58.6   27026     50   27800     55   27850
GR     60   28000     65   28800

QT      6   76526  163871  219709  375554  219709  219709
X1 7.4026       0   20000   27026      50      50      50

NC    .11     .11     .03      .1      .3
X1   7.44      90  288.17  8626.8     215     215     215
GR     60       0      60  157.55      58  288.17      54  404.14      50  490.42
GR     46   538.7      44   571.4      42  597.77      42  597.78      42  597.79
GR   29.6  683.85    27.6   844.4    27.6  907.68    29.6 1076.54    25.6 1102.52
GR   21.6 1155.82    20.6 1207.78    18.6 1278.23    17.6 1294.06    17.6 1322.42
GR   20.6 1335.35    22.6 1354.87    22.6 1433.02    21.6 1492.91    17.6 1583.87
GR   17.6 1637.79    18.6 1745.25    19.6 1765.13    22.6 1780.23    23.6 1798.41
GR   23.6 1854.48    22.6 1905.39    21.6 2202.14    22.6 2423.73    23.6 2523.95
GR   25.6 2652.91    26.6 2771.96    27.6 2855.68    29.6 2910.96    30.6  2984.7
GR   31.6    3121    31.6 3445.45    30.6 3520.23    30.6 3584.43    31.6 3651.02
GR   32.6 3918.06    33.6 4022.21    34.6  4090.8    34.6 4347.29    35.6 4454.93
GR   35.6 4545.93    34.6 4619.78    33.6 4732.57    32.6 4759.42    32.6 4803.28
GR   30.6  4871.8    30.6 4887.73    29.6 5406.62    28.6 5650.97    28.6 5748.58
GR   30.6    5783    30.6 5923.76    32.6  6041.6    31.6 6106.82    30.6 6143.78
GR   27.6 6188.13    26.6 6316.32    26.6 6499.01    24.6 6521.64    22.6 6630.29
GR   21.6  6638.3    18.6  6691.9    18.6 6740.55    21.6 6926.11    23.6 7094.01
GR   23.6 7191.49    22.6 7318.64    25.6 7437.12    26.6 7521.89    27.6 7666.68
GR   28.6 7863.44    31.6 7945.03    34.6 8061.17    35.6 8125.75    36.6 8139.14
GR     42 8491.74      44 8523.89      50 8580.37      52  8626.8      60  8772.3
```



```
NC   0.11    0.11    0.03     0.1     0.3
QT      6   75056  160681  214619  369116  214619  214619
X1   7.61      30   20000   28625    1280     562     880
GR     60   19450      55   19550      50   19720      45   19900      40   19950
GR   41.2   20000    27.3   20292    28.4   20725    26.9   20750    20.9   20790
GR   19.5   20975    27.6   21250    28.1   21625    24.1   21650    34.6   22000
GR   41.6   22200    41.6   22355    36.2   23780    38.6   24025    40.6   24920
GR   39.4   25170    39.6   25270    33.4   25725    28.1   26330    27.8   26917
GR   30.9   27700    26.4   27730    24.1   27920    40.6   28625      60   28650

X1   7.76      90     771 9836.14     850     800     820
GR     62       0      62  489.26      60  692.24      58     771      56  834.79
GR     54  853.86      50  904.39      44 1003.91      42 1016.08    37.6 1084.32
GR   34.6 1111.99    30.6 1137.07    30.6 1153.38    32.6 1179.64    32.6 1207.07
GR   28.6 1307.23    27.6 1341.56    23.6 1385.86    23.6 1432.49    24.6 1476.77
GR   24.6 1951.16    23.6 2064.42    19.6 2142.98    18.6 2169.23    18.6 2267.16
GR   19.6  2310.8    20.6 2379.51    20.6 2415.42    22.6 2486.57    24.6 2522.73
GR   28.6 2702.12    36.6 2738.89    36.6  3063.8    35.6 3134.15    35.6 3511.39
GR   36.6 3902.11    37.6 3938.96    38.6 4169.32    38.6 4408.28    37.6 4593.59
GR   36.6 4704.59    35.6 4771.45    35.6 4823.96    36.6 4877.86    36.6 4962.19
```

GR	34.6	5096.4	33.6	5200.6	33.6	5225.77	34.6	5318.5	34.6	5421.72
GR	33.6	5503.25	32.6	5725.49	33.6	5841.58	35.6	5949.58	37.6	6028.99
GR	38.6	6685.89	38.6	6916.53	37.6	6935.31	33.6	6967.93	33.6	7064.54
GR	34.6	7149.29	36.6	7216.18	36.6	7267.72	34.6	7318.26	31.6	7462.61
GR	29.6	7513.65	24.6	7662.68	23.6	7728.3	22.6	7866.81	21.6	8042.58
GR	21.6	8265.65	23.6	8385.69	26.6	8411.89	28.6	8458.17	28.6	8502.6
GR	29.6	8539.72	29.6	8610.67	28.6	8716.35	29.6	8812.57	30.6	8958.68
GR	32.6	9102.53	32.6	9289.83	33.6	9306.53	35.6	9311.9	36.6	9397.53
GR	37.6	9442.2	50	9592.67	60	9836.14	70	12158.31	70	12225.01

X1	8.18	90	0	10131.28	2044	2141	2196			
GR	62	0	58	123.67	52	282.94	50	321.61	46	441.7
GR	44	571.84	42	589.79	42	593.39	33.6	633.46	31.6	775.49
GR	29.6	855.4	28.6	916.54	28.6	1018.47	26.6	1059.95	26.6	1186.1
GR	27.6	1217.35	27.6	1403.32	23.6	1469.29	18.6	1520.89	16.6	1574.93
GR	16.6	1636.4	20.6	1679.92	26.6	1732.64	25.6	1781.4	25.6	1838.17
GR	23.6	1899.9	22.6	1983.03	22.6	2029.11	27.6	2383.07	29.6	2442.35
GR	31.6	2558.94	33.6	2641.9	34.6	2767.24	34.6	2895.38	33.6	3086.86
GR	32.6	3149.65	32.6	3348.49	33.6	3418.1	35.6	3506.3	35.6	3958.66
GR	35.6	4123.51	34.6	4223.84	34.6	4323.83	35.6	4468.25	36.6	4520.54
GR	37.6	4533.46	39.6	4687	39.6	4806.62	38.6	5470.77	36.6	5861.13
GR	36.6	6288.59	36.6	6508.12	35.6	6711.54	34.6	6830.72	34.6	6905.04
GR	33.6	7117.63	33.6	7452.66	30.6	7500.66	25.6	7546.39	23.6	7582.5
GR	23.6	7697.6	25.6	7890.71	25.6	7945.46	26.6	8014.74	27.6	8134.1
GR	27.6	8468.81	26.6	8519	26.6	8658.6	27.6	8769.8	29.6	8857.3
GR	32.6	8886.8	34.6	8997.2	32.6	9008.48	31.6	9035.85	28.6	9071.18
GR	25.6	9193.51	22.6	9274.24	22.6	9367.4	28.6	9395.16	30.6	9438.96
GR	28.6	9505.21	29.6	9566.81	32.6	9611.97	34.6	9726.04	35.6	9755.25
GR	36.6	9918.22	50	10131.28	55	10634.33	60	11105.23	50	11235.27

X1	8.67	90	4913	16141	9000	3177	2391			
GR	60.0	1.00	44	500	42	1200	38.6	3000	42	3400
GR	42	3700	35.6	4000	34.6	4156	34.6	4243	35.6	4299
GR	36.6	4355	37.6	4544	42	4791	44	4913	42	5213
GR	37.6	5344.31	36.6	5408.33	35.6	5469	32.6	6008	31.6	6099
GR	30.6	6107.72	29.6	6130.49	28.6	6139.98	28.6	6320.91	29.6	6337.56
GR	29.6	6345.87	30.6	6355.86	30.6	6361.9	29.6	6367.24	28.6	6372.57
GR	27.6	6379.42	26.6	6384.35	25.6	6389.27	24.6	6394.2	24.6	6448.01
GR	25.6	6477.2	25.6	6487.81	24.6	6531.11	23.6	6574.41	22.6	6617.7
GR	21.6	6661	20.6	6693.14	20.6	6693.37	21.6	6700.26	22.6	6707.16
GR	23.6	6714.37	24.6	6722.29	25.6	6730.22	25.6	6736.32	27.6	6752.54
GR	28.6	6773.68	28.6	6828.95	29.6	6895.05	29.6	6935.2	28.6	7010.54
GR	28.6	7115.84	27.6	7173.41	26.6	7186.62	25.6	7202.96	25.6	7286.02
GR	26.6	7317.91	27.6	7349.8	28.6	7382.76	29.6	7416.84	30.6	7426.5
GR	31.6	7445.67	32.6	7490.79	33.6	7506.12	33.6	7673.9	34.6	7700.56
GR	35.6	7717.98	36.6	7738.7	37.6	7761.94	42	7849.08	42	8423
GR	44	8476	46	8664	48	8805	48	8992	46	9040
GR	44	9089	42	9534	36.6	11234	30.6	11284	26.6	13254
GR	32.6	13794	34.6	14434	42	14977	50	16141	50	16721

X1	9.25	90	1482.97	13375	3200	3200	3062			
GR	58	0	54	84.32	46	290.31	42	343.23	42	420.17

```
GR    44   476.39    44   677.8    42   742.06     39  1028.07    40   1064.74
GR    42  1297.02    42  1482.97  36.6  1531.82   36.6  1733.64    42   1778.92
GR    42  1835.14  36.6   1853.7  36.6  2042.83   38.6  2058.93    42   2165.87
GR  37.6  2653.73  36.6  2884.43  34.6  2973.32   32.6   3125.1  30.6   3227.31
GR  30.6  3440.43  32.6  3539.47  32.6  3694.91   33.6  3796.25  33.6   3879.19
GR  32.6  3883.23  30.6  4014.25  31.6  4053.84   23.6  4077.66  21.6    4103.3
GR  21.6  4142.49  23.6  4210.25  29.6  4428.22   30.6  4512.25  29.6   4548.08
GR  29.6  4683.39  30.6  4822.04  31.6  4859.24   31.6  4945.96  32.6   4969.93
GR  32.6  5164.13  28.6  5259.78  27.6  5489.81   30.6  5586.26  29.6    5674.1
GR  29.6  5840.08  28.6  5933.49  29.6  6117.52   30.6  6218.87  29.6   6291.43
GR  35.6  6622.31    42   7000.5    42  7186.01     46  7281.58    50   7365.02
GR    50  7412.73    48  7530.52    48  8258.76     46  8409.42    46   8595.54
GR    44  9144.24    42  9278.05  40.6     9380   40.6     9800    42   10300.6
GR    42    10877  37.6  10950.0  34.6    11000   32.4    11300  32.4     12100
GR  34.6    12200  34.6    12500  32.6    12700   26.0    13025    42     13375
GR    50    13650    48    14445    50    14503     52    14900    50     14921
GR    50 14976.91    54 15030.06    54 15451.95     48 15509.12    46  15542.67

QT     4    66800  143300   174300   333600
NC  0.12     0.12    0.03       .1       .3
X1 10.12       89 2366.85  6330.06     7700     1000     4594
X3    10                   1232.04     54.7
GR  55.6        0    55.2       90     54.9   161.12     54.8   318.29   54.5      400
GR  54.5   505.44    50.4    590.1     50.7   644.14     49.6   763.76   49.8   821.19
GR  47.9   853.74    50.9   895.11       51   927.61       49   951.75   47.9   1054.3
GR  50.3  1085.94    53.3  1160.37     54.7  1232.04     50.1  1287.74     49  1373.79
GR  48.6  1482.72    49.1  1622.28     46.2  1678.02     46.3  1781.82   48.3  1866.53
GR  49.2   1949.4    48.8  2075.16     47.9  2163.11     43.8  2220.71   42.6  2269.24
GR  41.6  2366.85    40.6  2391.75       39  2452.47     37.7  2548.87   37.9  2765.45
GR  37.6  2952.69      38  3157.81     38.6  3299.81     38.3  3413.04   38.1  3746.92
GR  38.1  3993.99    38.9  4185.79     38.8  4286.36     40.5  4499.72   39.9   4728.9
1
 28FEB00    09:37:31                                               PAGE   9


GR  38.6  4754.82    40.1   4907.5  40.4627 4943.023     38.9  4984.51   37.2  5041.95
GR  37.2  5119.68    36.4  5177.29     37.3  5277.11     36.8  5355.15   38.1  5518.64
GR  37.9  5567.34    36.5  5613.59     33.5   5655.2     32.5   5769.5   30.3  5803.47
GR  32.8  5902.24    32.8   5982.5     34.2  6030.84     36.5  6067.52   37.5   6124.9
GR  37.8  6207.91    40.5  6273.13     43.8  6330.06     41.5  6462.94   41.4  6636.96
GR  44.8  6697.83    45.5  6728.93     44.5  6819.63       45  6861.77   44.5  6960.04
GR  44.8  7029.56   45.05     7060     44.7  7115.34     45.4  7181.81   45.6     7240
GR  45.6     7360    45.5   7468.6     43.4  7632.04     44.6  7864.56   47.6  7908.88
GR  47.7  7982.52    48.7  8044.72     48.8     8220     55.8     8990
1
 28FEB00    09:37:31                                               PAGE  10


  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG    HV    HL    OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH   AROB  VOL   TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH  XNR   WTN   ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC   ICONT CORAR TOPWID  ENDST


*PROF 1
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IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.
0

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CCHV=    .100 CEHV=    .300
*SECNO  .010
    .010   49.50    46.30     .00    46.30    46.30      .00      .00      .00    40.60
  82400.0      3.5  82393.6      2.8    172.8  237141.3    138.8       .0       .0    40.60
     .00     .02      .35     .02     .120     .030     .120     .000    -3.20  19939.36
  .000001      0.       0.       0.        0        0        0      .00  9609.36  29548.72


*SECNO  .020
    .020   49.50    46.30     .00      .00    46.30      .00      .00      .00    40.60
  82402.0      3.5  82395.6      2.8    172.8  237141.6    138.8    272.6     11.0    40.60
     .04     .02      .35     .02     .120     .030     .120     .000    -3.20  19939.36
  .000001      50.      50.      50.        0        0        0      .00  9609.36  29548.72


CCHV=    .100 CEHV=    .300
*SECNO  .470
    .470   49.50    46.30     .00      .00    46.30      .00      .00      .00    40.60
  82516.0      3.5  82509.6      2.8    172.9  237153.1    138.9  13502.1    544.5    40.60
    1.98     .02      .35     .02     .120     .030     .120     .000    -3.20  19939.35
  .000001    2000.    2428.    1000.        0        0        0      .00  9609.38  29548.73


CCHV=    .100 CEHV=    .300
*SECNO 1.110
   1.110   42.70    46.30     .00      .00    46.31      .00      .00      .00    50.90
  82678.0       .0  82594.4     83.6       .0  202133.1   2321.2  30631.1   1239.7    40.80
    4.28     .00      .41     .04     .000     .030     .110     .000     3.60  20037.37
  .000001    3200.    3379.    3000.        0        0        0      .00  8382.97  28420.34


CCHV=    .100 CEHV=    .300
*SECNO 1.990
   1.990   41.91    46.31     .00      .00    46.31      .00      .01      .00    40.60
  82900.0      8.1  82889.2      2.8    259.9  174833.8     90.1  50916.0   2085.8    40.60
    7.00     .03      .47     .03     .110     .030     .110     .000     4.40  19908.92
  .000001    3850.    4646.    6150.        0        0        0      .00  7320.65  27229.57
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SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 2.400
   2.400   41.71    46.31     .00      .00    46.31      .00      .00      .00    40.60
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 83003.0     5.7  82992.3     5.0    173.5  168216.5    154.0  59457.1   2447.1    40.60
   8.22     .03      .49      .03     .110     .030     .110     .000     4.60  19939.24
 .000001    400.    2165.    5000.      0        0        0       .00   7228.69  27167.94


CCHV=    .100 CEHV=    .300
*SECNO 2.650

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .53

  2.650   40.81    46.31     .00      .00    46.32      .01      .00      .00    40.60
 83066.0    10.8  83050.5     4.6    173.6  109123.6     78.6  63665.2   2653.0    41.00
   8.70     .06      .76      .06     .110     .030     .110     .000     5.50  19939.23
 .000005    400.    1320.    1650.      0        0        0       .00   6422.37  26361.60


CCHV=    .100 CEHV=    .300
*SECNO 3.950

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61

  3.950   40.74    46.34     .00      .00    46.34      .01      .02      .00    40.60
 83394.0     3.4  83387.0     3.6     87.5  140137.5     99.5  83336.4   3620.6    41.10
  11.91     .04      .60      .04     .110     .030     .110     .000     5.60  19969.50
 .000002   5700.    6864.    7500.      0        0        0       .00   5867.54  25837.04


*SECNO 4.390
  4.390   40.74    46.34     .00      .00    46.35      .01      .01      .00    40.60
 83505.0     3.7  83492.4     8.8     87.8  144640.3    205.1  90943.5   3972.6    40.60
  13.02     .04      .58      .04     .110     .030     .110     .000     5.60  19969.45
 .000002   1000.    2323.    3350.      0        0        0       .00   7322.96  27292.41


*SECNO 5.320
  5.320   36.96    46.36     .00      .00    46.36      .01      .02      .00    40.60
 83740.0    20.0  83718.3     1.7    352.2  107889.6     34.6 105222.8   4689.6    41.60
  14.78     .06      .78      .05     .110     .030     .110     .000     9.40  19877.57
 .000004   6850.    4910.    4500.      0        0        0       .00   5345.98  25223.55
```



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  SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL     OLOSS  L-BANK ELEV
  Q       QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    R-BANK ELEV
  TIME    VLOB     VCH      VROB     XNL      XNCH     XNR      WTN     ELMIN    SSTA
  SLOPE   XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR   TOPWID   ENDST


CCHV=    .100 CEHV=    .300
*SECNO 5.780
  5.780   35.07    46.37     .00      .00    46.38      .01      .01      .00    40.80
 83856.0    15.5  83838.4     2.1    218.6   85542.6     32.0 110664.9   4969.8    41.10
  15.47     .07      .98      .06     .110     .030     .110     .000    11.30  19921.54
```

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 .000007    7000.    2429.    4000.       0       0       0      .00  4308.60  24230.13


*SECNO 5.860
   5.860   35.07    46.37      .00      .00    46.38     .02      .00      .00    56.30
 83876.0      .0  83876.0      .0       .0  78383.7      .0  111470.4   5012.4    56.30
   15.58     .00     1.07     .00     .000     .030    .000     .000    11.30  20056.42
 .000008    4500.     422.     500.       0       0       0      .00  3720.94  23777.36


CCHV=    .300 CEHV=    .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

   5.880   35.07    46.37      .00      .00    46.39     .02      .00      .00    56.30
 83881.0      .0  83881.0      .0       .0  78352.5      .0  111650.3   5021.0    56.30
   15.61     .00     1.07     .00     .000     .030    .000     .000    11.30  20056.49
 .000008     100.     100.     100.       0       0       0      .00  3720.75  23777.24



SPECIAL BRIDGE

SB  XK      XKOR     COFQ     RDLEN     BWC      BWP      BAREA      SS      ELCHU    ELCHD
   1.05     1.50     2.50      .00    716.60   323.41  100542.00   31.77     1.50     1.50

*SECNO 5.887
CLASS A LOW FLOW

3420 BRIDGE W.S.=     46.37 BRIDGE VELOCITY=      1.03    CALCULATED CHANNEL AREA=
81593.

 EGPRS     EGLWC      H3      QWEIR     QLOW      BAREA   TRAPEZOID     ELLC     ELTRD
WEIRLN
                                                          AREA
    .00     46.39     .00        0.    83881.   100542.   100518.      51.90    56.30     0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

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  SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL     OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB      ACH      AROB      VOL      TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL       XNCH     XNR       WTN      ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT     CORAR    TOPWID   ENDST


   5.887   35.07    46.37      .00      .00    46.39     .02      .00      .00    56.30
 83883.0      .0  83883.0      .0       .0  78362.7      .0  111716.8   5024.1    56.30
   15.62     .00     1.07     .00     .000     .030    .000     .000    11.30  20056.47
 .000008      37.      37.      37.       0       0       0      .00  3720.81  23777.28
```

```
CCHV=    .100 CEHV=    .300
*SECNO 5.907
   5.907    35.07    46.37      .00       .00     46.39      .02       .00       .00     56.30
  83888.0       .0  83888.0       .0        .0  78365.7        .0  111896.7    5032.7    56.30
   15.64      .00     1.07      .00      .000      .030      .000      .000     11.30  20056.46
  .000008     100.     100.     100.        0         0         0       .00   3720.83  23777.29


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.52

   6.350    33.60    46.40      .00       .00     46.40      .01       .01       .00     41.10
  84000.0       .0  83962.1     37.9       1.0  141524.4    380.1  117816.9    5368.0     29.60
   16.74      .01      .59      .10      .110      .030      .110      .000     12.80  19999.62
  .000003    1900.    2339.    3800.        0         0         0       .00   8740.65  28740.27


*SECNO 6.990
   6.990    33.41    46.41      .00       .00     46.41      .00       .01       .00     41.10
  79457.0      4.0  79433.8     19.2      93.9  141822.6    394.2  128840.8    6034.1     40.20
   18.41      .04      .56      .05      .110      .030      .110      .000     13.00  19995.95
  .000003    3500.    3379.    3400.        0         0         0       .00   8430.90  28426.85


*SECNO 7.370

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .35

   7.370    31.41    46.41      .00       .00     46.45      .04       .02       .01     60.00
  76760.0       .0  76760.0       .0        .0  46012.6        .0  133175.9    6282.2     55.00
   18.75      .00     1.67      .00      .000      .030      .000      .000     15.00  20055.93
  .000022    3500.    2006.    1400.        0         0         0       .00   2340.33  26989.86
```



```
  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .300 CEHV=    .500
*SECNO 7.379

3265 DIVIDED FLOW
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.379   31.41   46.41     .00     .00   46.45     .04     .00     .00   60.00
 76760.0      .0 76760.0      .0      .0 45991.6      .0 133228.7  6284.9   55.00
   18.76     .00    1.67     .00    .000    .030    .000    .000   15.00 20055.97
 .000022     50.     50.     50.       0       0       0     .00 2340.10 26989.83

*SECNO 7.379

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.379   31.41   46.41     .00     .00   46.45     .05     .00     .00   58.60
 76760.0      .0 76760.0      .0      .0 45046.6      .0 133229.8  6284.9   58.60
   18.76     .00    1.70     .00    .000    .030    .000    .000   15.00 20055.97
 .000024      1.      1.      1.       0       0       0     .00 2294.81 26989.84

*SECNO 7.384

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.384   31.41   46.41     .00     .00   46.45     .05     .00     .00   58.60
 76760.0      .0 76760.0      .0      .0 45045.7      .0 133255.6  6286.2   58.60
   18.76     .00    1.70     .00    .000    .030    .000    .000   15.00 20055.97
 .000024     25.     25.     25.       0       0       0     .00 2294.80 26989.83
```



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  SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG      HV      HL     OLOSS  L-BANK ELEV
  Q      QLOB     QCH     QROB     ALOB     ACH     AROB     VOL     TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB     XNL     XNCH     XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST

CCHV=    .100 CEHV=    .300
*SECNO 7.393

3265 DIVIDED FLOW
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3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.393   31.41   46.41     .00     .00   46.45     .04     .00     .00   58.60
 76760.0      .0 76760.0      .0      .0 45660.2      .0 133307.7  6288.9   58.60
   18.77     .00    1.68     .00    .000    .030    .000    .000   15.00 20055.96
 .000022     50.     50.     50.       0       0       0     .00 2318.83 26989.84


*SECNO 7.403

3265 DIVIDED FLOW

   7.403   31.41   46.41     .00     .00   46.45     .04     .00     .00   58.60
 76526.0      .0 76526.0      .0      .0 45665.8      .0 133360.1  6291.5   58.60
   18.78     .00    1.68     .00    .000    .030    .000    .000   15.00 20055.95
 .000022     50.     50.     50.       0       0       0     .00 2318.89 26989.85


CCHV=    .100 CEHV=    .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.98

   7.440   28.85   46.45     .00     .00   46.46     .00     .00     .00   58.00
 76526.0      .0 76526.0      .0      .0 143881.3      .0 133827.9  6317.0   52.00
   18.89     .00     .53     .00    .000    .030    .000    .000   17.60  533.22
 .000002    215.    215.    215.       2       0       0     .00 8013.77 8546.99


CCHV=    .100 CEHV=    .300
*SECNO 7.610

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

   7.610   26.96   46.46     .00     .00   46.46     .01     .00     .00   41.20
 75056.0    47.3 75007.5     1.2   530.1 114351.3    22.2 136444.2  6487.4   40.60
   19.26     .09     .66     .06    .110    .030    .110    .000   19.50 19847.27
 .000006   1280.    880.    562.       0       0       0     .00 8785.29 28632.56
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB     QCH      QROB     ALOB      ACH     AROB     VOL     TWA     R-BANK ELEV
  TIME    VLOB     VCH      VROB     XNL      XNCH     XNR      WTN    ELMIN    SSTA
  SLOPE   XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR   TOPWID   ENDST


*SECNO 7.760
   7.760   27.86   46.46     .00     .00   46.47     .01     .00     .00   58.00
 75056.0      .0 75056.0      .0      .0 122473.3      .0 138678.6  6651.0   60.00
   19.63     .00     .61     .00    .000    .030    .000    .000   18.60  963.12
 .000004    850.    820.    800.       0       0       0     .00 8586.58 9549.70
```

```
*SECNO 8.180
  8.180   29.87   46.47    .00    .00   46.48    .00    .01    .00   62.00
 75056.0     .0 75056.0     .0     .0 136949.2     .0 145217.8  7110.6   50.00
  20.75    .00    .55    .00   .000   .030   .000   .000   16.60  427.55
 .000004   2044.   2196.   2141.      0      0      0    .00 9647.63 10075.17


*SECNO 8.670

3265 DIVIDED FLOW

  8.670   25.88   46.48    .00    .00   46.49    .01    .01    .00   44.00
 75056.0  3273.4 71782.6     .0 27695.8 117810.5     .0 155070.8  8124.4   50.00
  21.95    .12    .61    .00   .110   .030   .000   .000   20.60  422.34
 .000006   9000.   2391.   3177.      0      0      0    .00 14878.27 15630.30


*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION    9.25 EXTENDED     .50 FEET

  9.250   24.90   46.50    .00    .00   46.51    .01    .02    .00   42.00
 75056.0   555.8 74479.3   20.8  5490.5 118244.7  349.7 164599.2  9084.7   42.00
  23.31    .10    .63    .06   .110   .030   .110   .000   21.60  277.51
 .000007   3200.   3062.   3200.      0      0      0    .00 12180.39 15542.67


CCHV=   .100 CEHV=   .300
*SECNO 10.120

3265 DIVIDED FLOW

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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
  Q     QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH   XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR   TOPWID  ENDST


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .26


3470 ENCROACHMENT STATIONS=    1232.0   8990.0  TYPE=    1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
  10.120   16.36   46.66    .00    .00   46.71    .05    .19    .01   41.60
 66800.0   186.4 65737.2   876.4   718.2 35134.6  3848.6 173284.1 10018.0   43.80
  24.00    .26   1.87    .23   .120   .030   .120   .000   30.30  1669.15
 .000078   7700.   4594.   1000.      2      0      0    .00 5842.47  7895.01
```

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T1   LAKE HOUSTON.........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2   G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
T3   FILENAME:G1030FH2.IH2............50 YR FREQUENCY........JJS.....12/10/96

J1 ICHECK  INQ    NINV   IDIR   STRT   METRIC  HVINS   Q     WSEL   FQ

            3                                  48.7

J2 NPROF   IPLOT  PRFVS  XSECV  XSECH  FN   ALLDC  IBW   CHNIM   ITRACE

    2        -1
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG    HV    HL    OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH   AROB  VOL   TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH  XNR   WTN   ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC   ICONT CORAR TOPWID ENDST


*PROF 2

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=    .100 CEHV=    .300
*SECNO  .010
    .010   51.90   48.70     .00   48.70   48.71     .01     .00     .00   40.60
 180200.0    16.9 180169.6    13.5   349.0 259941.3   280.4     .0      .0   40.60
     .00     .05     .69     .05    .120    .030    .120    .000   -3.20 19913.83
  .000002      0.      0.      0.       0       0       0     .00 9655.40 29569.23


*SECNO  .020
    .020   51.90   48.70     .00     .00   48.71     .01     .00     .00   40.60
 180199.0    16.9 180168.6    13.5   349.0 259942.4   280.4   299.1    11.1   40.60
     .02     .05     .69     .05    .120    .030    .120    .000   -3.20 19913.83
  .000002     50.     50.     50.       0       0       0     .00 9655.40 29569.23


CCHV=    .100 CEHV=    .300
*SECNO  .470
    .470   51.91   48.71     .00     .00   48.71     .01     .01     .00   40.60
 180193.0    16.9 180162.5    13.6   349.4 259983.2   280.7 14811.7   546.2   40.60
     .99     .05     .69     .05    .120    .030    .120    .000   -3.20 19913.78
  .000002   2000.   2428.   1000.       0       0       0     .00 9655.48 29569.27
```

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CCHV=    .100 CEHV=    .300
*SECNO 1.110
   1.110   45.11   48.71     .00     .00   48.72     .01     .01     .00   50.90
 180183.0      .0 179867.2   315.8      .0 221102.8  3637.6  33618.6  1245.6   40.80
   2.15     .00     .81     .09    .000    .030    .110    .000    3.60 20017.78
  .000003   3200.   3379.   3000.      0       0       0     .00  8454.50 28472.27


CCHV=    .100 CEHV=    .300
*SECNO 1.990
   1.990   44.33   48.73     .00     .00   48.74     .01     .02     .00   40.60
 180169.0    38.3 180117.5    13.2   527.0 192246.8   182.7  55955.0  2099.1   40.60
   3.53     .07     .94     .07    .110    .030    .110    .000    4.40 19870.32
  .000004   3850.   4646.   6150.      0       0       0     .00  7372.64 27242.96
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB     QCH      QROB     ALOB     ACH     AROB     VOL     TWA     R-BANK ELEV
  TIME    VLOB     VCH      VROB     XNL      XNCH    XNR      WTN     ELMIN   SSTA
  SLOPE   XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR   TOPWID  ENDST


*SECNO 2.400
   2.400   44.14   48.74     .00     .00   48.75     .01     .01     .00   40.60
 180162.0    27.0 180111.1    23.9   352.3 185484.1   312.8  65374.4  2462.8   40.60
   4.15     .08     .97     .08    .110    .030    .110    .000    4.60 19913.42
  .000005    400.   2165.   5000.      0       0       0     .00  7277.44 27190.86


CCHV=    .100 CEHV=    .300
*SECNO 2.650

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .56

   2.650   43.24   48.74     .00     .00   48.77     .03     .01     .01   40.60
 180158.0    48.6 180087.4    22.1   352.7 124516.1   167.0  70083.7  2669.5   41.00
   4.40     .14    1.45     .13    .110    .030    .110    .000    5.50 19913.37
  .000016    400.   1320.   1650.      0       0       0     .00  6461.78 26375.14


CCHV=    .100 CEHV=    .300
*SECNO 3.950

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO = 1.52

   3.950   43.22   48.82     .00     .00   48.84     .02     .07     .00   40.60
 180138.0    16.2 180103.0    18.8   179.3 154492.6   216.0  92134.0  3642.4   41.10
   6.04     .09    1.17     .09    .110    .030    .110    .000    5.60 19956.33
  .000007   5700.   6864.   7500.      0       0       0     .00  5898.69 25855.02
```

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*SECNO 4.390
   4.390   43.24   48.84     .00     .00   48.86     .02     .02     .00   40.60
 180131.0    17.4 180072.6    41.0   180.8 162693.5   422.5 100620.2  3996.7   40.60
    6.62     .10    1.11     .10    .110    .030    .110    .000    5.60 19956.15
  .000008   1000.   2323.   3350.      0       0       0     .00 7367.34 27323.48


*SECNO 5.320
   5.320   39.48   48.88     .00     .00   48.91     .03     .05     .00   40.60
 180116.0    93.6 180013.2     9.2   729.1 121038.7    81.0 116708.7  4720.9   41.60
    7.54     .13    1.49     .11    .110    .030    .110    .000    9.40 19823.86
  .000014   6850.   4910.   4500.      0       0       0     .00 5407.41 25231.27


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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS  L-BANK ELEV
   Q      QLOB     QCH     QROB     ALOB     ACH     AROB     VOL     TWA    R-BANK ELEV
   TIME    VLOB     VCH     VROB     XNL     XNCH     XNR     WTN    ELMIN   SSTA
   SLOPE   XLOBL    XLCH    XLOBR   ITRIAL   IDC    ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=     .300
*SECNO 5.780
   5.780   37.61   48.91     .00     .00   48.96     .05     .04     .01   40.80
 180109.0    74.8 180023.8    10.5   464.2 96290.5    70.4 122870.9  5009.0   41.10
    7.90     .16    1.87     .15    .110    .030    .110    .000   11.30 19885.65
  .000022   7000.   2429.   4000.      1       0       0     .00 4350.35 24236.00


*SECNO 5.860
   5.860   37.61   48.91     .00     .00   48.98     .07     .01     .00   56.30
 180108.0      .0 180108.0      .0      .0 87891.3      .0 123787.4  5053.7   56.30
    7.96     .00    2.05     .00    .000    .030    .000    .000   11.30 20037.46
  .000026   4500.    422.    500.      2       0       0     .00 3776.36 23813.81


CCHV=    .300 CEHV=     .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

   5.880   37.61   48.91     .00     .00   48.98     .07     .00     .00   56.30
 180107.0      .0 180107.0      .0      .0 87900.3      .0 123989.2  5062.4   56.30
    7.97     .00    2.05     .00    .000    .030    .000    .000   11.30 20037.45
  .000026    100.    100.    100.      0       0       0     .00 3776.40 23813.85


SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP    BAREA    SS     ELCHU   ELCHD
   1.05    1.50    2.50     .00  716.60  323.41 100542.00   31.77    1.50    1.50
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*SECNO 5.887
CLASS A LOW FLOW

3420 BRIDGE W.S.=     48.91 BRIDGE VELOCITY=     2.00    CALCULATED CHANNEL AREA=
90050.

 EGPRS    EGLWC     H3     QWEIR     QLOW     BAREA  TRAPEZOID     ELLC    ELTRD
WEIRLN
                                                  AREA
    .00    48.99     .01       0.  180107.  100542.  100518.     51.90    56.30      0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

1
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL      OLOSS   L-BANK ELEV
  Q      QLOB     QCH      QROB     ALOB      ACH      AROB     VOL      TWA     R-BANK ELEV
  TIME    VLOB     VCH      VROB     XNL      XNCH      XNR      WTN      ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR   TOPWID   ENDST


   5.887    37.62    48.92      .00      .00    48.99      .07      .01      .00    56.30
 180107.0       .0  180107.0      .0       .0  87937.6       .0  124063.9   5065.6    56.30
    7.97      .00     2.05      .00     .000     .030     .000     .000    11.30  20037.40
  .000026      37.       37.      37.       0        0        0      .00  3776.59  23813.99


CCHV=     .100 CEHV=     .300
*SECNO 5.907
   5.907    37.63    48.93      .00      .00    48.99      .07      .00      .00    56.30
 180106.0       .0  180106.0      .0       .0  87947.4       .0  124265.8   5074.2    56.30
    7.99      .00     2.05      .00     .000     .030     .000     .000    11.30  20037.39
  .000026     100.     100.     100.       0        0        0      .00  3776.64  23814.03


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.63

   6.350    36.21    49.01      .00      .00    49.03      .02      .03      .00    41.10
 180100.0       .0  180006.7     93.2      2.2  164226.7    507.5  131058.3   5411.4    29.60
    8.58      .02     1.10      .18     .110     .030     .110     .000    12.80  19999.43
  .000010    1900.    2339.    3800.       1        0        0      .00  8747.88  28747.31


*SECNO 6.990
   6.990    36.04    49.04      .00      .00    49.06      .02      .03      .00    41.10
 170236.0     27.3  170125.5     83.3    280.2  163499.7    798.0  143831.7   6081.2    40.20
    9.48      .10     1.04      .10     .110     .030     .110     .000    13.00  19962.27
  .000008    3500.    3379.    3400.       2        0        0      .00  8518.21  28480.47
```

*SECNO 7.370

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .34

```
   7.370    34.02    49.02      .00      .00    49.18      .15      .08      .04    60.00
 164380.0       .0 164380.0       .0       .0  52203.8       .0 148822.5   6333.0    55.00
    9.66      .00     3.15      .00     .000     .030     .000     .000    15.00 20042.88
  .000068    3500.    2006.    1400.        2        0        0      .00  2406.12 26998.29
```

1


```
 SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS  L-BANK ELEV
 Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    R-BANK ELEV
 TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN  SSTA
 SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID ENDST
```

CCHV= .300 CEHV= .500
*SECNO 7.379

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

```
   7.379    34.03    49.03      .00      .00    49.18      .15      .00      .00    60.00
 164380.0       .0 164380.0       .0       .0  52208.3       .0 148882.4   6335.8    55.00
    9.66      .00     3.15      .00     .000     .030     .000     .000    15.00 20042.87
  .000068      50.      50.      50.        0        0        0      .00  2406.17 26998.30
```

*SECNO 7.379

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 12 MIN ELTRD= 50.00 MAX ELLC= 58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

```
   7.379    34.02    49.02      .00      .00    49.18      .16      .00      .00    58.60
 164380.0       .0 164380.0       .0       .0  51144.9       .0 148883.6   6335.8    58.60
    9.66      .00     3.21      .00     .000     .030     .000     .000    15.00 20042.87
  .000076       1.       1.       1.        0        0        0      .00  2359.13 26998.30
```

*SECNO 7.384

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 12 MIN ELTRD= 50.00 MAX ELLC= 58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

7.384	34.03	49.03	.00	.00	49.19	.16	.00	.00	58.60
164380.0	.0	164380.0	.0	.0	51141.5	.0	148913.0	6337.2	58.60
9.67	.00	3.21	.00	.000	.030	.000	.000	15.00	20042.87
.000076	25.	25.	25.	0	0	0	.00	2359.09	26998.30

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

CCHV= .100 CEHV= .300
*SECNO 7.393

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

7.393	34.03	49.03	.00	.00	49.19	.16	.00	.00	58.60
164380.0	.0	164380.0	.0	.0	51825.2	.0	148972.0	6339.9	58.60
9.67	.00	3.17	.00	.000	.030	.000	.000	15.00	20042.85
.000068	50.	50.	50.	0	0	0	.00	2383.18	26998.31

*SECNO 7.403

3265 DIVIDED FLOW

7.403	34.04	49.04	.00	.00	49.19	.16	.00	.00	58.60
163871.0	.0	163871.0	.0	.0	51844.3	.0	149031.5	6342.6	58.60
9.68	.00	3.16	.00	.000	.030	.000	.000	15.00	20042.81
.000068	50.	50.	50.	0	0	0	.00	2383.38	26998.34

CCHV= .100 CEHV= .300
*SECNO 7.440

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.10

7.440	31.60	49.20	.00	.00	49.21	.02	.00	.01	58.00
163871.0	.0	163871.0	.0	.0	165930.3	.0	149569.0	6368.5	52.00
9.74	.00	.99	.00	.000	.030	.000	.000	17.60	500.14
.000007	215.	215.	215.	2	0	0	.00	8072.66	8572.79

```
CCHV=    .100 CEHV=    .300
*SECNO 7.610
   7.610    29.70    49.20      .00      .00    49.22      .02      .01      .00    41.20
 160681.0    175.6  160500.0      5.4   1082.6  137943.6     47.7  152654.6   6540.9     40.60
    9.95      .16     1.16      .11     .110     .030     .110     .000    19.50  19748.79
  .000014    1280.     880.     562.        2        0        0      .00  8887.29  28636.08


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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 7.760
   7.760    30.61    49.21      .00      .00    49.23      .02      .01      .00    58.00
 160681.0       .0  160681.0       .0       .0  146191.8       .0  155340.0   6706.2    60.00
   10.15      .00     1.10      .00     .000     .030     .000     .000    18.60    917.52
  .000011     850.     820.     800.        0        0        0      .00  8665.55   9583.07


*SECNO 8.180
   8.180    32.64    49.24      .00      .00    49.25      .01      .02      .00    62.00
 160681.0       .0  160681.0       .0       .0  163830.7       .0  163154.6   7171.0    50.00
   10.78      .00      .98      .00     .000     .030     .000     .000    16.60    344.44
  .000009    2044.    2196.    2141.        0        0        0      .00  9774.74  10119.19


*SECNO 8.670
   8.670    28.67    49.27      .00      .00    49.28      .02      .03      .00    44.00
 160681.0   8924.3  151756.7       .0  40291.9  147756.3       .0  175868.5   8217.4     50.00
   11.50      .22     1.03      .00     .110     .030     .000     .000    20.60    335.70
  .000014    9000.    2391.    3177.        2        0        0      .00  15698.83  16034.53


*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION     9.25 EXTENDED     3.30 FEET

   9.250    27.71    49.31      .00      .00    49.33      .02      .04      .00    42.00
 160681.0   1824.2  158720.0    136.7   8975.8  149909.8   1365.1  188190.3   9269.0     42.00
   12.32      .20     1.06      .10     .110     .030     .110     .000    21.60    205.23
  .000015    3200.    3062.    3200.        0        0        0      .00  13919.86  15542.67


CCHV=    .100 CEHV=    .300
*SECNO 10.120
```

```
3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .30


3470 ENCROACHMENT STATIONS=    1232.0    8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
   10.120     19.27     49.57       .00       .00     49.70       .13       .34       .03     41.60
  143300.0     863.3  138552.9    3883.8    2342.9   46671.5    8841.8  199674.0   10336.7     43.80
    12.76       .37      2.97       .44      .120      .030      .120      .000     30.30   1329.02
   .000134     7700.     4594.     1000.        2         0         0       .00   6975.93   8304.95


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T1     LAKE HOUSTON.........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2     G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
T3     FILENAME:G1030FH2.IH2...........100 YR FREQUENCY........JJS.....12/10/96

J1  ICHECK    INQ      NINV      IDIR      STRT      METRIC    HVINS       Q        WSEL       FQ

            4                                         49.7

J2  NPROF     IPLOT    PRFVS     XSECV     XSECH       FN      ALLDC      IBW      CHNIM     ITRACE

     3           -1

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL     OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL      TWA    R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN     ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID   ENDST


*PROF 3

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=     .100 CEHV=     .300
*SECNO  .010
     .010     52.90     49.70       .00     49.70     49.71       .01       .00       .00     40.60
  246100.0      29.6  246046.6      23.8     440.5  269441.3     353.9        .0        .0     40.60
      .00       .07       .91       .07      .120      .030      .120      .000     -3.20  19903.19
   .000004        0.        0.        0.        0         0         0       .00   9674.59  29577.78


*SECNO  .020
     .020     52.90     49.70       .00       .00     49.71       .01       .00       .00     40.60
  246099.0      29.6  246045.6      23.8     440.5  269443.2     353.9     310.2      11.1     40.60
      .02       .07       .91       .07      .120      .030      .120      .000     -3.20  19903.19
```

```
  .000004     50.     50.     50.       0        0        0      .00   9674.59  29577.78


CCHV=     .100 CEHV=     .300
*SECNO  .470
    .470    52.91    49.71      .00      .00    49.72      .01      .01      .00    40.60
  246064.0     29.7  246010.5     23.8    441.2  269510.8    354.5  15359.0    546.9     40.60
     .75      .07      .91      .07     .120     .030     .120     .000    -3.20  19903.11
  .000004   2000.    2428.    1000.       0        0        0      .00   9674.73  29577.84


CCHV=     .100 CEHV=     .300
*SECNO 1.110
   1.110    46.12    49.72      .00      .00    49.74      .02      .02      .00    50.90
  246013.0       .0  245501.7    511.3       .0  229058.8   4225.9  34870.2   1248.1     40.80
    1.63      .00     1.07      .12     .000     .030     .110     .000     3.60  20009.57
  .000005   3200.    3379.    3000.       0        0        0      .00   8484.44  28494.02


CCHV=     .100 CEHV=     .300
*SECNO 1.990
   1.990    45.35    49.75      .00      .00    49.77      .02      .03      .00    40.60
  245944.0     67.4  245853.5     23.1    667.2  199570.4    231.3  58072.6   2104.7     40.60
    2.68      .10     1.23      .10     .110     .030     .110     .000     4.40  19854.08
  .000007   3850.    4646.    6150.       0        0        0      .00   7394.51  27248.59


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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS   L-BANK ELEV
   Q       QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA     R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID   ENDST


*SECNO 2.400
   2.400    45.16    49.76      .00      .00    49.79      .03      .02      .00    40.60
  245912.0     47.4  245822.6     42.0    446.6  192774.0    396.5  67863.8   2469.3     40.60
    3.15      .11     1.28      .11     .110     .030     .110     .000     4.60  19902.52
  .000008    400.    2165.    5000.       0        0        0      .00   7298.02  27200.54


CCHV=     .100 CEHV=     .300
*SECNO 2.650

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .57

   2.650    44.26    49.76      .00      .00    49.82      .05      .02      .01    40.60
  245892.0     83.6  245769.8     38.6    447.4  131025.2    214.3  72785.5   2676.5     41.00
    3.35      .19     1.88      .18     .110     .030     .110     .000     5.50  19902.43
  .000025    400.    1320.    1650.       0        0        0      .00   6478.44  26380.87


CCHV=     .100 CEHV=     .300
```

```
*SECNO 3.950

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.49

   3.950   44.29   49.89     .00     .00   49.93     .04     .11     .00   40.60
 245789.0    28.7 245726.3    34.0   229.2 160720.9   280.3  95858.4  3651.6   41.10
    4.59     .13    1.53     .12    .110    .030    .110    .000    5.60 19950.62
  .000011   5700.   6864.   7500.      1       0       0     .00 5912.21 25862.83


*SECNO 4.390
   4.390   44.32   49.92     .00     .00   49.96     .03     .03     .00   40.60
 245755.0    30.5 245652.5    72.0   231.7 170552.0   541.4 104728.5  4006.8   40.60
    5.04     .13    1.44     .13    .110    .030    .110    .000    5.60 19950.36
  .000012   1000.   2323.   3350.      0       0       0     .00 7386.65 27337.01


*SECNO 5.320
   5.320   40.59   49.99     .00     .00   50.05     .06     .08     .01   40.60
 245681.0   165.2 245498.8    17.0   937.8 126822.5   107.7 121613.7  4734.3   41.60
    5.75     .18    1.94     .16    .110    .030    .110    .000    9.40 19800.24
  .000022   6850.   4910.   4500.      0       0       0     .00 5434.43 25234.67


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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=   .300
*SECNO 5.780
   5.780   38.74   50.04     .00     .00   50.13     .09     .07     .01   40.80
 245645.0   132.7 245493.5    18.8   600.6 100998.7    91.9 128098.4  5025.7   41.10
    6.03     .22    2.43     .20    .110    .030    .110    .000   11.30 19869.93
  .000035   7000.   2429.   4000.      2       0       0     .00 4368.64 24238.57


*SECNO 5.860
   5.860   38.74   50.04     .00     .00   50.15     .11     .02     .01   56.30
 245639.0      .0 245639.0      .0      .0  92156.3      .0 129065.6  5071.4   56.30
    6.07     .00    2.67     .00    .000    .030    .000    .000   11.30 20032.01
  .000041   4500.    422.    500.      2       0       0     .00 3797.99 23830.00


CCHV=   .300 CEHV=   .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

   5.880   38.74   50.04     .00     .00   50.15     .11     .00     .00   56.30
 245637.0      .0 245637.0      .0      .0  92170.8      .0 129277.2  5080.1   56.30
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```
    6.08      .00     2.67      .00      .000      .030      .000      .000     11.30  20031.99
  .000041     100.     100.     100.        0         0         0      .00   3798.06  23830.05


SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC      BWP     BAREA    SS      ELCHU    ELCHD
    1.05    1.50    2.50     .00   716.60   323.41 100542.00   31.77    1.50     1.50

*SECNO 5.887
CLASS A LOW FLOW

3420 BRIDGE W.S.=     50.01 BRIDGE VELOCITY=      2.62    CALCULATED CHANNEL AREA=
93847.

 EGPRS    EGLWC     H3     QWEIR    QLOW    BAREA  TRAPEZOID    ELLC    ELTRD
WEIRLN
                                                    AREA
     .00    50.17     .02      0.  245637.  100542.  100518.     51.90    56.30     0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS   L-BANK ELEV
   Q      QLOB     QCH     QROB    ALOB    ACH    AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN    SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR   TOPWID   ENDST


   5.887    38.76    50.06     .00      .00    50.17     .11      .02      .00    56.30
  245637.0      .0  245637.0      .0       .0  92234.3      .0  129355.5   5083.3    56.30
    6.08      .00     2.66      .00      .000      .030      .000      .000     11.30  20031.91
  .000041      37.      37.      37.        0         0         0      .00   3798.39  23830.29


CCHV=    .100 CEHV=     .300
*SECNO 5.907
   5.907    38.76    50.06     .00      .00    50.17     .11      .00      .00    56.30
  245635.0      .0  245635.0      .0       .0  92250.0      .0  129567.2   5092.1    56.30
    6.09      .00     2.66      .00      .000      .030      .000      .000     11.30  20031.89
  .000041     100.     100.     100.        0         0         0      .00   3798.46  23830.35


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.67

   6.350    37.40    50.20     .00      .00    50.23     .03      .05      .01    41.10
  245600.0      .1  245464.4    135.5      3.0  174639.4    572.7  136757.7   5430.2    29.60
    6.56      .02     1.41      .24      .110      .030      .110      .000     12.80  19999.35
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 .000015    1900.   2339.   3800.      2      0      0     .00  8756.69 28756.04


*SECNO 6.990
  6.990    37.25    50.25     .00     .00    50.28     .03     .05     .00    41.10
 229864.0     52.7 229665.7    145.6    396.0 173457.7   1037.6 150337.8  6104.3    40.20
   7.27      .13     1.32     .14    .110     .030    .110    .000    13.00 19942.49
 .000012    3500.   3379.   3400.      2      0      0     .00  8617.59 28560.08


*SECNO 7.370

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .33

  7.370    35.21    50.21     .00     .00    50.46     .25     .12     .07    60.00
 220520.0       .0 220520.0       .0       .0  55087.0       .0 155632.7  6359.5    55.00
   7.41      .00     4.00     .00    .000     .030    .000    .000    15.00 19894.68
 .000105    3500.   2006.   1400.      2      0      0     .00  2465.22 27802.13


1
 28FEB00     09:37:31                                                    PAGE  31


  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST


CCHV=    .300 CEHV=    .500
*SECNO 7.379

3265 DIVIDED FLOW


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

  7.379    35.22    50.22     .00     .00    50.47     .25     .01     .00    60.00
 220520.0       .0 220520.0       .0       .0  55094.3       .0 155696.0  6362.3    55.00
   7.41      .00     4.00     .00    .000     .030    .000    .000    15.00 19894.60
 .000105      50.      50.      50.      0      0      0     .00  2465.70 27802.16


*SECNO 7.379

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=    50.00 MAX ELLC=    58.60


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60
```

```
   7.379   35.21   50.21    .00    .00   50.47    .26    .00    .01   58.60
 220520.0     .0 220520.0     .0     .0  53973.4     .0 155697.2  6362.4   58.60
   7.41    .00    4.09    .00   .000   .030   .000   .000   15.00 20036.91
 .000116     1.     1.     1.      0      0      0    .00  2388.37 27002.15
```

*SECNO 7.384

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   58.60 ELREA=   58.60

```
   7.384   35.22   50.22    .00    .00   50.48    .26    .00    .00   58.60
 220520.0     .0 220520.0     .0     .0  53967.5     .0 155728.2  6363.7   58.60
   7.41    .00    4.09    .00   .000   .030   .000   .000   15.00 20036.92
 .000116    25.    25.    25.      0      0      0    .00  2388.31 27002.14
```



```
 SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG    HV    HL   OLOSS  L-BANK ELEV
 Q     QLOB   QCH   QROB   ALOB   ACH   AROB   VOL   TWA   R-BANK ELEV
 TIME  VLOB   VCH   VROB   XNL    XNCH  XNR    WTN   ELMIN  SSTA
 SLOPE XLOBL  XLCH  XLOBR  ITRIAL IDC   ICONT  CORAR TOPWID ENDST
```

CCHV=   .100 CEHV=   .300
*SECNO 7.393

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   58.60 ELREA=   58.60

```
   7.393   35.23   50.23    .00    .00   50.48    .25    .01    .00   58.60
 220520.0     .0 220520.0     .0     .0  54684.8     .0 155790.5  6366.5   58.60
   7.41    .00    4.03    .00   .000   .030   .000   .000   15.00 20036.89
 .000105    50.    50.    50.      0      0      0    .00  2412.45 27002.16
```

*SECNO 7.403

3265 DIVIDED FLOW

```
   7.403   35.24   50.24    .00    .00   50.49    .25    .01    .00   58.60
 219709.0     .0 219708.9     .1    1.0  54715.3    2.8 155853.3  6369.3   58.60
   7.42    .03    4.02    .03   .110   .030   .110   .000   15.00 19894.14
 .000104    50.    50.    50.      0      0      0    .00  2444.80 27802.35
```

```
CCHV=   .100 CEHV=    .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.16

   7.440    32.89    50.49      .00      .00    50.51      .02      .00      .02    58.00
 219709.0       .0  219709.0       .0       .0  176401.0       .0  156423.7   6395.3    52.00
    7.47      .00     1.25      .00     .000     .030     .000     .000    17.60   479.86
  .000010     215.     215.     215.        2        0        0      .00  8111.88  8591.74


CCHV=   .100 CEHV=    .300
*SECNO 7.610
   7.610    31.00    50.50      .00      .00    50.53      .03      .01      .00    41.20
 214619.0    292.9  214316.9      9.2   1438.3  149128.2     63.1  159733.4   6568.8    40.60
    7.64      .20     1.44      .15     .110     .030     .110     .000    19.50 19703.11
  .000019    1280.     880.     562.        2        0        0      .00  8934.65 28637.75
```



```
  SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL    OLOSS  L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB      ACH     AROB      VOL     TWA   R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH      XNR      WTN   ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR   ITRIAL     IDC    ICONT    CORAR  TOPWID  ENDST


*SECNO 7.760
   7.760    31.91    50.51      .00      .00    50.54      .03      .01      .00    58.00
 214619.0       .0  214619.0       .0       .0  157484.6       .0  162634.0   6735.0    60.00
    7.80      .00     1.36      .00     .000     .030     .000     .000    18.60   897.96
  .000016     850.     820.     800.        0        0        0      .00  8707.10  9605.06


*SECNO 8.180

3265 DIVIDED FLOW

3280 CROSS SECTION     8.18 EXTENDED      .55 FEET

   8.180    33.95    50.55      .00      .00    50.58      .02      .03      .00    62.00
 214619.0       .0  214618.6       .4       .0  176691.6     17.3  171057.9   7203.6    50.00
    8.31      .00     1.21      .02     .000     .030     .110     .000    16.60   310.95
  .000013    2044.    2196.    2141.        0        0        0      .00  9883.00 11235.27


*SECNO 8.670
3280 CROSS SECTION     8.67 EXTENDED      .59 FEET

   8.670    29.99    50.59      .00      .00    50.61      .02      .04      .00    44.00
 214619.0  12736.4  201868.8     13.8  46379.1  162582.0    343.4  185173.6   8281.8    50.00
    8.91      .27     1.24      .04     .110     .030     .110     .000    20.60   294.41
  .000018    9000.    2391.    3177.        2        0        0      .00 16426.59 16721.00
```

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*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION    9.25 EXTENDED    4.64 FEET

   9.250   29.05   50.65    .00    .00   50.67    .02    .06    .00   42.00
 214619.0  2726.3 211541.2  351.5 10706.0 165746.5  2912.0 198929.7  9384.4   42.00
   9.59    .25   1.28    .12   .110   .030   .110   .000   21.60  170.83
  .000020   3200.   3062.   3200.     0     0     0    .00 14589.12 15542.67


CCHV=   .100 CEHV=   .300
*SECNO 10.120
1
  28FEB00    09:37:31                                        PAGE  34


   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS  L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR   TOPWID  ENDST


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .31


3470 ENCROACHMENT STATIONS=    1232.0   8990.0  TYPE=    1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
   10.120   20.61   50.91    .00    .00   51.07    .15    .36    .04   41.60
 174300.0   1523.0 167005.0  5772.0  3783.1  51986.4  11589.2 211858.2  10473.0   43.80
   10.00    .40   3.21    .50   .120   .030   .120   .000   30.30  1277.89
  .000136   7700.   4594.   1000.     2     0     0    .00  7174.58  8452.47


1
  28FEB00    09:37:31                                        PAGE  35


T1    LAKE HOUSTON........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2    G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
T3    FILENAME:G1030FH2.IH2...........500 YR FREQUENCY........JJS.....12/10/96

J1  ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS   Q     WSEL    FQ

          5                                   52.7

J2  NPROF   IPLOT   PRFVS   XSECV   XSECH    FN    ALLDC   IBW    CHNIM   ITRACE

    15        -1
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```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST
```

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*PROF 4

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=   .300
*SECNO  .010
    .010   55.90    52.70      .00    52.70    52.73      .03      .00      .00    40.60
 409900.0   100.3 409725.1    74.7    820.2 297941.3    764.6       .0       .0    40.60
     .00     .12     1.38      .10     .120     .030     .120     .000    -3.20 19840.60
 .000008      0.       0.       0.        0        0        0      .00 10457.18 30297.78


*SECNO  .020
    .020   55.90    52.70      .00      .00    52.73      .03      .00      .00    40.60
 409897.0   100.3 409722.1    74.7    820.3 297945.0    764.9    343.8     12.0    40.60
     .01     .12     1.38      .10     .120     .030     .120     .000    -3.20 19840.59
 .000008     50.      50.      50.        0        0        0      .00 10457.87 30298.46


CCHV=   .100 CEHV=   .300
*SECNO  .470
    .470   55.92    52.72      .00      .00    52.75      .03      .02      .00    40.60
 409784.0   100.5 409608.5    75.0    822.5 298079.0    776.3  17010.2    567.5    40.60
     .50     .12     1.37      .10     .120     .030     .120     .000    -3.20 19840.28
 .000008   2000.    2428.    1000.        0        0        0      .00 10482.79 30323.07


CCHV=   .100 CEHV=   .300
*SECNO 1.110
   1.110   49.14    52.74      .00      .00    52.78      .04      .03      .00    50.90
 409622.0     1.7 408202.3  1418.0     41.5 252926.3   8862.2  38744.9   1369.7    40.80
    1.08     .04     1.61      .16     .110     .030     .110     .000     3.60 19955.02
 .000010   3200.    3379.    3000.        0        0        0      .00 10603.14 30558.16


CCHV=   .100 CEHV=   .300
*SECNO 1.990
   1.990   48.39    52.79      .00      .00    52.84      .05      .06      .00    40.60
 409400.0   232.3 409087.1    80.6   1309.5 221471.6    467.0  64762.2   2384.7    40.60
    1.78     .18     1.85      .17     .110     .030     .110     .000     4.40 19716.23
 .000014   3850.    4646.    6150.        0        0        0      .00  7589.51 27305.74
```

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 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*SECNO 2.400
   2.400   48.22   52.82     .00     .00   52.88    .06    .03    .00   40.60
 409297.0  159.4 409011.5  126.1   824.0 214541.0  705.5 75674.5 2755.1   40.60
   2.10     .19    1.91     .18    .110    .030   .110   .000   4.60 19849.19
 .000016   400.   2165.   5000.      0       0      0    .00 7380.25 27229.44


CCHV=   .100 CEHV=   .300
*SECNO 2.650

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .60

   2.650   47.32   52.82     .00     .00   52.94    .11    .04    .02   40.60
 409234.0  267.9 408852.8  113.2   833.0 150389.1  389.8 81232.1 2963.7   41.00
   2.23     .32    2.72     .29    .110    .030   .110   .000   5.50 19843.41
 .000044   400.   1320.   1650.      1       0      0    .00 6554.50 26397.91


CCHV=   .100 CEHV=   .300
*SECNO 3.950

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.42

   3.950   47.46   53.06     .00     .00   53.14    .08    .20    .00   40.60
 408906.0   99.0 408699.4  107.6   434.7 179131.1  519.6 107355.5 3948.2  41.10
   3.07     .23    2.28     .21    .110    .030   .110   .000   5.60 19919.41
 .000022  5700.   6864.   7500.      2       0      0    .00 5966.48 25885.89


*SECNO 4.390
   4.390   47.52   53.12     .00     .00   53.19    .07    .05    .00   40.60
 408795.0  110.8 408471.6  212.6   538.8 193655.1  976.2 117364.3 4307.2  40.60
   3.38     .21    2.11     .22    .110    .030   .110   .000   5.60 19856.03
 .000023  1000.   2323.   3350.      0       0      0    .00 7520.75 27376.78


*SECNO 5.320
   5.320   43.84   53.24     .00     .00   53.36    .12    .15    .02   40.60
 408560.0  572.7 407932.3   55.0  1904.5 143778.5  207.4 136635.0 5060.0  41.60
   3.86     .30    2.84     .27    .110    .030   .110   .000   9.40 19605.36
 .000039  6850.   4910.   4500.      0       0      0    .00 5639.27 25244.63
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```
 SECNO    DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q      QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=    .300
*SECNO 5.780
  5.780   42.01   53.31    .00     .00    53.51    .20     .12     .02    40.80
 408444.0    400.3 407985.7    58.0   1102.3 114817.1    171.6 144104.0   5371.6    41.10
   4.05     .36    3.55     .34    .110    .030    .110    .000   11.30 19823.79
 .000063   7000.   2429.   4000.      2       0       0     .00 4422.33 24246.11


*SECNO 5.860
  5.860   42.01   53.31    .00     .00    53.55    .24     .03     .01    56.30
 408424.0       .0 408424.0      .0       .0 104694.9       .0 145225.2   5420.0    56.30
   4.08     .00    3.90     .00    .000    .030    .000    .000   11.30 20015.34
 .000076   4500.    422.    500.      2       0       0     .00 3861.72 23877.06


CCHV=    .300 CEHV=    .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.30 ELREA=     56.30

  5.880   42.02   53.32    .00     .00    53.56    .24     .01     .00    56.30
 408419.0       .0 408419.0      .0       .0 104721.8       .0 145465.5   5428.9    56.30
   4.09     .00    3.90     .00    .000    .030    .000    .000   11.30 20015.30
 .000076    100.    100.    100.      0       0       0     .00 3861.86 23877.16



SPECIAL BRIDGE

SB XK      XKOR    COFQ    RDLEN    BWC      BWP     BAREA    SS      ELCHU    ELCHD
   1.05    1.50    2.50     .00   716.60   323.41 100542.00   31.77    1.50     1.50

*SECNO 5.887
PRESSURE FLOW


 EGPRS    EGLWC     H3     QWEIR     QPR     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                          AREA
  53.70    53.59    .03       0.  408417.  100542.   100518.    51.90    56.30      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.30 ELREA=     56.30

  5.887   42.17   53.47    .00     .00    53.70    .23     .15     .00    56.30
 408417.0       .0 408417.0      .0       .0 105307.6       .0 145554.8   5432.2    56.30
   4.09     .00    3.88     .00    .000    .030    .000    .000   11.30 20014.52
 .000075     37.     37.     37.      2       0       0     .00 3864.82 23879.34
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 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=    .300
*SECNO 5.907
   5.907   42.18   53.48     .00     .00   53.71     .23     .01     .00   56.30
 408411.0      .0 408411.0     .0      .0 105336.8      .0 145796.5  5441.1   56.30
    4.10     .00    3.88     .00    .000    .030    .000    .000   11.30 20014.48
 .000075    100.    100.    100.       0       0       0     .00 3864.96 23879.45


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.78

   6.350   40.95   53.75     .00     .00   53.81     .06     .08     .02   41.10
 408300.0      .2 407998.6   301.2     5.8 205516.1   978.6 154185.1  5785.6   29.60
    4.42     .04    1.99     .31    .110    .030    .110    .000   12.80 19999.09
 .000024   1900.   2339.   3800.       2       0       0     .00 8863.48 28862.57


*SECNO 6.990
   6.990   40.83   53.83     .00     .00   53.89     .06     .07     .00   41.10
 388397.0   204.7 387569.4   622.9   973.5 203007.9  3508.7 170244.4  6501.7   40.20
    4.92     .21    1.91     .18    .110    .030    .110    .000   13.00 19835.04
 .000021   3500.   3379.   3400.       2       0       0     .00 9584.69 29419.72


*SECNO 7.370

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .29

   7.370   38.76   53.76     .00     .00   54.29     .52     .26     .14   60.00
 376580.0      .0 376580.0      .0      .0 64854.7      .0 176507.7  6788.3   55.00
    5.01     .00    5.81     .00    .000    .030    .000    .000   15.00 19805.96
 .000235   3500.   2006.   1400.       2       0       0     .00 3039.59 27837.62


CCHV=    .300 CEHV=    .500
*SECNO 7.379

3265 DIVIDED FLOW

1
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 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
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3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     58.60 ELREA=     58.60

   7.379   38.77   53.77     .00     .00   54.30     .52     .01     .00   60.00
 376580.0      .0 376580.0      .0      .0 64874.1      .0 176582.1  6791.8   55.00
    5.01     .00    5.80     .00    .000    .030    .000    .000   15.00 19805.80
 .000235     50.     50.     50.       0       0       0     .00 3040.62 27837.68
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*SECNO 7.379

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     58.60 ELREA=     58.60

   7.379   38.75   53.75     .00     .00   54.32     .56     .00     .02   58.60
 376580.0      .0 376580.0      .0      .0 62597.1      .0 176583.6  6791.9   58.60
    5.01     .00    6.02     .00    .000    .030    .000    .000   15.00 20019.18
 .000218      1.      1.      1.       1       0       0     .00 2475.39 27013.61
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*SECNO 7.384

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     58.60 ELREA=     58.60

   7.384   38.76   53.76     .00     .00   54.32     .56     .01     .00   58.60
 376580.0      .0 376580.0      .0      .0 62586.9      .0 176619.5  6793.3   58.60
    5.02     .00    6.02     .00    .000    .030    .000    .000   15.00 20019.20
 .000219     25.     25.     25.       0       0       0     .00 2475.29 27013.60
```

CCHV= .100 CEHV= .300

1


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 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
```

```
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST

*SECNO 7.393

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     58.60 ELREA=     58.60

   7.393   38.79   53.79     .00     .00   54.33     .55     .01     .00   58.60
 376580.0      .0 376580.0      .0      .0  63420.5      .0 176691.8  6796.1   58.60
    5.02     .00    5.94     .00    .000    .030    .000    .000   15.00 20019.11
 .000196     50.     50.     50.       1       0       0     .00 2499.74 27013.65

*SECNO 7.403

3265 DIVIDED FLOW

   7.403   38.80   53.80     .00     .00   54.34     .54     .01     .00   58.60
 375554.0    76.0 375270.2   207.8   264.0 63466.2   720.8 176765.2  6799.3   58.60
    5.02     .29    5.91     .29    .110    .030    .110    .000   15.00 19805.08
 .000194     50.     50.     50.       0       0       0     .00 3018.96 27837.97

CCHV=   .100 CEHV=    .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.29

   7.440   36.75   54.35     .00     .00   54.40     .05     .01     .05   58.00
 375554.0      .0 375550.8     3.2      .0 207985.9    50.2 177437.7  6827.2   52.00
    5.05     .00    1.81     .06    .000    .030    .110    .000   17.60  393.99
 .000018    215.    215.    215.       2       0       0     .00 8275.55 8669.54

CCHV=   .100 CEHV=    .300
*SECNO 7.610
   7.610   34.86   54.36     .00     .00   54.42     .06     .02     .00   41.20
 369116.0   865.6 368223.3    27.1  2839.6 182461.3   122.0 181424.4  7004.1   40.60
    5.17     .30    2.02     .22    .110    .030    .110    .000   19.50 19571.71
 .000028   1280.    880.    562.       2       0       0     .00 9071.03 28642.73
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

```
*SECNO 7.760
  7.760   35.79   54.39    .00    .00   54.45    .06    .02    .00   58.00
 369116.0     .0 369116.0     .0     .0 191473.0     .0 184972.8  7173.0   60.00
   5.29    .00    1.93    .00   .000   .030   .000   .000   18.60  850.23
 .000025   850.    820.   800.     0     0     0    .00  8849.09  9699.33


*SECNO 8.180

3265 DIVIDED FLOW

3280 CROSS SECTION    8.18 EXTENDED    4.45 FEET

  8.180   37.85   54.45    .00    .00   54.50    .05    .05    .00   62.00
 369116.0     .0 369001.6   114.4     .0 215107.3  1123.0 195248.9  7658.3   50.00
   5.65    .00    1.72    .10   .000   .030   .110   .000   16.60  218.00
 .000020  2044.   2196.  2141.     0     0     0    .00 10418.43 11235.27


*SECNO 8.670
3280 CROSS SECTION    8.67 EXTENDED    4.51 FEET

  8.670   33.91   54.51    .00    .00   54.55    .04    .06    .00   44.00
 369116.0 24772.2 343880.6   463.3 64730.5 206611.9  2617.9 213646.4  8767.9   50.00
   6.11    .38    1.66    .18   .110   .030   .110   .000   20.60  172.11
 .000023  9000.   2391.  3177.     2     0     0    .00 16548.89 16721.00


*SECNO 9.250
3280 CROSS SECTION    9.25 EXTENDED    8.58 FEET

  9.250   32.99   54.59    .00    .00   54.63    .04    .07    .00   42.00
 369116.0  5790.2 361236.2  2089.7 16076.5 212614.9  9715.7 231802.1  9907.4   42.00
   6.62    .36    1.70    .22   .110   .030   .110   .000   21.60   72.06
 .000025  3200.   3062.  3200.     0     0     0    .00 15470.61 15542.67


CCHV=   .100 CEHV=    .300
*SECNO 10.120

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .32

1
 28FEB00    09:37:31                                       PAGE  43


 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


3470 ENCROACHMENT STATIONS=    1232.0    8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
```

10.120	24.60	54.90	.00	.00	55.21	.31	.50	.08	41.60	
333600.0	5665.5	311698.7	16235.8	8412.1	67795.7	20930.7	249104.8	11117.4	43.80	
6.91	.67	4.60	.78	.120	.030	.120	.000	30.30	160.56	
.000195	7700.	4594.	1000.	2	0	0	.00	8730.70	8891.26	

THIS RUN EXECUTED 28FEB00 09:37:32

****
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

FILENAME:G1030FH2.IH2...

SUMMARY PRINTOUT

SECNO	VOL	AREA	CWSEL
.010	.00	237452.90	46.30
.010	.00	260570.70	48.70
.010	.00	270235.70	49.70
.010	.00	299526.00	52.70
.020	272.56	237453.30	46.30
.020	299.09	260571.80	48.70
.020	310.19	270237.60	49.70
.020	343.81	299530.20	52.70
.470	13502.09	237464.90	46.30
.470	14811.69	260613.20	48.71
.470	15358.99	270306.40	49.71
.470	17010.17	299677.80	52.72
1.110	30631.13	204454.20	46.30
1.110	33618.64	224740.40	48.71
1.110	34870.23	233284.60	49.72
1.110	38744.87	261829.90	52.74
1.990	50916.00	175183.90	46.31
1.990	55955.03	192956.50	48.73
1.990	58072.61	200468.80	49.75
1.990	64762.18	223248.10	52.79

	2.400	59457.07	168544.00	46.31
	2.400	65374.41	186149.10	48.74
	2.400	67863.82	193617.10	49.76
	2.400	75674.52	216070.50	52.82
*	2.650	63665.19	109375.90	46.31
*	2.650	70083.70	125035.90	48.74
*	2.650	72785.54	131686.90	49.76
*	2.650	81232.12	151611.90	52.82

	SECNO	VOL	AREA	CWSEL
*	3.950	83336.37	140324.50	46.34
*	3.950	92133.98	154887.80	48.82
*	3.950	95858.45	161230.40	49.89
*	3.950	107355.50	180085.40	53.06
	4.390	90943.52	144933.10	46.34
	4.390	100620.20	163296.80	48.84
	4.390	104728.50	171325.00	49.92
	4.390	117364.30	195170.00	53.12
	5.320	105222.80	108276.40	46.36
	5.320	116708.70	121848.80	48.88
	5.320	121613.70	127868.00	49.99
	5.320	136635.00	145890.50	53.24
	5.780	110664.90	85793.15	46.37
	5.780	122870.90	96825.09	48.91
	5.780	128098.40	101691.30	50.04
	5.780	144104.00	116091.00	53.31
	5.860	111470.40	78383.67	46.37
	5.860	123787.40	87891.30	48.91
	5.860	129065.60	92156.30	50.04
	5.860	145225.20	104694.90	53.31
	5.880	111650.30	78352.53	46.37
	5.880	123989.20	87900.32	48.91
	5.880	129277.20	92170.76	50.04
	5.880	145465.50	104721.80	53.32
	5.887	111716.80	78362.70	46.37
	5.887	124063.90	87937.60	48.92
	5.887	129355.50	92234.33	50.06
	5.887	145554.80	105307.60	53.47
	5.907	111896.70	78365.72	46.37
	5.907	124265.80	87947.35	48.93
	5.907	129567.20	92250.03	50.06
	5.907	145796.50	105336.80	53.48

*	6.350	117816.90	141905.60	46.40
*	6.350	131058.30	164736.50	49.01
*	6.350	136757.70	175215.00	50.20
*	6.350	154185.10	206500.50	53.75
	6.990	128840.80	142310.80	46.41
	6.990	143831.70	164577.90	49.04
	6.990	150337.80	174891.30	50.25
	6.990	170244.40	207490.10	53.83

	SECNO	VOL	AREA	CWSEL
*	7.370	133175.90	46012.61	46.41
*	7.370	148822.50	52203.75	49.02
*	7.370	155632.70	55087.03	50.21
*	7.370	176507.70	64854.68	53.76
	7.379	133228.70	45991.61	46.41
	7.379	148882.40	52208.31	49.03
	7.379	155696.00	55094.27	50.22
	7.379	176582.10	64874.11	53.77
	7.379	133229.80	45046.58	46.41
	7.379	148883.60	51144.92	49.02
	7.379	155697.20	53973.35	50.21
	7.379	176583.60	62597.12	53.75
	7.384	133255.60	45045.75	46.41
	7.384	148913.00	51141.48	49.03
	7.384	155728.20	53967.53	50.22
	7.384	176619.50	62586.90	53.76
	7.393	133307.70	45660.18	46.41
	7.393	148972.00	51825.18	49.03
	7.393	155790.50	54684.83	50.23
	7.393	176691.80	63420.49	53.79
	7.403	133360.10	45665.80	46.41
	7.403	149031.50	51844.34	49.04
	7.403	155853.30	54719.06	50.24
	7.403	176765.20	64451.07	53.80
*	7.440	133827.90	143881.30	46.45
*	7.440	149569.00	165930.30	49.20
*	7.440	156423.70	176401.00	50.49
*	7.440	177437.70	208036.10	54.35
*	7.610	136444.20	114903.50	46.46
	7.610	152654.60	139073.80	49.20
	7.610	159733.40	150629.60	50.50
	7.610	181424.40	185422.90	54.36

7.760	138678.60	122473.30	46.46
7.760	155340.00	146191.80	49.21
7.760	162634.00	157484.60	50.51
7.760	184972.80	191473.00	54.39
8.180	145217.80	136949.20	46.47
8.180	163154.60	163830.70	49.24
8.180	171057.90	176708.90	50.55
8.180	195248.90	216230.30	54.45

SECNO	VOL	AREA	CWSEL
8.670	155070.80	145506.30	46.48
8.670	175868.50	188048.20	49.27
8.670	185173.60	209304.50	50.59
8.670	213646.40	273960.30	54.51
9.250	164599.20	124084.90	46.50
9.250	188190.30	160250.70	49.31
9.250	198929.70	179364.50	50.65
9.250	231802.10	238407.20	54.59
* 10.120	173284.10	39701.40	46.66
* 10.120	199674.00	57856.18	49.57
* 10.120	211858.20	67358.77	50.91
* 10.120	249104.80	97138.48	54.90

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.650 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.650 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.650 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.650 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 3.950 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.950 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.950 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.950 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 6.350 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 6.350 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 6.350 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.370 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.370 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.370 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.370 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.440 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.440 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.440 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.440 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.610 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 10.120 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 10.120 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 10.120 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 10.120 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

Appendix B-3 HEC-2 Model Output (Sediment Removal Options)

HEC-2 Output

Alternative I - Channel Improvement West Fork d/s 3.5 miles

```
1*********************************************                    ****************************************
* HEC-2 WATER SURFACE PROFILES          *                         * U.S. ARMY CORPS OF ENGINEERS       *
*                                       *                         * HYDROLOGIC ENGINEERING CENTER      *
* Version  4.6.2;  May 1991             *                         * 609 SECOND STREET, SUITE D         *
*                                       *                         * DAVIS, CALIFORNIA 95616-4687       *
* RUN DATE   29FEB00   TIME   11:00:21  *                         *        (916) 756-1104              *
*********************************************                    ****************************************
```

```
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
```

```
1
 29FEB00    11:00:21                                    PAGE  1


                                         THIS RUN EXECUTED 29FEB00    11:00:21
 *************************************
 HEC-2 WATER SURFACE PROFILES

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

[redacted]200.OH2 ("CHANNEL IMPROVEMENT — WEST FORK 3.5 MILES")

```
T1    CF-0033 BROWN & ROOT SERVICES, 02/28/2000
T2    Lake Houston HEC-2 MODEL, REACH 3 (CIMP 200 ft + higher starting WSEL)
T3    Starting form river mile 3.615 u/s of Lake Houston Dam (multi-profile CI)

J1  ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS    Q     WSEL    FQ

       0      4      0                        50.5

J2  NPROF   IPLOT   PRFVS   XSECV   XSECH    FN    ALLDC    IBW    CHNIM    ITRACE

      -1      0      -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     150     55     56     25     26     35     60     59     64     65

J6  IHLEQ    ICOPY   SUBDIV   STRTDS    RMILE

       1


NC    0.11     0.11     0.03     0.1     0.3
QT       6    75056   160681  214619   369116    214619    214619
X1    7.61       30    20000   28625
GR      60    19450       55   19550       50     19720       45     19900       40     19950
GR    41.2    20000     27.3   20292     28.4     20725     26.9     20750     20.9     20790
GR    19.5    20975     27.6   21250     28.1     21625     24.1     21650     34.6     22000
GR    41.6    22200     41.6   22355     36.2     23780     38.6     24025     40.6     24920
GR    39.4    25170     39.6   25270     33.4     25725     28.1     26330     27.8     26917
GR    30.9    27700     26.4   27730     24.1     27920     40.6     28625       60     28650

X1    7.76       90      771  9836.14     850       800      820
GR      62        0       62  489.26       60    692.24       58       771       56    834.79
GR      54   853.86       50  904.39       44   1003.91       42   1016.08     37.6   1084.32
```

GR	34.6	1111.99	30.6	1137.07	30.6	1153.38	32.6	1179.64	32.6	1207.07
GR	28.6	1307.23	27.6	1341.56	23.6	1385.86	23.6	1432.49	24.6	1476.77
GR	24.6	1951.16	23.6	2064.42	19.6	2142.98	18.6	2169.23	18.6	2267.16
GR	19.6	2310.8	20.6	2379.51	20.6	2415.42	22.6	2486.57	24.6	2522.73
GR	28.6	2702.12	36.6	2738.89	36.6	3063.8	35.6	3134.15	35.6	3511.39
GR	36.6	3902.11	37.6	3938.96	38.6	4169.32	38.6	4408.28	37.6	4593.59
GR	36.6	4704.59	35.6	4771.45	35.6	4823.96	36.6	4877.86	36.6	4962.19
GR	34.6	5096.4	33.6	5200.6	33.6	5225.77	34.6	5318.5	34.6	5421.72
GR	33.6	5503.25	32.6	5725.49	33.6	5841.58	35.6	5949.58	37.6	6028.99
GR	38.6	6685.89	38.6	6916.53	37.6	6935.31	33.6	6967.93	33.6	7064.54
GR	34.6	7149.29	36.6	7216.18	36.6	7267.72	34.6	7318.26	31.6	7462.61
GR	29.6	7513.65	24.6	7662.68	23.6	7728.3	22.6	7866.81	21.6	8042.58
GR	21.6	8265.65	23.6	8385.69	26.6	8411.89	28.6	8458.17	28.6	8502.6

GR	29.6	8539.72	29.6	8610.67	28.6	8716.35	29.6	8812.57	30.6	8958.68
GR	32.6	9102.53	32.6	9289.83	33.6	9306.53	35.6	9311.9	36.6	9397.53
GR	37.6	9442.2	50	9592.67	60	9836.14	70	12158.31	70	12225.01

X1	8.18	90	0	10131.28	2044	2141	2196			
GR	62	0	58	123.67	52	282.94	50	321.61	46	441.7
GR	44	571.84	42	589.79	42	593.39	33.6	633.46	31.6	775.49
GR	29.6	855.4	28.6	916.54	28.6	1018.47	26.6	1059.95	26.6	1186.1
GR	27.6	1217.35	27.6	1403.32	23.6	1469.29	18.6	1520.89	16.6	1574.93
GR	16.6	1636.4	20.6	1679.92	26.6	1732.64	25.6	1781.4	25.6	1838.17
GR	23.6	1899.9	22.6	1983.03	22.6	2029.11	27.6	2383.07	29.6	2442.35
GR	31.6	2558.94	33.6	2641.9	34.6	2767.24	34.6	2895.38	33.6	3086.86
GR	32.6	3149.65	32.6	3348.49	33.6	3418.1	35.6	3506.3	35.6	3958.66
GR	35.6	4123.51	34.6	4223.84	34.6	4323.83	35.6	4468.25	36.6	4520.54
GR	37.6	4533.46	39.6	4687	39.6	4806.62	38.6	5470.77	36.6	5861.13
GR	36.6	6288.59	36.6	6508.12	35.6	6711.54	34.6	6830.72	34.6	6905.04
GR	33.6	7117.63	33.6	7452.66	30.6	7500.66	25.6	7546.39	23.6	7582.5
GR	23.6	7697.6	25.6	7890.71	25.6	7945.46	26.6	8014.74	27.6	8134.1
GR	27.6	8468.81	26.6	8519	26.6	8658.6	27.6	8769.8	29.6	8857.3
GR	32.6	8886.8	34.6	8997.2	32.6	9008.48	31.6	9035.85	28.6	9071.18
GR	25.6	9193.51	22.6	9274.24	22.6	9367.4	28.6	9395.16	30.6	9438.96
GR	28.6	9505.21	29.6	9566.81	32.6	9611.97	34.6	9726.04	35.6	9755.25
GR	36.6	9918.22	50	10131.28	55	10634.33	60	11105.23	50	11235.27

X1	8.67	90	4913	16141	9000	3177	2391			
GR	60.0	1.00	44	500	42	1200	38.6	3000	42	3400
GR	42	3700	35.6	4000	34.6	4156	34.6	4243	35.6	4299
GR	36.6	4355	37.6	4544	42	4791	44	4913	42	5213
GR	37.6	5344.31	36.6	5408.33	35.6	5469	32.6	6008	31.6	6099
GR	30.6	6107.72	29.6	6130.49	28.6	6139.98	28.6	6320.91	29.6	6337.56
GR	29.6	6345.87	30.6	6355.86	30.6	6361.9	29.6	6367.24	28.6	6372.57
GR	27.6	6379.42	26.6	6384.35	25.6	6389.27	24.6	6394.2	24.6	6448.01
GR	25.6	6477.2	25.6	6487.81	24.6	6531.11	23.6	6574.41	22.6	6617.7
GR	21.6	6661	20.6	6693.14	20.6	6693.37	21.6	6700.26	22.6	6707.16
GR	23.6	6714.37	24.6	6722.29	25.6	6730.22	25.6	6736.32	27.6	6752.54
GR	28.6	6773.68	28.6	6828.95	29.6	6895.05	29.6	6935.2	28.6	7010.54
GR	28.6	7115.84	27.6	7173.41	26.6	7186.62	25.6	7202.96	25.6	7286.02
GR	26.6	7317.91	27.6	7349.8	28.6	7382.76	29.6	7416.84	30.6	7426.5
GR	31.6	7445.67	32.6	7490.79	33.6	7506.12	33.6	7673.9	34.6	7700.56
GR	35.6	7717.98	36.6	7738.7	37.6	7761.94	42	7849.08	42	8423
GR	44	8476	46	8664	48	8805	48	8992	46	9040
GR	44	9089	42	9534	36.6	11234	30.6	11284	26.6	13254
GR	32.6	13794	34.6	14434	42	14977	50	16141	50	16721

X1	9.25	90	1482.97	13375	3200	3200	3062			
GR	58	0	54	84.32	46	290.31	42	343.23	42	420.17
GR	44	476.39	44	677.8	42	742.06	39	1028.07	40	1064.74
GR	42	1297.02	42	1482.97	36.6	1531.82	36.6	1733.64	42	1778.92
GR	42	1835.14	36.6	1853.7	36.6	2042.83	38.6	2058.93	42	2165.87
GR	37.6	2653.73	36.6	2884.43	34.6	2973.32	32.6	3125.1	30.6	3227.31
GR	30.6	3440.43	32.6	3539.47	32.6	3694.91	33.6	3796.25	33.6	3879.19
GR	32.6	3883.23	30.6	4014.25	31.6	4053.84	23.6	4077.66	21.6	4103.3
GR	21.6	4142.49	23.6	4210.25	29.6	4428.22	30.6	4512.25	29.6	4548.08

```
GR   29.6  4683.39   30.6  4822.04   31.6  4859.24   31.6  4945.96   32.6  4969.93
```



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GR   32.6  5164.13   28.6  5259.78   27.6  5489.81   30.6  5586.26   29.6  5674.1
GR   29.6  5840.08   28.6  5933.49   29.6  6117.52   30.6  6218.87   29.6  6291.43
GR   35.6  6622.31     42  7000.5      42  7186.01     46  7281.58     50  7365.02
GR     50  7412.73     48  7530.52     48  8258.76     46  8409.42     46  8595.54
GR     44  9144.24     42  9278.05   40.6  9380      40.6  9800        42  10300.6
GR     42  10877     37.6  10950.0   34.6  11000     32.4  11300     32.4  12100
GR   34.6  12200     34.6  12500     32.6  12700     26.0  13025       42  13375
GR     50  13650       48  14445       50  14503       52  14900       50  14921
GR     50  14976.91    54  15030.06    54  15451.95    48  15509.12    46  15542.67

QT      4  66800   143300  174300  333600
NC   0.12  0.12    0.03    .1      .3
X1  3.615    89  2366.85  6330.06   7700   1000   4594
X3     10          1232.04  54.7
CI   5720    20  0.030   18   22   200
GR   55.6     0    55.2     90     54.9  161.12    54.8  318.29    54.5  400
GR   54.5  505.44  50.4  590.1     50.7  644.14    49.6  763.76    49.8  821.19
GR   47.9  853.74  50.9  895.11      51  927.61      49  951.75    47.9  1054.3
GR   50.3  1085.94 53.3  1160.37   54.7  1232.04   50.1  1287.74     49  1373.79
GR   48.6  1482.72 49.1  1622.28   46.2  1678.02   46.3  1781.82   48.3  1866.53
GR   49.2  1949.4  48.8  2075.16   47.9  2163.11   43.8  2220.71   42.6  2269.24
GR   41.6  2366.85 40.6  2391.75     39  2452.47   37.7  2548.87   37.9  2765.45
GR   37.6  2952.69   38  3157.81   38.6  3299.81   38.3  3413.04   38.1  3746.92
GR   38.1  3993.99 38.9  4185.79   38.8  4286.36   40.5  4499.72   39.9  4728.9
GR   38.6  4754.82 40.1  4907.5  40.4627 4943.023  38.9  4984.51   37.2  5041.95
GR   37.2  5119.68 36.4  5177.29   37.3  5277.11   36.8  5355.15   38.1  5518.64
GR   37.9  5567.34 36.5  5613.59   33.5  5655.2    32.5  5769.5    30.3  5803.47
GR   32.8  5902.24 32.8  5982.5    34.2  6030.84   36.5  6067.52   37.5  6124.9
GR   37.8  6207.91 40.5  6273.13   43.8  6330.06   41.5  6462.94   41.4  6636.96
GR   44.8  6697.83 45.5  6728.93   44.5  6819.63     45  6861.77   44.5  6960.04
GR   44.8  7029.56 45.05 7060      44.7  7115.34   45.4  7181.81   45.6  7240
GR   45.6  7360    45.5  7468.6    43.4  7632.04   44.6  7864.56   47.6  7908.88
GR   47.7  7982.52 48.7  8044.72   48.8  8220      55.8  8990

QT      4  66160   140750  173330  329800
X1  4.745    84  2373.4  6703.71   3600   4500   5966
X3     10          1973.39   52   6985.59   48.6
CI   3040    21          18   20   200
GR  60.92     0    54.6  450     53.45  570      53.05  630      52.6  740
GR   52.7  830     52.5  930       52   989.14   52.45  1150     52.3  1284.73
GR   52.6  1434.66 52.6  1560    52.45  1730     52.3   1836.38  52.05  1940
GR     52  1973.39 51.1  2373.4   43.3  2385     39.8   2559.76    37  2645.83
GR     36  2728.22 35.3  2809.02  35.9  2887.92  31.2   3041.01  31.9  3156.16
GR   38.5  3253.79 38.3  3378.72  37.2  3446.92  38.7   3576.68  40.1  3661.26
GR     41  3745.2  42.8  3831.04  41.2  3910.34    41   3973.54  41.5  4029.61
GR   41.7  4160.5  41.2  4216.44  42.6  4487.7   44.7   4656.69  40.7  4714.42
GR   36.5  4755    36.2  4820     34.9  4900     38.1   5120     38.1  5180
GR   41.1  5200    42.3  5222     42.1  5272     39.7   5300     39.9  5500
GR   39.6  5550      38  5600     36.3  5740       37   5800     39.8  5962.55
GR     40  6057.51 39.7  6300.58    42  6371.11  43.1   6486.54    44  6532.85
GR   44.5  6559.55 45.2  6653.68  47.2  6703.71    47   6753.55  47.1  6787.33
GR   47.5  6829.55 47.3  6947.51  48.6  6985.59  48.4   7027.77  47.3  7052.29
GR   47.2  7079.78 46.5  7122.32  46.4  7303.07  46.8   7395.37  47.9  7436.05
GR   48.1  7535.6  50.2  7585.83  54.2  7722.58  54.7   7816.27  59.2  7868.73
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GR   60.8  7911.42   61  8096.6   61.5  8298   61.8  8402

QT      4  65990  140170  173080  328820
NC   0.12  0.12   0.03    0.3     0.5
X1  5.026    77   10508   14400   1030   4150   1482   0.9135
X3     10
CI                                .01
```

```
GR  70.3      0  60.1    847  55.1   4325  50.1   6125  47.5   6457
GR  51.9   6672    52   6723  49.3   6899    53   7002  51.3   7207
GR  47.8   7406  44.3   7535  50.7   7643    52   7675  49.2   7860
GR  50.7   7983    52   8074  50.8   8207  51.4   8253  50.6   8427
GR  44.2   8495  47.4   8539  44.2   8686  50.9   8716  48.5   8805
GR  53.1   8968  50.3   9257  52.8   9627  49.3   9739  48.6  10032
GR  41.6  10121  52.8  10240  51.6  10351  56.2  10508  49.2  10531
GR  44.1  10549  41.8  10584  28.9  10622  37.4  10682  36.1  10792
GR    26  11140  21.5  11250  21.5  11450    26  11570  41.3  11748
GR  41.3  11749  45.5  11830  46.2  11981  44.7  12010  41.2  12077
GR  46.2  12110    46  12265  42.6  12356  43.9  12514  41.7  12874
GR  42.3  13169  43.2  13369  44.1  13509  41.3  13921  44.5  14033
GR  43.9  14119  43.1  14221  47.6  14283    57  14400  63.4  14532
GR  64.7  14822  62.5  14960  66.5  15076  67.6  15152  66.1  15301
GR  65.8  15393  64.6  15581  65.5  15601  66.7  15706  62.2  15750
GR  64.2  15886  65.4  16039

NC   .12    .12  0.030
X1 5.027     69  10508  14300      1      1      1  0.9135
X3    10
X2     0      0      0   52.5  58.25
GR  70.3      0  60.1    847  50.1   6125  40.8   6399    52   6703
GR    53   6993  43.8   7631    52   7675  50.6   8427  44.2   8495
GR  53.1   8968  50.3   9257  52.8   9627  49.3   9739  48.6  10032
GR  41.6  10121  56.2  10508  28.9  10622  37.4  10682  37.4  10683
GR  36.1  10792  21.5  11250  21.5  11450  41.3  11748  41.3  11749
GR  41.3  11750  45.5  11830  46.2  11981    45  12004  52.5  12004
GR  44.7  12010  41.2  12077  46.2  12110  46.1  12162  52.5  12169
GR  46.1  12169  42.6  12356  43.5  12463  52.5  12463  43.5  12469
GR  43.9  12514  41.3  12663  52.5  12663  52.5  12669  41.3  12669
GR  41.7  12863  52.5  12869  41.7  12869  42.3  13163  52.5  13169
GR  42.3  13169  43.2  13363  52.5  13369  43.2  13369  44.1  13509
GR  41.3  13581  41.3  13663  52.5  13669  41.3  13669  41.3  13863
GR  52.5  13869  41.3  13921  44.5  14033  43.9  14113  52.5  14119
GR  43.9  14119  43.1  14221    56  14300  66.8  14676

X1 5.034      0      0      0     47     47     47
X3    10
X2     0      0      0   52.5  58.25

NC  0.12   0.12   0.03
X1 5.035     77  10508  14400      1      1      1  0.9135
X3    10
GR  70.3      0  60.1    847  55.1   4325  50.1   6125  47.5   6457
GR  51.9   6672    52   6723  49.3   6899    53   7002  51.3   7207
GR  47.8   7406  44.3   7535  50.7   7643    52   7675  49.2   7860
GR  50.7   7983    52   8074  50.8   8207  51.4   8253  50.6   8427
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GR  44.2   8495  47.4   8539  44.2   8686  50.9   8716  48.5   8805
GR  53.1   8968  50.3   9257  52.8   9627  49.3   9739  48.6  10032
GR  41.6  10121  52.8  10240  51.6  10351  56.2  10508  49.2  10531
GR  44.1  10549  41.8  10584  28.9  10622  37.4  10682  36.1  10792
GR    26  11140  21.5  11250  21.5  11450    26  11569  26.5  11570
GR  41.3  11749  45.5  11830  46.2  11981  44.7  12010  41.2  12077
GR  46.2  12110    46  12265  42.6  12356  43.9  12514  41.7  12874
GR  42.3  13169  43.2  13369  44.1  13509  41.3  13921  44.5  14033
GR  43.9  14119  43.1  14221  47.6  14283    57  14400  63.4  14532
GR  64.7  14822  62.5  14960  66.5  15076  67.6  15152  66.1  15301
GR  65.8  15393  64.6  15581  65.5  15601  66.7  15706  62.2  15750
GR  64.2  15886  65.4  16039

X1 5.037     77  10508  14400      8      8      8  0.9135
X3    10
GR  70.3      0  60.1    847  55.1   4325  50.1   6125  47.5   6457
GR  51.9   6672    52   6723  49.3   6899    53   7002  51.3   7207
GR  47.8   7406  44.3   7535  50.7   7643    52   7675  49.2   7860
GR  50.7   7983    52   8074  50.8   8207  51.4   8253  50.6   8427
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GR   44.2    8495    47.4    8539    44.2    8686    50.9    8716    48.5    8805
GR   53.1    8968    50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6   10121    52.8   10240    51.6   10351    56.2   10508    49.2   10531
GR   44.1   10549    41.8   10584    28.9   10622    37.4   10682    36.1   10792
GR     26   11140    21.5   11250    21.5   11450      26   11569    26.5   11570
GR   41.3   11749    45.5   11830    46.2   11981    44.7   12010    41.2   12077
GR   46.2   12110      46   12265    42.6   12356    43.9   12514    41.7   12874
GR   42.3   13169    43.2   13369    44.1   13509    41.3   13921    44.5   14033
GR   43.9   14119    43.1   14221    47.6   14283      57   14400    63.4   14532
GR   64.7   14822    62.5   14960    66.5   15076    67.6   15152    66.1   15301
GR   65.8   15393    64.6   15581    65.5   15601    66.7   15706    62.2   15750
GR   64.2   15886    65.4   16039

X1  5.038      67   10508   14300       1       1       1  0.9135
X2      0       0       0    52.5   58.25
X3     10
GR   70.3       0    60.1     847    50.1    6125    40.8    6399      52    6703
GR     53    6993    43.8    7631      52    7675    50.6    8427    44.2    8495
GR   53.1    8968    50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6   10121    56.2   10508    28.9   10622    37.4   10682    37.4   10683
GR   37.4   10689    36.1   10792      26   11140    21.5   11250    21.5   11450
GR   41.3   11749    45.5   11830    46.2   11981      45   12004    52.5   12010
GR   44.7   12010    41.2   12077    46.2   12110    46.1   12162    52.5   12169
GR   46.1   12169    42.6   12356    43.5   12463    52.5   12469    43.5   12469
GR   43.9   12514    41.2   12621    41.3   12663    52.5   12669    41.3   12669
GR   41.7   12863    52.5   12869    41.7   12869    42.3   13163    52.5   13169
GR   42.3   13169    43.2   13363    52.5   13369    43.2   13369    44.1   13509
GR   41.3   13663    52.5   13669    41.3   13863    52.5   13869    41.3   13921
GR   44.5   14033    43.9   14113    52.5   14113    43.9   14119    43.1   14221
GR     56   14300    66.8   14676
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X1  5.045       0       0       0      47      47      47
X2      0       0       0    52.5   58.25
X3     10

NC   0.12    0.12    0.03     0.1     0.3
X1  5.046      77   10508   14400       1       1       1  0.9135
X3     10
GR   70.3       0    60.1     847    55.1    4325    50.1    6125    47.5    6457
GR   51.9    6672      52    6723    49.3    6899      53    7002    51.3    7207
GR   47.8    7406    44.3    7535    50.7    7643      52    7675    49.2    7860
GR   50.7    7983      52    8074    50.8    8207    51.4    8253    50.6    8427
GR   44.2    8495    47.4    8539    44.2    8686    50.9    8716    48.5    8805
GR   53.1    8968    50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6   10121    52.8   10240    51.6   10351    56.2   10508    49.2   10531
GR   44.1   10549    41.8   10584    28.9   10622    37.4   10682    36.1   10792
GR     26   11140    21.5   11250    21.5   11450      26   11568    26.5   11570
GR   41.3   11749    45.5   11830    46.2   11981    44.7   12010    41.2   12077
GR   46.2   12110      46   12265    42.6   12356    43.9   12514    41.7   12874
GR   42.3   13169    43.2   13369    44.1   13509    41.3   13921    44.5   14033
GR   43.9   14119    43.1   14221    47.6   14283      57   14400    63.4   14532
GR   64.7   14822    62.5   14960    66.5   15076    67.6   15152    66.1   15301
GR   65.8   15393    64.6   15581    65.5   15601    66.7   15706    62.2   15750
GR   64.2   15886    65.4   16039

QT      4   65680  139080  172610  326970
NC   0.12    0.12    0.03     0.1     0.3
NH      4    0.12  6565.8    0.04 10389.97    0.03 11165.02    0.12 11754.54
X1  5.585      88 10389.97 11165.02   2664    1744    2847
X3     10
CI  10681      23     .03      20       8     200
GR  62.75       0      55    1050      51    1350    50.4    2130    49.8    2670
GR   49.3    2940      49 3070.97    47.4 3189.37    48.1 3332.69    44.9 3448.15
GR   47.2 3606.21    45.8 3712.03    48.1  3809.2    45.4  3992.9    48.9 4050.05
GR   50.5 4111.66    47.1 4292.93      49 4377.98    46.2 4426.95    48.4 4503.41
GR   51.7 4528.08      52  4646.6    47.9 4680.17    47.5 4744.32    49.6 4816.31
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GR   45.9  5042.82   46.4  5114.46   50.6  5214.31   50.4  5290.11   49  5321.9
GR   47.8  5469.67   49.5  5630.79   47.7  5658.97   46.1  5777.87   46.4  5924.67
GR   44.8  6004.29   43.3  6258.57   43.5  6470.87   48.9  6565.8   44.7  6646.34
GR   45.9  6743.32   44.5  6892.24   44.2  7009.22   44.5  7289.15   46.4  7330.53
GR   44.3  7392.93   41.7  7412.88   43.8  7516.5   42.6  7594.69   42.8  7688.63
GR   41.4  7768.32   42  7833.49   41.2  7910.79   42.2  8209.01   41.3  8286.36
GR   39.7  8308.22   39.9  8702   40.1  8964.4   39.4  9095.69   41.7  9292.52
GR   44.3  9703.77   41.6  9816.3   43.9  9860.54   41.3  9948.37   46.9  9970.67
GR   44.8  10033.63   43.0  10162.63   44.2  10190.96   43.9  10305.76   46.5  10332.73
GR   48.2  10389.97   44.7  10430.72   41.3  10459.1   32.9  10514.53   28.0  10567.09
GR   26.4  10611.42   24.7  10640.77   23.7  10681.82   25.7  10731.87   24.6  10751.83
GR   28.0  10782.41   30.2  10840.35   39.3  10888.46   38.5  10909.12   45.0  10961.37
GR   49.8  11165.02   54.6  11343.95   62.438  11754.54
1
 29FEB00    11:00:21                                        PAGE  7


QT    4   65210   137410   171900   324160
NC  0.08   .12   0.03   .1   .3
NH    5   0.12   2500   0.08   10000   0.03   17143   0.08   19000   0.12
NH  23560
X1  6.420   59   15845   16499   2300   2800   4409
CI  16190   24   0.030   20   8   200
X3   10
GR   75   0   75   2500   70   3400   70   6000   60   7000
GR   58.3   10000   56.1   10103   56.6   10179   57.3   10497   56.3   10543
GR   55.3   10654   57.2   10704   55.9   10873   52.1   10891   49   11004
GR   50.2   11061   53.5   11106   49.4   11290   48.2   11399   47.9   11517
GR   47.7   11625   48.9   11747   45.8   11900   46   11965   46.6   12181
GR   47.9   12699   48.1   12807   46.6   13068   46.2   13367   47.4   13489
GR   42.4   13758   41.8   14068   44.9   14127   46.8   14222   48.9   14266
GR   42.2   14433   38.1   14587   45   14654   41.5   14714   46.1   15114
GR   44.8   15161   46.9   15361   41.9   15727   46.7   15845   40.4   16043
GR   28.4   16309   44.9   16440   47.5   16499   43.3   16544   44.6   16859
GR   41.5   17143   44.5   17299   43.5   17474   41.4   17702   41.5   17822
GR   43   18004   61   18708   70   19600   70   23560

QT    4   64830   136080   171320   321910
NC  0.12   0.12   0.03   0.1   0.3
NH    4   .12   13568   0.03   15555   0.08   18896   .12   24402
X1   7.09   67   13568   15555   2000   3600   3538
X3   10            11840   53.1   20069   57.9
CI  16200   25   0.030   25   10   .01
GR   75.1   0   70.1   2300   60.1   3500   59.1   5310   55.1   7000
GR   52.9   9998   51.2   10405   48.3   10760   46.7   11002   48.1   11096
GR   50   11122   47   11313   46.7   11451   52.6   11572   53.1   11840
GR   52.5   12008   49.5   12394   44.7   12513   43.3   12597   44.3   12738
GR   45.4   12956   46.9   13568   45.2   13743   44.7   13868   43.8   13920
GR   44.8   13990   45.1   14281   44.7   14544   42.4   14583   43.1   14804
GR   41.6   14978   43.4   15013   42.2   15090   30.1   15260   31.6   15364
GR   47.4   15555   46.7   15598   45.5   15789   39.5   15858   36.1   15974
GR   35.8   16133   38.4   16239   42.5   16348   41.8   16564   44   16840
GR   44.7   17493   46.2   17579   44.6   18028   45.1   18178   43.3   18276
GR   43.9   18459   43   18497   44.4   18896   46.2   19531   56.9   19962
GR   57.9   20069   52.9   20275   53.4   20406   49.7   20651   51.5   20718
GR   54.8   21004   54.1   21070   54.3   21465   55   21585   53.8   21703
GR   60.1   22202   65   24402

QT    4   64610   135320   171000   320030
NC   .12   .12   .03   0.1   0.3
NH    5   .12   12000   0.05   14153   0.03   14598   0.05   16383   .12
NH  23100
X1   7.47   66   14153   14598   1500   1500   2006
X3   10                        16383   55.4
GR   75   0   75   4460   64.2   6000   70   6150   61.6   6693
GR   50.3   7163   46.9   7208   49.6   7585   46.7   7595   51   7861
GR   48.9   7931   50.6   8391   48   8503   49.8   8546   51.3   8691
GR   46.2   9217   50.4   9383   51.4   9536   49.2   9569   50.3   9803
GR   53.7   10039   53.5   10532   47.3   10859   48.5   10964   47.2   11235
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GR     45    11328    45.5    11905    48.6    12029    46.4    12059     42    12180
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GR   41.8    12274    44.9    12369    44.2    12639    45.9    12724    44.5    12772
GR   49.7    12832    48.5    12877    50.5    13056     45     13117    45.6    13218
GR   52.7    13383    48.5    13434     47     13591    41.8    13880    45.8    13922
GR   40.9    14010     47     14062    47.7    14153     29     14273     38     14585
GR   44.3    14598    43.4    14737    41.4    14777    40.4    14933    39.8    15545
GR   45.9    15676    48.5    15964    53.4    16211    55.4    16383     53     17600
GR    54     18600     55     18800     60     20560     70     21150     75     22400
GR    75     23100

NC    .12     .12    0.03
X1   8.07      90   5637.46  6519.38  2619.28  3201.18  2891.14
X3    10                    3455.36    61.13
GR   73.6       0      71    207.3    67.1   340.91    61.2   454.82    59.8   605.74
GR   63.3    903.8    58.3  1086.61     54   1321.33    54.2  1487.54    47.9  1600.81
GR   55.2  1766.53    53.5  1879.14    56.5  2066.56    53.1  2164.16    54.1  2425.57
GR   56.8  2597.07    52.7  2847.29    53.3  2923.49    50.4  3066.89    51.6   3182.9
GR   58.2   3240.1   61.15     3360    59.6   3625.8    56.1  3784.39     48   3837.18
GR    47   3910.62    41.7  3954.78    48.8   4041.7    47.3   4372.4     43   4430.63
GR    48   4823.38    45.7  5084.92    47.1   5209.7    44.3  5637.46    44.9  5883.73
GR   38.8  5971.26    41.9  6088.05    27.9  6099.51    32.1  6158.61    38.5  6417.39
GR   41.9   6498.6    46.7  6519.38    44.4  6698.82    44.6  6871.35    49.1  7166.61
GR   45.8  7214.35    48.7  7269.55    49.1  7385.35    46.4  7650.65    49.5  7758.86
GR   48.8  7837.12     53    8005.6    54.3  8165.26    54.2  8385.85    47.8  8751.03
GR   48.9  8956.83    47.3  9151.02    48.7  9234.09    48.6  9464.92    47.2   9691.7
GR   44.3  9845.44    44.3 10352.59    48.4 10497.67    48.7 10744.17    46.9 10944.93
GR   53.3 11073.35    58.8 11124.29    58.3 11461.72    60.5 11629.21    59.8 11752.03
GR   66.4 11793.39    67.5 11924.83   70.95    12100    69.2 12409.61    71.8 12474.39
GR   70.4 12728.04    74.2 12870.91    71.6 12991.35    74.9 13090.92    73.1 13188.25
GR   74.6 13307.27    72.3 13497.82    74.7 13757.58    73.4 13964.96    74.3 14201.59
GR   74.4  14577.6    73.6 14996.08    75.1 15169.17    73.7  15240.5    74.4 15481.47

QT     4    63800   132480   169770   315820
NC    .12     .12     .03      .1      .3
X1   8.49      91   2606.42  3168.51   2635.7  1605.14  2374.28
X3    10                              3851.71     54.7
GR   75.9       0    77.6       60    78.05      160   78.05      240     77    331.6
GR   72.3   368.12    69.4   412.95   71.35      460    69.7   534.73    67.2   564.85
GR   74.5      630    74.7      670    65.5   670.12    64.5      720    63.8   753.26
GR    55    814.19    51.2   856.53    46.4  1006.41    44.1  1184.02    46.1   1306.2
GR   45.1  1439.48    43.6  1567.36    42.1  1599.68    42.1  1656.52    45.3  1696.13
GR   46.6  1738.87    48.3  1871.15    45.8  1974.15    46.4  2040.15    43.1  2089.69
GR   43.2  2200.98    44.1  2303.81    45.6  2353.39     42   2371.86     46   2606.42
GR   37.9  2677.54    35.8  2837.08    35.9  2927.48   42.72  2959.44    47.7  3034.05
GR   49.5  3138.67    50.6  3168.51    48.9  3220.17    48.1  3328.05    48.6   3423.1
GR   50.4  3455.47    50.3  3565.82    52.2  3627.93    52.2  3679.39    54.7  3851.71
GR    53    3892.8    53.4     3940    51.9  3961.68     52   4079.34    52.9  4194.97
GR   55.8     4300    53.2  4350.46    54.7  4373.98    54.9  4425.24    53.8  4458.24
GR   54.6  4581.48    52.7  4690.43    53.9     4730    51.5  4768.99    52.7  4822.83
GR   50.7  4928.57    51.9   4949.8     52   5005.14    50.3  5083.53    51.9  5220.22
GR   50.4  5255.77    53.4  5329.85    55.9  5449.87    55.5  5530.76    52.5  5591.67
GR   51.4  5649.44    51.6  5719.53    50.4  5823.06    49.6  5989.14    44.2  6040.25
GR   44.2  6435.82    46.9  6530.15    48.9  6665.49    47.3  6720.92    47.2  6911.52
GR   55.6  6971.41    58.5  6998.91    61.3  7081.43    63.5  7116.99   66.48  7723.78
GR    71      8000
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QT     4    63510   131460   169330   314100
NH     5      .1  2567.98     .05  3385.13    0.03  3879.38    0.05     5000     .12
NH  10500
X1   9.41      94   3385.13  3879.38     2500     5500     4858
X3    10                    2460.63    56.91
GR   78.4       0    78.9    96.63    78.6   295.76    79.3   365.11    78.2    423.8
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GR   75.8   443.45   74.1   492.25   74.8   526.38   74.15    600    72.6    630
GR   72.8     670    65.3   721.32   60.2   753.27     56   813.24   54.4  854.41
GR   53.3   926.96     53  1014.31   51.5  1058.06   51.5  1133.33   50.5  1273.69
GR   51.4   1346.4   50.8  1454.34   51.1  1532.43   51.1  1736.18   51.8  1783.17
GR   51.8  1941.56   52.4  2003.11     53  2145.32   54.5  2316.56   56.8  2442.42
GR     56  2567.98   52.5  2621.33   52.4  2659.43   50.1  2775.83   49.4  2837.01
GR     50   3033.7   50.9  3141.06   43.5  3205.33   43.5  3281.17   51.8  3332.56
GR   53.3  3385.13   50.4  3417.41   45.2  3426.19   42.2  3442.41     42  3470.88
GR   38.1   3486.5   35.8  3658.23   36.2  3685.31   35.5  3798.17  42.72  3824.76
GR   48.2  3859.77   49.5  3879.38   44.1  3976.38   42.2  4082.27   42.2  4146.99
GR   43.8  4423.62   42.2  4450.81   48.9  4745.31   49.4  4914.17   48.4  5008.36
GR     48  5245.57   48.8   5332.6   48.1   5518.1   48.9  5669.75   47.9  5765.59
GR   50.2  5868.37   50.4  5903.32   49.4     6014     51  6193.43     53  6341.86
GR   52.1   6387.7   48.7  6470.08   48.4  6596.07   49.1  6831.48   48.1    6961
GR   49.1  7045.17   49.1  7203.02   48.4  7256.07   48.4     7513   50.4  7516.71
GR   49.7  7570.46   50.7  7615.19   48.4  7638.95   50.9  7797.35   55.4  7851.87
GR  57.57  7854.93  59.40     7877  61.45  7882.66     63     8000     64    8500
GR   64.3     8700     62     9300     67    10000     75    10500

QT      4    62850   129130   168330   309220
NC     .1      .12     0.03       .1       .3
X1  10.58       76  2518.22  3181.69     2700     3200     6177
X3     10                    1431.19    55.17     8020    59.05
GR   75.8        0   75.6     63.6   60.9   180.78   56.7   260.63   55.3     400
GR  54.85      520     54   579.97   53.5   709.98   51.1   790.94   50.6   912.57
GR   49.1   1025.2   49.2  1101.07   53.7  1157.02   54.5     1384   55.5  1418.21
GR   54.9  1763.41   52.9  1902.66   54.8  2083.95   54.5  2206.57     53   2255.4
GR   52.8  2438.35   53.6  2518.22   42.4  2566.64   40.3  2590.99   29.8  2603.35
GR   22.1  2654.44   22.5  2685.55   31.1  2771.89   34.7  2844.63   41.9  2867.55
GR   50.1  2913.09   48.2  3126.19   50.5  3181.69   49.3  3252.87   46.5  3306.48
GR   50.3  3409.33   47.5  3613.61   52.7   3701.6   50.2  3854.05   47.2   3900.8
GR   42.7  3930.19   44.6  3976.89   46.3  4107.08     50  4195.39   48.7  5535.67
GR   48.7  5863.58     49  5916.48   50.6  6045.31   49.2  7520.57   53.5  7702.66
GR  59.05     8020   59.3     8120   57.1  8360.19   57.2  8644.55   54.9  8710.45
GR   60.1  8984.95   59.4  9100.32   61.6     9300   63.4  9619.42   62.4  9928.89
GR   62.5 10100.96   64.8 10231.72     63 10264.23   65.3 10573.06   65.9 10735.19
GR  71.55    10860   72.2    10980  74.25    11110   73.2    11255   73.3 11458.81
GR   74.9 11812.08   74.7 12055.58   76.1  12161.3  75.45    12360  76.75    12560
GR   78.5 12699.89

QT      4    62690   128570   168090   310160
NC     .1      .12      .03       .1       .3
NH      3       .1     3262      .03     4059      .12    13987
1
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X1  10.86       43     3262     4059     1300     1100     1478
X3     10                                8865     62.3
GR   79.8        0   77.6      161   79.4      259   77.6      579   79.7     955
GR   78.9     1110   72.6     1684   52.3     1914   49.3     2212   50.4    2314
GR   52.2     3262   35.4     3575   31.7     3805   32.7     3875   52.4    4059
GR   46.4     4251     49     4323     45     4835   48.9     4896   44.9    5078
GR   47.3     5583   44.5     5654   43.2     5785   44.5     5945   41.7    6053
GR   57.6     6350   59.1     7698   60.1     8650   62.3     8865   59.2    9382
GR   61.6     9677   59.4     9772   60.6     9852   57.7    10128   56.7   10420
GR   54.4    10557   55.8    10709   60.7    11077   63.7    11730   72.9   12060
GR   74.4    13267   75.8    13671   79.7    13987

QT      4    62560   128120   167890   308450
NH      4      .12  2522.57      .05  3311.71      .03  3943.85      .12 13549.31
X1  11.09       82  3311.71  3943.85     1400     1600     1214
X3     10                    3311.71     53.3  6949.97     63.7
GR   77.9        0   78.6   449.85     74   650.88   61.2   796.99   53.8  853.81
GR   51.5  1009.93   52.1  1209.82   51.1  1415.55   52.9  1698.13   53.4  1881.01
GR   54.3  2005.52   54.3  2131.11   52.6  2522.57   52.3  2664.39   42.5  2721.63
GR   42.5  3112.03   45.4   3215.1   53.3  3311.71     51  3378.76     45    3400
GR   42.5  3427.89   34.6  3459.26   31.8  3669.22     36  3729.17     42  3745.04
GR   50.1  3767.43   55.5  3802.55     57  3943.85     52  4107.84   50.5  4209.1
GR   53.1  4359.76   56.2  4405.38   56.4  4699.98     55  4860.97   56.5  4932.99
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GR   54.4  5041.53    50.1     5150    52.2  5287.22    53.6  5519.22    51.9  5703.27
GR     52     5900    51.8     6040      52     6160    53.2     6300    54.5     6450
GR   57.8     6690    63.7  6949.97    63.9  7208.78    62.9  7282.45    61.9  7559.06
GR   59.2  7996.95    57.3     8229    58.1     8331    63.7     8477    61.2   8548.1
GR   62.8  8733.88    62.1  8893.69    62.3  9162.78    59.8  9368.39   62.65     9510
GR   62.2     9630    60.2  9723.91    61.8  9807.54    62.8 10002.69    59.7 10225.58
GR   62.6 10311.07    60.9 10350.09    62.5 10478.43    60.8 10575.85    64.4 11234.07
GR   67.3 11355.29    71.8 11460.13    75.3 11489.48   75.05    11790    74.1 11874.14
GR   74.1 12095.62    75.2 12273.93    75.5 12508.24    74.6 12649.39      76 13085.66
GR   74.3  13286.4    79.6 13549.31

QT      4    62410   127600   167670   307570
NC    .12      .12      .03       .3       .5
X1  11.35       89  2958.98  3804.94     1000     2300     1373
X3     10                       2199       58  6519.75     65.5
GR  75.43        0       66   155.36     64.3   287.39    63.9   438.76    60.9   535.19
GR   54.9   626.91       52   787.68     53.3   980.78    52.8  1186.05    55.1  1413.79
GR   55.2  1604.36     56.9  1641.25       57  1786.87   56.25     1790    56.3  2127.54
GR   58.1  2185.43     54.8  2259.37     54.4  2456.59    50.5  2653.09    51.8  2802.23
GR   53.9  2832.46     52.8  2958.98     44.7  3090.28    48.1  3150.77   37.64  3267.77
GR  38.74  3336.43    28.84  3406.43    29.04  3461.55   36.14     3538    42.5  3671.55
GR   52.6  3804.94     47.4  3855.04     47.9  3919.98    43.7  3952.95    42.6  4050.14
GR   44.3  4431.03     41.9  4584.19       47   4826.5    42.5  4859.87    42.6  4957.91
GR   48.7  5021.15     49.2  5059.55     43.9   5090.8    44.7  5266.47    43.2  5349.68
GR   50.2  5459.53     52.4  5575.87     50.4  5703.12    51.9  5904.76    49.1  6073.64
GR   49.1  6167.73     51.3  6273.19     59.7  6409.59    65.5  6519.75    65.7  6635.31
GR   63.6  6757.16       63  7060.24     63.3  7375.88      66     7690    64.7  7907.84
GR   65.5   7969.4     64.1   8340.7     64.9  8381.19    64.1  8668.42      62  8835.44
GR   62.5  8946.12     65.3  9083.61     63.6  9200.98   64.35     9450      63  9781.97
GR   63.1  10165.1     65.1 10443.04     64.4 10755.85    64.5 10988.16    68.1 11162.12
GR  71.35    11220     71.9 11348.07     74.6 11434.99    75.9 11601.85   78.45    11650
1
  29FEB00    11:00:21                                                   PAGE  11


GR   79.6    11960     81.1 12067.18     79.5 12180.83    80.3 12422.88    84.2 12477.71
GR  85.05    12580     83.5 12625.42     84.2    12770    82.9  13330.5

X1  11.38       85    19900    21000     1000     2300     1373     0.00      -1        0
X3     10      0.0      0.0      0.0      0.0      0.0      0.0      0.0     0.0      0.0
GR  85.00  14899.0    85.00  14900.0    85.00  16700.0    80.00  16850.0   75.00  16950.0
GR  70.00  17099.0    70.00  17100.0    65.00  17150.0    60.00  17350.0   55.00  17800.0
GR  65.90  19700.0    66.80  19800.0    67.30  19900.0    61.80  20000.0   60.70  20001.0
GR  55.60  20014.9    49.10  20030.0    44.10  20045.4    43.40  20060.3   45.20  20075.3
GR  45.80  20090.3    46.20  20105.3    45.30  20120.1    45.90  20136.6   46.00  20153.3
GR  45.30  20169.6    44.30  20186.2    44.70  20202.8    45.10  20219.6   45.00  20236.2
GR  45.30  20252.7    45.20  20269.3    45.20  20286.0    44.30  20302.6   43.70  20319.4
GR  40.00  20335.8    42.60  20352.5    38.10  20368.8    33.60  20385.4   35.50  20402.0
GR  33.20  20416.3    32.40  20430.0    31.70  20450.0    36.40  20470.0   34.80  20492.0
GR  37.60  20510.0    38.00  20527.2    38.30  20535.0    38.00  20565.0   37.40  20590.0
GR  37.00  20600.3    34.80  20615.0    27.80  20630.0    34.80  20645.0   36.30  20655.1
GR  39.20  20674.3    40.60  20693.3    38.60  20712.1    42.40  20731.4   43.50  20735.0
GR  47.40  20750.7    48.20  20769.8    47.20  20789.0    47.50  20808.0   47.50  20865.1
GR  47.80  20865.2    48.10  20884.2    47.90  20903.3    48.10  20922.3   48.70  20941.3
GR  54.90  20960.4    63.70  20978.7    63.90  20979.5    65.00  21000.0   64.30  21100.0
GR  55.00  22000.0    55.00  24800.0    60.00  25000.0    65.00  26200.0   65.00  26500.0
GR  70.00  27700.0    75.00  27800.0    80.00  28300.0    85.00  29700.0   90.00  30100.0

SB   1.25     1.50     2.60      0.0    189.0     20.4  22729.0    10.20   27.80    27.80
ET                                        9.1                      19900   21000
X1  11.39        0      0.0      0.0     50.0     50.0     50.0     0.00    0.00        0
X2      0     0.00        1    67.20    68.30     0.00        0     0.00    0.00        0
X3     10      0.0      0.0      0.0      0.0      0.0      0.0      0.0     0.0      0.0
BT     33  14899.0     87.0      0.0  16700.0     87.0      0.0  17000.0    85.0      0.0
BT  17560     80.0      0.0  18100.0     75.0      0.0  19200.0     70.0     0.0  19201.0
BT   70.0      0.0  20000.0     68.3      0.0  20000.1     68.3     65.7 20120.1     69.1
BT   66.7  20201.2     69.1     66.0  20416.3     69.8     67.1  20416.4    69.8     66.5
BT  20492     69.8     66.8  20492.1     69.8     65.1  20655.1     69.8    65.1  20655.2
BT   69.8     67.2  20978.7     68.8     65.6  20978.8     68.8      0.0 21000.0     68.0
BT    0.0  21100.0     67.3      0.0  21200.0     66.3      0.0  21201.0    66.3      0.0
```

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BT   23250    62.0    0.0  25100.0    65.0    0.0  26200.0    65.0    0.0  26400.0
BT   65.0    0.0  26700.0    70.0    0.0  27650.0    75.0    0.0  28150.0    82.0
BT   0.0  28750.0    87.0    0.0  29000.0    92.0    0.0  30300.0    92.0    0.0

ET                                    8.41
X1   11.4     89  2958.98  3804.94    50.0    50.0    50.0    0.00    0.00    0
X3   10                2199     58  6519.75    65.5
GR   75.43      0     66  155.36    64.3  287.39    63.9  438.76    60.9  535.19
GR   54.9  626.91     52  787.68    53.3  980.78    52.8  1186.05    55.1  1413.79
GR   55.2  1604.36   56.9  1641.25     57  1786.87   56.25    1790    56.3  2127.54
GR   58.1  2185.43   54.8  2259.37   54.4  2456.59    50.5  2653.09    51.8  2802.23
GR   53.9  2832.46   52.8  2958.98   44.7  3090.28    48.1  3150.77   37.64  3267.77
GR   38.74  3336.43  28.84  3406.43  29.04  3461.55   36.14    3538    42.5  3671.55
GR   52.6  3804.94   47.4  3855.04   47.9  3919.98    43.7  3952.95    42.6  4050.14
GR   44.3  4431.03   41.9  4584.19     47   4826.5    42.5  4859.87    42.6  4957.91
GR   48.7  5021.15   49.2  5059.55   43.9   5090.8    44.7  5266.47    43.2  5349.68
GR   50.2  5459.53   52.4  5575.87   50.4  5703.12    51.9  5904.76    49.1  6073.64
GR   49.1  6167.73   51.3  6273.19   59.7  6409.59    65.5  6519.75    65.7  6635.31
GR   63.6  6757.16     63  7060.24   63.3  7375.88      66    7690    64.7  7907.84
1
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GR   65.5   7969.4   64.1   8340.7   64.9  8381.19    64.1  8668.42      62  8835.44
GR   62.5  8946.12   65.3  9083.61   63.6  9200.98   64.35    9450      63  9781.97
GR   63.1  10165.1   65.1  10443.04  64.4  10755.85   64.5  10988.16   68.1  11162.12
GR   71.35   11220   71.9  11348.07  74.6  11434.99   75.9  11601.85  78.45    11650
GR   79.6    11960   81.1  12067.18  79.5  12180.83   80.3  12422.88   84.2  12477.71
GR   85.05   12580   83.5  12625.42  84.2    12770    82.9  13330.5

QT   4   62340   127340   167560   307140      0      0      0      0
NC   .12    .12    .03    .1    .3
NH   3   .120  3153.07   .030  3834.77   .120  14239.64
X1   11.48    83  3153.07  3834.77    400     700     370            -1
X3   10                1998.35   56.86
GR   76.29      0   74.2  141.74   72.1  251.69    67.3  387.98    65.6  572.84
GR   64.9  799.64   56.3  1051.78   56.7   1284.7    55.8  1423.54    57.5  1735.27
GR   55.8  1865.38   57.9  1950.43     57  2115.34    51.9  2192.24    51.6  2676.44
GR   48.1  2772.19   51.5   2897.5   47.5  3079.27    49.6  3153.07    48.4  3217.84
GR   40.8  3263.45   46.8  3312.88  38.33  3352.99   32.93   3453.9   28.63  3598.06
GR   22.83  3619.02  25.93  3642.69  21.73  3663.26   28.63  3710.06   40.09  3750.18
GR   50.5  3834.77   52.5  4098.58   52.5  4266.28    50.2  4616.96    53.2  5256.55
GR   55.8  5417.16   49.5  5542.31   49.6  5811.88    52.8  5944.08    50.5  6026.29
GR   49.2  6139.42   50.6  6300.68   60.8  6368.78    60.8  6489.41    52.1  6544.58
GR   49.1  6582.93   49.6  6866.77   53.6  6999.45    52.4  7192.35    55.8  7242.29
GR   52.1  7310.92   57.4   7392.7   58.9  7486.54    57.8   7527.2    59.3  7858.55
GR   62.3  8313.45   62.3   8520.5   63.1  8579.97    63.8  8874.31    63.1  9022.65
GR   64.7  9319.75     64  9847.05     66  10324.86   67.2  10502.28   70.9  10689.92
GR   75.6  10862.29    80  11138.46  81.4  11329.98   82.6  11935.13   82.6  12152.77
GR     84  12494.73  86.9  12751.65    91  12961.31   96.3  13165.82   98.2  13409.92
GR   97.1  13499.57  82.3  13562.28  82.6  13710.72   93.2  13739.27   91.2  13843.55
GR   84.7  14008.62  85.8  14187.33  84.3  14239.64

QT   4   62300   127200   167500   306900
NC   .12    .12    .03    .6    .8
X1   11.55    73    3153    3835   400.0   400.0   370.0    0.00      0
X3   10    0.0    0.0   1950    57.9    0.0    0.0    0.0
GR   75.4      0   74.2    142   67.3    388   65.6    573   64.9    800
GR   51.7    898   56.3   1052   56.7   1285   55.8   1424   51.7   1438
GR   51.7   1636   57.5   1735   57.9   1950     57   2115   51.9   2192
GR   51.6   2676   48.1   2772   51.5   2898   47.5   3079   49.6   3153
GR   48.4   3218   46.8   3313  38.33   3353  28.63   3598  22.83   3619
GR   25.93  3643  21.73   3663  28.63   3710  40.09   3750   50.5   3835
GR   52.5   4099   52.5   4266   50.2   4617   44.2   4679   44.3   5110
GR   53.2   5257   55.8   5417   49.5   5542   49.6   5812   52.8   5944
GR   50.5   6026   49.2   6139   50.6   6301   60.8   6369   60.8   6489
GR   52.1   6545   49.1   6583   49.6   6867   53.6   6999   52.4   7192
GR   52.1   7311   58.9   7487   59.3   7859   62.3   8313   62.3   8521
GR   63.1   8580   63.8   8874   63.1   9023   64.7   9320     64   9847
GR     66  10325   67.2  10502   70.9  10690   75.6  10862     80  11138
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GR   81.4    11330    82.6    11935    82.6    12153     84    12495    86.9    12752
GR     91    12961    96.3    13166    98.2    13410
```



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NH      4    .100  18850.0    .100  20250.0    .030  21748.6    .120  28900.0   0.000
X1 11.569      83    20250  21768.7      100      100      100    0.00    0.00       0
X3     10     0.0     0.0      0.0      0.0      0.0      0.0     0.0     0.0     0.0
GR  84.00  16850.0   80.00  17250.0   80.00  17251.0   80.00  17252.0   75.00  18025.0
GR  70.00  18075.0   65.00  18125.0   60.00  18200.0   60.00  18201.0   60.00  18202.0
GR  60.00  18450.0   60.00  18500.0   60.00  18600.0   60.00  18850.0   55.00  19350.0
GR  55.00  19351.0   68.70  20250.0   49.80  20287.0   49.30  20323.0   48.30  20340.0
GR  49.80  20360.4   48.40  20389.0   50.50  20396.9   48.10  20458.0   44.50  20495.0
GR  44.20  20506.1   45.40  20560.0   44.50  20600.0   45.00  20650.0   47.20  20711.0
GR  44.00  20721.0   42.80  20746.0   43.30  20770.0   35.50  20800.0   33.50  20820.0
GR  26.50  20920.0   24.10  20930.0   31.40  20940.0   25.40  20944.1   29.70  20960.0
GR  30.60  20970.0   33.20  20980.0   33.20  20981.0   35.00  20990.0   35.90  21000.0
GR  38.40  21010.0   38.40  21017.3   43.43  21039.0   45.80  21089.5   46.80  21162.7
GR  46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR  49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR  51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR  64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00  22500.
GR  55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00  24950.
GR  60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00  28150.
GR  85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00      0.0

SB   1.25     2.31    2.60      0.0       50       46    32375       20    24.1    24.1
NC   .120     .120    .035       .3       .5
X1 11.660       91  20226.0  21910.0      480      480      480    0.00       0
X2    0.0      0.0       1    63.08    69.07      0.0      0.0     0.0     0.0     0.0
X3     10      0.0     0.0      0.0      0.0      0.0      0.0     0.0     0.0     0.0
BT     27  16200.0   68.99      0.0  17200.0    64.77      0.0  17500.0   63.51     0.0
BT 18300.    67.62     0.0  18301.0    67.63      0.0  18669.0    72.15     0.0 19195.0
BT  71.42      0.0 20000.0    67.97      0.0  20100.0    68.42      0.0   20200   68.87
BT    0.0  20235.8   69.04    69.04  20242.8    69.07    63.08  20573.0   70.56   64.57
BT 20903.    72.04   66.05  21141.3    72.66    66.67  21563.0    71.21   65.22 21893.1
BT  69.73    63.74 21900.0    69.70    69.70  22000.0    69.24      0.0 22274.7   68.01
BT    0.0  22700.0   66.10      0.0  23449.7    65.50      0.0  24374.7   69.44     0.0
BT 26274.    85.80     0.0  28000.0    85.80      0.0  28300.0    85.80     0.0 28900.0
BT   90.0      0.0     0.0      0.0      0.0      0.0      0.0      0.0     0.0     0.0
GR  85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR  60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR  64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR  49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR  44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR  48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR  45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR  37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR  33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR  27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR  24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR  43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR  48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR  49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR  47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR  51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR  64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR  65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
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GR  90.50  28900.0    0.00      0.0     0.00      0.0     0.00      0.0    0.00     0.0

X1 11.679       73    3153     3835      100      100      100    0.00    0.00       0
X3     10      0.0     0.0     1950       57      0.0      0.0     0.0
GR   75.4        0    74.2      142     67.3      388     65.6      573    64.9     800
GR   51.7      898    56.3     1052     56.7     1285     55.8     1424    51.7    1438
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GR   51.7    1636    57.5    1735    57.9    1950     57    2115    51.9    2192
GR   51.6    2676    48.1    2772    51.5    2898    47.5    3079    49.6    3153
GR   48.4    3218    46.8    3313   38.33    3353   28.63    3598   22.83    3619
GR  25.93    3643   21.73    3663   28.63    3710   40.09    3750    50.5    3835
GR   52.5    4099    52.5    4266    50.2    4617    44.2    4679    44.3    5110
GR   53.2    5257    55.8    5417    49.5    5542    49.6    5812    52.8    5944
GR   50.5    6026    49.2    6139    50.6    6301    60.8    6369    60.8    6489
GR   52.1    6545    49.1    6583    49.6    6867    53.6    6999    52.4    7192
GR   52.1    7311    58.9    7487    59.3    7859    62.3    8313    62.3    8521
GR   63.1    8580    63.8    8874    63.1    9023    64.7    9320      64    9847
GR     66   10325    67.2   10502    70.9   10690    75.6   10862      80   11138
GR   81.4   11330    82.6   11935    82.6   12153      84   12495    86.9   12752
GR     91   12961    96.3   13166    98.2   13410

QT      4   62060  126360  167140  305490
NC   .120    .120    .030      .1      .3
X1  11.97      84 2273.46 2827.03     802    5043    2118
X3     10         1105.39    52.5    9060    74.8
GR  78.23       0    64.2  174.04    63.5  501.47    62.4  571.34    57.3  671.03
GR   46.1   969.8    52.3 1075.96    49.9 1240.38    49.5  1362.1    47.4 1575.32
GR   49.6  1774.8    45.3 2044.49    47.5 2118.35    44.4 2165.58    46.6 2273.46
GR  35.52 2351.83   41.02 2371.83   32.22 2411.83   31.72 2441.83   37.12 2621.82
GR   45.7 2759.78    44.7 2827.03    45.5 2960.44    44.9 3171.29    46.7    3200
GR   46.4 3463.72      47 3583.97    44.6 3643.28      45 3872.88      47 3996.03
GR   53.2 4123.35    60.5  4270.1    60.5 4509.54    57.2 4775.48      58 5148.72
GR   56.2 5363.59    55.1  5699.3    49.4 5956.27    49.6 6073.28    48.3 6272.85
GR     51 6381.63    52.1 6574.09    51.8 6814.08    53.2 6887.03    50.2 7041.29
GR   53.5 7127.14    51.6 7442.96    56.9 7800.49    62.4 7837.71    64.9 7999.27
GR   67.4 8385.92    67.1 8424.35    74.8    9060    66.9    9130   66.35    9190
GR   65.8  9282.6    53.6  9356.5    55.7 9527.42    58.8 9587.89    70.2 9638.17
GR   72.9 9884.04      75 10154.89   75.2 10427.45   76.1 10520.96   76.1 10769.8
GR   90.2   10830    91.8 11098.11   89.8 11321.02   86.3 11634.53   85.4 11757.32
GR   86.8 11952.18   85.2 12112.75   87.5 12345.14   83.2 12384.16   89.1 12447.67
GR   85.9 12555.51   90.4   12650    84.7 12970.55   83.1 13224.85     84 13312.97
GR     83 13508.04   84.5 13657.9    83.9 13887.88   86.8 14077.83
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SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST

*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=   .300
*SECNO 7.610
   7.610   31.00   50.50     .00   50.50   50.53     .03     .00     .00   41.20
214619.0   293.1 214316.7     9.2  1439.3 149155.0    63.2      .0      .0   40.60
     .00     .20    1.44     .15    .110    .030    .110    .000   19.50 19703.00
 .000019      0.      0.      0.       0       0       0     .00 8934.76 28637.76


*SECNO 7.760
   7.760   31.92   50.52     .00     .00   50.55     .03     .01     .00   58.00
214619.0      .0 214619.0      .0      .0 157541.8      .0  2901.3   166.2   60.00
     .17     .00    1.36     .00    .000    .030    .000    .000   18.60  897.88
 .000016    850.    820.    800.       0       0       0     .00 8707.34 9605.22


*SECNO 8.180
```

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3265 DIVIDED FLOW

3280 CROSS SECTION     8.18 EXTENDED     .55 FEET

   8.180   33.96   50.56     .00     .00   50.58     .02     .03     .00   62.00
 214619.0      .0 214618.6      .4      .0 176721.7    17.5  11327.4   634.7   50.00
    .67     .00    1.21     .02    .000    .030    .110    .000   16.60  310.89
  .000013   2044.   2196.   2141.      0       0       0     .00  9883.41 11235.27


*SECNO 8.670
3280 CROSS SECTION     8.67 EXTENDED     .60 FEET

   8.670   30.00   50.60     .00     .00   50.62     .02     .04     .00   44.00
 214619.0 12738.0 201867.1    13.9  46393.2 162616.1   345.2  25446.4  1713.0   50.00
   1.28     .27    1.24     .04    .110    .030    .110    .000   20.60  294.31
  .000018   9000.   2391.   3177.      2       0       0     .00 16426.69 16721.00
```



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   SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q        QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME     VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE    XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION     9.25 EXTENDED    4.64 FEET

   9.250   29.05   50.65     .00     .00   50.68     .02     .06     .00   42.00
 214619.0  2726.9 211540.1   352.0  10709.9 165782.3  2916.1  39205.9  2815.6   42.00
   1.95     .25    1.28     .12    .110    .030    .110    .000   21.60  170.75
  .000020   3200.   3062.   3200.      0       0       0     .00 14589.90 15542.67


CCHV=   .100 CEHV=   .300
*SECNO 3.615
CHIMP CLSTA=   5720.00 CELCH=     20.00 BW=    200.00 STCHL=   2366.85 STCHR=   6339.87
EXCAVATION DATA
AEX=   7544.3SQ-FT    VEXR=        .0K*CU-YD    VEXT=        .0K*CU-YD


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .38


3470 ENCROACHMENT STATIONS=    1232.0   8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=     54.70  ELENCR= 100000.00
   3.615   30.78   50.78     .00     .00   50.90     .12     .19     .03   41.60
 174300.0  1181.7 168597.7  4520.6  3634.6  59058.9  11231.3  52492.4  3904.3   43.63
   2.41     .33    2.85     .40    .120    .030    .120    .000   20.00  1279.54
  .000091   7700.   4594.   1000.      2       0       0     .00  7157.91  8437.45


*SECNO 4.745
CHIMP CLSTA=   3040.00 CELCH=     21.00 BW=    200.00 STCHL=   2373.40 STCHR=   6703.71
EXCAVATION DATA
AEX=   6703.4SQ-FT    VEXR=   1574.1K*CU-YD    VEXT=   1574.1K*CU-YD


3470 ENCROACHMENT STATIONS=    1973.4   6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=     52.00  ELENCR=     48.60
   4.745   30.36   51.36     .00     .00   51.50     .13     .59     .00   51.10
 173330.0      .5 172552.0   777.5    15.3  58678.3  2767.9  61429.0  4678.6   47.20
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```
   2.97    .03    2.94    .28    .120    .030    .120    .000    21.00  2256.80
 .000109   3600.   5966.   4500.      2      0      0     .00  5368.77  7625.57
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST

CCHV=    .300 CEHV=    .500
*SECNO 5.026

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .69

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.026   30.06   51.56     .00     .00   51.81     .25     .25     .06   56.20
 173080.0     .0 173080.0     .0      .0  43150.8      .0  63293.2  4856.7   57.00
   3.08     .00    4.01     .00    .000    .030    .000    .000   21.50  9613.00
 .000229   1030.   1482.   4150.      2      0      0     .00  3479.51 13092.51

*SECNO 5.027

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.027   30.06   51.56     .00     .00   51.81     .25     .00     .00   56.20
 173080.0     .0 173080.0     .0      .0  43002.7      .0  63294.2  4856.8   56.00
   3.08     .00    4.02     .00    .000    .030    .000    .000   21.50  9616.77
 .000237      1.      1.      1.      0      0      0     .00  3406.69 13038.19

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.034   30.07   51.57     .00     .00   51.82     .25     .01     .00   56.20
 173080.0     .0 173080.0     .0      .0  43037.3      .0  63340.6  4860.5   56.00
   3.08     .00    4.02     .00    .000    .030    .000    .000   21.50  9616.73
 .000236     47.     47.     47.      0      0      0     .00  3406.89 13038.25
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 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST
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*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.035   30.07   51.57    .00    .00   51.82    .25    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 43153.8     .0 63341.6  4860.6   57.00
    3.08     .00    4.01    .00   .000    .030   .000   .000   21.50 9612.96
  .000229      1.      1.     1.      0       0      0    .00 3479.67 13092.63


*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037   30.07   51.57    .00    .00   51.82    .25    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 43166.4     .0 63349.5  4861.2   57.00
    3.08     .00    4.01    .00   .000    .030   .000   .000   21.50 9612.95
  .000229      8.      8.     8.      0       0      0    .00 3479.72 13092.68


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038   30.06   51.56    .00    .00   51.83    .27    .00    .01   56.20
 173080.0      .0 173080.0     .0     .0 41841.0     .0 63350.5  4861.3   56.00
    3.08     .00    4.14    .00   .000    .030   .000   .000   21.50 9616.71
  .000257      1.      1.     1.      0       0      0    .00 3397.29 13038.28


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN  SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045   30.08   51.58    .00    .00   51.84    .27    .01    .00   56.20
 173080.0      .0 173080.0     .0     .0 41852.6     .0 63395.7  4865.0   56.00
    3.08     .00    4.14    .00   .000    .030   .000   .000   21.50 9616.70
  .000257     47.     47.    47.      0       0      0    .00 3397.41 13038.30


CCHV=   .100 CEHV=    .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046   30.09   51.59    .00    .00   51.84    .25    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 43211.9     .0 63396.6  4865.0   57.00
    3.08     .00    4.01    .00   .000    .030   .000   .000   21.50 9612.91
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 .000228     1.      1.      1.       1       0       0      .00  3479.92  13092.83


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 5.585
CHIMP CLSTA=  10681.00 CELCH=     23.00 BW=    200.00 STCHL=   10172.58 STCHR=   11165.02
EXCAVATION DATA
AEX=   4079.1SQ-FT    VEXR=    568.5K*CU-YD    VEXT=    2142.6K*CU-YD

   5.585    29.25    52.25     .00     .00    52.42     .16     .57     .01    43.42
 172610.0  92927.1  79661.4     21.5  56404.8  17889.3    112.2  67120.4   5285.7    49.80
   3.35     1.65     4.45     .19    .049    .031    .120    .000    23.00  1255.97
 .000182    2664.    2847.    1744.       2       0       0      .00 10000.52  11256.49


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 6.420
CHIMP CLSTA=  16190.00 CELCH=     24.00 BW=    200.00 STCHL=   15729.76 STCHR=   16499.00
EXCAVATION DATA
AEX=   6018.5SQ-FT    VEXR=    824.5K*CU-YD    VEXT=    2967.0K*CU-YD


3265 DIVIDED FLOW

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 29FEB00     11:00:21                                                        PAGE  20


  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH     AROB     VOL      TWA    R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH    XNR      WTN     ELMIN   SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


   6.420    28.77    52.77     .00     .00    52.94     .17     .52     .00    42.01
 171900.0  73925.0  72667.2  25307.8  32633.9  16199.0  16421.3  71727.6   5800.5    47.50
   3.64     2.27     4.49     1.54    .030    .030    .050    .000    24.00 10887.83
 .000141    2300.    4409.    2800.       2       0       0      .00  7455.54  18386.10


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=    11840.0   20069.0  TYPE=     1  TARGET=     8229.000
 ELENCL=     53.10  ELENCR=     57.90
   7.090    23.41    53.51     .00     .00    53.71     .20     .76     .01    46.90
 171320.0   9005.8 100118.7  62195.5  11280.1  22153.3  40526.8  76646.5   6373.0    47.40
   3.91      .80     4.52     1.53    .120    .030    .083    .000    30.10  9387.78
 .000334    2000.    3538.    3600.       2       0       0      .00 10437.55  19825.33


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=        .0   16383.0  TYPE=     1  TARGET=    16383.000
   7.470    25.06    54.06     .00     .00    54.36     .31     .62     .03    47.70
 171000.0  62450.0  58348.8  50201.2  41287.0   8465.6  16705.1  79242.0   6726.3    44.30
   4.04     1.51     6.89     3.01    .070    .030    .050    .000    29.00  7006.81
 .000385    1500.    2006.    1500.       2       0       0      .00  9260.53  16267.34


*SECNO 8.070
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```
3470 ENCROACHMENT STATIONS=    3455.4  15481.5  TYPE=     1  TARGET=   -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
   8.070    27.38    55.28      .00      .00    55.89      .61     1.44      .09    44.30
 171000.0  22057.5 108437.0  40505.4  16330.1  13899.6  32509.3  83524.8   7270.1    46.70
    4.19     1.35     7.80     1.25     .120     .030     .120     .000    27.90  3789.74
  .000635    2619.    2891.    3201.        2        0        0      .00  7301.94 11091.68
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL    OLOSS  L-BANK ELEV
 Q       QLOB     QCH    QROB    ALOB     ACH    AROB     VOL     TWA   R-BANK ELEV
 TIME    VLOB     VCH    VROB     XNL    XNCH     XNR     WTN   ELMIN    SSTA
 SLOPE   XLOBL   XLCH   XLOBR  ITRIAL    IDC    ICONT   CORAR  TOPWID   ENDST


CCHV=    .100 CEHV=     .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .66


3470 ENCROACHMENT STATIONS=       .0   3851.7  TYPE=     1  TARGET=    3851.709
   8.490    21.36    57.16      .00      .00    58.51     1.35     2.40      .22    46.00
 169770.0  52202.8 103794.2  13773.0  21104.2   8818.8  11807.3  86093.0   7574.6    50.60
    4.27     2.47    11.77     1.17     .120     .030     .120     .000    35.80   799.23
  .001442    2636.    2374.    1605.        3        0        0      .00  6186.99  6986.21


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.31


3470 ENCROACHMENT STATIONS=    2460.6  10500.0  TYPE=     1  TARGET=   -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
   9.410    24.91    60.41      .00      .00    60.65      .24     2.04      .11    53.30
 169330.0  24803.3  62688.6  81838.1  15045.5  10276.4  48772.8  92019.6   8254.5    49.50
    4.65     1.65     6.10     1.68     .057     .030     .079     .000    35.50   751.94
  .000268    2500.    4858.    5500.        3        0        0      .00  7127.85  7879.79


CCHV=    .100 CEHV=     .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=    1431.2   8020.0  TYPE=     1  TARGET=    6588.810
 ELENCL=    55.17  ELENCR=     59.05
  10.580    39.48    61.58      .00      .00    61.93      .35     1.24      .03    53.60
 168330.0  14190.6  90650.1  63489.3  15654.9  14173.8  59485.6  98681.1   8862.4    50.50
    4.97      .91     6.40     1.07     .100     .030     .120     .000    22.10   175.44
  .000286    2700.    6177.    3200.        2        0        0      .00  9121.88  9297.32
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 SECNO   DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL    OLOSS  L-BANK ELEV
 Q       QLOB     QCH    QROB    ALOB     ACH    AROB     VOL     TWA   R-BANK ELEV
 TIME    VLOB     VCH    VROB     XNL    XNCH     XNR     WTN   ELMIN    SSTA
 SLOPE   XLOBL   XLCH   XLOBR  ITRIAL    IDC    ICONT   CORAR  TOPWID   ENDST
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```
CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=      .0  8865.0  TYPE=     1  TARGET=    8864.999
   10.860    30.21    61.91      .00      .00    62.28      .37      .35      .01    52.20
  168090.0  16675.8 107653.1  43761.1  15127.0  17835.7  41925.6 100963.9   9081.3    52.40
    5.05     1.10     6.04     1.04     .100     .030     .120     .000    31.70  1805.08
  .000236    1300.    1478.    1100.       2        0        0      .00  7022.12  8827.20


1490 NH CARD USED
*SECNO 11.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .65


3470 ENCROACHMENT STATIONS=   3311.7   6950.0  TYPE=     1  TARGET=    3638.260
 ELENCL=    53.30 ELENCR=    63.70
   11.090    30.41    62.21      .00      .00    62.85      .64      .48      .08    53.30
  167890.0  39354.4  98691.7  29843.9  21726.1  11922.0  23945.1 103180.5   9306.8    57.00
    5.12     1.81     8.28     1.25     .082     .030     .120     .000    31.80   785.50
  .000562    1400.    1214.    1600.       2        0        0      .00  6098.65  6884.15


CCHV=   .300 CEHV=    .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=    58.00 ELENCR=    65.50
   11.350    34.26    63.10      .00      .00    63.43      .33      .49      .09    52.80
  167670.0  10971.4 106176.9  50521.7  15935.1  18486.6  41941.3 105831.5   9535.8    52.60
    5.23      .69     5.74     1.20     .120     .030     .120     .000    28.84   464.55
  .000221    1000.    1373.    2300.       2        0        0      .00  6009.57  6474.12


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS

1
  29FEB00     11:00:21                                                    PAGE  23


   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL     OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL     TWA     R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN     ELMIN   SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID  ENDST


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

   11.380    36.45    63.25      .00      .00    64.24      .99      .49      .33    66.30
  167670.0       .0 167670.0       .0       .0  21017.6       .0 107744.3   9664.5    64.00
    5.28      .00     7.98      .00     .000     .030     .000     .000    26.80 19955.36
  .000475    1000.    1373.    2300.       2        0        0      .00  1030.76 20986.12


SPECIAL BRIDGE
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SB XK     XKOR    COFQ    RDLEN    BWC      BWP     BAREA     SS      ELCHU   ELCHD
   1.25    1.50    2.60     .00   189.00   20.40  22729.00   10.20   27.80   27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=    63.16 BRIDGE VELOCITY=     8.96   CALCULATED CHANNEL AREA=    18713.

 EGPRS    EGLWC    H3     QWEIR    QLOW     BAREA   TRAPEZOID    ELLC    ELTRD   WEIRLN
                                   AREA
    .00   64.32    .09      0.  167670.   22729.   22477.    67.20   68.30      0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=       64.00

  11.390    36.54   63.34     .00     .00   64.32    .98     .08     .00   66.30
 167670.0      .0 167670.0     .0      .0  21105.3      .0 107768.4  9665.7   64.00
    5.28     .00    7.94     .00    .000    .030    .000    .000   26.80 19953.82
  .000470     50.     50.     50.       0       0       0     .00 1033.88 20987.70


*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  1.62

1
  29FEB00     11:00:21                                              PAGE  24


  SECNO    DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
  Q        QLOB    QCH     QROB    ALOB     ACH     AROB    VOL      TWA    R-BANK ELEV
  TIME     VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE    XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


3470 ENCROACHMENT STATIONS=    2199.0   6519.8 TYPE=     1 TARGET=     4320.750
 ELENCL=    58.00 ELENCR=    65.50
  11.400    35.42   64.26     .00     .00   64.54    .28     .01     .21   52.80
 167670.0  12742.7 104067.7  50859.6  18886.0  19472.3  45064.1 107828.4   9669.8    52.60
    5.28     .67    5.34    1.13    .120    .030    .120    .000   28.84   301.50
  .000178     50.     50.     50.       2       0       0     .00 6194.75  6496.25


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=    1998.3  14239.6 TYPE=     1 TARGET=    -1998.350
 ELENCL=    56.86 ELENCR= 100000.00
  11.480    43.59   64.32     .00     .00   64.62    .30     .07     .01   48.60
 167560.0  18043.8 106358.4  43157.9  23968.3  19422.3  55417.4 108997.7   9772.4    49.50
    5.32     .75    5.48     .78    .120    .030    .120    .000   20.73   662.82
  .000142    400.    370.    700.       2       0       0     .00 9500.13 10162.95


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=     1 TARGET=    -1950.000
 ELENCL=    57.90 ELENCR= 100000.00
  11.550    42.65   64.38     .00     .00   64.69    .31     .06     .01   49.60
 167500.0  17120.5 103179.4  47200.0  22239.8  18288.2  53749.5 109871.3   9856.1    50.50
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  5.35    .77   5.64    .88   .120   .030   .120   .000   21.73  807.21
 .000163   400.   370.   400.      0      0      0    .00 8835.94 9938.97


1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569   40.25   64.35    .00    .00   64.91    .56    .02    .20   68.70
 167500.0      .0 167500.0     .0     .0 27918.6     .0 110011.5  9868.0   67.10
   5.35    .00   6.00    .00   .000   .031   .000   .000   24.10 20258.51
 .000324   100.   100.   100.      2      0      0    .00 1501.28 21759.79


1
 29FEB00    11:00:21                                          PAGE  25


  SECNO  DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS   L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH   XNR     WTN     ELMIN   SSTA
  SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR   TOPWID  ENDST



SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    2.31    2.60     .00    50.00   46.00 32375.00   20.00   24.10   24.10

CCHV=   .300 CEHV=    .500
*SECNO 11.660
PRESSURE FLOW


 EGPRS    EGLWC     H3     QWEIR    QPR    BAREA  TRAPEZOID   ELLC    ELTRD   WEIRLN
                                         AREA
   65.31   64.91    .06      0.  167500.  32375.   30545.    63.08   69.07      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

  11.660   45.09   64.89    .00    .00   65.31    .42    .40    .00   68.90
 167500.0      .0 167500.0     .0     .0 32068.0     .0 110342.0  9885.4   68.20
   5.38    .00   5.22    .00   .000   .035   .000   .000   19.80 20235.86
 .000298   480.   480.   480.      2      0      0    .00 1665.54 21901.40


*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=    1  TARGET=   -1950.000
 ELENCL=    57.00 ELENCR= 100000.00
  11.679   43.44   65.17    .00    .00   65.39    .22    .02    .06   49.60
 167500.0 20411.7 94045.5 53042.9 24917.8 18825.1 58581.9 110496.3  9898.1    50.50
   5.38    .82   5.00    .91   .120   .035   .120   .000   21.73  711.80
 .000168   100.   100.   100.      2      0      0    .00 9415.30 10127.10


CCHV=   .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4   9060.0 TYPE=    1  TARGET=    7954.610
 ELENCL=    52.50 ELENCR=     74.80
  11.970   33.91   65.63    .00    .00   65.86    .23    .46    .00   46.60
 167140.0 25176.2 81201.6 60762.1 26779.1 14975.7 67236.2 119077.0 10640.3    44.70
   5.65    .94   5.42    .90   .120   .030   .120   .000   31.72  156.30
 .000149   802.  2118.  5043.      2      0      0    .00 7955.87 8112.17
```

THIS RUN EXECUTED 29FEB00 11:00:21

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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

Starting form river mile

SUMMARY PRINTOUT

	VLOB	VROB	AREA	VCH	QLOBP	QCHP	QROBP	VEXR	VEXT
	.204	.15	150657.40	1.44	.14	99.86	.00	.00	.00
	.000	.00	157541.80	1.36	.00	100.00	.00	.00	.00
	.000	.02	176739.20	1.21	.00	100.00	.00	.00	.00
	.275	.04	209354.50	1.24	5.94	94.06	.01	.00	.00
	.255	.12	179408.40	1.28	1.27	98.57	.16	.00	.00
*	.325	.40	73924.73	2.85	.68	96.73	2.59	.00	.00
	.033	.28	61461.57	2.94	.00	99.55	.45	1574.10	1574.10
*	.000	.00	43150.84	4.01	.00	100.00	.00	.00	1574.10
	.000	.00	43002.70	4.02	.00	100.00	.00	.00	1574.10
	.000	.00	43037.26	4.02	.00	100.00	.00	.00	1574.10
	.000	.00	43153.80	4.01	.00	100.00	.00	.00	1574.10
	.000	.00	43166.38	4.01	.00	100.00	.00	.00	1574.10
	.000	.00	41841.04	4.14	.00	100.00	.00	.00	1574.10
	.000	.00	41852.56	4.14	.00	100.00	.00	.00	1574.10
	.000	.00	43211.88	4.01	.00	100.00	.00	.00	1574.10
	1.648	.19	74406.30	4.45	53.84	46.15	.01	568.48	2142.58
	2.265	1.54	65254.12	4.49	43.00	42.27	14.72	824.45	2967.03

	VLOB	VROB	AREA	VCH	QLOBP	QCHP	QROBP	VEXR	VEXT
*	.798	1.53	73960.24	4.52	5.26	58.44	36.30	.00	2967.03
	1.513	3.01	66457.63	6.89	36.52	34.12	29.36	.00	2967.03

	1.351	1.25	62739.01	7.80	12.90	63.41	23.69	.00	2967.03
*	2.474	1.17	41730.38	11.77	30.75	61.14	8.11	.00	2967.03
*	1.649	1.68	74094.76	6.10	14.65	37.02	48.33	.00	2967.03
	.906	1.07	89314.30	6.40	8.43	53.85	37.72	.00	2967.03
	1.102	1.04	74888.40	6.04	9.92	64.04	26.03	.00	2967.03
*	1.811	1.25	57593.22	8.28	23.44	58.78	17.78	.00	2967.03
*	.689	1.20	76363.00	5.74	6.54	63.32	30.13	.00	2967.03
*	.000	.00	21017.64	7.98	.00	100.00	.00	.00	2967.03
	.000	.00	21105.27	7.94	.00	100.00	.00	.00	2967.03
*	.675	1.13	83422.42	5.34	7.60	62.07	30.33	.00	2967.03
	.753	.78	98807.96	5.48	10.77	63.47	25.76	.00	2967.03
	.770	.88	94277.55	5.64	10.22	61.60	28.18	.00	2967.03
	.000	.00	27918.59	6.00	.00	100.00	.00	.00	2967.03
	.000	.00	32068.03	5.22	.00	100.00	.00	.00	2967.03
	.819	.91	102324.80	5.00	12.19	56.15	31.67	.00	2967.03
	.940	.90	108991.00	5.42	15.06	48.58	36.35	.00	2967.03

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	7.610	.00	.00	.00	19.50	214619.00	50.50	.00	50.53	.19	1.44	150657.40494729.40	
	7.760	820.00	.00	.00	18.60	214619.00	50.52	.00	50.55	.16	1.36	157541.80537689.30	
	8.180	2196.00	.00	.00	16.60	214619.00	50.56	.00	50.58	.13	1.21	176739.20600985.40	
	8.670	2391.00	.00	.00	20.60	214619.00	50.60	.00	50.62	.18	1.24	209354.50508796.30	
	9.250	3062.00	.00	.00	21.60	214619.00	50.65	.00	50.68	.20	1.28	179408.40482494.80	
*	3.615	4594.00	.00	.00	20.00	174300.00	50.78	.00	50.90	.91	2.85	73924.73182820.40	
	4.745	5966.00	.00	.00	21.00	173330.00	51.36	.00	51.50	1.09	2.94	61461.57165851.10	
*	5.026	1482.00	.00	.00	21.50	173080.00	51.56	.00	51.81	2.29	4.01	43150.84114384.10	
	5.027	1.00	58.25	52.50	21.50	173080.00	51.56	.00	51.81	2.37	4.02	43002.70112491.50	
	5.034	47.00	58.25	52.50	21.50	173080.00	51.57	.00	51.82	2.36	4.02	43037.26112634.80	
	5.035	1.00	.00	.00	21.50	173080.00	51.57	.00	51.82	2.29	4.01	43153.80114391.90	
	5.037	8.00	.00	.00	21.50	173080.00	51.57	.00	51.82	2.29	4.01	43166.38114446.30	
	5.038	1.00	58.25	52.50	21.50	173080.00	51.56	.00	51.83	2.57	4.14	41841.04107938.60	
	5.045	47.00	58.25	52.50	21.50	173080.00	51.58	.00	51.84	2.57	4.14	41852.56107984.70	

	5.046	1.00	.00	.00	21.50	173080.00	51.59	.00	51.84	2.28	4.01	43211.88	114644.40
	5.585	2847.00	.00	.00	23.00	172610.00	52.25	.00	52.42	1.82	4.45	74406.30	127847.90
	6.420	4409.00	.00	.00	24.00	171900.00	52.77	.00	52.94	1.41	4.49	65254.12	144528.00
*	7.090	3538.00	.00	.00	30.10	171320.00	53.51	.00	53.71	3.34	4.52	73960.24	93679.20
	7.470	2006.00	.00	.00	29.00	171000.00	54.06	.00	54.36	3.85	6.89	66457.63	87189.82
	8.070	2891.14	.00	.00	27.90	171000.00	55.28	.00	55.89	6.35	7.80	62739.01	67860.18
*	8.490	2374.28	.00	.00	35.80	169770.00	57.16	.00	58.51	14.42	11.77	41730.38	44708.05
*	9.410	4858.00	.00	.00	35.50	169330.00	60.41	.00	60.65	2.68	6.10	74094.76	103449.90
	10.580	6177.00	.00	.00	22.10	168330.00	61.58	.00	61.93	2.86	6.40	89314.30	99563.93
	10.860	1478.00	.00	.00	31.70	168090.00	61.91	.00	62.28	2.36	6.04	74888.40	109415.30

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29FEB00 11:00:21 PAGE 29

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	11.090	1214.00	.00	.00	31.80	167890.00	62.21	.00	62.85	5.62	8.28	57593.22	70807.67
*	11.350	1373.00	.00	.00	28.84	167670.00	63.10	.00	63.43	2.21	5.74	76363.00	112828.20
*	11.380	1373.00	.00	.00	26.80	167670.00	63.25	.00	64.24	4.75	7.98	21017.64	76968.73
	11.390	50.00	68.30	67.20	26.80	167670.00	63.34	.00	64.32	4.70	7.94	21105.27	77350.07
*	11.400	50.00	.00	.00	28.84	167670.00	64.26	.00	64.54	1.78	5.34	83422.42	125525.20
	11.480	370.00	.00	.00	20.73	167560.00	64.32	.00	64.62	1.42	5.48	98807.96	140541.00
	11.550	370.00	.00	.00	21.73	167500.00	64.38	.00	64.69	1.63	5.64	94277.55	131089.30
	11.569	100.00	.00	.00	24.10	167500.00	64.35	.00	64.91	3.24	6.00	27918.59	93031.03
	11.660	480.00	69.07	63.08	19.80	167500.00	64.89	.00	65.31	2.98	5.22	32068.03	96969.77
	11.679	100.00	.00	.00	21.73	167500.00	65.17	.00	65.39	1.68	5.00	102324.80	129365.50
	11.970	2118.00	.00	.00	31.72	167140.00	65.63	.00	65.86	1.49	5.42	108991.00	137144.80

1
29FEB00 11:00:21 PAGE 30

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
7.610	214619.00	50.50	.00	.00	.00	8934.76	.00
7.760	214619.00	50.52	.00	.02	.00	8707.34	820.00
8.180	214619.00	50.56	.00	.04	.00	9883.41	2196.00
8.670	214619.00	50.60	.00	.04	.00	16426.69	2391.00
9.250	214619.00	50.65	.00	.06	.00	14589.90	3062.00

*	3.615	174300.00	50.78	.00	.13	.00	7157.91	4594.00
	4.745	173330.00	51.36	.00	.59	.00	5368.77	5966.00
*	5.026	173080.00	51.56	.00	.19	.00	3479.51	1482.00
	5.027	173080.00	51.56	.00	.00	.00	3406.69	1.00
	5.034	173080.00	51.57	.00	.01	.00	3406.89	47.00
	5.035	173080.00	51.57	.00	.00	.00	3479.67	1.00
	5.037	173080.00	51.57	.00	.00	.00	3479.72	8.00
	5.038	173080.00	51.56	.00	-.01	.00	3397.29	1.00
	5.045	173080.00	51.58	.00	.01	.00	3397.41	47.00
	5.046	173080.00	51.59	.00	.02	.00	3479.92	1.00
	5.585	172610.00	52.25	.00	.66	.00	10000.52	2847.00
	6.420	171900.00	52.77	.00	.52	.00	7455.54	4409.00
*	7.090	171320.00	53.51	.00	.74	.00	10437.55	3538.00
	7.470	171000.00	54.06	.00	.55	.00	9260.53	2006.00
	8.070	171000.00	55.28	.00	1.22	.00	7301.94	2891.14
*	8.490	169770.00	57.16	.00	1.88	.00	6186.99	2374.28
*	9.410	169330.00	60.41	.00	3.25	.00	7127.85	4858.00
	10.580	168330.00	61.58	.00	1.17	.00	9121.88	6177.00
	10.860	168090.00	61.91	.00	.33	.00	7022.12	1478.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	11.090	167890.00	62.21	.00	.29	.00	6098.65	1214.00
*	11.350	167670.00	63.10	.00	.89	.00	6009.57	1373.00
*	11.380	167670.00	63.25	.00	.16	.00	1030.76	1373.00
	11.390	167670.00	63.34	.00	.09	.00	1033.88	50.00
*	11.400	167670.00	64.26	.00	.92	.00	6194.75	50.00
	11.480	167560.00	64.32	.00	.06	.00	9500.13	370.00
	11.550	167500.00	64.38	.00	.06	.00	8835.94	370.00
	11.569	167500.00	64.35	.00	-.03	.00	1501.28	100.00
	11.660	167500.00	64.89	.00	.54	.00	1665.54	480.00
	11.679	167500.00	65.17	.00	.28	.00	9415.30	100.00
	11.970	167140.00	65.63	.00	.46	.00	7955.87	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 3.615 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.026 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Alternative IIA - Dredging Area A

```
1*********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES           *                     * U.S. ARMY CORPS OF ENGINEERS    *
*                          *                          * HYDROLOGIC ENGINEERING CENTER   *
* Version  4.6.2;  May 1991         *                      * 609 SECOND STREET, SUITE D      *
*                          *                          * DAVIS, CALIFORNIA 95616-4687    *
* RUN DATE   28FEB00   TIME  09:46:44 *                          *      (916) 756-1104         *
*********************************************          ****************************************


                  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
1
 28FEB00    09:46:44                                          PAGE   1


                                          THIS RUN EXECUTED 28FEB00    09:46:44
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
**************************************
DREDGING AREA A (R.M. (1.3); ELEV. 30'
T1     CF-0033 BROWN & ROOT SERVICES,  2/25/2000
T2     Lake Houston HEC-2 MODEL, REACH 3      [redacted]
T3     Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ     NINV    IDIR    STRT    METRIC   HVINS    Q     WSEL    FQ

    0       4      0                          50.91

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH   FN    ALLDC   IBW    CHNIM   ITRACE

   -1       0     -1


J3 VARIABLE CODES FOR SUMMARY PRINTOUT

   150      7      55      56      26      25      4      35      60      59

J6 IHLEQ   ICOPY   SUBDIV  STRTDS   RMILE

    1


QT     4    66800   143300   174300    333600
NC    0.12     0.12     0.03      .1        .3
      THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
      THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
X1   3.615      89   2366.85   6330.06
X3     10                1232.04       54.7
GR    55.6        0      55.2       90      54.9    161.12      54.8    318.29      54.5       400
GR    54.5   505.44      50.4    590.1      50.7    644.14      49.6    763.76      49.8    821.19
GR    47.9   853.74      50.9   895.11        51    927.61        49    951.75      47.9    1054.3
GR    50.3  1085.94      53.3  1160.37      54.7   1232.04      50.1   1287.74        49   1373.79
GR    48.6  1482.72      49.1  1622.28      46.2   1678.02      46.3   1781.82      48.3   1866.53
GR    49.2   1949.4      48.8  2075.16      47.9   2163.11      43.8   2220.71      42.6   2269.24
GR    41.6  2366.85      40.6  2391.75        39   2452.47      37.7   2548.87      37.9   2765.45
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GR   37.6   2952.69     38   3157.81    38.6   3299.81    38.3   3413.04    38.1   3746.92
GR   38.1   3993.99   38.9   4185.79    38.8   4286.36    40.5   4499.72    39.9    4728.9
GR   38.6   4754.82   40.1    4907.5 40.4627  4943.023    38.9   4984.51    37.2   5041.95
GR   37.2   5119.68   36.4   5177.29    37.3   5277.11    36.8   5355.15    38.1   5518.64
GR   37.9   5567.34   36.5   5613.59    33.5    5655.2    32.5    5769.5    30.3   5803.47
GR   32.8   5902.24   32.8    5982.5    34.2   6030.84    36.5   6067.52    37.5    6124.9
GR   37.8   6207.91   40.5   6273.13    43.8   6330.06    41.5   6462.94    41.4   6636.96
GR   44.8   6697.83   45.5   6728.93    44.5   6819.63      45   6861.77    44.5   6960.04
GR   44.8   7029.56  45.05      7060    44.7   7115.34    45.4   7181.81    45.6      7240
GR   45.6      7360   45.5    7468.6    43.4   7632.04    44.6   7864.56    47.6   7908.88
GR   47.7   7982.52   48.7   8044.72    48.8      8220    55.8      8990
1
 28FEB00    09:46:44                                                   PAGE   2


QT      4     66160   140750   173330    329800
X1  4.745        59   2373.4  6703.71      3600     4500      5966
X3     10               1973.39      52   6985.59     48.6
GR  60.92         0    54.6      450    53.45      570    53.05      630     52.6      740
GR   52.7       830    52.5      930       52   989.14    52.45     1150     52.3  1284.73
GR   52.6   1434.66    52.6     1560    52.45     1730     52.3  1836.38    52.05     1940
GR     52   1973.39    51.1   2373.4     43.3     2385     39.8  2559.76       37  2645.83
GR     36   2728.22    35.3  2809.02     35.9  2887.92     31.2  3041.01     31.9  3156.16
GR     30      3200      30     5720     36.3     5740       37     5800     39.8  5962.55
GR     40   6057.51    39.7  6300.58       42  6371.11     43.1  6486.54       44  6532.85
GR   44.5   6559.55    45.2  6653.68     47.2  6703.71       47  6753.55     47.1  6787.33
GR   47.5   6829.55    47.3  6947.51     48.6  6985.59     48.4  7027.77     47.3  7052.29
GR   47.2   7079.78    46.5  7122.32     46.4  7303.07     46.8  7395.37     47.9  7436.05
GR   48.1    7535.6    50.2  7585.83     54.2  7722.58     54.7  7816.27     59.2  7868.73
GR   60.8   7911.42      61   8096.6     61.5     8298     61.8     8402

QT      4     65990   140170   173080    328820
NC   0.12      0.12    0.03      0.3       0.5
X1  5.026        82   10508    14400      1030     4150      1482   0.9135
X3     10
GR   70.3         0    60.1      847      55.1     4325      50.1     6125     47.5     6457
GR   51.9      6672      52     6723      49.3     6899        53     7002     51.3     7207
GR   47.8      7406    44.3     7535      50.7     7643        52     7675     49.2     7860
GR   50.7      7983      52     8074      50.8     8207      51.4     8253     50.6     8427
GR   44.2      8495    47.4     8539      44.2     8686      50.9     8716     48.5     8805
GR   53.1      8968    50.3     9257      52.8     9627      49.3     9739     48.6    10032
GR   41.6     10121    52.8    10240      51.6    10351      56.2    10508     49.2    10531
GR   44.1     10549    41.8    10584      28.9    10622      37.4    10682     36.1    10792
GR   37.9     10846    41.3    10953        45    11066      26.5    11142     24.4    11222
GR   17.9     11240    14.8    11250      10.6    11262      21.6    11486     24.9    11552
GR   41.3     11749    45.5    11830      46.2    11981      44.7    12010     41.2    12077
GR   46.2     12110      46    12265      42.6    12356      43.9    12514     41.7    12874
GR   42.3     13169    43.2    13369      44.1    13509      41.3    13921     44.5    14033
GR   43.9     14119    43.1    14221      47.6    14283        57    14400     63.4    14532
GR   64.7     14822    62.5    14960      66.5    15076      67.6    15152     66.1    15301
GR   65.8     15393    64.6    15581      65.5    15601      66.7    15706     62.2    15750
GR   64.2     15886    65.4    16039

NC    .12       .12   0.030
X1  5.027       100   10508    14300         1        1         1   0.9135
X3     10
X2      0         0       0     52.5     58.25
GR   70.3         0    60.1      847      50.1     6125      40.8     6399       52     6703
GR     53      6993    43.8     7631        52     7675      50.6     8427     44.2     8495
GR   53.1      8968    50.3     9257      52.8     9627      49.3     9739     48.6    10032
GR   41.6     10121    56.2    10508      28.9    10622      37.4    10682     52.5    10683
GR   52.5     10689    37.4    10689      36.1    10792      37.9    10846     41.3    10953
GR   52.5     10953    52.5    10959      41.3    10959        45    11066     26.5    11142
GR   24.4     11222    17.9    11240      50.4    11240      52.5    11241     52.5    11250
GR   10.6     11262    21.3    11480      52.5    11480      52.5    11486     21.6    11486
GR   24.9     11552    24.4    11708      52.5    11708      52.5    11714     24.4    11714
GR   24.4     11732    45.5    11830      46.2    11981        45    12004     52.5    12004
GR   52.5     12010    44.7    12010      41.2    12077      46.2    12110     46.1    12162
1
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GR   52.5   12163   52.5   12169   46.1   12169   42.6   12356   43.5   12463
GR   52.5   12463   52.5   12469   43.5   12469   43.9   12514   41.2   12621
GR   41.3   12663   52.5   12663   52.5   12669   41.3   12669   41.7   12863
GR   52.5   12863   52.5   12869   41.7   12869   42.3   13163   52.5   13163
GR   52.5   13169   42.3   13169   43.2   13363   52.5   13363   52.5   13369
GR   43.2   13369   44.1   13509   41.3   13581   41.3   13663   52.5   13663
GR   52.5   13669   41.3   13669   41.3   13863   52.5   13863   52.5   13869
GR   41.3   13869   41.3   13921   44.5   14033   43.9   14113   52.5   14113
GR   52.5   14119   43.9   14119   43.1   14221     56   14300   66.8   14676

X1  5.034       0       0       0     47      47      47
X3     10
X2      0       0       0    52.5  58.25

NC   0.12    0.12    0.03
X1  5.035      82   10508   14400      1       1       1  0.9135
X3     10
GR   70.3       0   60.1     847   55.1    4325   50.1    6125   47.5    6457
GR   51.9    6672     52    6723   49.3    6899     53    7002   51.3    7207
GR   47.8    7406   44.3    7535   50.7    7643     52    7675   49.2    7860
GR   50.7    7983     52    8074   50.8    8207   51.4    8253   50.6    8427
GR   44.2    8495   47.4    8539   44.2    8686   50.9    8716   48.5    8805
GR   53.1    8968   50.3    9257   52.8    9627   49.3    9739   48.6   10032
GR   41.6   10121   52.8   10240   51.6   10351   56.2   10508   49.2   10531
GR   44.1   10549   41.8   10584   28.9   10622   37.4   10682   36.1   10792
GR   37.9   10846   41.3   10953     45   11066   26.5   11142   24.4   11222
GR   17.9   11240   14.8   11250   10.6   11262   21.6   11486   24.9   11552
GR   41.3   11749   45.5   11830   46.2   11981   44.7   12010   41.2   12077
GR   46.2   12110     46   12265   42.6   12356   43.9   12514   41.7   12874
GR   42.3   13169   43.2   13369   44.1   13509   41.3   13921   44.5   14033
GR   43.9   14119   43.1   14221   47.6   14283     57   14400   63.4   14532
GR   64.7   14822   62.5   14960   66.5   15076   67.6   15152   66.1   15301
GR   65.8   15393   64.6   15581   65.5   15601   66.7   15706   62.2   15750
GR   64.2   15886   65.4   16039

X1  5.037      82   10508   14400      8       8       8  0.9135
X3     10
GR   70.3       0   60.1     847   55.1    4325   50.1    6125   47.5    6457
GR   51.9    6672     52    6723   49.3    6899     53    7002   51.3    7207
GR   47.8    7406   44.3    7535   50.7    7643     52    7675   49.2    7860
GR   50.7    7983     52    8074   50.8    8207   51.4    8253   50.6    8427
GR   44.2    8495   47.4    8539   44.2    8686   50.9    8716   48.5    8805
GR   53.1    8968   50.3    9257   52.8    9627   49.3    9739   48.6   10032
GR   41.6   10121   52.8   10240   51.6   10351   56.2   10508   49.2   10531
GR   44.1   10549   41.8   10584   28.9   10622   37.4   10682   36.1   10792
GR   37.9   10846   41.3   10953     45   11066   26.5   11142   24.4   11222
GR   17.9   11240   14.8   11250   10.6   11262   21.6   11486   24.9   11552
GR   41.3   11749   45.5   11830   46.2   11981   44.7   12010   41.2   12077
GR   46.2   12110     46   12265   42.6   12356   43.9   12514   41.7   12874
GR   42.3   13169   43.2   13369   44.1   13509   41.3   13921   44.5   14033
GR   43.9   14119   43.1   14221   47.6   14283     57   14400   63.4   14532
GR   64.7   14822   62.5   14960   66.5   15076   67.6   15152   66.1   15301
GR   65.8   15393   64.6   15581   65.5   15601   66.7   15706   62.2   15750
GR   64.2   15886   65.4   16039
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X1  5.038     100   10508   14300      1       1       1  0.9135
X3     10
X2      0       0       0    52.5  58.25
GR   70.3       0   60.1     847   50.1    6125   40.8    6399     52    6703
GR     53    6993   43.8    7631     52    7675   50.6    8427   44.2    8495
GR   53.1    8968   50.3    9257   52.8    9627   49.3    9739   48.6   10032
GR   41.6   10121   56.2   10508   28.9   10622   37.4   10682   52.5   10683
GR   52.5   10689   37.4   10689   36.1   10792   37.9   10846   41.3   10953
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GR  52.5  10953  52.5  10959  41.3  10959  45    11066  26.5  11142
GR  24.4  11222  17.9  11240  50.4  11240  52.5  11241  52.5  11250
GR  10.6  11262  21.3  11480  52.5  11480  52.5  11486  21.6  11486
GR  24.9  11552  24.4  11708  52.5  11708  52.5  11714  24.4  11714
GR  24.4  11732  45.5  11830  46.2  11981  45    12004  52.5  12004
GR  52.5  12010  44.7  12010  41.2  12077  46.2  12110  46.1  12162
GR  52.5  12163  52.5  12169  46.1  12169  42.6  12356  43.5  12463
GR  52.5  12463  52.5  12469  43.5  12469  43.9  12514  41.2  12621
GR  41.3  12663  52.5  12663  52.5  12669  41.3  12669  41.7  12863
GR  52.5  12863  52.5  12869  41.7  12869  42.3  13163  52.5  13163
GR  52.5  13169  42.3  13169  43.2  13363  52.5  13363  52.5  13369
GR  43.2  13369  44.1  13509  41.3  13581  41.3  13663  52.5  13663
GR  52.5  13669  41.3  13669  41.3  13863  52.5  13863  52.5  13869
GR  41.3  13869  41.3  13921  44.5  14033  43.9  14113  52.5  14113
GR  52.5  14119  43.9  14119  43.1  14221  56    14300  66.8  14676

X1  5.045  0  0  0  47  47  47
X3  10
X2  0  0  0  52.5  58.25

NC  0.12  0.12  0.03  0.1  0.3
X1  5.046  82  10508  14400  1  1  1  0.9135
X3  10
GR  70.3  0      60.1  847    55.1  4325   50.1  6125   47.5  6457
GR  51.9  6672   52    6723   49.3  6899   53    7002   51.3  7207
GR  47.8  7406   44.3  7535   50.7  7643   52    7675   49.2  7860
GR  50.7  7983   52    8074   50.8  8207   51.4  8253   50.6  8427
GR  44.2  8495   47.4  8539   44.2  8686   50.9  8716   48.5  8805
GR  53.1  8968   50.3  9257   52.8  9627   49.3  9739   48.6  10032
GR  41.6  10121  52.8  10240  51.6  10351  56.2  10508  49.2  10531
GR  44.1  10549  41.8  10584  28.9  10622  37.4  10682  36.1  10792
GR  37.9  10846  41.3  10953  45    11066  26.5  11142  24.4  11222
GR  17.9  11240  14.8  11250  10.6  11262  21.6  11486  24.9  11552
GR  41.3  11749  45.5  11830  46.2  11981  44.7  12010  41.2  12077
GR  46.2  12110  46    12265  42.6  12356  43.9  12514  41.7  12874
GR  42.3  13169  43.2  13369  44.1  13509  41.3  13921  44.5  14033
GR  43.9  14119  43.1  14221  47.6  14283  57    14400  63.4  14532
GR  64.7  14822  62.5  14960  66.5  15076  67.6  15152  66.1  15301
GR  65.8  15393  64.6  15581  65.5  15601  66.7  15706  62.2  15750
GR  64.2  15886  65.4  16039
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NH  4  0.12  6565.8  0.04  10389.97  0.03  11165.02  0.12  11754.54
X1  5.585  92  10389.97  11165.02  2664  1744  2847
X3  10
GR  62.75  0         55       1050      51    1350      50.4  2130      49.8  2670
GR  49.3   2940      49       3070.97   47.4  3189.37   48.1  3332.69   44.9  3448.15
GR  47.2   3606.21   45.8     3712.03   48.1  3809.2    45.3  3910.28   45.4  3992.9
GR  48.9   4050.05   50.5     4111.66   47.1  4292.93   49    4377.98   46.2  4426.95
GR  48.4   4503.41   51.7     4528.08   52    4646.6    47.9  4680.17   47.5  4744.32
GR  49.6   4816.31   45.9     5042.82   46.4  5114.46   50.6  5214.31   50.4  5290.11
GR  49     5321.9    47.8     5469.67   49.5  5630.79   47.7  5658.97   46.1  5777.87
GR  46.4   5924.67   44.8     6004.29   43.3  6258.57   43.5  6470.87   48.9  6565.8
GR  44.7   6646.34   45.9     6743.32   44.5  6892.24   44.2  7009.22   44.5  7289.15
GR  46.4   7330.53   44.3     7392.93   41.7  7412.88   43.8  7516.5    42.6  7594.69
GR  42.8   7688.63   41.4     7768.32   42    7833.49   41.2  7910.79   42.2  8209.01
GR  41.3   8286.36   39.7     8308.22   39.9  8702      40.1  8964.4    39.4  9095.69
GR  41.7   9292.52   41.6     9541.35   44.3  9703.77   41.6  9816.3    43.9  9860.54
GR  41.3   9871.29   41.3     9948.37   46.9  9970.67   44.8  10033.63  43    10162.63
GR  44.2   10190.96  43.9     10305.76  46.5  10332.73  48.2  10389.97  44.7  10430.72
GR  41.3   10459.1   32.9     10514.53  28    10567.09  26.4  10611.42  24.7  10640.77
GR  23.7   10681.82  25.7     10731.87  24.6  10751.83  28    10782.41  30.2  10840.35
GR  39.3   10888.46  38.5     10909.12  45    10961.37  49.8  11027.75  49.8  11165.02
GR  54.6   11343.95  62.4385  11754.54
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QT 4 65210 137410 171900 324160
NC 0.08 .12 0.03 .1 .3
NH 5 0.12 2500 0.08 10000 0.03 17143 0.08 19000 0.12
NH 23560
X1 6.420 59 15845 16499 2300 2800 4409
X3 10
GR 75 0 75 2500 70 3400 70 6000 60 7000
GR 58.3 10000 56.1 10103 56.6 10179 57.3 10497 56.3 10543
GR 55.3 10654 57.2 10704 55.9 10873 52.1 10891 49 11004
GR 50.2 11061 53.5 11106 49.4 11290 48.2 11399 47.9 11517
GR 47.7 11625 48.9 11747 45.8 11900 46 11965 46.6 12181
GR 47.9 12699 48.1 12807 46.6 13068 46.2 13367 47.4 13489
GR 42.4 13758 41.8 14068 44.9 14127 46.8 14222 48.9 14266
GR 42.2 14433 38.1 14587 45 14654 41.5 14714 46.1 15114
GR 44.8 15161 46.9 15361 41.9 15727 46.7 15845 40.4 16043
GR 28.4 16309 44.9 16440 47.5 16499 43.3 16544 44.6 16859
GR 41.5 17143 44.5 17299 43.5 17474 41.4 17702 41.5 17822
GR 43 18004 61 18708 70 19600 70 23560

QT 4 64830 136080 171320 321910
NC 0.12 0.12 0.03 0.1 0.3
NH 4 .12 13568 0.03 15555 0.08 18896 .12 24402
X1 7.09 67 13568 15555 2000 3600 3538
X3 10 11840 53.1 20069 57.9
GR 75.1 0 70.1 2300 60.1 3500 59.1 5310 55.1 7000
GR 52.9 9998 51.2 10405 48.3 10760 46.7 11002 48.1 11096
GR 50 11122 47 11313 46.7 11451 52.6 11572 53.1 11840
GR 52.5 12008 49.5 12394 44.7 12513 43.3 12597 44.3 12738
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GR 45.4 12956 46.9 13568 45.2 13743 44.7 13868 43.8 13920
GR 44.8 13990 45.1 14281 44.7 14544 42.4 14583 43.1 14804
GR 41.6 14978 43.4 15013 42.2 15090 30.1 15260 31.6 15364
GR 47.4 15555 46.7 15598 45.5 15789 39.5 15858 36.1 15974
GR 35.8 16133 38.4 16239 42.5 16348 41.8 16564 44 16840
GR 44.7 17493 46.2 17579 44.6 18028 45.1 18178 43.3 18276
GR 43.9 18459 43 18497 44.4 18896 46.2 19531 56.9 19962
GR 57.9 20069 52.9 20275 53.4 20406 49.7 20651 51.5 20718
GR 54.8 21004 54.1 21070 54.3 21465 55 21585 53.8 21703
GR 60.1 22202 65 24402

QT 4 64610 135320 171000 320030
NC .12 .12 .03 0.1 0.3
NH 5 .12 12000 0.05 14153 0.03 14598 0.05 16383 .12
NH 23100
X1 7.47 66 14153 14598 1500 1500 2006
X3 10 16383 55.4
GR 75 0 75 4460 64.2 6000 70 6150 61.6 6693
GR 50.3 7163 46.9 7208 49.6 7585 46.7 7595 51 7861
GR 48.9 7931 50.6 8391 48 8503 49.8 8546 51.3 8691
GR 46.2 9217 50.4 9383 51.4 9536 49.2 9569 50.3 9803
GR 53.7 10039 53.5 10532 47.3 10859 48.5 10964 47.2 11235
GR 45 11328 45.5 11905 48.6 12029 46.4 12059 42 12180
GR 41.8 12274 44.9 12369 44.2 12639 45.9 12724 44.5 12772
GR 49.7 12832 48.5 12877 50.5 13056 45 13117 45.6 13218
GR 52.7 13383 48.5 13434 47 13591 41.8 13880 45.8 13922
GR 40.9 14010 47 14062 47.7 14153 29 14273 38 14585
GR 44.3 14598 43.4 14737 41.4 14777 40.4 14933 39.8 15545
GR 45.9 15676 48.5 15964 53.4 16211 55.4 16383 53 17600
GR 54 18600 55 18800 60 20560 70 21150 75 22400
GR 75 23100

NC .12 .12 0.03
X1 8.07 90 5637.46 6519.38 2619.28 3201.18 2891.14
X3 10 3455.36 61.13
GR 73.6 0 71 207.3 67.1 340.91 61.2 454.82 59.8 605.74
GR 63.3 903.8 58.3 1086.61 54 1321.33 54.2 1487.54 47.9 1600.81
GR 55.2 1766.53 53.5 1879.14 56.5 2066.56 53.1 2164.16 54.1 2425.57
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GR   56.8  2597.07   52.7  2847.29   53.3  2923.49   50.4  3066.89   51.6   3182.9
GR   58.2   3240.1  61.15     3360   59.6   3625.8   56.1  3784.39     48  3837.18
GR     47  3910.62   41.7  3954.78   48.8   4041.7   47.3   4372.4     43  4430.63
GR     48  4823.38   45.7  5084.92   47.1   5209.7   44.3  5637.46   44.9  5883.73
GR   38.8  5971.26   41.9  6088.05   27.9  6099.51   32.1  6158.61   38.5  6417.39
GR   41.9   6498.6   46.7  6519.38   44.4  6698.82   44.6  6871.35   49.1  7166.61
GR   45.8  7214.35   48.7  7269.55   49.1  7385.35   46.4  7650.65   49.5  7758.86
GR   48.8  7837.12     53   8005.6   54.3  8165.26   54.2  8385.85   47.8  8751.03
GR   48.9  8956.83   47.3  9151.02   48.7  9234.09   48.6  9464.92   47.2   9691.7
GR   44.3  9845.44   44.3 10352.59   48.4 10497.67   48.7 10744.17   46.9 10944.93
GR   53.3 11073.35   58.8 11124.29   58.3 11461.72   60.5 11629.21   59.8 11752.03
GR   66.4 11793.39   67.5 11924.83  70.95    12100   69.2 12409.61   71.8 12474.39
GR   70.4 12728.04   74.2 12870.91   71.6 12991.35   74.9 13090.92   73.1 13188.25
GR   74.6 13307.27   72.3 13497.82   74.7 13757.58   73.4 13964.96   74.3 14201.59
GR   74.4  14577.6   73.6 14996.08   75.1 15169.17   73.7  15240.5   74.4 15481.47
1
 28FEB00   09:46:44                                          PAGE   7


QT      4    63800   132480   169770   315820
NC    .12      .12      .03       .1       .3
X1   8.49       91  2606.42  3168.51   2635.7  1605.14  2374.28
X3     10                             3851.71     54.7
GR   75.9        0   77.6       60    78.05      160    78.05      240       77    331.6
GR   72.3   368.12   69.4   412.95    71.35      460     69.7   534.73     67.2   564.85
GR   74.5      630   74.7      670     65.5   670.12     64.5      720     63.8   753.26
GR     55   814.19   51.2   856.53     46.4  1006.41     44.1  1184.02     46.1   1306.2
GR   45.1  1439.48   43.6  1567.36     42.1  1599.68     42.1  1656.52     45.3  1696.13
GR   46.6  1738.87   48.3  1871.15     45.8  1974.15     46.4  2040.15     43.1  2089.69
GR   43.2  2200.98   44.1  2303.81     45.6  2353.39       42  2371.86       46  2606.42
GR   37.9  2677.54   35.8  2837.08     35.9  2927.48    42.72  2959.44     47.7  3034.05
GR   49.5  3138.67   50.6  3168.51     48.9  3220.17     48.1  3328.05     48.6   3423.1
GR   50.4  3455.47   50.3  3565.82     52.2  3627.93     52.2  3679.39     54.7  3851.71
GR     53   3892.8   53.4     3940     51.9  3961.68       52  4079.34     52.9  4194.97
GR   55.8     4300   53.2  4350.46     54.7  4373.98     54.9  4425.24     53.8  4458.24
GR   54.6  4581.48   52.7  4690.43     53.9     4730     51.5  4768.99     52.7  4822.83
GR   50.7  4928.57   51.9   4949.8       52  5005.14     50.3  5083.53     51.9  5220.22
GR   50.4  5255.77   53.4  5329.85     55.9  5449.87     55.5  5530.76     52.5  5591.67
GR   51.4  5649.44   51.6  5719.53     50.4  5823.06     49.6  5989.14     44.2  6040.25
GR   44.2  6435.82   46.9  6530.15     48.9  6665.49     47.3  6720.92     47.2  6911.52
GR   55.6  6971.41   58.5  6998.91     61.3  7081.43     63.5  7116.99    66.48  7723.78
GR     71     8000

QT      4    63510   131460   169330   314100
NH      5       .1  2567.98      .05  3385.13     0.03  3879.38     0.05     5000      .12
NH  10500
X1   9.41       94  3385.13  3879.38     2500     5500     4858
X3     10                    2460.63    56.91
GR   78.4        0   78.9    96.63     78.6   295.76     79.3   365.11     78.2    423.8
GR   75.8   443.45   74.1   492.25     74.8   526.38    74.15      600     72.6      630
GR   72.8      670   65.3   721.32     60.2   753.27       56   813.24     54.4   854.41
GR   53.3   926.96     53  1014.31     51.5  1058.06     51.5  1133.33     50.5  1273.69
GR   51.4   1346.4   50.8  1454.34     51.1  1532.43     51.1  1736.18     51.8  1783.17
GR   51.8  1941.56   52.4  2003.11       53  2145.32     54.5  2316.56     56.8  2442.42
GR     56  2567.98   52.5  2621.33     52.4  2659.43     50.1  2775.83     49.4  2837.01
GR     50   3033.7   50.9  3141.06     43.5  3205.33     43.5  3281.17     51.8  3332.56
GR   53.3  3385.13   50.4  3417.41     45.2  3426.19     42.2  3442.41       42  3470.88
GR   38.1   3486.5   35.8  3658.23     36.2  3685.31     35.5  3798.17    42.72  3824.76
GR   48.2  3859.77   49.5  3879.38     44.1  3976.38     42.2  4082.27     42.2  4146.99
GR   43.8  4423.62   42.2  4450.81     48.9  4745.31     49.4  4914.17     48.4  5008.36
GR     48  5245.57   48.8   5332.6     48.1   5518.1     48.9  5669.75     47.9  5765.59
GR   50.2  5868.37   50.4  5903.32     49.4     6014       51  6193.43       53  6341.86
GR   52.1   6387.7   48.7  6470.08     48.4  6596.07     49.1  6831.48     48.1     6961
GR   49.1  7045.17   49.1  7203.02     48.4  7256.07     48.4     7513     50.4  7516.71
GR   49.7  7570.46   50.7  7615.19     48.4  7638.95     50.9  7797.35     55.4  7851.87
GR  57.57  7854.93  59.40     7877    61.45  7882.66       63     8000       64     8500
GR   64.3     8700     62     9300       67    10000       75    10500
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 28FEB00   09:46:44                                          PAGE   8
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QT     4    62850   129130   168330   309220
NC    .1     .12     0.03      .1       .3
X1  10.58     76  2518.22  3181.69    2700     3200     6177
X3    10                1431.19    55.17    8020    59.05
GR   75.8      0    75.6    63.6    60.9   180.78    56.7   260.63    55.3     400
GR  54.85    520      54  579.97    53.5   709.98    51.1   790.94    50.6  912.57
GR   49.1  1025.2    49.2 1101.07    53.7  1157.02    54.5    1384    55.5 1418.21
GR   54.9 1763.41    52.9 1902.66    54.8  2083.95    54.5 2206.57      53  2255.4
GR   52.8 2438.35    53.6 2518.22    42.4  2566.64    40.3 2590.99    29.8 2603.35
GR   22.1 2654.44    22.5 2685.55    31.1  2771.89    34.7 2844.63    41.9 2867.55
GR   50.1 2913.09    48.2 3126.19    50.5  3181.69    49.3 3252.87    46.5 3306.48
GR   50.3 3409.33    47.5 3613.61    52.7   3701.6    50.2 3854.05    47.2  3900.8
GR   42.7 3930.19    44.6 3976.89    46.3  4107.08      50 4195.39    48.7 5535.67
GR   48.7 5863.58      49 5916.48    50.6  6045.31    49.2 7520.57    53.5 7702.66
GR  59.05    8020    59.3    8120    57.1  8360.19    57.2 8644.55    54.9 8710.45
GR   60.1 8984.95    59.4 9100.32    61.6     9300    63.4 9619.42    62.4 9928.89
GR   62.5 10100.96   64.8 10231.72     63 10264.23    65.3 10573.06   65.9 10735.19
GR  71.55   10860    72.2   10980   74.25    11110    73.2   11255    73.3 11458.81
GR   74.9 11812.08   74.7 12055.58   76.1  12161.3   75.45   12360   76.75   12560
GR   78.5 12699.89

QT     4    62690   128570   168090   310160
NC    .1     .12     .03      .1       .3
NH     3      .1    3262     .03     4059     .12    13987
X1  10.86     43    3262    4059     1300     1100     1478
X3    10                              8865     62.3
GR   79.8      0    77.6     161    79.4      259    77.6     579    79.7     955
GR   78.9   1110    72.6    1684    52.3     1914    49.3    2212    50.4    2314
GR   52.2   3262    35.4    3575    31.7     3805    32.7    3875    52.4    4059
GR   46.4   4251      49    4323      45     4835    48.9    4896    44.9    5078
GR   47.3   5583    44.5    5654    43.2     5785    44.5    5945    41.7    6053
GR   57.6   6350    59.1    7698    60.1     8650    62.3    8865    59.2    9382
GR   61.6   9677    59.4    9772    60.6     9852    57.7   10128    56.7   10420
GR   54.4  10557    55.8   10709    60.7    11077    63.7   11730    72.9   12060
GR   74.4  13267    75.8   13671    79.7    13987

QT     4    62560   128120   167890   308450
NH     4     .12 2522.57     .05  3311.71     .03  3943.85     .12 13549.31
X1  11.09     82 3311.71 3943.85     1400     1600     1214
X3    10                3311.71     53.3  6949.97     63.7
GR   77.9      0    78.6  449.85      74   650.88    61.2  796.99    53.8  853.81
GR   51.5 1009.93   52.1 1209.82    51.1  1415.55    52.9 1698.13    53.4 1881.01
GR   54.3 2005.52   54.3 2131.11    52.6  2522.57    52.3 2664.39    42.5 2721.63
GR   42.5 3112.03   45.4  3215.1    53.3  3311.71      51 3378.76      45    3400
GR   42.5 3427.89   34.6 3459.26    31.8  3669.22      36 3729.17      42 3745.04
GR   50.1 3767.43   55.5 3802.55      57  3943.85      52 4107.84    50.5  4209.1
GR   53.1 4359.76   56.2 4405.38    56.4  4699.98      55 4860.97    56.5 4932.99
GR   54.4 5041.53   50.1    5150    52.2  5287.22    53.6 5519.22    51.9 5703.27
GR     52   5900    51.8    6040      52     6160    53.2    6300    54.5    6450
GR   57.8   6690    63.7 6949.97    63.9  7208.78    62.9 7282.45    61.9 7559.06
GR   59.2 7996.95   57.3    8229    58.1     8331    63.7    8477    61.2  8548.1
GR   62.8 8733.88   62.1 8893.69    62.3  9162.78    59.8 9368.39   62.65    9510
GR   62.2   9630    60.2 9723.91    61.8  9807.54    62.8 10002.69   59.7 10225.58
1
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GR   62.6 10311.07   60.9 10350.09   62.5 10478.43   60.8 10575.85   64.4 11234.07
GR   67.3 11355.29   71.8 11460.13   75.3 11489.48  75.05   11790    74.1 11874.14
GR   74.1 12095.62   75.2 12273.93   75.5 12508.24   74.6 12649.39     76 13085.66
GR   74.3 13286.4    79.6 13549.31

QT     4    62410   127600   167670   307570
NC   .12     .12     .03      .3       .5
X1  11.35     89 2958.98 3804.94     1000     2300     1373
X3    10                   2199       58  6519.75     65.5
GR  75.43      0      66  155.36    64.3   287.39    63.9  438.76    60.9  535.19
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GR   54.9   626.91    52   787.68    53.3   980.78    52.8  1186.05    55.1  1413.79
GR   55.2  1604.36    56.9  1641.25    57   1786.87   56.25    1790     56.3  2127.54
GR   58.1  2185.43    54.8  2259.37    54.4  2456.59   50.5   2653.09   51.8  2802.23
GR   53.9  2832.46    52.8  2958.98    44.7  3090.28   48.1   3150.77   37.64  3267.77
GR   38.74  3336.43   28.84  3406.43   29.04  3461.55  36.14    3538     42.5  3671.55
GR   52.6  3804.94    47.4  3855.04    47.9  3919.98   43.7   3952.95   42.6  4050.14
GR   44.3  4431.03    41.9  4584.19    47   4826.5     42.5   4859.87   42.6  4957.91
GR   48.7  5021.15    49.2  5059.55    43.9  5090.8     44.7   5266.47   43.2  5349.68
GR   50.2  5459.53    52.4  5575.87    50.4  5703.12    51.9   5904.76   49.1  6073.64
GR   49.1  6167.73    51.3  6273.19    59.7  6409.59    65.5   6519.75   65.7  6635.31
GR   63.6  6757.16    63   7060.24    63.3  7375.88    66     7690     64.7  7907.84
GR   65.5  7969.4     64.1  8340.7     64.9  8381.19    64.1   8668.42   62    8835.44
GR   62.5  8946.12    65.3  9083.61    63.6  9200.98    64.35   9450     63    9781.97
GR   63.1  10165.1    65.1  10443.04   64.4  10755.85   64.5  10988.16   68.1  11162.12
GR   71.35   11220    71.9  11348.07   74.6  11434.99   75.9  11601.85   78.45   11650
GR   79.6   11960     81.1  12067.18   79.5  12180.83   80.3  12422.88   84.2  12477.71
GR   85.05   12580    83.5  12625.42   84.2   12770     82.9  13330.5

X1  11.38    85   19900   21000   1000    2300    1373    0.00    -1     0
X3   10     0.0    0.0    0.0     0.0     0.0     0.0     0.0     0.0    0.0
GR  85.00  14899.0  85.00  14900.0  85.00  16700.0  80.00  16850.0  75.00  16950.0
GR  70.00  17099.0  70.00  17100.0  65.00  17150.0  60.00  17350.0  55.00  17800.0
GR  65.90  19700.0  66.80  19800.0  67.30  19900.0  61.80  20000.0  60.70  20001.0
GR  55.60  20014.9  49.10  20030.0  44.10  20045.4  43.40  20060.3  45.20  20075.3
GR  45.80  20090.3  46.20  20105.3  45.30  20120.1  45.90  20136.6  46.00  20153.3
GR  45.30  20169.6  44.30  20186.2  44.70  20202.8  45.10  20219.6  45.00  20236.2
GR  45.30  20252.7  45.20  20269.3  45.20  20286.0  44.30  20302.6  43.70  20319.4
GR  40.00  20335.8  42.60  20352.5  38.10  20368.8  33.60  20385.4  35.50  20402.0
GR  33.20  20416.3  32.40  20430.0  31.70  20450.0  36.40  20470.0  34.80  20492.0
GR  37.60  20510.0  38.00  20527.2  38.30  20535.0  38.00  20565.0  37.40  20590.0
GR  37.00  20600.3  34.80  20615.0  27.80  20630.0  34.80  20645.0  36.30  20655.1
GR  39.20  20674.3  40.60  20693.3  38.60  20712.1  42.40  20731.4  43.50  20735.0
GR  47.40  20750.7  48.20  20769.8  47.20  20789.0  47.50  20808.0  47.50  20865.1
GR  47.80  20865.2  48.10  20884.2  47.90  20903.3  48.10  20922.3  48.70  20941.3
GR  54.90  20960.4  63.70  20978.7  63.90  20979.5  65.00  21000.0  64.30  21100.0
GR  55.00  22000.0  55.00  24800.0  60.00  25000.0  65.00  26200.0  65.00  26500.0
GR  70.00  27700.0  75.00  27800.0  80.00  28300.0  85.00  29700.0  90.00  30100.0

SB   1.25   1.50   2.60   0.0   189.0   20.4  22729.0   10.20   27.80   27.80
ET                               9.1                    19900   21000
1
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X1  11.39     0     0.0    0.0    50.0    50.0    50.0    0.00    0.00     0
X2    0    0.00     1    67.20   68.30    0.00     0      0.00    0.00     0
X3   10     0.0    0.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT    33  14899.0   87.0    0.0  16700.0   87.0    0.0  17000.0   85.0    0.0
BT  17560    80.0    0.0  18100.0   75.0    0.0  19200.0   70.0    0.0  19201.0
BT   70.0    0.0  20000.0   68.3    0.0  20000.1   68.3    65.7  20120.1   69.1
BT   66.7  20201.2   69.1   66.0  20416.3   69.8    67.1  20416.4   69.8    66.5
BT  20492    69.8    66.8  20492.1   69.8    65.1  20655.1   69.8    65.1  20655.2
BT   69.8    67.2  20978.7   68.8    65.6  20978.8   68.8    0.0  21000.0   68.0
BT    0.0  21100.0   67.3    0.0  21200.0   66.3    0.0  21201.0   66.3    0.0
BT  23250    62.0    0.0  25100.0   65.0    0.0  26200.0   65.0    0.0  26400.0
BT   65.0    0.0  26700.0   70.0    0.0  27650.0   75.0    0.0  28150.0   82.0
BT    0.0  28750.0   87.0    0.0  29000.0   92.0    0.0  30300.0   92.0    0.0

ET                               8.41
X1  11.4     89  2958.98  3804.94   50.0    50.0    50.0    0.00    0.00     0
X3   10                    2199      58   6519.75   65.5
GR  75.43     0      66   155.36   64.3   287.39   63.9   438.76   60.9   535.19
GR   54.9   626.91    52   787.68    53.3   980.78    52.8  1186.05    55.1  1413.79
GR   55.2  1604.36    56.9  1641.25    57   1786.87   56.25    1790     56.3  2127.54
GR   58.1  2185.43    54.8  2259.37    54.4  2456.59   50.5   2653.09   51.8  2802.23
GR   53.9  2832.46    52.8  2958.98    44.7  3090.28   48.1   3150.77   37.64  3267.77
GR   38.74  3336.43   28.84  3406.43   29.04  3461.55  36.14    3538     42.5  3671.55
GR   52.6  3804.94    47.4  3855.04    47.9  3919.98   43.7   3952.95   42.6  4050.14
GR   44.3  4431.03    41.9  4584.19    47   4826.5     42.5   4859.87   42.6  4957.91
GR   48.7  5021.15    49.2  5059.55    43.9  5090.8     44.7   5266.47   43.2  5349.68
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GR   50.2  5459.53    52.4  5575.87    50.4  5703.12    51.9  5904.76    49.1  6073.64
GR   49.1  6167.73    51.3  6273.19    59.7  6409.59    65.5  6519.75    65.7  6635.31
GR   63.6  6757.16      63  7060.24    63.3  7375.88      66     7690    64.7  7907.84
GR   65.5   7969.4    64.1   8340.7    64.9  8381.19    64.1  8668.42      62  8835.44
GR   62.5  8946.12    65.3  9083.61    63.6  9200.98   64.35     9450      63  9781.97
GR   63.1  10165.1    65.1 10443.04    64.4 10755.85    64.5 10988.16    68.1 11162.12
GR  71.35    11220    71.9 11348.07    74.6 11434.99    75.9 11601.85   78.45    11650
GR   79.6    11960    81.1 12067.18    79.5 12180.83    80.3 12422.88    84.2 12477.71
GR  85.05    12580    83.5 12625.42    84.2    12770    82.9  13330.5

QT      4    62340  127340   167560  307140       0       0       0       0
NC    .12      .12     .03       .1      .3
NH      3     .120 3153.07     .030 3834.77    .120 14239.64
X1  11.48       83 3153.07  3834.77     400     700     370              -1
X3     10                   1998.35   56.86
GR  76.29        0    74.2   141.74    72.1   251.69    67.3   387.98    65.6   572.84
GR   64.9   799.64    56.3  1051.78    56.7   1284.7    55.8  1423.54    57.5  1735.27
GR   55.8  1865.38    57.9  1950.43      57  2115.34    51.9  2192.24    51.6  2676.44
GR   48.1  2772.19    51.5   2897.5    47.5  3079.27    49.6  3153.07    48.4  3217.84
GR   40.8  3263.45    46.8  3312.88   38.33  3352.99   32.93   3453.9   28.63  3598.06
GR  22.83  3619.02   25.93  3642.69   21.73  3663.26   28.63  3710.06   40.09  3750.18
GR   50.5  3834.77    52.5  4098.58    52.5  4266.28    50.2  4616.96    53.2  5256.55
GR   55.8  5417.16    49.5  5542.31    49.6  5811.88    52.8  5944.08    50.5  6026.29
GR   49.2  6139.42    50.6  6300.68    60.8  6368.78    60.8  6489.41    52.1  6544.58
GR   49.1  6582.93    49.6  6866.77    53.6  6999.45    52.4  7192.35    55.8  7242.29
GR   52.1  7310.92    57.4   7392.7    58.9  7486.54    57.8   7527.2    59.3  7858.55
GR   62.3  8313.45    62.3   8520.5    63.1  8579.97    63.8  8874.31    63.1  9022.65
GR   64.7  9319.75      64  9847.05      66 10324.86    67.2 10502.28    70.9 10689.92
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GR   75.6 10862.29      80 11138.46    81.4 11329.98    82.6 11935.13    82.6 12152.77
GR     84 12494.73    86.9 12751.65      91 12961.31    96.3 13165.82    98.2 13409.92
GR   97.1 13499.57    82.3 13562.28    82.6 13710.72    93.2 13739.27    91.2 13843.55
GR   84.7 14008.62    85.8 14187.33    84.3 14239.64

QT      4    62300   127200   167500   306900
NC    .12      .12      .03       .6      .8
X1  11.55       73     3153     3835    400.0    400.0    370.0     0.00       0
X3     10      0.0      0.0     1950       57      0.0      0.0      0.0
GR   75.4        0     74.2      142     67.3      388     65.6      573     64.9      800
GR   51.7      898     56.3     1052     56.7     1285     55.8     1424     51.7     1438
GR   51.7     1636     57.5     1735     57.9     1950       57     2115     51.9     2192
GR   51.6     2676     48.1     2772     51.5     2898     47.5     3079     49.6     3153
GR   48.4     3218     46.8     3313    38.33     3353    28.63     3598    22.83     3619
GR  25.93     3643    21.73     3663    28.63     3710    40.09     3750     50.5     3835
GR   52.5     4099     52.5     4266     50.2     4617     44.2     4679     44.3     5110
GR   53.2     5257     55.8     5417     49.5     5542     49.6     5812     52.8     5944
GR   50.5     6026     49.2     6139     50.6     6301     60.8     6369     60.8     6489
GR   52.1     6545     49.1     6583     49.6     6867     53.6     6999     52.4     7192
GR   52.1     7311     58.9     7487     59.3     7859     62.3     8313     62.3     8521
GR   63.1     8580     63.8     8874     63.1     9023     64.7     9320       64     9847
GR     66    10325     67.2    10502     70.9    10690     75.6    10862       80    11138
GR   81.4    11330     82.6    11935     82.6    12153       84    12495     86.9    12752
GR     91    12961     96.3    13166     98.2    13410

NH      4     .100  18850.0     .100  20250.0     .030  21748.6     .120  28900.0    0.000
X1 11.569       83    20250  21768.7      100      100      100     0.00     0.00        0
X3     10      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR  84.00  16850.0    80.00  17250.0    80.00  17251.0    80.00  17252.0    75.00  18025.0
GR  70.00  18075.0    65.00  18125.0    60.00  18200.0    60.00  18201.0    60.00  18202.0
GR  60.00  18450.0    60.00  18500.0    60.00  18600.0    60.00  18850.0    55.00  19350.0
GR  55.00  19351.0    68.70  20250.0    49.80  20287.0    49.30  20323.0    48.30  20340.0
GR  49.80  20360.4    48.40  20389.0    50.50  20396.9    48.10  20458.0    44.50  20495.0
GR  44.20  20506.1    45.40  20560.0    44.50  20600.0    45.00  20650.0    47.20  20711.0
GR  44.00  20721.0    42.80  20746.0    43.30  20770.0    35.50  20800.0    33.50  20820.0
GR  26.50  20920.0    24.10  20930.0    31.40  20940.0    25.40  20944.1    29.70  20960.0
GR  30.60  20970.0    33.20  20980.0    33.20  20981.0    35.00  20990.0    35.90  21000.0
GR  38.40  21010.0    38.40  21017.3    43.43  21039.0    45.80  21089.5    46.80  21162.7
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GR  46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR  49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR  51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR  64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00  22500.
GR  55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00  24950.
GR  60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00  28150.
GR  85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00    0.0

SB   1.25    2.31    2.60    0.0    50     46    32375     20    24.1    24.1
NC   .120    .120    .035    .3     .5
X1 11.660     91  20226.0  21910.0    480     480     480    0.00     0
X2   0.0     0.0      1    63.08   69.07    0.0     0.0     0.0     0.0     0.0
X3    10     0.0     0.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT    27  16200.0   68.99    0.0  17200.0   64.77    0.0  17500.0   63.51    0.0
BT 18300.   67.62    0.0  18301.0   67.63    0.0  18669.0   72.15    0.0  19195.0
BT  71.42    0.0  20000.0   67.97    0.0  20100.0   68.42    0.0   20200   68.87
```



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BT    0.0  20235.8   69.04   69.04  20242.8   69.07   63.08  20573.0   70.56   64.57
BT 20903.   72.04   66.05  21141.3   72.66   66.67  21563.0   71.21   65.22  21893.1
BT  69.73   63.74  21900.0   69.70   69.70  22000.0   69.24    0.0  22274.7   68.01
BT    0.0  22700.0   66.10    0.0  23449.7   65.50    0.0  24374.7   69.44    0.0
BT 26274.   85.80    0.0  28000.0   85.80    0.0  28300.0   85.80    0.0  28900.0
BT   90.0    0.0     0.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0
GR  85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR  60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR  64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR  49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR  44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR  48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR  45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR  37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR  33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR  27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR  24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR  43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR  48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR  49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR  47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR  51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR  64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR  65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
GR  90.50  28900.0    0.00    0.0     0.00    0.0     0.00    0.0     0.00    0.0

X1 11.679     73    3153    3835     100     100     100    0.00    0.00     0
X3    10     0.0     0.0    1950      57     0.0     0.0     0.0
GR   75.4      0    74.2     142    67.3     388    65.6     573    64.9     800
GR   51.7    898    56.3    1052    56.7    1285    55.8    1424    51.7    1438
GR   51.7   1636    57.5    1735    57.9    1950      57    2115    51.9    2192
GR   51.6   2676    48.1    2772    51.5    2898    47.5    3079    49.6    3153
GR   48.4   3218    46.8    3313   38.33    3353   28.63    3598   22.83    3619
GR  25.93   3643   21.73    3663   28.63    3710   40.09    3750    50.5    3835
GR   52.5   4099    52.5    4266    50.2    4617    44.2    4679    44.3    5110
GR   53.2   5257    55.8    5417    49.5    5542    49.6    5812    52.8    5944
GR   50.5   6026    49.2    6139    50.6    6301    60.8    6369    60.8    6489
GR   52.1   6545    49.1    6583    49.6    6867    53.6    6999    52.4    7192
GR   52.1   7311    58.9    7487    59.3    7859    62.3    8313    62.3    8521
GR   63.1   8580    63.8    8874    63.1    9023    64.7    9320      64    9847
GR     66  10325    67.2   10502    70.9   10690    75.6   10862      80   11138
GR   81.4  11330    82.6   11935    82.6   12153      84   12495    86.9   12752
GR     91  12961    96.3   13166    98.2   13410

QT      4  62060  126360  167140  305490       0       0       0       0
NC   .120   .120    .030      .1      .3
X1  11.97     84 2273.46 2827.03     802    5043    2118
X3     10                1105.39    52.5    9060    74.8
GR  78.23      0    64.2  174.04    63.5  501.47    62.4  571.34    57.3  671.03
GR   46.1  969.8    52.3 1075.96    49.9 1240.38    49.5  1362.1    47.4 1575.32
```

GR	49.6	1774.8	45.3	2044.49	47.5	2118.35	44.4	2165.58	46.6	2273.46
GR	35.52	2351.83	41.02	2371.83	32.22	2411.83	31.72	2441.83	37.12	2621.82
GR	45.7	2759.78	44.7	2827.03	45.5	2960.44	44.9	3171.29	46.7	3200
GR	46.4	3463.72	47	3583.97	44.6	3643.28	45	3872.88	47	3996.03

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GR	53.2	4123.35	60.5	4270.1	60.5	4509.54	57.2	4775.48	58	5148.72
GR	56.2	5363.59	55.1	5699.3	49.4	5956.27	49.6	6073.28	48.3	6272.85
GR	51	6381.63	52.1	6574.09	51.8	6814.08	53.2	6887.03	50.2	7041.29
GR	53.5	7127.14	51.6	7442.96	56.9	7800.49	62.4	7837.71	64.9	7999.27
GR	67.4	8385.92	67.1	8424.35	74.8	9060	66.9	9130	66.35	9190
GR	65.8	9282.6	53.6	9356.5	55.7	9527.42	58.8	9587.89	70.2	9638.17
GR	72.9	9884.04	75	10154.89	75.2	10427.45	76.1	10520.96	76.1	10769.8
GR	90.2	10830	91.8	11098.11	89.8	11321.02	86.3	11634.53	85.4	11757.32
GR	86.8	11952.18	85.2	12112.75	87.5	12345.14	83.2	12384.16	89.1	12447.67
GR	85.9	12555.51	90.4	12650	84.7	12970.55	83.1	13224.85	84	13312.97
GR	83	13508.04	84.5	13657.9	83.9	13887.88	86.8	14077.83		

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SECNO DEPTH CWSEL CRIWS WSELK EG HV HL OLOSS L-BANK ELEV
Q QLOB QCH QROB ALOB ACH AROB VOL TWA R-BANK ELEV
TIME VLOB VCH VROB XNL XNCH XNR WTN ELMIN SSTA
SLOPE XLOBL XLCH XLOBR ITRIAL IDC ICONT CORAR TOPWID ENDST

*PROF 1

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR
DETAILS.
0

CCHV= .100 CEHV= .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS= 1232.0 8990.0 TYPE= 1 TARGET= -1232.040
ELENCL= 54.70 ELENCR= 100000.00
THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
3.615 20.61 50.91 .00 50.91 51.06 .15 .00 .00 41.60
174300.0 1521.8 167008.7 5769.5 3779.5 51973.1 11582.1 .0 .0 43.80
.00 .40 3.21 .50 .120 .030 .120 .000 30.30 1277.93
.000136 0. 0. 0. 0 0 0 .00 7174.17 8452.10

*SECNO 4.745

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.74

3470 ENCROACHMENT STATIONS= 1973.4 6985.6 TYPE= 1 TARGET= 5012.200
ELENCL= 52.00 ELENCR= 48.60
4.745 21.39 51.39 .00 .00 51.47 .08 .40 .01 51.10
173330.0 .4 172826.0 503.5 18.8 76897.6 2794.0 9724.6 775.6 47.20
.73 .02 2.25 .18 .120 .030 .120 .000 30.00 2244.23
.000044 3600. 5966. 4500. 2 0 0 .00 5382.30 7626.53

CCHV= .300 CEHV= .500
*SECNO 5.026

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .41

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   56.20 ELREA=   57.00

```
   5.026   40.85   51.45     .00     .00   51.73     .27     .16     .10   56.20
173080.0      .0 173080.0     .0      .0 41314.2      .0 11868.8   953.9   57.00
     .83     .00    4.19     .00    .000    .030    .000    .000   10.60 9613.30
 .000265   1030.   1482.   4150.       2       0       0     .00 3478.05 13091.35
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

*SECNO 5.027

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD=   58.25 MAX ELLC=   52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   56.20 ELREA=   56.00

```
   5.027   40.88   51.48     .00     .00   51.73     .26     .00     .01   56.20
173080.0      .0 173080.0     .0      .0 42667.3      .0 11869.8   953.9   56.00
     .83     .00    4.06     .00    .000    .030    .000    .000   10.60 9617.07
 .000261      1.      1.      1.       2       0       0     .00 3334.80 13037.75
```

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD=   58.25 MAX ELLC=   52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   56.20 ELREA=   56.00

```
   5.034   40.89   51.49     .00     .00   51.75     .26     .01     .00   56.20
173080.0      .0 173080.0     .0      .0 42708.5      .0 11915.9   957.5   56.00
     .84     .00    4.05     .00    .000    .030    .000    .000   10.60 9617.03
 .000261     47.     47.     47.       0       0       0     .00 3334.92 13037.82
```

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   56.20 ELREA=   57.00

```
   5.035   40.88   51.48     .00     .00   51.75     .27     .00     .01   56.20
173080.0      .0 173080.0     .0      .0 41437.9      .0 11916.8   957.6   57.00
     .84     .00    4.18     .00    .000    .030    .000    .000   10.60 9613.19
 .000262      1.      1.      1.       0       0       0     .00 3478.56 13091.75
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

```
*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037    40.88    51.48     .00     .00    51.76     .27     .00     .00    56.20
 173080.0       .0 173080.0      .0      .0  41417.5      .0  11924.4   958.3    57.00
     .84      .00     4.18     .00    .000     .030    .000    .000   10.60  9613.21
  .000263       8.       8.      8.       0        0       0     .00 3478.48 13091.69


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038    40.91    51.51     .00     .00    51.76     .25     .00     .01    56.20
 173080.0       .0 173080.0      .0      .0  42765.1      .0  11925.4   958.3    56.00
     .84      .00     4.05     .00    .000     .030    .000    .000   10.60  9616.96
  .000260       1.       1.      1.       2        0       0     .00 3335.10 13037.91


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045    40.92    51.52     .00     .00    51.77     .25     .01     .00    56.20
 173080.0       .0 173080.0      .0      .0  42806.0      .0  11971.6   961.9    56.00
     .84      .00     4.04     .00    .000     .030    .000    .000   10.60  9616.92
  .000259      47.      47.     47.       0        0       0     .00 3335.22 13037.98


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   SECNO   DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL    OLOSS  L-BANK ELEV
   Q      QLOB     QCH     QROB    ALOB     ACH    AROB     VOL     TWA   R-BANK ELEV
   TIME    VLOB     VCH    VROB     XNL    XNCH     XNR     WTN   ELMIN    SSTA
   SLOPE   XLOBL    XLCH   XLOBR  ITRIAL    IDC   ICONT   CORAR  TOPWID   ENDST


CCHV=     .100 CEHV=     .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046    40.91    51.51     .00     .00    51.78     .27     .00     .00    56.20
 173080.0       .0 173080.0      .0      .0  41520.4      .0  11972.5   962.0    57.00
     .84      .00     4.17     .00    .000     .030    .000    .000   10.60  9613.12
  .000261       1.       1.      1.       1        0       0     .00 3478.90 13092.02


CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 5.585
   5.585    28.64    52.34     .00     .00    52.49     .16     .70     .01    48.20
 172610.0 115105.5  57477.3    27.2 59284.5  11975.5   119.8 15536.0  1382.4    49.80
    1.11     1.94     4.80     .23    .049     .030    .120    .000   23.70  1249.84
```

```
 .000245   2664.   2847.   1744.     2     0     0    .00 10009.70 11259.54

CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW

   6.420   24.62   53.02    .00    .00   53.17    .15    .67    .00   46.70
 171900.0  99245.0  40075.9  32579.2  34827.6   9373.7  16891.8  19647.8   1890.2    47.50
   1.38    2.85    4.28    1.93   .030    .030   .050   .000   28.40 10886.65
 .000215   2300.   4409.   2800.     2     0     0    .00  7480.99 18395.83

CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0  TYPE=    1  TARGET=    8229.000
 ELENCL=    53.10 ELENCR=    57.90
   7.090   23.69   53.79    .00    .00   53.98    .19    .80    .01   46.90
 171320.0   9335.8  99785.3  62198.9  12523.8  22715.9  41737.5  24460.7   2471.7    47.40
   1.65     .75    4.39    1.49   .120    .030   .084   .000   30.10  8963.35
 .000306   2000.   3538.   3600.     2     0     0    .00 10873.39 19836.74
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST

CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=        .0  16383.0  TYPE=    1  TARGET=   16383.000
   7.470   25.29   54.29    .00    .00   54.58    .29    .57    .03   47.70
 171000.0  63484.5  57426.9  50088.6  42995.7   8571.9  17106.4  27150.2   2833.0    44.30
   1.78    1.48    6.70    2.93   .070    .030   .050   .000   29.00  6996.87
 .000357   1500.   2006.   1500.     2     0     0    .00  9291.02 16287.89

*SECNO 8.070

3470 ENCROACHMENT STATIONS=    3455.4  15481.5  TYPE=    1  TARGET=   -3455.360
 ELENCL=    61.13 ELENCR= 100000.00
   8.070   27.54   55.44    .00    .00   56.02    .59   1.35    .09   44.30
 171000.0  22207.5 107836.0  40956.5  16621.2  14038.6  33229.7  31542.5   3377.9    46.70
   1.94    1.34    7.68    1.23   .120    .030   .120   .000   27.90  3788.71
 .000607   2619.   2891.   3201.     2     0     0    .00  7304.43 11093.14

CCHV=   .100 CEHV=   .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .65

3470 ENCROACHMENT STATIONS=        .0   3851.7  TYPE=    1  TARGET=    3851.709
   8.490   21.45   57.25    .00    .00   58.57   1.32   2.32    .22   46.00
 169770.0  52178.2 103453.1  14138.7  21261.7   8867.8  12139.9  34148.7   3682.5    50.60
```

```
    2.02     2.45   11.67    1.16    .120    .030    .120    .000   35.80   798.62
  .001406   2636.   2374.   1605.       3       0       0     .00 6188.42  6987.04
```

1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID ENDST
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.29

```
3470 ENCROACHMENT STATIONS=   2460.6  10500.0 TYPE=    1 TARGET=   -2460.630
 ELENCL=    56.91 ELENCR= 100000.00
    9.410    24.95   60.45     .00     .00   60.69     .24    2.01     .11   53.30
 169330.0  24873.4 62602.3 81854.3 15140.7 10294.3 48917.4 40116.5  4362.5   49.50
    2.39     1.64    6.08    1.67    .057    .030    .079    .000   35.50  751.72
  .000266    2500.   4858.   5500.      3       0       0     .00 7128.18 7879.89
```

CCHV= .100 CEHV= .300
*SECNO 10.580

```
3470 ENCROACHMENT STATIONS=   1431.2   8020.0 TYPE=    1 TARGET=    6588.810
 ELENCL=    55.17 ELENCR=     59.05
   10.580    39.51   61.61     .00     .00   61.95     .35    1.23     .03   53.60
 168330.0  14240.5 90547.8 63541.7 15720.5 14192.4 59656.7 46797.1  4970.4   50.50
    2.71      .91    6.38    1.07    .100    .030    .120    .000   22.10  175.21
  .000284    2700.   6177.   3200.      2       0       0     .00 9124.64 9299.85
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 10.860

```
3470 ENCROACHMENT STATIONS=       .0   8865.0 TYPE=    1 TARGET=    8864.999
   10.860    30.24   61.94     .00     .00   62.30     .37     .34     .01   52.20
 168090.0  16698.7 107589.7 43801.6 15162.1 17854.9 42040.5 49085.7 5189.4   52.40
    2.80     1.10    6.03    1.04    .100    .030    .120    .000   31.70 1804.81
  .000235    1300.   1478.   1100.      2       0       0     .00 7024.74 8829.55
```

1490 NH CARD USED
*SECNO 11.090

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

```
3470 ENCROACHMENT STATIONS=   3311.7   6950.0 TYPE=    1 TARGET=    3638.260
 ELENCL=    53.30 ELENCR=     63.70
   11.090    30.43   62.23     .00     .00   62.87     .64     .48     .08   53.30
 167890.0  39408.3 98596.3 29885.5 21783.9 11936.5 24012.4 51307.6  5415.0   57.00
    2.87     1.81    8.26    1.24    .082    .030    .120    .000   31.80  785.24
  .000559    1400.   1214.   1600.      2       0       0     .00 6099.92 6885.16
```

```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=   .300 CEHV=   .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=    2199.0   6519.8 TYPE=     1  TARGET=    4320.750
 ELENCL=    58.00  ELENCR=    65.50
  11.350   34.28   63.12     .00     .00   63.45     .33     .49     .09   52.80
 167670.0  10998.8 106143.8  50527.4  15979.1  18501.6  41988.4  53963.2   5644.0    52.60
   2.97     .69    5.74    1.20    .120    .030    .120    .000   28.84   463.99
 .000220   1000.   1373.   2300.       2       0       0     .00  6010.47  6474.46


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

  11.380   36.47   63.27     .00     .00   64.26     .99     .48     .33   66.30
 167670.0       .0 167670.0       .0       .0  21034.9       .0  55878.2   5772.7   64.00
   3.03     .00    7.97     .00    .000    .030    .000    .000   26.80 19955.06
 .000474   1000.   1373.   2300.       2       0       0     .00  1031.38 20986.43



SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    1.50    2.60     .00   189.00   20.40 22729.00   10.20   27.80   27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=      63.17 BRIDGE VELOCITY=       8.95    CALCULATED CHANNEL AREA=      18728.
1
  28FEB00    09:46:44                                                   PAGE  21


  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST



 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                            AREA
    .00   64.34     .08       0.  167670.   22729.   22477.     67.20    68.30       0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

  11.390   36.56   63.36     .00     .00   64.34     .98     .08     .00   66.30
 167670.0       .0 167670.0       .0       .0  21122.4       .0  55902.4   5773.9   64.00
   3.03     .00    7.94     .00    .000    .030    .000    .000   26.80 19953.52
 .000469     50.     50.     50.       0       0       0     .00  1034.49 20988.01
```

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*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.62


3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=    58.00  ELENCR=    65.50
  11.400    35.44    64.28      .00      .00    64.56      .28      .01      .21    52.80
 167670.0   12765.4  104041.2  50863.4  18926.4  19485.1  45104.9  55962.5   5778.1    52.60
    3.03      .67     5.34     1.13     .120     .030     .120     .000    28.84   295.76
  .000178      50.      50.      50.        2        0        0      .00  6200.78  6496.54


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=    1998.3  14239.6  TYPE=     1  TARGET=   -1998.350
 ELENCL=    56.86  ELENCR= 100000.00
  11.480    43.61    64.34      .00      .00    64.64      .30      .07      .01    48.60
 167560.0   18059.7  106307.6  43192.7  24006.0  19432.6  55513.3  57133.4   5880.7    49.50
    3.07      .75     5.47      .78     .120     .030     .120     .000    20.73   657.91
  .000142     400.     370.     700.        2        0        0      .00  9508.66 10166.57


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  28FEB00    09:46:44                                                   PAGE  22


   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL     OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN     ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR   TOPWID   ENDST


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0  13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.550    42.66    64.39      .00      .00    64.70      .30      .06      .00    49.60
 167500.0   17819.9  102665.7  47014.4  23090.3  18298.4  53836.5  58011.9   5964.6    50.50
    3.10      .77     5.61      .87     .120     .030     .120     .000    21.73   806.21
  .000161     400.     370.     400.        0        0        0      .00  8854.55  9942.54


1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569    40.27    64.37      .00      .00    64.93      .56      .02      .20    68.70
 167500.0       .0  167500.0       .0       .0  27940.5       .0  58153.3   5976.5    67.10
    3.10      .00     5.99      .00     .000     .031     .000     .000    24.10 20258.48
  .000323     100.     100.     100.        2        0        0      .00  1501.36 21759.84


SPECIAL BRIDGE

SB  XK      XKOR     COFQ     RDLEN    BWC      BWP      BAREA    SS       ELCHU    ELCHD
```

```
  1.25    2.31    2.60    .00    50.00    46.00  32375.00    20.00    24.10    24.10

CCHV=   .300 CEHV=    .500
*SECNO 11.660
PRESSURE FLOW

 EGPRS     EGLWC      H3      QWEIR     QPR      BAREA  TRAPEZOID     ELLC     ELTRD     WEIRLN
                                          AREA
  65.33    64.93     .06       0.  167500.  32375.   30545.     63.08    69.07      0.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20
```

1

28FEB00   09:46:44   PAGE 23

```
 SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS    L-BANK ELEV
 Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL     TWA      R-BANK ELEV
 TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN     ELMIN    SSTA
 SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID   ENDST

  11.660    45.10    64.90     .00      .00    65.33     .42      .40      .00    68.90
 167500.0      .0  167500.0      .0      .0  32093.4      .0  58484.0   5993.9    68.20
   3.13      .00     5.22      .00     .000     .035     .000     .000    19.80  20235.85
  .000298    480.     480.     480.       2        0        0      .00  1665.59  21901.44

*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0   13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=     57.00  ELENCR= 100000.00
  11.679    43.46    65.19     .00      .00    65.41     .22      .02      .06    49.60
 167500.0  20428.2  93999.2  53072.6  24954.6  18835.4  58676.7  58638.5   6006.7    50.50
   3.13      .82     4.99      .90     .120     .035     .120     .000    21.73    706.91
  .000167    100.     100.     100.       2        0        0      .00  9423.79  10130.71

CCHV=    .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4    9060.0  TYPE=     1  TARGET=    7954.610
 ELENCL=     52.50  ELENCR=     74.80
  11.970    33.92    65.64     .00      .00    65.87     .23      .46      .00    46.60
 167140.0  25183.7  81171.1  60785.3  26808.4  14983.4  67309.5  67230.0   6749.2    44.70
   3.40      .94     5.42      .90     .120     .030     .120     .000    31.72    156.13
  .000148    802.    2118.    5043.       2        0        0      .00  7958.18   8114.31
```

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28FEB00   09:46:44   PAGE 24

THIS RUN EXECUTED 28FEB00   09:46:44

****

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

Starting form river mile

SUMMARY PRINTOUT

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
* 9724.618	.02	.18	2.25	79710.34	5382.30	.00	99.71	.29
* 11868.840	.00	.00	4.19	41314.24	3478.05	.00	100.00	.00
11869.800	.00	.00	4.06	42667.32	3334.80	.00	100.00	.00
11915.860	.00	.00	4.05	42708.54	3334.92	.00	100.00	.00
11916.830	.00	.00	4.18	41437.87	3478.56	.00	100.00	.00
11924.430	.00	.00	4.18	41417.55	3478.48	.00	100.00	.00
11925.400	.00	.00	4.05	42765.09	3335.10	.00	100.00	.00
11971.560	.00	.00	4.04	42806.04	3335.22	.00	100.00	.00
11972.530	.00	.00	4.17	41520.42	3478.90	.00	100.00	.00
15535.960	1.94	.23	4.80	71379.88	10009.70	66.69	33.30	.02
19647.750	2.85	1.93	4.28	61093.07	7480.99	57.73	23.31	18.95
24460.670	.75	1.49	4.39	76977.25	10873.39	5.45	58.24	36.31
27150.160	1.48	2.93	6.70	68674.01	9291.02	37.13	33.58	29.29
31542.470	1.34	1.23	7.68	63889.50	7304.43	12.99	63.06	23.95
* 34148.750	2.45	1.16	11.67	42269.31	6188.42	30.73	60.94	8.33
* 40116.490	1.64	1.67	6.08	74352.37	7128.18	14.69	36.97	48.34

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
46797.120	.91	1.07	6.38	89569.58	9124.64	8.46	53.79	37.75
49085.690	1.10	1.04	6.03	75057.51	7024.74	9.93	64.01	26.06
* 51307.630	1.81	1.24	8.26	57732.71	6099.92	23.47	58.73	17.80
* 53963.230	.69	1.20	5.74	76469.08	6010.47	6.56	63.31	30.14
* 55878.250	.00	.00	7.97	21034.92	1031.38	.00	100.00	.00
55902.440	.00	.00	7.94	21122.37	1034.49	.00	100.00	.00
* 55962.500	.67	1.13	5.34	83516.47	6200.78	7.61	62.05	30.34
57133.360	.75	.78	5.47	98951.96	9508.66	10.78	63.44	25.78
58011.900	.77	.87	5.61	95225.19	8854.55	10.64	61.29	28.07
58153.280	.00	.00	5.99	27940.47	1501.36	.00	100.00	.00
58484.040	.00	.00	5.22	32093.45	1665.59	.00	100.00	.00
58638.500	.82	.90	4.99	102466.80	9423.79	12.20	56.12	31.69

SUMMARY PRINTOUT

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
* 9724.618	.02	.18	2.25	79710.34	5382.30	.00	99.71	.29
* 11868.840	.00	.00	4.19	41314.24	3478.05	.00	100.00	.00
11869.800	.00	.00	4.06	42667.32	3334.80	.00	100.00	.00
11915.860	.00	.00	4.05	42708.54	3334.92	.00	100.00	.00
11916.830	.00	.00	4.18	41437.87	3478.56	.00	100.00	.00
11924.430	.00	.00	4.18	41417.55	3478.48	.00	100.00	.00
11925.400	.00	.00	4.05	42765.09	3335.10	.00	100.00	.00
11971.560	.00	.00	4.04	42806.04	3335.22	.00	100.00	.00
11972.530	.00	.00	4.17	41520.42	3478.90	.00	100.00	.00
15535.960	1.94	.23	4.80	71379.88	10009.70	66.69	33.30	.02
19647.750	2.85	1.93	4.28	61093.07	7480.99	57.73	23.31	18.95
24460.670	.75	1.49	4.39	76977.25	10873.39	5.45	58.24	36.31
27150.160	1.48	2.93	6.70	68674.01	9291.02	37.13	33.58	29.29
31542.470	1.34	1.23	7.68	63889.50	7304.43	12.99	63.06	23.95
* 34148.750	2.45	1.16	11.67	42269.31	6188.42	30.73	60.94	8.33
* 40116.490	1.64	1.67	6.08	74352.37	7128.18	14.69	36.97	48.34

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
46797.120	.91	1.07	6.38	89569.58	9124.64	8.46	53.79	37.75
49085.690	1.10	1.04	6.03	75057.51	7024.74	9.93	64.01	26.06
* 51307.630	1.81	1.24	8.26	57732.71	6099.92	23.47	58.73	17.80
* 53963.230	.69	1.20	5.74	76469.08	6010.47	6.56	63.31	30.14
* 55878.250	.00	.00	7.97	21034.92	1031.38	.00	100.00	.00
55902.440	.00	.00	7.94	21122.37	1034.49	.00	100.00	.00
* 55962.500	.67	1.13	5.34	83516.47	6200.78	7.61	62.05	30.34
57133.360	.75	.78	5.47	98951.96	9508.66	10.78	63.44	25.78
58011.900	.77	.87	5.61	95225.19	8854.55	10.64	61.29	28.07
58153.280	.00	.00	5.99	27940.47	1501.36	.00	100.00	.00
58484.040	.00	.00	5.22	32093.45	1665.59	.00	100.00	.00
58638.500	.82	.90	4.99	102466.80	9423.79	12.20	56.12	31.69

67229.980 .94 .90 5.42 109101.30 7958.18 15.07 48.56 36.37

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
*	4.745	5966.00	.00	.00	30.00	173330.00	51.39	.00	51.47	.44	2.25	79710.34	259895.80
*	5.026	1482.00	.00	.00	10.60	173080.00	51.45	.00	51.73	2.65	4.19	41314.24	106310.00
	5.027	1.00	58.25	52.50	10.60	173080.00	51.48	.00	51.73	2.61	4.06	42667.32	107053.70
	5.034	47.00	58.25	52.50	10.60	173080.00	51.49	.00	51.75	2.61	4.05	42708.54	107216.70
	5.035	1.00	.00	.00	10.60	173080.00	51.48	.00	51.75	2.62	4.18	41437.87	106830.20
	5.037	8.00	.00	.00	10.60	173080.00	51.48	.00	51.76	2.63	4.18	41417.55	106744.60
	5.038	1.00	58.25	52.50	10.60	173080.00	51.51	.00	51.76	2.60	4.05	42765.09	107440.50
	5.045	47.00	58.25	52.50	10.60	173080.00	51.52	.00	51.77	2.59	4.04	42806.04	107602.70
	5.046	1.00	.00	.00	10.60	173080.00	51.51	.00	51.78	2.61	4.17	41520.42	107178.00
	5.585	2847.00	.00	.00	23.70	172610.00	52.34	.00	52.49	2.45	4.80	71379.88	110232.30
	6.420	4409.00	.00	.00	28.40	171900.00	53.02	.00	53.17	2.15	4.28	61093.07	117350.50
	7.090	3538.00	.00	.00	30.10	171320.00	53.79	.00	53.98	3.06	4.39	76977.25	98004.22
	7.470	2006.00	.00	.00	29.00	171000.00	54.29	.00	54.58	3.57	6.70	68674.01	90451.75
	8.070	2891.14	.00	.00	27.90	171000.00	55.44	.00	56.02	6.07	7.68	63889.50	69378.99
*	8.490	2374.28	.00	.00	35.80	169770.00	57.25	.00	58.57	14.06	11.67	42269.31	45271.21
*	9.410	4858.00	.00	.00	35.50	169330.00	60.45	.00	60.69	2.66	6.08	74352.37	103892.80
	10.580	6177.00	.00	.00	22.10	168330.00	61.61	.00	61.95	2.84	6.38	89569.58	99894.13
	10.860	1478.00	.00	.00	31.70	168090.00	61.94	.00	62.30	2.35	6.03	75057.51	109676.20
*	11.090	1214.00	.00	.00	31.80	167890.00	62.23	.00	62.87	5.59	8.26	57732.71	71019.52
*	11.350	1373.00	.00	.00	28.84	167670.00	63.12	.00	63.45	2.20	5.74	76469.08	113015.40
*	11.380	1373.00	.00	.00	26.80	167670.00	63.27	.00	64.26	4.74	7.97	21034.92	77043.84
	11.390	50.00	68.30	67.20	26.80	167670.00	63.36	.00	64.34	4.69	7.94	21122.37	77424.63
*	11.400	50.00	.00	.00	28.84	167670.00	64.28	.00	64.56	1.78	5.34	83516.47	125695.20

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
11.480	370.00	.00	.00	20.73	167560.00	64.34	.00	64.64	1.42	5.47	98951.96	140732.80
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.70	1.61	5.61	95225.19	131867.60

11.569	100.00	.00	.00	24.10	167500.00	64.37	.00	64.93	3.23	5.99	27940.47 93136.19
11.660	480.00	69.07	63.08	19.80	167500.00	64.90	.00	65.33	2.98	5.22	32093.45 97095.56
11.679	100.00	.00	.00	21.73	167500.00	65.19	.00	65.41	1.67	4.99	102466.80129546.90
11.970	2118.00	.00	.00	31.72	167140.00	65.64	.00	65.87	1.48	5.42	109101.30137313.70

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3.615	174300.00	50.91	.00	.00	.00	7174.17	.00
*	4.745	173330.00	51.39	.00	.48	.00	5382.30	5966.00
*	5.026	173080.00	51.45	.00	.06	.00	3478.05	1482.00
	5.027	173080.00	51.48	.00	.02	.00	3334.80	1.00
	5.034	173080.00	51.49	.00	.01	.00	3334.92	47.00
	5.035	173080.00	51.48	.00	-.01	.00	3478.56	1.00
	5.037	173080.00	51.48	.00	.00	.00	3478.48	8.00
	5.038	173080.00	51.51	.00	.02	.00	3335.10	1.00
	5.045	173080.00	51.52	.00	.01	.00	3335.22	47.00
	5.046	173080.00	51.51	.00	-.01	.00	3478.90	1.00
	5.585	172610.00	52.34	.00	.83	.00	10009.70	2847.00
	6.420	171900.00	53.02	.00	.68	.00	7480.99	4409.00
	7.090	171320.00	53.79	.00	.77	.00	10873.39	3538.00
	7.470	171000.00	54.29	.00	.50	.00	9291.02	2006.00
	8.070	171000.00	55.44	.00	1.14	.00	7304.43	2891.14
*	8.490	169770.00	57.25	.00	1.81	.00	6188.42	2374.28
*	9.410	169330.00	60.45	.00	3.20	.00	7128.18	4858.00
	10.580	168330.00	61.61	.00	1.16	.00	9124.64	6177.00
	10.860	168090.00	61.94	.00	.33	.00	7024.74	1478.00
*	11.090	167890.00	62.23	.00	.29	.00	6099.92	1214.00
*	11.350	167670.00	63.12	.00	.89	.00	6010.47	1373.00
*	11.380	167670.00	63.27	.00	.16	.00	1031.38	1373.00
	11.390	167670.00	63.36	.00	.08	.00	1034.49	50.00
*	11.400	167670.00	64.28	.00	.92	.00	6200.78	50.00

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GR   29.9   28876   30.6   29013   31.6   29063   31.4   29113   40.6   29500
GR   52.3   29600   55     34310

NC   .11    .11     .03    .1      .3
QT   6      82678   180183 246013  409622 246013  246013
X1   1.11   69      20000  27900   3200   3000    3379
GR   55     19900   50.9   20000   38.6   20100   14.6   20200   10.6   20300
GR   9      20400   10.6   20480   10.5   20510   12.4   20750   8.6    20900
GR   7.6    21030   9      21050   8.3    21130   3.6    21250   8.6    21300
GR   21.6   21400   16.6   21500   17.1   21550   14.6   21600   11.6   21800
GR   18.6   22100   20.6   22140   22.1   22200   22.8   22330   21.6   22500
GR   21.4   22700   20.4   22830   19.6   23000   17     23200   17     23300
GR   17     23430   16.3   23590   16     23720   15.6   23800   16.1   23900
GR   16.6   24000   16.4   24100   14.8   24230   15.6   24280   15.6   24320
GR   14.8   24330   16.1   24340   16.5   24500   20.6   24750   21.8   24820
GR   23.3   24990   21.8   25000   20.1   25140   21.8   25300   20.6   25400
GR   21.3   25610   20.6   25990   21.1   26100   22.3   26150   21.6   26300
GR   22.5   26400   32.1   26740   32.1   26900   31.6   26920   33.1   27120
GR   35.5   27400   35.5   27500   38.6   27700   40.8   27900   42.1   28360
GR   43.4   28363   44.2   28375   50     28500   55     32250

NC   .11    .11     .03    .1      .3
QT   6      82900   180169 245944  409400 245944  245944
X1   1.99   56      20000  27198   3850   6150    4646
GR   55     19610   50     19850   40.6   20000   38.6   20040   22.3   20150
GR   21.1   20500   19.1   20590   17.1   20700   15.3   20790   15.6   20820
GR   14.8   20900   14.8   20990   15.6   21050   15.6   21150   10.6   21350
GR   8.6    21500   7.6    21590   4.4    21750   8.6    21790   18.6   21800
GR   22.6   21840   24.4   21870   24.4   21980   22.6   21990   18.7   22100
GR   22.6   22190   26.1   22250   26.1   22350   24.6   22480   23.6   22590
GR   23.6   22610   24.4   22790   24.6   22830   27.8   23390   29.1   23430
GR   27.8   23590   27.1   23600   27.8   23620   25.2   23990   22.6   24150
GR   22.6   24380   23.2   24880   23.5   24990   22.4   25380   19.8   25500
1
  28FEB00    09:37:31                                              PAGE   3


GR   20.6   25640   19.6   25790   19.5   25990   21.8   26590   20.5   26700
GR   22.4   26750   22.4   26800   30.6   26980   40.6   27198   50     27250
GR   55     27350

QT   6      83003   180162 245912  409297 245912  245912
X1   2.40   50      20000  27114   400    5000    2165
GR   55     19810   50     19900   40.6   20000   36.6   20100   30.6   20200
GR   29.8   20250   30.6   20300   31.5   20350   31.5   20575   30.0   20675
GR   30.8   20775   30.6   20800   31.8   21000   32.5   21120   30.6   21200
GR   26.8   21400   24.1   21520   16.6   21630   14.6   21800   16.1   21950
GR   15.6   22000   16.1   22050   14.6   22090   13.1   22200   13.6   22400
GR   13.6   22700   11.6   22800   16.1   22850   14.8   22880   15.4   23000
GR   9      23200   4.6    23400   14.6   23550   16.9   23590   20.8   23600
GR   25.1   23650   20.1   24200   24.5   24650   23.1   24775   23.8   24800
GR   23.8   24950   22.8   25000   21.8   25800   22.8   26200   23.6   26400
GR   24.6   26565   34.0   26800   38.6   26950   40.6   27114   55     27250

NC   .11    .11     .03    .1      .3
QT   6      83066   180158 245892  409234 245892  245892
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X1   2.65     33   20000   26332    400    1650    1320
GR     55  19800      50   19900   40.6   20000    32.6   20250     7.6   20450
GR    5.5  20490    14.6   21100   17.1   21120    16.8   21180    28.4   21300
GR   28.4  21650    24.4   22150   24.5   22250    28.6   22400    31.6   22850
GR   33.1  23200    34.1   23600   31.6   23890    33.6   24050    33.1   24160
GR     32  24250    32.6   24375   34.6   24490    31.6   24650    34.1   24760
GR   33.6  25000    31.6   25120   31.5   25420    32.6   25470    32.6   25700
GR   36.6  25850      41   26332     55   26410

NC    .11    .11     .03      .1     .3
QT      6  83394  180138  245789  408906  245789  245789
X1   3.95     51   20000   25799   5700    7500    6864
GR     60  19850      55   19900     50   19950    40.6   20000    23.1   20490
GR   24.8  20550    27.6   20790   21.8   20960    17.6   21120    20.2   21175
GR   21.8  21275    19.1   21350   20.2   21475    13.1   21575    17.9   21650
GR   12.6  21850     8.3   21950   12.6   22150    24.1   22290    23.6   22490
GR   20.2  22550      22   22640   17.6   22750      24   22900      24   23150
GR     25  23250      25   23550   22.6   23600    23.6   23690      24   23850
GR   20.6  23930    20.5   24000   22.5   24100    22.5   24150    21.6   24200
GR   21.6  24250      24   24300    8.6   24450     5.6   24590    16.6   24750
GR    9.6  24900    21.6   25000   21.6   25050    20.9   25100    28.6   25240
GR     24  25290    26.1   25350   34.6   25500    41.1   25799      55   25900
GR     60  26100

QT      6  83505  180131  245755  408795  245755  245755
X1   4.39     31   20000   27221   1000    3350    2323
GR     60  19550      55   19800     50   19950    40.6   20000    32.6   20200
GR   27.6  20340    25.6   20450   26.6   20630    25.6   21000    28.9   22400
GR   22.1  22650    26.3   23200   24.8   23310    28.1   23680    26.4   23930
GR   29.6  24500    18.5   24820   24.6   25150    14.6   25250     5.6   25475
GR   28.8  25650    28.6   25840   25.2   26000    20.8   26050    22.8   26120
GR   21.8  26200    26.6   26300   27.6   26600    40.6   27221      55   27400
GR     60  29600
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QT      6  83740  180116  245681  408560  245681  245681
X1   5.32     48   20000   25209   6850    4500    4910
GR     60  18390      55   19500     50   19800    40.6   20000    28.6   20225
GR   27.8  20300   28.50   20450   25.6   20600    22.4   20635    22.4   20665
GR   25.6  20700      23   20800   25.4   20825    25.4   20875    22.6   21100
GR     23  21350    21.6   21400   23.4   21440    21.4   21450    22.9   21840
GR   25.6  21890    25.6   22060   24.4   22070    22.6   22180    23.6   22200
GR   17.6  22230    22.6   22340   22.1   22440    20.1   22450    16.6   22660
GR   17.1  22775    15.6   22800    9.4   23040    25.6   23200    29.6   23400
GR   29.6  23675    30.5   23750   27.4   23900    26.4   24120    24.1   24275
GR   28.6  24545    26.1   24575   30.6   24700    35.6   24775      36   24865
GR   41.6  25209      55   25250     60   25300

NC    .11    .11     .03      .1     .3
QT      6  83856  180109  245645  408444  245645  245645
X1   5.78     35   20000   24218   7000    4000    2429
GR     60  19600      55   19800   40.8   20000    31.6   20300    30.1   20450
GR     28  20500      31   20725     31   20850      28   20950    24.7   21025
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GR   18.1   21050   18.6   21300   15.2   21340   18.6   21375   12.9   21450
GR   11.3   21550   12.6   21575   12.6   21610   13.9   21640   25.1   21775
GR   21.6   21860   21.3   22125   21.6   22175   21.1   22325   17.4   22400
GR   17.5   22450   29.6   22650   27.4   23150   25.6   23200   20.8   23300
GR   22.8   23350   23.6   23450   41.1   24218     55   24250     60   24330

QT      6   83876  180108  245639  408424  245639  245639
X1   5.86      50   20000   23920    4500     500     422
GR     55   18900   56.3   20000   56.1   20001   52.6   20019   51.9   20023
GR   48.8   20038   46.3   20057   42.9   20067   41.9   20076   41.4   20095
GR   40.4   20114   39.4   20138   38.4   20162   35.5   20186   33.5   20210
GR   26.9   20234   24.4   20255   23.9   20275   22.9   20295   31.6   20300
GR   30.1   20450     28   20500     31   20725     31   20850     28   20950
GR   24.7   21025   18.1   21050   18.6   21300   15.2   21340   18.6   21375
GR   12.9   21450   11.3   21550   12.6   21575   12.6   21610   13.9   21640
GR   25.1   21775   21.6   21860   21.3   22125   21.6   22175   21.1   22325
GR   17.4   22400   17.5   22450   29.6   22650   27.4   23150   25.6   23200
GR   20.8   23300   22.8   23350   23.6   23450   56.3   23920     55   24090

NC    .11     .11     .03      .3      .5
QT      6   83881  180107  245637  408419  245637  245637
X1   5.88       0   20000   23920     100     100     100
X3     10                                            56.3    56.3

SB   1.05     1.5     2.5          716.60  323.41  100542   31.77     1.5     1.5
QT      6   83883  180107  245637  408417  245637  245637
X1  5.887       0   20000   23920      37      37      37
X2                      1    51.9    56.3
X3     10                                            56.3    56.3
BT      6   18900      55      55   20000    56.3    56.3   20023    56.3    51.9
BT  23900    56.3    51.9   23920    56.3    56.3   24090      55      55
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NC    .11     .11     .03      .1      .3
QT      6   83888  180106  245635  408411  245635  245635
X1  5.907       0   20000   23920     100     100     100

QT      6   84000  180100  245600  408300  245600  245600
X1   6.35      32   20000   28695    1900    3800    2339
GR     60   19810     55   19999   41.1   20000   29.6   20700   30.6   21150
GR   34.4   21700   26.6   21950   34.4   22250     37   22420   32.6   23000
GR   29.6   23500   20.6   23720   19.5   23940   20.3   24000   14.6   24083
GR   12.8   24200   21.5   24450   19.1   24500   22.3   24580   21.5   24667
GR   26.6   24975   28.6   26050   35.6   26563   36.4   27030   33.8   27250
GR   34.4   27558   30.6   28000   31.1   28070   29.6   28695     50   28750
GR     55   28900     60   29350

QT      6   79457  170236  229864  388397  229864  229864
X1   6.99      51   20050   28300    3500    3400    3379
GR     65   18650     60   19600     55   19800     50   19950   46.1   20000
GR     45   20030   41.1   20050   34.6   20500   31.6   20900   29.6   21300
GR   30.9   21850   30.6   22120     13   22280   22.2   22400     22   22450
GR   24.1   22475     23   22600   28.3   22800   27.1   22900   29.5   23090
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GR    29.4   23095    31.9   23520    29.6   23650    31.4   24050    29.6   24400
GR    30.3   24880    28.6   24890    29.9   24900    17.5   25080    15.2   25400
GR    30.1   25900    28.6   25920      30   25950    27.8   26100    28.6   26200
GR    31.6   26350    30.1   26500    31.3   26550    28.1   26625    29.9   26825
GR    28.1   26900    28.6   27000    31.6   27200    31.1   27300    32.3   27400
GR    30.1   27900    40.2   28300      50   28500      55   29700      60   30000
GR      65   32700

QT       6   76760  164380  220520  376580  220520  220520
X1    7.37      36   19650   27850    3500    1400    2006
GR      65   18310      60   19650      50   19900    58.6   20000    57.6   20000
GR    37.6   20100    38.3   20140    28.7   20290    31.5   20330    23.5   20510
GR      15   20712    24.9   20790      23   21000    24.6   21120    24.3   21180
GR    25.1   21200    24.6   21290    57.1   21308    57.1   21326    58.6   21326
GR    58.6   21350    58.6   25650    58.6   25700    57.6   25700    56.8   25725
GR      15   26412    28.8   26650      26   26700    25.6   26750    26.6   26770
GR    18.6   26900    57.6   27026    58.6   27026      50   27800      55   27850
GR      60   28000      65   28800

NC     .11     .11     .03      .3      .5
X1   7.379       0   20000   27026      50      50      50
X3      10                                                    58.6    58.6

X1  7.3791      42   20000   27026       1       1       1
X2
X3      10                                                    58.6    58.6
BT      12   18310      65      65   19650      60      60   19900      50      50
BT   20000    58.6    57.6   21326    58.6    57.6   25650    58.6    58.6   25700
BT    58.6    57.6   27026    58.6    57.6   27800      50      50   27850      55
BT      55   28000      60      60   28800      65      65
GR      65   18310      60   19650      50   19900    58.6   20000    57.6   20000
GR    37.6   20100    38.3   20140    28.7   20290    31.5   20330    23.5   20510
GR      15   20712    57.6   20712    57.6   20724      15   20724    24.9   20790
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GR      23   21000    24.6   21120    24.3   21180    25.1   21200    24.6   21290
GR    57.1   21308    57.6   21326    58.6   21326    58.6   25650    58.6   25700
GR    57.6   25700    58.6   25725      15   26412    57.6   26412    57.6   26424
GR      15   26424    28.8   26650      26   26700    25.6   26750    26.6   26770
GR    18.6   26900    57.6   27026    58.6   27026      50   27800      55   27850
GR      60   28000      65   28800

X1  7.3838       0   20000   27026      25      25      25
X2
X3      10                                                    58.6    58.6
BT      12   18310      65      65   19650      60      60   19900      50      50
BT   20000    58.6    57.6   21326    58.6    57.6   25650    58.6    58.6   25700
BT    58.6    57.6   27026    58.6    57.6   27800      50      50   27850      55
BT      55   28000      60      60   28800      65      65

NC     .11     .11     .03      .1      .3
X1  7.3932      36   20000   27026      50      50      50
X3      10                                                    58.6    58.6
GR      65   18310      60   19650      50   19900    58.6   20000    57.6   20000
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GR   37.6   20100   38.3   20140   28.7   20290   31.5   20330   23.5   20510
GR     15   20712   24.9   20790     23   21000   24.6   21120   24.3   21180
GR   25.1   21200   24.6   21290   57.1   21308   57.1   21326   58.6   21326
GR   58.6   21350   58.6   25650   58.6   25700   57.6   25700   58.6   25725
GR     15   26412   28.8   26650     26   26700   25.6   26750   26.6   26770
GR   18.6   26900   57.6   27026   58.6   27026     50   27800     55   27850
GR     60   28000     65   28800

QT      6   76526  163871  219709  375554  219709  219709
X1 7.4026       0   20000   27026      50      50      50

NC    .11     .11     .03      .1      .3
X1   7.44      90  288.17  8626.8     215     215     215
GR     60       0     60  157.55     58  288.17     54  404.14     50  490.42
GR     46   538.7     44   571.4     42  597.77     42  597.78     42  597.79
GR   29.6  683.85   27.6   844.4   27.6  907.68   29.6 1076.54   25.6 1102.52
GR   21.6 1155.82   20.6 1207.78   18.6 1278.23   17.6 1294.06   17.6 1322.42
GR   20.6 1335.35   22.6 1354.87   22.6 1433.02   21.6 1492.91   17.6 1583.87
GR   17.6 1637.79   18.6 1745.25   19.6 1765.13   22.6 1780.23   23.6 1798.41
GR   23.6 1854.48   22.6 1905.39   21.6 2202.14   22.6 2423.73   23.6 2523.95
GR   25.6 2652.91   26.6 2771.96   27.6 2855.68   29.6 2910.96   30.6  2984.7
GR   31.6    3121   31.6 3445.45   30.6 3520.23   30.6 3584.43   31.6 3651.02
GR   32.6 3918.06   33.6 4022.21   34.6  4090.8   34.6 4347.29   35.6 4454.93
GR   35.6 4545.93   34.6 4619.78   33.6 4732.57   32.6 4759.42   32.6 4803.28
GR   30.6  4871.8   30.6 4887.73   29.6 5406.62   28.6 5650.97   28.6 5748.58
GR   30.6    5783   30.6 5923.76   32.6  6041.6   31.6 6106.82   30.6 6143.78
GR   27.6 6188.13   26.6 6316.32   26.6 6499.01   24.6 6521.64   22.6 6630.29
GR   21.6  6638.3   18.6  6691.9   18.6 6740.55   21.6 6926.11   23.6 7094.01
GR   23.6 7191.49   22.6 7318.64   25.6 7437.12   26.6 7521.89   27.6 7666.68
GR   28.6 7863.44   31.6 7945.03   34.6 8061.17   35.6 8125.75   36.6 8139.14
GR     42 8491.74     44 8523.89     50 8580.37     52  8626.8     60  8772.3
1
  28FEB00    09:37:31                                                PAGE   7


NC   0.11    0.11    0.03     0.1     0.3
QT      6   75056  160681  214619  369116  214619  214619
X1   7.61      30   20000   28625    1280     562     880
GR     60   19450     55   19550     50   19720     45   19900     40   19950
GR   41.2   20000   27.3   20292   28.4   20725   26.9   20750   20.9   20790
GR   19.5   20975   27.6   21250   28.1   21625   24.1   21650   34.6   22000
GR   41.6   22200   41.6   22355   36.2   23780   38.6   24025   40.6   24920
GR   39.4   25170   39.6   25270   33.4   25725   28.1   26330   27.8   26917
GR   30.9   27700   26.4   27730   24.1   27920   40.6   28625     60   28650

X1   7.76      90     771 9836.14     850     800     820
GR     62       0     62  489.26     60  692.24     58     771     56  834.79
GR     54  853.86     50  904.39     44 1003.91     42 1016.08   37.6 1084.32
GR   34.6 1111.99   30.6 1137.07   30.6 1153.38   32.6 1179.64   32.6 1207.07
GR   28.6 1307.23   27.6 1341.56   23.6 1385.86   23.6 1432.49   24.6 1476.77
GR   24.6 1951.16   23.6 2064.42   19.6 2142.98   18.6 2169.23   18.6 2267.16
GR   19.6  2310.8   20.6 2379.51   20.6 2415.42   22.6 2486.57   24.6 2522.73
GR   28.6 2702.12   36.6 2738.89   36.6  3063.8   35.6 3134.15   35.6 3511.39
GR   36.6 3902.11   37.6 3938.96   38.6 4169.32   38.6 4408.28   37.6 4593.59
GR   36.6 4704.59   35.6 4771.45   35.6 4823.96   36.6 4877.86   36.6 4962.19
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GR   34.6   5096.4    33.6   5200.6    33.6   5225.77    34.6   5318.5    34.6   5421.72
GR   33.6   5503.25   32.6   5725.49   33.6   5841.58    35.6   5949.58   37.6   6028.99
GR   38.6   6685.89   38.6   6916.53   37.6   6935.31    33.6   6967.93   33.6   7064.54
GR   34.6   7149.29   36.6   7216.18   36.6   7267.72    34.6   7318.26   31.6   7462.61
GR   29.6   7513.65   24.6   7662.68   23.6   7728.3     22.6   7866.81   21.6   8042.58
GR   21.6   8265.65   23.6   8385.69   26.6   8411.89    28.6   8458.17   28.6   8502.6
GR   29.6   8539.72   29.6   8610.67   28.6   8716.35    29.6   8812.57   30.6   8958.68
GR   32.6   9102.53   32.6   9289.83   33.6   9306.53    35.6   9311.9    36.6   9397.53
GR   37.6   9442.2    50     9592.67   60     9836.14    70    12158.31   70    12225.01

X1   8.18   90        0     10131.28   2044   2141       2196
GR   62     0         58     123.67    52     282.94     50     321.61    46     441.7
GR   44     571.84    42     589.79    42     593.39     33.6   633.46    31.6   775.49
GR   29.6   855.4     28.6   916.54    28.6   1018.47    26.6   1059.95   26.6   1186.1
GR   27.6   1217.35   27.6   1403.32   23.6   1469.29    18.6   1520.89   16.6   1574.93
GR   16.6   1636.4    20.6   1679.92   26.6   1732.64    25.6   1781.4    25.6   1838.17
GR   23.6   1899.9    22.6   1983.03   22.6   2029.11    27.6   2383.07   29.6   2442.35
GR   31.6   2558.94   33.6   2641.9    34.6   2767.24    34.6   2895.38   33.6   3086.86
GR   32.6   3149.65   32.6   3348.49   33.6   3418.1     35.6   3506.3    35.6   3958.66
GR   35.6   4123.51   34.6   4223.84   34.6   4323.83    35.6   4468.25   36.6   4520.54
GR   37.6   4533.46   39.6   4687      39.6   4806.62    38.6   5470.77   36.6   5861.13
GR   36.6   6288.59   36.6   6508.12   35.6   6711.54    34.6   6830.72   34.6   6905.04
GR   33.6   7117.63   33.6   7452.66   30.6   7500.66    25.6   7546.39   23.6   7582.5
GR   23.6   7697.6    25.6   7890.71   25.6   7945.46    26.6   8014.74   27.6   8134.1
GR   27.6   8468.81   26.6   8519      26.6   8658.6     27.6   8769.8    29.6   8857.3
GR   32.6   8886.8    34.6   8997.2    32.6   9008.48    31.6   9035.85   28.6   9071.18
GR   25.6   9193.51   22.6   9274.24   22.6   9367.4     28.6   9395.16   30.6   9438.96
GR   28.6   9505.21   29.6   9566.81   32.6   9611.97    34.6   9726.04   35.6   9755.25
GR   36.6   9918.22   50    10131.28   55    10634.33    60    11105.23   50    11235.27
1
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X1   8.67   90        4913   16141     9000   3177       2391
GR   60.0   1.00      44     500       42     1200       38.6   3000      42     3400
GR   42     3700      35.6   4000      34.6   4156       34.6   4243      35.6   4299
GR   36.6   4355      37.6   4544      42     4791       44     4913      42     5213
GR   37.6   5344.31   36.6   5408.33   35.6   5469       32.6   6008      31.6   6099
GR   30.6   6107.72   29.6   6130.49   28.6   6139.98    28.6   6320.91   29.6   6337.56
GR   29.6   6345.87   30.6   6355.86   30.6   6361.9     29.6   6367.24   28.6   6372.57
GR   27.6   6379.42   26.6   6384.35   25.6   6389.27    24.6   6394.2    24.6   6448.01
GR   25.6   6477.2    25.6   6487.81   24.6   6531.11    23.6   6574.41   22.6   6617.7
GR   21.6   6661      20.6   6693.14   20.6   6693.37    21.6   6700.26   22.6   6707.16
GR   23.6   6714.37   24.6   6722.29   25.6   6730.22    25.6   6736.32   27.6   6752.54
GR   28.6   6773.68   28.6   6828.95   29.6   6895.05    29.6   6935.2    28.6   7010.54
GR   28.6   7115.84   27.6   7173.41   26.6   7186.62    25.6   7202.96   25.6   7286.02
GR   26.6   7317.91   27.6   7349.8    28.6   7382.76    29.6   7416.84   30.6   7426.5
GR   31.6   7445.67   32.6   7490.79   33.6   7506.12    33.6   7673.9    34.6   7700.56
GR   35.6   7717.98   36.6   7738.7    37.6   7761.94    42     7849.08   42     8423
GR   44     8476      46     8664      48     8805       48     8992      46     9040
GR   44     9089      42     9534      36.6   11234      30.6   11284     26.6   13254
GR   32.6   13794     34.6   14434     42     14977      50     16141     50     16721

X1   9.25   90        1482.97 13375    3200   3200       3062
GR   58     0         54     84.32     46     290.31     42     343.23    42     420.17
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GR     44    476.39      44    677.8      42    742.06      39   1028.07      40   1064.74
GR     42   1297.02      42   1482.97    36.6   1531.82    36.6   1733.64      42   1778.92
GR     42   1835.14    36.6    1853.7    36.6   2042.83    38.6   2058.93      42   2165.87
GR   37.6   2653.73    36.6   2884.43    34.6   2973.32    32.6    3125.1    30.6   3227.31
GR   30.6   3440.43    32.6   3539.47    32.6   3694.91    33.6   3796.25    33.6   3879.19
GR   32.6   3883.23    30.6   4014.25    31.6   4053.84    23.6   4077.66    21.6    4103.3
GR   21.6   4142.49    23.6   4210.25    29.6   4428.22    30.6   4512.25    29.6   4548.08
GR   29.6   4683.39    30.6   4822.04    31.6   4859.24    31.6   4945.96    32.6   4969.93
GR   32.6   5164.13    28.6   5259.78    27.6   5489.81    30.6   5586.26    29.6    5674.1
GR   29.6   5840.08    28.6   5933.49    29.6   6117.52    30.6   6218.87    29.6   6291.43
GR   35.6   6622.31      42    7000.5      42   7186.01      46   7281.58      50   7365.02
GR     50   7412.73      48   7530.52      48   8258.76      46   8409.42      46   8595.54
GR     44   9144.24      42   9278.05    40.6      9380    40.6      9800      42   10300.6
GR     42     10877    37.6   10950.0    34.6     11000    32.4     11300    32.4     12100
GR   34.6     12200    34.6     12500    32.6     12700    26.0     13025      42     13375
GR     50     13650      48     14445      50     14503      52     14900      50     14921
GR     50  14976.91      54  15030.06      54  15451.95      48  15509.12      46  15542.67

QT      4     66800  143300    174300    333600
NC   0.12      0.12    0.03        .1        .3
X1  10.12        89 2366.85   6330.06      7700      1000      4594
X3     10            1232.04      54.7
GR   55.6         0    55.2        90    54.9    161.12    54.8    318.29    54.5       400
GR   54.5    505.44    50.4     590.1    50.7    644.14    49.6    763.76    49.8    821.19
GR   47.9    853.74    50.9    895.11      51    927.61      49    951.75    47.9    1054.3
GR   50.3   1085.94    53.3   1160.37    54.7   1232.04    50.1   1287.74      49   1373.79
GR   48.6   1482.72    49.1   1622.28    46.2   1678.02    46.3   1781.82    48.3   1866.53
GR   49.2    1949.4    48.8   2075.16    47.9   2163.11    43.8   2220.71    42.6   2269.24
GR   41.6   2366.85    40.6   2391.75      39   2452.47    37.7   2548.87    37.9   2765.45
GR   37.6   2952.69      38   3157.81    38.6   3299.81    38.3   3413.04    38.1   3746.92
GR   38.1   3993.99    38.9   4185.79    38.8   4286.36    40.5   4499.72    39.9    4728.9
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GR   38.6   4754.82    40.1    4907.5 40.4627  4943.023    38.9   4984.51    37.2   5041.95
GR   37.2   5119.68    36.4   5177.29    37.3   5277.11    36.8   5355.15    38.1   5518.64
GR   37.9   5567.34    36.5   5613.59    33.5    5655.2    32.5    5769.5    30.3   5803.47
GR   32.8   5902.24    32.8    5982.5    34.2   6030.84    36.5   6067.52    37.5    6124.9
GR   37.8   6207.91    40.5   6273.13    43.8   6330.06    41.5   6462.94    41.4   6636.96
GR   44.8   6697.83    45.5   6728.93    44.5   6819.63      45   6861.77    44.5   6960.04
GR   44.8   7029.56   45.05      7060    44.7   7115.34    45.4   7181.81    45.6      7240
GR   45.6      7360    45.5    7468.6    43.4   7632.04    44.6   7864.56    47.6   7908.88
GR   47.7   7982.52    48.7   8044.72    48.8      8220    55.8      8990
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SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

*PROF 1

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IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=    .100 CEHV=    .300
*SECNO  .010
   .010   49.50    46.30     .00    46.30    46.30     .00     .00     .00    40.60
 82400.0     3.5  82393.6     2.8    172.8  237141.3   138.8      .0      .0    40.60
    .00     .02     .35     .02    .120    .030    .120    .000   -3.20  19939.36
 .000001      0.      0.      0.       0       0       0     .00  9609.36  29548.72


*SECNO  .020
   .020   49.50    46.30     .00     .00    46.30     .00     .00     .00    40.60
 82402.0     3.5  82395.6     2.8    172.8  237141.6   138.8   272.6    11.0    40.60
    .04     .02     .35     .02    .120    .030    .120    .000   -3.20  19939.36
 .000001     50.     50.     50.       0       0       0     .00  9609.36  29548.72


CCHV=    .100 CEHV=    .300
*SECNO  .470
   .470   49.50    46.30     .00     .00    46.30     .00     .00     .00    40.60
 82516.0     3.5  82509.6     2.8    172.9  237153.1   138.9  13502.1   544.5    40.60
   1.98     .02     .35     .02    .120    .030    .120    .000   -3.20  19939.35
 .000001   2000.   2428.   1000.       0       0       0     .00  9609.38  29548.73


CCHV=    .100 CEHV=    .300
*SECNO 1.110
  1.110   42.70    46.30     .00     .00    46.31     .00     .00     .00    50.90
 82678.0      .0  82594.4    83.6      .0  202133.1  2321.2  30631.1  1239.7    40.80
   4.28     .00     .41     .04    .000    .030    .110    .000    3.60  20037.37
 .000001   3200.   3379.   3000.       0       0       0     .00  8382.97  28420.34


CCHV=    .100 CEHV=    .300
*SECNO 1.990
  1.990   41.91    46.31     .00     .00    46.31     .00     .01     .00    40.60
 82900.0     8.1  82889.2     2.8    259.9  174833.8    90.1  50916.0  2085.8    40.60
   7.00     .03     .47     .03    .110    .030    .110    .000    4.40  19908.92
 .000001   3850.   4646.   6150.       0       0       0     .00  7320.65  27229.57


1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID ENDST


*SECNO 2.400
  2.400   41.71    46.31     .00     .00    46.31     .00     .00     .00    40.60
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  83003.0     5.7  82992.3     5.0    173.5  168216.5    154.0  59457.1   2447.1    40.60
    8.22      .03     .49      .03    .110     .030     .110     .000     4.60  19939.24
  .000001    400.    2165.    5000.      0        0        0      .00  7228.69  27167.94


CCHV=   .100 CEHV=    .300
*SECNO 2.650

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .53

   2.650   40.81    46.31     .00      .00    46.32     .01      .00      .00    40.60
  83066.0    10.8  83050.5     4.6    173.6  109123.6     78.6  63665.2   2653.0    41.00
    8.70      .06     .76      .06    .110     .030     .110     .000     5.50  19939.23
  .000005    400.    1320.    1650.      0        0        0      .00  6422.37  26361.60


CCHV=   .100 CEHV=    .300
*SECNO 3.950

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61

   3.950   40.74    46.34     .00      .00    46.34     .01      .02      .00    40.60
  83394.0     3.4  83387.0     3.6     87.5  140137.5     99.5  83336.4   3620.6    41.10
   11.91      .04     .60      .04    .110     .030     .110     .000     5.60  19969.50
  .000002   5700.    6864.    7500.      0        0        0      .00  5867.54  25837.04


*SECNO 4.390
   4.390   40.74    46.34     .00      .00    46.35     .01      .01      .00    40.60
  83505.0     3.7  83492.4     8.8     87.8  144640.3    205.1  90943.5   3972.6    40.60
   13.02      .04     .58      .04    .110     .030     .110     .000     5.60  19969.45
  .000002   1000.    2323.    3350.      0        0        0      .00  7322.96  27292.41


*SECNO 5.320
   5.320   36.96    46.36     .00      .00    46.36     .01      .02      .00    40.60
  83740.0    20.0  83718.3     1.7    352.2  107889.6     34.6 105222.8   4689.6    41.60
   14.78      .06     .78      .05    .110     .030     .110     .000     9.40  19877.57
  .000004   6850.    4910.    4500.      0        0        0      .00  5345.98  25223.55
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SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV      HL      OLOSS   L-BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB    VOL     TWA     R-BANK ELEV
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR     WTN     ELMIN   SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT   CORAR   TOPWID  ENDST


CCHV=   .100 CEHV=    .300
*SECNO 5.780
   5.780   35.07    46.37     .00      .00    46.38     .01      .01      .00    40.80
  83856.0    15.5  83838.4     2.1    218.6   85542.6     32.0 110664.9   4969.8    41.10
   15.47      .07     .98      .06    .110     .030     .110     .000    11.30  19921.54
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 .000007   7000.   2429.   4000.     0     0     0    .00  4308.60  24230.13


*SECNO 5.860
  5.860   35.07   46.37    .00    .00   46.38    .02    .00    .00   56.30
 83876.0     .0  83876.0     .0     .0  78383.7     .0 111470.4   5012.4   56.30
  15.58    .00    1.07    .00   .000    .030   .000   .000   11.30  20056.42
 .000008   4500.    422.    500.     0     0     0    .00  3720.94  23777.36


CCHV=   .300 CEHV=   .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.30 ELREA=     56.30

  5.880   35.07   46.37    .00    .00   46.39    .02    .00    .00   56.30
 83881.0     .0  83881.0     .0     .0  78352.5     .0 111650.3   5021.0   56.30
  15.61    .00    1.07    .00   .000    .030   .000   .000   11.30  20056.49
 .000008    100.    100.    100.     0     0     0    .00  3720.75  23777.24



SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC     BWP    BAREA    SS     ELCHU    ELCHD
    1.05    1.50    2.50     .00   716.60   323.41 100542.00   31.77    1.50    1.50

*SECNO 5.887
CLASS A LOW FLOW

3420 BRIDGE W.S.=    46.37 BRIDGE VELOCITY=     1.03    CALCULATED CHANNEL AREA=
81593.

 EGPRS    EGLWC     H3     QWEIR    QLOW    BAREA  TRAPEZOID    ELLC    ELTRD
WEIRLN
                                           AREA
    .00    46.39     .00      0.   83881.  100542.  100518.    51.90    56.30     0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.30 ELREA=     56.30

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 28FEB00    09:37:31                                          PAGE  13


  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


  5.887   35.07   46.37    .00    .00   46.39    .02    .00    .00   56.30
 83883.0     .0  83883.0     .0     .0  78362.7     .0 111716.8   5024.1   56.30
  15.62    .00    1.07    .00   .000    .030   .000   .000   11.30  20056.47
 .000008     37.     37.     37.     0     0     0    .00  3720.81  23777.28
```

```
CCHV=    .100 CEHV=    .300
*SECNO 5.907
   5.907    35.07    46.37      .00      .00    46.39      .02      .00      .00    56.30
  83888.0       .0  83888.0       .0       .0  78365.7       .0 111896.7   5032.7    56.30
   15.64      .00     1.07      .00     .000     .030     .000     .000    11.30  20056.46
  .000008    100.     100.     100.        0        0        0      .00  3720.83  23777.29

*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.52

   6.350    33.60    46.40      .00      .00    46.40      .01      .01      .00    41.10
  84000.0       .0  83962.1     37.9      1.0 141524.4    380.1 117816.9   5368.0    29.60
   16.74      .01      .59      .10     .110     .030     .110     .000    12.80  19999.62
  .000003    1900.    2339.    3800.        0        0        0      .00  8740.65  28740.27

*SECNO 6.990
   6.990    33.41    46.41      .00      .00    46.41      .00      .01      .00    41.10
  79457.0      4.0  79433.8     19.2     93.9 141822.6    394.2 128840.8   6034.1    40.20
   18.41      .04      .56      .05     .110     .030     .110     .000    13.00  19995.95
  .000003    3500.    3379.    3400.        0        0        0      .00  8430.90  28426.85

*SECNO 7.370

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .35

   7.370    31.41    46.41      .00      .00    46.45      .04      .02      .01    60.00
  76760.0       .0  76760.0       .0       .0  46012.6       .0 133175.9   6282.2    55.00
   18.75      .00     1.67      .00     .000     .030     .000     .000    15.00  20055.93
  .000022    3500.    2006.    1400.        0        0        0      .00  2340.33  26989.86

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  28FEB00    09:37:31                                                    PAGE  14

  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA      R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID   ENDST

CCHV=    .300 CEHV=    .500
*SECNO 7.379

3265 DIVIDED FLOW
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.379   31.41    46.41     .00     .00    46.45     .04     .00     .00    60.00
 76760.0      .0  76760.0      .0      .0  45991.6      .0 133228.7  6284.9   55.00
   18.76     .00     1.67     .00    .000     .030    .000    .000   15.00 20055.97
 .000022     50.      50.     50.       0        0       0     .00 2340.10 26989.83

*SECNO 7.379

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=    50.00 MAX ELLC=    58.60


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.379   31.41    46.41     .00     .00    46.45     .05     .00     .00    58.60
 76760.0      .0  76760.0      .0      .0  45046.6      .0 133229.8  6284.9   58.60
   18.76     .00     1.70     .00    .000     .030    .000    .000   15.00 20055.97
 .000024      1.       1.      1.       0        0       0     .00 2294.81 26989.84

*SECNO 7.384

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=    50.00 MAX ELLC=    58.60


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.384   31.41    46.41     .00     .00    46.45     .05     .00     .00    58.60
 76760.0      .0  76760.0      .0      .0  45045.7      .0 133255.6  6286.2   58.60
   18.76     .00     1.70     .00    .000     .030    .000    .000   15.00 20055.97
 .000024     25.      25.     25.       0        0       0     .00 2294.80 26989.83
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID ENDST


CCHV=    .100 CEHV=    .300
*SECNO 7.393

3265 DIVIDED FLOW
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.393   31.41   46.41    .00    .00   46.45    .04    .00    .00   58.60
 76760.0      .0 76760.0     .0     .0 45660.2     .0 133307.7  6288.9   58.60
   18.77     .00    1.68    .00   .000    .030   .000    .000   15.00 20055.96
 .000022     50.     50.    50.      0       0      0     .00 2318.83 26989.84


*SECNO 7.403

3265 DIVIDED FLOW

   7.403   31.41   46.41    .00    .00   46.45    .04    .00    .00   58.60
 76526.0      .0 76526.0     .0     .0 45665.8     .0 133360.1  6291.5   58.60
   18.78     .00    1.68    .00   .000    .030   .000    .000   15.00 20055.95
 .000022     50.     50.    50.      0       0      0     .00 2318.89 26989.85


CCHV=    .100 CEHV=    .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.98

   7.440   28.85   46.45    .00    .00   46.46    .00    .00    .00   58.00
 76526.0      .0 76526.0     .0     .0 143881.3     .0 133827.9  6317.0   52.00
   18.89     .00     .53    .00   .000    .030   .000    .000   17.60  533.22
 .000002    215.    215.   215.      2       0      0     .00 8013.77 8546.99


CCHV=    .100 CEHV=    .300
*SECNO 7.610

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

   7.610   26.96   46.46    .00    .00   46.46    .01    .00    .00   41.20
 75056.0    47.3 75007.5    1.2  530.1 114351.3   22.2 136444.2  6487.4   40.60
   19.26     .09     .66    .06   .110    .030   .110    .000   19.50 19847.27
 .000006   1280.    880.   562.      0       0      0     .00 8785.29 28632.56


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS  L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN  SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID ENDST


*SECNO 7.760
   7.760   27.86   46.46    .00    .00   46.47    .01    .00    .00   58.00
 75056.0      .0 75056.0     .0     .0 122473.3     .0 138678.6  6651.0   60.00
   19.63     .00     .61    .00   .000    .030   .000    .000   18.60  963.12
 .000004    850.    820.   800.      0       0      0     .00 8586.58 9549.70
```

```
*SECNO 8.180
   8.180   29.87   46.47    .00    .00   46.48    .00    .01    .00   62.00
 75056.0      .0 75056.0     .0     .0 136949.2    .0 145217.8  7110.6   50.00
   20.75     .00     .55    .00   .000    .030   .000   .000   16.60  427.55
 .000004   2044.   2196.  2141.      0       0      0    .00 9647.63 10075.17
```

```
*SECNO 8.670

3265 DIVIDED FLOW

   8.670   25.88   46.48    .00    .00   46.49    .01    .01    .00   44.00
 75056.0  3273.4 71782.6     .0 27695.8 117810.5    .0 155070.8  8124.4   50.00
   21.95     .12     .61    .00   .110    .030   .000   .000   20.60  422.34
 .000006   9000.   2391.  3177.      0       0      0    .00 14878.27 15630.30
```

```
*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION    9.25 EXTENDED     .50 FEET

   9.250   24.90   46.50    .00    .00   46.51    .01    .02    .00   42.00
 75056.0   555.8 74479.3   20.8  5490.5 118244.7  349.7 164599.2  9084.7   42.00
   23.31     .10     .63    .06   .110    .030   .110   .000   21.60  277.51
 .000007   3200.   3062.  3200.      0       0      0    .00 12180.39 15542.67
```

```
CCHV=    .100 CEHV=    .300
*SECNO 10.120

3265 DIVIDED FLOW
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
```

```
3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .26
```

```
3470 ENCROACHMENT STATIONS=     1232.0    8990.0  TYPE=     1  TARGET=    -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
  10.120   16.36   46.66    .00    .00   46.71    .05    .19    .01   41.60
 66800.0   186.4 65737.2  876.4  718.2 35134.6 3848.6 173284.1 10018.0   43.80
   24.00     .26    1.87    .23   .120    .030   .120   .000   30.30 1669.15
 .000078   7700.   4594.  1000.      2       0      0    .00 5842.47  7895.01
```

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1
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T1    LAKE HOUSTON........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2    G103-00-00......EFFECTIVE MODEL...................1973 DATUM ADJUSTMENT
T3    FILENAME:G1030FH2.IH2...........50 YR FREQUENCY........JJS.....12/10/96

J1 ICHECK  INQ    NINV   IDIR   STRT   METRIC  HVINS   Q    WSEL   FQ

         3                                48.7

J2 NPROF   IPLOT  PRFVS  XSECV  XSECH  FN    ALLDC  IBW   CHNIM   ITRACE

   2          -1

1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG    HV    HL    OLOSS  L-BANK ELEV
  Q     QLOB    QCH    QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME   VLOB   VCH    VROB    XNL    XNCH    XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH   XLOBR   ITRIAL  IDC   ICONT  CORAR  TOPWID  ENDST

*PROF 2

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=    .100 CEHV=    .300
*SECNO  .010
   .010   51.90    48.70     .00   48.70   48.71     .01     .00     .00   40.60
 180200.0    16.9 180169.6    13.5   349.0 259941.3   280.4      .0      .0   40.60
    .00     .05     .69     .05    .120    .030    .120    .000   -3.20 19913.83
  .000002      0.      0.      0.      0      0      0     .00  9655.40 29569.23


*SECNO  .020
   .020   51.90    48.70     .00     .00   48.71     .01     .00     .00   40.60
 180199.0    16.9 180168.6    13.5   349.0 259942.4   280.4   299.1    11.1    40.60
    .02     .05     .69     .05    .120    .030    .120    .000   -3.20 19913.83
  .000002     50.     50.     50.      0      0      0     .00  9655.40 29569.23


CCHV=    .100 CEHV=    .300
*SECNO  .470
   .470   51.91    48.71     .00     .00   48.71     .01     .01     .00   40.60
 180193.0    16.9 180162.5    13.6   349.4 259983.2   280.7 14811.7   546.2    40.60
    .99     .05     .69     .05    .120    .030    .120    .000   -3.20 19913.78
  .000002   2000.   2428.   1000.      0      0      0     .00  9655.48 29569.27
```

```
CCHV=    .100 CEHV=    .300
*SECNO 1.110
   1.110    45.11    48.71      .00      .00    48.72      .01      .01      .00    50.90
 180183.0       .0  179867.2    315.8       .0  221102.8    3637.6   33618.6   1245.6     40.80
   2.15      .00      .81      .09     .000     .030     .110     .000     3.60  20017.78
 .000003    3200.    3379.    3000.       0        0        0      .00  8454.50  28472.27


CCHV=    .100 CEHV=    .300
*SECNO 1.990
   1.990    44.33    48.73      .00      .00    48.74      .01      .02      .00    40.60
 180169.0     38.3  180117.5     13.2    527.0  192246.8     182.7   55955.0   2099.1     40.60
   3.53      .07      .94      .07     .110     .030     .110     .000     4.40  19870.32
 .000004    3850.    4646.    6150.       0        0        0      .00  7372.64  27242.96
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH     AROB     VOL     TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL      XNCH    XNR      WTN     ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR   TOPWID   ENDST


*SECNO 2.400
   2.400    44.14    48.74      .00      .00    48.75      .01      .01      .00    40.60
 180162.0     27.0  180111.1     23.9    352.3  185484.1     312.8   65374.4   2462.8     40.60
   4.15      .08      .97      .08     .110     .030     .110     .000     4.60  19913.42
 .000005     400.    2165.    5000.       0        0        0      .00  7277.44  27190.86


CCHV=    .100 CEHV=    .300
*SECNO 2.650

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .56

   2.650    43.24    48.74      .00      .00    48.77      .03      .01      .01    40.60
 180158.0     48.6  180087.4     22.1    352.7  124516.1     167.0   70083.7   2669.5     41.00
   4.40      .14     1.45      .13     .110     .030     .110     .000     5.50  19913.37
 .000016     400.    1320.    1650.       0        0        0      .00  6461.78  26375.14


CCHV=    .100 CEHV=    .300
*SECNO 3.950

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO = 1.52

   3.950    43.22    48.82      .00      .00    48.84      .02      .07      .00    40.60
 180138.0     16.2  180103.0     18.8    179.3  154492.6     216.0   92134.0   3642.4     41.10
   6.04      .09     1.17      .09     .110     .030     .110     .000     5.60  19956.33
 .000007    5700.    6864.    7500.       0        0        0      .00  5898.69  25855.02
```

```
*SECNO 4.390
   4.390   43.24   48.84     .00     .00   48.86     .02     .02     .00   40.60
 180131.0    17.4 180072.6    41.0   180.8 162693.5   422.5 100620.2  3996.7   40.60
    6.62     .10    1.11     .10    .110    .030    .110    .000    5.60 19956.15
 .000008   1000.   2323.   3350.       0       0       0     .00 7367.34 27323.48


*SECNO 5.320
   5.320   39.48   48.88     .00     .00   48.91     .03     .05     .00   40.60
 180116.0    93.6 180013.2     9.2   729.1 121038.7    81.0 116708.7  4720.9   41.60
    7.54     .13    1.49     .11    .110    .030    .110    .000    9.40 19823.86
 .000014   6850.   4910.   4500.       0       0       0     .00 5407.41 25231.27
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1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN  SSTA
  SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID ENDST


CCHV=   .100 CEHV=   .300
*SECNO 5.780
   5.780   37.61   48.91     .00     .00   48.96     .05     .04     .01   40.80
 180109.0    74.8 180023.8    10.5   464.2 96290.5    70.4 122870.9  5009.0   41.10
    7.90     .16    1.87     .15    .110    .030    .110    .000   11.30 19885.65
 .000022   7000.   2429.   4000.       1       0       0     .00 4350.35 24236.00


*SECNO 5.860
   5.860   37.61   48.91     .00     .00   48.98     .07     .01     .00   56.30
 180108.0      .0 180108.0      .0      .0 87891.3      .0 123787.4  5053.7   56.30
    7.96     .00    2.05     .00    .000    .030    .000    .000   11.30 20037.46
 .000026   4500.    422.    500.       2       0       0     .00 3776.36 23813.81


CCHV=   .300 CEHV=   .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=    56.30 ELREA=    56.30

   5.880   37.61   48.91     .00     .00   48.98     .07     .00     .00   56.30
 180107.0      .0 180107.0      .0      .0 87900.3      .0 123989.2  5062.4   56.30
    7.97     .00    2.05     .00    .000    .030    .000    .000   11.30 20037.45
 .000026    100.    100.    100.       0       0       0     .00 3776.40 23813.85



SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN   BWC     BWP    BAREA    SS     ELCHU   ELCHD
   1.05    1.50    2.50     .00  716.60  323.41 100542.00   31.77    1.50    1.50
```

```
*SECNO 5.887
CLASS A LOW FLOW

3420 BRIDGE W.S.=     48.91 BRIDGE VELOCITY=     2.00    CALCULATED CHANNEL AREA=
90050.

 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA  TRAPEZOID    ELLC    ELTRD
WEIRLN
                                                     AREA
    .00    48.99     .01       0.  180107.  100542.  100518.     51.90    56.30      0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.30 ELREA=      56.30

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV      HL      OLOSS   L-BANK ELEV
   Q       QLOB     QCH      QROB     ALOB      ACH      AROB     VOL      TWA     R-BANK ELEV
   TIME     VLOB     VCH      VROB      XNL      XNCH      XNR      WTN      ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR   TOPWID   ENDST


    5.887    37.62    48.92      .00      .00    48.99      .07      .01      .00    56.30
  180107.0        .0  180107.0       .0        .0  87937.6        .0  124063.9   5065.6    56.30
     7.97      .00     2.05      .00     .000     .030     .000     .000    11.30  20037.40
   .000026      37.       37.       37.        0        0        0      .00  3776.59  23813.99


CCHV=    .100 CEHV=     .300
*SECNO 5.907
    5.907    37.63    48.93      .00      .00    48.99      .07      .00      .00    56.30
  180106.0        .0  180106.0       .0        .0  87947.4        .0  124265.8   5074.2    56.30
     7.99      .00     2.05      .00     .000     .030     .000     .000    11.30  20037.39
   .000026     100.      100.      100.        0        0        0      .00  3776.64  23814.03


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.63

    6.350    36.21    49.01      .00      .00    49.03      .02      .03      .00    41.10
  180100.0        .0  180006.7     93.2      2.2  164226.7    507.5  131058.3   5411.4    29.60
     8.58      .02     1.10      .18     .110     .030     .110     .000    12.80  19999.43
   .000010    1900.     2339.     3800.        1        0        0      .00  8747.88  28747.31


*SECNO 6.990
    6.990    36.04    49.04      .00      .00    49.06      .02      .03      .00    41.10
  170236.0      27.3  170125.5     83.3    280.2  163499.7    798.0  143831.7   6081.2    40.20
     9.48      .10     1.04      .10     .110     .030     .110     .000    13.00  19962.27
   .000008    3500.     3379.     3400.        2        0        0      .00  8518.21  28480.47
```

*SECNO 7.370

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .34

```
   7.370    34.02    49.02     .00      .00    49.18      .15      .08      .04    60.00
 164380.0      .0 164380.0      .0       .0  52203.8       .0 148822.5   6333.0    55.00
    9.66     .00     3.15     .00     .000     .030     .000     .000    15.00 20042.88
 .000068    3500.    2006.    1400.      2        0        0      .00  2406.12 26998.29
```



```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID ENDST
```

CCHV= .300 CEHV= .500
*SECNO 7.379

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

```
   7.379    34.03    49.03     .00      .00    49.18      .15      .00      .00    60.00
 164380.0      .0 164380.0      .0       .0  52208.3       .0 148882.4   6335.8    55.00
    9.66     .00     3.15     .00     .000     .030     .000     .000    15.00 20042.87
 .000068      50.      50.      50.      0        0        0      .00  2406.17 26998.30
```

*SECNO 7.379

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 12 MIN ELTRD= 50.00 MAX ELLC= 58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

```
   7.379    34.02    49.02     .00      .00    49.18      .16      .00      .00    58.60
 164380.0      .0 164380.0      .0       .0  51144.9       .0 148883.6   6335.8    58.60
    9.66     .00     3.21     .00     .000     .030     .000     .000    15.00 20042.87
 .000076       1.       1.       1.      0        0        0      .00  2359.13 26998.30
```

*SECNO 7.384

3265 DIVIDED FLOW

```
3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=    50.00 MAX ELLC=    58.60


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       58.60 ELREA=       58.60

   7.384    34.03    49.03     .00     .00    49.19     .16     .00     .00    58.60
 164380.0       .0  164380.0       .0       .0  51141.5       .0  148913.0   6337.2    58.60
    9.67      .00     3.21     .00    .000     .030    .000    .000    15.00  20042.87
  .000076      25.      25.      25.       0        0       0     .00  2359.09  26998.30


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   SECNO   DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
   Q       QLOB     QCH      QROB     ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB     VCH      VROB     XNL      XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=     .300
*SECNO 7.393

3265 DIVIDED FLOW


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       58.60 ELREA=       58.60

   7.393    34.03    49.03     .00     .00    49.19     .16     .00     .00    58.60
 164380.0       .0  164380.0       .0       .0  51825.2       .0  148972.0   6339.9    58.60
    9.67      .00     3.17     .00    .000     .030    .000    .000    15.00  20042.85
  .000068      50.      50.      50.       0        0       0     .00  2383.18  26998.31


*SECNO 7.403

3265 DIVIDED FLOW

   7.403    34.04    49.04     .00     .00    49.19     .16     .00     .00    58.60
 163871.0       .0  163871.0       .0       .0  51844.3       .0  149031.5   6342.6    58.60
    9.68      .00     3.16     .00    .000     .030    .000    .000    15.00  20042.81
  .000068      50.      50.      50.       0        0       0     .00  2383.38  26998.34


CCHV=    .100 CEHV=     .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.10

   7.440    31.60    49.20     .00     .00    49.21     .02     .00     .01    58.00
 163871.0       .0  163871.0       .0       .0  165930.3       .0  149569.0   6368.5    52.00
    9.74      .00      .99     .00    .000     .030    .000    .000    17.60   500.14
  .000007     215.     215.     215.       2        0       0     .00  8072.66  8572.79
```

```
CCHV=    .100 CEHV=    .300
*SECNO 7.610
   7.610    29.70    49.20      .00      .00    49.22      .02      .01      .00    41.20
 160681.0    175.6  160500.0      5.4   1082.6  137943.6     47.7  152654.6   6540.9     40.60
    9.95      .16     1.16      .11     .110     .030     .110     .000    19.50  19748.79
  .000014    1280.     880.     562.       2        0        0      .00  8887.29  28636.08
```



```
  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB      ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL       XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 7.760
   7.760    30.61    49.21      .00      .00    49.23      .02      .01      .00    58.00
 160681.0       .0  160681.0       .0       .0  146191.8       .0  155340.0   6706.2    60.00
   10.15      .00     1.10      .00     .000     .030     .000     .000    18.60   917.52
  .000011     850.     820.     800.       0        0        0      .00  8665.55   9583.07


*SECNO 8.180
   8.180    32.64    49.24      .00      .00    49.25      .01      .02      .00    62.00
 160681.0       .0  160681.0       .0       .0  163830.7       .0  163154.6   7171.0    50.00
   10.78      .00      .98      .00     .000     .030     .000     .000    16.60   344.44
  .000009    2044.    2196.    2141.       0        0        0      .00  9774.74  10119.19


*SECNO 8.670
   8.670    28.67    49.27      .00      .00    49.28      .02      .03      .00    44.00
 160681.0   8924.3  151756.7       .0  40291.9  147756.3       .0  175868.5   8217.4    50.00
   11.50      .22     1.03      .00     .110     .030     .000     .000    20.60   335.70
  .000014    9000.    2391.    3177.       2        0        0      .00  15698.83  16034.53


*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION    9.25 EXTENDED    3.30 FEET

   9.250    27.71    49.31      .00      .00    49.33      .02      .04      .00    42.00
 160681.0   1824.2  158720.0    136.7   8975.8  149909.8   1365.1  188190.3   9269.0    42.00
   12.32      .20     1.06      .10     .110     .030     .110     .000    21.60   205.23
  .000015    3200.    3062.    3200.       0        0        0      .00  13919.86  15542.67


CCHV=    .100 CEHV=    .300
*SECNO 10.120
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .30

3470 ENCROACHMENT STATIONS= 1232.0 8990.0 TYPE= 1 TARGET= -1232.040
ELENCL= 54.70 ELENCR= 100000.00

10.120	19.27	49.57	.00	.00	49.70	.13	.34	.03	41.60	
143300.0	863.3	138552.9	3883.8	2342.9	46671.5	8841.8	199674.0	10336.7	43.80	
12.76	.37	2.97	.44	.120	.030	.120	.000	30.30	1329.02	
.000134	7700.	4594.	1000.	2	0	0	.00	6975.93	8304.95	

T1 LAKE HOUSTON.........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2 G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
T3 FILENAME:G1030FH2.IH2...........100 YR FREQUENCY........JJS.....12/10/96

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		4						49.7		

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	3	-1								

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 3

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.
0

CCHV= .100 CEHV= .300
*SECNO .010

.010	52.90	49.70	.00	49.70	49.71	.01	.00	.00	40.60
246100.0	29.6	246046.6	23.8	440.5	269441.3	353.9	.0	.0	40.60
.00	.07	.91	.07	.120	.030	.120	.000	-3.20	19903.19
.000004	0.	0.	0.	0	0	0	.00	9674.59	29577.78

*SECNO .020

.020	52.90	49.70	.00	.00	49.71	.01	.00	.00	40.60
246099.0	29.6	246045.6	23.8	440.5	269443.2	353.9	310.2	11.1	40.60
.02	.07	.91	.07	.120	.030	.120	.000	-3.20	19903.19

```
  .000004     50.     50.     50.       0       0       0     .00   9674.59  29577.78


CCHV=    .100 CEHV=    .300
*SECNO  .470
    .470    52.91    49.71      .00      .00    49.72      .01      .01      .00    40.60
  246064.0     29.7  246010.5     23.8    441.2  269510.8    354.5  15359.0    546.9     40.60
     .75      .07      .91      .07     .120     .030     .120     .000    -3.20  19903.11
  .000004    2000.    2428.    1000.       0       0       0     .00   9674.73  29577.84


CCHV=    .100 CEHV=    .300
*SECNO 1.110
   1.110    46.12    49.72      .00      .00    49.74      .02      .02      .00    50.90
  246013.0       .0  245501.7    511.3       .0  229058.8   4225.9  34870.2   1248.1     40.80
    1.63      .00     1.07      .12     .000     .030     .110     .000     3.60  20009.57
  .000005    3200.    3379.    3000.       0       0       0     .00   8484.44  28494.02


CCHV=    .100 CEHV=    .300
*SECNO 1.990
   1.990    45.35    49.75      .00      .00    49.77      .02      .03      .00    40.60
  245944.0     67.4  245853.5     23.1    667.2  199570.4    231.3  58072.6   2104.7     40.60
    2.68      .10     1.23      .10     .110     .030     .110     .000     4.40  19854.08
  .000007    3850.    4646.    6150.       0       0       0     .00   7394.51  27248.59
```



```
   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB      ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL       XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 2.400
   2.400    45.16    49.76      .00      .00    49.79      .03      .02      .00    40.60
  245912.0     47.4  245822.6     42.0    446.6  192774.0    396.5  67863.8   2469.3     40.60
    3.15      .11     1.28      .11     .110     .030     .110     .000     4.60  19902.52
  .000008     400.    2165.    5000.       0       0       0     .00   7298.02  27200.54


CCHV=    .100 CEHV=    .300
*SECNO 2.650

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .57

   2.650    44.26    49.76      .00      .00    49.82      .05      .02      .01    40.60
  245892.0     83.6  245769.8     38.6    447.4  131025.2    214.3  72785.5   2676.5     41.00
    3.35      .19     1.88      .18     .110     .030     .110     .000     5.50  19902.43
  .000025     400.    1320.    1650.       0       0       0     .00   6478.44  26380.87


CCHV=    .100 CEHV=    .300
```

```
*SECNO 3.950

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.49

   3.950   44.29   49.89     .00     .00   49.93     .04     .11     .00   40.60
 245789.0    28.7 245726.3    34.0   229.2 160720.9   280.3  95858.4  3651.6   41.10
    4.59     .13    1.53     .12    .110    .030    .110    .000    5.60 19950.62
  .000011   5700.   6864.   7500.      1       0       0     .00 5912.21 25862.83


*SECNO 4.390
   4.390   44.32   49.92     .00     .00   49.96     .03     .03     .00   40.60
 245755.0    30.5 245652.5    72.0   231.7 170552.0   541.4 104728.5  4006.8   40.60
    5.04     .13    1.44     .13    .110    .030    .110    .000    5.60 19950.36
  .000012   1000.   2323.   3350.      0       0       0     .00 7386.65 27337.01


*SECNO 5.320
   5.320   40.59   49.99     .00     .00   50.05     .06     .08     .01   40.60
 245681.0   165.2 245498.8    17.0   937.8 126822.5   107.7 121613.7  4734.3   41.60
    5.75     .18    1.94     .16    .110    .030    .110    .000    9.40 19800.24
  .000022   6850.   4910.   4500.      0       0       0     .00 5434.43 25234.67
```



```
  SECNO    DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL    OLOSS  L-BANK ELEV
  Q        QLOB    QCH     QROB    ALOB     ACH    AROB     VOL     TWA   R-BANK ELEV
  TIME     VLOB    VCH     VROB    XNL      XNCH   XNR      WTN    ELMIN   SSTA
  SLOPE    XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT   CORAR  TOPWID  ENDST


CCHV=     .100 CEHV=     .300
*SECNO 5.780
   5.780   38.74   50.04     .00     .00   50.13     .09     .07     .01   40.80
 245645.0   132.7 245493.5    18.8   600.6 100998.7    91.9 128098.4  5025.7   41.10
    6.03     .22    2.43     .20    .110    .030    .110    .000   11.30 19869.93
  .000035   7000.   2429.   4000.      2       0       0     .00 4368.64 24238.57


*SECNO 5.860
   5.860   38.74   50.04     .00     .00   50.15     .11     .02     .01   56.30
 245639.0      .0 245639.0      .0      .0  92156.3      .0 129065.6  5071.4   56.30
    6.07     .00    2.67     .00    .000    .030    .000    .000   11.30 20032.01
  .000041   4500.    422.    500.      2       0       0     .00 3797.99 23830.00


CCHV=     .300 CEHV=     .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.30 ELREA=       56.30

   5.880   38.74   50.04     .00     .00   50.15     .11     .00     .00   56.30
 245637.0      .0 245637.0      .0      .0  92170.8      .0 129277.2  5080.1   56.30
```

```
   6.08     .00    2.67     .00    .000    .030    .000    .000    11.30  20031.99
 .000041     100.     100.     100.      0       0       0     .00   3798.06  23830.05


SPECIAL BRIDGE

SB  XK      XKOR     COFQ     RDLEN    BWC      BWP     BAREA     SS      ELCHU     ELCHD
   1.05     1.50     2.50      .00    716.60   323.41 100542.00    31.77     1.50     1.50

*SECNO 5.887
CLASS A LOW FLOW

3420 BRIDGE W.S.=     50.01 BRIDGE VELOCITY=      2.62    CALCULATED CHANNEL AREA=
93847.

 EGPRS    EGLWC     H3     QWEIR     QLOW     BAREA   TRAPEZOID     ELLC     ELTRD
WEIRLN
                                                        AREA
    .00    50.17     .02      0.   245637.  100542.  100518.     51.90    56.30      0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.30 ELREA=       56.30

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL      OLOSS    L-BANK ELEV
   Q      QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA     R-BANK ELEV
   TIME    VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR    TOPWID   ENDST


   5.887    38.76    50.06     .00     .00    50.17     .11     .02     .00    56.30
 245637.0      .0  245637.0      .0      .0  92234.3      .0  129355.5   5083.3    56.30
   6.08     .00    2.66     .00    .000    .030    .000    .000    11.30  20031.91
 .000041      37.      37.      37.      0       0       0     .00   3798.39  23830.29


CCHV=     .100 CEHV=     .300
*SECNO 5.907
   5.907    38.76    50.06     .00     .00    50.17     .11     .00     .00    56.30
 245635.0      .0  245635.0      .0      .0  92250.0      .0  129567.2   5092.1    56.30
   6.09     .00    2.66     .00    .000    .030    .000    .000    11.30  20031.89
 .000041     100.     100.     100.      0       0       0     .00   3798.46  23830.35


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.67

   6.350    37.40    50.20     .00     .00    50.23     .03     .05     .01    41.10
 245600.0      .1  245464.4    135.5     3.0  174639.4    572.7  136757.7   5430.2    29.60
   6.56     .02    1.41     .24    .110    .030    .110    .000    12.80  19999.35
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 .000015    1900.   2339.   3800.     2     0     0    .00  8756.69 28756.04

*SECNO 6.990
   6.990   37.25   50.25    .00    .00   50.28    .03    .05    .00   41.10
 229864.0    52.7 229665.7   145.6   396.0 173457.7  1037.6 150337.8  6104.3   40.20
   7.27     .13    1.32     .14    .110    .030    .110    .000   13.00 19942.49
 .000012    3500.   3379.   3400.     2     0     0    .00  8617.59 28560.08

*SECNO 7.370

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .33

   7.370   35.21   50.21    .00    .00   50.46    .25    .12    .07   60.00
 220520.0      .0 220520.0      .0      .0  55087.0      .0 155632.7  6359.5   55.00
   7.41     .00    4.00     .00    .000    .030    .000    .000   15.00 19894.68
 .000105    3500.   2006.   1400.     2     0     0    .00  2465.22 27802.13

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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST

CCHV=   .300 CEHV=   .500
*SECNO 7.379

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.379   35.22   50.22    .00    .00   50.47    .25    .01    .00   60.00
 220520.0      .0 220520.0      .0      .0  55094.3      .0 155696.0  6362.3   55.00
   7.41     .00    4.00     .00    .000    .030    .000    .000   15.00 19894.60
 .000105     50.     50.     50.     0     0     0    .00  2465.70 27802.16

*SECNO 7.379

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=    50.00 MAX ELLC=    58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60
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```
   7.379   35.21   50.21    .00    .00   50.47    .26    .00    .01   58.60
 220520.0     .0 220520.0     .0     .0  53973.4     .0 155697.2  6362.4   58.60
    7.41    .00    4.09    .00   .000    .030   .000   .000   15.00 20036.91
  .000116     1.      1.     1.      0       0      0    .00 2388.37 27002.15
```

*SECNO 7.384

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 12 MIN ELTRD= 50.00 MAX ELLC= 58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

```
   7.384   35.22   50.22    .00    .00   50.48    .26    .00    .00   58.60
 220520.0     .0 220520.0     .0     .0  53967.5     .0 155728.2  6363.7   58.60
    7.41    .00    4.09    .00   .000    .030   .000   .000   15.00 20036.92
  .000116    25.     25.    25.      0       0      0    .00 2388.31 27002.14
```



```
   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
   TIME   VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN  SSTA
   SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID ENDST
```

CCHV= .100 CEHV= .300
*SECNO 7.393

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 58.60 ELREA= 58.60

```
   7.393   35.23   50.23    .00    .00   50.48    .25    .01    .00   58.60
 220520.0     .0 220520.0     .0     .0  54684.8     .0 155790.5  6366.5   58.60
    7.41    .00    4.03    .00   .000    .030   .000   .000   15.00 20036.89
  .000105    50.     50.    50.      0       0      0    .00 2412.45 27002.16
```

*SECNO 7.403

3265 DIVIDED FLOW

```
   7.403   35.24   50.24    .00    .00   50.49    .25    .01    .00   58.60
 219709.0     .0 219708.9     .1    1.0  54715.3    2.8 155853.3  6369.3   58.60
    7.42    .03    4.02    .03   .110    .030   .110   .000   15.00 19894.14
  .000104    50.     50.    50.      0       0      0    .00 2444.80 27802.35
```

```
CCHV=   .100 CEHV=    .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.16

   7.440    32.89    50.49      .00      .00    50.51      .02      .00      .02    58.00
 219709.0       .0 219709.0       .0       .0 176401.0       .0 156423.7   6395.3    52.00
    7.47      .00     1.25      .00     .000     .030     .000     .000    17.60   479.86
  .000010     215.     215.     215.        2        0        0      .00  8111.88  8591.74


CCHV=   .100 CEHV=    .300
*SECNO 7.610
   7.610    31.00    50.50      .00      .00    50.53      .03      .01      .00    41.20
 214619.0    292.9 214316.9      9.2   1438.3 149128.2     63.1 159733.4   6568.8    40.60
    7.64      .20     1.44      .15     .110     .030     .110     .000    19.50 19703.11
  .000019    1280.     880.     562.        2        0        0      .00  8934.65 28637.75
```



```
   SECNO    DEPTH    CWSEL    CRIWS    WSELK       EG       HV       HL    OLOSS  L-BANK ELEV
   Q        QLOB      QCH      QROB     ALOB      ACH     AROB      VOL      TWA  R-BANK ELEV
   TIME     VLOB      VCH      VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
   SLOPE   XLOBL     XLCH    XLOBR   ITRIAL      IDC    ICONT    CORAR   TOPWID    ENDST


*SECNO 7.760
   7.760    31.91    50.51      .00      .00    50.54      .03      .01      .00    58.00
 214619.0       .0 214619.0       .0       .0 157484.6       .0 162634.0   6735.0    60.00
    7.80      .00     1.36      .00     .000     .030     .000     .000    18.60   897.96
  .000016     850.     820.     800.        0        0        0      .00  8707.10  9605.06


*SECNO 8.180

3265 DIVIDED FLOW

3280 CROSS SECTION     8.18 EXTENDED      .55 FEET

   8.180    33.95    50.55      .00      .00    50.58      .02      .03      .00    62.00
 214619.0       .0 214618.6       .4       .0 176691.6     17.3 171057.9   7203.6    50.00
    8.31      .00     1.21      .02     .000     .030     .110     .000    16.60   310.95
  .000013    2044.    2196.    2141.        0        0        0      .00  9883.00 11235.27


*SECNO 8.670
3280 CROSS SECTION     8.67 EXTENDED      .59 FEET

   8.670    29.99    50.59      .00      .00    50.61      .02      .04      .00    44.00
 214619.0  12736.4 201868.8     13.8  46379.1 162582.0    343.4 185173.6   8281.8    50.00
    8.91      .27     1.24      .04     .110     .030     .110     .000    20.60   294.41
  .000018    9000.    2391.    3177.        2        0        0      .00 16426.59 16721.00
```

*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION 9.25 EXTENDED 4.64 FEET

```
   9.250   29.05   50.65    .00    .00   50.67    .02    .06    .00   42.00
 214619.0  2726.3 211541.2  351.5 10706.0 165746.5  2912.0 198929.7  9384.4   42.00
    9.59     .25    1.28    .12   .110    .030   .110   .000   21.60  170.83
  .000020   3200.   3062.  3200.     0       0      0    .00 14589.12 15542.67
```

CCHV= .100 CEHV= .300
*SECNO 10.120
1
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```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .31

3470 ENCROACHMENT STATIONS= 1232.0 8990.0 TYPE= 1 TARGET= -1232.040
ELENCL= 54.70 ELENCR= 100000.00

```
  10.120   20.61   50.91    .00    .00   51.07    .15    .36    .04   41.60
 174300.0  1523.0 167005.0 5772.0  3783.1  51986.4 11589.2 211858.2 10473.0   43.80
   10.00     .40    3.21    .50   .120    .030   .120   .000   30.30 1277.89
  .000136   7700.   4594.  1000.     2       0      0    .00  7174.58  8452.47
```

1
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T1 LAKE HOUSTON.........................HARRIS COUNTY FLOOD INSURANCE STUDY
T2 G103-00-00......EFFECTIVE MODEL....................1973 DATUM ADJUSTMENT
T3 FILENAME:G1030FH2.IH2...........500 YR FREQUENCY........JJS.....12/10/96

```
J1 ICHECK  INQ   NINV   IDIR   STRT   METRIC  HVINS  Q    WSEL   FQ

           5                          52.7

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH   FN   ALLDC   IBW   CHNIM   ITRACE

   15      -1
```

```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
 Q      QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID ENDST

*PROF 4

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=   .300
*SECNO .010
   .010   55.90   52.70     .00   52.70   52.73     .03     .00     .00   40.60
 409900.0   100.3 409725.1    74.7   820.2 297941.3   764.6      .0      .0   40.60
    .00     .12    1.38     .10    .120    .030    .120    .000   -3.20 19840.60
 .000008      0.      0.      0.       0       0       0     .00 10457.18 30297.78


*SECNO .020
   .020   55.90   52.70     .00     .00   52.73     .03     .00     .00   40.60
 409897.0   100.3 409722.1    74.7   820.3 297945.0   764.9   343.8    12.0   40.60
    .01     .12    1.38     .10    .120    .030    .120    .000   -3.20 19840.59
 .000008     50.     50.     50.       0       0       0     .00 10457.87 30298.46


CCHV=   .100 CEHV=   .300
*SECNO .470
   .470   55.92   52.72     .00     .00   52.75     .03     .02     .00   40.60
 409784.0   100.5 409608.5    75.0   822.5 298079.0   776.3 17010.2   567.5   40.60
    .50     .12    1.37     .10    .120    .030    .120    .000   -3.20 19840.28
 .000008   2000.   2428.   1000.       0       0       0     .00 10482.79 30323.07


CCHV=   .100 CEHV=   .300
*SECNO 1.110
  1.110   49.14   52.74     .00     .00   52.78     .04     .03     .00   50.90
 409622.0     1.7 408202.3  1418.0    41.5 252926.3  8862.2 38744.9  1369.7   40.80
   1.08     .04    1.61     .16    .110    .030    .110    .000    3.60 19955.02
 .000010   3200.   3379.   3000.       0       0       0     .00 10603.14 30558.16


CCHV=   .100 CEHV=   .300
*SECNO 1.990
  1.990   48.39   52.79     .00     .00   52.84     .05     .06     .00   40.60
 409400.0   232.3 409087.1    80.6  1309.5 221471.6   467.0 64762.2  2384.7   40.60
   1.78     .18    1.85     .17    .110    .030    .110    .000    4.40 19716.23
 .000014   3850.   4646.   6150.       0       0       0     .00  7589.51 27305.74
```

```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 2.400
  2.400   48.22   52.82     .00     .00   52.88     .06     .03     .00   40.60
409297.0   159.4 409011.5   126.1   824.0 214541.0   705.5 75674.5  2755.1   40.60
   2.10     .19    1.91     .18    .110    .030    .110    .000    4.60 19849.19
 .000016   400.   2165.   5000.       0       0       0     .00 7380.25 27229.44


CCHV=   .100 CEHV=   .300
*SECNO 2.650

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .60

  2.650   47.32   52.82     .00     .00   52.94     .11     .04     .02   40.60
409234.0   267.9 408852.8   113.2   833.0 150389.1   389.8 81232.1  2963.7   41.00
   2.23     .32    2.72     .29    .110    .030    .110    .000    5.50 19843.41
 .000044   400.   1320.   1650.       1       0       0     .00 6554.50 26397.91


CCHV=   .100 CEHV=   .300
*SECNO 3.950

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.42

  3.950   47.46   53.06     .00     .00   53.14     .08     .20     .00   40.60
408906.0    99.0 408699.4   107.6   434.7 179131.1   519.6 107355.5  3948.2   41.10
   3.07     .23    2.28     .21    .110    .030    .110    .000    5.60 19919.41
 .000022  5700.   6864.   7500.       2       0       0     .00 5966.48 25885.89


*SECNO 4.390
  4.390   47.52   53.12     .00     .00   53.19     .07     .05     .00   40.60
408795.0   110.8 408471.6   212.6   538.8 193655.1   976.2 117364.3  4307.2   40.60
   3.38     .21    2.11     .22    .110    .030    .110    .000    5.60 19856.03
 .000023  1000.   2323.   3350.       0       0       0     .00 7520.75 27376.78


*SECNO 5.320
  5.320   43.84   53.24     .00     .00   53.36     .12     .15     .02   40.60
408560.0   572.7 407932.3    55.0  1904.5 143778.5   207.4 136635.0  5060.0   41.60
   3.86     .30    2.84     .27    .110    .030    .110    .000    9.40 19605.36
 .000039  6850.   4910.   4500.       0       0       0     .00 5639.27 25244.63
```

```
SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL      OLOSS    L-BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH     AROB    VOL     TWA      R-BANK ELEV
TIME     VLOB     VCH      VROB     XNL      XNCH    XNR     WTN     ELMIN    SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT   CORAR   TOPWID   ENDST


CCHV=   .100 CEHV=   .300
*SECNO 5.780
  5.780   42.01   53.31    .00    .00   53.51    .20    .12    .02   40.80
 408444.0    400.3 407985.7     58.0  1102.3 114817.1    171.6 144104.0  5371.6    41.10
   4.05    .36    3.55    .34   .110   .030   .110   .000   11.30  19823.79
 .000063   7000.   2429.   4000.     2     0     0    .00  4422.33  24246.11


*SECNO 5.860
  5.860   42.01   53.31    .00    .00   53.55    .24    .03    .01   56.30
 408424.0       .0 408424.0       .0      .0 104694.9       .0 145225.2  5420.0   56.30
   4.08    .00    3.90    .00   .000   .030   .000   .000   11.30  20015.34
 .000076   4500.    422.    500.     2     0     0    .00  3861.72  23877.06


CCHV=   .300 CEHV=   .500
*SECNO 5.880

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.30 ELREA=     56.30

  5.880   42.02   53.32    .00    .00   53.56    .24    .01    .00   56.30
 408419.0       .0 408419.0       .0      .0 104721.8       .0 145465.5  5428.9   56.30
   4.09    .00    3.90    .00   .000   .030   .000   .000   11.30  20015.30
 .000076    100.    100.    100.     0     0     0    .00  3861.86  23877.16



SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA     SS     ELCHU    ELCHD
   1.05   1.50    2.50    .00   716.60  323.41 100542.00   31.77    1.50    1.50

*SECNO 5.887
PRESSURE FLOW


 EGPRS    EGLWC    H3     QWEIR    QPR     BAREA   TRAPEZOID    ELLC    ELTRD    WEIRLN
                                                   AREA
  53.70    53.59    .03      0.  408417.  100542.  100518.     51.90    56.30      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.30 ELREA=     56.30

  5.887   42.17   53.47    .00    .00   53.70    .23    .15    .00   56.30
 408417.0       .0 408417.0       .0      .0 105307.6       .0 145554.8  5432.2   56.30
   4.09    .00    3.88    .00   .000   .030   .000   .000   11.30  20014.52
 .000075     37.     37.     37.     2     0     0    .00  3864.82  23879.34
```

```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=    .100 CEHV=    .300
*SECNO 5.907
   5.907    42.18    53.48     .00     .00    53.71     .23     .01     .00    56.30
 408411.0      .0 408411.0      .0      .0 105336.8      .0 145796.5  5441.1    56.30
    4.10      .00     3.88     .00    .000     .030    .000    .000   11.30 20014.48
  .000075    100.     100.    100.       0        0       0     .00 3864.96 23879.45


*SECNO 6.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.78

   6.350    40.95    53.75     .00     .00    53.81     .06     .08     .02    41.10
 408300.0      .2 407998.6   301.2     5.8 205516.1   978.6 154185.1  5785.6    29.60
    4.42      .04     1.99     .31    .110     .030    .110    .000   12.80 19999.09
  .000024   1900.    2339.   3800.       2        0       0     .00 8863.48 28862.57


*SECNO 6.990
   6.990    40.83    53.83     .00     .00    53.89     .06     .07     .00    41.10
 388397.0   204.7 387569.4   622.9   973.5 203007.9  3508.7 170244.4  6501.7    40.20
    4.92      .21     1.91     .18    .110     .030    .110    .000   13.00 19835.04
  .000021   3500.    3379.   3400.       2        0       0     .00 9584.69 29419.72


*SECNO 7.370

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .29

   7.370    38.76    53.76     .00     .00    54.29     .52     .26     .14    60.00
 376580.0      .0 376580.0      .0      .0  64854.7      .0 176507.7  6788.3    55.00
    5.01      .00     5.81     .00    .000     .030    .000    .000   15.00 19805.96
  .000235   3500.    2006.   1400.       2        0       0     .00 3039.59 27837.62


CCHV=    .300 CEHV=    .500
*SECNO 7.379

3265 DIVIDED FLOW
```

```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

  7.379   38.77   53.77     .00     .00   54.30     .52     .01     .00   60.00
 376580.0      .0 376580.0      .0      .0 64874.1      .0 176582.1  6791.8   55.00
   5.01     .00    5.80     .00    .000    .030    .000    .000   15.00 19805.80
 .000235     50.     50.     50.       0       0       0     .00 3040.62 27837.68

*SECNO 7.379

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

  7.379   38.75   53.75     .00     .00   54.32     .56     .00     .02   58.60
 376580.0      .0 376580.0      .0      .0 62597.1      .0 176583.6  6791.9   58.60
   5.01     .00    6.02     .00    .000    .030    .000    .000   15.00 20019.18
 .000218      1.      1.      1.       1       0       0     .00 2475.39 27013.61

*SECNO 7.384

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=  12 MIN ELTRD=   50.00 MAX ELLC=   58.60

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

  7.384   38.76   53.76     .00     .00   54.32     .56     .01     .00   58.60
 376580.0      .0 376580.0      .0      .0 62586.9      .0 176619.5  6793.3   58.60
   5.02     .00    6.02     .00    .000    .030    .000    .000   15.00 20019.20
 .000219     25.     25.     25.       0       0       0     .00 2475.29 27013.60

CCHV=    .100 CEHV=    .300
1
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
```

```
   Q      QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


*SECNO 7.393

3265 DIVIDED FLOW


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      58.60 ELREA=      58.60

   7.393   38.79   53.79     .00     .00   54.33     .55     .01     .00   58.60
 376580.0      .0 376580.0      .0      .0  63420.5      .0 176691.8  6796.1   58.60
   5.02     .00    5.94     .00    .000    .030    .000    .000   15.00 20019.11
  .000196     50.     50.     50.       1       0       0     .00 2499.74 27013.65


*SECNO 7.403

3265 DIVIDED FLOW

   7.403   38.80   53.80     .00     .00   54.34     .54     .01     .00   58.60
 375554.0    76.0 375270.2   207.8   264.0  63466.2   720.8 176765.2  6799.3    58.60
   5.02     .29    5.91     .29    .110    .030    .110    .000   15.00 19805.08
  .000194     50.     50.     50.       0       0       0     .00 3018.96 27837.97


CCHV=     .100 CEHV=     .300
*SECNO 7.440

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.29

   7.440   36.75   54.35     .00     .00   54.40     .05     .01     .05   58.00
 375554.0      .0 375550.8     3.2      .0 207985.9    50.2 177437.7  6827.2    52.00
   5.05     .00    1.81     .06    .000    .030    .110    .000   17.60  393.99
  .000018    215.    215.    215.       2       0       0     .00 8275.55 8669.54


CCHV=     .100 CEHV=     .300
*SECNO 7.610
   7.610   34.86   54.36     .00     .00   54.42     .06     .02     .00   41.20
 369116.0   865.6 368223.3    27.1  2839.6 182461.3   122.0 181424.4  7004.1    40.60
   5.17     .30    2.02     .22    .110    .030    .110    .000   19.50 19571.71
  .000028   1280.    880.    562.       2       0       0     .00 9071.03 28642.73


1
  28FEB00    09:37:31                                                    PAGE  42


   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL      OLOSS   L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

```
*SECNO 7.760
  7.760   35.79   54.39    .00    .00   54.45    .06    .02    .00   58.00
 369116.0     .0 369116.0     .0     .0 191473.0     .0 184972.8   7173.0   60.00
   5.29    .00   1.93    .00   .000   .030   .000   .000   18.60  850.23
 .000025   850.   820.   800.      0      0      0    .00 8849.09 9699.33


*SECNO 8.180

3265 DIVIDED FLOW

3280 CROSS SECTION    8.18 EXTENDED    4.45 FEET

  8.180   37.85   54.45    .00    .00   54.50    .05    .05    .00   62.00
 369116.0     .0 369001.6   114.4     .0 215107.3   1123.0 195248.9   7658.3   50.00
   5.65    .00   1.72    .10   .000   .030   .110   .000   16.60  218.00
 .000020   2044.   2196.   2141.      0      0      0    .00 10418.43 11235.27


*SECNO 8.670
3280 CROSS SECTION    8.67 EXTENDED    4.51 FEET

  8.670   33.91   54.51    .00    .00   54.55    .04    .06    .00   44.00
 369116.0 24772.2 343880.6   463.3 64730.5 206611.9   2617.9 213646.4   8767.9   50.00
   6.11    .38   1.66    .18   .110   .030   .110   .000   20.60  172.11
 .000023   9000.   2391.   3177.      2      0      0    .00 16548.89 16721.00


*SECNO 9.250
3280 CROSS SECTION    9.25 EXTENDED    8.58 FEET

  9.250   32.99   54.59    .00    .00   54.63    .04    .07    .00   42.00
 369116.0  5790.2 361236.2  2089.7 16076.5 212614.9   9715.7 231802.1   9907.4   42.00
   6.62    .36   1.70    .22   .110   .030   .110   .000   21.60   72.06
 .000025   3200.   3062.   3200.      0      0      0    .00 15470.61 15542.67


CCHV=   .100 CEHV=   .300
*SECNO 10.120

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .32
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```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


3470 ENCROACHMENT STATIONS=   1232.0   8990.0 TYPE=    1 TARGET=   -1232.040
 ELENCL=   54.70  ELENCR= 100000.00
```

10.120	24.60	54.90	.00	.00	55.21	.31	.50	.08	41.60	
333600.0	5665.5	311698.7	16235.8	8412.1	67795.7	20930.7	249104.8	11117.4	43.80	
6.91	.67	4.60	.78	.120	.030	.120	.000	30.30	160.56	
.000195	7700.	4594.	1000.	2	0	0	.00	8730.70	8891.26	

THIS RUN EXECUTED 28FEB00 09:37:32

****
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

FILENAME:G1030FH2.IH2...

SUMMARY PRINTOUT

SECNO	VOL	AREA	CWSEL
.010	.00	237452.90	46.30
.010	.00	260570.70	48.70
.010	.00	270235.70	49.70
.010	.00	299526.00	52.70
.020	272.56	237453.30	46.30
.020	299.09	260571.80	48.70
.020	310.19	270237.60	49.70
.020	343.81	299530.20	52.70
.470	13502.09	237464.90	46.30
.470	14811.69	260613.20	48.71
.470	15358.99	270306.40	49.71
.470	17010.17	299677.80	52.72
1.110	30631.13	204454.20	46.30
1.110	33618.64	224740.40	48.71
1.110	34870.23	233284.60	49.72
1.110	38744.87	261829.90	52.74
1.990	50916.00	175183.90	46.31
1.990	55955.03	192956.50	48.73
1.990	58072.61	200468.80	49.75
1.990	64762.18	223248.10	52.79

	2.400	59457.07	168544.00	46.31
	2.400	65374.41	186149.10	48.74
	2.400	67863.82	193617.10	49.76
	2.400	75674.52	216070.50	52.82
*	2.650	63665.19	109375.90	46.31
*	2.650	70083.70	125035.90	48.74
*	2.650	72785.54	131686.90	49.76
*	2.650	81232.12	151611.90	52.82

	SECNO	VOL	AREA	CWSEL
*	3.950	83336.37	140324.50	46.34
*	3.950	92133.98	154887.80	48.82
*	3.950	95858.45	161230.40	49.89
*	3.950	107355.50	180085.40	53.06
	4.390	90943.52	144933.10	46.34
	4.390	100620.20	163296.80	48.84
	4.390	104728.50	171325.00	49.92
	4.390	117364.30	195170.00	53.12
	5.320	105222.80	108276.40	46.36
	5.320	116708.70	121848.80	48.88
	5.320	121613.70	127868.00	49.99
	5.320	136635.00	145890.50	53.24
	5.780	110664.90	85793.15	46.37
	5.780	122870.90	96825.09	48.91
	5.780	128098.40	101691.30	50.04
	5.780	144104.00	116091.00	53.31
	5.860	111470.40	78383.67	46.37
	5.860	123787.40	87891.30	48.91
	5.860	129065.60	92156.30	50.04
	5.860	145225.20	104694.90	53.31
	5.880	111650.30	78352.53	46.37
	5.880	123989.20	87900.32	48.91
	5.880	129277.20	92170.76	50.04
	5.880	145465.50	104721.80	53.32
	5.887	111716.80	78362.70	46.37
	5.887	124063.90	87937.60	48.92
	5.887	129355.50	92234.33	50.06
	5.887	145554.80	105307.60	53.47
	5.907	111896.70	78365.72	46.37
	5.907	124265.80	87947.35	48.93
	5.907	129567.20	92250.03	50.06
	5.907	145796.50	105336.80	53.48

*	6.350	117816.90	141905.60	46.40
*	6.350	131058.30	164736.50	49.01
*	6.350	136757.70	175215.00	50.20
*	6.350	154185.10	206500.50	53.75
	6.990	128840.80	142310.80	46.41
	6.990	143831.70	164577.90	49.04
	6.990	150337.80	174891.30	50.25
	6.990	170244.40	207490.10	53.83

	SECNO	VOL	AREA	CWSEL
*	7.370	133175.90	46012.61	46.41
*	7.370	148822.50	52203.75	49.02
*	7.370	155632.70	55087.03	50.21
*	7.370	176507.70	64854.68	53.76
	7.379	133228.70	45991.61	46.41
	7.379	148882.40	52208.31	49.03
	7.379	155696.00	55094.27	50.22
	7.379	176582.10	64874.11	53.77
	7.379	133229.80	45046.58	46.41
	7.379	148883.60	51144.92	49.02
	7.379	155697.20	53973.35	50.21
	7.379	176583.60	62597.12	53.75
	7.384	133255.60	45045.75	46.41
	7.384	148913.00	51141.48	49.03
	7.384	155728.20	53967.53	50.22
	7.384	176619.50	62586.90	53.76
	7.393	133307.70	45660.18	46.41
	7.393	148972.00	51825.18	49.03
	7.393	155790.50	54684.83	50.23
	7.393	176691.80	63420.49	53.79
	7.403	133360.10	45665.80	46.41
	7.403	149031.50	51844.34	49.04
	7.403	155853.30	54719.06	50.24
	7.403	176765.20	64451.07	53.80
*	7.440	133827.90	143881.30	46.45
*	7.440	149569.00	165930.30	49.20
*	7.440	156423.70	176401.00	50.49
*	7.440	177437.70	208036.10	54.35
*	7.610	136444.20	114903.50	46.46
	7.610	152654.60	139073.80	49.20
	7.610	159733.40	150629.60	50.50
	7.610	181424.40	185422.90	54.36

7.760	138678.60	122473.30	46.46
7.760	155340.00	146191.80	49.21
7.760	162634.00	157484.60	50.51
7.760	184972.80	191473.00	54.39
8.180	145217.80	136949.20	46.47
8.180	163154.60	163830.70	49.24
8.180	171057.90	176708.90	50.55
8.180	195248.90	216230.30	54.45

SECNO	VOL	AREA	CWSEL
8.670	155070.80	145506.30	46.48
8.670	175868.50	188048.20	49.27
8.670	185173.60	209304.50	50.59
8.670	213646.40	273960.30	54.51
9.250	164599.20	124084.90	46.50
9.250	188190.30	160250.70	49.31
9.250	198929.70	179364.50	50.65
9.250	231802.10	238407.20	54.59
* 10.120	173284.10	39701.40	46.66
* 10.120	199674.00	57856.18	49.57
* 10.120	211858.20	67358.77	50.91
* 10.120	249104.80	97138.48	54.90

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.650 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.650 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.650 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 2.650 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 3.950 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.950 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.950 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 3.950 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 6.350 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 6.350 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 6.350 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.370 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.370 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.370 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.370 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.440 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.440 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.440 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 7.440 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.610 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 10.120 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 10.120 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 10.120 PROFILE= 3 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 10.120 PROFILE= 4 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

Appendix B-3 HEC-2 Model Output (Sediment Removal Options)

HEC-2 Output

Alternative I - Channel Improvement West Fork d/s 3.5 miles

```
1*********************************************           ****************************************
* HEC-2 WATER SURFACE PROFILES        *                         * U.S. ARMY CORPS OF ENGINEERS     *
*                              *                        * HYDROLOGIC ENGINEERING CENTER     *
* Version   4.6.2;  May 1991         *                          * 609 SECOND STREET, SUITE D      *
*                              *                        * DAVIS, CALIFORNIA 95616-4687     *
* RUN DATE    29FEB00    TIME   11:00:21 *                       *        (916) 756-1104        *
*********************************************           ****************************************




                      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
1
 29FEB00     11:00:21                                            PAGE   1



                                          THIS RUN EXECUTED 29FEB00    11:00:21
 **************************************
  HEC-2 WATER SURFACE PROFILES

  Version   4.6.2;  May 1991
 **************************************
[redacted] ( CHANNEL IMPROVEMENT -- WEST FORK 3.5 MILES )

T1     CF-0033 BROWN & ROOT SERVICES,  02/28/2000
T2     Lake Houston HEC-2 MODEL, REACH 3 (CIMP 200 ft + higher starting WSEL)
T3     Starting form river mile 3.615 u/s of Lake Houston Dam (multi-profile CI)

J1  ICHECK   INQ     NINV    IDIR    STRT    METRIC   HVINS    Q      WSEL     FQ

      0      4       0                                 50.5

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN     ALLDC    IBW     CHNIM     ITRACE

     -1       0      -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150      55      56      25      26      35      60      59      64      65

J6  IHLEQ    ICOPY    SUBDIV    STRTDS    RMILE

      1


NC    0.11     0.11     0.03     0.1      0.3
QT     6     75056   160681   214619    369116    214619    214619
X1   7.61      30    20000    28625
GR     60    19450      55    19550       50    19720       45    19900       40    19950
GR   41.2    20000    27.3    20292     28.4    20725     26.9    20750     20.9    20790
GR   19.5    20975    27.6    21250     28.1    21625     24.1    21650     34.6    22000
GR   41.6    22200    41.6    22355     36.2    23780     38.6    24025     40.6    24920
GR   39.4    25170    39.6    25270     33.4    25725     28.1    26330     27.8    26917
GR   30.9    27700    26.4    27730     24.1    27920     40.6    28625       60    28650

X1   7.76       90      771   9836.14      850      800      820
GR     62        0       62    489.26       60   692.24       58      771       56   834.79
GR     54   853.86       50    904.39       44  1003.91       42  1016.08     37.6  1084.32
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GR   34.6  1111.99   30.6  1137.07   30.6  1153.38   32.6  1179.64   32.6  1207.07
GR   28.6  1307.23   27.6  1341.56   23.6  1385.86   23.6  1432.49   24.6  1476.77
GR   24.6  1951.16   23.6  2064.42   19.6  2142.98   18.6  2169.23   18.6  2267.16
GR   19.6   2310.8   20.6  2379.51   20.6  2415.42   22.6  2486.57   24.6  2522.73
GR   28.6  2702.12   36.6  2738.89   36.6   3063.8   35.6  3134.15   35.6  3511.39
GR   36.6  3902.11   37.6  3938.96   38.6  4169.32   38.6  4408.28   37.6  4593.59
GR   36.6  4704.59   35.6  4771.45   35.6  4823.96   36.6  4877.86   36.6  4962.19
GR   34.6   5096.4   33.6   5200.6   33.6  5225.77   34.6   5318.5   34.6  5421.72
GR   33.6  5503.25   32.6  5725.49   33.6  5841.58   35.6  5949.58   37.6  6028.99
GR   38.6  6685.89   38.6  6916.53   37.6  6935.31   33.6  6967.93   33.6  7064.54
GR   34.6  7149.29   36.6  7216.18   36.6  7267.72   34.6  7318.26   31.6  7462.61
GR   29.6  7513.65   24.6  7662.68   23.6   7728.3   22.6  7866.81   21.6  8042.58
GR   21.6  8265.65   23.6  8385.69   26.6  8411.89   28.6  8458.17   28.6   8502.6
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GR   29.6  8539.72   29.6  8610.67   28.6  8716.35   29.6  8812.57   30.6  8958.68
GR   32.6  9102.53   32.6  9289.83   33.6  9306.53   35.6   9311.9   36.6  9397.53
GR   37.6   9442.2     50  9592.67     60  9836.14     70 12158.31     70 12225.01

X1   8.18      90      0 10131.28   2044     2141    2196
GR     62       0     58   123.67     52   282.94     50   321.61     46    441.7
GR     44   571.84     42   589.79     42   593.39   33.6   633.46   31.6   775.49
GR   29.6    855.4   28.6   916.54   28.6  1018.47   26.6  1059.95   26.6   1186.1
GR   27.6  1217.35   27.6  1403.32   23.6  1469.29   18.6  1520.89   16.6  1574.93
GR   16.6   1636.4   20.6  1679.92   26.6  1732.64   25.6   1781.4   25.6  1838.17
GR   23.6   1899.9   22.6  1983.03   22.6  2029.11   27.6  2383.07   29.6  2442.35
GR   31.6  2558.94   33.6   2641.9   34.6  2767.24   34.6  2895.38   33.6  3086.86
GR   32.6  3149.65   32.6  3348.49   33.6   3418.1   35.6   3506.3   35.6  3958.66
GR   35.6  4123.51   34.6  4223.84   34.6  4323.83   35.6  4468.25   36.6  4520.54
GR   37.6  4533.46   39.6     4687   39.6  4806.62   38.6  5470.77   36.6  5861.13
GR   36.6  6288.59   36.6  6508.12   35.6  6711.54   34.6  6830.72   34.6  6905.04
GR   33.6  7117.63   33.6  7452.66   30.6  7500.66   25.6  7546.39   23.6   7582.5
GR   23.6   7697.6   25.6  7890.71   25.6  7945.46   26.6  8014.74   27.6   8134.1
GR   27.6  8468.81   26.6     8519   26.6   8658.6   27.6   8769.8   29.6   8857.3
GR   32.6   8886.8   34.6   8997.2   32.6  9008.48   31.6  9035.85   28.6  9071.18
GR   25.6  9193.51   22.6  9274.24   22.6   9367.4   28.6  9395.16   30.6  9438.96
GR   28.6  9505.21   29.6  9566.81   32.6  9611.97   34.6  9726.04   35.6  9755.25
GR   36.6  9918.22     50 10131.28     55 10634.33     60 11105.23     50 11235.27

X1   8.67      90   4913    16141   9000     3177    2391
GR   60.0     1.00     44      500     42     1200   38.6     3000     42     3400
GR     42     3700   35.6     4000   34.6     4156   34.6     4243   35.6     4299
GR   36.6     4355   37.6     4544     42     4791     44     4913     42     5213
GR   37.6  5344.31   36.6  5408.33   35.6     5469   32.6     6008   31.6     6099
GR   30.6  6107.72   29.6  6130.49   28.6  6139.98   28.6  6320.91   29.6  6337.56
GR   29.6  6345.87   30.6  6355.86   30.6   6361.9   29.6  6367.24   28.6  6372.57
GR   27.6  6379.42   26.6  6384.35   25.6  6389.27   24.6   6394.2   24.6  6448.01
GR   25.6   6477.2   25.6  6487.81   24.6  6531.11   23.6  6574.41   22.6   6617.7
GR   21.6     6661   20.6  6693.14   20.6  6693.37   21.6  6700.26   22.6  6707.16
GR   23.6  6714.37   24.6  6722.29   25.6  6730.22   25.6  6736.32   27.6  6752.54
GR   28.6  6773.68   28.6  6828.95   29.6  6895.05   29.6   6935.2   28.6  7010.54
GR   28.6  7115.84   27.6  7173.41   26.6  7186.62   25.6  7202.96   25.6  7286.02
GR   26.6  7317.91   27.6   7349.8   28.6  7382.76   29.6  7416.84   30.6   7426.5
GR   31.6  7445.67   32.6  7490.79   33.6  7506.12   33.6   7673.9   34.6  7700.56
GR   35.6  7717.98   36.6   7738.7   37.6  7761.94     42  7849.08     42     8423
GR     44     8476     46     8664     48     8805     48     8992     46     9040
GR     44     9089     42     9534   36.6    11234   30.6    11284   26.6    13254
GR   32.6    13794   34.6    14434     42    14977     50    16141     50    16721

X1   9.25      90 1482.97    13375   3200     3200    3062
GR     58        0     54    84.32     46   290.31     42   343.23     42   420.17
GR     44   476.39     44    677.8     42   742.06     39  1028.07     40  1064.74
GR     42  1297.02     42  1482.97   36.6  1531.82   36.6  1733.64     42  1778.92
GR     42  1835.14   36.6   1853.7   36.6  2042.83   38.6  2058.93     42  2165.87
GR   37.6  2653.73   36.6  2884.43   34.6  2973.32   32.6   3125.1   30.6  3227.31
GR   30.6  3440.43   32.6  3539.47   32.6  3694.91   33.6  3796.25   33.6  3879.19
GR   32.6  3883.23   30.6  4014.25   31.6  4053.84   23.6  4077.66   21.6   4103.3
GR   21.6  4142.49   23.6  4210.25   29.6  4428.22   30.6  4512.25   29.6  4548.08
```

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GR   29.6   4683.39    30.6   4822.04    31.6   4859.24    31.6   4945.96    32.6   4969.93
```



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GR   32.6   5164.13    28.6   5259.78    27.6   5489.81    30.6   5586.26    29.6   5674.1
GR   29.6   5840.08    28.6   5933.49    29.6   6117.52    30.6   6218.87    29.6   6291.43
GR   35.6   6622.31      42   7000.5       42   7186.01      46   7281.58      50   7365.02
GR     50   7412.73      48   7530.52      48   8258.76      46   8409.42      46   8595.54
GR     44   9144.24      42   9278.05    40.6   9380       40.6   9800         42   10300.6
GR     42   10877      37.6   10950.0    34.6   11000      32.4   11300      32.4   12100
GR   34.6   12200      34.6   12500      32.6   12700      26.0   13025        42   13375
GR     50   13650        48   14445        50   14503        52   14900        50   14921
GR     50   14976.91     54   15030.06     54   15451.95     48   15509.12     46   15542.67

QT      4   66800    143300   174300   333600
NC   0.12    0.12      0.03       .1       .3
X1  3.615      89   2366.85  6330.06     7700     1000     4594
X3     10                    1232.04     54.7
CI   5720      20     0.030       18       22      200
GR   55.6       0      55.2       90     54.9   161.12     54.8   318.29     54.5   400
GR   54.5   505.44     50.4    590.1     50.7   644.14     49.6   763.76     49.8   821.19
GR   47.9   853.74     50.9   895.11       51   927.61       49   951.75     47.9   1054.3
GR   50.3   1085.94    53.3   1160.37    54.7   1232.04    50.1   1287.74      49   1373.79
GR   48.6   1482.72    49.1   1622.28    46.2   1678.02    46.3   1781.82    48.3   1866.53
GR   49.2   1949.4     48.8   2075.16    47.9   2163.11    43.8   2220.71    42.6   2269.24
GR   41.6   2366.85    40.6   2391.75      39   2452.47    37.7   2548.87    37.9   2765.45
GR   37.6   2952.69      38   3157.81    38.6   3299.81    38.3   3413.04    38.1   3746.92
GR   38.1   3993.99    38.9   4185.79    38.8   4286.36    40.5   4499.72    39.9   4728.9
GR   38.6   4754.82    40.1   4907.5  40.4627   4943.023    38.9   4984.51    37.2   5041.95
GR   37.2   5119.68    36.4   5177.29    37.3   5277.11    36.8   5355.15    38.1   5518.64
GR   37.9   5567.34    36.5   5613.59    33.5   5655.2     32.5   5769.5     30.3   5803.47
GR   32.8   5902.24    32.8   5982.5     34.2   6030.84    36.5   6067.52    37.5   6124.9
GR   37.8   6207.91    40.5   6273.13    43.8   6330.06    41.5   6462.94    41.4   6636.96
GR   44.8   6697.83    45.5   6728.93    44.5   6819.63      45   6861.77    44.5   6960.04
GR   44.8   7029.56   45.05   7060       44.7   7115.34    45.4   7181.81    45.6   7240
GR   45.6   7360       45.5   7468.6     43.4   7632.04    44.6   7864.56    47.6   7908.88
GR   47.7   7982.52    48.7   8044.72    48.8   8220       55.8   8990

QT      4   66160    140750   173330   329800
X1  4.745      84    2373.4  6703.71     3600     4500     5966
X3     10                    1973.39       52  6985.59     48.6
CI   3040      21                 18       20      200
GR  60.92       0      54.6      450    53.45      570    53.05      630     52.6   740
GR   52.7     830      52.5      930       52   989.14    52.45     1150     52.3   1284.73
GR   52.6   1434.66    52.6     1560    52.45     1730     52.3   1836.38    52.05   1940
GR     52   1973.39    51.1   2373.4     43.3     2385     39.8   2559.76       37   2645.83
GR     36   2728.22    35.3   2809.02    35.9   2887.92    31.2   3041.01    31.9   3156.16
GR   38.5   3253.79    38.3   3378.72    37.2   3446.92    38.7   3576.68    40.1   3661.26
GR     41   3745.2     42.8   3831.04    41.2   3910.34      41   3973.54    41.5   4029.61
GR   41.7   4160.5     41.2   4216.44    42.6   4487.7     44.7   4656.69    40.7   4714.42
GR   36.5   4755       36.2   4820       34.9   4900       38.1   5120       38.1   5180
GR   41.1   5200       42.3   5222       42.1   5272       39.7   5300       39.9   5500
GR   39.6   5550         38   5600       36.3   5740         37   5800       39.8   5962.55
GR     40   6057.51    39.7   6300.58      42   6371.11    43.1   6486.54      44   6532.85
GR   44.5   6559.55    45.2   6653.68    47.2   6703.71      47   6753.55    47.1   6787.33
GR   47.5   6829.55    47.3   6947.51    48.6   6985.59    48.4   7027.77    47.3   7052.29
GR   47.2   7079.78    46.5   7122.32    46.4   7303.07    46.8   7395.37    47.9   7436.05
GR   48.1   7535.6     50.2   7585.83    54.2   7722.58    54.7   7816.27    59.2   7868.73
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GR   60.8   7911.42      61   8096.6     61.5   8298       61.8   8402

QT      4   65990    140170   173080   328820
NC   0.12    0.12      0.03      0.3      0.5
X1  5.026      77     10508    14400     1030     4150     1482   0.9135
X3     10
CI                                        .01
```

```
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR     26  11140   21.5  11250   21.5  11450     26  11570   41.3  11748
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

NC    .12    .12  0.030
X1  5.027     69  10508  14300      1      1      1  0.9135
X3     10
X2      0      0      0   52.5  58.25
GR   70.3      0   60.1    847   50.1   6125   40.8   6399     52   6703
GR     53   6993   43.8   7631     52   7675   50.6   8427   44.2   8495
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   56.2  10508   28.9  10622   37.4  10682   37.4  10683
GR   36.1  10792   21.5  11250   21.5  11450   41.3  11748   41.3  11749
GR   41.3  11750   45.5  11830   46.2  11981     45  12004   52.5  12004
GR   44.7  12010   41.2  12077   46.2  12110   46.1  12162   52.5  12169
GR   46.1  12169   42.6  12356   43.5  12463   52.5  12463   43.5  12469
GR   43.9  12514   41.3  12663   52.5  12663   52.5  12669   41.3  12669
GR   41.7  12863   52.5  12869   41.7  12869   42.3  13163   52.5  13169
GR   42.3  13169   43.2  13363   52.5  13369   43.2  13369   44.1  13509
GR   41.3  13581   41.3  13663   52.5  13669   41.3  13669   41.3  13863
GR   52.5  13869   41.3  13921   44.5  14033   43.9  14113   52.5  14119
GR   43.9  14119   43.1  14221     56  14300   66.8  14676

X1  5.034      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03
X1  5.035     77  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
1
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```
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR     26  11140   21.5  11250   21.5  11450     26  11569   26.5  11570
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.037     77  10508  14400      8      8      8  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
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GR   44.2    8495    47.4    8539    44.2    8686    50.9    8716    48.5    8805
GR   53.1    8968    50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6   10121    52.8   10240    51.6   10351    56.2   10508    49.2   10531
GR   44.1   10549    41.8   10584    28.9   10622    37.4   10682    36.1   10792
GR     26   11140    21.5   11250    21.5   11450      26   11569    26.5   11570
GR   41.3   11749    45.5   11830    46.2   11981    44.7   12010    41.2   12077
GR   46.2   12110      46   12265    42.6   12356    43.9   12514    41.7   12874
GR   42.3   13169    43.2   13369    44.1   13509    41.3   13921    44.5   14033
GR   43.9   14119    43.1   14221    47.6   14283      57   14400    63.4   14532
GR   64.7   14822    62.5   14960    66.5   15076    67.6   15152    66.1   15301
GR   65.8   15393    64.6   15581    65.5   15601    66.7   15706    62.2   15750
GR   64.2   15886    65.4   16039

X1  5.038      67   10508   14300       1       1       1  0.9135
X2      0       0       0    52.5   58.25
X3     10
GR   70.3       0    60.1     847    50.1    6125    40.8    6399      52    6703
GR     53    6993    43.8    7631      52    7675    50.6    8427    44.2    8495
GR   53.1    8968    50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6   10121    56.2   10508    28.9   10622    37.4   10682    37.4   10683
GR   37.4   10689    36.1   10792      26   11140    21.5   11250    21.5   11450
GR   41.3   11749    45.5   11830    46.2   11981      45   12004    52.5   12010
GR   44.7   12010    41.2   12077    46.2   12110    46.1   12162    52.5   12169
GR   46.1   12169    42.6   12356    43.5   12463    52.5   12469    43.5   12469
GR   43.9   12514    41.2   12621    41.3   12663    52.5   12669    41.3   12669
GR   41.7   12863    52.5   12869    41.7   12869    42.3   13163    52.5   13169
GR   42.3   13169    43.2   13363    52.5   13369    43.2   13369    44.1   13509
GR   41.3   13663    52.5   13669    41.3   13863    52.5   13869    41.3   13921
GR   44.5   14033    43.9   14113    52.5   14113    43.9   14119    43.1   14221
GR     56   14300    66.8   14676
```



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X1  5.045       0       0       0      47      47      47
X2      0       0       0    52.5   58.25
X3     10

NC   0.12    0.12    0.03     0.1     0.3
X1  5.046      77   10508   14400       1       1       1  0.9135
X3     10
GR   70.3       0    60.1     847    55.1    4325    50.1    6125    47.5    6457
GR   51.9    6672      52    6723    49.3    6899      53    7002    51.3    7207
GR   47.8    7406    44.3    7535    50.7    7643      52    7675    49.2    7860
GR   50.7    7983      52    8074    50.8    8207    51.4    8253    50.6    8427
GR   44.2    8495    47.4    8539    44.2    8686    50.9    8716    48.5    8805
GR   53.1    8968    50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6   10121    52.8   10240    51.6   10351    56.2   10508    49.2   10531
GR   44.1   10549    41.8   10584    28.9   10622    37.4   10682    36.1   10792
GR     26   11140    21.5   11250    21.5   11450      26   11568    26.5   11570
GR   41.3   11749    45.5   11830    46.2   11981    44.7   12010    41.2   12077
GR   46.2   12110      46   12265    42.6   12356    43.9   12514    41.7   12874
GR   42.3   13169    43.2   13369    44.1   13509    41.3   13921    44.5   14033
GR   43.9   14119    43.1   14221    47.6   14283      57   14400    63.4   14532
GR   64.7   14822    62.5   14960    66.5   15076    67.6   15152    66.1   15301
GR   65.8   15393    64.6   15581    65.5   15601    66.7   15706    62.2   15750
GR   64.2   15886    65.4   16039

QT      4   65680  139080  172610  326970
NC   0.12    0.12    0.03     0.1     0.3
NH      4    0.12  6565.8    0.04 10389.97    0.03 11165.02    0.12 11754.54
X1  5.585      88 10389.97 11165.02   2664    1744    2847
X3     10
CI  10681      23     .03      20       8     200
GR  62.75       0      55    1050      51    1350    50.4    2130    49.8    2670
GR   49.3    2940      49 3070.97    47.4 3189.37    48.1 3332.69    44.9 3448.15
GR   47.2 3606.21    45.8 3712.03    48.1  3809.2    45.4  3992.9    48.9 4050.05
GR   50.5 4111.66    47.1 4292.93      49 4377.98    46.2 4426.95    48.4 4503.41
GR   51.7 4528.08      52  4646.6    47.9 4680.17    47.5 4744.32    49.6 4816.31
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GR   45.9  5042.82    46.4  5114.46    50.6   5214.31    50.4   5290.11    49    5321.9
GR   47.8  5469.67    49.5  5630.79    47.7   5658.97    46.1   5777.87    46.4  5924.67
GR   44.8  6004.29    43.3  6258.57    43.5   6470.87    48.9   6565.8     44.7  6646.34
GR   45.9  6743.32    44.5  6892.24    44.2   7009.22    44.5   7289.15    46.4  7330.53
GR   44.3  7392.93    41.7  7412.88    43.8   7516.5     42.6   7594.69    42.8  7688.63
GR   41.4  7768.32    42    7833.49    41.2   7910.79    42.2   8209.01    41.3  8286.36
GR   39.7  8308.22    39.9  8702       40.1   8964.4     39.4   9095.69    41.7  9292.52
GR   44.3  9703.77    41.6  9816.3     43.9   9860.54    41.3   9948.37    46.9  9970.67
GR   44.8  10033.63   43.0  10162.63   44.2   10190.96   43.9   10305.76   46.5  10332.73
GR   48.2  10389.97   44.7  10430.72   41.3   10459.1    32.9   10514.53   28.0  10567.09
GR   26.4  10611.42   24.7  10640.77   23.7   10681.82   25.7   10731.87   24.6  10751.83
GR   28.0  10782.41   30.2  10840.35   39.3   10888.46   38.5   10909.12   45.0  10961.37
GR   49.8  11165.02   54.6  11343.95   62.438 11754.54
```



```
QT    4    65210   137410   171900   324160
NC  0.08    .12    0.03     .1       .3
NH    5    0.12    2500     0.08     10000    0.03     17143    0.08     19000    0.12
NH  23560
X1  6.420   59     15845    16499    2300     2800     4409
CI  16190   24     0.030    20       8        200
X3   10
GR   75      0     75       2500     70       3400     70       6000     60       7000
GR  58.3   10000   56.1     10103    56.6     10179    57.3     10497    56.3     10543
GR  55.3   10654   57.2     10704    55.9     10873    52.1     10891    49       11004
GR  50.2   11061   53.5     11106    49.4     11290    48.2     11399    47.9     11517
GR  47.7   11625   48.9     11747    45.8     11900    46       11965    46.6     12181
GR  47.9   12699   48.1     12807    46.6     13068    46.2     13367    47.4     13489
GR  42.4   13758   41.8     14068    44.9     14127    46.8     14222    48.9     14266
GR  42.2   14433   38.1     14587    45       14654    41.5     14714    46.1     15114
GR  44.8   15161   46.9     15361    41.9     15727    46.7     15845    40.4     16043
GR  28.4   16309   44.9     16440    47.5     16499    43.3     16544    44.6     16859
GR  41.5   17143   44.5     17299    43.5     17474    41.4     17702    41.5     17822
GR   43    18004   61       18708    70       19600    70       23560

QT    4    64830   136080   171320   321910
NC  0.12    0.12   0.03     0.1      0.3
NH    4    .12     13568    0.03     15555    0.08     18896    .12      24402
X1  7.09    67     13568    15555    2000     3600     3538
X3   10                     11840    53.1     20069    57.9
CI  16200   25     0.030    25       10       .01
GR  75.1     0     70.1     2300     60.1     3500     59.1     5310     55.1     7000
GR  52.9   9998    51.2     10405    48.3     10760    46.7     11002    48.1     11096
GR   50    11122   47       11313    46.7     11451    52.6     11572    53.1     11840
GR  52.5   12008   49.5     12394    44.7     12513    43.3     12597    44.3     12738
GR  45.4   12956   46.9     13568    45.2     13743    44.7     13868    43.8     13920
GR  44.8   13990   45.1     14281    44.7     14544    42.4     14583    43.1     14804
GR  41.6   14978   43.4     15013    42.2     15090    30.1     15260    31.6     15364
GR  47.4   15555   46.7     15598    45.5     15789    39.5     15858    36.1     15974
GR  35.8   16133   38.4     16239    42.5     16348    41.8     16564    44       16840
GR  44.7   17493   46.2     17579    44.6     18028    45.1     18178    43.3     18276
GR  43.9   18459   43       18497    44.4     18896    46.2     19531    56.9     19962
GR  57.9   20069   52.9     20275    53.4     20406    49.7     20651    51.5     20718
GR  54.8   21004   54.1     21070    54.3     21465    55       21585    53.8     21703
GR  60.1   22202   65       24402

QT    4    64610   135320   171000   320030
NC   .12    .12    .03      0.1      0.3
NH    5    .12     12000    0.05     14153    0.03     14598    0.05     16383    .12
NH  23100
X1  7.47    66     14153    14598    1500     1500     2006
X3   10                              16383    55.4
GR   75      0     75       4460     64.2     6000     70       6150     61.6     6693
GR  50.3   7163    46.9     7208     49.6     7585     46.7     7595     51       7861
GR  48.9   7931    50.6     8391     48       8503     49.8     8546     51.3     8691
GR  46.2   9217    50.4     9383     51.4     9536     49.2     9569     50.3     9803
GR  53.7   10039   53.5     10532    47.3     10859    48.5     10964    47.2     11235
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GR     45     11328     45.5     11905     48.6     12029     46.4     12059     42     12180
1
  29FEB00     11:00:21                                                    PAGE   8


GR    41.8     12274     44.9     12369     44.2     12639     45.9     12724     44.5     12772
GR    49.7     12832     48.5     12877     50.5     13056     45     13117     45.6     13218
GR    52.7     13383     48.5     13434     47     13591     41.8     13880     45.8     13922
GR    40.9     14010     47     14062     47.7     14153     29     14273     38     14585
GR    44.3     14598     43.4     14737     41.4     14777     40.4     14933     39.8     15545
GR    45.9     15676     48.5     15964     53.4     16211     55.4     16383     53     17600
GR    54     18600     55     18800     60     20560     70     21150     75     22400
GR    75     23100

NC    .12     .12     0.03
X1    8.07     90     5637.46     6519.38     2619.28     3201.18     2891.14
X3    10                3455.36     61.13
GR    73.6     0     71     207.3     67.1     340.91     61.2     454.82     59.8     605.74
GR    63.3     903.8     58.3     1086.61     54     1321.33     54.2     1487.54     47.9     1600.81
GR    55.2     1766.53     53.5     1879.14     56.5     2066.56     53.1     2164.16     54.1     2425.57
GR    56.8     2597.07     52.7     2847.29     53.3     2923.49     50.4     3066.89     51.6     3182.9
GR    58.2     3240.1     61.15     3360     59.6     3625.8     56.1     3784.39     48     3837.18
GR    47     3910.62     41.7     3954.78     48.8     4041.7     47.3     4372.4     43     4430.63
GR    48     4823.38     45.7     5084.92     47.1     5209.7     44.3     5637.46     44.9     5883.73
GR    38.8     5971.26     41.9     6088.05     27.9     6099.51     32.1     6158.61     38.5     6417.39
GR    41.9     6498.6     46.7     6519.38     44.4     6698.82     44.6     6871.35     49.1     7166.61
GR    45.8     7214.35     48.7     7269.55     49.1     7385.35     46.4     7650.65     49.5     7758.86
GR    48.8     7837.12     53     8005.6     54.3     8165.26     54.2     8385.85     47.8     8751.03
GR    48.9     8956.83     47.3     9151.02     48.7     9234.09     48.6     9464.92     47.2     9691.7
GR    44.3     9845.44     44.3     10352.59     48.4     10497.67     48.7     10744.17     46.9     10944.93
GR    53.3     11073.35     58.8     11124.29     58.3     11461.72     60.5     11629.21     59.8     11752.03
GR    66.4     11793.39     67.5     11924.83     70.95     12100     69.2     12409.61     71.8     12474.39
GR    70.4     12728.04     74.2     12870.91     71.6     12991.35     74.9     13090.92     73.1     13188.25
GR    74.6     13307.27     72.3     13497.82     74.7     13757.58     73.4     13964.96     74.3     14201.59
GR    74.4     14577.6     73.6     14996.08     75.1     15169.17     73.7     15240.5     74.4     15481.47

QT     4     63800     132480     169770     315820
NC    .12     .12     .03     .1     .3
X1    8.49     91     2606.42     3168.51     2635.7     1605.14     2374.28
X3    10                               3851.71     54.7
GR    75.9     0     77.6     60     78.05     160     78.05     240     77     331.6
GR    72.3     368.12     69.4     412.95     71.35     460     69.7     534.73     67.2     564.85
GR    74.5     630     74.7     670     65.5     670.12     64.5     720     63.8     753.26
GR    55     814.19     51.2     856.53     46.4     1006.41     44.1     1184.02     46.1     1306.2
GR    45.1     1439.48     43.6     1567.36     42.1     1599.68     42.1     1656.52     45.3     1696.13
GR    46.6     1738.87     48.3     1871.15     45.8     1974.15     46.4     2040.15     43.1     2089.69
GR    43.2     2200.98     44.1     2303.81     45.6     2353.39     42     2371.86     46     2606.42
GR    37.9     2677.54     35.8     2837.08     35.9     2927.48     42.72     2959.44     47.7     3034.05
GR    49.5     3138.67     50.6     3168.51     48.9     3220.17     48.1     3328.05     48.6     3423.1
GR    50.4     3455.47     50.3     3565.82     52.2     3627.93     52.2     3679.39     54.7     3851.71
GR    53     3892.8     53.4     3940     51.9     3961.68     52     4079.34     52.9     4194.97
GR    55.8     4300     53.2     4350.46     54.7     4373.98     54.9     4425.24     53.8     4458.24
GR    54.6     4581.48     52.7     4690.43     53.9     4730     51.5     4768.99     52.7     4822.83
GR    50.7     4928.57     51.9     4949.8     52     5005.14     50.3     5083.53     51.9     5220.22
GR    50.4     5255.77     53.4     5329.85     55.9     5449.87     55.5     5530.76     52.5     5591.67
GR    51.4     5649.44     51.6     5719.53     50.4     5823.06     49.6     5989.14     44.2     6040.25
GR    44.2     6435.82     46.9     6530.15     48.9     6665.49     47.3     6720.92     47.2     6911.52
GR    55.6     6971.41     58.5     6998.91     61.3     7081.43     63.5     7116.99     66.48     7723.78
GR    71     8000
1
  29FEB00     11:00:21                                                    PAGE   9


QT     4     63510     131460     169330     314100
NH     5     .1     2567.98     .05     3385.13     0.03     3879.38     0.05     5000     .12
NH    10500
X1    9.41     94     3385.13     3879.38     2500     5500     4858
X3    10                2460.63     56.91
GR    78.4     0     78.9     96.63     78.6     295.76     79.3     365.11     78.2     423.8
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GR   75.8   443.45   74.1   492.25   74.8   526.38   74.15   600   72.6   630
GR   72.8   670   65.3   721.32   60.2   753.27   56   813.24   54.4   854.41
GR   53.3   926.96   53   1014.31   51.5   1058.06   51.5   1133.33   50.5   1273.69
GR   51.4   1346.4   50.8   1454.34   51.1   1532.43   51.1   1736.18   51.8   1783.17
GR   51.8   1941.56   52.4   2003.11   53   2145.32   54.5   2316.56   56.8   2442.42
GR   56   2567.98   52.5   2621.33   52.4   2659.43   50.1   2775.83   49.4   2837.01
GR   50   3033.7   50.9   3141.06   43.5   3205.33   43.5   3281.17   51.8   3332.56
GR   53.3   3385.13   50.4   3417.41   45.2   3426.19   42.2   3442.41   42   3470.88
GR   38.1   3486.5   35.8   3658.23   36.2   3685.31   35.5   3798.17   42.72   3824.76
GR   48.2   3859.77   49.5   3879.38   44.1   3976.38   42.2   4082.27   42.2   4146.99
GR   43.8   4423.62   42.2   4450.81   48.9   4745.31   49.4   4914.17   48.4   5008.36
GR   48   5245.57   48.8   5332.6   48.1   5518.1   48.9   5669.75   47.9   5765.59
GR   50.2   5868.37   50.4   5903.32   49.4   6014   51   6193.43   53   6341.86
GR   52.1   6387.7   48.7   6470.08   48.4   6596.07   49.1   6831.48   48.1   6961
GR   49.1   7045.17   49.1   7203.02   48.4   7256.07   48.4   7513   50.4   7516.71
GR   49.7   7570.46   50.7   7615.19   48.4   7638.95   50.9   7797.35   55.4   7851.87
GR   57.57   7854.93   59.40   7877   61.45   7882.66   63   8000   64   8500
GR   64.3   8700   62   9300   67   10000   75   10500

QT   4   62850   129130   168330   309220
NC   .1   .12   0.03   .1   .3
X1   10.58   76   2518.22   3181.69   2700   3200   6177
X3   10      1431.19   55.17   8020   59.05
GR   75.8   0   75.6   63.6   60.9   180.78   56.7   260.63   55.3   400
GR   54.85   520   54   579.97   53.5   709.98   51.1   790.94   50.6   912.57
GR   49.1   1025.2   49.2   1101.07   53.7   1157.02   54.5   1384   55.5   1418.21
GR   54.9   1763.41   52.9   1902.66   54.8   2083.95   54.5   2206.57   53   2255.4
GR   52.8   2438.35   53.6   2518.22   42.4   2566.64   40.3   2590.99   29.8   2603.35
GR   22.1   2654.44   22.5   2685.55   31.1   2771.89   34.7   2844.63   41.9   2867.55
GR   50.1   2913.09   48.2   3126.19   50.5   3181.69   49.3   3252.87   46.5   3306.48
GR   50.3   3409.33   47.5   3613.61   52.7   3701.6   50.2   3854.05   47.2   3900.8
GR   42.7   3930.19   44.6   3976.89   46.3   4107.08   50   4195.39   48.7   5535.67
GR   48.7   5863.58   49   5916.48   50.6   6045.31   49.2   7520.57   53.5   7702.66
GR   59.05   8020   59.3   8120   57.1   8360.19   57.2   8644.55   54.9   8710.45
GR   60.1   8984.95   59.4   9100.32   61.6   9300   63.4   9619.42   62.4   9928.89
GR   62.5   10100.96   64.8   10231.72   63   10264.23   65.3   10573.06   65.9   10735.19
GR   71.55   10860   72.2   10980   74.25   11110   73.2   11255   73.3   11458.81
GR   74.9   11812.08   74.7   12055.58   76.1   12161.3   75.45   12360   76.75   12560
GR   78.5   12699.89

QT   4   62690   128570   168090   310160
NC   .1   .12   .03   .1   .3
NH   3   .1   3262   .03   4059   .12   13987
1
  29FEB00   11:00:21                                   PAGE  10


X1   10.86   43   3262   4059   1300   1100   1478
X3   10                          8865   62.3
GR   79.8   0   77.6   161   79.4   259   77.6   579   79.7   955
GR   78.9   1110   72.6   1684   52.3   1914   49.3   2212   50.4   2314
GR   52.2   3262   35.4   3575   31.7   3805   32.7   3875   52.4   4059
GR   46.4   4251   49   4323   45   4835   48.9   4896   44.9   5078
GR   47.3   5583   44.5   5654   43.2   5785   44.5   5945   41.7   6053
GR   57.6   6350   59.1   7698   60.1   8650   62.3   8865   59.2   9382
GR   61.6   9677   59.4   9772   60.6   9852   57.7   10128   56.7   10420
GR   54.4   10557   55.8   10709   60.7   11077   63.7   11730   72.9   12060
GR   74.4   13267   75.8   13671   79.7   13987

QT   4   62560   128120   167890   308450
NH   4   .12   2522.57   .05   3311.71   .03   3943.85   .12   13549.31
X1   11.09   82   3311.71   3943.85   1400   1600   1214
X3   10      3311.71   53.3   6949.97   63.7
GR   77.9   0   78.6   449.85   74   650.88   61.2   796.99   53.8   853.81
GR   51.5   1009.93   52.1   1209.82   51.1   1415.55   52.9   1698.13   53.4   1881.01
GR   54.3   2005.52   54.3   2131.11   52.6   2522.57   52.3   2664.39   42.5   2721.63
GR   42.5   3112.03   45.4   3215.1   53.3   3311.71   51   3378.76   45   3400
GR   42.5   3427.89   34.6   3459.26   31.8   3669.22   36   3729.17   42   3745.04
GR   50.1   3767.43   55.5   3802.55   57   3943.85   52   4107.84   50.5   4209.1
GR   53.1   4359.76   56.2   4405.38   56.4   4699.98   55   4860.97   56.5   4932.99
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GR   54.4  5041.53    50.1     5150     52.2   5287.22    53.6   5519.22    51.9   5703.27
GR     52     5900    51.8     6040       52      6160    53.2      6300    54.5      6450
GR   57.8     6690    63.7  6949.97     63.9   7208.78    62.9   7282.45    61.9   7559.06
GR   59.2  7996.95    57.3     8229     58.1      8331    63.7      8477    61.2    8548.1
GR   62.8  8733.88    62.1  8893.69     62.3   9162.78    59.8   9368.39   62.65      9510
GR   62.2     9630    60.2  9723.91     61.8   9807.54    62.8  10002.69    59.7  10225.58
GR   62.6 10311.07    60.9 10350.09     62.5  10478.43    60.8  10575.85    64.4  11234.07
GR   67.3 11355.29    71.8 11460.13     75.3  11489.48   75.05     11790    74.1  11874.14
GR   74.1 12095.62    75.2 12273.93     75.5  12508.24    74.6  12649.39      76  13085.66
GR   74.3  13286.4    79.6 13549.31

QT      4    62410  127600   167670   307570
NC    .12      .12     .03       .3       .5
X1  11.35       89 2958.98  3804.94     1000      2300    1373
X3     10                      2199       58   6519.75    65.5
GR  75.43        0      66   155.36     64.3    287.39    63.9    438.76    60.9    535.19
GR   54.9   626.91      52   787.68     53.3    980.78    52.8   1186.05    55.1   1413.79
GR   55.2  1604.36    56.9  1641.25       57   1786.87   56.25      1790    56.3   2127.54
GR   58.1  2185.43    54.8  2259.37     54.4   2456.59    50.5   2653.09    51.8   2802.23
GR   53.9  2832.46    52.8  2958.98     44.7   3090.28    48.1   3150.77   37.64   3267.77
GR  38.74  3336.43   28.84  3406.43    29.04   3461.55   36.14      3538    42.5   3671.55
GR   52.6  3804.94    47.4  3855.04     47.9   3919.98    43.7   3952.95    42.6   4050.14
GR   44.3  4431.03    41.9  4584.19       47    4826.5    42.5   4859.87    42.6   4957.91
GR   48.7  5021.15    49.2  5059.55     43.9    5090.8    44.7   5266.47    43.2   5349.68
GR   50.2  5459.53    52.4  5575.87     50.4   5703.12    51.9   5904.76    49.1   6073.64
GR   49.1  6167.73    51.3  6273.19     59.7   6409.59    65.5   6519.75    65.7   6635.31
GR   63.6  6757.16      63  7060.24     63.3   7375.88      66      7690    64.7   7907.84
GR   65.5   7969.4    64.1   8340.7     64.9   8381.19    64.1   8668.42      62   8835.44
GR   62.5  8946.12    65.3  9083.61     63.6   9200.98   64.35      9450      63   9781.97
GR   63.1  10165.1    65.1 10443.04     64.4  10755.85    64.5  10988.16    68.1  11162.12
GR  71.35    11220    71.9 11348.07     74.6  11434.99    75.9  11601.85   78.45     11650
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GR   79.6    11960    81.1 12067.18     79.5  12180.83    80.3  12422.88    84.2  12477.71
GR  85.05    12580    83.5 12625.42     84.2     12770    82.9   13330.5

X1  11.38       85   19900    21000     1000      2300    1373      0.00      -1         0
X3     10      0.0     0.0      0.0      0.0       0.0     0.0       0.0     0.0       0.0
GR  85.00  14899.0   85.00  14900.0    85.00   16700.0   80.00   16850.0   75.00   16950.0
GR  70.00  17099.0   70.00  17100.0    65.00   17150.0   60.00   17350.0   55.00   17800.0
GR  65.90  19700.0   66.80  19800.0    67.30   19900.0   61.80   20000.0   60.70   20001.0
GR  55.60  20014.9   49.10  20030.0    44.10   20045.4   43.40   20060.3   45.20   20075.3
GR  45.80  20090.3   46.20  20105.3    45.30   20120.1   45.90   20136.6   46.00   20153.3
GR  45.30  20169.6   44.30  20186.2    44.70   20202.8   45.10   20219.6   45.00   20236.2
GR  45.30  20252.7   45.20  20269.3    45.20   20286.0   44.30   20302.6   43.70   20319.4
GR  40.00  20335.8   42.60  20352.5    38.10   20368.8   33.60   20385.4   35.50   20402.0
GR  33.20  20416.3   32.40  20430.0    31.70   20450.0   36.40   20470.0   34.80   20492.0
GR  37.60  20510.0   38.00  20527.2    38.30   20535.0   38.00   20565.0   37.40   20590.0
GR  37.00  20600.3   34.80  20615.0    27.80   20630.0   34.80   20645.0   36.30   20655.1
GR  39.20  20674.3   40.60  20693.3    38.60   20712.1   42.40   20731.4   43.50   20735.0
GR  47.40  20750.7   48.20  20769.8    47.20   20789.0   47.50   20808.0   47.50   20865.1
GR  47.80  20865.2   48.10  20884.2    47.90   20903.3   48.10   20922.3   48.70   20941.3
GR  54.90  20960.4   63.70  20978.7    63.90   20979.5   65.00   21000.0   64.30   21100.0
GR  55.00  22000.0   55.00  24800.0    60.00   25000.0   65.00   26200.0   65.00   26500.0
GR  70.00  27700.0   75.00  27800.0    80.00   28300.0   85.00   29700.0   90.00   30100.0

SB   1.25     1.50    2.60      0.0    189.0      20.4 22729.0     10.20   27.80     27.80
ET                                       9.1                19900    21000
X1  11.39        0     0.0      0.0     50.0      50.0    50.0      0.00    0.00         0
X2      0     0.00       1    67.20    68.30      0.00       0      0.00    0.00         0
X3     10      0.0     0.0      0.0      0.0       0.0     0.0       0.0     0.0       0.0
BT     33  14899.0    87.0      0.0  16700.0      87.0     0.0   17000.0    85.0       0.0
BT  17560     80.0     0.0  18100.0     75.0       0.0 19200.0      70.0     0.0   19201.0
BT   70.0      0.0 20000.0     68.3      0.0   20000.1    68.3      65.7 20120.1      69.1
BT   66.7  20201.2    69.1     66.0  20416.3      69.8    67.1   20416.4    69.8      66.5
BT  20492     69.8    66.8  20492.1     69.8      65.1 20655.1      69.8    65.1   20655.2
BT   69.8     67.2 20978.7     68.8     65.6   20978.8    68.8       0.0 21000.0      68.0
BT    0.0  21100.0    67.3      0.0  21200.0      66.3     0.0   21201.0    66.3       0.0
```

```
BT   23250     62.0     0.0   25100.0     65.0     0.0   26200.0     65.0     0.0   26400.0
BT    65.0      0.0  26700.0     70.0      0.0  27650.0     75.0      0.0  28150.0     82.0
BT     0.0  28750.0     87.0      0.0  29000.0     92.0      0.0  30300.0     92.0      0.0

ET                                       8.41
X1    11.4      89  2958.98  3804.94     50.0     50.0     50.0     0.00     0.00        0
X3      10               2199       58  6519.75     65.5
GR   75.43       0       66   155.36     64.3   287.39     63.9   438.76     60.9   535.19
GR    54.9  626.91       52   787.68     53.3   980.78     52.8  1186.05     55.1  1413.79
GR    55.2 1604.36     56.9  1641.25       57  1786.87    56.25     1790     56.3  2127.54
GR    58.1 2185.43     54.8  2259.37     54.4  2456.59     50.5  2653.09     51.8  2802.23
GR    53.9 2832.46     52.8  2958.98     44.7  3090.28     48.1  3150.77    37.64  3267.77
GR   38.74 3336.43    28.84  3406.43    29.04  3461.55    36.14     3538     42.5  3671.55
GR    52.6 3804.94     47.4  3855.04     47.9  3919.98     43.7  3952.95     42.6  4050.14
GR    44.3 4431.03     41.9  4584.19       47   4826.5     42.5  4859.87     42.6  4957.91
GR    48.7 5021.15     49.2  5059.55     43.9   5090.8     44.7  5266.47     43.2  5349.68
GR    50.2 5459.53     52.4  5575.87     50.4  5703.12     51.9  5904.76     49.1  6073.64
GR    49.1 6167.73     51.3  6273.19     59.7  6409.59     65.5  6519.75     65.7  6635.31
GR    63.6 6757.16       63  7060.24     63.3  7375.88       66     7690     64.7  7907.84
1
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GR    65.5  7969.4     64.1   8340.7     64.9  8381.19     64.1  8668.42       62  8835.44
GR    62.5 8946.12     65.3  9083.61     63.6  9200.98    64.35     9450       63  9781.97
GR    63.1 10165.1     65.1 10443.04     64.4 10755.85     64.5 10988.16     68.1 11162.12
GR   71.35   11220     71.9 11348.07     74.6 11434.99     75.9 11601.85    78.45    11650
GR    79.6   11960     81.1 12067.18     79.5 12180.83     80.3 12422.88     84.2 12477.71
GR   85.05   12580     83.5 12625.42     84.2    12770     82.9  13330.5

QT       4   62340   127340   167560   307140        0        0        0        0
NC     .12     .12      .03       .1       .3
NH       3    .120  3153.07     .030  3834.77     .120 14239.64
X1   11.48      83  3153.07  3834.77      400      700      370                -1
X3      10              1998.35    56.86
GR   76.29       0     74.2   141.74     72.1   251.69     67.3   387.98     65.6   572.84
GR    64.9  799.64     56.3  1051.78     56.7   1284.7     55.8  1423.54     57.5  1735.27
GR    55.8 1865.38     57.9  1950.43       57  2115.34     51.9  2192.24     51.6  2676.44
GR    48.1 2772.19     51.5   2897.5     47.5  3079.27     49.6  3153.07     48.4  3217.84
GR    40.8 3263.45     46.8  3312.88    38.33  3352.99    32.93   3453.9    28.63  3598.06
GR   22.83 3619.02    25.93  3642.69    21.73  3663.26    28.63  3710.06    40.09  3750.18
GR    50.5 3834.77     52.5  4098.58     52.5  4266.28     50.2  4616.96     53.2  5256.55
GR    55.8 5417.16     49.5  5542.31     49.6  5811.88     52.8  5944.08     50.5  6026.29
GR    49.2 6139.42     50.6  6300.68     60.8  6368.78     60.8  6489.41     52.1  6544.58
GR    49.1 6582.93     49.6  6866.77     53.6  6999.45     52.4  7192.35     55.8  7242.29
GR    52.1 7310.92     57.4   7392.7     58.9  7486.54     57.8   7527.2     59.3  7858.55
GR    62.3 8313.45     62.3   8520.5     63.1  8579.97     63.8  8874.31     63.1  9022.65
GR    64.7 9319.75       64  9847.05       66 10324.86     67.2 10502.28     70.9 10689.92
GR    75.6 10862.29      80 11138.46     81.4 11329.98     82.6 11935.13     82.6 12152.77
GR      84 12494.73    86.9 12751.65       91 12961.31     96.3 13165.82     98.2 13409.92
GR    97.1 13499.57    82.3 13562.28     82.6 13710.72     93.2 13739.27     91.2 13843.55
GR    84.7 14008.62    85.8 14187.33     84.3 14239.64

QT       4   62300   127200   167500   306900
NC     .12     .12      .03       .6       .8
X1   11.55      73     3153     3835    400.0    400.0    370.0     0.00        0
X3      10     0.0      0.0     1950     57.9      0.0      0.0      0.0
GR    75.4       0     74.2      142     67.3      388     65.6      573     64.9      800
GR    51.7     898     56.3     1052     56.7     1285     55.8     1424     51.7     1438
GR    51.7    1636     57.5     1735     57.9     1950       57     2115     51.9     2192
GR    51.6    2676     48.1     2772     51.5     2898     47.5     3079     49.6     3153
GR    48.4    3218     46.8     3313    38.33     3353    28.63     3598    22.83     3619
GR   25.93    3643    21.73     3663    28.63     3710    40.09     3750     50.5     3835
GR    52.5    4099     52.5     4266     50.2     4617     44.2     4679     44.3     5110
GR    53.2    5257     55.8     5417     49.5     5542     49.6     5812     52.8     5944
GR    50.5    6026     49.2     6139     50.6     6301     60.8     6369     60.8     6489
GR    52.1    6545     49.1     6583     49.6     6867     53.6     6999     52.4     7192
GR    52.1    7311     58.9     7487     59.3     7859     62.3     8313     62.3     8521
GR    63.1    8580     63.8     8874     63.1     9023     64.7     9320       64     9847
GR      66   10325     67.2    10502     70.9    10690     75.6    10862       80    11138
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GR   81.4    11330    82.6    11935    82.6    12153    84    12495    86.9    12752
GR   91      12961    96.3    13166    98.2    13410
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NH    4    .100  18850.0   .100  20250.0   .030  21748.6   .120  28900.0   0.000
X1  11.569    83   20250  21768.7    100     100     100    0.00    0.00     0
X3   10    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
GR  84.00  16850.0  80.00  17250.0  80.00  17251.0  80.00  17252.0  75.00  18025.0
GR  70.00  18075.0  65.00  18125.0  60.00  18200.0  60.00  18201.0  60.00  18202.0
GR  60.00  18450.0  60.00  18500.0  60.00  18600.0  60.00  18850.0  55.00  19350.0
GR  55.00  19351.0  68.70  20250.0  49.80  20287.0  49.30  20323.0  48.30  20340.0
GR  49.80  20360.4  48.40  20389.0  50.50  20396.9  48.10  20458.0  44.50  20495.0
GR  44.20  20506.1  45.40  20560.0  44.50  20600.0  45.00  20650.0  47.20  20711.0
GR  44.00  20721.0  42.80  20746.0  43.30  20770.0  35.50  20800.0  33.50  20820.0
GR  26.50  20920.0  24.10  20930.0  31.40  20940.0  25.40  20944.1  29.70  20960.0
GR  30.60  20970.0  33.20  20980.0  33.20  20981.0  35.00  20990.0  35.90  21000.0
GR  38.40  21010.0  38.40  21017.3  43.43  21039.0  45.80  21089.5  46.80  21162.7
GR  46.40  21176.0  51.80  21206.0  51.90  21232.0  49.40  21259.0  50.00  21273.8
GR  49.20  21310.3  50.70  21494.0  49.40  21530.9  49.60  21603.9  49.10  21640.4
GR  51.49  21677.0  51.80  21707.0  55.10  21739.0  60.90  21748.6  67.10  21768.7
GR  64.20  21850.0  63.70  21970.0  61.00  22199.0  61.00  22200.0  60.00  22500.
GR  55.00  23000.0  50.00  23400.0  50.00  23450.0  55.00  23700.0  55.00  24950.
GR  60.00  25700.0  65.00  25900.0  70.00  27700.0  75.00  27900.0  80.00  28150.
GR  85.00  28450.0  90.00  28700.0  90.50  28900.0   0.00    0.0

SB   1.25   2.31   2.60   0.0    50    46   32375    20    24.1   24.1
NC   .120   .120   .035   .3    .5
X1  11.660    91  20226.0  21910.0    480     480     480    0.00     0
X2   0.0    0.0     1   63.08   69.07    0.0    0.0    0.0    0.0    0.0
X3   10    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
BT   27  16200.0   68.99    0.0  17200.0   64.77    0.0  17500.0   63.51    0.0
BT 18300.   67.62    0.0  18301.0   67.63    0.0  18669.0   72.15    0.0  19195.0
BT  71.42    0.0  20000.0   67.97    0.0  20100.0   68.42    0.0  20200   68.87
BT   0.0  20235.8   69.04   69.04  20242.8   69.07   63.08  20573.0   70.56   64.57
BT 20903.   72.04   66.05  21141.3   72.66   66.67  21563.0   71.21   65.22  21893.1
BT  69.73   63.74  21900.0   69.70   69.70  22000.0   69.24    0.0  22274.7   68.01
BT   0.0  22700.0   66.10    0.0  23449.7   65.50    0.0  24374.7   69.44    0.0
BT 26274.   85.80    0.0  28000.0   85.80    0.0  28300.0   85.80    0.0  28900.0
BT  90.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
GR  85.00  16200.0  85.00  16500.0  80.00  18100.0  75.00  18350.0  65.00  18500.0
GR  60.00  18800.0  55.00  19200.0  50.00  19600.0  50.00  19601.0  68.90  20226.0
GR  64.97  20235.8  62.60  20237.6  48.40  20267.5  48.30  20295.5  49.00  20308.0
GR  49.20  20362.0  46.80  20375.5  45.60  20394.0  43.70  20400.0  42.60  20435.5
GR  44.30  20466.0  44.80  20492.0  45.80  20495.5  47.70  20555.5  47.60  20616.0
GR  48.00  20676.0  47.00  20736.0  45.70  20796.1  46.30  20877.7  46.70  20877.7
GR  45.70  20909.0  43.90  20924.0  42.90  20935.0  39.10  20940.0  37.20  20955.0
GR  37.50  20958.3  38.40  20970.0  37.40  20980.0  36.10  20990.0  34.80  21010.0
GR  33.80  21020.0  29.40  21030.0  30.40  21039.6  27.20  21050.0  28.80  21060.0
GR  27.60  21065.8  26.10  21080.0  22.00  21100.0  19.80  21110.0  20.40  21120.7
GR  24.20  21130.0  28.20  21140.0  29.90  21155.0  37.00  21160.0  41.00  21170.0
GR  43.40  21179.0  45.10  21181.0  45.70  21183.0  46.30  21210.0  49.10  21232.0
GR  48.40  21241.0  51.90  21258.0  52.00  21286.0  50.30  21301.0  49.90  21421.0
GR  49.40  21481.0  49.70  21541.0  49.00  21600.7  48.80  21625.0  44.60  21680.0
GR  47.20  21703.0  46.40  21721.2  47.30  21781.2  49.50  21800.0  49.10  21841.0
GR  51.60  21877.0  62.10  21898.3  64.35  21900.0  68.20  21910.0  64.00  22000.0
GR  64.40  22100.0  60.00  22700.0  50.00  23500.0  55.00  24100.0  60.00  25600.0
GR  65.00  26000.0  70.00  27700.0  75.00  27800.0  85.00  28400.0  90.00  28700.0
```



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GR  90.50  28900.0   0.00    0.0   0.00    0.0   0.00    0.0   0.00    0.0

X1  11.679    73    3153    3835    100    100    100    0.00    0.00     0
X3   10    0.0    0.0   1950    57    0.0    0.0    0.0
GR  75.4     0    74.2    142    67.3    388    65.6    573    64.9    800
GR  51.7   898    56.3   1052    56.7   1285    55.8   1424    51.7   1438
```

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GR   51.7    1636   57.5    1735   57.9    1950    57    2115   51.9    2192
GR   51.6    2676   48.1    2772   51.5    2898   47.5   3079   49.6    3153
GR   48.4    3218   46.8    3313  38.33    3353  28.63   3598  22.83    3619
GR  25.93    3643  21.73    3663  28.63    3710  40.09   3750   50.5    3835
GR   52.5    4099   52.5    4266   50.2    4617   44.2   4679   44.3    5110
GR   53.2    5257   55.8    5417   49.5    5542   49.6   5812   52.8    5944
GR   50.5    6026   49.2    6139   50.6    6301   60.8   6369   60.8    6489
GR   52.1    6545   49.1    6583   49.6    6867   53.6   6999   52.4    7192
GR   52.1    7311   58.9    7487   59.3    7859   62.3   8313   62.3    8521
GR   63.1    8580   63.8    8874   63.1    9023   64.7   9320     64    9847
GR     66   10325   67.2   10502   70.9   10690   75.6  10862     80   11138
GR   81.4   11330   82.6   11935   82.6   12153     84  12495   86.9   12752
GR     91   12961   96.3   13166   98.2   13410

QT      4   62060  126360  167140  305490
NC   .120    .120    .030      .1      .3
X1  11.97      84 2273.46 2827.03     802    5043    2118
X3     10          1105.39   52.5    9060    74.8
GR  78.23        0   64.2  174.04   63.5  501.47   62.4  571.34   57.3  671.03
GR   46.1    969.8   52.3 1075.96   49.9 1240.38   49.5  1362.1   47.4 1575.32
GR   49.6   1774.8   45.3 2044.49   47.5 2118.35   44.4 2165.58   46.6 2273.46
GR  35.52  2351.83  41.02 2371.83  32.22 2411.83  31.72 2441.83  37.12 2621.82
GR   45.7  2759.78   44.7 2827.03   45.5 2960.44   44.9 3171.29   46.7    3200
GR   46.4  3463.72     47 3583.97   44.6 3643.28     45 3872.88     47 3996.03
GR   53.2  4123.35   60.5  4270.1   60.5 4509.54   57.2 4775.48     58 5148.72
GR   56.2  5363.59   55.1  5699.3   49.4 5956.27   49.6 6073.28   48.3 6272.85
GR     51  6381.63   52.1 6574.09   51.8 6814.08   53.2 6887.03   50.2 7041.29
GR   53.5  7127.14   51.6 7442.96   56.9 7800.49   62.4 7837.71   64.9 7999.27
GR   67.4  8385.92   67.1 8424.35   74.8    9060   66.9    9130  66.35    9190
GR   65.8   9282.6   53.6  9356.5   55.7 9527.42   58.8 9587.89   70.2 9638.17
GR   72.9  9884.04     75 10154.89  75.2 10427.45  76.1 10520.96  76.1 10769.8
GR   90.2    10830   91.8 11098.11  89.8 11321.02  86.3 11634.53  85.4 11757.32
GR   86.8 11952.18   85.2 12112.75  87.5 12345.14  83.2 12384.16  89.1 12447.67
GR   85.9 12555.51   90.4    12650  84.7 12970.55  83.1 13224.85    84 13312.97
GR     83 13508.04   84.5  13657.9  83.9 13887.88  86.8 14077.83


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=    .100 CEHV=    .300
*SECNO 7.610
   7.610   31.00   50.50     .00   50.50   50.53     .03     .00     .00   41.20
 214619.0   293.1 214316.7     9.2  1439.3 149155.0   63.2      .0      .0   40.60
     .00     .20    1.44     .15    .110    .030    .110    .000   19.50 19703.00
 .000019      0.      0.      0.       0       0       0     .00 8934.76 28637.76


*SECNO 7.760
   7.760   31.92   50.52     .00     .00   50.55     .03     .01     .00   58.00
 214619.0      .0 214619.0      .0      .0 157541.8     .0  2901.3   166.2   60.00
     .17     .00    1.36     .00    .000    .030    .000    .000   18.60  897.88
 .000016    850.    820.    800.       0       0       0     .00 8707.34 9605.22


*SECNO 8.180
```

```
3265 DIVIDED FLOW

3280 CROSS SECTION     8.18 EXTENDED      .55 FEET

   8.180    33.96    50.56      .00      .00    50.58      .02      .03      .00    62.00
 214619.0       .0 214618.6       .4       .0 176721.7     17.5  11327.4    634.7    50.00
    .67      .00     1.21      .02     .000     .030     .110     .000    16.60   310.89
  .000013    2044.    2196.    2141.        0        0        0      .00  9883.41 11235.27


*SECNO 8.670
3280 CROSS SECTION     8.67 EXTENDED      .60 FEET

   8.670    30.00    50.60      .00      .00    50.62      .02      .04      .00    44.00
 214619.0  12738.0 201867.1     13.9  46393.2 162616.1    345.2  25446.4   1713.0    50.00
   1.28      .27     1.24      .04     .110     .030     .110     .000    20.60   294.31
  .000018    9000.    2391.    3177.        2        0        0      .00 16426.69 16721.00


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  29FEB00    11:00:21                                                   PAGE  16


   SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL    OLOSS  L-BANK ELEV
   Q         QLOB      QCH     QROB     ALOB      ACH     AROB      VOL      TWA  R-BANK ELEV
   TIME     VLOB      VCH     VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
   SLOPE    XLOBL     XLCH    XLOBR   ITRIAL      IDC    ICONT    CORAR   TOPWID    ENDST


*SECNO 9.250

3265 DIVIDED FLOW

3280 CROSS SECTION     9.25 EXTENDED     4.64 FEET

   9.250    29.05    50.65      .00      .00    50.68      .02      .06      .00    42.00
 214619.0   2726.9 211540.1    352.0  10709.9 165782.3   2916.1  39205.9   2815.6    42.00
   1.95      .25     1.28      .12     .110     .030     .110     .000    21.60   170.75
  .000020    3200.    3062.    3200.        0        0        0      .00 14589.90 15542.67


CCHV=    .100 CEHV=    .300
*SECNO 3.615
CHIMP CLSTA=   5720.00 CELCH=     20.00 BW=    200.00 STCHL=   2366.85 STCHR=   6339.87
EXCAVATION DATA
AEX=   7544.3SQ-FT    VEXR=       .0K*CU-YD    VEXT=        .0K*CU-YD


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .38


3470 ENCROACHMENT STATIONS=     1232.0    8990.0  TYPE=      1  TARGET=    -1232.040
 ELENCL=     54.70  ELENCR= 100000.00
   3.615    30.78    50.78      .00      .00    50.90      .12      .19      .03    41.60
 174300.0   1181.7 168597.7   4520.6   3634.6  59058.9  11231.3  52492.4   3904.3    43.63
   2.41      .33     2.85      .40     .120     .030     .120     .000    20.00  1279.54
  .000091    7700.    4594.    1000.        2        0        0      .00  7157.91  8437.45


*SECNO 4.745
CHIMP CLSTA=   3040.00 CELCH=     21.00 BW=    200.00 STCHL=   2373.40 STCHR=   6703.71
EXCAVATION DATA
AEX=   6703.4SQ-FT    VEXR=    1574.1K*CU-YD    VEXT=     1574.1K*CU-YD


3470 ENCROACHMENT STATIONS=     1973.4    6985.6  TYPE=      1  TARGET=     5012.200
 ELENCL=     52.00  ELENCR=     48.60
   4.745    30.36    51.36      .00      .00    51.50      .13      .59      .00    51.10
 173330.0       .5 172552.0    777.5     15.3  58678.3   2767.9  61429.0   4678.6    47.20
```

```
  2.97     .03    2.94     .28    .120    .030    .120    .000    21.00  2256.80
 .000109   3600.   5966.   4500.      2       0       0     .00  5368.77  7625.57
```



```
 SECNO  DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS  L-BANK ELEV
 Q      QLOB    QCH     QROB    ALOB     ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME   VLOB    VCH     VROB    XNL      XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE  XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT  CORAR  TOPWID ENDST


CCHV=   .300 CEHV=    .500
*SECNO 5.026

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .69


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       57.00

   5.026    30.06    51.56     .00     .00    51.81     .25     .25     .06   56.20
 173080.0      .0 173080.0      .0      .0  43150.8      .0  63293.2  4856.7   57.00
    3.08     .00     4.01     .00    .000     .030    .000    .000   21.50  9613.00
 .000229    1030.    1482.   4150.      2        0       0     .00  3479.51 13092.51


*SECNO 5.027

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       56.00

   5.027    30.06    51.56     .00     .00    51.81     .25     .00     .00   56.20
 173080.0      .0 173080.0      .0      .0  43002.7      .0  63294.2  4856.8   56.00
    3.08     .00     4.02     .00    .000     .030    .000    .000   21.50  9616.77
 .000237      1.       1.      1.      0        0       0     .00  3406.69 13038.19


*SECNO 5.034

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       56.20 ELREA=       56.00

   5.034    30.07    51.57     .00     .00    51.82     .25     .01     .00   56.20
 173080.0      .0 173080.0      .0      .0  43037.3      .0  63340.6  4860.5   56.00
    3.08     .00     4.02     .00    .000     .030    .000    .000   21.50  9616.73
 .000236     47.      47.     47.      0        0       0     .00  3406.89 13038.25
```



```
 SECNO  DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS  L-BANK ELEV
 Q      QLOB    QCH     QROB    ALOB     ACH    AROB   VOL    TWA    R-BANK ELEV
 TIME   VLOB    VCH     VROB    XNL      XNCH   XNR    WTN    ELMIN  SSTA
 SLOPE  XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT  CORAR  TOPWID ENDST
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```
*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     57.00

   5.035   30.07   51.57    .00    .00   51.82    .25    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 43153.8     .0 63341.6  4860.6   57.00
   3.08     .00    4.01    .00   .000    .030   .000   .000   21.50 9612.96
 .000229      1.      1.     1.      0      0      0    .00 3479.67 13092.63


*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     57.00

   5.037   30.07   51.57    .00    .00   51.82    .25    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 43166.4     .0 63349.5  4861.2   57.00
   3.08     .00    4.01    .00   .000    .030   .000   .000   21.50 9612.95
 .000229      8.      8.     8.      0      0      0    .00 3479.72 13092.68


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  0 MIN ELTRD=  58.25 MAX ELLC=  52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     56.00

   5.038   30.06   51.56    .00    .00   51.83    .27    .00    .01   56.20
 173080.0      .0 173080.0     .0     .0 41841.0     .0 63350.5  4861.3   56.00
   3.08     .00    4.14    .00   .000    .030   .000   .000   21.50 9616.71
 .000257      1.      1.     1.      0      0      0    .00 3397.29 13038.28


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  0 MIN ELTRD=  58.25 MAX ELLC=  52.50
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  SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
  Q      QLOB   QCH    QROB   ALOB   ACH    AROB   VOL    TWA   R-BANK ELEV
  TIME   VLOB   VCH    VROB   XNL    XNCH   XNR    WTN    ELMIN  SSTA
  SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC    ICONT  CORAR  TOPWID ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     56.00

   5.045   30.08   51.58    .00    .00   51.84    .27    .01    .00   56.20
 173080.0      .0 173080.0     .0     .0 41852.6     .0 63395.7  4865.0   56.00
   3.08     .00    4.14    .00   .000    .030   .000   .000   21.50 9616.70
 .000257     47.     47.    47.      0      0      0    .00 3397.41 13038.30


CCHV=   .100 CEHV=    .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     57.00

   5.046   30.09   51.59    .00    .00   51.84    .25    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 43211.9     .0 63396.6  4865.0   57.00
   3.08     .00    4.01    .00   .000    .030   .000   .000   21.50 9612.91
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```
 .000228     1.      1.      1.       1       0       0      .00  3479.92  13092.83


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 5.585
CHIMP CLSTA=  10681.00 CELCH=     23.00 BW=    200.00 STCHL=   10172.58 STCHR=   11165.02
EXCAVATION DATA
AEX=   4079.1SQ-FT    VEXR=     568.5K*CU-YD    VEXT=     2142.6K*CU-YD

   5.585    29.25    52.25      .00      .00    52.42      .16      .57      .01    43.42
 172610.0  92927.1  79661.4     21.5  56404.8  17889.3    112.2  67120.4   5285.7    49.80
    3.35     1.65     4.45      .19     .049     .031     .120     .000    23.00  1255.97
 .000182    2664.    2847.    1744.       2       0       0      .00 10000.52  11256.49


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 6.420
CHIMP CLSTA=  16190.00 CELCH=     24.00 BW=    200.00 STCHL=   15729.76 STCHR=   16499.00
EXCAVATION DATA
AEX=   6018.5SQ-FT    VEXR=     824.5K*CU-YD    VEXT=     2967.0K*CU-YD


3265 DIVIDED FLOW
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   SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL    OLOSS  L-BANK ELEV
     Q       QLOB      QCH     QROB     ALOB      ACH     AROB      VOL      TWA  R-BANK ELEV
   TIME      VLOB      VCH     VROB      XNL     XNCH      XNR      WTN    ELMIN     SSTA
   SLOPE    XLOBL     XLCH    XLOBR   ITRIAL      IDC    ICONT    CORAR   TOPWID    ENDST


   6.420    28.77    52.77      .00      .00    52.94      .17      .52      .00    42.01
 171900.0  73925.0  72667.2  25307.8  32633.9  16199.0  16421.3  71727.6   5800.5    47.50
    3.64     2.27     4.49     1.54     .030     .030     .050     .000    24.00 10887.83
 .000141    2300.    4409.    2800.       2       0       0      .00  7455.54  18386.10


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=    11840.0  20069.0  TYPE=     1  TARGET=     8229.000
 ELENCL=     53.10  ELENCR=     57.90
   7.090    23.41    53.51      .00      .00    53.71      .20      .76      .01    46.90
 171320.0   9005.8 100118.7  62195.5  11280.1  22153.3  40526.8  76646.5   6373.0    47.40
    3.91      .80     4.52     1.53     .120     .030     .083     .000    30.10  9387.78
 .000334    2000.    3538.    3600.       2       0       0      .00 10437.55  19825.33


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=         .0  16383.0  TYPE=     1  TARGET=    16383.000
   7.470    25.06    54.06      .00      .00    54.36      .31      .62      .03    47.70
 171000.0  62450.0  58348.8  50201.2  41287.0   8465.6  16705.1  79242.0   6726.3    44.30
    4.04     1.51     6.89     3.01     .070     .030     .050     .000    29.00  7006.81
 .000385    1500.    2006.    1500.       2       0       0      .00  9260.53  16267.34


*SECNO 8.070
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```
3470 ENCROACHMENT STATIONS=    3455.4  15481.5  TYPE=     1  TARGET=   -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
   8.070    27.38    55.28     .00     .00    55.89     .61    1.44     .09   44.30
 171000.0  22057.5 108437.0  40505.4  16330.1  13899.6  32509.3  83524.8  7270.1    46.70
    4.19     1.35     7.80    1.25    .120    .030    .120    .000   27.90  3789.74
  .000635    2619.    2891.   3201.      2       0       0     .00  7301.94 11091.68
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  SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


CCHV=    .100 CEHV=    .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .66


3470 ENCROACHMENT STATIONS=        .0   3851.7  TYPE=     1  TARGET=    3851.709
   8.490    21.36    57.16     .00     .00    58.51    1.35    2.40     .22   46.00
 169770.0  52202.8 103794.2  13773.0  21104.2   8818.8  11807.3  86093.0  7574.6    50.60
    4.27     2.47    11.77    1.17    .120    .030    .120    .000   35.80   799.23
  .001442    2636.    2374.   1605.      3       0       0     .00  6186.99  6986.21


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.31


3470 ENCROACHMENT STATIONS=    2460.6  10500.0  TYPE=     1  TARGET=   -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
   9.410    24.91    60.41     .00     .00    60.65     .24    2.04     .11   53.30
 169330.0  24803.3  62688.6  81838.1  15045.5  10276.4  48772.8  92019.6  8254.5    49.50
    4.65     1.65     6.10    1.68    .057    .030    .079    .000   35.50   751.94
  .000268    2500.    4858.   5500.      3       0       0     .00  7127.85  7879.79


CCHV=    .100 CEHV=    .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=    1431.2   8020.0  TYPE=     1  TARGET=    6588.810
 ELENCL=    55.17  ELENCR=    59.05
  10.580    39.48    61.58     .00     .00    61.93     .35    1.24     .03   53.60
 168330.0  14190.6  90650.1  63489.3  15654.9  14173.8  59485.6  98681.1  8862.4    50.50
    4.97      .91     6.40    1.07    .100    .030    .120    .000   22.10   175.44
  .000286    2700.    6177.   3200.      2       0       0     .00  9121.88  9297.32
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  SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
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```
CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=      .0  8865.0  TYPE=    1  TARGET=    8864.999
   10.860    30.21    61.91      .00      .00    62.28      .37      .35      .01    52.20
  168090.0  16675.8 107653.1  43761.1  15127.0  17835.7  41925.6 100963.9   9081.3    52.40
     5.05     1.10     6.04     1.04     .100     .030     .120     .000    31.70  1805.08
   .000236    1300.    1478.    1100.       2        0        0      .00  7022.12  8827.20


1490 NH CARD USED
*SECNO 11.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .65


3470 ENCROACHMENT STATIONS=   3311.7   6950.0  TYPE=    1  TARGET=    3638.260
 ELENCL=    53.30  ELENCR=    63.70
   11.090    30.41    62.21      .00      .00    62.85      .64      .48      .08    53.30
  167890.0  39354.4  98691.7  29843.9  21726.1  11922.0  23945.1 103180.5   9306.8    57.00
     5.12     1.81     8.28     1.25     .082     .030     .120     .000    31.80   785.50
   .000562    1400.    1214.    1600.       2        0        0      .00  6098.65  6884.15


CCHV=   .300 CEHV=    .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=    1  TARGET=    4320.750
 ELENCL=    58.00  ELENCR=    65.50
   11.350    34.26    63.10      .00      .00    63.43      .33      .49      .09    52.80
  167670.0  10971.4 106176.9  50521.7  15935.1  18486.6  41941.3 105831.5   9535.8    52.60
     5.23      .69     5.74     1.20     .120     .030     .120     .000    28.84   464.55
   .000221    1000.    1373.    2300.       2        0        0      .00  6009.57  6474.12


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS

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   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG      HV      HL     OLOSS   L-BANK ELEV
   Q      QLOB     QCH     QROB    ALOB     ACH     AROB     VOL      TWA     R-BANK ELEV
   TIME    VLOB     VCH     VROB     XNL     XNCH     XNR     WTN     ELMIN    SSTA
   SLOPE   XLOBL    XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID   ENDST


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

   11.380    36.45    63.25      .00      .00    64.24      .99      .49      .33    66.30
  167670.0       .0 167670.0       .0       .0  21017.6       .0 107744.3   9664.5    64.00
     5.28      .00     7.98      .00     .000     .030     .000     .000    26.80 19955.36
   .000475    1000.    1373.    2300.       2        0        0      .00  1030.76 20986.12


SPECIAL BRIDGE
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SB XK     XKOR    COFQ    RDLEN    BWC     BWP      BAREA    SS      ELCHU    ELCHD
   1.25    1.50    2.60     .00   189.00   20.40  22729.00   10.20   27.80    27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=     63.16 BRIDGE VELOCITY=     8.96   CALCULATED CHANNEL AREA=   18713.

 EGPRS    EGLWC     H3     QWEIR    QLOW     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                    AREA
    .00   64.32     .09       0.  167670.  22729.   22477.     67.20    68.30       0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      66.30 ELREA=      64.00

   11.390    36.54    63.34      .00      .00    64.32      .98      .08      .00    66.30
  167670.0       .0 167670.0       .0       .0  21105.3       .0 107768.4   9665.7    64.00
     5.28      .00     7.94      .00     .000     .030     .000     .000    26.80 19953.82
   .000470      50.      50.      50.        0        0        0      .00  1033.88 20987.70


*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  1.62
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID  ENDST


3470 ENCROACHMENT STATIONS=    2199.0   6519.8 TYPE=     1  TARGET=     4320.750
 ELENCL=     58.00 ELENCR=     65.50
   11.400    35.42    64.26      .00      .00    64.54      .28      .01      .21    52.80
  167670.0  12742.7 104067.7  50859.6  18886.0  19472.3  45064.1 107828.4   9669.8    52.60
     5.28      .67     5.34     1.13     .120     .030     .120     .000    28.84   301.50
   .000178      50.      50.      50.        2        0        0      .00  6194.75  6496.25


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=    1998.3  14239.6 TYPE=     1  TARGET=    -1998.350
 ELENCL=     56.86 ELENCR= 100000.00
   11.480    43.59    64.32      .00      .00    64.62      .30      .07      .01    48.60
  167560.0  18043.8 106358.4  43157.9  23968.3  19422.3  55417.4 108997.7   9772.4    49.50
     5.32      .75     5.48      .78     .120     .030     .120     .000    20.73   662.82
   .000142     400.     370.     700.        2        0        0      .00  9500.13 10162.95


CCHV=    .600 CEHV=     .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=     1  TARGET=    -1950.000
 ELENCL=     57.90 ELENCR= 100000.00
   11.550    42.65    64.38      .00      .00    64.69      .31      .06      .01    49.60
  167500.0  17120.5 103179.4  47200.0  22239.8  18288.2  53749.5 109871.3   9856.1    50.50
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   5.35     .77    5.64     .88    .120    .030    .120    .000    21.73   807.21
 .000163    400.    370.    400.      0       0       0     .00  8835.94  9938.97


1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     68.70 ELREA=     67.10

  11.569   40.25   64.35    .00     .00   64.91    .56     .02     .20    68.70
 167500.0     .0 167500.0     .0      .0 27918.6      .0 110011.5  9868.0   67.10
   5.35     .00    6.00     .00    .000    .031    .000    .000    24.10 20258.51
 .000324    100.    100.    100.      2       0       0     .00  1501.28 21759.79


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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL     OLOSS   L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST



SPECIAL BRIDGE

SB  XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU    ELCHD
   1.25    2.31    2.60     .00    50.00   46.00 32375.00   20.00    24.10    24.10

CCHV=   .300 CEHV=   .500
*SECNO 11.660
PRESSURE FLOW


 EGPRS    EGLWC     H3     QWEIR     QPR     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                            AREA
   65.31   64.91     .06      0.  167500.   32375.   30545.     63.08   69.07       0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     68.90 ELREA=     68.20

  11.660   45.09   64.89    .00     .00   65.31    .42     .40     .00    68.90
 167500.0     .0 167500.0     .0      .0 32068.0      .0 110342.0  9885.4   68.20
   5.38     .00    5.22     .00    .000    .035    .000    .000    19.80 20235.86
 .000298    480.    480.    480.      2       0       0     .00  1665.54 21901.40


*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0  13410.0 TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.679   43.44   65.17    .00     .00   65.39    .22     .02     .06    49.60
 167500.0 20411.7  94045.5  53042.9  24917.8  18825.1  58581.9 110496.3  9898.1    50.50
   5.38     .82    5.00     .91    .120    .035    .120    .000    21.73   711.80
 .000168    100.    100.    100.      2       0       0     .00  9415.30 10127.10


CCHV=   .100 CEHV=   .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4   9060.0 TYPE=     1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=    74.80
  11.970   33.91   65.63    .00     .00   65.86    .23     .46     .00    46.60
 167140.0 25176.2  81201.6  60762.1  26779.1  14975.7  67236.2 119077.0  10640.3   44.70
   5.65     .94    5.42     .90    .120    .030    .120    .000    31.72   156.30
 .000149    802.   2118.   5043.      2       0       0     .00  7955.87  8112.17
```

THIS RUN EXECUTED 29FEB00 11:00:21

****

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

Starting form river mile

SUMMARY PRINTOUT

	VLOB	VROB	AREA	VCH	QLOBP	QCHP	QROBP	VEXR	VEXT
	.204	.15	150657.40	1.44	.14	99.86	.00	.00	.00
	.000	.00	157541.80	1.36	.00	100.00	.00	.00	.00
	.000	.02	176739.20	1.21	.00	100.00	.00	.00	.00
	.275	.04	209354.50	1.24	5.94	94.06	.01	.00	.00
	.255	.12	179408.40	1.28	1.27	98.57	.16	.00	.00
*	.325	.40	73924.73	2.85	.68	96.73	2.59	.00	.00
	.033	.28	61461.57	2.94	.00	99.55	.45	1574.10	1574.10
*	.000	.00	43150.84	4.01	.00	100.00	.00	.00	1574.10
	.000	.00	43002.70	4.02	.00	100.00	.00	.00	1574.10
	.000	.00	43037.26	4.02	.00	100.00	.00	.00	1574.10
	.000	.00	43153.80	4.01	.00	100.00	.00	.00	1574.10
	.000	.00	43166.38	4.01	.00	100.00	.00	.00	1574.10
	.000	.00	41841.04	4.14	.00	100.00	.00	.00	1574.10
	.000	.00	41852.56	4.14	.00	100.00	.00	.00	1574.10
	.000	.00	43211.88	4.01	.00	100.00	.00	.00	1574.10
	1.648	.19	74406.30	4.45	53.84	46.15	.01	568.48	2142.58
	2.265	1.54	65254.12	4.49	43.00	42.27	14.72	824.45	2967.03

	VLOB	VROB	AREA	VCH	QLOBP	QCHP	QROBP	VEXR	VEXT
*	.798	1.53	73960.24	4.52	5.26	58.44	36.30	.00	2967.03
	1.513	3.01	66457.63	6.89	36.52	34.12	29.36	.00	2967.03

	1.351	1.25	62739.01	7.80	12.90	63.41	23.69	.00	2967.03
*	2.474	1.17	41730.38	11.77	30.75	61.14	8.11	.00	2967.03
*	1.649	1.68	74094.76	6.10	14.65	37.02	48.33	.00	2967.03
	.906	1.07	89314.30	6.40	8.43	53.85	37.72	.00	2967.03
	1.102	1.04	74888.40	6.04	9.92	64.04	26.03	.00	2967.03
*	1.811	1.25	57593.22	8.28	23.44	58.78	17.78	.00	2967.03
*	.689	1.20	76363.00	5.74	6.54	63.32	30.13	.00	2967.03
*	.000	.00	21017.64	7.98	.00	100.00	.00	.00	2967.03
	.000	.00	21105.27	7.94	.00	100.00	.00	.00	2967.03
*	.675	1.13	83422.42	5.34	7.60	62.07	30.33	.00	2967.03
	.753	.78	98807.96	5.48	10.77	63.47	25.76	.00	2967.03
	.770	.88	94277.55	5.64	10.22	61.60	28.18	.00	2967.03
	.000	.00	27918.59	6.00	.00	100.00	.00	.00	2967.03
	.000	.00	32068.03	5.22	.00	100.00	.00	.00	2967.03
	.819	.91	102324.80	5.00	12.19	56.15	31.67	.00	2967.03
	.940	.90	108991.00	5.42	15.06	48.58	36.35	.00	2967.03

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	7.610	.00	.00	.00	19.50	214619.00	50.50	.00	50.53	.19	1.44	150657.40494729.40	
	7.760	820.00	.00	.00	18.60	214619.00	50.52	.00	50.55	.16	1.36	157541.80537689.30	
	8.180	2196.00	.00	.00	16.60	214619.00	50.56	.00	50.58	.13	1.21	176739.20600985.40	
	8.670	2391.00	.00	.00	20.60	214619.00	50.60	.00	50.62	.18	1.24	209354.50508796.30	
	9.250	3062.00	.00	.00	21.60	214619.00	50.65	.00	50.68	.20	1.28	179408.40482494.80	
*	3.615	4594.00	.00	.00	20.00	174300.00	50.78	.00	50.90	.91	2.85	73924.73182820.40	
	4.745	5966.00	.00	.00	21.00	173330.00	51.36	.00	51.50	1.09	2.94	61461.57165851.10	
*	5.026	1482.00	.00	.00	21.50	173080.00	51.56	.00	51.81	2.29	4.01	43150.84114384.10	
	5.027	1.00	58.25	52.50	21.50	173080.00	51.56	.00	51.81	2.37	4.02	43002.70112491.50	
	5.034	47.00	58.25	52.50	21.50	173080.00	51.57	.00	51.82	2.36	4.02	43037.26112634.80	
	5.035	1.00	.00	.00	21.50	173080.00	51.57	.00	51.82	2.29	4.01	43153.80114391.90	
	5.037	8.00	.00	.00	21.50	173080.00	51.57	.00	51.82	2.29	4.01	43166.38114446.30	
	5.038	1.00	58.25	52.50	21.50	173080.00	51.56	.00	51.83	2.57	4.14	41841.04107938.60	
	5.045	47.00	58.25	52.50	21.50	173080.00	51.58	.00	51.84	2.57	4.14	41852.56107984.70	

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	5.046	1.00	.00	.00	21.50	173080.00	51.59	.00	51.84	2.28	4.01	43211.88	114644.40
	5.585	2847.00	.00	.00	23.00	172610.00	52.25	.00	52.42	1.82	4.45	74406.30	127847.90
	6.420	4409.00	.00	.00	24.00	171900.00	52.77	.00	52.94	1.41	4.49	65254.12	144528.00
*	7.090	3538.00	.00	.00	30.10	171320.00	53.51	.00	53.71	3.34	4.52	73960.24	93679.20
	7.470	2006.00	.00	.00	29.00	171000.00	54.06	.00	54.36	3.85	6.89	66457.63	87189.82
	8.070	2891.14	.00	.00	27.90	171000.00	55.28	.00	55.89	6.35	7.80	62739.01	67860.18
*	8.490	2374.28	.00	.00	35.80	169770.00	57.16	.00	58.51	14.42	11.77	41730.38	44708.05
*	9.410	4858.00	.00	.00	35.50	169330.00	60.41	.00	60.65	2.68	6.10	74094.76	103449.90
	10.580	6177.00	.00	.00	22.10	168330.00	61.58	.00	61.93	2.86	6.40	89314.30	99563.93
	10.860	1478.00	.00	.00	31.70	168090.00	61.91	.00	62.28	2.36	6.04	74888.40	109415.30

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	11.090	1214.00	.00	.00	31.80	167890.00	62.21	.00	62.85	5.62	8.28	57593.22	70807.67
*	11.350	1373.00	.00	.00	28.84	167670.00	63.10	.00	63.43	2.21	5.74	76363.00	112828.20
*	11.380	1373.00	.00	.00	26.80	167670.00	63.25	.00	64.24	4.75	7.98	21017.64	76968.73
	11.390	50.00	68.30	67.20	26.80	167670.00	63.34	.00	64.32	4.70	7.94	21105.27	77350.07
*	11.400	50.00	.00	.00	28.84	167670.00	64.26	.00	64.54	1.78	5.34	83422.42	125525.20
	11.480	370.00	.00	.00	20.73	167560.00	64.32	.00	64.62	1.42	5.48	98807.96	140541.00
	11.550	370.00	.00	.00	21.73	167500.00	64.38	.00	64.69	1.63	5.64	94277.55	131089.30
	11.569	100.00	.00	.00	24.10	167500.00	64.35	.00	64.91	3.24	6.00	27918.59	93031.03
	11.660	480.00	69.07	63.08	19.80	167500.00	64.89	.00	65.31	2.98	5.22	32068.03	96969.77
	11.679	100.00	.00	.00	21.73	167500.00	65.17	.00	65.39	1.68	5.00	102324.80	129365.50
	11.970	2118.00	.00	.00	31.72	167140.00	65.63	.00	65.86	1.49	5.42	108991.00	137144.80

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
7.610	214619.00	50.50	.00	.00	.00	8934.76	.00
7.760	214619.00	50.52	.00	.02	.00	8707.34	820.00
8.180	214619.00	50.56	.00	.04	.00	9883.41	2196.00
8.670	214619.00	50.60	.00	.04	.00	16426.69	2391.00
9.250	214619.00	50.65	.00	.06	.00	14589.90	3062.00

*	3.615 174300.00	50.78	.00	.13	.00	7157.91	4594.00
	4.745 173330.00	51.36	.00	.59	.00	5368.77	5966.00
*	5.026 173080.00	51.56	.00	.19	.00	3479.51	1482.00
	5.027 173080.00	51.56	.00	.00	.00	3406.69	1.00
	5.034 173080.00	51.57	.00	.01	.00	3406.89	47.00
	5.035 173080.00	51.57	.00	.00	.00	3479.67	1.00
	5.037 173080.00	51.57	.00	.00	.00	3479.72	8.00
	5.038 173080.00	51.56	.00	-.01	.00	3397.29	1.00
	5.045 173080.00	51.58	.00	.01	.00	3397.41	47.00
	5.046 173080.00	51.59	.00	.02	.00	3479.92	1.00
	5.585 172610.00	52.25	.00	.66	.00	10000.52	2847.00
	6.420 171900.00	52.77	.00	.52	.00	7455.54	4409.00
*	7.090 171320.00	53.51	.00	.74	.00	10437.55	3538.00
	7.470 171000.00	54.06	.00	.55	.00	9260.53	2006.00
	8.070 171000.00	55.28	.00	1.22	.00	7301.94	2891.14
*	8.490 169770.00	57.16	.00	1.88	.00	6186.99	2374.28
*	9.410 169330.00	60.41	.00	3.25	.00	7127.85	4858.00
	10.580 168330.00	61.58	.00	1.17	.00	9121.88	6177.00
	10.860 168090.00	61.91	.00	.33	.00	7022.12	1478.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	11.090	167890.00	62.21	.00	.29	.00	6098.65	1214.00
*	11.350	167670.00	63.10	.00	.89	.00	6009.57	1373.00
*	11.380	167670.00	63.25	.00	.16	.00	1030.76	1373.00
	11.390	167670.00	63.34	.00	.09	.00	1033.88	50.00
*	11.400	167670.00	64.26	.00	.92	.00	6194.75	50.00
	11.480	167560.00	64.32	.00	.06	.00	9500.13	370.00
	11.550	167500.00	64.38	.00	.06	.00	8835.94	370.00
	11.569	167500.00	64.35	.00	-.03	.00	1501.28	100.00
	11.660	167500.00	64.89	.00	.54	.00	1665.54	480.00
	11.679	167500.00	65.17	.00	.28	.00	9415.30	100.00
	11.970	167140.00	65.63	.00	.46	.00	7955.87	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 3.615 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.026 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Alternative IIA - Dredging Area A

```
1*********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES          *                * U.S. ARMY CORPS OF ENGINEERS      *
*                                *                      * HYDROLOGIC ENGINEERING CENTER   *
* Version  4.6.2;  May 1991          *                   * 609 SECOND STREET, SUITE D     *
*                                *                      * DAVIS, CALIFORNIA 95616-4687    *
* RUN DATE   28FEB00   TIME  09:46:44 *                  *      (916) 756-1104           *
*********************************************           ****************************************
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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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1
28FEB00   09:46:44   PAGE   1

THIS RUN EXECUTED 28FEB00   09:46:44

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

Version  4.6.2;  May 1991
**************************************
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DREDGING AREA A (R.M. 11.3); ELEV. 30'

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T1     CF-0033 BROWN & ROOT SERVICES,  2/25/2000
T2     Lake Houston HEC-2 MODEL, REACH 3    [redacted]
T3     Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ     NINV    IDIR     STRT     METRIC   HVINS    Q       WSEL     FQ

    0      4      0                          50.91

J2 NPROF    IPLOT    PRFVS    XSECV    XSECH    FN      ALLDC    IBW      CHNIM     ITRACE

   -1      0     -1


J3 VARIABLE CODES FOR SUMMARY PRINTOUT

  150      7      55      56      26      25      4      35      60      59

J6 IHLEQ    ICOPY    SUBDIV   STRTDS    RMILE

    1


QT      4    66800    143300    174300     333600
NC    0.12     0.12     0.03      .1        .3
      THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
      THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
X1   3.615       89   2366.85   6330.06
X3     10                1232.04       54.7
GR    55.6        0     55.2        90     54.9    161.12     54.8    318.29     54.5       400
GR    54.5   505.44     50.4     590.1     50.7    644.14     49.6    763.76     49.8    821.19
GR    47.9   853.74     50.9    895.11       51    927.61       49    951.75     47.9    1054.3
GR    50.3  1085.94     53.3   1160.37     54.7   1232.04     50.1   1287.74       49   1373.79
GR    48.6  1482.72     49.1   1622.28     46.2   1678.02     46.3   1781.82     48.3   1866.53
GR    49.2   1949.4     48.8   2075.16     47.9   2163.11     43.8   2220.71     42.6   2269.24
GR    41.6  2366.85     40.6   2391.75       39   2452.47     37.7   2548.87     37.9   2765.45
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GR    37.6   2952.69     38   3157.81     38.6   3299.81     38.3   3413.04     38.1   3746.92
GR    38.1   3993.99    38.9   4185.79    38.8   4286.36     40.5   4499.72     39.9   4728.9
GR    38.6   4754.82    40.1   4907.5   40.4627  4943.023    38.9   4984.51     37.2   5041.95
GR    37.2   5119.68    36.4   5177.29    37.3   5277.11     36.8   5355.15     38.1   5518.64
GR    37.9   5567.34    36.5   5613.59    33.5   5655.2      32.5   5769.5      30.3   5803.47
GR    32.8   5902.24    32.8   5982.5     34.2   6030.84     36.5   6067.52     37.5   6124.9
GR    37.8   6207.91    40.5   6273.13    43.8   6330.06     41.5   6462.94     41.4   6636.96
GR    44.8   6697.83    45.5   6728.93    44.5   6819.63     45     6861.77     44.5   6960.04
GR    44.8   7029.56   45.05   7060       44.7   7115.34     45.4   7181.81     45.6   7240
GR    45.6   7360       45.5   7468.6     43.4   7632.04     44.6   7864.56     47.6   7908.88
GR    47.7   7982.52    48.7   8044.72    48.8   8220        55.8   8990
1
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QT     4     66160    140750    173330    329800
X1   4.745     59     2373.4   6703.71     3600      4500      5966
X3    10              1973.39      52    6985.59     48.6
GR   60.92     0      54.6      450     53.45      570     53.05      630      52.6      740
GR    52.7    830     52.5      930      52      989.14    52.45     1150      52.3    1284.73
GR    52.6  1434.66   52.6     1560     52.45     1730     52.3    1836.38    52.05     1940
GR     52   1973.39   51.1    2373.4    43.3      2385     39.8    2559.76     37     2645.83
GR     36   2728.22   35.3    2809.02   35.9    2887.92    31.2    3041.01    31.9    3156.16
GR     30    3200      30      5720     36.3      5740      37      5800      39.8    5962.55
GR     40   6057.51   39.7    6300.58    42     6371.11    43.1    6486.54     44     6532.85
GR    44.5  6559.55   45.2    6653.68   47.2    6703.71     47     6753.55    47.1    6787.33
GR    47.5  6829.55   47.3    6947.51   48.6    6985.59    48.4    7027.77    47.3    7052.29
GR    47.2  7079.78   46.5    7122.32   46.4    7303.07    46.8    7395.37    47.9    7436.05
GR    48.1  7535.6    50.2    7585.83   54.2    7722.58    54.7    7816.27    59.2    7868.73
GR    60.8  7911.42    61     8096.6    61.5     8298      61.8     8402

QT     4     65990    140170    173080    328820
NC    0.12   0.12     0.03     0.3      0.5
X1   5.026    82     10508     14400     1030      4150      1482    0.9135
X3    10
GR    70.3     0      60.1      847     55.1      4325     50.1      6125     47.5      6457
GR    51.9   6672      52       6723     49.3      6899      53       7002     51.3      7207
GR    47.8   7406     44.3      7535     50.7      7643      52       7675     49.2      7860
GR    50.7   7983      52       8074     50.8      8207     51.4      8253     50.6      8427
GR    44.2   8495     47.4      8539     44.2      8686     50.9      8716     48.5      8805
GR    53.1   8968     50.3      9257     52.8      9627     49.3      9739     48.6     10032
GR    41.6  10121     52.8     10240     51.6     10351     56.2     10508     49.2     10531
GR    44.1  10549     41.8     10584     28.9     10622     37.4     10682     36.1     10792
GR    37.9  10846     41.3     10953      45      11066     26.5     11142     24.4     11222
GR    17.9  11240     14.8     11250     10.6     11262     21.6     11486     24.9     11552
GR    41.3  11749     45.5     11830     46.2     11981     44.7     12010     41.2     12077
GR    46.2  12110      46      12265     42.6     12356     43.9     12514     41.7     12874
GR    42.3  13169     43.2     13369     44.1     13509     41.3     13921     44.5     14033
GR    43.9  14119     43.1     14221     47.6     14283      57      14400     63.4     14532
GR    64.7  14822     62.5     14960     66.5     15076     67.6     15152     66.1     15301
GR    65.8  15393     64.6     15581     65.5     15601     66.7     15706     62.2     15750
GR    64.2  15886     65.4     16039

NC    .12    .12     0.030
X1   5.027   100     10508     14300       1         1         1     0.9135
X3    10
X2     0      0        0      52.5     58.25
GR    70.3     0      60.1      847     50.1      6125     40.8      6399      52       6703
GR     53    6993     43.8      7631      52       7675     50.6      8427     44.2      8495
GR    53.1   8968     50.3      9257     52.8      9627     49.3      9739     48.6     10032
GR    41.6  10121     56.2     10508     28.9     10622     37.4     10682     52.5     10683
GR    52.5  10689     37.4     10689     36.1     10792     37.9     10846     41.3     10953
GR    52.5  10953     52.5     10959     41.3     10959      45      11066     26.5     11142
GR    24.4  11222     17.9     11240     50.4     11240     52.5     11241     52.5     11250
GR    10.6  11262     21.3     11480     52.5     11480     52.5     11486     21.6     11486
GR    24.9  11552     24.4     11708     52.5     11708     52.5     11714     24.4     11714
GR    24.4  11732     45.5     11830     46.2     11981      45      12004     52.5     12004
GR    52.5  12010     44.7     12010     41.2     12077     46.2     12110     46.1     12162
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GR	52.5	12163	52.5	12169	46.1	12169	42.6	12356	43.5	12463
GR	52.5	12463	52.5	12469	43.5	12469	43.9	12514	41.2	12621
GR	41.3	12663	52.5	12663	52.5	12669	41.3	12669	41.7	12863
GR	52.5	12863	52.5	12869	41.7	12869	42.3	13163	52.5	13163
GR	52.5	13169	42.3	13169	43.2	13363	52.5	13363	52.5	13369
GR	43.2	13369	44.1	13509	41.3	13581	41.3	13663	52.5	13663
GR	52.5	13669	41.3	13669	41.3	13863	52.5	13863	52.5	13869
GR	41.3	13869	41.3	13921	44.5	14033	43.9	14113	52.5	14113
GR	52.5	14119	43.9	14119	43.1	14221	56	14300	66.8	14676

X1	5.034	0	0	0	47	47	47	
X3	10							
X2	0	0	0	52.5	58.25			

NC	0.12	0.12	0.03							
X1	5.035	82	10508	14400	1	1	1	0.9135		
X3	10									
GR	70.3	0	60.1	847	55.1	4325	50.1	6125	47.5	6457
GR	51.9	6672	52	6723	49.3	6899	53	7002	51.3	7207
GR	47.8	7406	44.3	7535	50.7	7643	52	7675	49.2	7860
GR	50.7	7983	52	8074	50.8	8207	51.4	8253	50.6	8427
GR	44.2	8495	47.4	8539	44.2	8686	50.9	8716	48.5	8805
GR	53.1	8968	50.3	9257	52.8	9627	49.3	9739	48.6	10032
GR	41.6	10121	52.8	10240	51.6	10351	56.2	10508	49.2	10531
GR	44.1	10549	41.8	10584	28.9	10622	37.4	10682	36.1	10792
GR	37.9	10846	41.3	10953	45	11066	26.5	11142	24.4	11222
GR	17.9	11240	14.8	11250	10.6	11262	21.6	11486	24.9	11552
GR	41.3	11749	45.5	11830	46.2	11981	44.7	12010	41.2	12077
GR	46.2	12110	46	12265	42.6	12356	43.9	12514	41.7	12874
GR	42.3	13169	43.2	13369	44.1	13509	41.3	13921	44.5	14033
GR	43.9	14119	43.1	14221	47.6	14283	57	14400	63.4	14532
GR	64.7	14822	62.5	14960	66.5	15076	67.6	15152	66.1	15301
GR	65.8	15393	64.6	15581	65.5	15601	66.7	15706	62.2	15750
GR	64.2	15886	65.4	16039						

X1	5.037	82	10508	14400	8	8	8	0.9135		
X3	10									
GR	70.3	0	60.1	847	55.1	4325	50.1	6125	47.5	6457
GR	51.9	6672	52	6723	49.3	6899	53	7002	51.3	7207
GR	47.8	7406	44.3	7535	50.7	7643	52	7675	49.2	7860
GR	50.7	7983	52	8074	50.8	8207	51.4	8253	50.6	8427
GR	44.2	8495	47.4	8539	44.2	8686	50.9	8716	48.5	8805
GR	53.1	8968	50.3	9257	52.8	9627	49.3	9739	48.6	10032
GR	41.6	10121	52.8	10240	51.6	10351	56.2	10508	49.2	10531
GR	44.1	10549	41.8	10584	28.9	10622	37.4	10682	36.1	10792
GR	37.9	10846	41.3	10953	45	11066	26.5	11142	24.4	11222
GR	17.9	11240	14.8	11250	10.6	11262	21.6	11486	24.9	11552
GR	41.3	11749	45.5	11830	46.2	11981	44.7	12010	41.2	12077
GR	46.2	12110	46	12265	42.6	12356	43.9	12514	41.7	12874
GR	42.3	13169	43.2	13369	44.1	13509	41.3	13921	44.5	14033
GR	43.9	14119	43.1	14221	47.6	14283	57	14400	63.4	14532
GR	64.7	14822	62.5	14960	66.5	15076	67.6	15152	66.1	15301
GR	65.8	15393	64.6	15581	65.5	15601	66.7	15706	62.2	15750
GR	64.2	15886	65.4	16039						

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X1	5.038	100	10508	14300	1	1	1	0.9135		
X3	10									
X2	0	0	0	52.5	58.25					
GR	70.3	0	60.1	847	50.1	6125	40.8	6399	52	6703
GR	53	6993	43.8	7631	52	7675	50.6	8427	44.2	8495
GR	53.1	8968	50.3	9257	52.8	9627	49.3	9739	48.6	10032
GR	41.6	10121	56.2	10508	28.9	10622	37.4	10682	52.5	10683
GR	52.5	10689	37.4	10689	36.1	10792	37.9	10846	41.3	10953

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GR   52.5   10953   52.5   10959   41.3   10959   45     11066   26.5   11142
GR   24.4   11222   17.9   11240   50.4   11240   52.5   11241   52.5   11250
GR   10.6   11262   21.3   11480   52.5   11480   52.5   11486   21.6   11486
GR   24.9   11552   24.4   11708   52.5   11708   52.5   11714   24.4   11714
GR   24.4   11732   45.5   11830   46.2   11981   45     12004   52.5   12004
GR   52.5   12010   44.7   12010   41.2   12077   46.2   12110   46.1   12162
GR   52.5   12163   52.5   12169   46.1   12169   42.6   12356   43.5   12463
GR   52.5   12463   52.5   12469   43.5   12469   43.9   12514   41.2   12621
GR   41.3   12663   52.5   12663   52.5   12669   41.3   12669   41.7   12863
GR   52.5   12863   52.5   12869   41.7   12869   42.3   13163   52.5   13163
GR   52.5   13169   42.3   13169   43.2   13363   52.5   13363   52.5   13369
GR   43.2   13369   44.1   13509   41.3   13581   41.3   13663   52.5   13663
GR   52.5   13669   41.3   13669   41.3   13863   52.5   13863   52.5   13869
GR   41.3   13869   41.3   13921   44.5   14033   43.9   14113   52.5   14113
GR   52.5   14119   43.9   14119   43.1   14221   56     14300   66.8   14676

X1  5.045   0   0   0   47   47   47
X3   10
X2   0   0   0   52.5   58.25

NC   0.12   0.12   0.03   0.1   0.3
X1  5.046   82   10508   14400   1   1   1   0.9135
X3   10
GR   70.3   0       60.1   847     55.1   4325    50.1   6125    47.5   6457
GR   51.9   6672    52     6723    49.3   6899    53     7002    51.3   7207
GR   47.8   7406    44.3   7535    50.7   7643    52     7675    49.2   7860
GR   50.7   7983    52     8074    50.8   8207    51.4   8253    50.6   8427
GR   44.2   8495    47.4   8539    44.2   8686    50.9   8716    48.5   8805
GR   53.1   8968    50.3   9257    52.8   9627    49.3   9739    48.6   10032
GR   41.6   10121   52.8   10240   51.6   10351   56.2   10508   49.2   10531
GR   44.1   10549   41.8   10584   28.9   10622   37.4   10682   36.1   10792
GR   37.9   10846   41.3   10953   45     11066   26.5   11142   24.4   11222
GR   17.9   11240   14.8   11250   10.6   11262   21.6   11486   24.9   11552
GR   41.3   11749   45.5   11830   46.2   11981   44.7   12010   41.2   12077
GR   46.2   12110   46     12265   42.6   12356   43.9   12514   41.7   12874
GR   42.3   13169   43.2   13369   44.1   13509   41.3   13921   44.5   14033
GR   43.9   14119   43.1   14221   47.6   14283   57     14400   63.4   14532
GR   64.7   14822   62.5   14960   66.5   15076   67.6   15152   66.1   15301
GR   65.8   15393   64.6   15581   65.5   15601   66.7   15706   62.2   15750
GR   64.2   15886   65.4   16039
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QT   4   65680   139080   172610   326970
NC   0.12   0.12   0.03   0.1   0.3
NH   4   0.12   6565.8   0.04   10389.97   0.03   11165.02   0.12   11754.54
X1  5.585   92   10389.97   11165.02   2664   1744   2847
X3   10
GR   62.75   0          55        1050       51     1350       50.4   2130       49.8   2670
GR   49.3    2940       49        3070.97    47.4   3189.37    48.1   3332.69    44.9   3448.15
GR   47.2    3606.21    45.8      3712.03    48.1   3809.2     45.3   3910.28    45.4   3992.9
GR   48.9    4050.05    50.5      4111.66    47.1   4292.93    49     4377.98    46.2   4426.95
GR   48.4    4503.41    51.7      4528.08    52     4646.6     47.9   4680.17    47.5   4744.32
GR   49.6    4816.31    45.9      5042.82    46.4   5114.46    50.6   5214.31    50.4   5290.11
GR   49      5321.9     47.8      5469.67    49.5   5630.79    47.7   5658.97    46.1   5777.87
GR   46.4    5924.67    44.8      6004.29    43.3   6258.57    43.5   6470.87    48.9   6565.8
GR   44.7    6646.34    45.9      6743.32    44.5   6892.24    44.2   7009.22    44.5   7289.15
GR   46.4    7330.53    44.3      7392.93    41.7   7412.88    43.8   7516.5     42.6   7594.69
GR   42.8    7688.63    41.4      7768.32    42     7833.49    41.2   7910.79    42.2   8209.01
GR   41.3    8286.36    39.7      8308.22    39.9   8702       40.1   8964.4     39.4   9095.69
GR   41.7    9292.52    41.6      9541.35    44.3   9703.77    41.6   9816.3     43.9   9860.54
GR   41.3    9871.29    41.3      9948.37    46.9   9970.67    44.8   10033.63   43     10162.63
GR   44.2    10190.96   43.9      10305.76   46.5   10332.73   48.2   10389.97   44.7   10430.72
GR   41.3    10459.1    32.9      10514.53   28     10567.09   26.4   10611.42   24.7   10640.77
GR   23.7    10681.82   25.7      10731.87   24.6   10751.83   28     10782.41   30.2   10840.35
GR   39.3    10888.46   38.5      10909.12   45     10961.37   49.8   11027.75   49.8   11165.02
GR   54.6    11343.95   62.4385   11754.54
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QT     4    65210    137410    171900    324160
NC   0.08     .12     0.03       .1        .3
NH     5     0.12     2500      0.08     10000     0.03     17143     0.08     19000     0.12
NH  23560
X1  6.420      59    15845     16499      2300     2800      4409
X3    10
GR    75        0       75      2500        70     3400        70     6000        60     7000
GR   58.3   10000     56.1     10103      56.6    10179      57.3    10497      56.3    10543
GR   55.3   10654     57.2     10704      55.9    10873      52.1    10891        49    11004
GR   50.2   11061     53.5     11106      49.4    11290      48.2    11399      47.9    11517
GR   47.7   11625     48.9     11747      45.8    11900        46    11965      46.6    12181
GR   47.9   12699     48.1     12807      46.6    13068      46.2    13367      47.4    13489
GR   42.4   13758     41.8     14068      44.9    14127      46.8    14222      48.9    14266
GR   42.2   14433     38.1     14587        45    14654      41.5    14714      46.1    15114
GR   44.8   15161     46.9     15361      41.9    15727      46.7    15845      40.4    16043
GR   28.4   16309     44.9     16440      47.5    16499      43.3    16544      44.6    16859
GR   41.5   17143     44.5     17299      43.5    17474      41.4    17702      41.5    17822
GR     43   18004       61     18708        70    19600        70    23560

QT     4    64830    136080    171320    321910
NC   0.12    0.12     0.03      0.1       0.3
NH     4      .12    13568      0.03     15555     0.08     18896       .12     24402
X1   7.09      67    13568     15555      2000     3600      3538
X3    10                     11840        53.1    20069      57.9
GR   75.1       0     70.1      2300      60.1     3500      59.1      5310      55.1     7000
GR   52.9    9998     51.2     10405      48.3    10760      46.7     11002      48.1    11096
GR     50   11122       47     11313      46.7    11451      52.6     11572      53.1    11840
GR   52.5   12008     49.5     12394      44.7    12513      43.3     12597      44.3    12738
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GR   45.4   12956     46.9     13568      45.2    13743      44.7     13868      43.8    13920
GR   44.8   13990     45.1     14281      44.7    14544      42.4     14583      43.1    14804
GR   41.6   14978     43.4     15013      42.2    15090      30.1     15260      31.6    15364
GR   47.4   15555     46.7     15598      45.5    15789      39.5     15858      36.1    15974
GR   35.8   16133     38.4     16239      42.5    16348      41.8     16564        44    16840
GR   44.7   17493     46.2     17579      44.6    18028      45.1     18178      43.3    18276
GR   43.9   18459       43     18497      44.4    18896      46.2     19531      56.9    19962
GR   57.9   20069     52.9     20275      53.4    20406      49.7     20651      51.5    20718
GR   54.8   21004     54.1     21070      54.3    21465        55     21585      53.8    21703
GR   60.1   22202       65     24402

QT     4    64610    135320    171000    320030
NC    .12     .12      .03      0.1       0.3
NH     5      .12    12000      0.05     14153     0.03     14598      0.05     16383      .12
NH  23100
X1   7.47      66    14153     14598      1500     1500      2006
X3    10                                 16383     55.4
GR    75        0       75      4460      64.2     6000        70      6150      61.6     6693
GR   50.3    7163     46.9      7208      49.6     7585      46.7      7595        51     7861
GR   48.9    7931     50.6      8391        48     8503      49.8      8546      51.3     8691
GR   46.2    9217     50.4      9383      51.4     9536      49.2      9569      50.3     9803
GR   53.7   10039     53.5     10532      47.3    10859      48.5     10964      47.2    11235
GR     45   11328     45.5     11905      48.6    12029      46.4     12059        42    12180
GR   41.8   12274     44.9     12369      44.2    12639      45.9     12724      44.5    12772
GR   49.7   12832     48.5     12877      50.5    13056        45     13117      45.6    13218
GR   52.7   13383     48.5     13434        47    13591      41.8     13880      45.8    13922
GR   40.9   14010       47     14062      47.7    14153        29     14273        38    14585
GR   44.3   14598     43.4     14737      41.4    14777      40.4     14933      39.8    15545
GR   45.9   15676     48.5     15964      53.4    16211      55.4     16383        53    17600
GR     54   18600       55     18800        60    20560        70     21150        75    22400
GR     75   23100

NC    .12     .12     0.03
X1   8.07      90  5637.46   6519.38   2619.28  3201.18   2891.14
X3    10                   3455.36     61.13
GR   73.6       0       71     207.3      67.1   340.91      61.2    454.82      59.8   605.74
GR   63.3   903.8     58.3   1086.61        54  1321.33      54.2   1487.54      47.9  1600.81
GR   55.2 1766.53     53.5   1879.14      56.5  2066.56      53.1   2164.16      54.1  2425.57
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GR   56.8  2597.07    52.7  2847.29    53.3  2923.49    50.4  3066.89    51.6   3182.9
GR   58.2   3240.1   61.15     3360    59.6   3625.8    56.1  3784.39      48  3837.18
GR     47  3910.62    41.7  3954.78    48.8   4041.7    47.3   4372.4      43  4430.63
GR     48  4823.38    45.7  5084.92    47.1   5209.7    44.3  5637.46    44.9  5883.73
GR   38.8  5971.26    41.9  6088.05    27.9  6099.51    32.1  6158.61    38.5  6417.39
GR   41.9   6498.6    46.7  6519.38    44.4  6698.82    44.6  6871.35    49.1  7166.61
GR   45.8  7214.35    48.7  7269.55    49.1  7385.35    46.4  7650.65    49.5  7758.86
GR   48.8  7837.12      53   8005.6    54.3  8165.26    54.2  8385.85    47.8  8751.03
GR   48.9  8956.83    47.3  9151.02    48.7  9234.09    48.6  9464.92    47.2   9691.7
GR   44.3  9845.44    44.3 10352.59    48.4 10497.67    48.7 10744.17    46.9 10944.93
GR   53.3 11073.35    58.8 11124.29    58.3 11461.72    60.5 11629.21    59.8 11752.03
GR   66.4 11793.39    67.5 11924.83   70.95    12100    69.2 12409.61    71.8 12474.39
GR   70.4 12728.04    74.2 12870.91    71.6 12991.35    74.9 13090.92    73.1 13188.25
GR   74.6 13307.27    72.3 13497.82    74.7 13757.58    73.4 13964.96    74.3 14201.59
GR   74.4  14577.6    73.6 14996.08    75.1 15169.17    73.7  15240.5    74.4 15481.47
1
  28FEB00    09:46:44                                                 PAGE   7


QT      4    63800   132480   169770   315820
NC    .12      .12      .03       .1       .3
X1   8.49       91  2606.42  3168.51   2635.7  1605.14  2374.28
X3     10                              3851.71     54.7
GR   75.9        0    77.6       60   78.05      160   78.05      240      77    331.6
GR   72.3   368.12    69.4   412.95   71.35      460    69.7   534.73    67.2   564.85
GR   74.5      630    74.7      670    65.5   670.12    64.5      720    63.8   753.26
GR     55   814.19    51.2   856.53    46.4  1006.41    44.1  1184.02    46.1   1306.2
GR   45.1  1439.48    43.6  1567.36    42.1  1599.68    42.1  1656.52    45.3  1696.13
GR   46.6  1738.87    48.3  1871.15    45.8  1974.15    46.4  2040.15    43.1  2089.69
GR   43.2  2200.98    44.1  2303.81    45.6  2353.39      42  2371.86      46  2606.42
GR   37.9  2677.54    35.8  2837.08    35.9  2927.48   42.72  2959.44    47.7  3034.05
GR   49.5  3138.67    50.6  3168.51    48.9  3220.17    48.1  3328.05    48.6   3423.1
GR   50.4  3455.47    50.3  3565.82    52.2  3627.93    52.2  3679.39    54.7  3851.71
GR     53   3892.8    53.4     3940    51.9  3961.68      52  4079.34    52.9  4194.97
GR   55.8     4300    53.2  4350.46    54.7  4373.98    54.9  4425.24    53.8  4458.24
GR   54.6  4581.48    52.7  4690.43    53.9     4730    51.5  4768.99    52.7  4822.83
GR   50.7  4928.57    51.9   4949.8      52  5005.14    50.3  5083.53    51.9  5220.22
GR   50.4  5255.77    53.4  5329.85    55.9  5449.87    55.5  5530.76    52.5  5591.67
GR   51.4  5649.44    51.6  5719.53    50.4  5823.06    49.6  5989.14    44.2  6040.25
GR   44.2  6435.82    46.9  6530.15    48.9  6665.49    47.3  6720.92    47.2  6911.52
GR   55.6  6971.41    58.5  6998.91    61.3  7081.43    63.5  7116.99   66.48  7723.78
GR     71     8000

QT      4    63510   131460   169330   314100
NH      5       .1  2567.98      .05  3385.13     0.03  3879.38     0.05     5000      .12
NH  10500
X1   9.41       94  3385.13  3879.38     2500     5500     4858
X3     10                    2460.63    56.91
GR   78.4        0    78.9    96.63    78.6   295.76    79.3   365.11    78.2    423.8
GR   75.8   443.45    74.1   492.25    74.8   526.38   74.15      600    72.6      630
GR   72.8      670    65.3   721.32    60.2   753.27      56   813.24    54.4   854.41
GR   53.3   926.96      53  1014.31    51.5  1058.06    51.5  1133.33    50.5  1273.69
GR   51.4   1346.4    50.8  1454.34    51.1  1532.43    51.1  1736.18    51.8  1783.17
GR   51.8  1941.56    52.4  2003.11      53  2145.32    54.5  2316.56    56.8  2442.42
GR     56  2567.98    52.5  2621.33    52.4  2659.43    50.1  2775.83    49.4  2837.01
GR     50   3033.7    50.9  3141.06    43.5  3205.33    43.5  3281.17    51.8  3332.56
GR   53.3  3385.13    50.4  3417.41    45.2  3426.19    42.2  3442.41      42  3470.88
GR   38.1   3486.5    35.8  3658.23    36.2  3685.31    35.5  3798.17   42.72  3824.76
GR   48.2  3859.77    49.5  3879.38    44.1  3976.38    42.2  4082.27    42.2  4146.99
GR   43.8  4423.62    42.2  4450.81    48.9  4745.31    49.4  4914.17    48.4  5008.36
GR     48  5245.57    48.8   5332.6    48.1   5518.1    48.9  5669.75    47.9  5765.59
GR   50.2  5868.37    50.4  5903.32    49.4     6014      51  6193.43      53  6341.86
GR   52.1   6387.7    48.7  6470.08    48.4  6596.07    49.1  6831.48    48.1     6961
GR   49.1  7045.17    49.1  7203.02    48.4  7256.07    48.4     7513    50.4  7516.71
GR   49.7  7570.46    50.7  7615.19    48.4  7638.95    50.9  7797.35    55.4  7851.87
GR  57.57  7854.93   59.40     7877   61.45  7882.66      63     8000      64     8500
GR   64.3     8700      62     9300      67    10000      75    10500
1
  28FEB00    09:46:44                                                 PAGE   8
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QT     4    62850   129130   168330   309220
NC    .1     .12     0.03      .1       .3
X1  10.58     76   2518.22   3181.69    2700     3200     6177
X3    10               1431.19    55.17    8020    59.05
GR   75.8      0    75.6    63.6    60.9   180.78    56.7   260.63    55.3     400
GR  54.85    520      54  579.97    53.5   709.98    51.1   790.94    50.6  912.57
GR   49.1 1025.2    49.2 1101.07    53.7  1157.02    54.5     1384    55.5 1418.21
GR   54.9 1763.41   52.9 1902.66    54.8  2083.95    54.5  2206.57      53  2255.4
GR   52.8 2438.35   53.6 2518.22    42.4  2566.64    40.3  2590.99    29.8 2603.35
GR   22.1 2654.44   22.5 2685.55    31.1  2771.89    34.7  2844.63    41.9 2867.55
GR   50.1 2913.09   48.2 3126.19    50.5  3181.69    49.3  3252.87    46.5 3306.48
GR   50.3 3409.33   47.5 3613.61    52.7   3701.6    50.2  3854.05    47.2  3900.8
GR   42.7 3930.19   44.6 3976.89    46.3  4107.08      50  4195.39    48.7 5535.67
GR   48.7 5863.58     49 5916.48    50.6  6045.31    49.2  7520.57    53.5 7702.66
GR  59.05   8020    59.3    8120    57.1  8360.19    57.2  8644.55    54.9 8710.45
GR   60.1 8984.95   59.4 9100.32    61.6     9300    63.4  9619.42    62.4 9928.89
GR   62.5 10100.96  64.8 10231.72     63 10264.23    65.3 10573.06    65.9 10735.19
GR  71.55  10860    72.2   10980   74.25    11110    73.2    11255    73.3 11458.81
GR   74.9 11812.08  74.7 12055.58   76.1  12161.3   75.45    12360   76.75   12560
GR   78.5 12699.89

QT     4    62690   128570   168090   310160
NC    .1     .12      .03      .1       .3
NH     3      .1     3262     .03     4059     .12    13987
X1  10.86     43     3262    4059     1300     1100     1478
X3    10                              8865     62.3
GR   79.8      0    77.6     161    79.4      259    77.6      579    79.7     955
GR   78.9   1110    72.6    1684    52.3     1914    49.3     2212    50.4    2314
GR   52.2   3262    35.4    3575    31.7     3805    32.7     3875    52.4    4059
GR   46.4   4251      49    4323      45     4835    48.9     4896    44.9    5078
GR   47.3   5583    44.5    5654    43.2     5785    44.5     5945    41.7    6053
GR   57.6   6350    59.1    7698    60.1     8650    62.3     8865    59.2    9382
GR   61.6   9677    59.4    9772    60.6     9852    57.7    10128    56.7   10420
GR   54.4  10557    55.8   10709    60.7    11077    63.7    11730    72.9   12060
GR   74.4  13267    75.8   13671    79.7    13987

QT     4    62560   128120   167890   308450
NH     4     .12  2522.57     .05  3311.71      .03  3943.85      .12 13549.31
X1  11.09     82  3311.71  3943.85    1400     1600     1214
X3    10               3311.71    53.3  6949.97    63.7
GR   77.9      0    78.6  449.85      74   650.88    61.2   796.99    53.8  853.81
GR   51.5 1009.93   52.1 1209.82    51.1  1415.55    52.9  1698.13    53.4 1881.01
GR   54.3 2005.52   54.3 2131.11    52.6  2522.57    52.3  2664.39    42.5 2721.63
GR   42.5 3112.03   45.4  3215.1    53.3  3311.71      51  3378.76      45    3400
GR   42.5 3427.89   34.6 3459.26    31.8  3669.22      36  3729.17      42 3745.04
GR   50.1 3767.43   55.5 3802.55      57  3943.85      52  4107.84    50.5  4209.1
GR   53.1 4359.76   56.2 4405.38    56.4  4699.98      55  4860.97    56.5 4932.99
GR   54.4 5041.53   50.1    5150    52.2  5287.22    53.6  5519.22    51.9 5703.27
GR     52   5900    51.8    6040      52     6160    53.2     6300    54.5    6450
GR   57.8   6690    63.7 6949.97    63.9  7208.78    62.9  7282.45    61.9 7559.06
GR   59.2 7996.95   57.3    8229    58.1     8331    63.7     8477    61.2  8548.1
GR   62.8 8733.88   62.1 8893.69    62.3  9162.78    59.8  9368.39   62.65    9510
GR   62.2   9630    60.2 9723.91    61.8  9807.54    62.8 10002.69    59.7 10225.58
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GR   62.6 10311.07  60.9 10350.09   62.5 10478.43    60.8 10575.85    64.4 11234.07
GR   67.3 11355.29  71.8 11460.13   75.3 11489.48   75.05    11790    74.1 11874.14
GR   74.1 12095.62  75.2 12273.93   75.5 12508.24    74.6 12649.39      76 13085.66
GR   74.3 13286.4   79.6 13549.31

QT     4    62410   127600   167670   307570
NC   .12     .12      .03      .3       .5
X1  11.35     89  2958.98  3804.94    1000     2300     1373
X3    10                 2199      58  6519.75    65.5
GR  75.43      0      66  155.36    64.3   287.39    63.9   438.76    60.9  535.19
```

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GR   54.9   626.91     52   787.68    53.3   980.78    52.8  1186.05    55.1  1413.79
GR   55.2  1604.36   56.9  1641.25      57  1786.87   56.25     1790    56.3  2127.54
GR   58.1  2185.43   54.8  2259.37    54.4  2456.59    50.5  2653.09    51.8  2802.23
GR   53.9  2832.46   52.8  2958.98    44.7  3090.28    48.1  3150.77   37.64  3267.77
GR  38.74  3336.43  28.84  3406.43   29.04  3461.55   36.14     3538    42.5  3671.55
GR   52.6  3804.94   47.4  3855.04    47.9  3919.98    43.7  3952.95    42.6  4050.14
GR   44.3  4431.03   41.9  4584.19      47   4826.5    42.5  4859.87    42.6  4957.91
GR   48.7  5021.15   49.2  5059.55    43.9   5090.8    44.7  5266.47    43.2  5349.68
GR   50.2  5459.53   52.4  5575.87    50.4  5703.12    51.9  5904.76    49.1  6073.64
GR   49.1  6167.73   51.3  6273.19    59.7  6409.59    65.5  6519.75    65.7  6635.31
GR   63.6  6757.16     63  7060.24    63.3  7375.88      66     7690    64.7  7907.84
GR   65.5   7969.4   64.1   8340.7    64.9  8381.19    64.1  8668.42      62  8835.44
GR   62.5  8946.12   65.3  9083.61    63.6  9200.98   64.35     9450      63  9781.97
GR   63.1  10165.1   65.1 10443.04    64.4 10755.85    64.5 10988.16    68.1 11162.12
GR  71.35    11220   71.9 11348.07    74.6 11434.99    75.9 11601.85   78.45    11650
GR   79.6    11960   81.1 12067.18    79.5 12180.83    80.3 12422.88    84.2 12477.71
GR  85.05    12580   83.5 12625.42    84.2    12770    82.9  13330.5

X1  11.38      85   19900    21000    1000    2300    1373    0.00      -1       0
X3     10     0.0     0.0      0.0     0.0     0.0     0.0     0.0     0.0     0.0
GR  85.00  14899.0  85.00  14900.0   85.00  16700.0   80.00  16850.0   75.00  16950.0
GR  70.00  17099.0  70.00  17100.0   65.00  17150.0   60.00  17350.0   55.00  17800.0
GR  65.90  19700.0  66.80  19800.0   67.30  19900.0   61.80  20000.0   60.70  20001.0
GR  55.60  20014.9  49.10  20030.0   44.10  20045.4   43.40  20060.3   45.20  20075.3
GR  45.80  20090.3  46.20  20105.3   45.30  20120.1   45.90  20136.6   46.00  20153.3
GR  45.30  20169.6  44.30  20186.2   44.70  20202.8   45.10  20219.6   45.00  20236.2
GR  45.30  20252.7  45.20  20269.3   45.20  20286.0   44.30  20302.6   43.70  20319.4
GR  40.00  20335.8  42.60  20352.5   38.10  20368.8   33.60  20385.4   35.50  20402.0
GR  33.20  20416.3  32.40  20430.0   31.70  20450.0   36.40  20470.0   34.80  20492.0
GR  37.60  20510.0  38.00  20527.2   38.30  20535.0   38.00  20565.0   37.40  20590.0
GR  37.00  20600.3  34.80  20615.0   27.80  20630.0   34.80  20645.0   36.30  20655.1
GR  39.20  20674.3  40.60  20693.3   38.60  20712.1   42.40  20731.4   43.50  20735.0
GR  47.40  20750.7  48.20  20769.8   47.20  20789.0   47.50  20808.0   47.50  20865.1
GR  47.80  20865.2  48.10  20884.2   47.90  20903.3   48.10  20922.3   48.70  20941.3
GR  54.90  20960.4  63.70  20978.7   63.90  20979.5   65.00  21000.0   64.30  21100.0
GR  55.00  22000.0  55.00  24800.0   60.00  25000.0   65.00  26200.0   65.00  26500.0
GR  70.00  27700.0  75.00  27800.0   80.00  28300.0   85.00  29700.0   90.00  30100.0

SB   1.25    1.50    2.60     0.0   189.0    20.4  22729.0   10.20   27.80   27.80
ET                                    9.1                    19900   21000
1
```



```
X1  11.39       0     0.0     0.0    50.0    50.0    50.0    0.00    0.00       0
X2      0    0.00       1   67.20   68.30    0.00       0    0.00    0.00       0
X3     10     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT     33 14899.0    87.0     0.0 16700.0    87.0     0.0 17000.0    85.0     0.0
BT  17560    80.0     0.0 18100.0    75.0     0.0 19200.0    70.0     0.0 19201.0
BT   70.0     0.0 20000.0    68.3     0.0 20000.1    68.3    65.7 20120.1    69.1
BT   66.7 20201.2    69.1    66.0 20416.3    69.8    67.1 20416.4    69.8    66.5
BT  20492    69.8    66.8 20492.1    69.8    65.1 20655.1    69.8    65.1 20655.2
BT   69.8    67.2 20978.7    68.8    65.6 20978.8    68.8     0.0 21000.0    68.0
BT    0.0 21100.0    67.3     0.0 21200.0    66.3     0.0 21201.0    66.3     0.0
BT  23250    62.0     0.0 25100.0    65.0     0.0 26200.0    65.0     0.0 26400.0
BT   65.0     0.0 26700.0    70.0     0.0 27650.0    75.0     0.0 28150.0    82.0
BT    0.0 28750.0    87.0     0.0 29000.0    92.0     0.0 30300.0    92.0     0.0

ET                                   8.41
X1   11.4      89 2958.98 3804.94    50.0    50.0    50.0    0.00    0.00       0
X3     10                    2199      58 6519.75    65.5
GR  75.43        0     66   155.36    64.3   287.39    63.9   438.76    60.9   535.19
GR   54.9   626.91     52   787.68    53.3   980.78    52.8  1186.05    55.1  1413.79
GR   55.2  1604.36   56.9  1641.25      57  1786.87   56.25     1790    56.3  2127.54
GR   58.1  2185.43   54.8  2259.37    54.4  2456.59    50.5  2653.09    51.8  2802.23
GR   53.9  2832.46   52.8  2958.98    44.7  3090.28    48.1  3150.77   37.64  3267.77
GR  38.74  3336.43  28.84  3406.43   29.04  3461.55   36.14     3538    42.5  3671.55
GR   52.6  3804.94   47.4  3855.04    47.9  3919.98    43.7  3952.95    42.6  4050.14
GR   44.3  4431.03   41.9  4584.19      47   4826.5    42.5  4859.87    42.6  4957.91
GR   48.7  5021.15   49.2  5059.55    43.9   5090.8    44.7  5266.47    43.2  5349.68
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GR   50.2  5459.53   52.4  5575.87   50.4  5703.12   51.9  5904.76   49.1  6073.64
GR   49.1  6167.73   51.3  6273.19   59.7  6409.59   65.5  6519.75   65.7  6635.31
GR   63.6  6757.16     63  7060.24   63.3  7375.88     66     7690   64.7  7907.84
GR   65.5   7969.4   64.1   8340.7   64.9  8381.19   64.1  8668.42     62  8835.44
GR   62.5  8946.12   65.3  9083.61   63.6  9200.98  64.35     9450     63  9781.97
GR   63.1  10165.1   65.1 10443.04   64.4 10755.85   64.5 10988.16   68.1 11162.12
GR  71.35    11220   71.9 11348.07   74.6 11434.99   75.9 11601.85  78.45    11650
GR   79.6    11960   81.1 12067.18   79.5 12180.83   80.3 12422.88   84.2 12477.71
GR  85.05    12580   83.5 12625.42   84.2    12770   82.9  13330.5

QT      4    62340   127340   167560   307140        0        0        0        0
NC    .12      .12      .03       .1       .3
NH      3     .120  3153.07     .030  3834.77     .120 14239.64
X1  11.48       83  3153.07  3834.77      400      700      370                 -1
X3     10                    1998.35    56.86
GR  76.29        0   74.2   141.74   72.1   251.69   67.3   387.98   65.6   572.84
GR   64.9   799.64   56.3  1051.78   56.7   1284.7   55.8  1423.54   57.5  1735.27
GR   55.8  1865.38   57.9  1950.43     57  2115.34   51.9  2192.24   51.6  2676.44
GR   48.1  2772.19   51.5   2897.5   47.5  3079.27   49.6  3153.07   48.4  3217.84
GR   40.8  3263.45   46.8  3312.88  38.33  3352.99  32.93   3453.9  28.63  3598.06
GR  22.83  3619.02  25.93  3642.69  21.73  3663.26  28.63  3710.06  40.09  3750.18
GR   50.5  3834.77   52.5  4098.58   52.5  4266.28   50.2  4616.96   53.2  5256.55
GR   55.8  5417.16   49.5  5542.31   49.6  5811.88   52.8  5944.08   50.5  6026.29
GR   49.2  6139.42   50.6  6300.68   60.8  6368.78   60.8  6489.41   52.1  6544.58
GR   49.1  6582.93   49.6  6866.77   53.6  6999.45   52.4  7192.35   55.8  7242.29
GR   52.1  7310.92   57.4   7392.7   58.9  7486.54   57.8   7527.2   59.3  7858.55
GR   62.3  8313.45   62.3   8520.5   63.1  8579.97   63.8  8874.31   63.1  9022.65
GR   64.7  9319.75     64  9847.05     66 10324.86   67.2 10502.28   70.9 10689.92
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GR   75.6 10862.29     80 11138.46   81.4 11329.98   82.6 11935.13   82.6 12152.77
GR     84 12494.73   86.9 12751.65     91 12961.31   96.3 13165.82   98.2 13409.92
GR   97.1 13499.57   82.3 13562.28   82.6 13710.72   93.2 13739.27   91.2 13843.55
GR   84.7 14008.62   85.8 14187.33   84.3 14239.64

QT      4    62300   127200   167500   306900
NC    .12      .12      .03       .6       .8
X1  11.55       73     3153     3835    400.0    400.0    370.0     0.00        0
X3     10      0.0      0.0     1950       57      0.0      0.0      0.0
GR   75.4        0   74.2      142   67.3      388   65.6      573   64.9      800
GR   51.7      898   56.3     1052   56.7     1285   55.8     1424   51.7     1438
GR   51.7     1636   57.5     1735   57.9     1950     57     2115   51.9     2192
GR   51.6     2676   48.1     2772   51.5     2898   47.5     3079   49.6     3153
GR   48.4     3218   46.8     3313  38.33     3353  28.63     3598  22.83     3619
GR  25.93     3643  21.73     3663  28.63     3710  40.09     3750   50.5     3835
GR   52.5     4099   52.5     4266   50.2     4617   44.2     4679   44.3     5110
GR   53.2     5257   55.8     5417   49.5     5542   49.6     5812   52.8     5944
GR   50.5     6026   49.2     6139   50.6     6301   60.8     6369   60.8     6489
GR   52.1     6545   49.1     6583   49.6     6867   53.6     6999   52.4     7192
GR   52.1     7311   58.9     7487   59.3     7859   62.3     8313   62.3     8521
GR   63.1     8580   63.8     8874   63.1     9023   64.7     9320     64     9847
GR     66    10325   67.2    10502   70.9    10690   75.6    10862     80    11138
GR   81.4    11330   82.6    11935   82.6    12153     84    12495   86.9    12752
GR     91    12961   96.3    13166   98.2    13410

NH      4     .100  18850.0     .100  20250.0     .030  21748.6     .120  28900.0    0.000
X1 11.569       83    20250  21768.7      100      100      100     0.00     0.00        0
X3     10      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR  84.00  16850.0  80.00  17250.0  80.00  17251.0  80.00  17252.0  75.00  18025.0
GR  70.00  18075.0  65.00  18125.0  60.00  18200.0  60.00  18201.0  60.00  18202.0
GR  60.00  18450.0  60.00  18500.0  60.00  18600.0  60.00  18850.0  55.00  19350.0
GR  55.00  19351.0  68.70  20250.0  49.80  20287.0  49.30  20323.0  48.30  20340.0
GR  49.80  20360.4  48.40  20389.0  50.50  20396.9  48.10  20458.0  44.50  20495.0
GR  44.20  20506.1  45.40  20560.0  44.50  20600.0  45.00  20650.0  47.20  20711.0
GR  44.00  20721.0  42.80  20746.0  43.30  20770.0  35.50  20800.0  33.50  20820.0
GR  26.50  20920.0  24.10  20930.0  31.40  20940.0  25.40  20944.1  29.70  20960.0
GR  30.60  20970.0  33.20  20980.0  33.20  20981.0  35.00  20990.0  35.90  21000.0
GR  38.40  21010.0  38.40  21017.3  43.43  21039.0  45.80  21089.5  46.80  21162.7
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GR  46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR  49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR  51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR  64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00  22500.
GR  55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00  24950.
GR  60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00  28150.
GR  85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00    0.0

SB   1.25    2.31    2.60    0.0     50     46    32375     20    24.1    24.1
NC   .120    .120    .035    .3      .5
X1 11.660     91  20226.0  21910.0    480    480    480    0.00      0
X2   0.0     0.0      1   63.08   69.07    0.0    0.0    0.0    0.0    0.0
X3    10     0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
BT    27  16200.0   68.99    0.0  17200.0   64.77    0.0  17500.0   63.51    0.0
BT 18300.   67.62    0.0  18301.0   67.63    0.0  18669.0   72.15    0.0  19195.0
BT  71.42    0.0  20000.0   67.97    0.0  20100.0   68.42    0.0   20200   68.87
1
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BT    0.0  20235.8   69.04   69.04  20242.8   69.07   63.08  20573.0   70.56   64.57
BT 20903.   72.04   66.05  21141.3   72.66   66.67  21563.0   71.21   65.22  21893.1
BT  69.73   63.74  21900.0   69.70   69.70  22000.0   69.24    0.0  22274.7   68.01
BT    0.0  22700.0   66.10    0.0  23449.7   65.50    0.0  24374.7   69.44    0.0
BT 26274.   85.80    0.0  28000.0   85.80    0.0  28300.0   85.80    0.0  28900.0
BT   90.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
GR  85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR  60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR  64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR  49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR  44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR  48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR  45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR  37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR  33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR  27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR  24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR  43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR  48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR  49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR  47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR  51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR  64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR  65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
GR  90.50  28900.0    0.00    0.0    0.00    0.0    0.00    0.0    0.00    0.0

X1 11.679     73    3153    3835    100    100    100    0.00    0.00      0
X3    10     0.0    0.0    1950     57    0.0    0.0    0.0
GR   75.4      0    74.2    142    67.3    388    65.6    573    64.9    800
GR   51.7    898    56.3   1052    56.7   1285    55.8   1424    51.7   1438
GR   51.7   1636    57.5   1735    57.9   1950     57    2115    51.9   2192
GR   51.6   2676    48.1   2772    51.5   2898    47.5   3079    49.6   3153
GR   48.4   3218    46.8   3313   38.33   3353   28.63   3598   22.83   3619
GR  25.93   3643   21.73   3663   28.63   3710   40.09   3750    50.5   3835
GR   52.5   4099    52.5   4266    50.2   4617    44.2   4679    44.3   5110
GR   53.2   5257    55.8   5417    49.5   5542    49.6   5812    52.8   5944
GR   50.5   6026    49.2   6139    50.6   6301    60.8   6369    60.8   6489
GR   52.1   6545    49.1   6583    49.6   6867    53.6   6999    52.4   7192
GR   52.1   7311    58.9   7487    59.3   7859    62.3   8313    62.3   8521
GR   63.1   8580    63.8   8874    63.1   9023    64.7   9320     64    9847
GR    66   10325    67.2  10502    70.9  10690    75.6  10862     80   11138
GR   81.4  11330    82.6  11935    82.6  12153     84   12495    86.9  12752
GR    91   12961    96.3  13166    98.2  13410

QT     4   62060  126360  167140  305490      0      0      0      0
NC   .120    .120    .030     .1     .3
X1  11.97     84  2273.46  2827.03    802   5043   2118
X3    10               1105.39   52.5   9060   74.8
GR  78.23      0    64.2  174.04    63.5  501.47    62.4  571.34    57.3  671.03
GR   46.1  969.8    52.3  1075.96   49.9  1240.38   49.5  1362.1    47.4  1575.32
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GR   49.6   1774.8    45.3  2044.49    47.5   2118.35    44.4   2165.58    46.6   2273.46
GR  35.52  2351.83   41.02   2371.83   32.22   2411.83   31.72   2441.83   37.12   2621.82
GR   45.7  2759.78    44.7  2827.03    45.5   2960.44    44.9   3171.29    46.7      3200
GR   46.4  3463.72      47  3583.97    44.6   3643.28      45   3872.88      47   3996.03
1
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GR   53.2  4123.35    60.5   4270.1    60.5   4509.54    57.2   4775.48      58   5148.72
GR   56.2  5363.59    55.1   5699.3    49.4   5956.27    49.6   6073.28    48.3   6272.85
GR     51  6381.63    52.1  6574.09    51.8   6814.08    53.2   6887.03    50.2   7041.29
GR   53.5  7127.14    51.6  7442.96    56.9   7800.49    62.4   7837.71    64.9   7999.27
GR   67.4  8385.92    67.1  8424.35    74.8      9060    66.9      9130   66.35      9190
GR   65.8   9282.6    53.6   9356.5    55.7   9527.42    58.8   9587.89    70.2   9638.17
GR   72.9  9884.04      75 10154.89    75.2  10427.45    76.1  10520.96    76.1   10769.8
GR   90.2    10830    91.8 11098.11    89.8  11321.02    86.3  11634.53    85.4  11757.32
GR   86.8 11952.18    85.2 12112.75    87.5  12345.14    83.2  12384.16    89.1  12447.67
GR   85.9 12555.51    90.4    12650    84.7  12970.55    83.1  13224.85      84  13312.97
GR     83 13508.04    84.5  13657.9    83.9  13887.88    86.8  14077.83


1
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL    OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL   TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN   ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR TOPWID  ENDST


*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=    .100 CEHV=    .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=    1232.0   8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
       THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
       THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
    3.615    20.61    50.91     .00    50.91    51.06     .15     .00     .00    41.60
  174300.0   1521.8 167008.7   5769.5   3779.5  51973.1  11582.1      .0      .0    43.80
      .00      .40     3.21     .50     .120     .030     .120     .000    30.30  1277.93
   .000136      0.       0.       0.       0        0        0      .00  7174.17  8452.10


*SECNO 4.745

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.74


3470 ENCROACHMENT STATIONS=    1973.4   6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60
    4.745    21.39    51.39     .00     .00    51.47     .08     .40     .01    51.10
  173330.0       .4 172826.0    503.5     18.8  76897.6   2794.0   9724.6   775.6    47.20
      .73      .02     2.25     .18     .120     .030     .120     .000    30.00  2244.23
   .000044    3600.    5966.    4500.       2        0        0      .00  5382.30  7626.53


CCHV=    .300 CEHV=    .500
*SECNO 5.026

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .41
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3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.026   40.85   51.45    .00     .00   51.73     .27     .16     .10    56.20
 173080.0      .0 173080.0     .0      .0  41314.2      .0  11868.8   953.9   57.00
    .83     .00    4.19    .00    .000    .030    .000    .000   10.60  9613.30
  .000265   1030.   1482.   4150.      2       0       0     .00  3478.05 13091.35
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 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
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*SECNO 5.027

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.027   40.88   51.48    .00     .00   51.73     .26     .00     .01    56.20
 173080.0      .0 173080.0     .0      .0  42667.3      .0  11869.8   953.9   56.00
    .83     .00    4.06    .00    .000    .030    .000    .000   10.60  9617.07
  .000261      1.      1.      1.      2       0       0     .00  3334.80 13037.75


*SECNO 5.034

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.034   40.89   51.49    .00     .00   51.75     .26     .01     .00    56.20
 173080.0      .0 173080.0     .0      .0  42708.5      .0  11915.9   957.5   56.00
    .84     .00    4.05    .00    .000    .030    .000    .000   10.60  9617.03
  .000261     47.     47.     47.      0       0       0     .00  3334.92 13037.82


*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.035   40.88   51.48    .00     .00   51.75     .27     .00     .01    56.20
 173080.0      .0 173080.0     .0      .0  41437.9      .0  11916.8   957.6   57.00
    .84     .00    4.18    .00    .000    .030    .000    .000   10.60  9613.19
  .000262      1.      1.      1.      0       0       0     .00  3478.56 13091.75
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 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
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*SECNO 5.037

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037   40.88   51.48    .00    .00   51.76    .27    .00    .00   56.20
 173080.0      .0 173080.0    .0     .0  41417.5     .0 11924.4   958.3   57.00
    .84     .00    4.18    .00   .000   .030   .000   .000   10.60  9613.21
  .000263      8.      8.      8.      0      0      0    .00  3478.48 13091.69


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038   40.91   51.51    .00    .00   51.76    .25    .00    .01   56.20
 173080.0      .0 173080.0    .0     .0  42765.1     .0 11925.4   958.3   56.00
    .84     .00    4.05    .00   .000   .030   .000   .000   10.60  9616.96
  .000260      1.      1.      1.      2      0      0    .00  3335.10 13037.91


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045   40.92   51.52    .00    .00   51.77    .25    .01    .00   56.20
 173080.0      .0 173080.0    .0     .0  42806.0     .0 11971.6   961.9   56.00
    .84     .00    4.04    .00   .000   .030   .000   .000   10.60  9616.92
  .000259     47.     47.     47.      0      0      0    .00  3335.22 13037.98
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
   TIME    VLOB    VCH    VROB    XNL    XNCH    XNR    WTN    ELMIN    SSTA
   SLOPE   XLOBL   XLCH   XLOBR  ITRIAL   IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=    .100 CEHV=     .300
*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046   40.91   51.51    .00    .00   51.78    .27    .00    .00   56.20
 173080.0      .0 173080.0    .0     .0  41520.4     .0 11972.5   962.0   57.00
    .84     .00    4.17    .00   .000   .030   .000   .000   10.60  9613.12
  .000261      1.      1.      1.      1      0      0    .00  3478.90 13092.02


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 5.585
   5.585   28.64   52.34    .00    .00   52.49    .16    .70    .01   48.20
 172610.0 115105.5 57477.3   27.2  59284.5  11975.5   119.8 15536.0  1382.4    49.80
    1.11    1.94    4.80    .23   .049   .030   .120   .000   23.70  1249.84
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 .000245   2664.   2847.   1744.      2      0      0     .00 10009.70 11259.54


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW

   6.420   24.62   53.02    .00     .00    53.17    .15     .67     .00    46.70
 171900.0  99245.0  40075.9  32579.2  34827.6   9373.7  16891.8  19647.8   1890.2    47.50
   1.38    2.85    4.28    1.93   .030    .030    .050    .000    28.40  10886.65
 .000215   2300.   4409.   2800.      2      0      0     .00  7480.99 18395.83


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0 TYPE=    1 TARGET=    8229.000
 ELENCL=    53.10 ELENCR=    57.90
   7.090   23.69   53.79    .00     .00    53.98    .19     .80     .01    46.90
 171320.0   9335.8  99785.3  62198.9  12523.8  22715.9  41737.5  24460.7   2471.7    47.40
   1.65     .75    4.39    1.49   .120    .030    .084    .000    30.10   8963.35
 .000306   2000.   3538.   3600.      2      0      0     .00 10873.39 19836.74
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=       .0  16383.0 TYPE=    1 TARGET=   16383.000
   7.470   25.29   54.29    .00     .00    54.58    .29     .57     .03    47.70
 171000.0  63484.5  57426.9  50088.6  42995.7   8571.9  17106.4  27150.2   2833.0    44.30
   1.78    1.48    6.70    2.93   .070    .030    .050    .000    29.00   6996.87
 .000357   1500.   2006.   1500.      2      0      0     .00  9291.02 16287.89


*SECNO 8.070

3470 ENCROACHMENT STATIONS=    3455.4  15481.5 TYPE=    1 TARGET=   -3455.360
 ELENCL=    61.13 ELENCR= 100000.00
   8.070   27.54   55.44    .00     .00    56.02    .59    1.35     .09    44.30
 171000.0  22207.5 107836.0  40956.5  16621.2  14038.6  33229.7  31542.5   3377.9    46.70
   1.94    1.34    7.68    1.23   .120    .030    .120    .000    27.90   3788.71
 .000607   2619.   2891.   3201.      2      0      0     .00  7304.43 11093.14


CCHV=   .100 CEHV=    .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO =  .65


3470 ENCROACHMENT STATIONS=       .0   3851.7 TYPE=    1 TARGET=    3851.709
   8.490   21.45   57.25    .00     .00    58.57   1.32    2.32     .22    46.00
 169770.0  52178.2 103453.1  14138.7  21261.7   8867.8  12139.9  34148.7   3682.5    50.60
```

```
   2.02    2.45   11.67    1.16    .120    .030    .120    .000   35.80   798.62
 .001406   2636.   2374.   1605.      3       0       0     .00  6188.42  6987.04
```

1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK     EG      HV      HL     OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL      TWA   R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN     ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR   TOPWID ENDST
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.29

```
3470 ENCROACHMENT STATIONS=   2460.6  10500.0  TYPE=    1  TARGET=   -2460.630
 ELENCL=    56.91  ELENCR= 100000.00
   9.410   24.95   60.45     .00     .00   60.69     .24    2.01     .11   53.30
 169330.0 24873.4 62602.3 81854.3 15140.7 10294.3 48917.4 40116.5  4362.5   49.50
    2.39    1.64    6.08    1.67    .057    .030    .079    .000   35.50   751.72
 .000266   2500.   4858.   5500.      3       0       0     .00  7128.18  7879.89
```

CCHV= .100 CEHV= .300
*SECNO 10.580

```
3470 ENCROACHMENT STATIONS=   1431.2   8020.0  TYPE=    1  TARGET=    6588.810
 ELENCL=    55.17  ELENCR=     59.05
  10.580   39.51   61.61     .00     .00   61.95     .35    1.23     .03   53.60
 168330.0 14240.5 90547.8 63541.7 15720.5 14192.4 59656.7 46797.1  4970.4   50.50
    2.71     .91    6.38    1.07    .100    .030    .120    .000   22.10   175.21
 .000284   2700.   6177.   3200.      2       0       0     .00  9124.64  9299.85
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 10.860

```
3470 ENCROACHMENT STATIONS=       .0   8865.0  TYPE=    1  TARGET=    8864.999
  10.860   30.24   61.94     .00     .00   62.30     .37     .34     .01   52.20
 168090.0 16698.7 107589.7 43801.6 15162.1 17854.9 42040.5 49085.7  5189.4   52.40
    2.80    1.10    6.03    1.04    .100    .030    .120    .000   31.70  1804.81
 .000235   1300.   1478.   1100.      2       0       0     .00  7024.74  8829.55
```

1490 NH CARD USED
*SECNO 11.090

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

```
3470 ENCROACHMENT STATIONS=   3311.7   6950.0  TYPE=    1  TARGET=    3638.260
 ELENCL=    53.30  ELENCR=     63.70
  11.090   30.43   62.23     .00     .00   62.87     .64     .48     .08   53.30
 167890.0 39408.3 98596.3 29885.5 21783.9 11936.5 24012.4 51307.6  5415.0   57.00
    2.87    1.81    8.26    1.24    .082    .030    .120    .000   31.80   785.24
 .000559   1400.   1214.   1600.      2       0       0     .00  6099.92  6885.16
```

```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=   .300 CEHV=    .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=     4320.750
 ELENCL=     58.00  ELENCR=     65.50
   11.350    34.28    63.12     .00     .00    63.45     .33     .49     .09    52.80
 167670.0  10998.8  106143.8  50527.4  15979.1  18501.6  41988.4  53963.2   5644.0    52.60
     2.97      .69     5.74    1.20    .120     .030    .120    .000    28.84   463.99
  .000220    1000.    1373.   2300.      2       0       0     .00  6010.47  6474.46


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=        64.00

   11.380    36.47    63.27     .00     .00    64.26     .99     .48     .33    66.30
 167670.0       .0  167670.0      .0      .0  21034.9      .0  55878.2   5772.7    64.00
     3.03      .00     7.97     .00    .000     .030    .000    .000    26.80 19955.06
  .000474    1000.    1373.   2300.      2       0       0     .00  1031.38 20986.43



SPECIAL BRIDGE

SB  XK      XKOR    COFQ    RDLEN    BWC     BWP      BAREA    SS      ELCHU    ELCHD
     1.25    1.50    2.60     .00   189.00   20.40  22729.00   10.20   27.80    27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=      63.17 BRIDGE VELOCITY=       8.95    CALCULATED CHANNEL AREA=       18728.
```

```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST



 EGPRS     EGLWC      H3     QWEIR     QLOW     BAREA   TRAPEZOID    ELLC     ELTRD    WEIRLN
                                               AREA
     .00    64.34     .08        0.   167670.   22729.    22477.      67.20    68.30       0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=        64.00

   11.390    36.56    63.36     .00     .00    64.34     .98     .08     .00    66.30
 167670.0       .0  167670.0      .0      .0  21122.4      .0  55902.4   5773.9    64.00
     3.03      .00     7.94     .00    .000     .030    .000    .000    26.80 19953.52
  .000469      50.      50.     50.      0       0       0     .00  1034.49 20988.01
```

```
*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.62


3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=     58.00  ELENCR=     65.50
  11.400    35.44    64.28      .00       .00     64.56      .28       .01       .21     52.80
 167670.0   12765.4  104041.2  50863.4  18926.4  19485.1  45104.9  55962.5   5778.1     52.60
    3.03      .67     5.34     1.13     .120      .030      .120      .000     28.84    295.76
  .000178     50.       50.       50.        2         0         0       .00   6200.78   6496.54


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480

3470 ENCROACHMENT STATIONS=    1998.3   14239.6  TYPE=     1  TARGET=   -1998.350
 ELENCL=     56.86  ELENCR= 100000.00
  11.480    43.61    64.34      .00       .00     64.64      .30       .07       .01     48.60
 167560.0   18059.7  106307.6  43192.7  24006.0  19432.6  55513.3  57133.4   5880.7     49.50
    3.07      .75     5.47      .78     .120      .030      .120      .000     20.73    657.91
  .000142    400.     370.     700.        2         0         0       .00   9508.66  10166.57


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  28FEB00     09:46:44                                                        PAGE  22


   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS    L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL      TWA      R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN      ELMIN    SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR    TOPWID   ENDST


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=    1950.0   13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=     57.00  ELENCR= 100000.00
  11.550    42.66    64.39      .00       .00     64.70      .30       .06       .00     49.60
 167500.0   17819.9  102665.7  47014.4  23090.3  18298.4  53836.5  58011.9   5964.6     50.50
    3.10      .77     5.61      .87     .120      .030      .120      .000     21.73    806.21
  .000161    400.     370.     400.        0         0         0       .00   8854.55   9942.54


1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

  11.569    40.27    64.37      .00       .00     64.93      .56       .02       .20     68.70
 167500.0      .0  167500.0      .0        .0   27940.5       .0   58153.3   5976.5     67.10
    3.10      .00     5.99      .00     .000      .031      .000      .000     24.10  20258.48
  .000323    100.     100.     100.        2         0         0       .00   1501.36  21759.84


SPECIAL BRIDGE

SB  XK      XKOR     COFQ     RDLEN    BWC      BWP      BAREA    SS       ELCHU    ELCHD
```

```
   1.25    2.31    2.60     .00    50.00    46.00  32375.00    20.00    24.10    24.10

CCHV=    .300 CEHV=    .500
*SECNO 11.660
PRESSURE FLOW


 EGPRS     EGLWC     H3      QWEIR     QPR      BAREA   TRAPEZOID    ELLC     ELTRD     WEIRLN
                                       AREA
   65.33    64.93     .06       0.  167500.  32375.   30545.     63.08    69.07       0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=        68.90 ELREA=        68.20

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  28FEB00     09:46:44                                                       PAGE  23


  SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL       OLOSS    L-BANK ELEV
  Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL      TWA      R-BANK ELEV
  TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN      ELMIN    SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR    TOPWID   ENDST


  11.660    45.10    64.90     .00      .00    65.33     .42      .40      .00    68.90
 167500.0      .0  167500.0     .0       .0  32093.4      .0  58484.0   5993.9    68.20
   3.13      .00     5.22      .00     .000     .035     .000     .000    19.80 20235.85
  .000298    480.     480.     480.       2        0        0      .00  1665.59 21901.44


*SECNO 11.679

3470 ENCROACHMENT STATIONS=     1950.0   13410.0  TYPE=      1  TARGET=    -1950.000
 ELENCL=     57.00  ELENCR= 100000.00
  11.679    43.46    65.19     .00      .00    65.41     .22      .02      .06    49.60
 167500.0  20428.2  93999.2  53072.6  24954.6  18835.4  58676.7  58638.5   6006.7     50.50
   3.13      .82     4.99      .90     .120     .035     .120     .000    21.73   706.91
  .000167    100.     100.     100.       2        0        0      .00  9423.79 10130.71


CCHV=    .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=     1105.4    9060.0  TYPE=      1  TARGET=     7954.610
 ELENCL=     52.50  ELENCR=     74.80
  11.970    33.92    65.64     .00      .00    65.87     .23      .46      .00    46.60
 167140.0  25183.7  81171.1  60785.3  26808.4  14983.4  67309.5  67230.0   6749.2     44.70
   3.40      .94     5.42      .90     .120     .030     .120     .000    31.72   156.13
  .000148    802.    2118.    5043.       2        0        0      .00  7958.18  8114.31


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  28FEB00     09:46:44                                                       PAGE  24



                                                   THIS RUN EXECUTED 28FEB00    09:46:44
**************************************
 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


Starting form river mile
```

SUMMARY PRINTOUT

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
* 9724.618	.02	.18	2.25	79710.34	5382.30	.00	99.71	.29
* 11868.840	.00	.00	4.19	41314.24	3478.05	.00	100.00	.00
11869.800	.00	.00	4.06	42667.32	3334.80	.00	100.00	.00
11915.860	.00	.00	4.05	42708.54	3334.92	.00	100.00	.00
11916.830	.00	.00	4.18	41437.87	3478.56	.00	100.00	.00
11924.430	.00	.00	4.18	41417.55	3478.48	.00	100.00	.00
11925.400	.00	.00	4.05	42765.09	3335.10	.00	100.00	.00
11971.560	.00	.00	4.04	42806.04	3335.22	.00	100.00	.00
11972.530	.00	.00	4.17	41520.42	3478.90	.00	100.00	.00
15535.960	1.94	.23	4.80	71379.88	10009.70	66.69	33.30	.02
19647.750	2.85	1.93	4.28	61093.07	7480.99	57.73	23.31	18.95
24460.670	.75	1.49	4.39	76977.25	10873.39	5.45	58.24	36.31
27150.160	1.48	2.93	6.70	68674.01	9291.02	37.13	33.58	29.29
31542.470	1.34	1.23	7.68	63889.50	7304.43	12.99	63.06	23.95
* 34148.750	2.45	1.16	11.67	42269.31	6188.42	30.73	60.94	8.33
* 40116.490	1.64	1.67	6.08	74352.37	7128.18	14.69	36.97	48.34

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
46797.120	.91	1.07	6.38	89569.58	9124.64	8.46	53.79	37.75
49085.690	1.10	1.04	6.03	75057.51	7024.74	9.93	64.01	26.06
* 51307.630	1.81	1.24	8.26	57732.71	6099.92	23.47	58.73	17.80
* 53963.230	.69	1.20	5.74	76469.08	6010.47	6.56	63.31	30.14
* 55878.250	.00	.00	7.97	21034.92	1031.38	.00	100.00	.00
55902.440	.00	.00	7.94	21122.37	1034.49	.00	100.00	.00
* 55962.500	.67	1.13	5.34	83516.47	6200.78	7.61	62.05	30.34
57133.360	.75	.78	5.47	98951.96	9508.66	10.78	63.44	25.78
58011.900	.77	.87	5.61	95225.19	8854.55	10.64	61.29	28.07
58153.280	.00	.00	5.99	27940.47	1501.36	.00	100.00	.00
58484.040	.00	.00	5.22	32093.45	1665.59	.00	100.00	.00
58638.500	.82	.90	4.99	102466.80	9423.79	12.20	56.12	31.69

SUMMARY PRINTOUT

	VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
	.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
*	9724.618	.02	.18	2.25	79710.34	5382.30	.00	99.71	.29
*	11868.840	.00	.00	4.19	41314.24	3478.05	.00	100.00	.00
	11869.800	.00	.00	4.06	42667.32	3334.80	.00	100.00	.00
	11915.860	.00	.00	4.05	42708.54	3334.92	.00	100.00	.00
	11916.830	.00	.00	4.18	41437.87	3478.56	.00	100.00	.00
	11924.430	.00	.00	4.18	41417.55	3478.48	.00	100.00	.00
	11925.400	.00	.00	4.05	42765.09	3335.10	.00	100.00	.00
	11971.560	.00	.00	4.04	42806.04	3335.22	.00	100.00	.00
	11972.530	.00	.00	4.17	41520.42	3478.90	.00	100.00	.00
	15535.960	1.94	.23	4.80	71379.88	10009.70	66.69	33.30	.02
	19647.750	2.85	1.93	4.28	61093.07	7480.99	57.73	23.31	18.95
	24460.670	.75	1.49	4.39	76977.25	10873.39	5.45	58.24	36.31
	27150.160	1.48	2.93	6.70	68674.01	9291.02	37.13	33.58	29.29
	31542.470	1.34	1.23	7.68	63889.50	7304.43	12.99	63.06	23.95
*	34148.750	2.45	1.16	11.67	42269.31	6188.42	30.73	60.94	8.33
*	40116.490	1.64	1.67	6.08	74352.37	7128.18	14.69	36.97	48.34

	VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
	46797.120	.91	1.07	6.38	89569.58	9124.64	8.46	53.79	37.75
	49085.690	1.10	1.04	6.03	75057.51	7024.74	9.93	64.01	26.06
*	51307.630	1.81	1.24	8.26	57732.71	6099.92	23.47	58.73	17.80
*	53963.230	.69	1.20	5.74	76469.08	6010.47	6.56	63.31	30.14
*	55878.250	.00	.00	7.97	21034.92	1031.38	.00	100.00	.00
	55902.440	.00	.00	7.94	21122.37	1034.49	.00	100.00	.00
*	55962.500	.67	1.13	5.34	83516.47	6200.78	7.61	62.05	30.34
	57133.360	.75	.78	5.47	98951.96	9508.66	10.78	63.44	25.78
	58011.900	.77	.87	5.61	95225.19	8854.55	10.64	61.29	28.07
	58153.280	.00	.00	5.99	27940.47	1501.36	.00	100.00	.00
	58484.040	.00	.00	5.22	32093.45	1665.59	.00	100.00	.00
	58638.500	.82	.90	4.99	102466.80	9423.79	12.20	56.12	31.69

67229.980 .94 .90 5.42 109101.30 7958.18 15.07 48.56 36.37

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
*	4.745	5966.00	.00	.00	30.00	173330.00	51.39	.00	51.47	.44	2.25	79710.34	259895.80
*	5.026	1482.00	.00	.00	10.60	173080.00	51.45	.00	51.73	2.65	4.19	41314.24	106310.00
	5.027	1.00	58.25	52.50	10.60	173080.00	51.48	.00	51.73	2.61	4.06	42667.32	107053.70
	5.034	47.00	58.25	52.50	10.60	173080.00	51.49	.00	51.75	2.61	4.05	42708.54	107216.70
	5.035	1.00	.00	.00	10.60	173080.00	51.48	.00	51.75	2.62	4.18	41437.87	106830.20
	5.037	8.00	.00	.00	10.60	173080.00	51.48	.00	51.76	2.63	4.18	41417.55	106744.60
	5.038	1.00	58.25	52.50	10.60	173080.00	51.51	.00	51.76	2.60	4.05	42765.09	107440.50
	5.045	47.00	58.25	52.50	10.60	173080.00	51.52	.00	51.77	2.59	4.04	42806.04	107602.70
	5.046	1.00	.00	.00	10.60	173080.00	51.51	.00	51.78	2.61	4.17	41520.42	107178.00
	5.585	2847.00	.00	.00	23.70	172610.00	52.34	.00	52.49	2.45	4.80	71379.88	110232.30
	6.420	4409.00	.00	.00	28.40	171900.00	53.02	.00	53.17	2.15	4.28	61093.07	117350.50
	7.090	3538.00	.00	.00	30.10	171320.00	53.79	.00	53.98	3.06	4.39	76977.25	98004.22
	7.470	2006.00	.00	.00	29.00	171000.00	54.29	.00	54.58	3.57	6.70	68674.01	90451.75
	8.070	2891.14	.00	.00	27.90	171000.00	55.44	.00	56.02	6.07	7.68	63889.50	69378.99
*	8.490	2374.28	.00	.00	35.80	169770.00	57.25	.00	58.57	14.06	11.67	42269.31	45271.21
*	9.410	4858.00	.00	.00	35.50	169330.00	60.45	.00	60.69	2.66	6.08	74352.37	103892.80
	10.580	6177.00	.00	.00	22.10	168330.00	61.61	.00	61.95	2.84	6.38	89569.58	99894.13
	10.860	1478.00	.00	.00	31.70	168090.00	61.94	.00	62.30	2.35	6.03	75057.51	109676.20
*	11.090	1214.00	.00	.00	31.80	167890.00	62.23	.00	62.87	5.59	8.26	57732.71	71019.52
*	11.350	1373.00	.00	.00	28.84	167670.00	63.12	.00	63.45	2.20	5.74	76469.08	113015.40
*	11.380	1373.00	.00	.00	26.80	167670.00	63.27	.00	64.26	4.74	7.97	21034.92	77043.84
	11.390	50.00	68.30	67.20	26.80	167670.00	63.36	.00	64.34	4.69	7.94	21122.37	77424.63
*	11.400	50.00	.00	.00	28.84	167670.00	64.28	.00	64.56	1.78	5.34	83516.47	125695.20

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
11.480	370.00	.00	.00	20.73	167560.00	64.34	.00	64.64	1.42	5.47	98951.96	140732.80
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.70	1.61	5.61	95225.19	131867.60

11.569	100.00	.00	.00	24.10	167500.00	64.37	.00	64.93	3.23	5.99	27940.47	93136.19
11.660	480.00	69.07	63.08	19.80	167500.00	64.90	.00	65.33	2.98	5.22	32093.45	97095.56
11.679	100.00	.00	.00	21.73	167500.00	65.19	.00	65.41	1.67	4.99	102466.80	129546.90
11.970	2118.00	.00	.00	31.72	167140.00	65.64	.00	65.87	1.48	5.42	109101.30	137313.70

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3.615	174300.00	50.91	.00	.00	.00	7174.17	.00
*	4.745	173330.00	51.39	.00	.48	.00	5382.30	5966.00
*	5.026	173080.00	51.45	.00	.06	.00	3478.05	1482.00
	5.027	173080.00	51.48	.00	.02	.00	3334.80	1.00
	5.034	173080.00	51.49	.00	.01	.00	3334.92	47.00
	5.035	173080.00	51.48	.00	-.01	.00	3478.56	1.00
	5.037	173080.00	51.48	.00	.00	.00	3478.48	8.00
	5.038	173080.00	51.51	.00	.02	.00	3335.10	1.00
	5.045	173080.00	51.52	.00	.01	.00	3335.22	47.00
	5.046	173080.00	51.51	.00	-.01	.00	3478.90	1.00
	5.585	172610.00	52.34	.00	.83	.00	10009.70	2847.00
	6.420	171900.00	53.02	.00	.68	.00	7480.99	4409.00
	7.090	171320.00	53.79	.00	.77	.00	10873.39	3538.00
	7.470	171000.00	54.29	.00	.50	.00	9291.02	2006.00
	8.070	171000.00	55.44	.00	1.14	.00	7304.43	2891.14
*	8.490	169770.00	57.25	.00	1.81	.00	6188.42	2374.28
*	9.410	169330.00	60.45	.00	3.20	.00	7128.18	4858.00
	10.580	168330.00	61.61	.00	1.16	.00	9124.64	6177.00
	10.860	168090.00	61.94	.00	.33	.00	7024.74	1478.00
*	11.090	167890.00	62.23	.00	.29	.00	6099.92	1214.00
*	11.350	167670.00	63.12	.00	.89	.00	6010.47	1373.00
*	11.380	167670.00	63.27	.00	.16	.00	1031.38	1373.00
	11.390	167670.00	63.36	.00	.08	.00	1034.49	50.00
*	11.400	167670.00	64.28	.00	.92	.00	6200.78	50.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
11.480	167560.00	64.34	.00	.06	.00	9508.66	370.00
11.550	167500.00	64.39	.00	.06	.00	8854.55	370.00
11.569	167500.00	64.37	.00	-.03	.00	1501.36	100.00
11.660	167500.00	64.90	.00	.54	.00	1665.59	480.00
11.679	167500.00	65.19	.00	.28	.00	9423.79	100.00
11.970	167140.00	65.64	.00	.46	.00	7958.18	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 4.745 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 5.026 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Alternative - Dredging Area B (Lake Houston Parkway)

```
1*********************************************            ****************************************
* HEC-2 WATER SURFACE PROFILES              *            * U.S. ARMY CORPS OF ENGINEERS          *
*                                           *            * HYDROLOGIC ENGINEERING CENTER         *
* Version  4.6.2; May 1991                  *            * 609 SECOND STREET, SUITE D            *
*                                           *            * DAVIS, CALIFORNIA 95616-4687          *
* RUN DATE   28FEB00   TIME  09:47:58       *            *      (916) 756-1104                   *
*********************************************            ****************************************
```

```
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
```

1
 28FEB00   09:47:58   PAGE 1

THIS RUN EXECUTED 28FEB00   09:47:58

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

Version  4.6.2; May 1991
**************************************
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DREDGING AREA B (R.M. 11.6 @ LK HOU BRIDGE) TO ELEV. 26.0'

```
T1   CF-0033 BROWN & ROOT SERVICES, 2/25/2000
T2   Lake Houston HEC-2 MODEL, REACH 3   [redacted]
T3   Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK  INQ   NINV  IDIR  STRT  METRIC  HVINS  Q   WSEL  FQ

    0   4   0                       50.91

J2 NPROF  IPLOT  PRFVS  XSECV  XSECH  FN  ALLDC  IBW  CHNIM  ITRACE

   -1   0   -1


J3 VARIABLE CODES FOR SUMMARY PRINTOUT

  150    7    55    56    26    25    4    35    60    59

J6 IHLEQ  ICOPY  SUBDIV  STRTDS  RMILE

    1


QT     4   66800   143300   174300   333600
NC   0.12   0.12   0.03   .1    .3
     THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
     THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
X1  3.615      89  2366.85  6330.06
X3    10               1232.04      54.7
GR   55.6        0    55.2       90    54.9   161.12    54.8   318.29    54.5      400
GR   54.5   505.44    50.4    590.1    50.7   644.14    49.6   763.76    49.8   821.19
GR   47.9   853.74    50.9   895.11      51   927.61      49   951.75    47.9   1054.3
GR   50.3  1085.94    53.3  1160.37    54.7  1232.04    50.1  1287.74      49  1373.79
GR   48.6  1482.72    49.1  1622.28    46.2  1678.02    46.3  1781.82    48.3  1866.53
GR   49.2   1949.4    48.8  2075.16    47.9  2163.11    43.8  2220.71    42.6  2269.24
GR   41.6  2366.85    40.6  2391.75      39  2452.47    37.7  2548.87    37.9  2765.45
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GR   37.6  2952.69     38  3157.81    38.6  3299.81    38.3  3413.04    38.1  3746.92
GR   38.1  3993.99   38.9  4185.79    38.8  4286.36    40.5  4499.72    39.9   4728.9
GR   38.6  4754.82   40.1   4907.5 40.4627 4943.023    38.9  4984.51    37.2  5041.95
GR   37.2  5119.68   36.4  5177.29    37.3  5277.11    36.8  5355.15    38.1  5518.64
GR   37.9  5567.34   36.5  5613.59    33.5   5655.2    32.5   5769.5    30.3  5803.47
GR   32.8  5902.24   32.8   5982.5    34.2  6030.84    36.5  6067.52    37.5   6124.9
GR   37.8  6207.91   40.5  6273.13    43.8  6330.06    41.5  6462.94    41.4  6636.96
GR   44.8  6697.83   45.5  6728.93    44.5  6819.63      45  6861.77    44.5  6960.04
GR   44.8  7029.56  45.05     7060    44.7  7115.34    45.4  7181.81    45.6     7240
GR   45.6     7360   45.5   7468.6    43.4  7632.04    44.6  7864.56    47.6  7908.88
GR   47.7  7982.52   48.7  8044.72    48.8     8220    55.8     8990
1
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QT      4    66160  140750   173330  329800
X1  4.745       84  2373.4  6703.71    3600    4500    5966
X3     10              1973.39       52 6985.59    48.6
GR  60.92        0   54.6      450   53.45      570   53.05      630    52.6      740
GR   52.7      830   52.5      930      52   989.14   52.45     1150    52.3  1284.73
GR   52.6  1434.66   52.6     1560   52.45     1730    52.3  1836.38   52.05     1940
GR     52  1973.39   51.1   2373.4    43.3     2385    39.8  2559.76      37  2645.83
GR     36  2728.22   35.3  2809.02    35.9  2887.92    31.2  3041.01    31.9  3156.16
GR   38.5  3253.79   38.3  3378.72    37.2  3446.92    38.7  3576.68    40.1  3661.26
GR     41   3745.2   42.8  3831.04    41.2  3910.34      41  3973.54    41.5  4029.61
GR   41.7   4160.5   41.2  4216.44    42.6   4487.7    44.7  4656.69    40.7  4714.42
GR   36.5     4755   36.2     4820    34.9     4900    38.1     5120    38.1     5180
GR   41.1     5200   42.3     5222    42.1     5272    39.7     5300    39.9     5500
GR   39.6     5550     38     5600    36.3     5740      37     5800    39.8  5962.55
GR     40  6057.51   39.7  6300.58      42  6371.11    43.1  6486.54      44  6532.85
GR   44.5  6559.55   45.2  6653.68    47.2  6703.71      47  6753.55    47.1  6787.33
GR   47.5  6829.55   47.3  6947.51    48.6  6985.59    48.4  7027.77    47.3  7052.29
GR   47.2  7079.78   46.5  7122.32    46.4  7303.07    46.8  7395.37    47.9  7436.05
GR   48.1   7535.6   50.2  7585.83    54.2  7722.58    54.7  7816.27    59.2  7868.73
GR   60.8  7911.42     61   8096.6    61.5     8298    61.8     8402

QT      4    65990  140170   173080  328820
NC   0.12     0.12   0.03      0.3     0.5
X1  5.026       82  10508    14400    1030    4150    1482  0.9135
X3     10
GR   70.3        0   60.1      847    55.1     4325    50.1     6125    47.5     6457
GR   51.9     6672     52     6723    49.3     6899      53     7002    51.3     7207
GR   47.8     7406   44.3     7535    50.7     7643      52     7675    49.2     7860
GR   50.7     7983     52     8074    50.8     8207    51.4     8253    50.6     8427
GR   44.2     8495   47.4     8539    44.2     8686    50.9     8716    48.5     8805
GR   53.1     8968   50.3     9257    52.8     9627    49.3     9739    48.6    10032
GR   41.6    10121   52.8    10240    51.6    10351    56.2    10508    49.2    10531
GR   44.1    10549   41.8    10584    28.9    10622    37.4    10682    36.1    10792
GR   37.9    10846   41.3    10953      45    11066    26.5    11142    24.4    11222
GR   17.9    11240   14.8    11250    10.6    11262    21.6    11486    24.9    11552
GR   41.3    11749   45.5    11830    46.2    11981    44.7    12010    41.2    12077
GR   46.2    12110     46    12265    42.6    12356    43.9    12514    41.7    12874
GR   42.3    13169   43.2    13369    44.1    13509    41.3    13921    44.5    14033
GR   43.9    14119   43.1    14221    47.6    14283      57    14400    63.4    14532
GR   64.7    14822   62.5    14960    66.5    15076    67.6    15152    66.1    15301
GR   65.8    15393   64.6    15581    65.5    15601    66.7    15706    62.2    15750
GR   64.2    15886   65.4    16039

NC    .12      .12  0.030
X1  5.027      100  10508    14300       1       1       1  0.9135
X3     10
X2      0        0      0     52.5   58.25
GR   70.3        0   60.1      847    50.1     6125    40.8     6399      52     6703
GR     53     6993   43.8     7631      52     7675    50.6     8427    44.2     8495
GR   53.1     8968   50.3     9257    52.8     9627    49.3     9739    48.6    10032
GR   41.6    10121   56.2    10508    28.9    10622    37.4    10682    52.5    10683
GR   52.5    10689   37.4    10689    36.1    10792    37.9    10846    41.3    10953
GR   52.5    10953   52.5    10959    41.3    10959      45    11066    26.5    11142
1
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GR   24.4  11222   17.9  11240   50.4  11240   52.5  11241   52.5  11250
GR   10.6  11262   21.3  11480   52.5  11480   52.5  11486   21.6  11486
GR   24.9  11552   24.4  11708   52.5  11708   52.5  11714   24.4  11714
GR   24.4  11732   45.5  11830   46.2  11981     45  12004   52.5  12004
GR   52.5  12010   44.7  12010   41.2  12077   46.2  12110   46.1  12162
GR   52.5  12163   52.5  12169   46.1  12169   42.6  12356   43.5  12463
GR   52.5  12463   52.5  12469   43.5  12469   43.9  12514   41.2  12621
GR   41.3  12663   52.5  12663   52.5  12669   41.3  12669   41.7  12863
GR   52.5  12863   52.5  12869   41.7  12869   42.3  13163   52.5  13163
GR   52.5  13169   42.3  13169   43.2  13363   52.5  13363   52.5  13369
GR   43.2  13369   44.1  13509   41.3  13581   41.3  13663   52.5  13663
GR   52.5  13669   41.3  13669   41.3  13863   52.5  13863   52.5  13869
GR   41.3  13869   41.3  13921   44.5  14033   43.9  14113   52.5  14113
GR   52.5  14119   43.9  14119   43.1  14221     56  14300   66.8  14676

X1  5.034      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03
X1  5.035     82  10508  14400      1      1      1 0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.037     82  10508  14400      8      8      8 0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
1
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GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.038    100  10508  14300      1      1      1 0.9135
X3     10
X2      0      0      0   52.5  58.25
```

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GR   70.3      0   60.1     847    50.1    6125    40.8    6399      52    6703
GR     53   6993   43.8    7631      52    7675    50.6    8427    44.2    8495
GR   53.1   8968   50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6  10121   56.2   10508    28.9   10622    37.4   10682    52.5   10683
GR   52.5  10689   37.4   10689    36.1   10792    37.9   10846    41.3   10953
GR   52.5  10953   52.5   10959    41.3   10959      45   11066    26.5   11142
GR   24.4  11222   17.9   11240    50.4   11240    52.5   11241    52.5   11250
GR   10.6  11262   21.3   11480    52.5   11480    52.5   11486    21.6   11486
GR   24.9  11552   24.4   11708    52.5   11708    52.5   11714    24.4   11714
GR   24.4  11732   45.5   11830    46.2   11981      45   12004    52.5   12004
GR   52.5  12010   44.7   12010    41.2   12077    46.2   12110    46.1   12162
GR   52.5  12163   52.5   12169    46.1   12169    42.6   12356    43.5   12463
GR   52.5  12463   52.5   12469    43.5   12469    43.9   12514    41.2   12621
GR   41.3  12663   52.5   12663    52.5   12669    41.3   12669    41.7   12863
GR   52.5  12863   52.5   12869    41.7   12869    42.3   13163    52.5   13163
GR   52.5  13169   42.3   13169    43.2   13363    52.5   13363    52.5   13369
GR   43.2  13369   44.1   13509    41.3   13581    41.3   13663    52.5   13663
GR   52.5  13669   41.3   13669    41.3   13863    52.5   13863    52.5   13869
GR   41.3  13869   41.3   13921    44.5   14033    43.9   14113    52.5   14113
GR   52.5  14119   43.9   14119    43.1   14221      56   14300    66.8   14676

X1  5.045      0      0       0      47      47      47
X3     10
X2      0      0      0    52.5   58.25

NC   0.12   0.12   0.03     0.1     0.3
       DREDGE AREA UPSTREAM OF LAKE HOUSTON PARKWAY BRRIDGE @ ELEV. 26.
X1  5.046     82  10508   14400       1       1       1  0.9135
X3     10
GR   70.3      0   60.1     847    55.1    4325    50.1    6125    47.5    6457
GR   51.9   6672     52    6723    49.3    6899      53    7002    51.3    7207
GR   47.8   7406   44.3    7535    50.7    7643      52    7675    49.2    7860
GR   50.7   7983     52    8074    50.8    8207    51.4    8253    50.6    8427
GR   44.2   8495   47.4    8539    44.2    8686    50.9    8716    48.5    8805
GR   53.1   8968   50.3    9257    52.8    9627    49.3    9739    48.6   10032
GR   41.6  10121   52.8   10240    51.6   10351    56.2   10508    49.2   10531
GR   44.1  10549   41.8   10584    28.9   10622      26   10640      26   10641
GR     26  10642     26   10643      26   11141      26   11142    24.4   11222
GR   17.9  11240   14.8   11250    10.6   11262    21.6   11486    24.9   11552
GR   41.3  11749   45.5   11830    46.2   11981    44.7   12010    41.2   12077
GR   46.2  12110     46   12265    42.6   12356    43.9   12514    41.7   12874
GR   42.3  13169   43.2   13369    44.1   13509    41.3   13921    44.5   14033
GR   43.9  14119   43.1   14221    47.6   14283      57   14400    63.4   14532
GR   64.7  14822   62.5   14960    66.5   15076    67.6   15152    66.1   15301
GR   65.8  15393   64.6   15581    65.5   15601    66.7   15706    62.2   15750
1
  28FEB00    09:47:58                                                PAGE   5


GR   64.2  15886   65.4   16039

QT      4  65680  139080  172610  326970
NC   0.12   0.12   0.03     0.1     0.3
NH      4   0.12  6565.8    0.04  10389.97    0.03  11165.02    0.12  11754.54
X1  5.585     92  10389.97  11165.02   2664    1744    2847
X3     10
GR  62.75      0     55    1050      51    1350    50.4    2130    49.8    2670
GR   49.3   2940     49  3070.97    47.4  3189.37    48.1  3332.69    44.9  3448.15
GR   47.2  3606.21   45.8  3712.03    48.1  3809.2    45.3  3910.28    45.4  3992.9
GR   48.9  4050.05   50.5  4111.66    47.1  4292.93      49  4377.98    46.2  4426.95
GR   48.4  4503.41   51.7  4528.08      52  4646.6    47.9  4680.17    47.5  4744.32
GR   49.6  4816.31   45.9  5042.82    46.4  5114.46    50.6  5214.31    50.4  5290.11
GR     49  5321.9    47.8  5469.67    49.5  5630.79    47.7  5658.97    46.1  5777.87
GR   46.4  5924.67   44.8  6004.29    43.3  6258.57    43.5  6470.87    48.9  6565.8
GR   44.7  6646.34   45.9  6743.32    44.5  6892.24    44.2  7009.22    44.5  7289.15
GR   46.4  7330.53   44.3  7392.93    41.7  7412.88    43.8  7516.5    42.6  7594.69
GR   42.8  7688.63   41.4  7768.32      42  7833.49    41.2  7910.79    42.2  8209.01
GR   41.3  8286.36   39.7  8308.22    39.9    8702    40.1  8964.4    39.4  9095.69
GR   41.7  9292.52   41.6  9541.35    44.3  9703.77    41.6  9816.3    43.9  9860.54
GR   41.3  9871.29   41.3  9948.37    46.9  9970.67    44.8  10033.63     43  10162.63
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GR   44.2  10190.96    43.9  10305.76     46.5   10332.73     48.2   10389.97      44.7   10430.72
GR   41.3   10459.1    32.9  10514.53      28   10567.09     26.4   10611.42     24.7   10640.77
GR   23.7  10681.82    25.7  10731.87    24.6   10751.83      28   10782.41      30.2   10840.35
GR   39.3  10888.46    38.5  10909.12     45   10961.37     49.8   11027.75      49.8   11165.02
GR   54.6  11343.95   62.4385  11754.54

QT     4    65210    137410    171900    324160
NC   0.08     .12     0.03      .1       .3
NH     5    0.12     2500     0.08     10000     0.03     17143     0.08     19000     0.12
NH   23560
X1   6.420     59    15845    16499     2300     2800     4409
X3    10
GR    75       0      75     2500      70     3400      70     6000      60      7000
GR   58.3    10000    56.1    10103    56.6    10179    57.3    10497    56.3    10543
GR   55.3    10654    57.2    10704    55.9    10873    52.1    10891     49     11004
GR   50.2    11061    53.5    11106    49.4    11290    48.2    11399    47.9    11517
GR   47.7    11625    48.9    11747    45.8    11900     46     11965    46.6    12181
GR   47.9    12699    48.1    12807    46.6    13068    46.2    13367    47.4    13489
GR   42.4    13758    41.8    14068    44.9    14127    46.8    14222    48.9    14266
GR   42.2    14433    38.1    14587     45     14654    41.5    14714    46.1    15114
GR   44.8    15161    46.9    15361    41.9    15727    46.7    15845    40.4    16043
GR   28.4    16309    44.9    16440    47.5    16499    43.3    16544    44.6    16859
GR   41.5    17143    44.5    17299    43.5    17474    41.4    17702    41.5    17822
GR    43     18004     61     18708     70     19600     70     23560

QT     4    64830    136080    171320    321910
NC   0.12    0.12     0.03     0.1      0.3
NH     4     .12    13568     0.03    15555     0.08    18896     .12     24402
X1   7.09     67    13568    15555     2000     3600     3538
X3    10                11840     53.1    20069     57.9
GR   75.1      0     70.1     2300     60.1     3500     59.1     5310     55.1     7000
GR   52.9     9998    51.2    10405    48.3    10760    46.7    11002    48.1    11096
GR    50     11122     47     11313    46.7    11451    52.6    11572    53.1    11840
1
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GR   52.5    12008    49.5    12394    44.7    12513    43.3    12597    44.3    12738
GR   45.4    12956    46.9    13568    45.2    13743    44.7    13868    43.8    13920
GR   44.8    13990    45.1    14281    44.7    14544    42.4    14583    43.1    14804
GR   41.6    14978    43.4    15013    42.2    15090    30.1    15260    31.6    15364
GR   47.4    15555    46.7    15598    45.5    15789    39.5    15858    36.1    15974
GR   35.8    16133    38.4    16239    42.5    16348    41.8    16564     44     16840
GR   44.7    17493    46.2    17579    44.6    18028    45.1    18178    43.3    18276
GR   43.9    18459     43     18497    44.4    18896    46.2    19531    56.9    19962
GR   57.9    20069    52.9    20275    53.4    20406    49.7    20651    51.5    20718
GR   54.8    21004    54.1    21070    54.3    21465     55     21585    53.8    21703
GR   60.1    22202     65     24402

QT     4    64610    135320    171000    320030
NC    .12     .12      .03     0.1      0.3
NH     5     .12    12000     0.05    14153     0.03    14598     0.05    16383     .12
NH   23100
X1   7.47     66    14153    14598     1500     1500     2006
X3    10                                16383     55.4
GR    75       0      75     4460     64.2     6000      70     6150     61.6     6693
GR   50.3     7163    46.9     7208    49.6     7585    46.7     7595     51      7861
GR   48.9     7931    50.6     8391     48      8503    49.8     8546    51.3     8691
GR   46.2     9217    50.4     9383    51.4     9536    49.2     9569    50.3     9803
GR   53.7    10039    53.5    10532    47.3    10859    48.5    10964    47.2    11235
GR    45     11328    45.5    11905    48.6    12029    46.4    12059     42     12180
GR   41.8    12274    44.9    12369    44.2    12639    45.9    12724    44.5    12772
GR   49.7    12832    48.5    12877    50.5    13056     45     13117    45.6    13218
GR   52.7    13383    48.5    13434     47     13591    41.8    13880    45.8    13922
GR   40.9    14010     47     14062    47.7    14153     29     14273     38     14585
GR   44.3    14598    43.4    14737    41.4    14777    40.4    14933    39.8    15545
GR   45.9    15676    48.5    15964    53.4    16211    55.4    16383     53     17600
GR    54     18600     55     18800     60     20560     70     21150     75     22400
GR    75     23100
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NC    .12    .12    0.03
X1   8.07     90   5637.46   6519.38   2619.28   3201.18   2891.14
X3     10               3455.36     61.13
GR   73.6      0     71    207.3    67.1   340.91    61.2   454.82    59.8   605.74
GR   63.3    903.8   58.3  1086.61    54    1321.33   54.2  1487.54    47.9  1600.81
GR   55.2  1766.53   53.5  1879.14    56.5  2066.56   53.1  2164.16    54.1  2425.57
GR   56.8  2597.07   52.7  2847.29    53.3  2923.49   50.4  3066.89    51.6   3182.9
GR   58.2   3240.1  61.15     3360    59.6   3625.8   56.1  3784.39     48  3837.18
GR     47  3910.62   41.7  3954.78    48.8   4041.7   47.3   4372.4     43  4430.63
GR     48  4823.38   45.7  5084.92    47.1   5209.7   44.3  5637.46    44.9  5883.73
GR   38.8  5971.26   41.9  6088.05    27.9  6099.51   32.1  6158.61    38.5  6417.39
GR   41.9   6498.6   46.7  6519.38    44.4  6698.82   44.6  6871.35    49.1  7166.61
GR   45.8  7214.35   48.7  7269.55    49.1  7385.35   46.4  7650.65    49.5  7758.86
GR   48.8  7837.12     53   8005.6    54.3  8165.26   54.2  8385.85    47.8  8751.03
GR   48.9  8956.83   47.3  9151.02    48.7  9234.09   48.6  9464.92    47.2   9691.7
GR   44.3  9845.44   44.3 10352.59    48.4 10497.67   48.7 10744.17    46.9 10944.93
GR   53.3 11073.35   58.8 11124.29    58.3 11461.72   60.5 11629.21    59.8 11752.03
GR   66.4 11793.39   67.5 11924.83   70.95    12100   69.2 12409.61    71.8 12474.39
GR   70.4 12728.04   74.2 12870.91    71.6 12991.35   74.9 13090.92    73.1 13188.25
GR   74.6 13307.27   72.3 13497.82    74.7 13757.58   73.4 13964.96    74.3 14201.59
GR   74.4  14577.6   73.6 14996.08    75.1 15169.17   73.7  15240.5    74.4 15481.47
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QT      4    63800    132480    169770    315820
NC    .12    .12    .03    .1    .3
X1   8.49     91   2606.42   3168.51    2635.7   1605.14   2374.28
X3     10                    3851.71      54.7
GR   75.9      0   77.6       60   78.05      160   78.05      240     77    331.6
GR   72.3   368.12   69.4   412.95   71.35      460    69.7   534.73   67.2   564.85
GR   74.5      630   74.7      670    65.5   670.12    64.5      720   63.8   753.26
GR     55   814.19   51.2   856.53    46.4  1006.41    44.1  1184.02   46.1   1306.2
GR   45.1  1439.48   43.6  1567.36    42.1  1599.68    42.1  1656.52   45.3  1696.13
GR   46.6  1738.87   48.3  1871.15    45.8  1974.15    46.4  2040.15   43.1  2089.69
GR   43.2  2200.98   44.1  2303.81    45.6  2353.39      42  2371.86     46  2606.42
GR   37.9  2677.54   35.8  2837.08    35.9  2927.48   42.72  2959.44   47.7  3034.05
GR   49.5  3138.67   50.6  3168.51    48.9  3220.17    48.1  3328.05   48.6   3423.1
GR   50.4  3455.47   50.3  3565.82    52.2  3627.93    52.2  3679.39   54.7  3851.71
GR     53   3892.8   53.4     3940    51.9  3961.68      52  4079.34   52.9  4194.97
GR   55.8     4300   53.2  4350.46    54.7  4373.98    54.9  4425.24   53.8  4458.24
GR   54.6  4581.48   52.7  4690.43    53.9     4730    51.5  4768.99   52.7  4822.83
GR   50.7  4928.57   51.9   4949.8      52  5005.14    50.3  5083.53   51.9  5220.22
GR   50.4  5255.77   53.4  5329.85    55.9  5449.87    55.5  5530.76   52.5  5591.67
GR   51.4  5649.44   51.6  5719.53    50.4  5823.06    49.6  5989.14   44.2  6040.25
GR   44.2  6435.82   46.9  6530.15    48.9  6665.49    47.3  6720.92   47.2  6911.52
GR   55.6  6971.41   58.5  6998.91    61.3  7081.43    63.5  7116.99  66.48  7723.78
GR     71     8000

QT      4    63510    131460    169330    314100
NH      5     .1  2567.98    .05  3385.13    0.03  3879.38    0.05     5000    .12
NH  10500
X1   9.41     94   3385.13   3879.38      2500      5500      4858
X3     10               2460.63     56.91
GR   78.4      0   78.9    96.63    78.6   295.76    79.3   365.11   78.2    423.8
GR   75.8   443.45   74.1   492.25    74.8   526.38   74.15      600   72.6      630
GR   72.8      670   65.3   721.32    60.2   753.27      56   813.24   54.4   854.41
GR   53.3   926.96     53  1014.31    51.5  1058.06    51.5  1133.33   50.5  1273.69
GR   51.4   1346.4   50.8  1454.34    51.1  1532.43    51.1  1736.18   51.8  1783.17
GR   51.8  1941.56   52.4  2003.11      53  2145.32    54.5  2316.56   56.8  2442.42
GR     56  2567.98   52.5  2621.33    52.4  2659.43    50.1  2775.83   49.4  2837.01
GR     50   3033.7   50.9  3141.06    43.5  3205.33    43.5  3281.17   51.8  3332.56
GR   53.3  3385.13   50.4  3417.41    45.2  3426.19    42.2  3442.41     42  3470.88
GR   38.1   3486.5   35.8  3658.23    36.2  3685.31    35.5  3798.17  42.72  3824.76
GR   48.2  3859.77   49.5  3879.38    44.1  3976.38    42.2  4082.27   42.2  4146.99
GR   43.8  4423.62   42.2  4450.81    48.9  4745.31    49.4  4914.17   48.4  5008.36
GR     48  5245.57   48.8   5332.6    48.1   5518.1    48.9  5669.75   47.9  5765.59
GR   50.2  5868.37   50.4  5903.32    49.4     6014      51  6193.43     53  6341.86
GR   52.1   6387.7   48.7  6470.08    48.4  6596.07    49.1  6831.48   48.1     6961
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GR   49.1  7045.17   49.1  7203.02   48.4  7256.07   48.4    7513   50.4  7516.71
GR   49.7  7570.46   50.7  7615.19   48.4  7638.95   50.9 7797.35   55.4  7851.87
GR  57.57  7854.93  59.40     7877  61.45  7882.66     63    8000     64     8500
GR   64.3     8700     62     9300     67    10000     75   10500
1
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QT      4    62850   129130   168330   309220
NC     .1      .12     0.03       .1       .3
X1  10.58       76  2518.22  3181.69     2700     3200     6177
X3     10                     1431.19    55.17     8020    59.05
GR   75.8        0     75.6     63.6     60.9   180.78     56.7   260.63     55.3      400
GR  54.85      520       54   579.97     53.5   709.98     51.1   790.94     50.6   912.57
GR   49.1   1025.2     49.2  1101.07     53.7  1157.02     54.5     1384     55.5  1418.21
GR   54.9  1763.41     52.9  1902.66     54.8  2083.95     54.5  2206.57       53   2255.4
GR   52.8  2438.35     53.6  2518.22     42.4  2566.64     40.3  2590.99     29.8  2603.35
GR   22.1  2654.44     22.5  2685.55     31.1  2771.89     34.7  2844.63     41.9  2867.55
GR   50.1  2913.09     48.2  3126.19     50.5  3181.69     49.3  3252.87     46.5  3306.48
GR   50.3  3409.33     47.5  3613.61     52.7   3701.6     50.2  3854.05     47.2   3900.8
GR   42.7  3930.19     44.6  3976.89     46.3  4107.08       50  4195.39     48.7  5535.67
GR   48.7  5863.58       49  5916.48     50.6  6045.31     49.2  7520.57     53.5  7702.66
GR  59.05     8020     59.3     8120     57.1  8360.19     57.2  8644.55     54.9  8710.45
GR   60.1  8984.95     59.4  9100.32     61.6     9300     63.4  9619.42     62.4  9928.89
GR   62.5 10100.96     64.8 10231.72       63 10264.23     65.3 10573.06     65.9 10735.19
GR  71.55    10860     72.2    10980    74.25    11110     73.2    11255     73.3 11458.81
GR   74.9 11812.08     74.7 12055.58     76.1  12161.3    75.45    12360    76.75    12560
GR   78.5 12699.89

QT      4    62690   128570   168090   310160
NC     .1      .12      .03       .1       .3
NH      3       .1     3262      .03     4059      .12    13987
X1  10.86       43     3262     4059     1300     1100     1478
X3     10                                 8865     62.3
GR   79.8        0     77.6      161     79.4      259     77.6      579     79.7      955
GR   78.9     1110     72.6     1684     52.3     1914     49.3     2212     50.4     2314
GR   52.2     3262     35.4     3575     31.7     3805     32.7     3875     52.4     4059
GR   46.4     4251       49     4323       45     4835     48.9     4896     44.9     5078
GR   47.3     5583     44.5     5654     43.2     5785     44.5     5945     41.7     6053
GR   57.6     6350     59.1     7698     60.1     8650     62.3     8865     59.2     9382
GR   61.6     9677     59.4     9772     60.6     9852     57.7    10128     56.7    10420
GR   54.4    10557     55.8    10709     60.7    11077     63.7    11730     72.9    12060
GR   74.4    13267     75.8    13671     79.7    13987

QT      4    62560   128120   167890   308450
NH      4      .12  2522.57      .05  3311.71      .03  3943.85      .12 13549.31
X1  11.09       82  3311.71  3943.85     1400     1600     1214
X3     10                     3311.71     53.3  6949.97     63.7
GR   77.9        0     78.6   449.85       74   650.88     61.2   796.99     53.8   853.81
GR   51.5  1009.93     52.1  1209.82     51.1  1415.55     52.9  1698.13     53.4  1881.01
GR   54.3  2005.52     54.3  2131.11     52.6  2522.57     52.3  2664.39     42.5  2721.63
GR   42.5  3112.03     45.4   3215.1     53.3  3311.71       51  3378.76       45     3400
GR   42.5  3427.89     34.6  3459.26     31.8  3669.22       36  3729.17       42  3745.04
GR   50.1  3767.43     55.5  3802.55       57  3943.85       52  4107.84     50.5   4209.1
GR   53.1  4359.76     56.2  4405.38     56.4  4699.98       55  4860.97     56.5  4932.99
GR   54.4  5041.53     50.1     5150     52.2  5287.22     53.6  5519.22     51.9  5703.27
GR     52     5900     51.8     6040       52     6160     53.2     6300     54.5     6450
GR   57.8     6690     63.7  6949.97     63.9  7208.78     62.9  7282.45     61.9  7559.06
GR   59.2  7996.95     57.3     8229     58.1     8331     63.7     8477     61.2   8548.1
GR   62.8  8733.88     62.1  8893.69     62.3  9162.78     59.8  9368.39    62.65     9510
GR   62.2     9630     60.2  9723.91     61.8  9807.54     62.8 10002.69     59.7 10225.58
1
```


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GR   62.6 10311.07     60.9 10350.09     62.5 10478.43     60.8 10575.85     64.4 11234.07
GR   67.3 11355.29     71.8 11460.13     75.3 11489.48    75.05    11790     74.1 11874.14
GR   74.1 12095.62     75.2 12273.93     75.5 12508.24     74.6 12649.39       76 13085.66
GR   74.3  13286.4     79.6 13549.31
```

```
QT    4   62410   127600   167670   307570
NC   .12    .12    .03    .3    .5
X1  11.35    89  2958.98  3804.94    1000    2300    1373
X3   10              2199     58  6519.75    65.5
GR  75.43     0     66   155.36   64.3   287.39   63.9   438.76   60.9   535.19
GR   54.9  626.91    52   787.68   53.3   980.78   52.8  1186.05   55.1  1413.79
GR   55.2  1604.36   56.9  1641.25    57   1786.87  56.25    1790   56.3  2127.54
GR   58.1  2185.43   54.8  2259.37   54.4  2456.59   50.5  2653.09   51.8  2802.23
GR   53.9  2832.46   52.8  2958.98   44.7  3090.28   48.1  3150.77  37.64  3267.77
GR  38.74  3336.43  28.84  3406.43  29.04  3461.55  36.14   3538   42.5  3671.55
GR   52.6  3804.94   47.4  3855.04   47.9  3919.98   43.7  3952.95   42.6  4050.14
GR   44.3  4431.03   41.9  4584.19    47   4826.5   42.5  4859.87   42.6  4957.91
GR   48.7  5021.15   49.2  5059.55   43.9   5090.8   44.7  5266.47   43.2  5349.68
GR   50.2  5459.53   52.4  5575.87   50.4  5703.12   51.9  5904.76   49.1  6073.64
GR   49.1  6167.73   51.3  6273.19   59.7  6409.59   65.5  6519.75   65.7  6635.31
GR   63.6  6757.16    63   7060.24   63.3  7375.88    66    7690   64.7  7907.84
GR   65.5   7969.4   64.1   8340.7   64.9  8381.19   64.1  8668.42    62   8835.44
GR   62.5  8946.12   65.3  9083.61   63.6  9200.98  64.35    9450    63   9781.97
GR   63.1  10165.1   65.1  10443.04  64.4  10755.85  64.5  10988.16  68.1  11162.12
GR  71.35   11220   71.9  11348.07  74.6  11434.99  75.9  11601.85  78.45   11650
GR   79.6   11960   81.1  12067.18  79.5  12180.83  80.3  12422.88  84.2  12477.71
GR  85.05   12580   83.5  12625.42  84.2   12770   82.9   13330.5

X1  11.38    85   19900   21000    1000    2300    1373    0.00    -1     0
X3   10    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
GR  85.00  14899.0  85.00  14900.0  85.00  16700.0  80.00  16850.0  75.00  16950.0
GR  70.00  17099.0  70.00  17100.0  65.00  17150.0  60.00  17350.0  55.00  17800.0
GR  65.90  19700.0  66.80  19800.0  67.30  19900.0  61.80  20000.0  60.70  20001.0
GR  55.60  20014.9  49.10  20030.0  44.10  20045.4  43.40  20060.3  45.20  20075.3
GR  45.80  20090.3  46.20  20105.3  45.30  20120.1  45.90  20136.6  46.00  20153.3
GR  45.30  20169.6  44.30  20186.2  44.70  20202.8  45.10  20219.6  45.00  20236.2
GR  45.30  20252.7  45.20  20269.3  45.20  20286.0  44.30  20302.6  43.70  20319.4
GR  40.00  20335.8  42.60  20352.5  38.10  20368.8  33.60  20385.4  35.50  20402.0
GR  33.20  20416.3  32.40  20430.0  31.70  20450.0  36.40  20470.0  34.80  20492.0
GR  37.60  20510.0  38.00  20527.2  38.30  20535.0  38.00  20565.0  37.40  20590.0
GR  37.00  20600.3  34.80  20615.0  27.80  20630.0  34.80  20645.0  36.30  20655.1
GR  39.20  20674.3  40.60  20693.3  38.60  20712.1  42.40  20731.4  43.50  20735.0
GR  47.40  20750.7  48.20  20769.8  47.20  20789.0  47.50  20808.0  47.50  20865.1
GR  47.80  20865.2  48.10  20884.2  47.90  20903.3  48.10  20922.3  48.70  20941.3
GR  54.90  20960.4  63.70  20978.7  63.90  20979.5  65.00  21000.0  64.30  21100.0
GR  55.00  22000.0  55.00  24800.0  60.00  25000.0  65.00  26200.0  65.00  26500.0
GR  70.00  27700.0  75.00  27800.0  80.00  28300.0  85.00  29700.0  90.00  30100.0

SB   1.25    1.50    2.60    0.0    189.0    20.4  22729.0   10.20   27.80   27.80
ET                                  9.1                   19900    21000
1
  28FEB00    09:47:58                                              PAGE  10


X1  11.39     0     0.0     0.0    50.0    50.0    50.0    0.00    0.00     0
X2    0    0.00     1    67.20   68.30    0.00     0     0.00    0.00     0
X3   10    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
BT   33  14899.0   87.0    0.0  16700.0   87.0    0.0  17000.0   85.0    0.0
BT 17560    80.0    0.0  18100.0   75.0    0.0  19200.0   70.0    0.0  19201.0
BT   70.0    0.0  20000.0   68.3    0.0  20000.1   68.3   65.7  20120.1   69.1
BT   66.7  20201.2   69.1   66.0  20416.3   69.8   67.1  20416.4   69.8   66.5
BT  20492   69.8   66.8  20492.1   69.8   65.1  20655.1   69.8   65.1  20655.2
BT   69.8   67.2  20978.7   68.8   65.6  20978.8   68.8    0.0  21000.0   68.0
BT    0.0  21100.0   67.3    0.0  21200.0   66.3    0.0  21201.0   66.3    0.0
BT  23250   62.0    0.0  25100.0   65.0    0.0  26200.0   65.0    0.0  26400.0
BT   65.0    0.0  26700.0   70.0    0.0  27650.0   75.0    0.0  28150.0   82.0
BT    0.0  28750.0   87.0    0.0  29000.0   92.0    0.0  30300.0   92.0    0.0

ET                                  8.41
X1   11.4    89  2958.98  3804.94    50.0    50.0    50.0    0.00    0.00     0
X3   10              2199     58  6519.75    65.5
GR  75.43     0     66   155.36   64.3   287.39   63.9   438.76   60.9   535.19
GR   54.9  626.91    52   787.68   53.3   980.78   52.8  1186.05   55.1  1413.79
GR   55.2  1604.36   56.9  1641.25    57   1786.87  56.25    1790   56.3  2127.54
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GR   58.1   2185.43    54.8   2259.37    54.4   2456.59    50.5   2653.09    51.8   2802.23
GR   53.9   2832.46    52.8   2958.98    44.7   3090.28    48.1   3150.77   37.64   3267.77
GR  38.74   3336.43   28.84   3406.43   29.04   3461.55   36.14      3538    42.5   3671.55
GR   52.6   3804.94    47.4   3855.04    47.9   3919.98    43.7   3952.95    42.6   4050.14
GR   44.3   4431.03    41.9   4584.19      47    4826.5    42.5   4859.87    42.6   4957.91
GR   48.7   5021.15    49.2   5059.55    43.9    5090.8    44.7   5266.47    43.2   5349.68
GR   50.2   5459.53    52.4   5575.87    50.4   5703.12    51.9   5904.76    49.1   6073.64
GR   49.1   6167.73    51.3   6273.19    59.7   6409.59    65.5   6519.75    65.7   6635.31
GR   63.6   6757.16      63   7060.24    63.3   7375.88      66      7690    64.7   7907.84
GR   65.5    7969.4    64.1    8340.7    64.9   8381.19    64.1   8668.42      62   8835.44
GR   62.5   8946.12    65.3   9083.61    63.6   9200.98   64.35      9450      63   9781.97
GR   63.1   10165.1    65.1  10443.04    64.4  10755.85    64.5  10988.16    68.1  11162.12
GR  71.35     11220    71.9  11348.07    74.6  11434.99    75.9  11601.85   78.45     11650
GR   79.6     11960    81.1  12067.18    79.5  12180.83    80.3  12422.88    84.2  12477.71
GR  85.05     12580    83.5  12625.42    84.2     12770    82.9   13330.5

QT      4   62340   127340   167560   307140        0        0        0        0
NC    .12     .12     .03       .1       .3
NH      3    .120  3153.07     .030  3834.77     .120  14239.64
X1  11.48      83  3153.07  3834.77      400      700      370                -1
X3     10                  1998.35    56.86
GR  76.29       0    74.2   141.74     72.1   251.69     67.3   387.98     65.6   572.84
GR   64.9  799.64    56.3  1051.78     56.7   1284.7     55.8  1423.54     57.5  1735.27
GR   55.8 1865.38    57.9  1950.43       57  2115.34     51.9  2192.24     51.6  2676.44
GR   48.1 2772.19    51.5   2897.5     47.5  3079.27     49.6  3153.07     48.4  3217.84
GR   40.8 3263.45    46.8  3312.88    38.33  3352.99    32.93   3453.9    28.63  3598.06
GR  22.83 3619.02   25.93  3642.69    21.73  3663.26    28.63  3710.06    40.09  3750.18
GR   50.5 3834.77    52.5  4098.58     52.5  4266.28     50.2  4616.96     53.2  5256.55
GR   55.8 5417.16    49.5  5542.31     49.6  5811.88     52.8  5944.08     50.5  6026.29
GR   49.2 6139.42    50.6  6300.68     60.8  6368.78     60.8  6489.41     52.1  6544.58
GR   49.1 6582.93    49.6  6866.77     53.6  6999.45     52.4  7192.35     55.8  7242.29
GR   52.1 7310.92    57.4   7392.7     58.9  7486.54     57.8   7527.2     59.3  7858.55
GR   62.3 8313.45    62.3   8520.5     63.1  8579.97     63.8  8874.31     63.1  9022.65
GR   64.7 9319.75      64  9847.05       66 10324.86     67.2 10502.28     70.9 10689.92
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GR   75.6 10862.29      80 11138.46     81.4 11329.98     82.6 11935.13     82.6 12152.77
GR     84 12494.73    86.9 12751.65       91 12961.31     96.3 13165.82     98.2 13409.92
GR   97.1 13499.57    82.3 13562.28     82.6 13710.72     93.2 13739.27     91.2 13843.55
GR   84.7 14008.62    85.8 14187.33     84.3 14239.64

QT      4   62300   127200   167500   306900
NC    .12     .12     .03       .6       .8
X1  11.55      73    3153     3835    400.0    400.0    370.0     0.00        0
X3     10     0.0     0.0     1950       57      0.0      0.0      0.0
GR   75.4       0    74.2      142     67.3      388     65.6      573     64.9      800
GR   51.7     898    56.3     1052     56.7     1285     55.8     1424     51.7     1438
GR   51.7    1636    57.5     1735     57.9     1950       57     2115     51.9     2192
GR   51.6    2676    48.1     2772     51.5     2898     47.5     3079     49.6     3153
GR   48.4    3218    46.8     3313    38.33     3353    28.63     3598    22.83     3619
GR  25.93    3643   21.73     3663    28.63     3710    40.09     3750     50.5     3835
GR   52.5    4099    52.5     4266     50.2     4617     44.2     4679     44.3     5110
GR   53.2    5257    55.8     5417     49.5     5542     49.6     5812     52.8     5944
GR   50.5    6026    49.2     6139     50.6     6301     60.8     6369     60.8     6489
GR   52.1    6545    49.1     6583     49.6     6867     53.6     6999     52.4     7192
GR   52.1    7311    58.9     7487     59.3     7859     62.3     8313     62.3     8521
GR   63.1    8580    63.8     8874     63.1     9023     64.7     9320       64     9847
GR     66   10325    67.2    10502     70.9    10690     75.6    10862       80    11138
GR   81.4   11330    82.6    11935     82.6    12153       84    12495     86.9    12752
GR     91   12961    96.3    13166     98.2    13410

NH      4    .100  18850.0     .100  20250.0     .030  21748.6     .120  28900.0    0.000
X1 11.569      83    20250  21768.7      100      100      100     0.00     0.00        0
X3     10     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR  84.00  16850.0   80.00  17250.0   80.00  17251.0   80.00  17252.0   75.00  18025.0
GR  70.00  18075.0   65.00  18125.0   60.00  18200.0   60.00  18201.0   60.00  18202.0
GR  60.00  18450.0   60.00  18500.0   60.00  18600.0   60.00  18850.0   55.00  19350.0
GR  55.00  19351.0   68.70  20250.0   49.80  20287.0   49.30  20323.0   48.30  20340.0
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GR   49.80  20360.4   48.40  20389.0   50.50  20396.9   48.10  20458.0   44.50  20495.0
GR   44.20  20506.1   45.40  20560.0   44.50  20600.0   45.00  20650.0   47.20  20711.0
GR   44.00  20721.0   42.80  20746.0   43.30  20770.0   35.50  20800.0   33.50  20820.0
GR   26.50  20920.0   24.10  20930.0   31.40  20940.0   25.40  20944.1   29.70  20960.0
GR   30.60  20970.0   33.20  20980.0   33.20  20981.0   35.00  20990.0   35.90  21000.0
GR   38.40  21010.0   38.40  21017.3   43.43  21039.0   45.80  21089.5   46.80  21162.7
GR   46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR   49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR   51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR   64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00  22500.
GR   55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00  24950.
GR   60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00  28150.
GR   85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00      0.0

SB    1.25    2.31    2.60     0.0      50      46   32375      20    24.1    24.1
NC    .120    .120    .035      .3      .5
X1  11.660      91  20226.0  21910.0     480     480     480    0.00       0
X2     0.0     0.0       1   63.08   69.07     0.0     0.0     0.0     0.0     0.0
X3      10     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT      27  16200.0   68.99     0.0  17200.0   64.77     0.0  17500.0   63.51     0.0
BT  18300.    67.62     0.0  18301.0   67.63     0.0  18669.0   72.15     0.0  19195.0
BT   71.42     0.0  20000.0   67.97     0.0  20100.0   68.42     0.0   20200   68.87
```



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BT     0.0  20235.8   69.04   69.04  20242.8   69.07   63.08  20573.0   70.56   64.57
BT  20903.    72.04   66.05  21141.3   72.66   66.67  21563.0   71.21   65.22  21893.1
BT   69.73   63.74  21900.0   69.70   69.70  22000.0   69.24     0.0  22274.7   68.01
BT     0.0  22700.0   66.10     0.0  23449.7   65.50     0.0  24374.7   69.44     0.0
BT  26274.    85.80     0.0  28000.0   85.80     0.0  28300.0   85.80     0.0  28900.0
BT    90.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
GR   85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR   60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR   64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR   49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR   44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR   48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR   45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR   37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR   33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR   27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR   24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR   43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR   48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR   49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR   47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR   51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR   64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR   65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
GR   90.50  28900.0    0.00     0.0    0.00     0.0    0.00     0.0    0.00     0.0

X1  11.679      73    3153    3835     100     100     100    0.00    0.00       0
X3      10     0.0     0.0    1950      57     0.0     0.0     0.0
GR    75.4       0    74.2     142    67.3     388    65.6     573    64.9     800
GR    51.7     898    56.3    1052    56.7    1285    55.8    1424    51.7    1438
GR    51.7    1636    57.5    1735    57.9    1950      57    2115    51.9    2192
GR    51.6    2676    48.1    2772    51.5    2898    47.5    3079    49.6    3153
GR    48.4    3218    46.8    3313   38.33    3353   28.63    3598   22.83    3619
GR   25.93    3643   21.73    3663   28.63    3710   40.09    3750    50.5    3835
GR    52.5    4099    52.5    4266    50.2    4617    44.2    4679    44.3    5110
GR    53.2    5257    55.8    5417    49.5    5542    49.6    5812    52.8    5944
GR    50.5    6026    49.2    6139    50.6    6301    60.8    6369    60.8    6489
GR    52.1    6545    49.1    6583    49.6    6867    53.6    6999    52.4    7192
GR    52.1    7311    58.9    7487    59.3    7859    62.3    8313    62.3    8521
GR    63.1    8580    63.8    8874    63.1    9023    64.7    9320      64    9847
GR      66   10325    67.2   10502    70.9   10690    75.6   10862      80   11138
GR    81.4   11330    82.6   11935    82.6   12153      84   12495    86.9   12752
GR      91   12961    96.3   13166    98.2   13410
```

```
QT     4   62060   126360   167140   305490       0       0       0       0
NC  .120    .120     .030       .1       .3
X1  11.97     84  2273.46  2827.03      802    5043    2118
X3    10              1105.39     52.5     9060    74.8
GR  78.23      0    64.2   174.04    63.5   501.47    62.4   571.34    57.3   671.03
GR   46.1  969.8    52.3  1075.96    49.9  1240.38    49.5   1362.1    47.4  1575.32
GR   49.6 1774.8    45.3  2044.49    47.5  2118.35    44.4  2165.58    46.6  2273.46
GR  35.52 2351.83  41.02  2371.83   32.22  2411.83   31.72  2441.83   37.12  2621.82
GR   45.7 2759.78   44.7  2827.03    45.5  2960.44    44.9  3171.29    46.7     3200
GR   46.4 3463.72     47  3583.97    44.6  3643.28      45  3872.88      47  3996.03
1
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GR   53.2  4123.35   60.5   4270.1   60.5  4509.54   57.2  4775.48     58  5148.72
GR   56.2  5363.59   55.1   5699.3   49.4  5956.27   49.6  6073.28   48.3  6272.85
GR     51  6381.63   52.1  6574.09   51.8  6814.08   53.2  6887.03   50.2  7041.29
GR   53.5  7127.14   51.6  7442.96   56.9  7800.49   62.4  7837.71   64.9  7999.27
GR   67.4  8385.92   67.1  8424.35   74.8     9060   66.9     9130  66.35     9190
GR   65.8   9282.6   53.6   9356.5   55.7  9527.42   58.8  9587.89   70.2  9638.17
GR   72.9  9884.04     75 10154.89   75.2 10427.45   76.1 10520.96   76.1  10769.8
GR   90.2    10830   91.8 11098.11   89.8 11321.02   86.3 11634.53   85.4 11757.32
GR   86.8 11952.18   85.2 12112.75   87.5 12345.14   83.2 12384.16   89.1 12447.67
GR   85.9 12555.51   90.4    12650   84.7 12970.55   83.1 13224.85     84 13312.97
GR     83 13508.04   84.5  13657.9   83.9 13887.88   86.8 14077.83


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   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL    OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL   TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN   ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR TOPWID  ENDST


*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=   .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=    1232.0   8990.0 TYPE=    1  TARGET=  -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
      THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
      THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
    3.615    20.61    50.91     .00    50.91    51.06     .15     .00     .00    41.60
  174300.0   1521.8 167008.7  5769.5   3779.5  51973.1 11582.1      .0      .0    43.80
      .00      .40     3.21     .50     .120     .030    .120    .000   30.30  1277.93
   .000136       0.       0.      0.       0        0       0     .00 7174.17  8452.10


*SECNO 4.745

3470 ENCROACHMENT STATIONS=    1973.4   6985.6 TYPE=    1  TARGET=   5012.200
 ELENCL=    52.00  ELENCR=     48.60
    4.745    20.54    51.74     .00      .00    51.90     .16     .84     .00    51.10
  173330.0      6.5 172233.1  1090.4     92.3  53629.3  3122.6  8151.2   782.7    47.20
      .52      .07     3.21     .35     .120     .030    .120    .000   31.20  2087.00
   .000147    3600.    5966.   4500.       2        0       0     .00 5551.63  7638.63


CCHV=   .300 CEHV=   .500
*SECNO 5.026
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.026   41.37   51.97    .00    .00   52.22    .25    .27    .05   56.20
 173080.0      .0 173080.0     .0     .0 43119.8     .0  9946.9   963.6   57.00
    .62     .00    4.01    .00    .000    .030    .000    .000   10.60  9611.74
  .000231   1030.   1482.   4150.      2      0      0     .00 3485.50 13097.25

*SECNO 5.027
1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.027   41.39   51.99    .00    .00   52.23    .24    .00    .00   56.20
 173080.0      .0 173080.0     .0     .0 44353.1     .0  9947.9   963.6   56.00
    .62     .00    3.90    .00    .000    .030    .000    .000   10.60  9615.15
  .000231      1.      1.      1.      1      0      0     .00 3340.00 13040.57

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.034   41.40   52.00    .00    .00   52.24    .24    .01    .00   56.20
 173080.0      .0 173080.0     .0     .0 44419.9     .0  9995.7   967.2   56.00
    .62     .00    3.90    .00    .000    .030    .000    .000   10.60  9615.07
  .000230     47.     47.     47.      0      0      0     .00 3340.21 13040.69

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.035   41.40   52.00    .00    .00   52.25    .25    .00    .01   56.20
 173080.0      .0 173080.0     .0     .0 43224.7     .0  9996.8   967.3   57.00
    .62     .00    4.00    .00    .000    .030    .000    .000   10.60  9611.65
  .000229      1.      1.      1.      0      0      0     .00 3485.93 13097.59

*SECNO 5.037
1
  28FEB00   09:47:58                                                  PAGE  16

  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037    41.40    52.00     .00     .00    52.25     .25     .00     .00    56.20
 173080.0       .0  173080.0      .0      .0  43208.0      .0  10004.7   968.0   57.00
     .62      .00     4.01     .00    .000    .030    .000    .000   10.60  9611.67
  .000229       8.       8.       8.       0       0       0     .00  3485.87 13097.54


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038    41.42    52.02     .00     .00    52.25     .24     .00     .00    56.20
 173080.0       .0  173080.0      .0      .0  44437.1      .0  10005.7   968.0   56.00
     .62      .00     3.89     .00    .000    .030    .000    .000   10.60  9615.05
  .000230       1.       1.       1.       1       0       0     .00  3340.26 13040.71


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=  0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045    41.43    52.03     .00     .00    52.26     .23     .01     .00    56.20
 173080.0       .0  173080.0      .0      .0  44503.3      .0  10053.7   971.6   56.00
     .63      .00     3.89     .00    .000    .030    .000    .000   10.60  9614.98
  .000229      47.      47.      47.       0       0       0     .00  3340.47 13040.83


CCHV=   .100 CEHV=   .300
1
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA   R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN  SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID ENDST


*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

     DREDGE AREA UPSTREAM OF LAKE HOUSTON PARKWAY BRRIDGE @ ELEV. 26.
   5.046    41.48    52.08     .00     .00    52.27     .19     .00     .00    56.20
 173080.0       .0  173080.0      .0      .0  49262.8      .0  10054.8   971.7   57.00
     .63      .00     3.51     .00    .000    .030    .000    .000   10.60  9611.44
  .000148       1.       1.       1.       2       0       0     .00  3486.98 13098.41


CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 5.585
   5.585    28.94    52.64     .00     .00    52.79     .15     .52     .00    48.20
 172610.0 115972.7  56602.1    35.2  62092.3  12213.3   150.6  13965.4  1393.3   49.80
```

```
   .91    1.87    4.63    .23    .049    .030    .120    .000    23.70  1226.83
 .000223    2664.    2847.    1744.      2      0      0     .00  10044.15  11270.97


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW

   6.420    24.86    53.26     .00     .00    53.40     .14     .61     .00    46.70
 171900.0  99980.7  39418.8  32500.6  36022.5   9532.0  17352.0  18218.7   1902.8    47.50
   1.18     2.78     4.14     1.87    .030    .030    .050    .000    28.40  10885.50
 .000196    2300.    4409.    2800.      2      0      0     .00   7505.76  18405.29


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0   20069.0  TYPE=    1  TARGET=    8229.000
 ELENCL=    53.10  ELENCR=    57.90
   7.090    23.88    53.98     .00     .00    54.16     .18     .74     .01    46.90
 171320.0   9576.4  99554.2  62189.4  13401.5  23083.6  42530.6  23152.4   2491.6    47.40
   1.46      .71     4.31     1.46    .120    .030    .084    .000    30.10  8685.96
 .000288    2000.    3538.    3600.      2      0      0     .00  11158.23  19844.19
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID  ENDST


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=      .0   16383.0  TYPE=    1  TARGET=   16383.000
   7.470    25.45    54.45     .00     .00    54.73     .27     .54     .03    47.70
 171000.0  64152.7  56832.6  50014.7  44132.3   8642.6  17375.8  25904.9   2858.2    44.30
   1.60     1.45     6.58     2.88    .071    .030    .050    .000    29.00  6990.27
 .000341    1500.    2006.    1500.      2      0      0     .00   9311.27  16301.54


*SECNO 8.070

3470 ENCROACHMENT STATIONS=    3455.4   15481.5  TYPE=    1  TARGET=   -3455.360
 ELENCL=    61.13  ELENCR= 100000.00
   8.070    27.64    55.54     .00     .00    56.12     .57    1.30     .09    44.30
 171000.0  22307.8 107431.6  41260.6  16820.7  14133.7  33723.1  30370.9   3403.9    46.70
   1.75     1.33     7.60     1.22    .120    .030    .120    .000    27.90  3788.01
 .000590    2619.    2891.    3201.      2      0      0     .00   7306.13  11094.14


CCHV=   .100 CEHV=    .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65


3470 ENCROACHMENT STATIONS=      .0    3851.7  TYPE=    1  TARGET=    3851.709
   8.490    21.51    57.31     .00     .00    58.61    1.30    2.27     .22    46.00
```

```
 169770.0  52159.9 103214.5  14395.5  21372.3   8902.1  12373.5  33003.5   3708.6    50.60
   1.83     2.44    11.59     1.16     .120     .030     .120     .000    35.80   798.20
 .001382    2636.    2374.    1605.      3        0        0      .00   6189.42  6987.62
```

1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


```
 SECNO    DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS  L-BANK ELEV
 Q        QLOB    QCH     QROB    ALOB     ACH     AROB    VOL    TWA    R-BANK ELEV
 TIME     VLOB    VCH     VROB    XNL      XNCH    XNR     WTN    ELMIN  SSTA
 SLOPE    XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR  TOPWID ENDST
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.28

```
3470 ENCROACHMENT STATIONS=   2460.6  10500.0 TYPE=    1 TARGET=  -2460.630
 ELENCL=    56.91 ELENCR= 100000.00
   9.410    24.97    60.47      .00      .00    60.71      .24     2.00      .11    53.30
 169330.0  24923.4  62540.8  81865.8  15208.6  10307.0  49020.7  39000.3   4388.6    49.50
   2.21     1.64     6.07     1.67     .057     .030     .079     .000    35.50   751.55
 .000264    2500.    4858.    5500.      3        0        0      .00   7128.41  7879.96
```

CCHV= .100 CEHV= .300
*SECNO 10.580

```
3470 ENCROACHMENT STATIONS=   1431.2   8020.0 TYPE=    1 TARGET=   6588.810
 ELENCL=    55.17 ELENCR=    59.05
  10.580    39.53    61.63      .00      .00    61.97      .35     1.23      .03    53.60
 168330.0  14276.0  90474.8  63579.2  15767.3  14205.6  59778.9  45694.6   4996.7    50.50
   2.53      .91     6.37     1.06     .100     .030     .120     .000    22.10   175.05
 .000283    2700.    6177.    3200.      2        0        0      .00   9128.21  9303.26
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 10.860

```
3470 ENCROACHMENT STATIONS=       .0   8865.0 TYPE=    1 TARGET=   8864.999
  10.860    30.25    61.95      .00      .00    62.32      .37      .34      .01    52.20
 168090.0  16715.1 107544.3  43830.5  15187.3  17868.7  42122.8  47987.3   5215.7    52.40
   2.62     1.10     6.02     1.04     .100     .030     .120     .000    31.70  1804.61
 .000234    1300.    1478.    1100.      2        0        0      .00   7026.63  8831.24
```

1490 NH CARD USED
*SECNO 11.090

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

```
3470 ENCROACHMENT STATIONS=   3311.7   6950.0 TYPE=    1 TARGET=   3638.260
 ELENCL=    53.30 ELENCR=    63.70
  11.090    30.45    62.25      .00      .00    62.88      .64      .48      .08    53.30
 167890.0  39446.7  98528.0  29915.3  21825.3  11946.8  24060.6  50213.0   5441.4    57.00
   2.69     1.81     8.25     1.24     .082     .030     .120     .000    31.80   785.05
 .000556    1400.    1214.    1600.      2        0        0      .00   6100.83  6885.88
```

```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


CCHV=   .300 CEHV=    .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=      1  TARGET=     4320.750
 ELENCL=    58.00  ELENCR=     65.50
   11.350    34.29    63.13      .00      .00    63.46      .33      .48      .09    52.80
 167670.0  11018.4 106120.0  50531.5  16010.8  18512.3  42022.2  52872.0   5670.5    52.60
     2.79      .69     5.73     1.20     .120     .030     .120     .000    28.84   463.58
  .000220    1000.    1373.    2300.        2        0        0      .00  6011.12  6474.70


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

   11.380    36.48    63.28      .00      .00    64.27      .99      .48      .33    66.30
 167670.0       .0 167670.0       .0       .0  21047.3       .0  54788.6   5799.2    64.00
     2.84      .00     7.97      .00     .000     .030     .000     .000    26.80 19954.84
  .000473    1000.    1373.    2300.        2        0        0      .00  1031.82 20986.65



SPECIAL BRIDGE

SB XK      XKOR    COFQ     RDLEN    BWC      BWP      BAREA    SS       ELCHU    ELCHD
    1.25    1.50    2.60      .00   189.00    20.40 22729.00    10.20    27.80    27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=     63.19 BRIDGE VELOCITY=       8.95    CALCULATED CHANNEL AREA=      18739.
1
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  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
  Q      QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
  TIME   VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
  SLOPE  XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST



 EGPRS    EGLWC      H3     QWEIR     QLOW     BAREA  TRAPEZOID     ELLC    ELTRD    WEIRLN
                                               AREA
    .00    64.35     .08        0.  167670.   22729.    22477.     67.20    68.30        0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30 ELREA=       64.00

   11.390    36.57    63.37      .00      .00    64.35      .98      .08      .00    66.30
 167670.0       .0 167670.0       .0       .0  21134.7       .0  54812.8   5800.4    64.00
     2.85      .00     7.93      .00     .000     .030     .000     .000    26.80 19953.30
```

```
 .000468     50.     50.     50.       0       0       0     .00  1034.93  20988.23
```

*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.62

```
3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=    58.00  ELENCR=    65.50
  11.400    35.45    64.29     .00     .00    64.57     .28     .01     .21    52.80
 167670.0  12781.7 104022.1  50866.2  18955.5  19494.4  45134.3  54872.9   5804.5    52.60
   2.85      .67     5.34     1.13    .120     .030    .120    .000    28.84   291.63
 .000178     50.     50.     50.       2       0       0     .00  6205.12  6496.75
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 11.480

```
3470 ENCROACHMENT STATIONS=    1998.3  14239.6  TYPE=     1  TARGET=   -1998.350
 ELENCL=    56.86  ELENCR= 100000.00
  11.480    43.62    64.35     .00     .00    64.65     .30     .07     .01    48.60
 167560.0  18071.1 106271.2  43217.7  24033.1  19440.0  55582.0  56044.9   5907.2    49.50
   2.88      .75     5.47     .78    .120     .030    .120    .000    20.73   654.39
 .000141    400.    370.    700.       2       0       0     .00  9514.77  10169.16
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL    OLOSS  L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB     ACH     AROB    VOL   TWA    R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL      XNCH    XNR     WTN   ELMIN  SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC     ICONT   CORAR TOPWID ENDST
```

CCHV= .600 CEHV= .800
*SECNO 11.550

3265 DIVIDED FLOW

```
3470 ENCROACHMENT STATIONS=    1950.0  13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.550    42.67    64.40     .00     .00    64.71     .30     .06     .00    49.60
 167500.0  17832.1 102633.0  47034.9  23115.5  18305.8  53899.1  56924.3   5991.2    50.50
   2.91      .77     5.61     .87    .120     .030    .120    .000    21.73   806.07
 .000161    400.    370.    400.       0       0       0     .00  8867.32  9945.10
```

1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 68.70 ELREA= 67.10

```
  11.569    40.28    64.38     .00     .00    64.94     .56     .02     .20    68.70
 167500.0      .0 167500.0      .0      .0  27956.6      .0  57065.8   6003.1    67.10
   2.92      .00     5.99     .00    .000     .031    .000    .000    24.10  20258.46
 .000323    100.    100.    100.       2       0       0     .00  1501.41  21759.88
```

SPECIAL BRIDGE

```
SB XK     XKOR    COFQ    RDLEN    BWC     BWP      BAREA    SS      ELCHU    ELCHD
   1.25    2.31    2.60     .00    50.00    46.00 32375.00   20.00    24.10    24.10

CCHV=   .300 CEHV=    .500
*SECNO 11.660
PRESSURE FLOW


 EGPRS    EGLWC     H3     QWEIR    QPR     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                          AREA
   65.34    64.94     .06       0.  167500.  32375.   30545.     63.08    69.07      0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       68.90 ELREA=       68.20

1
  28FEB00     09:47:58                                                    PAGE  23


   SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB    VOL     TWA    R-BANK ELEV
   TIME   VLOB    VCH     VROB    XNL     XNCH    XNR    WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR   TOPWID  ENDST


   11.660    45.12    64.92     .00     .00    65.34     .42     .40     .00    68.90
  167500.0       .0  167500.0      .0      .0  32112.1      .0  57396.8   6020.5    68.20
    2.94     .00     5.22     .00    .000    .035    .000    .000    19.80  20235.84
  .000297    480.     480.     480.      2       0       0     .00  1665.63  21901.47


*SECNO 11.679

3470 ENCROACHMENT STATIONS=     1950.0   13410.0  TYPE=      1  TARGET=    -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
   11.679    43.47    65.20     .00     .00    65.42     .22     .02     .06    49.60
  167500.0  20440.3  93965.4  53094.3  24981.7  18842.9  58746.3  57551.4   6033.3    50.50
    2.95     .82     4.99     .90    .120    .035    .120    .000    21.73   703.33
  .000167    100.     100.     100.      2       0       0     .00  9430.01  10133.35


CCHV=   .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=     1105.4    9060.0  TYPE=      1  TARGET=     7954.610
 ELENCL=    52.50  ELENCR=     74.80
   11.970    33.93    65.65     .00     .00    65.88     .23     .46     .00    46.60
  167140.0  25189.1  81148.7  60802.2  26829.9  14989.0  67363.3  66150.8   6776.1    44.70
    3.21     .94     5.41     .90    .120    .030    .120    .000    31.72   156.00
  .000148    802.    2118.    5043.      2       0       0     .00  7959.88  8115.89


1
  28FEB00     09:47:58                                                    PAGE  24



                                                   THIS RUN EXECUTED 28FEB00    09:47:58
**************************************
 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
```

Starting form river mile

SUMMARY PRINTOUT

	VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
	.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
	8151.214	.07	.35	3.21	56844.21	5551.63	.00	99.37	.63
	9946.853	.00	.00	4.01	43119.80	3485.50	.00	100.00	.00
	9947.856	.00	.00	3.90	44353.10	3340.00	.00	100.00	.00
	9995.748	.00	.00	3.90	44419.91	3340.21	.00	100.00	.00
	9996.754	.00	.00	4.00	43224.65	3485.93	.00	100.00	.00
	10004.690	.00	.00	4.01	43208.01	3485.87	.00	100.00	.00
	10005.700	.00	.00	3.89	44437.07	3340.26	.00	100.00	.00
	10053.680	.00	.00	3.89	44503.28	3340.47	.00	100.00	.00
	10054.750	.00	.00	3.51	49262.80	3486.98	.00	100.00	.00
	13965.440	1.87	.23	4.63	74456.21	10044.15	67.19	32.79	.02
	18218.730	2.78	1.87	4.14	62906.47	7505.76	58.16	22.93	18.91
	23152.380	.71	1.46	4.31	79015.70	11158.23	5.59	58.11	36.30
	25904.930	1.45	2.88	6.58	70150.61	9311.27	37.52	33.24	29.25
	30370.950	1.33	1.22	7.60	64677.53	7306.13	13.05	62.83	24.13
*	33003.520	2.44	1.16	11.59	42647.85	6189.42	30.72	60.80	8.48
*	39000.290	1.64	1.67	6.07	74536.32	7128.41	14.72	36.93	48.35

	VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
	45694.600	.91	1.06	6.37	89751.87	9128.21	8.48	53.75	37.77
	47987.280	1.10	1.04	6.02	75178.76	7026.63	9.94	63.98	26.08
*	50213.030	1.81	1.24	8.25	57832.73	6100.83	23.50	58.69	17.82
*	52871.970	.69	1.20	5.73	76545.25	6011.12	6.57	63.29	30.14
*	54788.600	.00	.00	7.97	21047.32	1031.82	.00	100.00	.00
	54812.810	.00	.00	7.93	21134.66	1034.93	.00	100.00	.00
*	54872.910	.67	1.13	5.34	83584.23	6205.12	7.62	62.04	30.34
	56044.890	.75	.78	5.47	99055.14	9514.77	10.78	63.42	25.79
	56924.340	.77	.87	5.61	95320.30	8867.32	10.65	61.27	28.08
	57065.850	.00	.00	5.99	27956.56	1501.41	.00	100.00	.00
	57396.800	.00	.00	5.22	32112.12	1665.63	.00	100.00	.00
	57551.400	.82	.90	4.99	102570.90	9430.01	12.20	56.10	31.70

66150.800 .94 .90 5.41 109182.30 7959.88 15.07 48.55 36.38

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21	143031.00
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80	114001.30
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10	113789.00
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91	114058.80
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65	114454.10
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01	114382.20
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07	114128.10
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28	114395.70
5.046	1.00	.00	.00	10.60	173080.00	52.08	.00	52.27	1.48	3.51	49262.80	142377.30
5.585	2847.00	.00	.00	23.70	172610.00	52.64	.00	52.79	2.23	4.63	74456.21	115665.50
6.420	4409.00	.00	.00	28.40	171900.00	53.26	.00	53.40	1.96	4.14	62906.47	122683.00
7.090	3538.00	.00	.00	30.10	171320.00	53.98	.00	54.16	2.88	4.31	79015.70	100896.00
7.470	2006.00	.00	.00	29.00	171000.00	54.45	.00	54.73	3.41	6.58	70150.61	92656.52
8.070	2891.14	.00	.00	27.90	171000.00	55.54	.00	56.12	5.90	7.60	64677.53	70428.46
* 8.490	2374.28	.00	.00	35.80	169770.00	57.31	.00	58.61	13.82	11.59	42647.85	45669.45
* 9.410	4858.00	.00	.00	35.50	169330.00	60.47	.00	60.71	2.64	6.07	74536.32	104209.70
10.580	6177.00	.00	.00	22.10	168330.00	61.63	.00	61.97	2.83	6.37	89751.87	100130.40
10.860	1478.00	.00	.00	31.70	168090.00	61.95	.00	62.32	2.34	6.02	75178.76	109863.50
* 11.090	1214.00	.00	.00	31.80	167890.00	62.25	.00	62.88	5.56	8.25	57832.73	71171.59
* 11.350	1373.00	.00	.00	28.84	167670.00	63.13	.00	63.46	2.20	5.73	76545.25	113149.90
* 11.380	1373.00	.00	.00	26.80	167670.00	63.28	.00	64.27	4.73	7.97	21047.32	77097.88
11.390	50.00	68.30	67.20	26.80	167670.00	63.37	.00	64.35	4.68	7.93	21134.66	77478.07
* 11.400	50.00	.00	.00	28.84	167670.00	64.29	.00	64.57	1.78	5.34	83584.23	125817.70

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
11.480	370.00	.00	.00	20.73	167560.00	64.35	.00	64.65	1.41	5.47	99055.14	140870.30

11.550	370.00	.00	.00	21.73	167500.00	64.40	.00	64.71	1.61	5.61	95320.30	131997.60
11.569	100.00	.00	.00	24.10	167500.00	64.38	.00	64.94	3.23	5.99	27956.56	93213.23
11.660	480.00	69.07	63.08	19.80	167500.00	64.92	.00	65.34	2.97	5.22	32112.12	97188.00
11.679	100.00	.00	.00	21.73	167500.00	65.20	.00	65.42	1.67	4.99	102570.90	129680.00
11.970	2118.00	.00	.00	31.72	167140.00	65.65	.00	65.88	1.48	5.41	109182.30	137437.60

1

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3.615	174300.00	50.91	.00	.00	.00	7174.17	.00
	4.745	173330.00	51.74	.00	.83	.00	5551.63	5966.00
	5.026	173080.00	51.97	.00	.23	.00	3485.50	1482.00
	5.027	173080.00	51.99	.00	.02	.00	3340.00	1.00
	5.034	173080.00	52.00	.00	.01	.00	3340.21	47.00
	5.035	173080.00	52.00	.00	-.01	.00	3485.93	1.00
	5.037	173080.00	52.00	.00	.00	.00	3485.87	8.00
	5.038	173080.00	52.02	.00	.02	.00	3340.26	1.00
	5.045	173080.00	52.03	.00	.01	.00	3340.47	47.00
	5.046	173080.00	52.08	.00	.05	.00	3486.98	1.00
	5.585	172610.00	52.64	.00	.57	.00	10044.15	2847.00
	6.420	171900.00	53.26	.00	.62	.00	7505.76	4409.00
	7.090	171320.00	53.98	.00	.71	.00	11158.23	3538.00
	7.470	171000.00	54.45	.00	.48	.00	9311.27	2006.00
	8.070	171000.00	55.54	.00	1.09	.00	7306.13	2891.14
*	8.490	169770.00	57.31	.00	1.76	.00	6189.42	2374.28
*	9.410	169330.00	60.47	.00	3.16	.00	7128.41	4858.00
	10.580	168330.00	61.63	.00	1.15	.00	9128.21	6177.00
	10.860	168090.00	61.95	.00	.33	.00	7026.63	1478.00
*	11.090	167890.00	62.25	.00	.29	.00	6100.83	1214.00
*	11.350	167670.00	63.13	.00	.88	.00	6011.12	1373.00
*	11.380	167670.00	63.28	.00	.16	.00	1031.82	1373.00
	11.390	167670.00	63.37	.00	.08	.00	1034.93	50.00
*	11.400	167670.00	64.29	.00	.92	.00	6205.12	50.00

1

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
11.480	167560.00	64.35	.00	.06	.00	9514.77	370.00
11.550	167500.00	64.40	.00	.06	.00	8867.32	370.00
11.569	167500.00	64.38	.00	-.03	.00	1501.41	100.00
11.660	167500.00	64.92	.00	.54	.00	1665.63	480.00
11.679	167500.00	65.20	.00	.28	.00	9430.01	100.00
11.970	167140.00	65.65	.00	.46	.00	7959.88	2118.00

1

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Alternative IIB - Dredging Area C

```
1*********************************************              ***************************************
* HEC-2 WATER SURFACE PROFILES             *                * U.S. ARMY CORPS OF ENGINEERS      *
*                                          *                * HYDROLOGIC ENGINEERING CENTER     *
* Version  4.6.2; May 1991                 *                * 609 SECOND STREET, SUITE D        *
*                                          *                * DAVIS, CALIFORNIA 95616-4687      *
* RUN DATE  28FEB00   TIME  09:48:49       *                *       (916) 756-1104              *
*********************************************              ***************************************
```

```
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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1
 28FEB00    09:48:49                                          PAGE  1
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THIS RUN EXECUTED 28FEB00 09:48:49

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

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

DREDGING AREA C (RM 12.2); BOTTOM ELEV. 30'

```
T1    CF-0033 BROWN & ROOT SERVICES,  02/25/2000
T2    Lake Houston HEC-2 MODEL, REACH 3      FILENAME[redacted],
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK  INQ    NINV   IDIR   STRT   METRIC  HVINS   Q     WSEL    FQ

    0      4      0                      50.91

J2 NPROF   IPLOT   PRFVS   XSECV   XSECH   FN    ALLDC   IBW    CHNIM   ITRACE

   -1      0      -1

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

  150      7      55      56      26      25      4      35      60      59

J6 IHLEQ   ICOPY   SUBDIV   STRTDS   RMILE

    1

QT     4    66800    143300    174300    333600
NC   0.12    0.12    0.03     .1      .3
     THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
     THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
X1  3.615       89  2366.85  6330.06
X3    10                1232.04      54.7
GR   55.6       0     55.2      90     54.9   161.12     54.8   318.29     54.5      400
GR   54.5  505.44     50.4   590.1     50.7   644.14     49.6   763.76     49.8   821.19
GR   47.9  853.74     50.9  895.11       51   927.61       49   951.75     47.9   1054.3
GR   50.3 1085.94     53.3 1160.37     54.7  1232.04     50.1  1287.74       49  1373.79
GR   48.6 1482.72     49.1 1622.28     46.2  1678.02     46.3  1781.82     48.3  1866.53
GR   49.2  1949.4     48.8 2075.16     47.9  2163.11     43.8  2220.71     42.6  2269.24
GR   41.6 2366.85     40.6 2391.75       39  2452.47     37.7  2548.87     37.9  2765.45
```

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GR   37.6  2952.69    38  3157.81    38.6  3299.81    38.3  3413.04    38.1  3746.92
GR   38.1  3993.99  38.9  4185.79    38.8  4286.36    40.5  4499.72    39.9   4728.9
GR   38.6  4754.82  40.1   4907.5 40.4627 4943.023    38.9  4984.51    37.2  5041.95
GR   37.2  5119.68  36.4  5177.29    37.3  5277.11    36.8  5355.15    38.1  5518.64
GR   37.9  5567.34  36.5  5613.59    33.5   5655.2    32.5   5769.5    30.3  5803.47
GR   32.8  5902.24  32.8   5982.5    34.2  6030.84    36.5  6067.52    37.5   6124.9
GR   37.8  6207.91  40.5  6273.13    43.8  6330.06    41.5  6462.94    41.4  6636.96
GR   44.8  6697.83  45.5  6728.93    44.5  6819.63      45  6861.77    44.5  6960.04
GR   44.8  7029.56 45.05     7060    44.7  7115.34    45.4  7181.81    45.6     7240
GR   45.6     7360  45.5   7468.6    43.4  7632.04    44.6  7864.56    47.6  7908.88
GR   47.7  7982.52  48.7  8044.72    48.8     8220    55.8     8990
1
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```
QT      4    66160   140750   173330   329800
X1  4.745       84   2373.4  6703.71     3600     4500     5966
X3     10              1973.39       52  6985.59     48.6
GR  60.92        0    54.6      450   53.45      570   53.05      630    52.6      740
GR   52.7      830    52.5      930      52   989.14   52.45     1150    52.3  1284.73
GR   52.6  1434.66    52.6     1560   52.45     1730    52.3  1836.38   52.05     1940
GR     52  1973.39    51.1   2373.4    43.3     2385    39.8  2559.76      37  2645.83
GR     36  2728.22    35.3  2809.02    35.9  2887.92    31.2  3041.01    31.9  3156.16
GR   38.5  3253.79    38.3  3378.72    37.2  3446.92    38.7  3576.68    40.1  3661.26
GR     41   3745.2    42.8  3831.04    41.2  3910.34      41  3973.54    41.5  4029.61
GR   41.7   4160.5    41.2  4216.44    42.6   4487.7    44.7  4656.69    40.7  4714.42
GR   36.5     4755    36.2     4820    34.9     4900    38.1     5120    38.1     5180
GR   41.1     5200    42.3     5222    42.1     5272    39.7     5300    39.9     5500
GR   39.6     5550      38     5600    36.3     5740      37     5800    39.8  5962.55
GR     40  6057.51    39.7  6300.58      42  6371.11    43.1  6486.54      44  6532.85
GR   44.5  6559.55    45.2  6653.68    47.2  6703.71      47  6753.55    47.1  6787.33
GR   47.5  6829.55    47.3  6947.51    48.6  6985.59    48.4  7027.77    47.3  7052.29
GR   47.2  7079.78    46.5  7122.32    46.4  7303.07    46.8  7395.37    47.9  7436.05
GR   48.1   7535.6    50.2  7585.83    54.2  7722.58    54.7  7816.27    59.2  7868.73
GR   60.8  7911.42      61   8096.6    61.5     8298    61.8     8402

QT      4    65990   140170   173080   328820
NC   0.12     0.12    0.03      0.3     0.5
X1  5.026       82   10508    14400    1030     4150     1482   0.9135
X3     10
GR   70.3        0    60.1      847    55.1     4325    50.1     6125    47.5     6457
GR   51.9     6672      52     6723    49.3     6899      53     7002    51.3     7207
GR   47.8     7406    44.3     7535    50.7     7643      52     7675    49.2     7860
GR   50.7     7983      52     8074    50.8     8207    51.4     8253    50.6     8427
GR   44.2     8495    47.4     8539    44.2     8686    50.9     8716    48.5     8805
GR   53.1     8968    50.3     9257    52.8     9627    49.3     9739    48.6    10032
GR   41.6    10121    52.8    10240    51.6    10351    56.2    10508    49.2    10531
GR   44.1    10549    41.8    10584    28.9    10622    37.4    10682    36.1    10792
GR   37.9    10846    41.3    10953      45    11066    26.5    11142    24.4    11222
GR   17.9    11240    14.8    11250    10.6    11262    21.6    11486    24.9    11552
GR   41.3    11749    45.5    11830    46.2    11981    44.7    12010    41.2    12077
GR   46.2    12110      46    12265    42.6    12356    43.9    12514    41.7    12874
GR   42.3    13169    43.2    13369    44.1    13509    41.3    13921    44.5    14033
GR   43.9    14119    43.1    14221    47.6    14283      57    14400    63.4    14532
GR   64.7    14822    62.5    14960    66.5    15076    67.6    15152    66.1    15301
GR   65.8    15393    64.6    15581    65.5    15601    66.7    15706    62.2    15750
GR   64.2    15886    65.4    16039

NC    .12      .12   0.030
X1  5.027      100   10508    14300       1        1        1   0.9135
X3     10
X2      0        0       0     52.5   58.25
GR   70.3        0    60.1      847    50.1     6125    40.8     6399      52     6703
GR     53     6993    43.8     7631      52     7675    50.6     8427    44.2     8495
GR   53.1     8968    50.3     9257    52.8     9627    49.3     9739    48.6    10032
GR   41.6    10121    56.2    10508    28.9    10622    37.4    10682    52.5    10683
GR   52.5    10689    37.4    10689    36.1    10792    37.9    10846    41.3    10953
GR   52.5    10953    52.5    10959    41.3    10959      45    11066    26.5    11142
1
```

```
GR   24.4  11222  17.9  11240  50.4  11240  52.5  11241  52.5  11250
GR   10.6  11262  21.3  11480  52.5  11480  52.5  11486  21.6  11486
GR   24.9  11552  24.4  11708  52.5  11708  52.5  11714  24.4  11714
GR   24.4  11732  45.5  11830  46.2  11981    45  12004  52.5  12004
GR   52.5  12010  44.7  12010  41.2  12077  46.2  12110  46.1  12162
GR   52.5  12163  52.5  12169  46.1  12169  42.6  12356  43.5  12463
GR   52.5  12463  52.5  12469  43.5  12469  43.9  12514  41.2  12621
GR   41.3  12663  52.5  12663  52.5  12669  41.3  12669  41.7  12863
GR   52.5  12863  52.5  12869  41.7  12869  42.3  13163  52.5  13163
GR   52.5  13169  42.3  13169  43.2  13363  52.5  13363  52.5  13369
GR   43.2  13369  44.1  13509  41.3  13581  41.3  13663  52.5  13663
GR   52.5  13669  41.3  13669  41.3  13863  52.5  13863  52.5  13869
GR   41.3  13869  41.3  13921  44.5  14033  43.9  14113  52.5  14113
GR   52.5  14119  43.9  14119  43.1  14221    56  14300  66.8  14676

X1  5.034      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03
X1  5.035     82  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0  60.1    847  55.1   4325  50.1   6125  47.5   6457
GR   51.9   6672    52   6723  49.3   6899    53   7002  51.3   7207
GR   47.8   7406  44.3   7535  50.7   7643    52   7675  49.2   7860
GR   50.7   7983    52   8074  50.8   8207  51.4   8253  50.6   8427
GR   44.2   8495  47.4   8539  44.2   8686  50.9   8716  48.5   8805
GR   53.1   8968  50.3   9257  52.8   9627  49.3   9739  48.6  10032
GR   41.6  10121  52.8  10240  51.6  10351  56.2  10508  49.2  10531
GR   44.1  10549  41.8  10584  28.9  10622  37.4  10682  36.1  10792
GR   37.9  10846  41.3  10953    45  11066  26.5  11142  24.4  11222
GR   17.9  11240  14.8  11250  10.6  11262  21.6  11486  24.9  11552
GR   41.3  11749  45.5  11830  46.2  11981  44.7  12010  41.2  12077
GR   46.2  12110    46  12265  42.6  12356  43.9  12514  41.7  12874
GR   42.3  13169  43.2  13369  44.1  13509  41.3  13921  44.5  14033
GR   43.9  14119  43.1  14221  47.6  14283    57  14400  63.4  14532
GR   64.7  14822  62.5  14960  66.5  15076  67.6  15152  66.1  15301
GR   65.8  15393  64.6  15581  65.5  15601  66.7  15706  62.2  15750
GR   64.2  15886  65.4  16039

X1  5.037     82  10508  14400      8      8      8  0.9135
X3     10
GR   70.3      0  60.1    847  55.1   4325  50.1   6125  47.5   6457
GR   51.9   6672    52   6723  49.3   6899    53   7002  51.3   7207
GR   47.8   7406  44.3   7535  50.7   7643    52   7675  49.2   7860
GR   50.7   7983    52   8074  50.8   8207  51.4   8253  50.6   8427
GR   44.2   8495  47.4   8539  44.2   8686  50.9   8716  48.5   8805
GR   53.1   8968  50.3   9257  52.8   9627  49.3   9739  48.6  10032
GR   41.6  10121  52.8  10240  51.6  10351  56.2  10508  49.2  10531
GR   44.1  10549  41.8  10584  28.9  10622  37.4  10682  36.1  10792
GR   37.9  10846  41.3  10953    45  11066  26.5  11142  24.4  11222
GR   17.9  11240  14.8  11250  10.6  11262  21.6  11486  24.9  11552
GR   41.3  11749  45.5  11830  46.2  11981  44.7  12010  41.2  12077
GR   46.2  12110    46  12265  42.6  12356  43.9  12514  41.7  12874
1
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GR   42.3  13169  43.2  13369  44.1  13509  41.3  13921  44.5  14033
GR   43.9  14119  43.1  14221  47.6  14283    57  14400  63.4  14532
GR   64.7  14822  62.5  14960  66.5  15076  67.6  15152  66.1  15301
GR   65.8  15393  64.6  15581  65.5  15601  66.7  15706  62.2  15750
GR   64.2  15886  65.4  16039

X1  5.038    100  10508  14300      1      1      1  0.9135
X3     10
X2      0      0      0   52.5  58.25
```

```
GR   70.3      0   60.1    847   50.1   6125   40.8   6399     52   6703
GR     53   6993   43.8   7631     52   7675   50.6   8427   44.2   8495
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   56.2  10508   28.9  10622   37.4  10682   52.5  10683
GR   52.5  10689   37.4  10689   36.1  10792   37.9  10846   41.3  10953
GR   52.5  10953   52.5  10959   41.3  10959     45  11066   26.5  11142
GR   24.4  11222   17.9  11240   50.4  11240   52.5  11241   52.5  11250
GR   10.6  11262   21.3  11480   52.5  11480   52.5  11486   21.6  11486
GR   24.9  11552   24.4  11708   52.5  11708   52.5  11714   24.4  11714
GR   24.4  11732   45.5  11830   46.2  11981     45  12004   52.5  12004
GR   52.5  12010   44.7  12010   41.2  12077   46.2  12110   46.1  12162
GR   52.5  12163   52.5  12169   46.1  12169   42.6  12356   43.5  12463
GR   52.5  12463   52.5  12469   43.5  12469   43.9  12514   41.2  12621
GR   41.3  12663   52.5  12663   52.5  12669   41.3  12669   41.7  12863
GR   52.5  12863   52.5  12869   41.7  12869   42.3  13163   52.5  13163
GR   52.5  13169   42.3  13169   43.2  13363   52.5  13363   52.5  13369
GR   43.2  13369   44.1  13509   41.3  13581   41.3  13663   52.5  13663
GR   52.5  13669   41.3  13669   41.3  13863   52.5  13863   52.5  13869
GR   41.3  13869   41.3  13921   44.5  14033   43.9  14113   52.5  14113
GR   52.5  14119   43.9  14119   43.1  14221     56  14300   66.8  14676

X1  5.045      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03    0.1    0.3
X1  5.046     82  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039
1
  28FEB00    09:48:49                                        PAGE   5


QT      4  65680  139080  172610  326970
NC   0.12   0.12   0.03    0.1    0.3
NH      4   0.12  6565.8   0.04   9095   0.03  11165.02   0.12  11754.54
     DREDGE AREA C @ FEMA CROSS SECTION 5.585 WITH DREDGE @ ELEVATION 30.
X1  5.585     77   9095  11165.02   2664   1744   2847
X3      0
GR  62.75        0     55      1050     51     1350   50.4     2130   49.8     2670
GR   49.3     2940     49   3070.97   47.4  3189.37   48.1  3332.69   44.9  3448.15
GR   47.2  3606.21   45.8   3712.03   48.1   3809.2   45.3  3910.28   45.4   3992.9
GR   48.9  4050.05   50.5   4111.66   47.1  4292.93     49  4377.98   46.2  4426.95
GR   48.4  4503.41   51.7   4528.08     52   4646.6   47.9  4680.17   47.5  4744.32
GR   49.6  4816.31   45.9   5042.82   46.4  5114.46   50.6  5214.31   50.4  5290.11
GR     49   5321.9   47.8   5469.67   49.5  5630.79   47.7  5658.97   46.1  5777.87
GR   46.4  5924.67   44.8   6004.29   43.3  6258.57   43.5  6470.87   48.9   6565.8
GR   44.7  6646.34   45.9   6743.32   44.5  6892.24   44.2  7009.22   44.5  7289.15
GR   46.4  7330.53   44.3   7392.93   41.7  7412.88   43.8   7516.5   42.6  7594.69
GR   42.8  7688.63   41.4   7768.32     42  7833.49   41.2  7910.79   42.2  8209.01
GR   41.3  8286.36   39.7   8308.22   39.9     8702   40.1   8964.4   39.4  9095.69
GR     30     9145     30  10514.53     28 10567.09   26.4 10611.42   24.7 10640.77
GR   23.7 10681.82   25.7  10731.87   24.6 10751.83     28 10782.41   30.2 10840.35
```

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GR   39.3  10888.46   38.5  10909.12    45  10961.37   49.8  11027.75   49.8  11165.02
GR   54.6  11343.95  62.4385  11754.54

QT    4    65210   137410   171900   324160
NC   0.08    .12    0.03     .1      .3
NH    5    0.12    2500    0.08    10000    0.03    17143    0.08    19000    0.12
NH  23560
X1  6.420    59    15845   16499    2300    2800    4409
X3   10
GR   75      0     75    2500     70    3400     70    6000     60    7000
GR   58.3   10000   56.1   10103   56.6   10179   57.3   10497   56.3   10543
GR   55.3   10654   57.2   10704   55.9   10873   52.1   10891    49    11004
GR   50.2   11061   53.5   11106   49.4   11290   48.2   11399   47.9   11517
GR   47.7   11625   48.9   11747   45.8   11900    46    11965   46.6   12181
GR   47.9   12699   48.1   12807   46.6   13068   46.2   13367   47.4   13489
GR   42.4   13758   41.8   14068   44.9   14127   46.8   14222   48.9   14266
GR   42.2   14433   38.1   14587    45    14654   41.5   14714   46.1   15114
GR   44.8   15161   46.9   15361   41.9   15727   46.7   15845   40.4   16043
GR   28.4   16309   44.9   16440   47.5   16499   43.3   16544   44.6   16859
GR   41.5   17143   44.5   17299   43.5   17474   41.4   17702   41.5   17822
GR    43    18004    61    18708    70    19600    70    23560

QT    4    64830   136080   171320   321910
NC   0.12   0.12    0.03    0.1     0.3
NH    4     .12   13568    0.03   15555    0.08   18896    .12   24402
X1   7.09    67   13568   15555    2000    3600    3538
X3   10                  11840   53.1   20069   57.9
GR   75.1     0    70.1    2300   60.1    3500   59.1    5310   55.1    7000
GR   52.9    9998   51.2   10405   48.3   10760   46.7   11002   48.1   11096
GR    50    11122    47    11313   46.7   11451   52.6   11572   53.1   11840
GR   52.5   12008   49.5   12394   44.7   12513   43.3   12597   44.3   12738
GR   45.4   12956   46.9   13568   45.2   13743   44.7   13868   43.8   13920
GR   44.8   13990   45.1   14281   44.7   14544   42.4   14583   43.1   14804
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GR   41.6   14978   43.4   15013   42.2   15090   30.1   15260   31.6   15364
GR   47.4   15555   46.7   15598   45.5   15789   39.5   15858   36.1   15974
GR   35.8   16133   38.4   16239   42.5   16348   41.8   16564    44    16840
GR   44.7   17493   46.2   17579   44.6   18028   45.1   18178   43.3   18276
GR   43.9   18459    43    18497   44.4   18896   46.2   19531   56.9   19962
GR   57.9   20069   52.9   20275   53.4   20406   49.7   20651   51.5   20718
GR   54.8   21004   54.1   21070   54.3   21465    55    21585   53.8   21703
GR   60.1   22202    65    24402

QT    4    64610   135320   171000   320030
NC   .12    .12    .03     0.1     0.3
NH    5     .12   12000    0.05   14153    0.03   14598    0.05   16383    .12
NH  23100
X1   7.47    66   14153   14598    1500    1500    2006
X3   10                           16383   55.4
GR   75      0     75    4460   64.2    6000     70    6150   61.6    6693
GR   50.3    7163   46.9    7208   49.6    7585   46.7    7595    51     7861
GR   48.9    7931   50.6    8391    48     8503   49.8    8546   51.3    8691
GR   46.2    9217   50.4    9383   51.4    9536   49.2    9569   50.3    9803
GR   53.7   10039   53.5   10532   47.3   10859   48.5   10964   47.2   11235
GR    45    11328   45.5   11905   48.6   12029   46.4   12059    42    12180
GR   41.8   12274   44.9   12369   44.2   12639   45.9   12724   44.5   12772
GR   49.7   12832   48.5   12877   50.5   13056    45    13117   45.6   13218
GR   52.7   13383   48.5   13434    47    13591   41.8   13880   45.8   13922
GR   40.9   14010    47    14062   47.7   14153    29    14273    38    14585
GR   44.3   14598   43.4   14737   41.4   14777   40.4   14933   39.8   15545
GR   45.9   15676   48.5   15964   53.4   16211   55.4   16383    53    17600
GR    54    18600    55    18800    60    20560    70    21150    75    22400
GR    75    23100

NC   .12    .12    0.03
X1   8.07    90  5637.46  6519.38  2619.28  3201.18  2891.14
X3   10              3455.36   61.13
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GR   73.6      0     71    207.3    67.1   340.91    61.2   454.82    59.8   605.74
GR   63.3    903.8   58.3  1086.61    54    1321.33    54.2  1487.54    47.9  1600.81
GR   55.2  1766.53   53.5  1879.14    56.5  2066.56    53.1  2164.16    54.1  2425.57
GR   56.8  2597.07   52.7  2847.29    53.3  2923.49    50.4  3066.89    51.6   3182.9
GR   58.2   3240.1  61.15     3360    59.6   3625.8    56.1  3784.39    48    3837.18
GR   47    3910.62   41.7  3954.78    48.8   4041.7    47.3   4372.4    43    4430.63
GR   48    4823.38   45.7  5084.92    47.1   5209.7    44.3  5637.46    44.9  5883.73
GR   38.8  5971.26   41.9  6088.05    27.9  6099.51    32.1  6158.61    38.5  6417.39
GR   41.9   6498.6   46.7  6519.38    44.4  6698.82    44.6  6871.35    49.1  7166.61
GR   45.8  7214.35   48.7  7269.55    49.1  7385.35    46.4  7650.65    49.5  7758.86
GR   48.8  7837.12   53    8005.6     54.3  8165.26    54.2  8385.85    47.8  8751.03
GR   48.9  8956.83   47.3  9151.02    48.7  9234.09    48.6  9464.92    47.2   9691.7
GR   44.3  9845.44   44.3 10352.59    48.4 10497.67    48.7 10744.17    46.9 10944.93
GR   53.3 11073.35   58.8 11124.29    58.3 11461.72    60.5 11629.21    59.8 11752.03
GR   66.4 11793.39   67.5 11924.83   70.95    12100    69.2 12409.61    71.8 12474.39
GR   70.4 12728.04   74.2 12870.91    71.6 12991.35    74.9 13090.92    73.1 13188.25
GR   74.6 13307.27   72.3 13497.82    74.7 13757.58    73.4 13964.96    74.3 14201.59
GR   74.4  14577.6   73.6 14996.08    75.1 15169.17    73.7  15240.5    74.4 15481.47
```



```
QT    4   63800  132480  169770  315820
NC   .12    .12    .03     .1      .3
X1  8.49     91  2606.42  3168.51   2635.7  1605.14  2374.28
X3   10                             3851.71    54.7
GR   75.9      0     77.6     60    78.05     160    78.05     240     77     331.6
GR   72.3   368.12   69.4   412.95   71.35     460    69.7   534.73    67.2   564.85
GR   74.5    630     74.7    670     65.5   670.12    64.5    720     63.8   753.26
GR   55     814.19   51.2   856.53   46.4  1006.41    44.1  1184.02    46.1   1306.2
GR   45.1  1439.48   43.6  1567.36   42.1  1599.68    42.1  1656.52    45.3  1696.13
GR   46.6  1738.87   48.3  1871.15   45.8  1974.15    46.4  2040.15    43.1  2089.69
GR   43.2  2200.98   44.1  2303.81   45.6  2353.39    42    2371.86    46    2606.42
GR   37.9  2677.54   35.8  2837.08   35.9  2927.48   42.72  2959.44    47.7  3034.05
GR   49.5  3138.67   50.6  3168.51   48.9  3220.17    48.1  3328.05    48.6   3423.1
GR   50.4  3455.47   50.3  3565.82   52.2  3627.93    52.2  3679.39    54.7  3851.71
GR   53     3892.8   53.4    3940    51.9  3961.68    52    4079.34    52.9  4194.97
GR   55.8    4300    53.2  4350.46   54.7  4373.98    54.9  4425.24    53.8  4458.24
GR   54.6  4581.48   52.7  4690.43   53.9    4730     51.5  4768.99    52.7  4822.83
GR   50.7  4928.57   51.9   4949.8   52    5005.14    50.3  5083.53    51.9  5220.22
GR   50.4  5255.77   53.4  5329.85   55.9  5449.87    55.5  5530.76    52.5  5591.67
GR   51.4  5649.44   51.6  5719.53   50.4  5823.06    49.6  5989.14    44.2  6040.25
GR   44.2  6435.82   46.9  6530.15   48.9  6665.49    47.3  6720.92    47.2  6911.52
GR   55.6  6971.41   58.5  6998.91   61.3  7081.43    63.5  7116.99   66.48  7723.78
GR   71     8000

QT    4   63510  131460  169330  314100
NH    5     .1  2567.98    .05  3385.13    0.03  3879.38    0.05    5000     .12
NH  10500
X1  9.41     94  3385.13  3879.38    2500    5500    4858
X3   10            2460.63   56.91
GR   78.4      0     78.9   96.63    78.6   295.76    79.3   365.11    78.2    423.8
GR   75.8   443.45   74.1   492.25   74.8   526.38   74.15    600     72.6     630
GR   72.8    670     65.3   721.32   60.2   753.27    56     813.24    54.4   854.41
GR   53.3   926.96   53    1014.31   51.5  1058.06    51.5  1133.33    50.5  1273.69
GR   51.4   1346.4   50.8  1454.34   51.1  1532.43    51.1  1736.18    51.8  1783.17
GR   51.8  1941.56   52.4  2003.11   53    2145.32    54.5  2316.56    56.8  2442.42
GR   56    2567.98   52.5  2621.33   52.4  2659.43    50.1  2775.83    49.4  2837.01
GR   50     3033.7   50.9  3141.06   43.5  3205.33    43.5  3281.17    51.8  3332.56
GR   53.3  3385.13   50.4  3417.41   45.2  3426.19    42.2  3442.41    42    3470.88
GR   38.1   3486.5   35.8  3658.23   36.2  3685.31    35.5  3798.17   42.72  3824.76
GR   48.2  3859.77   49.5  3879.38   44.1  3976.38    42.2  4082.27    42.2  4146.99
GR   43.8  4423.62   42.2  4450.81   48.9  4745.31    49.4  4914.17    48.4  5008.36
GR   48    5245.57   48.8   5332.6   48.1   5518.1    48.9  5669.75    47.9  5765.59
GR   50.2  5868.37   50.4  5903.32   49.4    6014     51    6193.43    53    6341.86
GR   52.1   6387.7   48.7  6470.08   48.4  6596.07    49.1  6831.48    48.1    6961
GR   49.1  7045.17   49.1  7203.02   48.4  7256.07    48.4    7513     50.4  7516.71
GR   49.7  7570.46   50.7  7615.19   48.4  7638.95    50.9  7797.35    55.4  7851.87
GR  57.57  7854.93  59.40    7877   61.45  7882.66    63      8000     64      8500
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GR   64.3    8700     62     9300     67    10000     75    10500
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QT     4   62850   129130   168330   309220
NC    .1     .12     0.03       .1       .3
X1 10.58      76  2518.22  3181.69     2700     3200     6177
X3    10                  1431.19    55.17     8020    59.05
GR  75.8       0     75.6     63.6     60.9   180.78     56.7   260.63     55.3      400
GR 54.85     520       54   579.97     53.5   709.98     51.1   790.94     50.6   912.57
GR  49.1  1025.2     49.2  1101.07     53.7  1157.02     54.5     1384     55.5  1418.21
GR  54.9 1763.41     52.9  1902.66     54.8  2083.95     54.5  2206.57       53   2255.4
GR  52.8 2438.35     53.6  2518.22     42.4  2566.64     40.3  2590.99     29.8  2603.35
GR  22.1 2654.44     22.5  2685.55     31.1  2771.89     34.7  2844.63     41.9  2867.55
GR  50.1 2913.09     48.2  3126.19     50.5  3181.69     49.3  3252.87     46.5  3306.48
GR  50.3 3409.33     47.5  3613.61     52.7   3701.6     50.2  3854.05     47.2   3900.8
GR  42.7 3930.19     44.6  3976.89     46.3  4107.08       50  4195.39     48.7  5535.67
GR  48.7 5863.58       49  5916.48     50.6  6045.31     49.2  7520.57     53.5  7702.66
GR 59.05    8020     59.3     8120     57.1  8360.19     57.2  8644.55     54.9  8710.45
GR  60.1 8984.95     59.4  9100.32     61.6     9300     63.4  9619.42     62.4  9928.89
GR  62.5 10100.96    64.8 10231.72       63 10264.23     65.3 10573.06     65.9 10735.19
GR 71.55   10860     72.2    10980    74.25    11110     73.2    11255     73.3 11458.81
GR  74.9 11812.08    74.7 12055.58     76.1  12161.3    75.45    12360    76.75    12560
GR  78.5 12699.89

QT     4   62690   128570   168090   310160
NC    .1     .12      .03       .1       .3
NH     3      .1     3262      .03     4059      .12    13987
X1 10.86      43     3262     4059     1300     1100     1478
X3    10                               8865     62.3
GR  79.8       0     77.6      161     79.4      259     77.6      579     79.7      955
GR  78.9    1110     72.6     1684     52.3     1914     49.3     2212     50.4     2314
GR  52.2    3262     35.4     3575     31.7     3805     32.7     3875     52.4     4059
GR  46.4    4251       49     4323       45     4835     48.9     4896     44.9     5078
GR  47.3    5583     44.5     5654     43.2     5785     44.5     5945     41.7     6053
GR  57.6    6350     59.1     7698     60.1     8650     62.3     8865     59.2     9382
GR  61.6    9677     59.4     9772     60.6     9852     57.7    10128     56.7    10420
GR  54.4   10557     55.8    10709     60.7    11077     63.7    11730     72.9    12060
GR  74.4   13267     75.8    13671     79.7    13987

QT     4   62560   128120   167890   308450
NH     4     .12  2522.57      .05  3311.71      .03  3943.85      .12 13549.31
X1 11.09      82  3311.71  3943.85     1400     1600     1214
X3    10                  3311.71     53.3  6949.97     63.7
GR  77.9       0     78.6   449.85       74   650.88     61.2   796.99     53.8   853.81
GR  51.5 1009.93     52.1  1209.82     51.1  1415.55     52.9  1698.13     53.4  1881.01
GR  54.3 2005.52     54.3  2131.11     52.6  2522.57     52.3  2664.39     42.5  2721.63
GR  42.5 3112.03     45.4   3215.1     53.3  3311.71       51  3378.76       45     3400
GR  42.5 3427.89     34.6  3459.26     31.8  3669.22       36  3729.17       42  3745.04
GR  50.1 3767.43     55.5  3802.55       57  3943.85       52  4107.84     50.5   4209.1
GR  53.1 4359.76     56.2  4405.38     56.4  4699.98       55  4860.97     56.5  4932.99
GR  54.4 5041.53     50.1     5150     52.2  5287.22     53.6  5519.22     51.9  5703.27
GR    52    5900     51.8     6040       52     6160     53.2     6300     54.5     6450
GR  57.8    6690     63.7  6949.97     63.9  7208.78     62.9  7282.45     61.9  7559.06
GR  59.2 7996.95     57.3     8229     58.1     8331     63.7     8477     61.2   8548.1
GR  62.8 8733.88     62.1  8893.69     62.3  9162.78     59.8  9368.39    62.65     9510
GR  62.2    9630     60.2  9723.91     61.8  9807.54     62.8 10002.69     59.7 10225.58
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GR  62.6 10311.07    60.9 10350.09     62.5 10478.43     60.8 10575.85     64.4 11234.07
GR  67.3 11355.29    71.8 11460.13     75.3 11489.48    75.05    11790     74.1 11874.14
GR  74.1 12095.62    75.2 12273.93     75.5 12508.24     74.6 12649.39       76 13085.66
GR  74.3  13286.4    79.6 13549.31

QT     4   62410   127600   167670   307570
NC   .12     .12      .03       .3       .5
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X1   11.35      89  2958.98  3804.94     1000     2300     1373
X3     10                  2199      58   6519.75     65.5
GR   75.43       0      66   155.36     64.3    287.39     63.9    438.76     60.9    535.19
GR    54.9   626.91     52    787.68     53.3    980.78     52.8   1186.05     55.1   1413.79
GR    55.2  1604.36     56.9  1641.25     57    1786.87     56.25     1790      56.3   2127.54
GR    58.1  2185.43     54.8  2259.37     54.4  2456.59     50.5   2653.09      51.8   2802.23
GR    53.9  2832.46     52.8  2958.98     44.7  3090.28     48.1   3150.77     37.64   3267.77
GR   38.74   3336.43    28.84  3406.43    29.04   3461.55    36.14    3538      42.5   3671.55
GR    52.6  3804.94     47.4  3855.04     47.9  3919.98     43.7   3952.95     42.6   4050.14
GR    44.3  4431.03     41.9  4584.19     47    4826.5      42.5   4859.87     42.6   4957.91
GR    48.7  5021.15     49.2  5059.55     43.9   5090.8     44.7   5266.47     43.2   5349.68
GR    50.2  5459.53     52.4  5575.87     50.4  5703.12     51.9   5904.76     49.1   6073.64
GR    49.1  6167.73     51.3  6273.19     59.7  6409.59     65.5   6519.75     65.7   6635.31
GR    63.6  6757.16     63    7060.24     63.3  7375.88     66      7690      64.7   7907.84
GR    65.5  7969.4     64.1   8340.7     64.9   8381.19     64.1   8668.42     62    8835.44
GR    62.5  8946.12     65.3  9083.61     63.6  9200.98     64.35    9450       63    9781.97
GR    63.1  10165.1     65.1  10443.04     64.4  10755.85     64.5  10988.16     68.1  11162.12
GR   71.35    11220     71.9  11348.07     74.6  11434.99     75.9  11601.85     78.45    11650
GR    79.6    11960     81.1  12067.18     79.5  12180.83     80.3  12422.88     84.2  12477.71
GR   85.05    12580     83.5  12625.42     84.2    12770      82.9   13330.5

X1   11.38      85    19900    21000     1000     2300     1373     0.00      -1        0
X3     10      0.0     0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR   85.00   14899.0   85.00   14900.0   85.00   16700.0   80.00   16850.0   75.00   16950.0
GR   70.00   17099.0   70.00   17100.0   65.00   17150.0   60.00   17350.0   55.00   17800.0
GR   65.90   19700.0   66.80   19800.0   67.30   19900.0   61.80   20000.0   60.70   20001.0
GR   55.60   20014.9   49.10   20030.0   44.10   20045.4   43.40   20060.3   45.20   20075.3
GR   45.80   20090.3   46.20   20105.3   45.30   20120.1   45.90   20136.6   46.00   20153.3
GR   45.30   20169.6   44.30   20186.2   44.70   20202.8   45.10   20219.6   45.00   20236.2
GR   45.30   20252.7   45.20   20269.3   45.20   20286.0   44.30   20302.6   43.70   20319.4
GR   40.00   20335.8   42.60   20352.5   38.10   20368.8   33.60   20385.4   35.50   20402.0
GR   33.20   20416.3   32.40   20430.0   31.70   20450.0   36.40   20470.0   34.80   20492.0
GR   37.60   20510.0   38.00   20527.2   38.30   20535.0   38.00   20565.0   37.40   20590.0
GR   37.00   20600.3   34.80   20615.0   27.80   20630.0   34.80   20645.0   36.30   20655.1
GR   39.20   20674.3   40.60   20693.3   38.60   20712.1   42.40   20731.4   43.50   20735.0
GR   47.40   20750.7   48.20   20769.8   47.20   20789.0   47.50   20808.0   47.50   20865.1
GR   47.80   20865.2   48.10   20884.2   47.90   20903.3   48.10   20922.3   48.70   20941.3
GR   54.90   20960.4   63.70   20978.7   63.90   20979.5   65.00   21000.0   64.30   21100.0
GR   55.00   22000.0   55.00   24800.0   60.00   25000.0   65.00   26200.0   65.00   26500.0
GR   70.00   27700.0   75.00   27800.0   80.00   28300.0   85.00   29700.0   90.00   30100.0

SB    1.25     1.50     2.60     0.0     189.0     20.4   22729.0    10.20    27.80    27.80
ET                                        9.1                       19900    21000
1
  28FEB00    09:48:49                                                   PAGE  10


X1   11.39       0      0.0      0.0     50.0     50.0     50.0     0.00     0.00       0
X2      0     0.00       1     67.20    68.30     0.00       0      0.00     0.00       0
X3     10      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
BT     33   14899.0    87.0      0.0   16700.0    87.0      0.0   17000.0    85.0      0.0
BT   17560    80.0      0.0   18100.0    75.0      0.0   19200.0    70.0      0.0   19201.0
BT    70.0     0.0   20000.0    68.3      0.0   20000.1    68.3     65.7   20120.1    69.1
BT    66.7  20201.2    69.1     66.0   20416.3    69.8     67.1   20416.4    69.8     66.5
BT   20492    69.8     66.8   20492.1    69.8     65.1   20655.1    69.8     65.1   20655.2
BT    69.8    67.2   20978.7    68.8     65.6   20978.8    68.8      0.0   21000.0    68.0
BT     0.0  21100.0    67.3      0.0   21200.0    66.3      0.0   21201.0    66.3      0.0
BT   23250    62.0      0.0   25100.0    65.0      0.0   26200.0    65.0      0.0   26400.0
BT    65.0     0.0   26700.0    70.0      0.0   27650.0    75.0      0.0   28150.0    82.0
BT     0.0  28750.0    87.0      0.0   29000.0    92.0      0.0   30300.0    92.0      0.0

ET                                       8.41
X1    11.4      89  2958.98  3804.94     50.0     50.0     50.0     0.00     0.00       0
X3     10                  2199      58   6519.75     65.5
GR   75.43       0      66   155.36     64.3    287.39     63.9    438.76     60.9    535.19
GR    54.9   626.91     52    787.68     53.3    980.78     52.8   1186.05     55.1   1413.79
GR    55.2  1604.36     56.9  1641.25     57    1786.87     56.25     1790      56.3   2127.54
GR    58.1  2185.43     54.8  2259.37     54.4  2456.59     50.5   2653.09      51.8   2802.23
GR    53.9  2832.46     52.8  2958.98     44.7  3090.28     48.1   3150.77     37.64   3267.77
GR   38.74   3336.43    28.84  3406.43    29.04   3461.55    36.14    3538      42.5   3671.55
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GR   52.6  3804.94   47.4  3855.04   47.9  3919.98   43.7  3952.95   42.6  4050.14
GR   44.3  4431.03   41.9  4584.19     47   4826.5   42.5  4859.87   42.6  4957.91
GR   48.7  5021.15   49.2  5059.55   43.9   5090.8   44.7  5266.47   43.2  5349.68
GR   50.2  5459.53   52.4  5575.87   50.4  5703.12   51.9  5904.76   49.1  6073.64
GR   49.1  6167.73   51.3  6273.19   59.7  6409.59   65.5  6519.75   65.7  6635.31
GR   63.6  6757.16     63  7060.24   63.3  7375.88     66     7690   64.7  7907.84
GR   65.5   7969.4   64.1   8340.7   64.9  8381.19   64.1  8668.42     62  8835.44
GR   62.5  8946.12   65.3  9083.61   63.6  9200.98  64.35     9450     63  9781.97
GR   63.1  10165.1   65.1 10443.04   64.4 10755.85   64.5 10988.16   68.1 11162.12
GR  71.35    11220   71.9 11348.07   74.6 11434.99   75.9 11601.85  78.45    11650
GR   79.6    11960   81.1 12067.18   79.5 12180.83   80.3 12422.88   84.2 12477.71
GR  85.05    12580   83.5 12625.42   84.2    12770   82.9  13330.5

QT      4    62340   127340   167560   307140        0        0        0        0
NC    .12      .12      .03       .1       .3
NH      3     .120  3153.07     .030  3834.77     .120 14239.64
X1  11.48       83  3153.07  3834.77      400      700      370                -1
X3     10                    1998.35    56.86
GR  76.29        0   74.2   141.74   72.1   251.69   67.3   387.98   65.6   572.84
GR   64.9   799.64   56.3  1051.78   56.7   1284.7   55.8  1423.54   57.5  1735.27
GR   55.8  1865.38   57.9  1950.43     57  2115.34   51.9  2192.24   51.6  2676.44
GR   48.1  2772.19   51.5   2897.5   47.5  3079.27   49.6  3153.07   48.4  3217.84
GR   40.8  3263.45   46.8  3312.88  38.33  3352.99  32.93   3453.9  28.63  3598.06
GR  22.83  3619.02  25.93  3642.69  21.73  3663.26  28.63  3710.06  40.09  3750.18
GR   50.5  3834.77   52.5  4098.58   52.5  4266.28   50.2  4616.96   53.2  5256.55
GR   55.8  5417.16   49.5  5542.31   49.6  5811.88   52.8  5944.08   50.5  6026.29
GR   49.2  6139.42   50.6  6300.68   60.8  6368.78   60.8  6489.41   52.1  6544.58
GR   49.1  6582.93   49.6  6866.77   53.6  6999.45   52.4  7192.35   55.8  7242.29
GR   52.1  7310.92   57.4   7392.7   58.9  7486.54   57.8   7527.2   59.3  7858.55
GR   62.3  8313.45   62.3   8520.5   63.1  8579.97   63.8  8874.31   63.1  9022.65
GR   64.7  9319.75     64  9847.05     66 10324.86   67.2 10502.28   70.9 10689.92
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GR   75.6 10862.29     80 11138.46   81.4 11329.98   82.6 11935.13   82.6 12152.77
GR     84 12494.73   86.9 12751.65     91 12961.31   96.3 13165.82   98.2 13409.92
GR   97.1 13499.57   82.3 13562.28   82.6 13710.72   93.2 13739.27   91.2 13843.55
GR   84.7 14008.62   85.8 14187.33   84.3 14239.64

QT      4    62300   127200   167500   306900
NC    .12      .12      .03       .6       .8
X1  11.55       73     3153     3835    400.0    400.0    370.0     0.00        0
X3     10      0.0      0.0     1950       57      0.0      0.0      0.0
GR   75.4        0   74.2      142   67.3      388   65.6      573   64.9      800
GR   51.7      898   56.3     1052   56.7     1285   55.8     1424   51.7     1438
GR   51.7     1636   57.5     1735   57.9     1950     57     2115   51.9     2192
GR   51.6     2676   48.1     2772   51.5     2898   47.5     3079   49.6     3153
GR   48.4     3218   46.8     3313  38.33     3353  28.63     3598  22.83     3619
GR  25.93     3643  21.73     3663  28.63     3710  40.09     3750   50.5     3835
GR   52.5     4099   52.5     4266   50.2     4617   44.2     4679   44.3     5110
GR   53.2     5257   55.8     5417   49.5     5542   49.6     5812   52.8     5944
GR   50.5     6026   49.2     6139   50.6     6301   60.8     6369   60.8     6489
GR   52.1     6545   49.1     6583   49.6     6867   53.6     6999   52.4     7192
GR   52.1     7311   58.9     7487   59.3     7859   62.3     8313   62.3     8521
GR   63.1     8580   63.8     8874   63.1     9023   64.7     9320     64     9847
GR     66    10325   67.2    10502   70.9    10690   75.6    10862     80    11138
GR   81.4    11330   82.6    11935   82.6    12153     84    12495   86.9    12752
GR     91    12961   96.3    13166   98.2    13410

NH      4     .100  18850.0     .100  20250.0     .030  21748.6     .120  28900.0    0.000
X1 11.569       83    20250  21768.7      100      100      100     0.00     0.00        0
X3     10      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR  84.00  16850.0  80.00  17250.0  80.00  17251.0  80.00  17252.0  75.00  18025.0
GR  70.00  18075.0  65.00  18125.0  60.00  18200.0  60.00  18201.0  60.00  18202.0
GR  60.00  18450.0  60.00  18500.0  60.00  18600.0  60.00  18850.0  55.00  19350.0
GR  55.00  19351.0  68.70  20250.0  49.80  20287.0  49.30  20323.0  48.30  20340.0
GR  49.80  20360.4  48.40  20389.0  50.50  20396.9  48.10  20458.0  44.50  20495.0
GR  44.20  20506.1  45.40  20560.0  44.50  20600.0  45.00  20650.0  47.20  20711.0
GR  44.00  20721.0  42.80  20746.0  43.30  20770.0  35.50  20800.0  33.50  20820.0
```

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GR   26.50  20920.0   24.10  20930.0   31.40  20940.0   25.40  20944.1   29.70  20960.0
GR   30.60  20970.0   33.20  20980.0   33.20  20981.0   35.00  20990.0   35.90  21000.0
GR   38.40  21010.0   38.40  21017.3   43.43  21039.0   45.80  21089.5   46.80  21162.7
GR   46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR   49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR   51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR   64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00   22500.
GR   55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00   24950.
GR   60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00   28150.
GR   85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00      0.0

SB   1.25    2.31    2.60     0.0      50      46    32375      20    24.1    24.1
NC   .120    .120    .035      .3      .5
X1 11.660      91  20226.0  21910.0     480     480     480    0.00       0
X2    0.0     0.0       1   63.08   69.07     0.0     0.0     0.0     0.0     0.0
X3     10     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT     27 16200.0   68.99     0.0 17200.0   64.77     0.0 17500.0   63.51     0.0
BT 18300.   67.62     0.0 18301.0   67.63     0.0 18669.0   72.15     0.0 19195.0
BT  71.42     0.0 20000.0   67.97     0.0 20100.0   68.42     0.0   20200   68.87
1
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BT    0.0 20235.8   69.04   69.04 20242.8   69.07   63.08 20573.0   70.56   64.57
BT 20903.   72.04   66.05 21141.3   72.66   66.67 21563.0   71.21   65.22 21893.1
BT  69.73   63.74 21900.0   69.70   69.70 22000.0   69.24     0.0 22274.7   68.01
BT    0.0 22700.0   66.10     0.0 23449.7   65.50     0.0 24374.7   69.44     0.0
BT 26274.   85.80     0.0 28000.0   85.80     0.0 28300.0   85.80     0.0 28900.0
BT   90.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
GR   85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR   60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR   64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR   49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR   44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR   48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR   45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR   37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR   33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR   27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR   24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR   43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR   48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR   49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR   47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR   51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR   64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR   65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
GR   90.50  28900.0    0.00     0.0    0.00     0.0    0.00     0.0    0.00     0.0

X1 11.679      73    3153    3835     100     100     100    0.00    0.00       0
X3     10     0.0     0.0    1950      57     0.0     0.0     0.0
GR   75.4       0    74.2     142    67.3     388    65.6     573    64.9     800
GR   51.7     898    56.3    1052    56.7    1285    55.8    1424    51.7    1438
GR   51.7    1636    57.5    1735    57.9    1950      57    2115    51.9    2192
GR   51.6    2676    48.1    2772    51.5    2898    47.5    3079    49.6    3153
GR   48.4    3218    46.8    3313   38.33    3353   28.63    3598   22.83    3619
GR  25.93    3643   21.73    3663   28.63    3710   40.09    3750    50.5    3835
GR   52.5    4099    52.5    4266    50.2    4617    44.2    4679    44.3    5110
GR   53.2    5257    55.8    5417    49.5    5542    49.6    5812    52.8    5944
GR   50.5    6026    49.2    6139    50.6    6301    60.8    6369    60.8    6489
GR   52.1    6545    49.1    6583    49.6    6867    53.6    6999    52.4    7192
GR   52.1    7311    58.9    7487    59.3    7859    62.3    8313    62.3    8521
GR   63.1    8580    63.8    8874    63.1    9023    64.7    9320      64    9847
GR     66   10325    67.2   10502    70.9   10690    75.6   10862      80   11138
GR   81.4   11330    82.6   11935    82.6   12153      84   12495    86.9   12752
GR     91   12961    96.3   13166    98.2   13410

QT      4   62060  126360  167140  305490       0       0       0       0
NC   .120    .120    .030      .1      .3
X1  11.97      84 2273.46 2827.03     802    5043    2118
```

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X3    10              1105.39     52.5     9060     74.8
GR  78.23        0    64.2   174.04     63.5   501.47     62.4   571.34     57.3   671.03
GR   46.1    969.8    52.3  1075.96     49.9  1240.38     49.5   1362.1     47.4  1575.32
GR   49.6   1774.8    45.3  2044.49     47.5  2118.35     44.4  2165.58     46.6  2273.46
GR  35.52  2351.83   41.02  2371.83    32.22  2411.83    31.72  2441.83    37.12  2621.82
GR   45.7  2759.78    44.7  2827.03     45.5  2960.44     44.9  3171.29     46.7     3200
GR   46.4  3463.72      47  3583.97     44.6  3643.28       45  3872.88       47  3996.03
```



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GR   53.2  4123.35    60.5   4270.1     60.5  4509.54     57.2  4775.48       58  5148.72
GR   56.2  5363.59    55.1   5699.3     49.4  5956.27     49.6  6073.28     48.3  6272.85
GR     51  6381.63    52.1  6574.09     51.8  6814.08     53.2  6887.03     50.2  7041.29
GR   53.5  7127.14    51.6  7442.96     56.9  7800.49     62.4  7837.71     64.9  7999.27
GR   67.4  8385.92    67.1  8424.35     74.8     9060     66.9     9130    66.35     9190
GR   65.8   9282.6    53.6   9356.5     55.7  9527.42     58.8  9587.89     70.2  9638.17
GR   72.9  9884.04      75 10154.89     75.2 10427.45     76.1 10520.96     76.1  10769.8
GR   90.2    10830    91.8 11098.11     89.8 11321.02     86.3 11634.53     85.4 11757.32
GR   86.8 11952.18    85.2 12112.75     87.5 12345.14     83.2 12384.16     89.1 12447.67
GR   85.9 12555.51    90.4    12650     84.7 12970.55     83.1 13224.85       84 13312.97
GR     83 13508.04    84.5  13657.9     83.9 13887.88     86.8 14077.83
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
```

*PROF 1

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR DETAILS.

0

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CCHV=   .100 CEHV=   .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=   1232.0   8990.0  TYPE=    1  TARGET=   -1232.040
 ELENCL=   54.70  ELENCR= 100000.00
      THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
      THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
   3.615    20.61    50.91     .00    50.91    51.06     .15     .00     .00   41.60
 174300.0   1521.8 167008.7   5769.5   3779.5  51973.1  11582.1      .0      .0   43.80
     .00     .40     3.21     .50     .120     .030     .120    .000   30.30 1277.93
 .000136      0.       0.      0.        0        0        0     .00 7174.17 8452.10


*SECNO 4.745

3470 ENCROACHMENT STATIONS=   1973.4   6985.6  TYPE=    1  TARGET=    5012.200
 ELENCL=   52.00  ELENCR=   48.60
   4.745    20.54    51.74     .00     .00    51.90     .16     .84     .00   51.10
 173330.0      6.5 172233.1   1090.4     92.3  53629.3   3122.6   8151.2   782.7   47.20
     .52     .07     3.21     .35     .120     .030     .120    .000   31.20 2087.00
 .000147    3600.    5966.   4500.        2        0        0     .00 5551.63 7638.63


CCHV=   .300 CEHV=   .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=     57.00
```

```
   5.026   41.37   51.97    .00     .00   52.22    .25     .27     .05   56.20
 173080.0      .0 173080.0     .0      .0 43119.8      .0  9946.9   963.6   57.00
   .62     .00    4.01    .00    .000    .030    .000    .000   10.60  9611.74
 .000231    1030.    1482.   4150.       2       0       0     .00 3485.50 13097.25
```

*SECNO 5.027

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SECNO  DEPTH  CWSEL  CRIWS  WSELK  EG     HV     HL     OLOSS  L-BANK ELEV
Q      QLOB   QCH    QROB   ALOB   ACH    AROB   VOL    TWA    R-BANK ELEV
TIME   VLOB   VCH    VROB   XNL    XNCH   XNR    WTN    ELMIN  SSTA
SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC    ICONT  CORAR  TOPWID ENDST
```

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
   5.027   41.39   51.99    .00     .00   52.23    .24     .00     .00   56.20
 173080.0      .0 173080.0     .0      .0 44353.1      .0  9947.9   963.6   56.00
   .62     .00    3.90    .00    .000    .030    .000    .000   10.60  9615.15
 .000231      1.      1.      1.       1       0       0     .00 3340.00 13040.57
```

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
   5.034   41.40   52.00    .00     .00   52.24    .24     .01     .00   56.20
 173080.0      .0 173080.0     .0      .0 44419.9      .0  9995.7   967.2   56.00
   .62     .00    3.90    .00    .000    .030    .000    .000   10.60  9615.07
 .000230     47.     47.     47.       0       0       0     .00 3340.21 13040.69
```

*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
   5.035   41.40   52.00    .00     .00   52.25    .25     .00     .01   56.20
 173080.0      .0 173080.0     .0      .0 43224.7      .0  9996.8   967.3   57.00
   .62     .00    4.00    .00    .000    .030    .000    .000   10.60  9611.65
 .000229      1.      1.      1.       0       0       0     .00 3485.93 13097.59
```

*SECNO 5.037

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SECNO  DEPTH  CWSEL  CRIWS  WSELK  EG     HV     HL     OLOSS  L-BANK ELEV
Q      QLOB   QCH    QROB   ALOB   ACH    AROB   VOL    TWA    R-BANK ELEV
TIME   VLOB   VCH    VROB   XNL    XNCH   XNR    WTN    ELMIN  SSTA
SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC    ICONT  CORAR  TOPWID ENDST
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037   41.40   52.00    .00    .00   52.25    .25    .00    .00   56.20
 173080.0      .0 173080.0      .0      .0  43208.0      .0  10004.7    968.0   57.00
     .62     .00    4.01     .00    .000    .030    .000    .000   10.60  9611.67
 .000229      8.      8.      8.       0       0       0     .00  3485.87 13097.54


*SECNO 5.038

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038   41.42   52.02    .00    .00   52.25    .24    .00    .00   56.20
 173080.0      .0 173080.0      .0      .0  44437.1      .0  10005.7    968.0   56.00
     .62     .00    3.89     .00    .000    .030    .000    .000   10.60  9615.05
 .000230      1.      1.      1.       1       0       0     .00  3340.26 13040.71


*SECNO 5.045

3265 DIVIDED FLOW


3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=   58.25 MAX ELLC=   52.50


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045   41.43   52.03    .00    .00   52.26    .23    .01    .00   56.20
 173080.0      .0 173080.0      .0      .0  44503.3      .0  10053.7    971.6   56.00
     .63     .00    3.89     .00    .000    .030    .000    .000   10.60  9614.98
 .000229     47.     47.     47.       0       0       0     .00  3340.47 13040.83


CCHV=    .100 CEHV=    .300
1
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   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB     QCH      QROB     ALOB     ACH     AROB     VOL     TWA     R-BANK ELEV
   TIME    VLOB     VCH      VROB     XNL      XNCH    XNR      WTN     ELMIN   SSTA
   SLOPE   XLOBL    XLCH     XLOBR    ITRIAL   IDC     ICONT    CORAR   TOPWID  ENDST


*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046   41.42   52.02    .00    .00   52.27    .25    .00    .00   56.20
 173080.0      .0 173080.0      .0      .0  43311.6      .0  10054.7    971.7   57.00
     .63     .00    4.00     .00    .000    .030    .000    .000   10.60  9611.58
 .000227      1.      1.      1.       0       0       0     .00  3486.29 13097.87


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 5.585

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.84

      DREDGE AREA C @ FEMA CROSS SECTION 5.585 WITH DREDGE @ ELEVATION 30.
   5.585   28.76   52.46    .00    .00   52.57    .11    .29    .01   40.10
 172610.0  41243.1 131350.7    16.2  46330.9  44096.9    132.3  14330.5   1395.7   49.80
```

```
   .94     .89    2.98     .12    .053    .030    .120    .000    23.70  1240.18
 .000067   2664.   2847.   1744.      2       0       0     .00  10024.15  11264.33


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .55

   6.420   24.52   52.92     .00     .00   53.08     .15     .49     .01    46.70
 171900.0  98966.5  40325.1  32608.3  34390.9   9315.8  16723.8  19706.5   1938.2    47.50
   1.25    2.88    4.33    1.95    .030    .030    .050    .000    28.40  10887.07
 .000222   2300.   4409.   2800.      0       0       0     .00   7471.92  18392.36


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 7.090

3470 ENCROACHMENT STATIONS=   11840.0  20069.0  TYPE=     1  TARGET=     8229.000
1
  28FEB00     09:48:49                                                      PAGE  18


   SECNO     DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS   L-BANK ELEV
   Q        QLOB      QCH      QROB     ALOB      ACH      AROB     VOL      TWA     R-BANK ELEV
   TIME     VLOB      VCH      VROB     XNL      XNCH      XNR      WTN      ELMIN    SSTA
   SLOPE    XLOBL     XLCH     XLOBR    ITRIAL    IDC     ICONT    CORAR    TOPWID   ENDST


 ELENCL=     53.10  ELENCR=     57.90
   7.090   23.62   53.72     .00     .00   53.91     .19     .82     .01    46.90
 171320.0   9244.2  99875.6  62200.2  12184.4  22567.7  41418.2  24473.1   2516.7    47.40
   1.52     .76    4.43    1.50    .120    .030    .084    .000    30.10   9075.17
 .000313   2000.   3538.   3600.      2       0       0     .00  10758.56  19833.73


CCHV=    .100 CEHV=     .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=        .0  16383.0  TYPE=     1  TARGET=    16383.000
   7.470   25.23   54.23     .00     .00   54.52     .29     .58     .03    47.70
 171000.0  63218.8  57663.5  50117.7  42551.0   8544.3  17001.5  27137.7   2875.9    44.30
   1.65    1.49    6.75    2.95    .070    .030    .050    .000    29.00   6999.46
 .000364   1500.   2006.   1500.      2       0       0     .00   9283.09  16282.55


*SECNO 8.070

3470 ENCROACHMENT STATIONS=    3455.4  15481.5  TYPE=     1  TARGET=    -3455.360
 ELENCL=     61.13  ELENCR= 100000.00
   8.070   27.50   55.40     .00     .00   55.99     .59    1.37     .09    44.30
 171000.0  22168.4 107993.3  40838.4  16544.4  14001.9  33039.7  31501.4   3420.5    46.70
   1.80    1.34    7.71    1.24    .120    .030    .120    .000    27.90   3788.98
 .000615   2619.   2891.   3201.      2       0       0     .00   7303.77  11092.76


CCHV=    .100 CEHV=     .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65
```

```
3470 ENCROACHMENT STATIONS=       .0   3851.7  TYPE=     1  TARGET=     3851.709
   8.490    21.43    57.23     .00     .00    58.55     1.33     2.34      .22    46.00
 169770.0  52184.9 103544.0  14041.2  21219.7   8854.7  12051.2  34097.5   3725.1     50.60
    1.88     2.46    11.69     1.17    .120     .030     .120     .000    35.80   798.78
 .001416    2636.    2374.    1605.       3        0        0      .00  6188.03  6986.82
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.30


3470 ENCROACHMENT STATIONS=    2460.6  10500.0  TYPE=     1  TARGET=    -2460.630
 ELENCL=     56.91  ELENCR= 100000.00
   9.410    24.94    60.44     .00     .00    60.68      .24     2.02      .11    53.30
 169330.0  24854.6  62625.4  81850.0  15115.1  10289.5  48878.6  40054.3   4405.0     49.50
    2.26     1.64     6.09     1.67    .057     .030     .079     .000    35.50   751.78
 .000266    2500.    4858.    5500.       3        0        0      .00  7128.09  7879.87


CCHV=    .100  CEHV=     .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=    1431.2   8020.0  TYPE=     1  TARGET=     6588.810
 ELENCL=     55.17  ELENCR=     59.05
  10.580    39.50    61.60     .00     .00    61.95      .35     1.24      .03    53.60
 168330.0  14227.1  90575.2  63527.7  15702.9  14187.4  59610.7  46729.8   5013.0     50.50
    2.58      .91     6.38     1.07    .100     .030     .120     .000    22.10   175.27
 .000284    2700.    6177.    3200.       2        0        0      .00  9123.90  9299.17


CCHV=    .100  CEHV=     .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=       .0   8865.0  TYPE=     1  TARGET=     8864.999
  10.860    30.23    61.93     .00     .00    62.30      .37      .35      .01    52.20
 168090.0  16692.5 107606.8  43790.7  15152.7  17849.8  42009.6  49016.8   5231.9     52.40
    2.67     1.10     6.03     1.04    .100     .030     .120     .000    31.70  1804.88
 .000235    1300.    1478.    1100.       2        0        0      .00  7024.04  8828.92


1490 NH CARD USED
*SECNO 11.090
```



```
SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS   L-BANK ELEV
Q       QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA     R-BANK ELEV
TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

```
3470 ENCROACHMENT STATIONS=   3311.7   6950.0 TYPE=    1  TARGET=    3638.260
 ELENCL=    53.30 ELENCR=    63.70
   11.090    30.42    62.22      .00      .00    62.86      .64      .48      .08    53.30
 167890.0  39393.8  98621.9  29874.3  21768.3  11932.6  23994.3  51237.3   5457.5    57.00
     2.74     1.81     8.26     1.25     .082     .030     .120     .000    31.80   785.31
  .000560    1400.    1214.    1600.        2        0        0      .00  6099.58  6884.89
```

CCHV= .300 CEHV= .500
*SECNO 11.350

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.59

```
3470 ENCROACHMENT STATIONS=   2199.0   6519.8 TYPE=    1  TARGET=    4320.750
 ELENCL=    58.00 ELENCR=    65.50
   11.350    34.27    63.11      .00      .00    63.44      .33      .49      .09    52.80
 167670.0  10991.4 106152.7  50525.9  15967.3  18497.6  41975.7  53891.7   5686.5    52.60
     2.84      .69     5.74     1.20     .120     .030     .120     .000    28.84   464.14
  .000220    1000.    1373.    2300.        2        0        0      .00  6010.23  6474.37
```

*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .68

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 66.30 ELREA= 64.00

```
   11.380    36.47    63.27      .00      .00    64.25      .99      .48      .33    66.30
 167670.0       .0 167670.0       .0       .0  21030.3       .0  55806.1   5815.2    64.00
     2.90      .00     7.97      .00     .000     .030     .000     .000    26.80 19955.14
  .000474    1000.    1373.    2300.        2        0        0      .00  1031.21 20986.35
```



```
  SECNO   DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
  Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST
```

SPECIAL BRIDGE

```
SB XK     XKOR     COFQ     RDLEN    BWC      BWP      BAREA    SS      ELCHU    ELCHD
   1.25     1.50     2.60      .00   189.00    20.40 22729.00    10.20    27.80    27.80
```

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.= 63.17 BRIDGE VELOCITY= 8.95 CALCULATED CHANNEL AREA= 18724.

```
 EGPRS    EGLWC     H3     QWEIR     QLOW    BAREA  TRAPEZOID   ELLC    ELTRD   WEIRLN
                                                     AREA
    .00    64.33    .08       0.  167670.   22729.   22477.    67.20    68.30       0.
```

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 66.30 ELREA= 64.00

```
 11.390   36.55   63.35    .00     .00   64.33    .98    .08    .00   66.30
167670.0     .0 167670.0     .0      .0  21117.8     .0  55830.3  5816.4   64.00
   2.90    .00    7.94    .00    .000   .030    .000    .000   26.80 19953.60
 .000469    50.     50.    50.      0      0       0     .00  1034.33 20987.93
```

*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.62

```
3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=     1  TARGET=    4320.750
 ELENCL=    58.00 ELENCR=    65.50
 11.400   35.43   64.27    .00     .00   64.55    .28    .01    .21   52.80
167670.0 12759.3 104048.3 50862.4 18915.6 19481.7 45094.0 55890.3  5820.6   52.60
   2.90    .67    5.34    1.13    .120   .030    .120    .000   28.84   297.30
 .000178    50.     50.    50.      2      0       0     .00  6199.16  6496.46
```

CCHV= .100 CEHV= .300
1490 NH CARD USED
*SECNO 11.480
1


```
 SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
 Q       QLOB    QCH     QROB    ALOB     ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME    VLOB    VCH     VROB    XNL      XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT  CORAR TOPWID ENDST
```

```
3470 ENCROACHMENT STATIONS=   1998.3  14239.6  TYPE=     1  TARGET=   -1998.350
 ELENCL=    56.86 ELENCR= 100000.00
 11.480   43.60   64.33    .00     .00   64.63    .30    .07    .01   48.60
167560.0 18055.4 106321.3 43183.3 23995.8 19429.8 55487.4 57060.8  5923.2   49.50
   2.94    .75    5.47    .78     .120   .030    .120    .000   20.73   659.24
 .000142   400.    370.   700.      2      0       0     .00  9506.36 10165.59
```

CCHV= .600 CEHV= .800
*SECNO 11.550

3265 DIVIDED FLOW

```
3470 ENCROACHMENT STATIONS=   1950.0  13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00 ELENCR= 100000.00
 11.550   42.66   64.39    .00     .00   64.69    .30    .06    .00   49.60
167500.0 17815.3 102678.0 47006.7 23080.8 18295.7 53813.0 57939.0  6007.0   50.50
   2.96    .77    5.61    .87     .120   .030    .120    .000   21.73   806.26
 .000161   400.    370.   400.      0      0       0     .00  8849.75  9941.58
```

1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=   68.70 ELREA=   67.10

```
 11.569   40.26   64.36    .00     .00   64.92    .56    .02    .20   68.70
167500.0     .0 167500.0     .0      .0  27934.4     .0  58080.3  6018.9   67.10
   2.97    .00    6.00    .00    .000   .031    .000    .000   24.10 20258.49
 .000324   100.    100.   100.      2      0       0     .00  1501.34 21759.83
```

```
SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN    BWC     BWP     BAREA    SS      ELCHU   ELCHD
   1.25    2.31    2.60     .00    50.00   46.00 32375.00   20.00   24.10   24.10

CCHV=   .300 CEHV=    .500
*SECNO 11.660
1
  28FEB00    09:48:49                                               PAGE  23


  SECNO    DEPTH   CWSEL   CRIWS   WSELK   EG      HV      HL      OLOSS   L-BANK ELEV
  Q        QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
  TIME     VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
  SLOPE    XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


PRESSURE FLOW


 EGPRS    EGLWC     H3     QWEIR    QPR     BAREA  TRAPEZOID    ELLC    ELTRD    WEIRLN
                                    AREA
  65.32    64.92     .06      0.  167500.  32375.   30545.     63.08   69.07      0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     68.90 ELREA=      68.20

  11.660    45.10   64.90     .00     .00   65.32     .42     .40     .00   68.90
 167500.0      .0 167500.0     .0      .0 32086.4      .0 58411.0  6036.3   68.20
    2.99      .00    5.22     .00    .000    .035    .000    .000   19.80 20235.85
 .000298     480.    480.    480.       2       0       0     .00 1665.58 21901.43


*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0   13410.0 TYPE=    1  TARGET=   -1950.000
 ELENCL=     57.00 ELENCR= 100000.00
  11.679    43.45   65.18     .00     .00   65.41     .22     .02     .06   49.60
 167500.0 20423.6 94012.0 53064.3 24944.4 18832.5 58650.5 58565.4  6049.1   50.50
    3.00      .82    4.99     .90    .120    .035    .120    .000   21.73  708.27
 .000167     100.    100.    100.       2       0       0     .00 9421.44 10129.71


CCHV=   .100 CEHV=    .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4    9060.0 TYPE=    1  TARGET=    7954.610
 ELENCL=     52.50 ELENCR=     74.80
  11.970    33.92   65.64     .00     .00   65.87     .23     .46     .00   46.60
 167140.0 25181.6 81179.5 60778.9 26800.3 14981.3 67289.2 67153.9  6791.5   44.70
    3.26      .94    5.42     .90    .120    .030    .120    .000   31.72  156.18
 .000148     802.   2118.   5043.       2       0       0     .00 7957.54  8113.72


1
  28FEB00    09:48:49                                               PAGE  24



                                              THIS RUN EXECUTED 28FEB00    09:48:50
*****************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
*****************************************
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Starting form river mile

SUMMARY PRINTOUT

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
8151.214	.07	.35	3.21	56844.21	5551.63	.00	99.37	.63
9946.853	.00	.00	4.01	43119.80	3485.50	.00	100.00	.00
9947.856	.00	.00	3.90	44353.10	3340.00	.00	100.00	.00
9995.748	.00	.00	3.90	44419.91	3340.21	.00	100.00	.00
9996.754	.00	.00	4.00	43224.65	3485.93	.00	100.00	.00
10004.690	.00	.00	4.01	43208.01	3485.87	.00	100.00	.00
10005.700	.00	.00	3.89	44437.07	3340.26	.00	100.00	.00
10053.680	.00	.00	3.89	44503.28	3340.47	.00	100.00	.00
10054.690	.00	.00	4.00	43311.63	3486.29	.00	100.00	.00
* 14330.490	.89	.12	2.98	90560.10	10024.15	23.89	76.10	.01
* 19706.460	2.88	1.95	4.33	60430.54	7471.92	57.57	23.46	18.97
24473.050	.76	1.50	4.43	76170.38	10758.56	5.40	58.30	36.31
27137.690	1.49	2.95	6.75	68096.77	9283.09	36.97	33.72	29.31
31501.360	1.34	1.24	7.71	63586.04	7303.77	12.96	63.15	23.88
* 34097.550	2.46	1.17	11.69	42125.55	6188.03	30.74	60.99	8.27
* 40054.310	1.64	1.67	6.09	74283.16	7128.09	14.68	36.98	48.34

1

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VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
46729.790	.91	1.07	6.38	89500.97	9123.90	8.45	53.81	37.74
49016.810	1.10	1.04	6.03	75012.01	7024.04	9.93	64.02	26.05
* 51237.330	1.81	1.25	8.26	57695.23	6099.58	23.46	58.74	17.79
* 53891.680	.69	1.20	5.74	76440.58	6010.23	6.56	63.31	30.13
* 55806.090	.00	.00	7.97	21030.27	1031.21	.00	100.00	.00
55830.280	.00	.00	7.94	21117.78	1034.33	.00	100.00	.00
* 55890.320	.67	1.13	5.34	83491.20	6199.16	7.61	62.06	30.33
57060.760	.75	.78	5.47	98913.01	9506.36	10.78	63.45	25.77
57938.960	.77	.87	5.61	95189.52	8849.75	10.64	61.30	28.06
58080.290	.00	.00	6.00	27934.42	1501.34	.00	100.00	.00

58410.980	.00	.00	5.22	32086.42	1665.58	.00	100.00	.00
58565.390	.82	.90	4.99	102427.40	9421.44	12.19	56.13	31.68
67153.890	.94	.90	5.42	109070.80	7957.54	15.07	48.57	36.36

Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21	143031.00
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80	114001.30
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10	113789.00
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91	114058.80
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65	114454.10
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01	114382.20
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07	114128.10
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28	114395.70
5.046	1.00	.00	.00	10.60	173080.00	52.02	.00	52.27	2.27	4.00	43311.63	114830.20
* 5.585	2847.00	.00	.00	23.70	172610.00	52.46	.00	52.57	.67	2.98	90560.10	211605.80
* 6.420	4409.00	.00	.00	28.40	171900.00	52.92	.00	53.08	2.22	4.33	60430.54	115425.90
7.090	3538.00	.00	.00	30.10	171320.00	53.72	.00	53.91	3.13	4.43	76170.38	96852.99
7.470	2006.00	.00	.00	29.00	171000.00	54.23	.00	54.52	3.64	6.75	68096.77	89596.72
8.070	2891.14	.00	.00	27.90	171000.00	55.40	.00	55.99	6.15	7.71	63586.04	68976.84
* 8.490	2374.28	.00	.00	35.80	169770.00	57.23	.00	58.55	14.16	11.69	42125.55	45120.55
* 9.410	4858.00	.00	.00	35.50	169330.00	60.44	.00	60.68	2.66	6.09	74283.16	103773.70
10.580	6177.00	.00	.00	22.10	168330.00	61.60	.00	61.95	2.84	6.38	89500.97	99805.34
10.860	1478.00	.00	.00	31.70	168090.00	61.93	.00	62.30	2.35	6.03	75012.01	109606.00
* 11.090	1214.00	.00	.00	31.80	167890.00	62.22	.00	62.86	5.60	8.26	57695.23	70962.56
* 11.350	1373.00	.00	.00	28.84	167670.00	63.11	.00	63.44	2.20	5.74	76440.58	112965.10
* 11.380	1373.00	.00	.00	26.80	167670.00	63.27	.00	64.25	4.74	7.97	21030.27	77023.61
11.390	50.00	68.30	67.20	26.80	167670.00	63.35	.00	64.33	4.69	7.94	21117.78	77404.52
* 11.400	50.00	.00	.00	28.84	167670.00	64.27	.00	64.55	1.78	5.34	83491.20	125649.60

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K

11.480	370.00	.00	.00	20.73	167560.00	64.33	.00	64.63	1.42	5.47	98913.01	140680.90
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.69	1.61	5.61	95189.52	131818.90
11.569	100.00	.00	.00	24.10	167500.00	64.36	.00	64.92	3.24	6.00	27934.42	93107.22
11.660	480.00	69.07	63.08	19.80	167500.00	64.90	.00	65.32	2.98	5.22	32086.42	97060.81
11.679	100.00	.00	.00	21.73	167500.00	65.18	.00	65.41	1.67	4.99	102427.40	129496.60
11.970	2118.00	.00	.00	31.72	167140.00	65.64	.00	65.87	1.48	5.42	109070.80	137266.90

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3.615	174300.00	50.91	.00	.00	.00	7174.17	.00
	4.745	173330.00	51.74	.00	.83	.00	5551.63	5966.00
	5.026	173080.00	51.97	.00	.23	.00	3485.50	1482.00
	5.027	173080.00	51.99	.00	.02	.00	3340.00	1.00
	5.034	173080.00	52.00	.00	.01	.00	3340.21	47.00
	5.035	173080.00	52.00	.00	-.01	.00	3485.93	1.00
	5.037	173080.00	52.00	.00	.00	.00	3485.87	8.00
	5.038	173080.00	52.02	.00	.02	.00	3340.26	1.00
	5.045	173080.00	52.03	.00	.01	.00	3340.47	47.00
	5.046	173080.00	52.02	.00	-.01	.00	3486.29	1.00
*	5.585	172610.00	52.46	.00	.44	.00	10024.15	2847.00
*	6.420	171900.00	52.92	.00	.46	.00	7471.92	4409.00
	7.090	171320.00	53.72	.00	.80	.00	10758.56	3538.00
	7.470	171000.00	54.23	.00	.51	.00	9283.09	2006.00
	8.070	171000.00	55.40	.00	1.16	.00	7303.77	2891.14
*	8.490	169770.00	57.23	.00	1.83	.00	6188.03	2374.28
*	9.410	169330.00	60.44	.00	3.21	.00	7128.09	4858.00
	10.580	168330.00	61.60	.00	1.16	.00	9123.90	6177.00
	10.860	168090.00	61.93	.00	.33	.00	7024.04	1478.00
*	11.090	167890.00	62.22	.00	.29	.00	6099.58	1214.00
*	11.350	167670.00	63.11	.00	.89	.00	6010.23	1373.00
*	11.380	167670.00	63.27	.00	.16	.00	1031.21	1373.00
	11.390	167670.00	63.35	.00	.08	.00	1034.33	50.00

* 11.400	167670.00	64.27	.00	.92	.00	6199.16	50.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
11.480	167560.00	64.33	.00	.06	.00	9506.36	370.00
11.550	167500.00	64.39	.00	.06	.00	8849.75	370.00
11.569	167500.00	64.36	.00	-.03	.00	1501.34	100.00
11.660	167500.00	64.90	.00	.54	.00	1665.58	480.00
11.679	167500.00	65.18	.00	.28	.00	9421.44	100.00
11.970	167140.00	65.64	.00	.46	.00	7957.54	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 5.585 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 6.420 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

HEC-2 Output

Alternative IIC - Dredging Area D

```
1*********************************************          ****************************************
* HEC-2 WATER SURFACE PROFILES              *          * U.S. ARMY CORPS OF ENGINEERS          *
*                                           *          * HYDROLOGIC ENGINEERING CENTER         *
* Version  4.6.2;  May 1991                 *          * 609 SECOND STREET, SUITE D            *
*                                           *          * DAVIS, CALIFORNIA 95616-4687          *
* RUN DATE   28FEB00   TIME   09:51:26      *          *       (916) 756-1104                  *
*********************************************          ****************************************
```

```
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
```

```
1
 28FEB00    09:51:26                                                PAGE  1
```

THIS RUN EXECUTED 28FEB00   09:51:26

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

Version  4.6.2;  May 1991
**************************************
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DREDGING — AREA D (RM 12.9); BOTTOM ELEV. 35'

```
T1    CF-0033 BROWN & ROOT SERVICES,  02/25/2000
T2    Lake Houston HEC-2 MODEL, REACH 3     FILENAME:DREDGD35.IH2
T3    Starting form river mile 3.615 u/s of Lake Houston Dam

J1 ICHECK   INQ    NINV    IDIR    STRT    METRIC   HVINS    Q      WSEL     FQ

    0      4      0                          50.91

J2 NPROF   IPLOT    PRFVS   XSECV   XSECH    FN     ALLDC    IBW    CHNIM   ITRACE

   -1       0      -1


J3 VARIABLE CODES FOR SUMMARY PRINTOUT

  150     7     55     56     26     25     4     35     60     59

J6 IHLEQ    ICOPY    SUBDIV   STRTDS    RMILE

    1


QT      4     66800    143300    174300    333600
NC    0.12     0.12     0.03       .1        .3
      THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
      THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
X1   3.615       89   2366.85   6330.06
X3     10                   1232.04      54.7
GR    55.6        0     55.2       90     54.9   161.12     54.8   318.29     54.5      400
GR    54.5   505.44     50.4    590.1     50.7   644.14     49.6   763.76     49.8   821.19
GR    47.9   853.74     50.9   895.11       51   927.61       49   951.75     47.9   1054.3
GR    50.3  1085.94     53.3  1160.37     54.7  1232.04     50.1  1287.74       49  1373.79
GR    48.6  1482.72     49.1  1622.28     46.2  1678.02     46.3  1781.82     48.3  1866.53
GR    49.2   1949.4     48.8  2075.16     47.9  2163.11     43.8  2220.71     42.6  2269.24
GR    41.6  2366.85     40.6  2391.75       39  2452.47     37.7  2548.87     37.9  2765.45
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GR   37.6  2952.69     38  3157.81     38.6  3299.81     38.3  3413.04     38.1  3746.92
GR   38.1  3993.99   38.9  4185.79     38.8  4286.36     40.5  4499.72     39.9   4728.9
GR   38.6  4754.82   40.1   4907.5  40.4627  4943.023    38.9  4984.51     37.2  5041.95
GR   37.2  5119.68   36.4  5177.29     37.3  5277.11     36.8  5355.15     38.1  5518.64
GR   37.9  5567.34   36.5  5613.59     33.5   5655.2     32.5   5769.5     30.3  5803.47
GR   32.8  5902.24   32.8   5982.5     34.2  6030.84     36.5  6067.52     37.5   6124.9
GR   37.8  6207.91   40.5  6273.13     43.8  6330.06     41.5  6462.94     41.4  6636.96
GR   44.8  6697.83   45.5  6728.93     44.5  6819.63       45  6861.77     44.5  6960.04
GR   44.8  7029.56  45.05     7060     44.7  7115.34     45.4  7181.81     45.6     7240
GR   45.6     7360   45.5   7468.6     43.4  7632.04     44.6  7864.56     47.6  7908.88
GR   47.7  7982.52   48.7  8044.72     48.8     8220     55.8     8990
1
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QT      4   66160   140750   173330   329800
X1  4.745      84   2373.4  6703.71     3600     4500     5966
X3     10              1973.39       52  6985.59     48.6
GR  60.92       0     54.6      450    53.45      570    53.05      630     52.6      740
GR   52.7     830     52.5      930       52   989.14    52.45     1150     52.3  1284.73
GR   52.6 1434.66     52.6     1560    52.45     1730     52.3  1836.38    52.05     1940
GR     52 1973.39     51.1   2373.4     43.3     2385     39.8  2559.76       37  2645.83
GR     36 2728.22     35.3  2809.02     35.9  2887.92     31.2  3041.01     31.9  3156.16
GR   38.5 3253.79     38.3  3378.72     37.2  3446.92     38.7  3576.68     40.1  3661.26
GR     41  3745.2     42.8  3831.04     41.2  3910.34       41  3973.54     41.5  4029.61
GR   41.7  4160.5     41.2  4216.44     42.6   4487.7     44.7  4656.69     40.7  4714.42
GR   36.5    4755     36.2     4820     34.9     4900     38.1     5120     38.1     5180
GR   41.1    5200     42.3     5222     42.1     5272     39.7     5300     39.9     5500
GR   39.6    5550       38     5600     36.3     5740       37     5800     39.8  5962.55
GR     40 6057.51     39.7  6300.58       42  6371.11     43.1  6486.54       44  6532.85
GR   44.5 6559.55     45.2  6653.68     47.2  6703.71       47  6753.55     47.1  6787.33
GR   47.5 6829.55     47.3  6947.51     48.6  6985.59     48.4  7027.77     47.3  7052.29
GR   47.2 7079.78     46.5  7122.32     46.4  7303.07     46.8  7395.37     47.9  7436.05
GR   48.1  7535.6     50.2  7585.83     54.2  7722.58     54.7  7816.27     59.2  7868.73
GR   60.8 7911.42       61   8096.6     61.5     8298     61.8     8402

QT      4   65990   140170   173080   328820
NC   0.12    0.12     0.03      0.3      0.5
X1  5.026      82    10508    14400     1030     4150     1482   0.9135
X3     10
GR   70.3       0     60.1      847     55.1     4325     50.1     6125     47.5     6457
GR   51.9    6672       52     6723     49.3     6899       53     7002     51.3     7207
GR   47.8    7406     44.3     7535     50.7     7643       52     7675     49.2     7860
GR   50.7    7983       52     8074     50.8     8207     51.4     8253     50.6     8427
GR   44.2    8495     47.4     8539     44.2     8686     50.9     8716     48.5     8805
GR   53.1    8968     50.3     9257     52.8     9627     49.3     9739     48.6    10032
GR   41.6   10121     52.8    10240     51.6    10351     56.2    10508     49.2    10531
GR   44.1   10549     41.8    10584     28.9    10622     37.4    10682     36.1    10792
GR   37.9   10846     41.3    10953       45    11066     26.5    11142     24.4    11222
GR   17.9   11240     14.8    11250     10.6    11262     21.6    11486     24.9    11552
GR   41.3   11749     45.5    11830     46.2    11981     44.7    12010     41.2    12077
GR   46.2   12110       46    12265     42.6    12356     43.9    12514     41.7    12874
GR   42.3   13169     43.2    13369     44.1    13509     41.3    13921     44.5    14033
GR   43.9   14119     43.1    14221     47.6    14283       57    14400     63.4    14532
GR   64.7   14822     62.5    14960     66.5    15076     67.6    15152     66.1    15301
GR   65.8   15393     64.6    15581     65.5    15601     66.7    15706     62.2    15750
GR   64.2   15886     65.4    16039

NC    .12     .12    0.030
X1  5.027     100    10508    14300        1        1        1   0.9135
X3     10
X2      0       0        0     52.5    58.25
GR   70.3       0     60.1      847     50.1     6125     40.8     6399       52     6703
GR     53    6993     43.8     7631       52     7675     50.6     8427     44.2     8495
GR   53.1    8968     50.3     9257     52.8     9627     49.3     9739     48.6    10032
GR   41.6   10121     56.2    10508     28.9    10622     37.4    10682     52.5    10683
GR   52.5   10689     37.4    10689     36.1    10792     37.9    10846     41.3    10953
GR   52.5   10953     52.5    10959     41.3    10959       45    11066     26.5    11142
1
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GR   24.4   11222   17.9   11240   50.4   11240   52.5   11241   52.5   11250
GR   10.6   11262   21.3   11480   52.5   11480   52.5   11486   21.6   11486
GR   24.9   11552   24.4   11708   52.5   11708   52.5   11714   24.4   11714
GR   24.4   11732   45.5   11830   46.2   11981     45   12004   52.5   12004
GR   52.5   12010   44.7   12010   41.2   12077   46.2   12110   46.1   12162
GR   52.5   12163   52.5   12169   46.1   12169   42.6   12356   43.5   12463
GR   52.5   12463   52.5   12469   43.5   12469   43.9   12514   41.2   12621
GR   41.3   12663   52.5   12663   52.5   12669   41.3   12669   41.7   12863
GR   52.5   12863   52.5   12869   41.7   12869   42.3   13163   52.5   13163
GR   52.5   13169   42.3   13169   43.2   13363   52.5   13363   52.5   13369
GR   43.2   13369   44.1   13509   41.3   13581   41.3   13663   52.5   13663
GR   52.5   13669   41.3   13669   41.3   13863   52.5   13863   52.5   13869
GR   41.3   13869   41.3   13921   44.5   14033   43.9   14113   52.5   14113
GR   52.5   14119   43.9   14119   43.1   14221     56   14300   66.8   14676

X1  5.034      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03
X1  5.035     82  10508  14400      1      1      1  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.037     82  10508  14400      8      8      8  0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
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GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039

X1  5.038    100  10508  14300      1      1      1  0.9135
X3     10
X2      0      0      0   52.5  58.25
```

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GR   70.3      0   60.1    847   50.1   6125   40.8   6399     52   6703
GR     53   6993   43.8   7631     52   7675   50.6   8427   44.2   8495
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   56.2  10508   28.9  10622   37.4  10682   52.5  10683
GR   52.5  10689   37.4  10689   36.1  10792   37.9  10846   41.3  10953
GR   52.5  10953   52.5  10959   41.3  10959     45  11066   26.5  11142
GR   24.4  11222   17.9  11240   50.4  11240   52.5  11241   52.5  11250
GR   10.6  11262   21.3  11480   52.5  11480   52.5  11486   21.6  11486
GR   24.9  11552   24.4  11708   52.5  11708   52.5  11714   24.4  11714
GR   24.4  11732   45.5  11830   46.2  11981     45  12004   52.5  12004
GR   52.5  12010   44.7  12010   41.2  12077   46.2  12110   46.1  12162
GR   52.5  12163   52.5  12169   46.1  12169   42.6  12356   43.5  12463
GR   52.5  12463   52.5  12469   43.5  12469   43.9  12514   41.2  12621
GR   41.3  12663   52.5  12663   52.5  12669   41.3  12669   41.7  12863
GR   52.5  12863   52.5  12869   41.7  12869   42.3  13163   52.5  13163
GR   52.5  13169   42.3  13169   43.2  13363   52.5  13363   52.5  13369
GR   43.2  13369   44.1  13509   41.3  13581   41.3  13663   52.5  13663
GR   52.5  13669   41.3  13669   41.3  13863   52.5  13863   52.5  13869
GR   41.3  13869   41.3  13921   44.5  14033   43.9  14113   52.5  14113
GR   52.5  14119   43.9  14119   43.1  14221     56  14300   66.8  14676

X1  5.045      0      0      0     47     47     47
X3     10
X2      0      0      0   52.5  58.25

NC   0.12   0.12   0.03    0.1    0.3
X1  5.046     82  10508  14400      1      1      1 0.9135
X3     10
GR   70.3      0   60.1    847   55.1   4325   50.1   6125   47.5   6457
GR   51.9   6672     52   6723   49.3   6899     53   7002   51.3   7207
GR   47.8   7406   44.3   7535   50.7   7643     52   7675   49.2   7860
GR   50.7   7983     52   8074   50.8   8207   51.4   8253   50.6   8427
GR   44.2   8495   47.4   8539   44.2   8686   50.9   8716   48.5   8805
GR   53.1   8968   50.3   9257   52.8   9627   49.3   9739   48.6  10032
GR   41.6  10121   52.8  10240   51.6  10351   56.2  10508   49.2  10531
GR   44.1  10549   41.8  10584   28.9  10622   37.4  10682   36.1  10792
GR   37.9  10846   41.3  10953     45  11066   26.5  11142   24.4  11222
GR   17.9  11240   14.8  11250   10.6  11262   21.6  11486   24.9  11552
GR   41.3  11749   45.5  11830   46.2  11981   44.7  12010   41.2  12077
GR   46.2  12110     46  12265   42.6  12356   43.9  12514   41.7  12874
GR   42.3  13169   43.2  13369   44.1  13509   41.3  13921   44.5  14033
GR   43.9  14119   43.1  14221   47.6  14283     57  14400   63.4  14532
GR   64.7  14822   62.5  14960   66.5  15076   67.6  15152   66.1  15301
GR   65.8  15393   64.6  15581   65.5  15601   66.7  15706   62.2  15750
GR   64.2  15886   65.4  16039
1
  28FEB00    09:51:26                                          PAGE   5


QT      4  65680  139080  172610  326970
NC   0.12   0.12   0.03    0.1    0.3
NH      4   0.12  6565.8   0.04 10389.97   0.03 11165.02   0.12 11754.54
X1  5.585     92 10389.97 11165.02   2664   1744   2847
X3     10
GR  62.75      0     55    1050     51    1350   50.4    2130   49.8    2670
GR   49.3   2940     49 3070.97   47.4 3189.37   48.1 3332.69   44.9 3448.15
GR   47.2 3606.21   45.8 3712.03  48.1  3809.2   45.3 3910.28   45.4  3992.9
GR   48.9 4050.05   50.5 4111.66  47.1 4292.93     49 4377.98   46.2 4426.95
GR   48.4 4503.41   51.7 4528.08    52  4646.6   47.9 4680.17   47.5 4744.32
GR   49.6 4816.31   45.9 5042.82  46.4 5114.46   50.6 5214.31   50.4 5290.11
GR     49  5321.9   47.8 5469.67  49.5 5630.79   47.7 5658.97   46.1 5777.87
GR   46.4 5924.67   44.8 6004.29  43.3 6258.57   43.5 6470.87   48.9  6565.8
GR   44.7 6646.34   45.9 6743.32  44.5 6892.24   44.2 7009.22   44.5 7289.15
GR   46.4 7330.53   44.3 7392.93  41.7 7412.88   43.8  7516.5   42.6 7594.69
GR   42.8 7688.63   41.4 7768.32    42 7833.49   41.2 7910.79   42.2 8209.01
GR   41.3 8286.36   39.7 8308.22  39.9    8702   40.1  8964.4   39.4 9095.69
GR   41.7 9292.52   41.6 9541.35  44.3 9703.77   41.6  9816.3   43.9 9860.54
GR   41.3 9871.29   41.3 9948.37  46.9 9970.67   44.8 10033.63    43 10162.63
GR   44.2 10190.96  43.9 10305.76 46.5 10332.73  48.2 10389.97  44.7 10430.72
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GR   41.3  10459.1    32.9  10514.53    28   10567.09    26.4  10611.42    24.7  10640.77
GR   23.7  10681.82   25.7  10731.87    24.6  10751.83   28    10782.41    30.2  10840.35
GR   39.3  10888.46   38.5  10909.12    45    10961.37   49.8  11027.75    49.8  11165.02
GR   54.6  11343.95  62.4385  11754.54

QT    4   65210   137410   171900   324160
NC  0.08    .12    0.03     .1      .3
NH    5    0.12   2500     0.08    10000    0.03    17143    0.08    19000    0.12
NH  23560
    DREDGE AREA D @ FEMA CROSS SECITON D WITH AREA DREDGING @ ELEVATION 35.
X1  6.420    49    15845   16499    2300    2800    4409
X3   10
GR   75       0    75     2500     70     3400     70     6000     60     7000
GR   58.3   10000   56.1   10103   56.6   10179   57.3   10497   56.3   10543
GR   55.3   10654   57.2   10704   55.9   10873   52.1   10891   49     11004
GR   50.2   11061   53.5   11106   49.4   11290   48.2   11399   47.9   11517
GR   47.7   11625   48.9   11747   45.8   11900   46     11965   46.6   12181
GR   47.9   12699   48.1   12807   46.6   13068   46.2   13367   47.4   13489
GR   42.4   13758   41.8   14068   44.9   14127   46.8   14222   48.9   14266
GR   42.2   14433   38.1   14587   35     14600   35     16199   35     16200
GR   28.4   16309   35     16370   35     16371   35     17790   41.5   17820
GR   43     18004   61     18708   70     19600   70     23560

QT    4   64830   136080   171320   321910
NC  0.12   0.12    0.03     0.1     0.3
NH    4    .12    13568    0.03    15555    0.08    18896    .12    24402
X1  7.09     67   13568    15555    2000     3600     3538
X3   10                  11840    53.1    20069    57.9
GR   75.1     0    70.1    2300    60.1    3500    59.1    5310    55.1    7000
GR   52.9    9998   51.2   10405   48.3   10760   46.7   11002   48.1   11096
GR   50     11122   47     11313   46.7   11451   52.6   11572   53.1   11840
GR   52.5   12008   49.5   12394   44.7   12513   43.3   12597   44.3   12738
GR   45.4   12956   46.9   13568   45.2   13743   44.7   13868   43.8   13920
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GR   44.8   13990   45.1   14281   44.7   14544   42.4   14583   43.1   14804
GR   41.6   14978   43.4   15013   42.2   15090   30.1   15260   31.6   15364
GR   47.4   15555   46.7   15598   45.5   15789   39.5   15858   36.1   15974
GR   35.8   16133   38.4   16239   42.5   16348   41.8   16564   44     16840
GR   44.7   17493   46.2   17579   44.6   18028   45.1   18178   43.3   18276
GR   43.9   18459   43     18497   44.4   18896   46.2   19531   56.9   19962
GR   57.9   20069   52.9   20275   53.4   20406   49.7   20651   51.5   20718
GR   54.8   21004   54.1   21070   54.3   21465   55     21585   53.8   21703
GR   60.1   22202   65     24402

QT    4   64610   135320   171000   320030
NC   .12    .12    .03     0.1     0.3
NH    5     .12   12000    0.05    14153    0.03    14598    0.05    16383    .12
NH  23100
X1  7.47     66   14153    14598    1500     1500     2006
X3   10                                    16383    55.4
GR   75       0    75     4460     64.2    6000     70     6150     61.6    6693
GR   50.3    7163   46.9    7208   49.6    7585   46.7    7595   51      7861
GR   48.9    7931   50.6    8391   48      8503   49.8    8546   51.3    8691
GR   46.2    9217   50.4    9383   51.4    9536   49.2    9569   50.3    9803
GR   53.7   10039   53.5   10532   47.3   10859   48.5   10964   47.2   11235
GR   45     11328   45.5   11905   48.6   12029   46.4   12059   42     12180
GR   41.8   12274   44.9   12369   44.2   12639   45.9   12724   44.5   12772
GR   49.7   12832   48.5   12877   50.5   13056   45     13117   45.6   13218
GR   52.7   13383   48.5   13434   47     13591   41.8   13880   45.8   13922
GR   40.9   14010   47     14062   47.7   14153   29     14273   38     14585
GR   44.3   14598   43.4   14737   41.4   14777   40.4   14933   39.8   15545
GR   45.9   15676   48.5   15964   53.4   16211   55.4   16383   53     17600
GR   54     18600   55     18800   60     20560   70     21150   75     22400
GR   75     23100

NC   .12    .12    0.03
X1  8.07     90  5637.46  6519.38  2619.28  3201.18  2891.14
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GR  57.57  7854.93   59.40    7877    61.45  7882.66     63     8000     64     8500
GR   64.3     8700      62    9300      67    10000     75    10500
1
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QT      4    62850    129130    168330    309220
NC     .1      .12      0.03       .1       .3
X1  10.58       76   2518.22   3181.69     2700     3200     6177
X3     10               1431.19    55.17     8020    59.05
GR   75.8        0      75.6     63.6     60.9   180.78     56.7   260.63     55.3      400
GR  54.85      520        54   579.97     53.5   709.98     51.1   790.94     50.6   912.57
GR   49.1   1025.2      49.2  1101.07     53.7  1157.02     54.5     1384     55.5  1418.21
GR   54.9  1763.41      52.9  1902.66     54.8  2083.95     54.5  2206.57       53   2255.4
GR   52.8  2438.35      53.6  2518.22     42.4  2566.64     40.3  2590.99     29.8  2603.35
GR   22.1  2654.44      22.5  2685.55     31.1  2771.89     34.7  2844.63     41.9  2867.55
GR   50.1  2913.09      48.2  3126.19     50.5  3181.69     49.3  3252.87     46.5  3306.48
GR   50.3  3409.33      47.5  3613.61     52.7   3701.6     50.2  3854.05     47.2   3900.8
GR   42.7  3930.19      44.6  3976.89     46.3  4107.08       50  4195.39     48.7  5535.67
GR   48.7  5863.58        49  5916.48     50.6  6045.31     49.2  7520.57     53.5  7702.66
GR  59.05     8020      59.3     8120     57.1  8360.19     57.2  8644.55     54.9  8710.45
GR   60.1  8984.95      59.4  9100.32     61.6     9300     63.4  9619.42     62.4  9928.89
GR   62.5 10100.96      64.8 10231.72       63 10264.23     65.3 10573.06     65.9 10735.19
GR  71.55    10860      72.2    10980    74.25    11110     73.2    11255     73.3 11458.81
GR   74.9 11812.08      74.7 12055.58     76.1  12161.3    75.45    12360    76.75    12560
GR   78.5 12699.89

QT      4    62690    128570    168090    310160
NC     .1      .12       .03       .1       .3
NH      3       .1      3262      .03     4059      .12    13987
X1  10.86       43      3262     4059     1300     1100     1478
X3     10                                 8865     62.3
GR   79.8        0      77.6      161     79.4      259     77.6      579     79.7      955
GR   78.9     1110      72.6     1684     52.3     1914     49.3     2212     50.4     2314
GR   52.2     3262      35.4     3575     31.7     3805     32.7     3875     52.4     4059
GR   46.4     4251        49     4323       45     4835     48.9     4896     44.9     5078
GR   47.3     5583      44.5     5654     43.2     5785     44.5     5945     41.7     6053
GR   57.6     6350      59.1     7698     60.1     8650     62.3     8865     59.2     9382
GR   61.6     9677      59.4     9772     60.6     9852     57.7    10128     56.7    10420
GR   54.4    10557      55.8    10709     60.7    11077     63.7    11730     72.9    12060
GR   74.4    13267      75.8    13671     79.7    13987

QT      4    62560    128120    167890    308450
NH      4      .12   2522.57      .05  3311.71      .03  3943.85      .12 13549.31
X1  11.09       82   3311.71  3943.85     1400     1600     1214
X3     10               3311.71     53.3  6949.97     63.7
GR   77.9        0      78.6   449.85       74   650.88     61.2   796.99     53.8   853.81
GR   51.5  1009.93      52.1  1209.82     51.1  1415.55     52.9  1698.13     53.4  1881.01
GR   54.3  2005.52      54.3  2131.11     52.6  2522.57     52.3  2664.39     42.5  2721.63
GR   42.5  3112.03      45.4   3215.1     53.3  3311.71       51  3378.76       45     3400
GR   42.5  3427.89      34.6  3459.26     31.8  3669.22       36  3729.17       42  3745.04
GR   50.1  3767.43      55.5  3802.55       57  3943.85       52  4107.84     50.5   4209.1
GR   53.1  4359.76      56.2  4405.38     56.4  4699.98       55  4860.97     56.5  4932.99
GR   54.4  5041.53      50.1     5150     52.2  5287.22     53.6  5519.22     51.9  5703.27
GR     52     5900      51.8     6040       52     6160     53.2     6300     54.5     6450
GR   57.8     6690      63.7  6949.97     63.9  7208.78     62.9  7282.45     61.9  7559.06
GR   59.2  7996.95      57.3     8229     58.1     8331     63.7     8477     61.2   8548.1
GR   62.8  8733.88      62.1  8893.69     62.3  9162.78     59.8  9368.39    62.65     9510
GR   62.2     9630      60.2  9723.91     61.8  9807.54     62.8 10002.69     59.7 10225.58
1
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GR   62.6 10311.07      60.9 10350.09     62.5 10478.43     60.8 10575.85     64.4 11234.07
GR   67.3 11355.29      71.8 11460.13     75.3 11489.48    75.05    11790     74.1 11874.14
GR   74.1 12095.62      75.2 12273.93     75.5 12508.24     74.6 12649.39       76 13085.66
GR   74.3  13286.4      79.6 13549.31

QT      4    62410    127600    167670    307570
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NC   .12    .12    .03    .3     .5
X1  11.35    89  2958.98  3804.94    1000    2300    1373
X3   10              2199     58   6519.75    65.5
GR  75.43     0     66   155.36    64.3   287.39    63.9   438.76    60.9   535.19
GR  54.9   626.91    52   787.68    53.3   980.78    52.8  1186.05    55.1  1413.79
GR  55.2  1604.36   56.9  1641.25    57   1786.87   56.25   1790     56.3  2127.54
GR  58.1  2185.43   54.8  2259.37   54.4  2456.59   50.5   2653.09   51.8  2802.23
GR  53.9  2832.46   52.8  2958.98   44.7  3090.28   48.1   3150.77   37.64 3267.77
GR  38.74 3336.43  28.84  3406.43  29.04  3461.55   36.14   3538     42.5  3671.55
GR  52.6  3804.94   47.4  3855.04   47.9  3919.98   43.7   3952.95   42.6  4050.14
GR  44.3  4431.03   41.9  4584.19    47   4826.5    42.5   4859.87   42.6  4957.91
GR  48.7  5021.15   49.2  5059.55   43.9  5090.8    44.7   5266.47   43.2  5349.68
GR  50.2  5459.53   52.4  5575.87   50.4  5703.12   51.9   5904.76   49.1  6073.64
GR  49.1  6167.73   51.3  6273.19   59.7  6409.59   65.5   6519.75   65.7  6635.31
GR  63.6  6757.16    63   7060.24   63.3  7375.88    66    7690      64.7  7907.84
GR  65.5  7969.4    64.1  8340.7    64.9  8381.19   64.1   8668.42    62   8835.44
GR  62.5  8946.12   65.3  9083.61   63.6  9200.98   64.35  9450       63   9781.97
GR  63.1  10165.1   65.1  10443.04  64.4  10755.85  64.5   10988.16  68.1  11162.12
GR  71.35  11220    71.9  11348.07  74.6  11434.99  75.9   11601.85  78.45  11650
GR  79.6   11960    81.1  12067.18  79.5  12180.83  80.3   12422.88  84.2  12477.71
GR  85.05  12580    83.5  12625.42  84.2   12770    82.9   13330.5

X1  11.38    85    19900    21000    1000    2300    1373    0.00    -1     0
X3   10     0.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0    0.0
GR  85.00  14899.0  85.00  14900.0  85.00  16700.0  80.00  16850.0  75.00  16950.0
GR  70.00  17099.0  70.00  17100.0  65.00  17150.0  60.00  17350.0  55.00  17800.0
GR  65.90  19700.0  66.80  19800.0  67.30  19900.0  61.80  20000.0  60.70  20001.0
GR  55.60  20014.9  49.10  20030.0  44.10  20045.4  43.40  20060.3  45.20  20075.3
GR  45.80  20090.3  46.20  20105.3  45.30  20120.1  45.90  20136.6  46.00  20153.3
GR  45.30  20169.6  44.30  20186.2  44.70  20202.8  45.10  20219.6  45.00  20236.2
GR  45.30  20252.7  45.20  20269.3  45.20  20286.0  44.30  20302.6  43.70  20319.4
GR  40.00  20335.8  42.60  20352.5  38.10  20368.8  33.60  20385.4  35.50  20402.0
GR  33.20  20416.3  32.40  20430.0  31.70  20450.0  36.40  20470.0  34.80  20492.0
GR  37.60  20510.0  38.00  20527.2  38.30  20535.0  38.00  20565.0  37.40  20590.0
GR  37.00  20600.3  34.80  20615.0  27.80  20630.0  34.80  20645.0  36.30  20655.1
GR  39.20  20674.3  40.60  20693.3  38.60  20712.1  42.40  20731.4  43.50  20735.0
GR  47.40  20750.7  48.20  20769.8  47.20  20789.0  47.50  20808.0  47.50  20865.1
GR  47.80  20865.2  48.10  20884.2  47.90  20903.3  48.10  20922.3  48.70  20941.3
GR  54.90  20960.4  63.70  20978.7  63.90  20979.5  65.00  21000.0  64.30  21100.0
GR  55.00  22000.0  55.00  24800.0  60.00  25000.0  65.00  26200.0  65.00  26500.0
GR  70.00  27700.0  75.00  27800.0  80.00  28300.0  85.00  29700.0  90.00  30100.0

SB   1.25    1.50    2.60    0.0    189.0    20.4   22729.0   10.20   27.80   27.80
ET                                   9.1                     19900   21000
1
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X1  11.39     0     0.0     0.0     50.0    50.0    50.0    0.00    0.00     0
X2    0    0.00     1    67.20   68.30    0.00     0     0.00    0.00     0
X3   10     0.0    0.0     0.0     0.0     0.0     0.0     0.0     0.0    0.0
BT   33  14899.0   87.0    0.0  16700.0   87.0    0.0  17000.0   85.0    0.0
BT 17560   80.0    0.0  18100.0   75.0    0.0  19200.0   70.0    0.0  19201.0
BT  70.0    0.0 20000.0   68.3    0.0  20000.1   68.3    65.7  20120.1   69.1
BT  66.7 20201.2   69.1   66.0  20416.3   69.8    67.1  20416.4   69.8    66.5
BT 20492   69.8    66.8 20492.1   69.8    65.1  20655.1   69.8    65.1  20655.2
BT  69.8   67.2 20978.7   68.8    65.6  20978.8   68.8    0.0  21000.0   68.0
BT   0.0 21100.0   67.3    0.0  21200.0   66.3    0.0  21201.0   66.3    0.0
BT 23250   62.0    0.0  25100.0   65.0    0.0  26200.0   65.0    0.0  26400.0
BT  65.0    0.0 26700.0   70.0    0.0  27650.0   75.0    0.0  28150.0   82.0
BT   0.0 28750.0   87.0    0.0  29000.0   92.0    0.0  30300.0   92.0    0.0

ET                                  8.41
X1   11.4    89  2958.98  3804.94   50.0    50.0    50.0    0.00    0.00     0
X3   10              2199     58   6519.75    65.5
GR  75.43     0     66   155.36    64.3   287.39    63.9   438.76    60.9   535.19
GR  54.9   626.91    52   787.68    53.3   980.78    52.8  1186.05    55.1  1413.79
GR  55.2  1604.36   56.9  1641.25    57   1786.87   56.25   1790     56.3  2127.54
GR  58.1  2185.43   54.8  2259.37   54.4  2456.59   50.5   2653.09   51.8  2802.23
GR  53.9  2832.46   52.8  2958.98   44.7  3090.28   48.1   3150.77   37.64 3267.77
```

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GR   38.74   3336.43   28.84   3406.43   29.04   3461.55   36.14   3538   42.5   3671.55
GR   52.6   3804.94   47.4   3855.04   47.9   3919.98   43.7   3952.95   42.6   4050.14
GR   44.3   4431.03   41.9   4584.19   47   4826.5   42.5   4859.87   42.6   4957.91
GR   48.7   5021.15   49.2   5059.55   43.9   5090.8   44.7   5266.47   43.2   5349.68
GR   50.2   5459.53   52.4   5575.87   50.4   5703.12   51.9   5904.76   49.1   6073.64
GR   49.1   6167.73   51.3   6273.19   59.7   6409.59   65.5   6519.75   65.7   6635.31
GR   63.6   6757.16   63   7060.24   63.3   7375.88   66   7690   64.7   7907.84
GR   65.5   7969.4   64.1   8340.7   64.9   8381.19   64.1   8668.42   62   8835.44
GR   62.5   8946.12   65.3   9083.61   63.6   9200.98   64.35   9450   63   9781.97
GR   63.1   10165.1   65.1   10443.04   64.4   10755.85   64.5   10988.16   68.1   11162.12
GR   71.35   11220   71.9   11348.07   74.6   11434.99   75.9   11601.85   78.45   11650
GR   79.6   11960   81.1   12067.18   79.5   12180.83   80.3   12422.88   84.2   12477.71
GR   85.05   12580   83.5   12625.42   84.2   12770   82.9   13330.5

QT   4   62340   127340   167560   307140   0   0   0   0
NC   .12   .12   .03   .1   .3
NH   3   .120   3153.07   .030   3834.77   .120   14239.64
X1   11.48   83   3153.07   3834.77   400   700   370   -1
X3   10   1998.35   56.86
GR   76.29   0   74.2   141.74   72.1   251.69   67.3   387.98   65.6   572.84
GR   64.9   799.64   56.3   1051.78   56.7   1284.7   55.8   1423.54   57.5   1735.27
GR   55.8   1865.38   57.9   1950.43   57   2115.34   51.9   2192.24   51.6   2676.44
GR   48.1   2772.19   51.5   2897.5   47.5   3079.27   49.6   3153.07   48.4   3217.84
GR   40.8   3263.45   46.8   3312.88   38.33   3352.99   32.93   3453.9   28.63   3598.06
GR   22.83   3619.02   25.93   3642.69   21.73   3663.26   28.63   3710.06   40.09   3750.18
GR   50.5   3834.77   52.5   4098.58   52.5   4266.28   50.2   4616.96   53.2   5256.55
GR   55.8   5417.16   49.5   5542.31   49.6   5811.88   52.8   5944.08   50.5   6026.29
GR   49.2   6139.42   50.6   6300.68   60.8   6368.78   60.8   6489.41   52.1   6544.58
GR   49.1   6582.93   49.6   6866.77   53.6   6999.45   52.4   7192.35   55.8   7242.29
GR   52.1   7310.92   57.4   7392.7   58.9   7486.54   57.8   7527.2   59.3   7858.55
GR   62.3   8313.45   62.3   8520.5   63.1   8579.97   63.8   8874.31   63.1   9022.65
GR   64.7   9319.75   64   9847.05   66   10324.86   67.2   10502.28   70.9   10689.92
1
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GR   75.6   10862.29   80   11138.46   81.4   11329.98   82.6   11935.13   82.6   12152.77
GR   84   12494.73   86.9   12751.65   91   12961.31   96.3   13165.82   98.2   13409.92
GR   97.1   13499.57   82.3   13562.28   82.6   13710.72   93.2   13739.27   91.2   13843.55
GR   84.7   14008.62   85.8   14187.33   84.3   14239.64

QT   4   62300   127200   167500   306900
NC   .12   .12   .03   .6   .8
X1   11.55   73   3153   3835   400.0   400.0   370.0   0.00   0
X3   10   0.0   0.0   1950   57   0.0   0.0   0.0
GR   75.4   0   74.2   142   67.3   388   65.6   573   64.9   800
GR   51.7   898   56.3   1052   56.7   1285   55.8   1424   51.7   1438
GR   51.7   1636   57.5   1735   57.9   1950   57   2115   51.9   2192
GR   51.6   2676   48.1   2772   51.5   2898   47.5   3079   49.6   3153
GR   48.4   3218   46.8   3313   38.33   3353   28.63   3598   22.83   3619
GR   25.93   3643   21.73   3663   28.63   3710   40.09   3750   50.5   3835
GR   52.5   4099   52.5   4266   50.2   4617   44.2   4679   44.3   5110
GR   53.2   5257   55.8   5417   49.5   5542   49.6   5812   52.8   5944
GR   50.5   6026   49.2   6139   50.6   6301   60.8   6369   60.8   6489
GR   52.1   6545   49.1   6583   49.6   6867   53.6   6999   52.4   7192
GR   52.1   7311   58.9   7487   59.3   7859   62.3   8313   62.3   8521
GR   63.1   8580   63.8   8874   63.1   9023   64.7   9320   64   9847
GR   66   10325   67.2   10502   70.9   10690   75.6   10862   80   11138
GR   81.4   11330   82.6   11935   82.6   12153   84   12495   86.9   12752
GR   91   12961   96.3   13166   98.2   13410

NH   4   .100   18850.0   .100   20250.0   .030   21748.6   .120   28900.0   0.000
X1   11.569   83   20250   21768.7   100   100   100   0.00   0.00   0
X3   10   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
GR   84.00   16850.0   80.00   17250.0   80.00   17251.0   80.00   17252.0   75.00   18025.0
GR   70.00   18075.0   65.00   18125.0   60.00   18200.0   60.00   18201.0   60.00   18202.0
GR   60.00   18450.0   60.00   18500.0   60.00   18600.0   60.00   18850.0   55.00   19350.0
GR   55.00   19351.0   68.70   20250.0   49.80   20287.0   49.30   20323.0   48.30   20340.0
GR   49.80   20360.4   48.40   20389.0   50.50   20396.9   48.10   20458.0   44.50   20495.0
GR   44.20   20506.1   45.40   20560.0   44.50   20600.0   45.00   20650.0   47.20   20711.0
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GR  44.00  20721.0   42.80  20746.0   43.30  20770.0   35.50  20800.0   33.50  20820.0
GR  26.50  20920.0   24.10  20930.0   31.40  20940.0   25.40  20944.1   29.70  20960.0
GR  30.60  20970.0   33.20  20980.0   33.20  20981.0   35.00  20990.0   35.90  21000.0
GR  38.40  21010.0   38.40  21017.3   43.43  21039.0   45.80  21089.5   46.80  21162.7
GR  46.40  21176.0   51.80  21206.0   51.90  21232.0   49.40  21259.0   50.00  21273.8
GR  49.20  21310.3   50.70  21494.0   49.40  21530.9   49.60  21603.9   49.10  21640.4
GR  51.49  21677.0   51.80  21707.0   55.10  21739.0   60.90  21748.6   67.10  21768.7
GR  64.20  21850.0   63.70  21970.0   61.00  22199.0   61.00  22200.0   60.00   22500.
GR  55.00  23000.0   50.00  23400.0   50.00  23450.0   55.00  23700.0   55.00   24950.
GR  60.00  25700.0   65.00  25900.0   70.00  27700.0   75.00  27900.0   80.00   28150.
GR  85.00  28450.0   90.00  28700.0   90.50  28900.0    0.00     0.0

SB   1.25    2.31    2.60     0.0      50      46   32375      20    24.1    24.1
NC   .120    .120    .035      .3      .5
X1 11.660      91  20226.0 21910.0    480     480     480    0.00       0
X2    0.0     0.0       1   63.08   69.07     0.0     0.0     0.0     0.0     0.0
X3     10     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
BT     27 16200.0   68.99     0.0 17200.0   64.77     0.0 17500.0   63.51     0.0
BT 18300.   67.62     0.0 18301.0   67.63     0.0 18669.0   72.15     0.0 19195.0
BT  71.42     0.0 20000.0   67.97     0.0 20100.0   68.42     0.0   20200   68.87
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BT    0.0 20235.8   69.04   69.04 20242.8   69.07   63.08 20573.0   70.56   64.57
BT 20903.   72.04   66.05 21141.3   72.66   66.67 21563.0   71.21   65.22 21893.1
BT  69.73   63.74 21900.0   69.70   69.70 22000.0   69.24     0.0 22274.7   68.01
BT    0.0 22700.0   66.10     0.0 23449.7   65.50     0.0 24374.7   69.44     0.0
BT 26274.   85.80     0.0 28000.0   85.80     0.0 28300.0   85.80     0.0 28900.0
BT   90.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
GR  85.00  16200.0   85.00  16500.0   80.00  18100.0   75.00  18350.0   65.00  18500.0
GR  60.00  18800.0   55.00  19200.0   50.00  19600.0   50.00  19601.0   68.90  20226.0
GR  64.97  20235.8   62.60  20237.6   48.40  20267.5   48.30  20295.5   49.00  20308.0
GR  49.20  20362.0   46.80  20375.5   45.60  20394.0   43.70  20400.0   42.60  20435.5
GR  44.30  20466.0   44.80  20492.0   45.80  20495.5   47.70  20555.5   47.60  20616.0
GR  48.00  20676.0   47.00  20736.0   45.70  20796.1   46.30  20877.7   46.70  20877.7
GR  45.70  20909.0   43.90  20924.0   42.90  20935.0   39.10  20940.0   37.20  20955.0
GR  37.50  20958.3   38.40  20970.0   37.40  20980.0   36.10  20990.0   34.80  21010.0
GR  33.80  21020.0   29.40  21030.0   30.40  21039.6   27.20  21050.0   28.80  21060.0
GR  27.60  21065.8   26.10  21080.0   22.00  21100.0   19.80  21110.0   20.40  21120.7
GR  24.20  21130.0   28.20  21140.0   29.90  21155.0   37.00  21160.0   41.00  21170.0
GR  43.40  21179.0   45.10  21181.0   45.70  21183.0   46.30  21210.0   49.10  21232.0
GR  48.40  21241.0   51.90  21258.0   52.00  21286.0   50.30  21301.0   49.90  21421.0
GR  49.40  21481.0   49.70  21541.0   49.00  21600.7   48.80  21625.0   44.60  21680.0
GR  47.20  21703.0   46.40  21721.2   47.30  21781.2   49.50  21800.0   49.10  21841.0
GR  51.60  21877.0   62.10  21898.3   64.35  21900.0   68.20  21910.0   64.00  22000.0
GR  64.40  22100.0   60.00  22700.0   50.00  23500.0   55.00  24100.0   60.00  25600.0
GR  65.00  26000.0   70.00  27700.0   75.00  27800.0   85.00  28400.0   90.00  28700.0
GR  90.50  28900.0    0.00     0.0    0.00     0.0    0.00     0.0    0.00     0.0

X1 11.679      73    3153    3835     100     100     100    0.00    0.00       0
X3     10     0.0     0.0    1950      57     0.0     0.0     0.0
GR   75.4       0    74.2     142    67.3     388    65.6     573    64.9     800
GR   51.7     898    56.3    1052    56.7    1285    55.8    1424    51.7    1438
GR   51.7    1636    57.5    1735    57.9    1950      57    2115    51.9    2192
GR   51.6    2676    48.1    2772    51.5    2898    47.5    3079    49.6    3153
GR   48.4    3218    46.8    3313   38.33    3353   28.63    3598   22.83    3619
GR  25.93    3643   21.73    3663   28.63    3710   40.09    3750    50.5    3835
GR   52.5    4099    52.5    4266    50.2    4617    44.2    4679    44.3    5110
GR   53.2    5257    55.8    5417    49.5    5542    49.6    5812    52.8    5944
GR   50.5    6026    49.2    6139    50.6    6301    60.8    6369    60.8    6489
GR   52.1    6545    49.1    6583    49.6    6867    53.6    6999    52.4    7192
GR   52.1    7311    58.9    7487    59.3    7859    62.3    8313    62.3    8521
GR   63.1    8580    63.8    8874    63.1    9023    64.7    9320      64    9847
GR     66   10325    67.2   10502    70.9   10690    75.6   10862      80   11138
GR   81.4   11330    82.6   11935    82.6   12153      84   12495    86.9   12752
GR     91   12961    96.3   13166    98.2   13410

QT      4   62060  126360  167140  305490       0       0       0       0
NC   .120    .120    .030      .1      .3
```

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X1  11.97     84  2273.46  2827.03     802     5043     2118
X3    10            1105.39     52.5    9060     74.8
GR  78.23      0    64.2   174.04    63.5   501.47    62.4   571.34    57.3   671.03
GR   46.1   969.8    52.3  1075.96    49.9  1240.38    49.5   1362.1    47.4  1575.32
GR   49.6  1774.8    45.3  2044.49    47.5  2118.35    44.4  2165.58    46.6  2273.46
GR  35.52 2351.83   41.02  2371.83   32.22  2411.83   31.72  2441.83   37.12  2621.82
GR   45.7 2759.78    44.7  2827.03    45.5  2960.44    44.9  3171.29    46.7     3200
GR   46.4 3463.72      47  3583.97    44.6  3643.28      45  3872.88      47  3996.03
1
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GR   53.2 4123.35    60.5   4270.1    60.5  4509.54    57.2  4775.48      58  5148.72
GR   56.2 5363.59    55.1   5699.3    49.4  5956.27    49.6  6073.28    48.3  6272.85
GR     51 6381.63    52.1  6574.09    51.8  6814.08    53.2  6887.03    50.2  7041.29
GR   53.5 7127.14    51.6  7442.96    56.9  7800.49    62.4  7837.71    64.9  7999.27
GR   67.4 8385.92    67.1  8424.35    74.8     9060    66.9     9130   66.35     9190
GR   65.8  9282.6    53.6   9356.5    55.7  9527.42    58.8  9587.89    70.2  9638.17
GR   72.9 9884.04      75 10154.89    75.2 10427.45    76.1 10520.96    76.1  10769.8
GR   90.2   10830    91.8 11098.11    89.8 11321.02    86.3 11634.53    85.4 11757.32
GR   86.8 11952.18   85.2 12112.75    87.5 12345.14    83.2 12384.16    89.1 12447.67
GR   85.9 12555.51   90.4    12650    84.7 12970.55    83.1 13224.85      84 13312.97
GR     83 13508.04   84.5  13657.9    83.9 13887.88    86.8 14077.83


1
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   SECNO    DEPTH   CWSEL   CRIWS   WSELK   EG     HV     HL     OLOSS  L-BANK ELEV
   Q      QLOB    QCH     QROB    ALOB    ACH    AROB   VOL    TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR    WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT  CORAR  TOPWID  ENDST


*PROF 1

IHLEQ = 1.  THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH.  SEE DOCUMENTATION FOR
DETAILS.
0

CCHV=   .100 CEHV=    .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS=    1232.0   8990.0  TYPE=     1  TARGET=   -1232.040
 ELENCL=    54.70  ELENCR= 100000.00
      THIS MODEL HAS BEEN REVISED BY REMOVING THE X3 10 ENCROACHMENTS.
      THIS MODEL IS THE SIMILAR TO THE BRSREV.IH2 MODEL.
   3.615    20.61    50.91     .00    50.91    51.06     .15     .00     .00    41.60
 174300.0   1521.8 167008.7   5769.5   3779.5  51973.1  11582.1      .0      .0    43.80
     .00      .40     3.21     .50     .120     .030    .120    .000   30.30  1277.93
  .000136      0.       0.      0.        0        0       0     .00 7174.17  8452.10


*SECNO 4.745

3470 ENCROACHMENT STATIONS=    1973.4   6985.6  TYPE=     1  TARGET=    5012.200
 ELENCL=    52.00  ELENCR=    48.60
   4.745    20.54    51.74     .00      .00    51.90     .16     .84     .00    51.10
 173330.0      6.5 172233.1   1090.4     92.3  53629.3  3122.6  8151.2   782.7    47.20
     .52      .07     3.21     .35     .120     .030    .120    .000   31.20  2087.00
  .000147    3600.    5966.   4500.        2        0       0     .00 5551.63  7638.63


CCHV=   .300 CEHV=    .500
*SECNO 5.026

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=     56.20 ELREA=      57.00
```

```
  5.026   41.37   51.97    .00    .00   52.22    .25    .27    .05   56.20
 173080.0     .0 173080.0     .0     .0 43119.8     .0  9946.9  963.6   57.00
   .62    .00   4.01    .00   .000   .030   .000   .000  10.60  9611.74
 .000231   1030.  1482.  4150.     2      0      0    .00  3485.50 13097.25
```

*SECNO 5.027

1


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 SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG    HV    HL    OLOSS  L-BANK ELEV
 Q      QLOB   QCH    QROB   ALOB   ACH   AROB   VOL   TWA    R-BANK ELEV
 TIME   VLOB   VCH    VROB   XNL    XNCH  XNR    WTN   ELMIN  SSTA
 SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC   ICONT  CORAR TOPWID ENDST
```

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.027   41.39   51.99    .00    .00   52.23    .24    .00    .00   56.20
 173080.0     .0 173080.0     .0     .0 44353.1     .0  9947.9  963.6   56.00
   .62    .00   3.90    .00   .000   .030   .000   .000  10.60  9615.15
 .000231     1.     1.     1.     1      0      0    .00  3340.00 13040.57
```

*SECNO 5.034

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 0 MIN ELTRD= 58.25 MAX ELLC= 52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 56.00

```
  5.034   41.40   52.00    .00    .00   52.24    .24    .01    .00   56.20
 173080.0     .0 173080.0     .0     .0 44419.9     .0  9995.7  967.2   56.00
   .62    .00   3.90    .00   .000   .030   .000   .000  10.60  9615.07
 .000230    47.    47.    47.     0      0      0    .00  3340.21 13040.69
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*SECNO 5.035

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.20 ELREA= 57.00

```
  5.035   41.40   52.00    .00    .00   52.25    .25    .00    .01   56.20
 173080.0     .0 173080.0     .0     .0 43224.7     .0  9996.8  967.3   57.00
   .62    .00   4.00    .00   .000   .030   .000   .000  10.60  9611.65
 .000229     1.     1.     1.     0      0      0    .00  3485.93 13097.59
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*SECNO 5.037

1


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 SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG    HV    HL    OLOSS  L-BANK ELEV
 Q      QLOB   QCH    QROB   ALOB   ACH   AROB   VOL   TWA    R-BANK ELEV
 TIME   VLOB   VCH    VROB   XNL    XNCH  XNR    WTN   ELMIN  SSTA
 SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC   ICONT  CORAR TOPWID ENDST
```

```
3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.037   41.40   52.00    .00    .00   52.25    .25    .00    .00   56.20
 173080.0     .0 173080.0     .0     .0  43208.0     .0  10004.7   968.0   57.00
    .62    .00    4.01    .00   .000    .030   .000   .000   10.60  9611.67
  .000229     8.     8.     8.      0      0      0    .00  3485.87 13097.54

*SECNO 5.038

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.038   41.42   52.02    .00    .00   52.25    .24    .00    .00   56.20
 173080.0     .0 173080.0     .0     .0  44437.1     .0  10005.7   968.0   56.00
    .62    .00    3.89    .00   .000    .030   .000   .000   10.60  9615.05
  .000230     1.     1.     1.      1      0      0    .00  3340.26 13040.71

*SECNO 5.045

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD=   0 MIN ELTRD=    58.25 MAX ELLC=    52.50

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      56.00

   5.045   41.43   52.03    .00    .00   52.26    .23    .01    .00   56.20
 173080.0     .0 173080.0     .0     .0  44503.3     .0  10053.7   971.6   56.00
    .63    .00    3.89    .00   .000    .030   .000   .000   10.60  9614.98
  .000229    47.    47.    47.      0      0      0    .00  3340.47 13040.83

CCHV=    .100 CEHV=    .300
1
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  SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG    HV    HL   OLOSS  L-BANK ELEV
  Q     QLOB   QCH    QROB   ALOB   ACH   AROB   VOL    TWA   R-BANK ELEV
  TIME   VLOB   VCH    VROB   XNL    XNCH   XNR    WTN   ELMIN  SSTA
  SLOPE  XLOBL  XLCH   XLOBR  ITRIAL IDC    ICONT  CORAR  TOPWID ENDST

*SECNO 5.046

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      56.20 ELREA=      57.00

   5.046   41.42   52.02    .00    .00   52.27    .25    .00    .00   56.20
 173080.0     .0 173080.0     .0     .0  43311.6     .0  10054.7   971.7   57.00
    .63    .00    4.00    .00   .000    .030   .000   .000   10.60  9611.58
  .000227     1.     1.     1.      0      0      0    .00  3486.29 13097.87

CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 5.585
   5.585   29.05   52.75    .00    .00   52.89    .14    .62    .01   48.20
 172610.0 116272.6 56299.2   38.2  63098.1  12298.4   162.4  13804.7  1393.6   49.80
    .91   1.84    4.58    .24   .049    .030   .120   .000   23.70  1218.60
  .000215  2664.  2847.  1744.      2      0      0    .00 10056.46 11275.06
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CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 6.420

3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.67

     DREDGE AREA D @ FEMA CROSS SECITON D WITH AREA DREDGING @ ELEVATION 35.
   6.420    24.77    53.17     .00      .00     53.27      .10      .37      .00     35.00
 171900.0  40836.7  99111.0  31952.4  24603.9  32748.2  30272.0  19377.9   1931.0     35.00
    1.30     1.66     3.03     1.06     .030     .030     .080     .000    28.40  10885.91
  .000076    2300.    4409.    2800.       2        0        0      .00  7496.99  18401.94


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.090

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .50


3470 ENCROACHMENT STATIONS=    11840.0  20069.0  TYPE=     1  TARGET=     8229.000
1
  28FEB00    09:51:26                                                   PAGE  18


   SECNO    DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL     OLOSS   L-BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    R-BANK ELEV
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN     ELMIN     SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT   CORAR   TOPWID    ENDST


 ELENCL=    53.10 ELENCR=    57.90
   7.090    23.65    53.75     .00      .00     53.94      .19      .64      .03     46.90
 171320.0   9287.6  99832.6  62199.8  12345.6  22638.6  41570.9  25444.2   2533.6     47.40
    1.59      .75     4.41     1.50     .120     .030     .084     .000    30.10   9021.71
  .000309    2000.    3538.    3600.       2        0        0      .00 10813.46  19835.17


CCHV=   .100 CEHV=    .300
1490 NH CARD USED
*SECNO 7.470

3470 ENCROACHMENT STATIONS=         .0  16383.0  TYPE=     1  TARGET=    16383.000
   7.470    25.26    54.26     .00      .00     54.55      .29      .58      .03     47.70
 171000.0  63343.6  57552.4  50104.0  42759.3   8557.2  17050.6  28120.6   2893.8     44.30
    1.73     1.48     6.73     2.94     .070     .030     .050     .000    29.00   6998.25
  .000361    1500.    2006.    1500.       2        0        0      .00  9286.80  16285.05


*SECNO 8.070

3470 ENCROACHMENT STATIONS=     3455.4  15481.5  TYPE=     1  TARGET=    -3455.360
 ELENCL=    61.13 ELENCR= 100000.00
   8.070    27.51    55.41     .00      .00     56.00      .59     1.36      .09     44.30
 171000.0  22186.7 107919.7  40893.6  16580.3  14019.1  33128.4  32497.6   3438.5     46.70
    1.88     1.34     7.70     1.23     .120     .030     .120     .000    27.90   3788.86
  .000611    2619.    2891.    3201.       2        0        0      .00  7304.08  11092.94


CCHV=   .100 CEHV=    .300
*SECNO 8.490

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .65
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3470 ENCROACHMENT STATIONS=      .0  3851.7  TYPE=    1  TARGET=    3851.709
   8.490   21.44   57.24     .00     .00   58.56    1.32    2.33     .22   46.00
 169770.0 52181.7 103501.6 14086.7 21239.3  8860.8 12092.6 35098.5  3743.1   50.60
    1.96    2.46   11.68    1.16    .120    .030    .120    .000   35.80  798.71
  .001411   2636.   2374.   1605.      3       0       0     .00 6188.21 6986.92
```



```
 SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
 Q      QLOB   QCH    QROB   ALOB    ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME   VLOB   VCH    VROB   XNL     XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE  XLOBL  XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR TOPWID ENDST

1490 NH CARD USED
*SECNO 9.410

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.30

3470 ENCROACHMENT STATIONS=  2460.6  10500.0  TYPE=    1  TARGET=   -2460.630
 ELENCL=   56.91  ELENCR= 100000.00
   9.410   24.94   60.44     .00     .00   60.68     .24    2.02     .11   53.30
 169330.0 24863.3 62614.6 81852.0 15127.0 10291.7 48896.6 41060.4  4423.1   49.50
    2.34    1.64    6.08    1.67    .057    .030    .079    .000   35.50  751.75
  .000266   2500.   4858.   5500.      3       0       0     .00 7128.13 7879.88

CCHV=   .100 CEHV=   .300
*SECNO 10.580

3470 ENCROACHMENT STATIONS=  1431.2  8020.0  TYPE=    1  TARGET=    6588.810
 ELENCL=   55.17  ELENCR=   59.05
  10.580   39.50   61.60     .00     .00   61.95     .35    1.24     .03   53.60
 168330.0 14233.3 90562.5 63534.2 15711.1 14189.7 59632.1 47738.3  5031.0   50.50
    2.66     .91    6.38    1.07    .100    .030    .120    .000   22.10  175.24
  .000284   2700.   6177.   3200.      2       0       0     .00 9124.25 9299.49

CCHV=   .100 CEHV=   .300
1490 NH CARD USED
*SECNO 10.860

3470 ENCROACHMENT STATIONS=      .0  8865.0  TYPE=    1  TARGET=    8864.999
  10.860   30.23   61.93     .00     .00   62.30     .37     .35     .01   52.20
 168090.0 16695.4 107598.9 43795.7 15157.1 17852.2 42023.9 50026.0  5250.0   52.40
    2.74    1.10    6.03    1.04    .100    .030    .120    .000   31.70 1804.85
  .000235   1300.   1478.   1100.      2       0       0     .00 7024.37 8829.21

1490 NH CARD USED
*SECNO 11.090
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 SECNO  DEPTH  CWSEL  CRIWS  WSELK   EG     HV     HL    OLOSS  L-BANK ELEV
 Q      QLOB   QCH    QROB   ALOB    ACH    AROB   VOL   TWA    R-BANK ELEV
 TIME   VLOB   VCH    VROB   XNL     XNCH   XNR    WTN   ELMIN  SSTA
 SLOPE  XLOBL  XLCH   XLOBR  ITRIAL  IDC    ICONT  CORAR TOPWID ENDST
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3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .65


3470 ENCROACHMENT STATIONS=    3311.7   6950.0  TYPE=     1  TARGET=     3638.260
 ELENCL=     53.30  ELENCR=     63.70
   11.090     30.43     62.23       .00       .00     62.86       .64       .48       .08     53.30
  167890.0  39400.5  98610.0  29879.5  21775.5  11934.4  24002.7  52247.2   5475.6     57.00
     2.81      1.81      8.26      1.24      .082      .030      .120      .000     31.80    785.28
  .000559     1400.     1214.     1600.        2         0         0       .00   6099.74   6885.02


CCHV=     .300  CEHV=     .500
*SECNO 11.350

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.59


3470 ENCROACHMENT STATIONS=    2199.0   6519.8  TYPE=     1  TARGET=     4320.750
 ELENCL=     58.00  ELENCR=     65.50
   11.350     34.27     63.11       .00       .00     63.44       .33       .49       .09     52.80
  167670.0  10994.8 106148.6  50526.6  15972.8  18499.4  41981.6  54902.2   5704.6     52.60
     2.92       .69      5.74      1.20      .120      .030      .120      .000     28.84    464.07
  .000220     1000.     1373.     2300.        2         0         0       .00   6010.34   6474.41


*SECNO 11.380

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .68


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30  ELREA=       64.00

   11.380     36.47     63.27       .00       .00     64.26       .99       .48       .33     66.30
  167670.0        .0  167670.0       .0        .0   21032.4       .0   56816.8   5833.3     64.00
     2.97       .00      7.97       .00      .000      .030      .000      .000     26.80  19955.10
  .000474     1000.     1373.     2300.        2         0         0       .00   1031.29  20986.39


1
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   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB     ACH    AROB   VOL    TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL      XNCH   XNR    WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL   IDC    ICONT  CORAR  TOPWID  ENDST


SPECIAL BRIDGE

SB  XK      XKOR     COFQ     RDLEN    BWC      BWP      BAREA      SS      ELCHU     ELCHD
     1.25     1.50     2.60      .00    189.00    20.40  22729.00    10.20    27.80     27.80

*SECNO 11.390
CLASS A LOW FLOW

3420 BRIDGE W.S.=      63.17  BRIDGE VELOCITY=       8.95    CALCULATED CHANNEL AREA=      18726.

 EGPRS     EGLWC      H3      QWEIR     QLOW     BAREA   TRAPEZOID    ELLC     ELTRD    WEIRLN
                                                           AREA
     .00     64.33      .08        0.   167670.    22729.    22477.     67.20     68.30        0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       66.30  ELREA=       64.00
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```
   11.390   36.55   63.35    .00     .00   64.33    .98    .08    .00   66.30
 167670.0      .0 167670.0     .0      .0  21119.9     .0  56841.0  5834.5   64.00
    2.97    .00    7.94    .00    .000    .030    .000    .000   26.80 19953.56
  .000469     50.    50.    50.      0       0       0    .00  1034.40 20987.96


*SECNO 11.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.62


3470 ENCROACHMENT STATIONS=   2199.0   6519.8  TYPE=    1  TARGET=    4320.750
 ELENCL=    58.00  ELENCR=    65.50
   11.400   35.43   64.27    .00     .00   64.55    .28    .01    .21   52.80
 167670.0 12762.1 104045.0 50862.9 18920.6 19483.3 45099.1 56901.1  5838.6   52.60
    2.97    .67    5.34   1.13    .120    .030    .120    .000   28.84   296.59
  .000178     50.    50.    50.      2       0       0    .00  6199.91  6496.50


CCHV=    .100 CEHV=    .300
1490 NH CARD USED
*SECNO 11.480
1
  28FEB00    09:51:26                                                PAGE  22


   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG     HV     HL    OLOSS  L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH    AROB    VOL    TWA    R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH   XNR     WTN    ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC    ICONT   CORAR  TOPWID  ENDST


3470 ENCROACHMENT STATIONS=   1998.3  14239.6  TYPE=    1  TARGET=   -1998.350
 ELENCL=    56.86  ELENCR= 100000.00
   11.480   43.61   64.34    .00     .00   64.63    .30    .07    .01   48.60
 167560.0 18057.4 106315.0 43187.6 24000.5 19431.1 55499.4 58071.7  5941.3   49.50
    3.01    .75    5.47    .78    .120    .030    .120    .000   20.73   658.62
  .000142    400.   370.   700.      2       0       0    .00  9507.42 10166.04


CCHV=    .600 CEHV=    .800
*SECNO 11.550

3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=   1950.0  13410.0  TYPE=    1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
   11.550   42.66   64.39    .00     .00   64.70    .30    .06    .00   49.60
 167500.0 17817.4 102672.3 47010.3 23085.2 18297.0 53823.9 58950.1  6025.1   50.50
    3.04    .77    5.61    .87    .120    .030    .120    .000   21.73   806.23
  .000161    400.   370.   400.      0       0       0    .00  8851.99  9942.02


1490 NH CARD USED
*SECNO 11.569
1530 MANNINGS N VALUES FOR CHANNEL COMPOSITED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.70 ELREA=      67.10

   11.569   40.27   64.37    .00     .00   64.92    .56    .02    .20   68.70
 167500.0      .0 167500.0     .0      .0  27937.2     .0  59091.4  6037.0   67.10
    3.04    .00    6.00    .00    .000    .031    .000    .000   24.10 20258.49
  .000324    100.   100.   100.      2       0       0    .00  1501.35 21759.83
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SPECIAL BRIDGE

SB XK     XKOR    COFQ    RDLEN   BWC     BWP    BAREA     SS      ELCHU   ELCHD
   1.25    2.31    2.60     .00   50.00   46.00 32375.00   20.00   24.10   24.10

CCHV=   .300 CEHV=   .500
*SECNO 11.660
1
  28FEB00    09:51:26                                                PAGE  23


   SECNO   DEPTH   CWSEL   CRIWS   WSELK    EG      HV      HL     OLOSS   L-BANK ELEV
   Q       QLOB    QCH     QROB    ALOB    ACH     AROB    VOL     TWA     R-BANK ELEV
   TIME    VLOB    VCH     VROB    XNL     XNCH    XNR     WTN     ELMIN   SSTA
   SLOPE   XLOBL   XLCH    XLOBR   ITRIAL  IDC     ICONT   CORAR   TOPWID  ENDST


PRESSURE FLOW


 EGPRS    EGLWC     H3     QWEIR    QPR     BAREA  TRAPEZOID   ELLC    ELTRD    WEIRLN
                                            AREA
   65.33   64.92    .06       0.  167500.  32375.   30545.    63.08   69.07       0.



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      68.90 ELREA=      68.20

  11.660   45.10   64.90     .00     .00   65.33     .42     .40     .00   68.90
 167500.0      .0 167500.0     .0      .0  32089.7      .0  59422.1  6054.5   68.20
   3.07     .00    5.22     .00    .000    .035    .000    .000   19.80 20235.85
 .000298    480.    480.    480.       2       0       0     .00 1665.58 21901.44


*SECNO 11.679

3470 ENCROACHMENT STATIONS=    1950.0  13410.0  TYPE=     1  TARGET=   -1950.000
 ELENCL=    57.00  ELENCR= 100000.00
  11.679   43.45   65.18     .00     .00   65.41     .22     .02     .06   49.60
 167500.0  20425.8  94006.1  53068.1  24949.2  18833.9  58662.6  59576.6  6067.2    50.50
   3.08     .82    4.99     .90    .120    .035    .120    .000   21.73  707.64
 .000167    100.    100.    100.       2       0       0     .00 9422.53 10130.17


CCHV=   .100 CEHV=   .300
*SECNO 11.970

3470 ENCROACHMENT STATIONS=    1105.4   9060.0  TYPE=     1  TARGET=    7954.610
 ELENCL=    52.50  ELENCR=     74.80
  11.970   33.92   65.64     .00     .00   65.87     .23     .46     .00   46.60
 167140.0  25182.6  81175.6  60781.8  26804.1  14982.3  67298.7  68166.5  6809.7    44.70
   3.34     .94    5.42     .90    .120    .030    .120    .000   31.72  156.15
 .000148    802.   2118.   5043.       2       0       0     .00 7957.84  8114.00


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  28FEB00    09:51:26                                                PAGE  24



                                               THIS RUN EXECUTED 28FEB00    09:51:26
**************************************
 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Starting form river mile

SUMMARY PRINTOUT

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
.000	.40	.50	3.21	67334.71	7174.17	.87	95.82	3.31
8151.214	.07	.35	3.21	56844.21	5551.63	.00	99.37	.63
9946.853	.00	.00	4.01	43119.80	3485.50	.00	100.00	.00
9947.856	.00	.00	3.90	44353.10	3340.00	.00	100.00	.00
9995.748	.00	.00	3.90	44419.91	3340.21	.00	100.00	.00
9996.754	.00	.00	4.00	43224.65	3485.93	.00	100.00	.00
10004.690	.00	.00	4.01	43208.01	3485.87	.00	100.00	.00
10005.700	.00	.00	3.89	44437.07	3340.26	.00	100.00	.00
10053.680	.00	.00	3.89	44503.28	3340.47	.00	100.00	.00
10054.690	.00	.00	4.00	43311.63	3486.29	.00	100.00	.00
13804.670	1.84	.24	4.58	75558.88	10056.46	67.36	32.62	.02
* 19377.910	1.66	1.06	3.03	87624.09	7496.99	23.76	57.66	18.59
* 25444.160	.75	1.50	4.41	76555.09	10813.46	5.42	58.27	36.31
28120.570	1.48	2.94	6.73	68367.20	9286.80	37.04	33.66	29.30
32497.640	1.34	1.23	7.70	63727.80	7304.08	12.97	63.11	23.91
* 35098.540	2.46	1.16	11.68	42192.61	6188.21	30.74	60.97	8.30
* 41060.420	1.64	1.67	6.08	74315.35	7128.13	14.68	36.98	48.34

VOL	VLOB	VROB	VCH	AREA	TOPWID	QLOBP	QCHP	QROBP
47738.300	.91	1.07	6.38	89532.93	9124.25	8.46	53.80	37.74
50026.040	1.10	1.04	6.03	75033.15	7024.37	9.93	64.01	26.05
* 52247.220	1.81	1.24	8.26	57712.60	6099.74	23.47	58.73	17.80
* 54902.150	.69	1.20	5.74	76453.79	6010.34	6.56	63.31	30.13
* 56816.840	.00	.00	7.97	21032.43	1031.29	.00	100.00	.00
56841.030	.00	.00	7.94	21119.91	1034.40	.00	100.00	.00
* 56901.080	.67	1.13	5.34	83502.93	6199.91	7.61	62.05	30.34
58071.710	.75	.78	5.47	98931.00	9507.42	10.78	63.45	25.77
58950.070	.77	.87	5.61	95206.14	8851.99	10.64	61.30	28.07
59091.420	.00	.00	6.00	27937.22	1501.35	.00	100.00	.00

59422.150	.00	.00	5.22	32089.68	1665.58	.00	100.00	.00
59576.570	.82	.90	4.99	102445.60	9422.53	12.19	56.12	31.68
68166.470	.94	.90	5.42	109085.00	7957.84	15.07	48.57	36.37

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71	149409.40
	4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21	143031.00
	5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80	114001.30
	5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10	113789.00
	5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91	114058.80
	5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65	114454.10
	5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01	114382.20
	5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07	114128.10
	5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28	114395.70
	5.046	1.00	.00	.00	10.60	173080.00	52.02	.00	52.27	2.27	4.00	43311.63	114830.20
	5.585	2847.00	.00	.00	23.70	172610.00	52.75	.00	52.89	2.15	4.58	75558.88	117640.60
*	6.420	4409.00	.00	.00	28.40	171900.00	53.17	.00	53.27	.76	3.03	87624.09	196714.30
*	7.090	3538.00	.00	.00	30.10	171320.00	53.75	.00	53.94	3.09	4.41	76555.09	97402.37
	7.470	2006.00	.00	.00	29.00	171000.00	54.26	.00	54.55	3.61	6.73	68367.20	89996.82
	8.070	2891.14	.00	.00	27.90	171000.00	55.41	.00	56.00	6.11	7.70	63727.80	69164.58
*	8.490	2374.28	.00	.00	35.80	169770.00	57.24	.00	58.56	14.11	11.68	42192.61	45190.79
*	9.410	4858.00	.00	.00	35.50	169330.00	60.44	.00	60.68	2.66	6.08	74315.35	103829.10
	10.580	6177.00	.00	.00	22.10	168330.00	61.60	.00	61.95	2.84	6.38	89532.93	99846.69
	10.860	1478.00	.00	.00	31.70	168090.00	61.93	.00	62.30	2.35	6.03	75033.15	109638.60
*	11.090	1214.00	.00	.00	31.80	167890.00	62.23	.00	62.86	5.59	8.26	57712.60	70988.97
*	11.350	1373.00	.00	.00	28.84	167670.00	63.11	.00	63.44	2.20	5.74	76453.79	112988.40
*	11.380	1373.00	.00	.00	26.80	167670.00	63.27	.00	64.26	4.74	7.97	21032.43	77032.99
	11.390	50.00	68.30	67.20	26.80	167670.00	63.35	.00	64.33	4.69	7.94	21119.91	77413.80
*	11.400	50.00	.00	.00	28.84	167670.00	64.27	.00	64.55	1.78	5.34	83502.93	125670.80

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
11.480	370.00	.00	.00	20.73	167560.00	64.34	.00	64.63	1.42	5.47	98931.00	140704.90
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.70	1.61	5.61	95206.14	131841.60
11.569	100.00	.00	.00	24.10	167500.00	64.37	.00	64.92	3.24	6.00	27937.22	93120.70
11.660	480.00	69.07	63.08	19.80	167500.00	64.90	.00	65.33	2.98	5.22	32089.68	97076.94
11.679	100.00	.00	.00	21.73	167500.00	65.18	.00	65.41	1.67	4.99	102445.60	129519.80
11.970	2118.00	.00	.00	31.72	167140.00	65.64	.00	65.87	1.48	5.42	109085.00	137288.80

Starting form river mile

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3.615	174300.00	50.91	.00	.00	.00	7174.17	.00
	4.745	173330.00	51.74	.00	.83	.00	5551.63	5966.00
	5.026	173080.00	51.97	.00	.23	.00	3485.50	1482.00
	5.027	173080.00	51.99	.00	.02	.00	3340.00	1.00
	5.034	173080.00	52.00	.00	.01	.00	3340.21	47.00
	5.035	173080.00	52.00	.00	-.01	.00	3485.93	1.00
	5.037	173080.00	52.00	.00	.00	.00	3485.87	8.00
	5.038	173080.00	52.02	.00	.02	.00	3340.26	1.00
	5.045	173080.00	52.03	.00	.01	.00	3340.47	47.00
	5.046	173080.00	52.02	.00	-.01	.00	3486.29	1.00
	5.585	172610.00	52.75	.00	.73	.00	10056.46	2847.00
*	6.420	171900.00	53.17	.00	.42	.00	7496.99	4409.00
*	7.090	171320.00	53.75	.00	.58	.00	10813.46	3538.00
	7.470	171000.00	54.26	.00	.51	.00	9286.80	2006.00
	8.070	171000.00	55.41	.00	1.15	.00	7304.08	2891.14
*	8.490	169770.00	57.24	.00	1.82	.00	6188.21	2374.28
*	9.410	169330.00	60.44	.00	3.21	.00	7128.13	4858.00
	10.580	168330.00	61.60	.00	1.16	.00	9124.25	6177.00
	10.860	168090.00	61.93	.00	.33	.00	7024.37	1478.00
*	11.090	167890.00	62.23	.00	.29	.00	6099.74	1214.00
*	11.350	167670.00	63.11	.00	.89	.00	6010.34	1373.00
*	11.380	167670.00	63.27	.00	.16	.00	1031.29	1373.00
	11.390	167670.00	63.35	.00	.08	.00	1034.40	50.00

* 11.400	167670.00	64.27	.00	.92	.00	6199.91	50.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
11.480	167560.00	64.34	.00	.06	.00	9507.42	370.00
11.550	167500.00	64.39	.00	.06	.00	8851.99	370.00
11.569	167500.00	64.37	.00	-.03	.00	1501.35	100.00
11.660	167500.00	64.90	.00	.54	.00	1665.58	480.00
11.679	167500.00	65.18	.00	.28	.00	9422.53	100.00
11.970	167140.00	65.64	.00	.46	.00	7957.84	2118.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 6.420 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 8.490 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 9.410 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.090 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.350 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.380 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 11.400 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

Appendix C Revised Floodplain Maps and Aerial Photo Maps

LEGEND

FLOODWAY BOUNDARY (EXISTING)
100 YR FLOOD PLAIN BOUNDARY (EXISTING)
500 YR FLOOD PLAIN BOUNDARY (EXISTING)
APPROX BOUNDARY OF REVISED 100 YR FLOOD PLAIN (1999 SURVEY)
POTENTIAL AREA IMPACTED BY REVISED FLOODPLAIN BOUNDARY (1999 SURVEY)

Brown & Root Services

Eng'd by Halliburton Tech Services, Inc

0 1000 2000 3000
SCALE IN FEET

REVISED FLOODPLAIN MAP

Appendix D

Site Visit Information for Potential Dredged Fills or Dredged Material Disposal

Trip Report - West Fork San Jacinto River SandPit (Hallett Materials)

Lake Houston Flood Study Project

January 13, 1999

John Saavedra and John Kuo visited a sand pit site operated by Hallett Materials at W. Fork San Jacinto River on January 13, 1999. We met with Frank Johnson, VP Texas Operation of Hallett. Also invited to the site visit was Bill Bellenger of ?? to exchange info regarding the possible use of jet-pump dredging technique.

During the site visit, several pictures were taken and are attached in this report. Frank indicated the sediment damage during the Oct./Nov., 1998 flood was the most serious he ever witness since sandpit operation in mid 1980s, although the flood stage may not be the highest in the area. Various issues were discussed and summarized as follows.

1. The Hallett Materials currently dredges sand from a 450-acre, riverfront private property, 3 miles north of U.S. 59. The operation includes two barge-mounted suction dredge setups using 12-in pump. Near surface sand pocket was reported about 35 feet thick (40-45 feet deep) and was believed to be old river channel deposits. Frank indicated that the operation does not involve any river sediment dredging.

   Reportedly, Hallett currently dredges about 2 million tons of sand per year under 24-hour operation. Material compositions are about 50% fine sand, 50% median and coarser sand, and about 3% (or less) gravels. Demands for median sand as "concrete sand" are sufficiently good. However, demands for fine sand as "mortar sand" or "cement stabilized sand" are only about 40% of the supply. Surplus fine sand was used to fill the pits.

2. Frank indicated the cost of dredging is about $4 per cubic yard (high number) whereas the materials are typically sell for $5 to $6 per cubic yard. The initial setup cost is about $1 million, being mostly equipment.

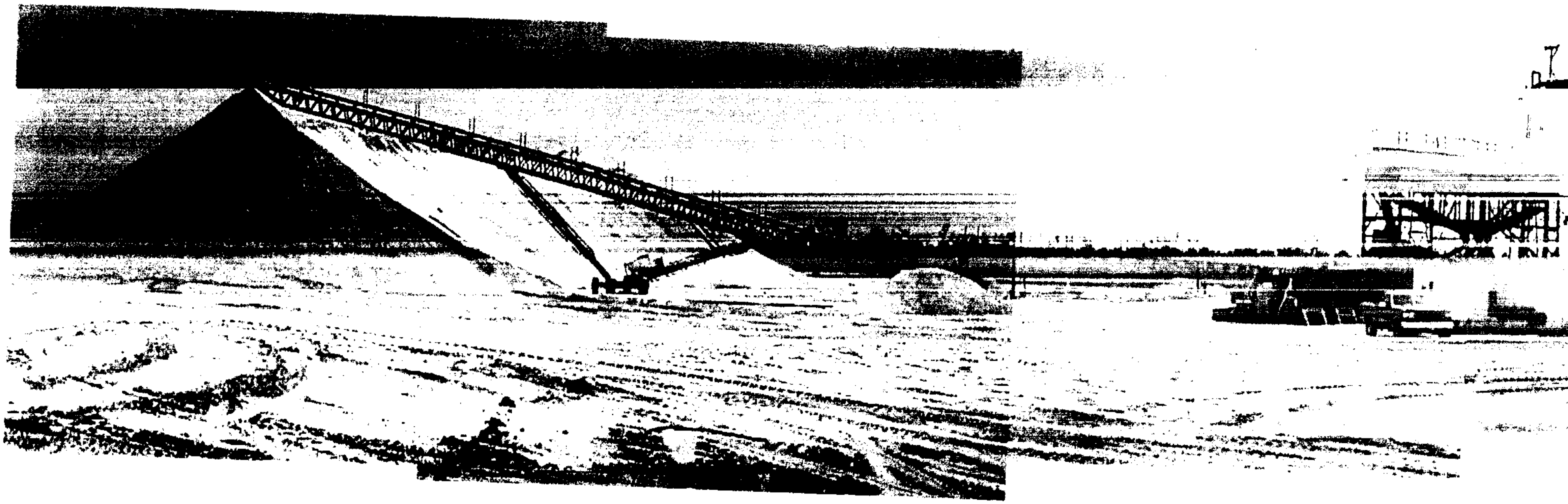
3. Frank indicated that under current dredging rate the sandpit will be completed in about 5 years. Hallett has already found another site (closeby) for future operation. Frank also suggested that Hallett would like to work with the agencies and us to expand the dredging toward the river. Apparently, Frank believes about 40 feet sand exists along the riverbank. By doing so, Hallett would dredge a 40 feet pit adjacent to the exist river and it may be used as a catch basin to mitigate the sediment problem.

4. A pilot-dredging program between 1960 Bridge and US 59 Bridge was discussed to restore the flood capacity. Frank indicated Hallett will pay $0.40 per ton for the materials bring to his site. Hallett would also bid the dredging work if cost can be managed under $4 per cubic yard. Under this option, approximately 7 miles of hauling distance would need to be assessed/provided.

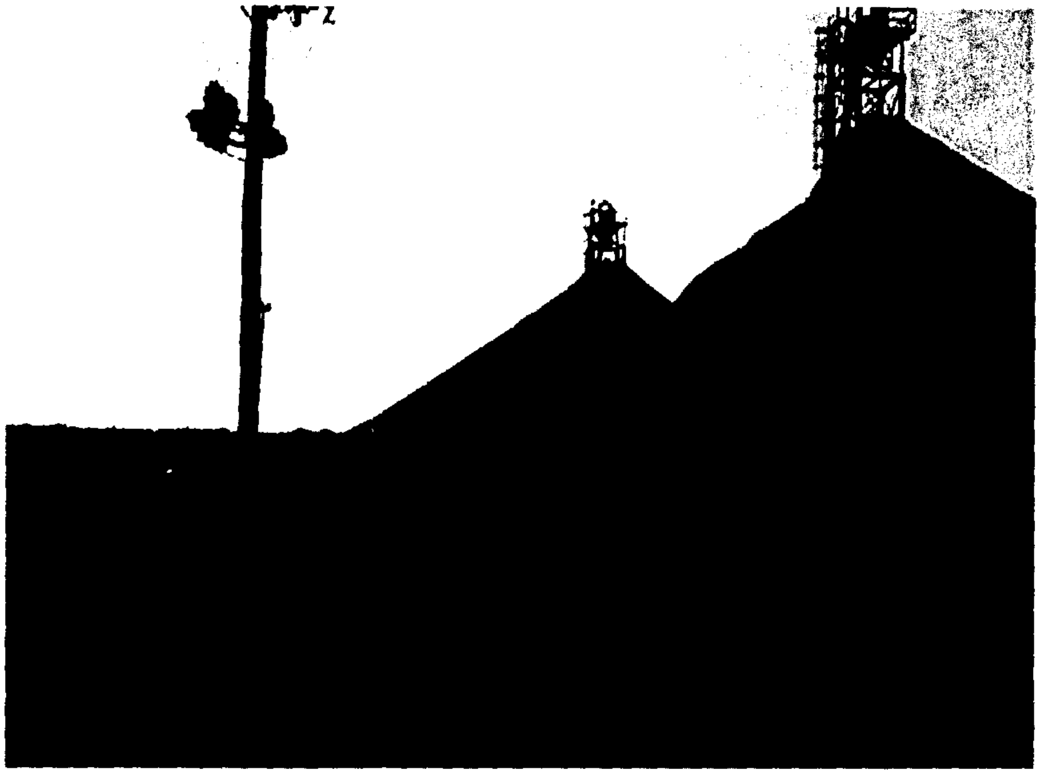
5. Frank also indicated another possibility to handle the dredge material is an old sandpit site about 1.5 miles east of the US 59 off 1960 near Sherwell and Baker Road. This site was previously owned by Hallett. Frank will check on the status of the site.

Cc: Project File (CF-0033)
John Saavedra
Bill Espey
David Parkhill
John Kuo

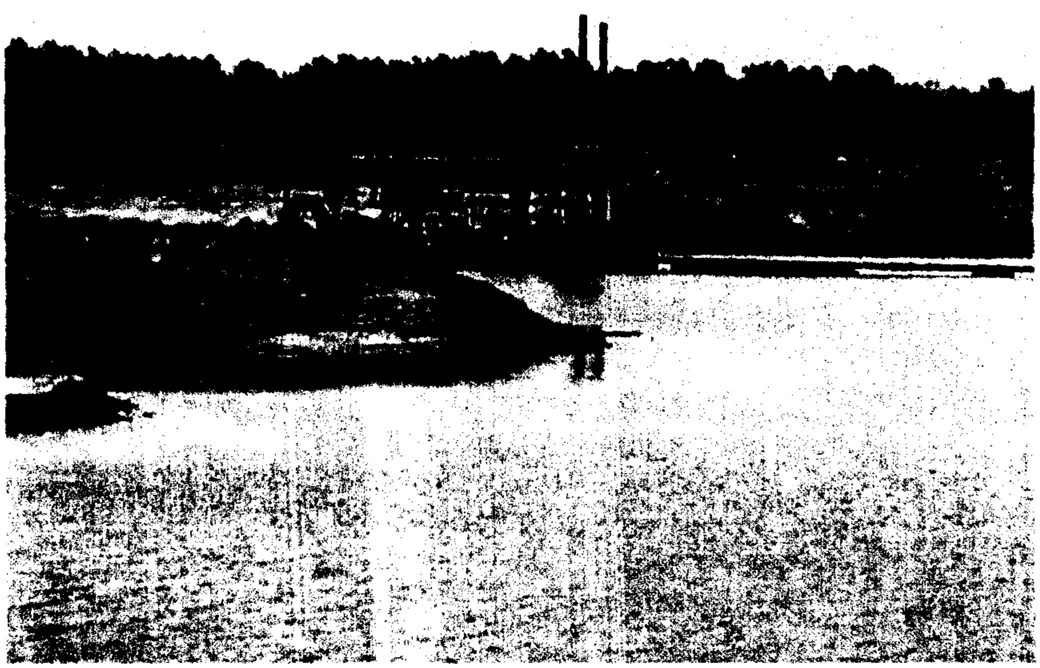
1/13/1999
West Fork San Jacinto River – East Bank at Hallett Sand Pit Property looking West
White Sand Bar (10 ft up from water elev.) is River Sediment from Oct/Nov. 1998 Flood



1/13/1999
Sand Pit Operation (Hallett Material) – Concrete Sand Pile



1/13/1999; Fine Sand Pile



1/13/1999; Hydraulic Dredging Setup w/12" Pump (Output 2 units, 24-hr op., 2M tons/year)

Brown & Root, Services
Interoffice Memorandum

TO: John Saavedra, P.E.
David Parkhill, P.E.

FROM: John Kuo, P.E.
Dan Gise

DATE: October 8, 1999

SUBJECT: Lake Houston Trip Report - Dredge Material Disposal Sites
Project No.: CF-0033

Dan and I visited Lake Houston area on Oct. 6, 1999. The purpose of the trip is to gather preliminary and site specific data about the potential disposal site available for dredged material disposal. Prior to the trip, we did a quick office check using aerial photos, personal communications with some of the sand pit operators who we met before, and HCAD database for potential candidate sites. During the trip, we met a few of the land owners/operators and discussed the optional use of their sites. In general, most people that we talked to are very interested in sharing their sites to support our disposal considerations since most of the sites have limited development value. We also took a few pictures of those sites that we visited. Brief summary of these sites, their conditions, and contact are also attached. This information will be used to conclude disposal site considerations for Lake Houston Report.

Trip Summary and Notes

Property	Notes	Photos
118 Acre property (Ron Holley) Ref: TCB	Most of this area is in the regulatory floodway (75%) and the remainder is in the 100-year floodplain. It has not been impacted by sand quarrying, but has been recently clearcut. This area likely contains large areas of jurisdictional wetlands and may be difficult to permit. Reportedly, the owner has express interest to the Task Force of acquiring about 8 ft of dredge fills.	Photo 1-1
187 acre property (Exxon or Mike Tenzer) Ref: TCB	This area is largely untouched. It has not been quarried or logged. It is surrounded by portions of a golf course and park, including soccer fields. From the very cursory survey of this tract, it does not appear to have the same extent of jurisdictional wetland issues that the tract discussed above has. None of the northern tract is in the 100-year floodplain. Half of the western tract is in the 100-year floodplain. Per our conversations with TCB, the owner has already obtained a permit to cut/fill about 300,000 yds of soils. Scheduled earthwork is planned for the beginning of next year. Timing may be an issue to use dredged fills instead.	None
Nantucket General Homes	We did not visit this site. This tract is approximately 9.9 acres in size. It is located on the east side of US 59 south of the river.	None
Friendswood Development	This is an approximately 62.7 acre site located east of US 59 and south of the river. It has not been clearcut. Most of this site is located in the 100-year floodplain. Southern half of the site may be developable. Good location for dredged fills but may be difficult to implement due to the existing residential development behind the site.	Photo 1-21
Hallett Materials (Frank Johnson, 281-354-2215)	We did not visit this site. The operator has been previously contacted. Hallett's site is a 450 acre size, riverfront property located about 4 miles north of US59 along W Fork. Hallett presently dredges about 1 million yards of sand on site. Hallet showed interest of purchase dredged material from the project. The results of this	None

	communication are reported in out last trip report in April 1999.	
Ramblewood Road (Hubert Bestow, 281-445-5001)	This is a series of several abandoned sandpits. The largest of these pits is located south of a power and pipeline easement. It lacks extensive hydrophytic vegetation and therefore would not likely be claimed as jurisdictional under Section 404 of the Clean Water Act by the Corps of Engineers. The other pits are located north of the power and pipeline easement. The westernmost pit contains a moderate amount of vegetation and large expanses of shallow areas and would likely be considered jurisdictional by the Corps. The other pits have less vegetation and may not be considered jurisdictional. These pits do not appear to be in the 100-year floodplain. The site is about 50 acres with reported depth of 50 ft. The owner is interested in using the site as disposal pit.	Photos 2-18 through 2-21 (south) and 2-22 and 2-23 (north).
Houston Industrial Materials (Gerald Enloe, 281-441-9682)	This site is divided into two operations which occupies about 100 acre of land. The eastern pit is operated by Horace Dixon (281) 441 9682 and Gerald Enloe. It is largely inactive. Genoa Materials operates the western half. The Genoa Materials operation is a fairly new venture. There is not much capacity for material dredged from the river on the Genoa Materials operation. The contact person for Genoa Materials is Jim Pace (281) 802 6075. Houston Industrial Materials owns the site and leases the rights to mine sand to both operators. This site is located in the 100-year floodplain. There are no jurisdictional issues under Section 404 of the Clean Water Act with the Genoa Materials portion of the site. Only a small amount of wetland vegetation is present in the eastern half of the site so the Corps of Engineers is unlikely to claim jurisdiction over this area. Should vegetation begin to establish itself on the eastern portion of the site, the operator should resume operations to reduce the likelihood that the	2-7 through 2-16

	Corps would claim jurisdiction over the site. The presence of abandoned drill pipe indicates that old oil deposits likely underlie these pits. Genoa's dredging plan is to dredge about a total of 1 millions yards of sand on site. They are currently building a new processing plant on site.	
Don Schneider Site (DDS) 281-540-6610	This area is comprised of three large pits, one active and two inactive. The area is located in the floodplain and has been flooded frequently over the last few years. Total site is about 200 acres bounded by the main channel on the north. There may be some jurisdictional issues with inactive pits; however, the amount of vegetation growing in pits is small. Should be able to permit sites. If site is selected, we may wish to have DDS re-activate the pits to avoid issues of Corps jurisdiction. In a conversation between Brown & Root and Mr. Schneider (owner/operator), Mr. Schneider stated that he can place up to 1,000,000 tons of suitable material on-site due to the amount of material removed previously from the site. Due to the proximity and capacity of these sites, they may make suitable disposal areas for material removed from the river. The presence of abandoned drill pipe indicates that old oil deposits likely underlie portions of these pits.	Photos 2-24 and 3-1 through 3-4
Barto Watson Sand Pit 281-446-2459	We did not visit this site. This tract is approximately 8.7 acres in size. It is located on the east side of US 59 and west of the railroad on the south side of the river.	

1-1 118 acre tract by soccer fields. North of channel. Area has been clearout, likely jurisdictional areas present. (Key Map 336-H,M.)

1-2 Area upstream of north Lake Houston Parkway. Showing portion of large island or peninsula.

1-4 Area upstream of north Lake Houston Parkway.
Note Main Channel of river and large island or peninsula.

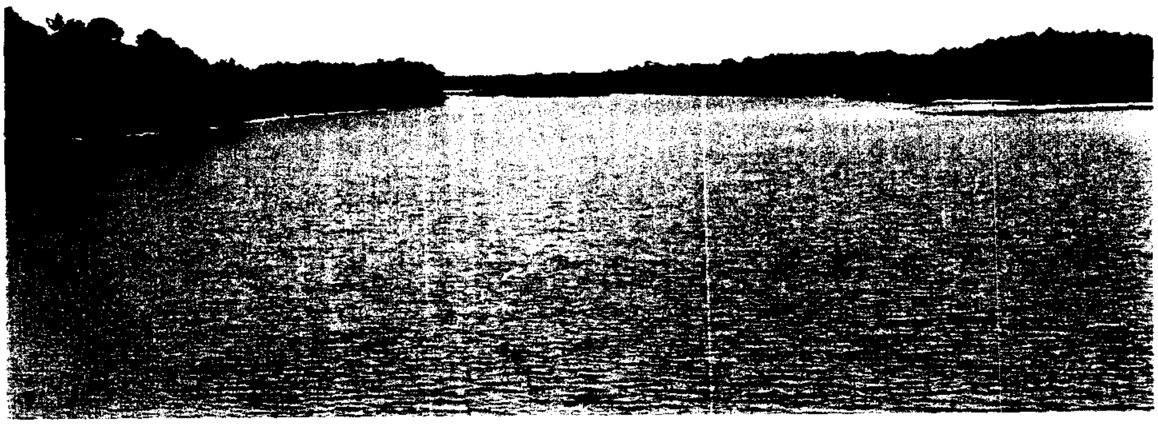
1-5 Photo from northeast side of large point upstream of north Lake Houston Parkway. Photo is looking downstream. South of channel. (Key Map 337-M)

1-8 Photo of Large embayment downstream of Lake Houston Parkway on south side of River. View is downstream to the northeast. (Key Map 337I).

1-14 Downstream of Lake Houston Parkway (South side of River). View is to WSW at upstream end of large, shallow embayment. Area is wet when lake is up.

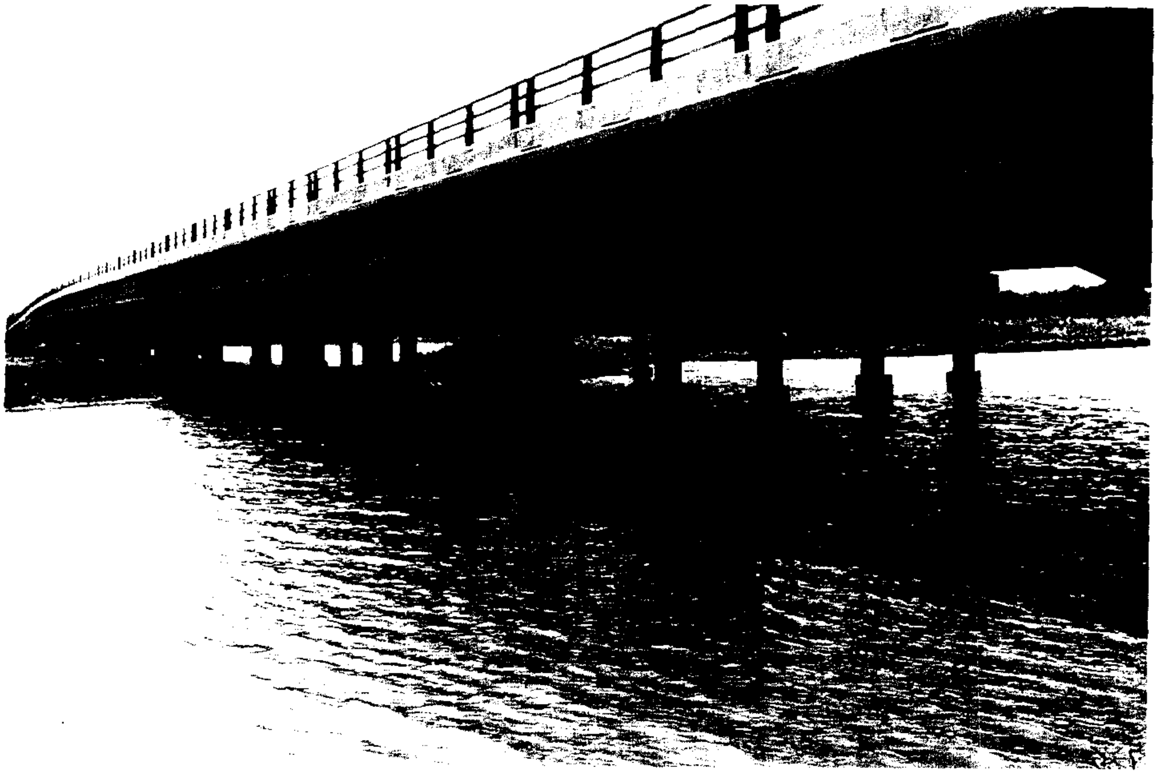
1-15 Island of sediment in channel at north Lake Houston Parkway bridge. View is downstream from north end of bridge.

1-16 Photo 1 of 3 photo panorama. View is down stream from east side, north end of Lake Houston Parkway. Water in picture is portion of main channel, W. Fork San Jacinto.



1-17 Photo 2 of 3 Photo panorama. View is downstream from east Side of north Lake Houston Parkway at main channel, W. Fork San Jacinto River.

1-18 Photo 3 of 3 Photo panorama. Photo is of south downstream bank of main channel. Photo was taken from the east side of the North Lake Houston Parkway bridge over the W. Fork San Jacinto River.



1-22 Photo 2 of 2. Photo panorama. View is across main channel of W. Fork San Jacinto River. View is from east side of north end of North Lake Houston Parkway bridge over main channel of W. Fork San Jacinto.

2-3 Photo 1 of 4 photo panorama. View is to SSW. Body of water in center left side of page is main channel W. Fork San Jacinto River. Photo is from west side of Lake Houston Parkway Bridge.

1-19 View is of south side downstream bank. Note shoaling. Photo was taken from the east side of the North Lake Houston Parkway bridge.

1-21 Photo 1 of 2 photo panorama taken from east side. Photo of north end of Lake Houston Parkway bridge.

2-4 Photo 2 of 4 photo panorama. View is to WSW from west side of Lake Houston Parkway bridge.
Note flock of Roseate Spoonbills on bar in center right of photo.

2-5 Photo 3 of 4 photo panorama. View is to WNW from west side of Lake Houston Parkway bridge.

2-6 Photo 4 of 4 photo panorama. View is to NW from west side of Lake Houston Parkway bridge.

2-11 HIM property. View is to the south southwest. New sandpit processing plant is under construction at background.

2-13 Photo 1 of 4 photo panorama. View is to west of HIM property.

2-14 Photo 2 of 4 photo panorama of Genoa operation from east to north. View is to west northwest of HIM property.

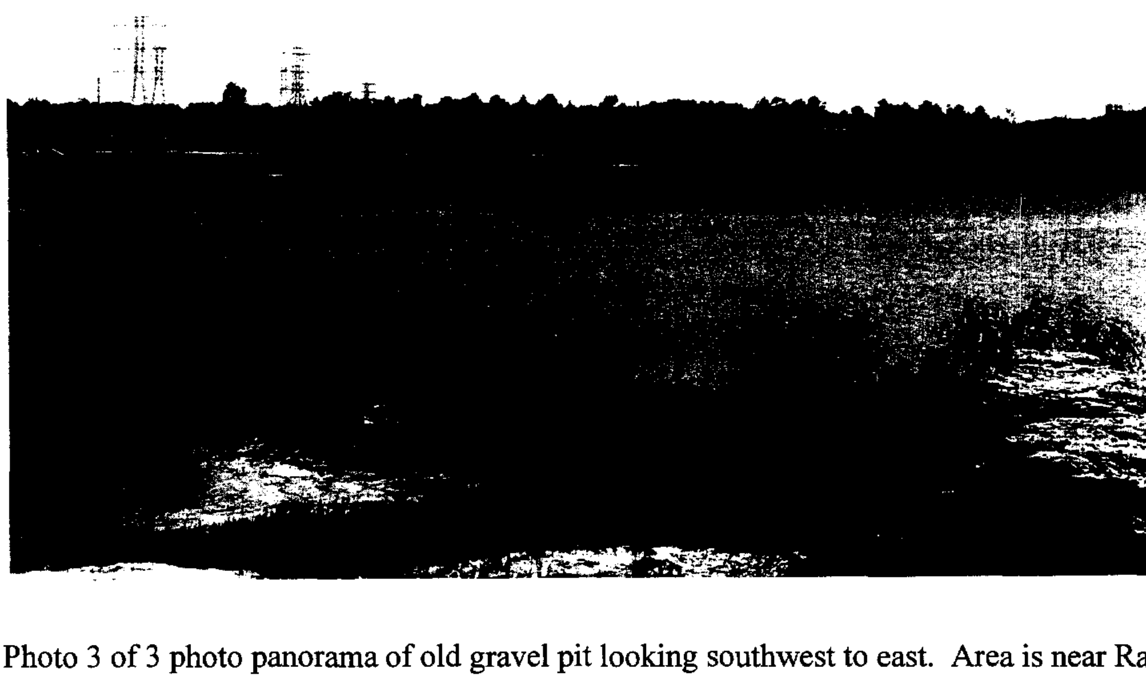
2-15 Photo 3 of 4 photo panorama from west to north. View is to north and northwest of HIM property.

2-16 Photo 4 of 4 photo panorama of Genoa operations looking west to north. View is to north of HIM property. West Fork Channel is behind tree line.

2-17 HIM Property looking east.

2-18 Photo 1 of 3 photo panorama of old pit near Ramblewood subdivision looking southwest to east.
View is to Southwest.

2-19 Photo 2 of 3 photo panorama of old gravel pit looking southwest to east. Note lack of vegetation around shore and in water.



2-20 Photo 3 of 3 photo panorama of old gravel pit looking southwest to east. Area is near Ramblewood subdivision.

2-23 Old gravel pit east of Ramblewood Estates. View is to northeast. (Key Map 336T.)

3-1 Sand processing machinery. Schneider (DDS pit) on east side of property.

3-2 East pit behind DDS office. Pit is inactive. View is to east.

3-6 DDS sand pit active (west) pit. View is from east looking west.

Appendix E Correspondences and Information for Permit Issues

TEXAS PARKS & WILDLIFE

March 8, 2000

Mr. Dan Gise
Brown & Root Services
9900 Westpark Drive
Houston, TX 77063-5169

Dear Mr. Gise:

This letter is in response to your request for information on rare species within or near the proposed regional flood protection study for a Lake Houston flood program. To that end, please find enclosed the annotated list of rare species for Harris and Montgomery counties. Currently, there are no known occurrences within the project area. However, there is a known *Haliaeetus leucocephalus* (Bald Eagle) territory proximal to the project (see enclosed printout) and the project area could be used for foraging purposes. Species with the greatest likelihood for occurrence are marked on the species list. Also of significance are the natural communities, such as bottomland hardwood and upland pine communities, that may exist adjacent to the project. The upland pine communities could support the state and federally listed endangered *Picoides borealis* (Red-cockaded Woodpecker) which has known locations just across the county line in Montgomery County.

Contact Kathy Boydston of the Wildlife Habitat Assessment Program, Wildlife Division (512/389-4581) for a review of fish and wildlife impacts that might result from the proposed alternatives of dredging or other channel work and disposal of spoil.

Given the small proportion of public versus private land in Texas, the TPWD Biological and Conservation Data System (BCD) includes less than a representative inventory of rare resources in many areas of the state; although, it is based on the best data **available** to the state regarding rare species. Thus, these data do not provide a definite statement as to the presence or absence of rare species within your project area, nor can these data substitute for an on-site evaluation by qualified biologists. This information is intended to assist you in avoiding harm to species that may occur on your site. **Please do not include species occurrence printouts in your draft or final documents. Because some species are especially sensitive to collection or harassment, these records are**

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512-389-4800
www.tpwd.state.tx.us

for reference only. This letter does not constitute a review of fish and wildlife impacts that might result from the activity for which this information is provided.

Thank you for the opportunity to comment on this project. Please contact us if you have any questions or need additional assistance (512/912-7011).

Sincerely,

Sandra J. Birnbaum

Sandra J. Birnbaum, Environmental Data Technician
Wildlife Diversity Program, Wildlife Division

Enclosures

HARRIS COUNTY

	Federal Status	State Status
***** AMPHIBIANS *****		
Houston Toad (*Bufo houstonensis*) – endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations	LE	E
***** BIRDS *****		
American Peregrine Falcon (*Falco peregrinus anatum*) - potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon (*Falco peregrinus tundrius*) - due to similar field characteristics, treat all Peregrine Falcons as federal listed Endangered; potential migrant	DL	T
Attwater's Greater Prairie-chicken (*Tympanuchus cupido attwateri*) - this county within historic range; endemic; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July	LE	E
→ **Bald Eagle (*Haliaeetus leucocephalus*)** - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	LT-PDL	T
Black Rail (*Laterallus jamaicensis*) – salt, brackish, and freshwater marshes, pond borders, wet meadows, & grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia		
Brown Pelican (*Pelecanus occidentalis*) - largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Henslow's Sparrow (*Ammodramus henslowii*) - wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county		
Mountain Plover (*Charadrius montanus*) - shortgrass plains and plowed fields (bare, dirt fields); primarily insectivorous; winter resident in this area	PT	
Piping Plover (*Charadrius melodus*) – wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
Reddish Egret (*Egretta rufescens*) – resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear		T
Snowy Plover (*Charadrius alexandrinus*) - wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
? **Swallow-tailed Kite (*Elanoides forficatus*)** - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees		T
White-faced Ibis (*Plegadis chihi*) – prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats		T
White-tailed Hawk (*Buteo albicaudatus*) - near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed		T

Species	Federal Status	State Status
savanna-chaparral; breeding March-May		
Whooping Crane ***(Grus americana)*** - potential migrant	LE	E
Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960		T

*** BIRDS-RELATED ***

Colonial waterbird nesting areas - many rookeries active annually

*** FISHES ***

Species	Federal Status	State Status
Creek Chubsucker (*Erimyzon oblongus*) - small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks		T

*** MAMMALS ***

Species	Federal Status	State Status
Plains Spotted Skunk (*Spilogale putorius interrupta*) - catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie		
Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		T
Southeastern Myotis (*Myotis austroriparius*) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		

*** REPTILES ***

Species	Federal Status	State Status
Alligator Snapping Turtle (*Macroclemys temminckii*) - deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October		T
Atlantic Hawksbill Sea Turtle *(Eretmochelys imbricata)* - Gulf and bay system	LE	E
Green Sea Turtle *(Chelonia mydas)* - Gulf and bay system	LT	T
Gulf Saltmarsh Snake (*Nerodia clarkii*) - saline flats, coastal bays, & brackish river mouths		
Kemp's Ridley Sea Turtle *(Lepidochelys kempii)* - Gulf and bay system	LE	E
Leatherback Sea Turtle *(Dermochelys coriacea)* - Gulf and bay system	LE	E
Loggerhead Sea Turtle *(Caretta caretta)* - Gulf and bay system	LT	T
Smooth Green Snake (*Liochlorophis vernalis*) - Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation		T
Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*) - coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide		
Texas Garter Snake (*Thamnophis sirtalis annectens*) - wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August		

	Federal Status	State Status
Texas Horned Lizard (***Phrynosoma cornutum***) - open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September		T
→ **Timber/Canebrake Rattlesnake** (***Crotalus horridus***) - swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto		T

*** VASCULAR PLANTS ***

	Federal Status	State Status
Coastal gay-feather ***(Liatris bracteata)*** - endemic; black clay soils of prairie remnants; flowering in fall		
Houston machaeranthera ***(Machaeranthera aurea)*** - endemic; seasonally wet, saline barren areas, around the base of mima mounds in coastal prairies, or barren to somewhat vegetated openings in grasslands, including pastures and roadsides, on loamy to sandy loam soils; flowering October-November		
Texas windmill-grass (***Chloris texensis***) - endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall		
Texas meadow rue ***(Thalictrum texanum)*** - endemic; mesic woodlands or forests, including wet ditches on partially shaded roadsides; flowering March-May		
Texas prairie dawn ***(Hymenoxys texana)*** - endemic; in poorly drained depressions or base of mima mounds in open grasslands or almost barren areas on slightly saline soils; flowering March-early April	LE	E
Threeflower broomweed ***(Thurovia triflora)*** - endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November		

LE,LT - Federally Listed Endangered/Threatened
PE,PT - Federally Proposed Endangered/Threatened
E/SA,T/SA - Federally Endangered/Threatened by Similarity of Appearance
C1 - Federal Candidate, Category 1; information supports proposing to list as endangered/threatened
DL,PDL - Federally Delisted/Proposed Delisted
E,T - State Endangered/Threatened
"blank" - Rare, but with no regulatory listing status

Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.

MONTGOMERY COUNTY

*** BIRDS ***

Species	Federal Status	State Status
American Peregrine Falcon (***Falco peregrinus anatum***) - potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon (***Falco peregrinus tundrius***) - due to similar field characteristics, treat all Peregrine Falcons as federal listed Endangered; potential migrant	DL	T
Bachman's Sparrow (***Aimophila aestivalis***) - open pine woods with scattered bushes or understory, brushy or overgrown hillsides, overgrown fields with thickets and brambles, grassy orchards; nests on ground against grass tuft or under low shrub		T
Bald Eagle (***Haliaeetus leucocephalus***) – found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	LT-PDL	T
Henslow's Sparrow (***Ammodramus henslowii***) - wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county		
Red-cockaded Woodpecker (***Picoides borealis***) - cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, & loblolly	LE	E
White-faced Ibis (***Plegadis chihi***) - prefers freshwater marshes, sloughs, and irrigated rice fields, but can be found in brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats		T
Wood Stork (***Mycteria americana***) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960		T

*** FISHES ***

Species	Federal Status	State Status
Creek Chubsucker (***Erimyzon oblongus***) – small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks		T
Paddlefish (***Polyodon spathula***) - prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir		T

*** MAMMALS ***

Species	Federal Status	State Status
Plains Spotted Skunk (***Spilogale putorius interrupta***) - catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie		
Rafinesque's Big-Eared Bat (***Corynorhinus rafinesquii***) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		T
Southeastern Myotis (***Myotis austroriparius***) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		

*** REPTILES ***

Species	Federal Status	State Status
Alligator Snapping Turtle (*Macroclemys temminckii*) - deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October		T
Louisiana Pine Snake (*Pituophis melanoleucus ruthveni*) - mixed deciduous-longleaf pine woodlands; breeds April-September	C1	T
Texas Garter Snake (*Thamnophis sirtalis annectens*) - wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August		
Texas Horned Lizard (*Phrynosoma cornutum*) - open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September		T
Timber/Canebrake Rattlesnake (*Crotalus horridus*) - swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto		T

*** VASCULAR PLANTS ***

Species	Federal Status	State Status
Correll's false dragon-head (*Physostegia correllii*) - wet soils including roadside ditches and irrigation channels; flowering June-July		

LE,LT	Federally Listed Endangered/Threatened
PE,PT	Federally Proposed Endangered/Threatened
E/SA,T/SA	Federally Endangered/Threatened by Similarity of Appearance
C1	Federal Candidate, Category 1; information supports proposing to list as endangered/threatened
DL,PDL	Federally Delisted/Proposed Delisted
E,T	State Endangered/Threatened
"blank"	Rare, but with no regulatory listing status

Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.

TEXAS BIOLOGICAL AND CONSERVATION DATA SYSTEM
TEXAS PARKS AND WILDLIFE DEPARTMENT
08 MAR 2000

AME: HALIAEETUS LEUCOCEPHALUS
COMMON NAME: BALD EAGLE
OTHER NAME:
FEDERAL STATUS: LT-PDL — STATE STATUS: T
GLOBAL RANK: G4 — STATE RANK: S3B,S3N
IDENTIFIED: Y — TRACK: Y — SENSITIVITY: Y
COUNTY: Harris

USGS TOPO MAPS:	TOPO QUAD:	MARGIN #:
CROSBY	2909581	2
HUFFMAN	3009511	1
MOONSHINE HILL	3009512	5
HARMASTON	2909582	5

ELEMENT OCCURRENCE NUMBER: 059 — DATE LAST OBSERVED: 1999
PRECISION: M — DATE FIRST OBSERVED: 1990
OCCURRENCE RANK: — DATE SURVEYED:
SURVEY COMMENTS:

MANAGED AREAS: — CONTAINED:

DIRECTIONS:
LAKE HOUSTON

SCRIPTION:

QUALITATIVE/QUANTITATIVE DATA:
NEST: 101-1A=1990 ACTIVE NEST PRODUCED 0 YOUNG, 1991-92 NEST INACTIVE; 101-1B=1993 NEST ACTIVE?, 1994-96 ACTIVE NEST PRODUCED 1 YOUNG, 1997 ACTIVE NEST PRODUCED 2 YOUNG, 1998 ACTIVE NEST PRODUCED 1 YOUNG, 1999 NEST INACTIVE

MANAGEMENT COMMENTS:

PROTECTION COMMENTS:

OTHER COMMENTS:
TPWD NEST #101-1A AND 101-1B

SOURCE OF INFORMATION:
MITCHELL, MARK. 1999. PROJECT NO. 30: BALD EAGLE NEST SURVEY AND MANAGEMENT. PERFORMANCE REPORT. AUGUST 31, 1999.

THIS FORM REPLACES PREVIOUS FORM 3510-6 (8-92)
See Reverse for Instructions

Form Approved. OMB No. 2040-0086
Approval expires: 8-31-98

NPDES FORM

EPA

United States Environmental Protection Agency
Washington, DC 20460

Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity Under a NPDES General Permit

...ission of this Notice of Intent constitutes notice that the party identified in Section II of this form intends to be authorized by a NPDES permit issued for s... water discharges associated with industrial activity in the State identified in Section III of this form. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit. ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.

I. Permit Selection: You must indicate the NPDES Storm Water general permit under which you are applying for coverage. Check one of these.

Baseline Industrial ☐ Baseline Construction ☐ Multi-Sector (Group Permit) ☐

II. Facility Operator Information

Name: ____ Phone: ____

Address: ____ Status of Owner/Operator: ☐

City: ____ State: ____ ZIP Code: ____

III. Facility/Site Location Information

Name: ____

Is the facility located on Indian Lands? (Y or N) ☐

Address: ____

City: ____ State: ____ ZIP Code: ____

Latitude: ____ Longitude: ____ Quarter: ____ Section: ____ Township: ____ Range: ____

IV. Site Activity Information

MS4 Operator Name: ____

Receiving Water Body: ____

...ou are filing as a co-permittee, ...er storm water general permit number: ____

SIC or Designated Activity Code: Primary: ____ 2nd: ____

Is the facility required to submit monitoring data? (1, 2, 3, or 4) ☐

If You Have Another Existing NPDES Permit, Enter Permit Number: ____

Multi-Sector Permit Applicants Only:

Based on the instructions provided in Addendum H of the Multi-Sector permit, are species identified in Addendum H in proximity to the storm water discharges to be covered under this permit, or the areas of BMP construction to control those storm water discharges? (Y or N) ☐

Will construction (land disturbing activities) be conducted for storm water controls? (Y or N) ☐

Is applicant subject to and in compliance with a written historic preservation agreement? (Y or N) ☐

V. Additional Information Required for Construction Activities Only

Project Start Date: ____ Completion Date: ____ Estimated Area to be Disturbed (in Acres): ____

Is the Storm Water Pollution Prevention Plan in compliance with State and/or Local sediment and erosion plans? (Y or N) ☐

VI. Certification: The certification statement in Box 1 applies to all applicants.
The certification statement in Box 2 applies only to facilities applying for the Multi-Sector storm water general permit.

BOX 1

ALL APPLICANTS:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

BOX 2

MULTI-SECTOR STORM WATER GENERAL PERMIT APPLICANTS ONLY:

I certify under penalty of law that I have read and understand the Part I.B. eligibility requirements for coverage under the Multi-Sector storm water general permit, including those requirements relating to the protection of species identified in Addendum H.

To the best of my knowledge, the discharges covered under this permit, and construction of BMPs to control storm water run-off, are not likely to and will not likely adversely affect any species identified in Addendum H of the Multi-Sector storm water general permit or are otherwise eligible for coverage due to previous authorization under the Endangered Species Act.

To the best of my knowledge, I further certify that such discharges, and construction of BMPs to control storm water run-off, do not have an effect on properties listed or eligible for listing on the National Register of Historic Places under the National Historic Preservation Act, or are otherwise eligible for coverage due to a previous agreement under the National Historic Preservation Act.

I understand that continued coverage under the Multi-Sector general permit is contingent upon maintaining eligibility as provided for in Part I.B.

Print Name: ____ Date: ____

Signature: ____

THIS FORM REPLACES PREVIOUS FORM 3510-7 (8-92)

Please See Instructions Before Completing This Form

Form Approved. OMB No. 2040-0086
Approval expires: 8-31-98

NPDES FORM

EPA

United States Environmental Protection Agency
Washington, DC 20460

Notice of Termination (NOT) of Coverage Under a NPDES General Permit for Storm Water Discharges Associated with Industrial Activity

Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the NPDES program. ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.

I. Permit Information

NPDES Storm Water General Permit Number: ____________

Check Here if You are No Longer the Operator of the Facility: ☐

Check Here if the Storm Water Discharge is Being Terminated: ☐

II. Facility Operator Information

Name: ____________ Phone: ____________

Address: ____________

City: ____________ State: ____ ZIP Code: ____________

III. Facility/Site Location Information

Name: ____________

Address: ____________

City: ____________ State: ____ ZIP Code: ____________

Latitude: ______ Longitude: ______ Quarter: ____ Section: ____ Township: ______ Range: ______

IV. Certification:

I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that are authorized by a NPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

Print Name: ____________ Date: ________

Signature: ____________

Instructions for Completing Notice of Termination (NOT) Form

Who May File a Notice of Termination (NOT) Form

Permittees who are presently covered under an EPA-issued National Pollutant Discharge Elimination System (NPDES) General Permit (including the 1995 Multi-Sector Permit) for Storm Water Dicharges Associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at 40 CFR 122.26(b)(14), or when they are no longer the operator of the facilities.

For construction activities, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with industrial activity from the construction site that are authorized by a NPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

Where to File NOT Form

Send this form to the the following address:

Storm Water Notice of Termination (4203)
401 M Street, S.W.
Washington, DC 20460

Completing the Form

Type or print, using upper-case letters, in the appropriate areas only. Please place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use only one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions about this form, telephone or write the Notice of Intent Processing Center at (703) 931-3230.

RECEIVED

MAR - 3 1999

Brown & Root USFWS ClearLake ES *Services*

9900 Westpark Drive (77063-5169) / Post Office Box 3 Houston, TX

A review of U.S. Fish and Wildlife Service files and your project information indicate that no federally listed or proposed threatened or endangered species are likely to occur at the project site.

Approved: Edith Erfling

Date: April 1, 1999

for Carlos [illegible]
Project Leader, Clear Lake ES Field Office
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058

March 2, 1999

Ms. Edith Erfling
Endangered Species Biologist
U. S. Department of the Interior
Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, TX 77058

Subject: **Regional Flood Protection Study for a Lake Houston Flood Program, Threatened and Endangered Species, Species of Concern and Sensitive Natural Communities**

Dear Ms. Erfling:

Brown & Root is studying the effects of sedimentation in the upper end of Lake Houston on flooding in the surrounding and upstream properties. The study area extends from the Harris/Montgomery County line, just upstream of U. S. 59 on the West Fork of the San Jacinto River in Harris County, Texas to just north of the F. M. 1960 bridge. While any work would occur in the aforementioned area, the effects of the study may extend several miles north of U. S. 59. The project will likely require a Section 404 permit from the U. S. Army Corps of Engineers.

The scope of the study includes investigating various alternatives to reduce flooding in the upper reaches of Lake Houston and the West Fork of the San Jacinto upstream of the Lake. Alternatives may include removal of sediment by dredging or other channel work and disposing of any materials removed. We are seeking your assistance in providing information regarding threatened and endangered species, species of concern, and sensitive natural communities on the project site or within a half-mile radius of this area. We will utilize this information to determine environmental issues associated with each alternative activity, assess the impacts of various alternatives on environmentally sensitive areas and determine which alternatives may be unacceptable. The location of the site has been marked in red on a U.S.G.S. quadrangle map and representations of this map showing the site location are attached. The site is located on the Moonshine Hill quadrangle.

Should you have any questions, please do not hesitate to contact me. I may be reached at (713) 260-3134. Thank you for your assistance.

Sincerely,

Dan Gise

Dan Gise
Brown & Root Services

Brown & Root, Inc.

A Halliburton Company

TEXAS HISTORICAL COMMISSION

The State Agency for Historic Preservation

GEORGE W. BUSH, GOVERNOR
JOHN L. NAU, III, CHAIRMAN
F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

April 6, 1999

Mr. Dan Gise
Brown and Root Services
P.O. Box 3
Houston, TX 77001-0003

Re: Project review under Section 106 of the National Historic Preservation Act of 1966
Lake Houston Flood Program
(COE-VD)

Dear Mr. Gise:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the proposed undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission.

The review staff, led by Bill Martin, has completed its review. Our records indicate that the proposed project area has potential for containing significant archeological sites, but none are recorded on our maps because this area has never been surveyed by a professional archeologist. Therefore, we believe that an archeological survey should be conducted.

We recommend that the areas that will suffer ground disturbance or will be buried by dredged materials should be surveyed by a qualified professional to locate sites that may be present. The survey should be conducted using a survey methodology that conforms to the enclosed survey standards. A report of investigations should be produced in conformance with the Secretary of the Interior's Guidelines for Archaeology and Historic Preservation, and submitted to this office for review.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this federal review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we can be of further assistance, please contact Bill Martin at 512/463-5867.**

Sincerely,

William A. Martin

for
F. Lawerence Oaks, State Historic Preservation Officer

FLO/wam

Enclosure

P.O. BOX 12276 · AUSTIN, TX 78711-2276 · 512/463-6100 · FAX 512/475-4872 · TDD 1-800/735-2989
www.thc.state.tx.us

Memorandum

To: John Saavedra

CC: John Kuo

From: Dan Gise

Date: 05/05/99

Re: Diversion of San Jacinto River for silt removal

I spoke with Kerry Stanley of the US Army Corps of Engineers at approximately 2:00 PM on May 3, regarding rerouting the West Fork of the San Jacinto River through an existing sandpit as a means of removing sediment from the River. The sandpit is located several miles upstream of US 59. Kerry informed me that the West Fork of the San Jacinto is not a navigable river in this area due to the construction of the Lake Houston Dam. For this reason there would be no Section 10 permit required. He also stated that unless there was fill involved, no Section 404 permit would be required. Therefore, the participation of the US Army Corps of Engineers is in doubt.

Kerry suggested that we meet with the Corps to discuss the project with them. They would like to see information regarding the planned bypass area to assist them in determining what the role of the US Army Corps of Engineers in this project would be, if any. He also suggested that we meet with the other regulatory agencies, such as the TNRCC, the TPWD, and the USFWS to collect input from these agencies. Again, our plans for this site would have to be formalized with a good deal of detail prior to this meeting. Kerry suggested that we should also contact the SJRA to gather their input.

In summary, the Corps of Engineers is not likely to be an impediment to development of this bypass; however, we need to discuss the project with the Corps and collect input from the other agencies with jurisdiction over this area.

Dan

Appendix F Public Participation Records

CITY OF HOUSTON

Post Office Box 1562 Houston, Texas 77251-1562

Lee P. Brown, Mayor

Chief of Staff
Office of the Mayor

JIMMIE SCHINDEWOLF, P.E.

Director of Public
Works & Engineering

February 19, 1998

Ms. Janet Qureshi
Office of Congressman Kevin Brady
North District Regional Office
200 River Pointe Drive
Suite 304
Conroe, Texas 77304

Re: Regional Flood Protection Planning Study

Dear Ms. Qureshi:

In response to your letter to Mr. Charles Settle dated February 18, 1998 on the above referenced subject, we will be extremely delighted to have input from the Congressman's office in identifying flood mitigation measures in the Lake Houston watershed.

The City of Houston is currently conducting a Regional Flood Protection Planning Study for the Lake Houston watershed with the help of a grant from the Texas Water Development Board. The coparticipants in this study are Harris County Flood Control District, Montgomery County and the San Jacinto River Authority.

The next progress meeting for this study is set for February 25, 2:30 - 4:00 P.M. in the first floor conference room of the Swift Energy Company Building located at 16825 Northchase Blvd. (Two Greenspoint Plaza). For your information, a draft agenda for the meeting is attached. As the Projects Director for Congressman Kevin Brady, your input at this coparticipants status meeting should be very helpful.

If you need additional assistance or information please let me know or call Harish Jajoo, P.E., of my staff at (713)754-0891.

Sincerely,

Frederick A. Perrenot, P.E.
General Manager
Public Utilities Group
Department of Public Works and Engineering

FAP:REH:HJ:js

cc: Jimmie Schindewolf, P.E.
Ronald E. Hudson, P.E.
Charles F. Settle, P.E.
Fred Garcia, P.E. (H.C.F.C.D.)
Jim Adams, P.E. (S.J.R.A.)
Mark J. Mooney, P.E. (Montgomery County)
Gilbert Ward (T.W.D.B.)
David Parkhill, P.E. (Brown & Root)

Attachment

CITY OF HOUSTON

Post Office Box 1562 Houston, Texas 77251-1562

Bob Lanier, Mayor

CITY COUNCIL MEMBERS: Helen Huey Michael J. Yarbrough Martha J. Wong Jew Don Boney, Jr. Rob Todd Ray F. Driscoll John Kelley Felix Fraga John E. Castillo Gracie Guzman Saenz Joe Roach Orlando Sanchez Chris Bell Judson W. Robinson III CITY CONTROLLER: Lloyd E. Kelley

Chief of Staff
Office of the Mayor

JIMMIE SCHINDEWOLF, P.E.

Director of Public
Works & Engineering

October 16, 1997

Mr. James C. Harding
5010 Sandy Cedar Dr.
Houston, TX 77345

RE: Lake Houston Flood Study

Dear Mr. Harding:

This letter is in response to your concerns expressed in your "Needs Identification Form" regarding the flooding situation in the Lake Houston area.

The City of Houston is currently conducting a Regional Flood Protection Study for the Lake Houston Watershed Area. Brown & Root, Inc., a consulting engineering firm, has been retained to do this study. The study is jointly sponsored and locally funded by the City of Houston, Harris County Flood Control District, Montgomery County, and the San Jacinto River Authority. In addition, the Texas Water Development Board (TWDB) awarded a planning grant to the City for this study.

The main focus of this study is to evaluate various factors contributing to the flooding of the Lake Houston area that includes sedimentation, siltation, and flood plain analyses. The study will provide possible solutions and cost estimates in the final report. Please note that public comments will be received during various phases of this study. You will be notified of these public meetings.

The study is estimated to be completed by March 1999. If you have any other questions on this study, please call Harish Jajoo, PE. of my staff at 713-754-0891.

Very truly yours,

Ronald E. Hudson, P.E.
Senior Assistant Director
Planning & Operations Support
Department of Public Works and Engineering

REH:CFS:HJ:jm

cc: Council Member Rob Todd
Jimmie Schindewolf
Frederick A. Perrenot
Gary Oradat
Maria Lara (Planning & Development)
John Saavedra (Brown & Root)

Printed on Recycled Paper

Carl Masterson 713-627-3200 11/25 (Burnet ... Works/...)

CITY OF HOUSTON

Post Office Box 1562 Houston, Texas 77251-1562

Bob Lanier, Mayor

Chief of Staff
Office of the Mayor

JIMMIE SCHINDEWOLF, P.E.

Director of Public
Works & Engineering

October 16,1997

Mr. Dean Peniche
Greentree Village
4115 Haven Pines Drive
Houston, TX 77345

RE: Lake Houston Flood Study

Dear Mr. Peniche:

This letter is in response to your concerns expressed in your "Needs Identification Form" regarding the flooding situation in the Lake Houston area.

The City of Houston is currently conducting a Regional Flood Protection Study for the Lake Houston Watershed Area. Brown & Root, Inc., a consulting engineering firm, has been retained to do this study. The study is jointly sponsored and locally funded by the City of Houston, Harris County Flood Control District, Montgomery County, and the San Jacinto River Authority. In addition, the Texas Water Development Board (TWDB) awarded a planning grant to the City for this study.

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Very truly yours,

Ronald E. Hudson, P.E.
Senior Assistant Director
Planning & Operations Support
Department of Public Works and Engineering

REH:CFS:HJ:jm

cc: Council Member Rob Todd
Jimmie Schindewolf
Frederick A. Perrenot
Gary Oradat
Maria Lara (Planning & Development)
John Saavedra (Brown & Root)

CITY OF HOUSTON

Post Office Box 1562 Houston, Texas 77251-1562

Bob Lanier, Mayor

Chief of Staff
Office of the Mayor

JIMMIE SCHINDEWOLF, P.E.

Director of Public
Works & Engineering

October 16, 1997

Mr. Philip A. Ruziska
2010 Wind Creek Dr.
Houston, TX 77345

RE: Lake Houston Flood Study

Dear Mr. Ruziska:

This letter is in response to your concerns expressed in your "Needs Identification Form" regarding the flooding situation in the Lake Houston area.

The City of Houston is currently conducting a Regional Flood Protection Study for the Lake Houston Watershed Area. Brown & Root, Inc., a consulting engineering firm, has been retained to do this study. The study is jointly sponsored and locally funded by the City of Houston, Harris County Flood Control District, Montgomery County, and the San Jacinto River Authority. In addition, the Texas Water Development Board (TWDB) awarded a planning grant to the City for this study.

The main focus of this study is to evaluate various factors contributing to the flooding of the Lake Houston area that includes sedimentation, siltation, and flood plain analyses. The study will provide possible solutions and cost estimates in the final report. Please note that public comments will be received during various phases of this study. You will be notified of these public meetings.

The study is estimated to be completed by March 1999. If you have any other questions on this study, please call Harish Jajoo, PE. of my staff at 713-754-0891.

Very truly yours,

Ronald E. Hudson, P.E.
Senior Assistant Director
Planning & Operations Support
Department of Public Works and Engineering

REH:CFS:HJ:jm

cc: Council Member Rob Todd
Jimmie Schindewolf
Frederick A. Perrenot
Gary Oradat
Maria Lara (Planning & Development)
John Saavedra (Brown & Root)

8231 Shoregrove Drive
Humble, TX 77346
September 28, 1997

TNRCC
P.O. Box 13087
Austin, TX 78711-3087
Attn: Barry R. McBee, Chairman

RE: Water Pollution of West Fork of San Jacinto River and Lake Houston

Dear Mr. McBee,

As a landowner living on Lake Houston, and also as a seaplane pilot, I was flying back from a Seaplane Fly-in on Lake Texoma. I was following the San Jacinto River from Lake Conroe to Lake Houston looking for gravel pits that are polluting the river. Today, I noticed very white and cloudy water entering the West Fork of the San Jacinto River at the location below described as Gravel Pit Number 1 at those coordinates. I took four pictures, which I will get developed next week and send them to you. Please look into this immediately, so that we can prevent further polluting of the river and Lake Houston. This leak is coming from the west side of a diked in area southwest of where the machinery is, and is flowing sort of through the woods, then down into the river. This is a definite violation of pollution ordinances. Since I had my camera and GPS I marked this spot with my GPS. The following location was dumping pollutants from their gravel pits into the river:

Gravel Pit No. 1   N 30 ° 09.474'   W 95 ° 22.531'   GPS Point # 42

Gravel Pit No. 1 is just a few miles to the West of Williams Airport in Porter, TX. I am not sure of the names of this gravel pit operator. If you send me a map of the operators on the river, then I would better able to identify the pit polluting. This same pit has continually been in violation of pollution ordinances.

I feel that if these Gravel Pit operators are going to continue to pollute the river, their license to operate these Gravel Pits should be revoked. This is the third time I have found them dumping wastewater into the river. I am getting the aerial photos developed and they will be sent to you as soon as I get them back. In the mean time, I think something should be done about this pollution.

Thank you for your help and I am sure all the homeowners on Lake Houston would much like to see these operators comply with the law. Please call me at 281-852-1035, if I can be of any more help.

Sincerely,

Marshall Gildermaster

Marshall Gildermaster

Cc: Frederick A. Perrenot,, P.E. City of Houston Director of Public Works and Engineering
TNRCC Carl Forrester Fax 512-239-5533

COPY

TEXAS FLOOD CONTROL CITIZENS

Congressman Kevin Brady
200 River Point Drive, Suite 304
Conroe, TX 77305

Dear Congressman Brady:

A study by the Corp of Engineers dated September 1988, reported that flooding along the San Jacinto River and its neighboring tributaries caused 14.2 million dollars of damage annually. Of course this figure was much increased in 1994 and 1998. The loss of lives in Texas, as reported in the Conroe *Courier*, was 21 in the 1994 flood and 27 in the 1998 flood. With the amount of growth and construction in the Harris and Montgomery County areas, as well as else where in Texas, we predict that the number of deaths, financial loss as well as environmental and health damages will substantially increase annually.

The time for action is now. Texas Flood Control Citizens calls upon our legislators to stop this needless loss of lives and money. With your assistance the following projects can and should be initiated:

1. The snagging and over bank clearing of the San Jancinto River would be cost effective according to the *Core of Engineers Study of 1988*. Various types of clearing are illustrated; including that illustrated on page 45 figure 4 of the *Feasibility Report*. Although clearing has been discussed repeatedly in the past, we find that the San Jacinto River Authority has done nothing since the original mandate in 1931. Therefore, we again request that steps be taken to open this natural water way and drainage system.

We request that Texas obtains assistance from the National Guard and the U.S. Army Reserve. This could markedly decrease the cost to clean up the San Jacinto River. A sponsoring agent may be required to be appointed to work with the Adjutant General. We believe this can be done in Texas as it has been done in Louisiana, Iowa and Illinois. Military trainees are required to take at least two to four weeks of training a year. Rather than sending them to other parts of the world, TFCC believes that their assistance should be

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www.tfcc.net

obtained to help right here in Texas. For example, Iowa has done this successfully and they did not even have a levy at the time of their flooding. New Orleans is below sea level and has controlled flooding through the positive steps taken by the Corps of Engineers. Illinois, Mississippi, and Tennessee are the three States we can draw from to get reserve units. Senator Hutchinson of the Armed Services Committee has assisted other States in obtaining military assistance. Now is the time to help Texans.

The snagging and over bank clearing of the San Jancinto River does not have to be performed from River Basin starting at Galveston to Lake Conroe but mainly from Lake Houston to Lake Conroe. Experts have told us this is true because, from Lake Houston down to Galveston, the River Basin is wide enough and deep enough such that little or no additional work need be done.

2. A commercial organization could help fund such a project. They could then process the sand for commercial use, thus creating a win-win environment.

3. An additional solution for many of the homes that are directly in the path of flooding by the San Jacinto River is to create cascading retention ponds or a reservoir between Lake Conroe and Mc Dade Estates. The San Jacinto River Authority and the city of Houston own the Lake Conroe water supply reservoir. Lake Conroe does not contain flood control storage, according to the Corps of Engineers report, but it is the major contributor to flooding in River Plantation, Mc Dade Estates, Artesian Forest and other neighboring communities. Flood control was part of the San Jacinto River Authority original dedicated and mandated written plans. This should have been considered and implemented before construction of the lake and of the dam. The Lake Conroe Dam due to poor planning and/or mismanagement has become a major source of our flooding problems.

We request your assistance in these matters, which we sincerely believe will help alleviate flooding here in Texas.

Very truly yours,

Daniel C. Keesee MD

Daniel C. Keesee, M.D.
President, TFCC

TFCCsenKBH

TEXAS FLOOD CONTROL CITIZENS

Congressman Kevin Brady
200 River Pointe Drive
Suite 304
Conroe, TX 77304

Dear Congressman Brady:

I am a member of T.F.C.C. (Texas Flood Control Citizens). In the last few months, our group has had open meetings with the City of Conroe Engineers, the Montgomery County Engineers, the Montgomery County Commissioner, the Mayor of Conroe, and the Manager of the San Jacinto River Authority. All we've heard is that the only solution to the flooding problems is to raise taxes to buy out flood-prone homes. **WE DISAGREE!**

When Lake Conroe was first proposed in the original legislative documents, which are still in effect, it was for water reserves and **flood control**. This lake is not used for flood control like it should be. In the 1980's, our rainy season was mainly in May and June. But now, in the 1990's the rainy season has been in October and November.

If the water level of Lake Conroe was lowered just one foot during rainy seasons or when there are predictions of storms or heavy rains in our area, this would help tremendously because the lake covers over 100 square miles. In addition, the water entering the lake could be released at a much slower rate than in the past, before the lake starts rising. These actions would reduce flooding on the lake as well as down stream to homes, businesses, roads and bridges. Flooding also causes land erosion, and increases the risk to peoples' lives and health. THESE PREVENTATIVE MEASURES WOULD NOT COST ADDITIONAL TAX DOLLARS.

The revenues on Lake Conroe produce about 5 million dollars per year from water contracts and permit fees. This a drop in the bucket compared to the damages that have been caused in the past with the many floods. The preventive measures, that I suggested above, would help save property values that affect tax revenues, as well as all of the 10's of millions of dollars that it costs FEMA and the taxpayers.

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www.tfcc.net

The cost of the construction of Lake Conroe was paid off approximately five years ago. The Board of the San Jacinto River Authority and its Manager refuse to take the necessary actions to use this lake for any kind of useful flood control. All they want to do is to keep the level of the lake at its maximum designed level to protect their water contracts. They claim that if they let the level of the lake down one foot and they had a drought, then they may lose a few months of the five to seven year water supply they have stored in Lake Conroe. For several years, there has been very little water supplied from Lake Conroe to serve their water contracts. It's about time something is done to change the way the dam, Lake Conroe, and the San Jacinto River Authority are operating.

In 1998, a huge sewer pipe, which is approximately 8 feet in diameter, was installed by the city of Conroe across the San Jacinto River just north of FM 2854. This could also contribute to more flooding in this area.

It has been suggested that clearing the river of old trees, stumps, debris and silt in addition to enlarging the openings under bridges and through roadways would help. However, this may be a long term and costly project and may never be accomplished.

Thank you for your consideration in this matter. We will deeply appreciate any positive action you may take to protect the citizens of Texas from floods.

Yours truly,

Alan R. Schultz

Alan R. Schultz
Vice-President, T.F.C.C.
211 Garden West
Conroe, Texas 77304
409-441-2039

Public Meeting - August 28, 1997

PUBLIC MEETING NOTICE

SUBJECT:	**REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM**
DATE/LOCATION:	August 28, 1997 7:00p.m. - 8:30p.m. Kingwood College (Teaching Theater) 20,000 Kingwood Drive (West of US-59)
SPONSORED BY:	Texas Water Development Board City of Houston Harris County Flood Control District San Jacinto River Authority Montgomery County

AGENDA

7:00 p.m.	Introductory Remarks by City of Houston (Sponsoring Agency)
7:15 p.m.	Project Scope Description presented by Brown and Root, Inc. (Project Consultant)
7:30 p.m.	Public Comments (Five minutes maximum per speaker)
8:30 p.m.	Adjourn

INTRODUCTION: On October 17, 1996, the Texas Water Development Board (TWBD) awarded a planning grant to the City of Houston for a Regional Flood Protection Planning Study. The Study is jointly sponsored and locally funded by the City of Houston, Harris County Flood Control District, Montgomery County and the San Jacinto River Authority. Joint sponsorship agreements are now in place and a Project Consultant has been retained to perform engineering consulting work for the project.

PURPOSE: The purpose of the public meeting is to disseminate information about the project scope and provide a forum for interested parties to provide input to the Lake Houston Flood Study Project Team. Formal written statements or public testimony may be submitted during the meeting which begins at 7:00pm.

BACKGROUND: Lake Houston, completed in 1954, is a major water source for the City of Houston and the surrounding region. The age of the reservoir, record floods in recent years, and increased urbanization have caused a number of conditions to develop in the Lake Houston watershed that need attention. Future development in the watershed is currently governed by multiple overlapping jurisdictions among a number of different government groups and agencies. After every major rainstorm, there are new deposits of fine silt along the channel and in the lake. The regulatory floodplains, as currently designated, need to be re-evaluated and the source and alternative solutions to the siltation and flooding problems in the upstream areas need to be studied. These issues require a regional approach as outlined for this Study.

FOR ADDITIONAL INFORMATION, AND IF YOU WISH TO CONTINUE RECEIVING NOTICES REGARDING THIS PROJECT, PLEASE CONTACT MR. HARISH JAJOO, P.E., SENIOR ENGINEER, CITY OF HOUSTON, 1801 MAIN, 13th FLOOR, HOUSTON, TEXAS 77002, TEL: (713) 754-0891, OR MR. JOHN J. SAAVEDRA, P.E., PROJECT MANAGER, BROWN & ROOT, INC., P.O. BOX 3, BLDG. 03-711C, HOUSTON, TEXAS 77001-0003, TEL; (713) 676-7573.

1) <u>WELCOME</u> (2-3 MINUTES)

A) CALL MEETING TO ORDER

B) INTRODUCE SELF

C) STATE TOPIC OF MEETING:

"REGIONAL STUDY FOR THE LAKE HOUSTON WATERSHED PROGRAM"

D) OUTLINE AGENDA

7:00 PM <u>INTRODUCTORY REMARKS</u>
MR. FREDERICK A. PERRENOT, P.E.
DEPUTY DIRECTOR, PUBLIC UTILITIES
CITY OF HOUSTON

7:15 PM <u>PROJECT DESCRIPTION</u>
MR. JOHN J. SAAVEDRA, P.E.
PROJECT MANAGER, BROWN & ROOT, INC.

7:30 PM <u>PUBLIC COMMENTS</u>
MR. FREDERICK A. PERRENOT, P.E.

8:30 PM <u>ADJOURN</u> (AFTER PUBLIC COMMENTS)

2) PURPOSE OF MEETING (2-3 MINUTES)

A) **PURPOSE**

THE PURPOSE OF THE PUBLIC MEETING IS TO DISSEMINATE INFORMATION ABOUT THE PROJECT SCOPE AND PROVIDE A FORUM FOR INTERESTED PARTIES TO PROVIDE INPUT TO THE LAKE HOUSTON FLOOD STUDY PROJECT TEAM. FORMAL WRITTEN STATEMENTS OR PUBLIC TESTIMONY MAY BE SUBMITTED DURING THE MEETING.

B) **BACKGROUND OF STUDY**

ON OCTOBER 17, 1996, THE TEXAS WATER DEVELOPMENT BOARD (TWBD) AWARDED A PLANNING GRANT TO THE CITY OF HOUSTON FOR A REGIONAL FLOOD PROTECTION PLANNING STUDY. THE STUDY IS JOINTLY SPONSORED AND LOCALLY FUNDED BY THE CITY OF HOUSTON, HARRIS COUNTY FLOOD CONTROL DISTRICT, MONTGOMERY COUNTY AND THE SAN JACINTO RIVER AUTHORITY. JOINT SPONSORSHIP AGREEMENTS ARE NOW IN PLACE AND A PROJECT CONSULTANT HAS BEEN RETAINED TO PERFORM ENGINEERING CONSULTING WORK FOR THE PROJECT.

3) <u>INTRODUCTION OF INDIVIDUALS</u> (2-3 MINUTES)

A) SPONSORS

MR. DON BLANTON, P.E.
MONTGOMERY CO. ENGINEER

MR. JIM ADAMS, P.E.
GENERAL MANAGER
SAN JACINTO RIVER AUTHORITY

MR. ARTHUR L. STOREY, JR., P.E.
EXECUTIVE DIRECTOR
HARRIS COUNTY FLOOD CONTROL DISTRICT
represented by
MR. FRED GARCIA, P.E.
PLANNING DEPT. MGR.

B) V.I.P.'S (to be provided by B&R during meeting)

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4) INTRODUCE **BROWN & ROOT**

A) BACKGROUND DISCUSSION

LAKE HOUSTON, COMPLETED IN 1954, IS A MAJOR WATER SOURCE FOR THE CITY OF HOUSTON AND THE SURROUNDING REGION. THE AGE OF THE RESERVOIR, RECORD FLOODS IN RECENT YEARS, AND INCREASED URBANIZATION HAVE CAUSED A NUMBER OF CONDITIONS TO DEVELOP IN THE LAKE HOUSTON WATERSHED THAT NEED ATTENTION. FUTURE DEVELOPMENT IN THE WATERSHED IS CURRENTLY GOVERNED BY MULTIPLE OVERLAPPING JURISDICTIONS AMONG A NUMBER OF DIFFERENT GOVERNMENT GROUPS AND AGENCIES. AFTER EVERY MAJOR RAINSTORM, THERE ARE NEW DEPOSITS OF FINE SILT ALONG THE CHANNEL AND IN THE LAKE. THE REGULATORY FLOODPLAINS, AS CURRENTLY DESIGNATED, NEED TO BE RE-EVALUATED AND THE SOURCE AND ALTERNATIVE SOLUTIONS TO THE SILTATION AND FLOODING PROBLEMS IN THE UPSTREAM AREAS NEED TO BE STUDIED. THESE ISSUES REQUIRE A REGIONAL APPROACH AS OUTLINED FOR THIS STUDY.

B) INTRODUCE **MR. JOHN SAAVEDRA, P.E.**

TO DISCUSS THE SCOPE IN MORE DETAIL, WE HAVE ASKED THE BROWN & ROOT PROJECT MANAGER – MR. JOHN SAAVEDRA – TO PRESENT A 10-MINUTE OVERVIEW OF THE STUDY THAT THEY WILL BE CONDUCTING.

5) PROCEDURES FOR PUBLIC COMMENT SESSION

A) USE OF MICROPHONE

B) 3-MINUTE TIME LIMIT--------30-SECOND NOTICE

C) WRITTEN COMMENT PERIOD-----2 WEEKS

D) RESPONSE TO COMMENTS

1. NOT HERE TO ANSWER QUESTIONS: HERE TO GATHER INFORMATION

2. IF APPROPRIATE, WILL RESPOND IN WRITING TO INDIVIDUAL COMMENTS

3. WE WILL BE AVAILABLE TO ANSWER QUESTIONS AFTER THE MEETING, IF TIME PERMITS

E) APPEAL FOR COURTESY/RESPECT FOR INDIVIDUAL PRESENTERS

6) CLOSING STATEMENTS

A) THANK YOU FOR ATTENDING

B) SUBMIT YOUR COMMENTS TO THE ADDRESS AT THE BOTTOM OF THE PUBLIC MEETING NOTICE

C) REITERATE INTENT TO CONDUCT ADDITIONAL PUBLIC MEETINGS

- SECOND MEETING IN **MAY 1998**

- THIRD MEETING IN **AUGUST 1998** IN ACCORDANCE WITH THE PROJECT SCHEDULE

D) GOODNIGHT

JOHN J. SAAVEDRA, P.E.

Mr. Saavedra is a Registered Professional Engineer employed with Brown & Root and is the Project Manager for this Study.

His extensive experience consists of employment in various engineering capacities including positions as:

- Manager of the Stormwater Division for the City of Houston
- Senior Engineer, Pct. 4 Project Coordinator with the Harris Co. Flood Control District
- Hydraulic Engineer with the Galveston District, Corps of Engineers.

Now, here is John to present the scope of the project.

Brown & Root *Services*

4100 Clinton Drive (77020-6299) / Post Office Box 3 / Houston, TX 77001-0003

Regional Flood Protection Study for the Lake Houston Watershed Program

Kingwood College
August 28, 1997

Public Meeting Minutes

Mr. Fred Perrenot - (City of Houston) made opening remarks regarding the history of the project and introduced the sponsors.

John Saavedra (Brown & Root) presented an overview of the project with respect to technical objectives, scope and public participation.

Fred Perrenot entertained questions from the audience which are summarized as follows, not necessarily in the order of occurrence:

Roy Schultz discussed the October 1994 flood and expressed support for the project with respect to flood protection in the area. He also expressed concern that the Lake Conroe flood releases may not have been coordinated with downstream flooding conditions during the 1994 flood.

Mike Byers, President Humble Area Chamber, was complimentary in regards to the project objectives. He suggested that consideration should be given to looking at additional flood discharge gates (off to one side) at Lake Houston. This would allow possible draw down of the lake prior to upstream floods.

Allen Potok mentioned that the North Houston Association had not received notices. There was suggestion that there was a conflict with a water rate public meeting and that public notice could be increased through the local education channels and newspapers.

William Kotlam (Alexander Engineering) representing Lazy River Utility Water District in the San Jacinto Basin expressed some concern about Lake Conroe flood releases with respect to compounding flood conditions downstream.

Ty Eckley mentioned the sand deposition on the Kingwood Country Club golf course. The sand was significant, white and very fine grained. He also mentioned the impervious cover controls used by the City of Austin.

Kriss Brink spoke about his long family history of living on the river. His concern was that dredging the river would not be a perrmanent solution because one can't fool mother nature.

Julius Sephus from Atascocita was not flooded during the October 1994 flood. He was complimentary of the project but also cautioned that if dredging reduces the impediment to flow, it could increase flooding downstream.

Marian Burrows and Vicki Flake asked several questions. The thrust of their questions were related to the release of floodwaters from Lake Conroe during the October 1994 flood.

Jim Adams responded to several comments/questions regarding the October 1994 flood. He described the rainfall pattern and drainage areas of Lake Houston (above Lake Houston: 2835 mi^2; above Lake Conroe: 440 mi^2). He also provided a handout of material regarding the October 1994 flood releases.

Meeting was adjourned.

confirm: 15 names in addresses to be added to the label files & Emailed back to you

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Kriss A. Brink — made spoke about living on the river

Mailing Address: 1422 Chestnut Ridge

Street Address: " Forest Cove —
(if not the same as mailing address)

City: Kingwood Zip: 77339

Phone: 359-4161 Fax: "

Organization or Subdivision: Forest Cove

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☑ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: MARIAN BURROWS
Mailing Address: 1700 MAGNOLIA LANE
Street Address: KINGWOOD, TEXAS
(if not the same as mailing address)
City: ______ Zip: 77339-3483
Phone: (281)-358-3033 Fax: ______
Organization or Subdivision: FOREST COVE

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: I am so glad to see everyone trying to work together, to solve this terrible problem. After the flood of Oct. 94 Forest Cove lost over 200 Homes - Very few people have returned. It saddens me, to think that this might happen again - Thank you, for trying to solve this problem.

Marian Burrows.

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Donald David

Mailing Address: PO Box 97

Street Address: ______
(if not the same as mailing address)

City: Humble TX Zip: 77347-0097

Phone: 713-552-7575 Fax: 713-552-6630

Organization or Subdivision: HARRIS County MUD 152

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Ty Eckley (Sports Jacket)
Mailing Address: #8 N. Main
Street Address: ______
(if not the same as mailing address)
City: Kwood Zip: 77339
Phone: 360-5111 Fax: 360-8444
Organization or Subdivision: ______

Would you like to make a Public Statement?
☐ Yes ☑ No — Talked about the City of Austin Study...

If yes, whom do you represent?
☑ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Vicki Flake

Mailing Address: 1111 Forest Cove Dr.

Street Address: Same As Above
(if not the same as mailing address)

City: Kingwood Zip: 77339

Phone: 281-358-2210 Fax: 281 358-5909

Organization or Subdivision: Forest Cove Prop. As.

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☑ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions:

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: CLAY O. HAYNES HC. Pct 4 Project Coordinator.
Mailing Address: HARRIS County Flood Control District
Street Address: 9900 NORTHWEST FREEWAY
(if not the same as mailing address)
City: Houston, TX Zip: 77092
Phone: (713) 684-4000 Fax: (713) 684-4102
Organization or Subdivision: ______

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ______

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Clinton Johnson

Mailing Address: 103 W. Main Humble 77338

Street Address: ____________
(if not the same as mailing address)

City: Humble Zip: 77338

Phone: 281-446-4928 Fax: 281-446-4928

Organization or Subdivision: City of Humble Emerg. Mngmt.

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ____________

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Frank Johnson   Sandpit Operators

Mailing Address: Box 329

Street Address: #1 Hallett Dr
(if not the same as mailing address)

City: Porter TX   Zip: 77339

Phone: 281 354-2215   Fax: 281 354-1906

Organization or Subdivision: __________

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other __________ (please specify)

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: __________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: WILLIAM KOTLAN
Mailing Address: 400 RANDAL WAY Suite 200
Street Address: ____
(if not the same as mailing address)
City: Spring TX Zip: 77388
Phone: 281-350-7027 Fax: 281-350-7035
Organization or Subdivision: ALEXANDER ENGINEERING

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☒ Other LAZY RIVER I.D. *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: ____

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Alan Dotok

Mailing Address: ~~[illegible]~~ P0120069

Street Address: 5767 Woodway
(if not the same as mailing address)

City: Houston Zip: 77257

Phone: 267-2955 Fax: 267-7110

Organization or Subdivision: Hunters Village

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☒ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: ED RAINEY

Mailing Address: 3138 LAKE CRESCENT DR.

Street Address: ______________________
(if not the same as mailing address)

City: KINGWOOD, TX Zip: 77339

Phone: 281 358-6612 Fax: 281-358-0694

Organization or Subdivision: KINGWOOD LAKES

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ______________________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ______________________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Scott Saenger

Mailing Address: 6335 Gulfton #200

Street Address: ____________________
(if not the same as mailing address)

City: Hou Zip: 77081

Phone: 713 777 5337 Fax: 713 777-5976

Organization or Subdivision: ____________________

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☑ Other Engineer *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ____________________

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: ROY LEE SCHULTZ

Mailing Address: 10102 CANTERTROT DR.

Street Address: ______________________
(if not the same as mailing address)

City: HUMBLE Zip: 77338-2202

Phone: 281-446-2308 Fax: ______________________

Organization or Subdivision: NORTHSHIRE

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ______________________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: I WOULD ASK THAT A STATEMENT AS TO WHERE FUNDING MAY COME FROM TO RESOLVE NEEDS, IF SOME NEEDS ARE FOUND.

SOME TIME FRAMES?

Regional Flood Protection Study for a
Lake Houston Watershed Flood Program

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: JULIUS R. SEPHUS

Mailing Address: 7418 MAPLE WALK DR.

Street Address: ____________
(if not the same as mailing address)

City: Humble Zip: 77346

Phone: 281-852-0154 Fax: ____________

Organization or Subdivision: HCMUD # 152

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☐ Yes ☐ No

Comments/Questions: ____________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: FREDERICK A. PERRENOT

Mailing Address: PO Box 1562

Street Address: ______________________
(if not the same as mailing address)

City: Houston Zip: 77070

Phone: 713/754-0501 Fax: ______

Organization or Subdivision: COH

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other ______
(please specify)

Would you like to receive future notices regarding this project?
☐ Yes ☐ No

Comments/Questions: ______________________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: RON WYATT Floodplain Admin / Mont. Co.

Mailing Address: 301 N. THOMPSON STE 208

Street Address: ____________________
(if not the same as mailing address)

City: CONROE Zip: 77301

Phone: 409-539-7836 Fax: 409-539-7802

Organization or Subdivision: MONTGOMERY COUNTY

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ____________________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: FREDERICK A. PERRENOT
Mailing Address: PO Box 1562
Street Address:
(if not the same as mailing address)
City: Houston Zip: 77070
Phone: 713/754-0501 Fax:
Organization or Subdivision: COH

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other ______
(please specify)

Would you like to receive future notices regarding this project?
☐ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: David Parkhill Brown & Root

Mailing Address: PO Box 3

Street Address: ______________________
(if not the same as mailing address)

City: Houston Zip: 77001

Phone: ~~[illegible]~~ 6764613 Fax: 6764679

Organization or Subdivision: Brown & Root

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☑ Other Brown & Root *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: ______________________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: MIKE BYERS

Mailing Address: 110 W. MAIN ST

Street Address: ______
(if not the same as mailing address)

City: HUMBLE   Zip: 77338

Phone: 281-446-2128   Fax: ______

Organization or Subdivision: HUMBLE AREA CHAMBER

Would you like to make a Public Statement?
☐ Yes   ☐ No

If yes, whom do you represent?
☐ Self   ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes   ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, August 28, 1997
Kingwood College (Teaching Theater)

Attendance Record

Name: Jim Adams
Mailing Address: PO Box 329
Street Address: ______
(if not the same as mailing address)
City: Conroe, Tx Zip: 77356
Phone: 409/588-1111 Fax: 409/588-3043
Organization or Subdivision: SJRA

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☒ Other SJRA *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: ______

Public Meeting - April 8, 1999

Summary – April 8, 1999 Public Meeting
Flood Protection Planning Study for Lake Houston Watershed

- Attendants – more than 160

- Representatives from Public Agencies –

Mike Byers	President, Humble Area Chamber of Commerce
Gilbert Ward	Project Manager, TWDB
Chuck Settle	Sr. Assistant Director, City of Houston
Jim Adams	General Manager, San Jacinto River Authority
Fred Garcia	Planning Dept Manager, Harris Co. Flood Control District
Bud Taylor	Councilman Office, Rob Todd
Addie Wiseman	Councilman Office, Rob Todd
Heatner Montgomery	Congressman Office, Bradey

- Representatives from Other Entities –

Judi Arbogast	Kindwood Observer
Suzanne West	Register Newspapers
Ty Turner	Jones & Carter
Erik Spencer	Van DeWiele Engineer
Joseph Stunja	President, Friendswood Development
Phillip Stika	Manager, Kingwood Country Club
Larry Smith	Member, Energy and Water Conservation Corp.
Marilyn Taylor	Member, Parks Board of Kingwood
Henry Boyle	Montgomery MUD #15
Gary Montgomery	North Houston Association

- Questions/Comments (total 25 formal comment sheets received)

(1) Comments

- Support unified efforts to get funding for problem solving (R. Schults/Northshire)
- Suggest C.O.H. to install gates at Lake Houston dam and to offer suggestion and actions for handling emergencies in flooded area (Penny Bowes/Belleau Wood)
- Project scope is too limited; Concern of shoreline problem at downstream of Lake Houston Parkway; Dredging of 1960 bridge (P. Ruziska/Fosters Mill)
- Project is 10 years too late; C.O.H. is too slow responding to the issue (M. Riener)
- Concerns of remediation and future basin (M. Taylor)
- Sand pit operation may have caused the flood (The Bertrands/River Club Estates)

- Suggest to use non-destructive places for excess water storage during flood (The Phelans/Kings Point Cove)

- Like buyout option (B. Austin/Forest Cove)

- Interested in information of B&R's flood study (3)

- Concerns about flood above elev. 60 feet; Suggest to develop real time prediction system for flood crest level (K. Hilarides/Forest Cove)

(2) Questions

<u>Flood Study</u>

- What is the gradient between Hwy 59 to Lake Houston dam? What was the maximum elevation of water over the Lake Houston dam in 1994 flood? (J. Weisinger/Kingwood Lakes)

- Are the benefits additive? How can we limit new siltation sources from upstream due to new developments in Montgomery Co.? (H. Boyle)

- What is the status of COE's channelization project on Cypress Creek? Any impact to W. Fork? What enforcement procedures may be implemented to minimize construction impact (debris and sands) from Montgomery County? (B. Borchardt/Kings Manor)

- Who is responsible for removing debris at the bridge crossings? (J. Juneman/Forest Cove)

- What is the impact of flood protection project on Gleneagle Subdivision and Montgomery MUD #15? (H. Boyle/M. Cox)

- What is the impact of subsidence on flooding? How long would it be for re-dredging? As a long-term solution, can Lake Houston be converted to a flood control reservoir? Cost? (J. Boyer/ Kingwood Lakes)

- Would like to have someone call her for answers of (1) a review cope of the study, (2) a list of previous studies, (3) how costs are weighted in the study, and (4) does the study address the requirements of runoff in Montgomery? (M. Martin/Kingwood)

- When does study be complet and work begin? (S. Towne/Kings Forest)

Buyout

- Why does the City still allow Ron Holley (builders) building houses in flooded area (outlined area of Deer Ridge Sub.)? (M. Burrows/Forest Cove)

- What will happen to the Lakeside properties not brought out in 1994 flood? Why can't Ben's Branch be opened for natural drainage to the river? (M. Eberle/Lakeside)

- Can Kingwood F. FA Ag Barnes (school) be buyout? Is there any grant money available? Why does the City still allow developer to build houses in flooded area (south end of Woodland Hills Dr.)? (The Turners/Trailwood)

Lake Conroe Reservoir

- Who control water level in Lake Conore? Has it changed in recent years? (D. Fonseca)

LAKE HOUSTON PUBLIC MEETING

SIGN - IN.

NAME	ADDRESS	PHONE #
JOHN J. SAAVEDRA	B&R	713-260-3244
~~RAY ANDERSON~~	~~1819 GOLDEN LEAF KW77339~~	281-359-3745
Vicki Flake	1111 Forest Cove	281-358-2210
Bettye Norman	1721 Mustang	281-358-1845
Marian Burrows	1700 Magnolia Ln.	281-358-3033
Bud Taylor	CM/TODD	713-247-2008
JUSTIN BERNDT	ATASCOCITA	281-852-2066
TONY GELDENS	4545 KINGW. DR #2002	281-360-7598
MIKE MATHENA	400 RANDAL WAY #200	281-350-7027
Robert Williams	3 838 N SAM HOUSTON PKWY #310	281 447 1600
OWEN H. PARKER	5406 UPPER LAKE DR, HUMBLE	281 852-2102
ED SHACKELFORD	22540 ALDINE WESTFIELD	281-358-8100
BARRY BROCK	102 Granberry Humble.	281-446-2327
MARK J. MARTIN	114 W. HIGGINS	281-446 3861
DAVID C. COWE	810 KINGWOOD DRIVE	281-358-2111
J.R. & Gloria Bertrand	20042 OLDS Drive	281 358 8814
Elliott Norton	20014 Russell Dr.	281-358 1504
Michael S. Sullivan	PO BOX 339 Channelview TX 77530	
Joe & Lynda Turner	2006 Shady Branch KW	77339
JoAnn McDonald	1320 Palmetto Lane Kingwood, Tx	281 358 3706
SHIRLEY & AL EGGLESTON	1331 HICKORY LN. FOREST COVE	281 358 35
Vera Myers	18915 Key Tower - #46 -	
Debbie Malone	19220 LAKESHIRE Dist #46	
John F. Miller	1420 Sycamore Lane	281 358 3265
Henry Boyle	17086 Cleneagle Dr	409 273 4697
Millie Cox	25 Swan Court	409 273 4675
Jean & Ralph McLeod	1221 Buttercup	281-358-380
CHARLES F. Settle	City of Houston	(713) 837-045

JAMES BAILEY 3838 N. SAM Houston PKY E, Suite 295 Houston 281-442-5300

Perry Bowers 20142 Belleau Wood Dr. Humble 281-852-8215

Ross Blair 7502 Pinehollow Dr. Humble 281-319-4000

✓ Oscar Bierman 11315 Dogwood Humble 77338

✓ David Fonseca 3211 White Blossom Humble, 77338

✓ Dennis Johnston 20634 Kenswick Drive Humble 77338

✓ Doug Stanley 777 Post Oak #200 H, TX 77056

✓ Joe Castillo 3903 Valley ~~Haven~~ D Kingwood TX 77339

~~Julie Arbogast Kingwood Observer~~

~~Roy Lee Schultz Northshire - Resident~~

✓ A.G. Pete Hinojosa 1730 Buttercup Kingwood Tx

✓ Gary Montgomery 2609 Crossvine, Woodlands, TX 77380

✓ Jim + Linda Phelan 1530 Scenic Shore KW 77345

✓ Jack + Annette Doggett 1211 Hickory Ln Kingwood 773

✓ David Vogt 1544 Sawdust Woodlands 7738

~~Joan Rogers 3138 Lake Crescent Kingwood, Tx~~

~~Suzanne West Register Newspapers~~

✓ Ron Appleby 1218 Chestnut Ridge Kwood 79

✓ Jerry + Diane Marsh 18683 Clover Path Porter Tx. 77365

✓ David Woerner 5507 Cedar Bay Dr Kingwood 77345

✓ Phillip P Stika 1700 Lake Kingwood Trl. K Tx 77339

✓ Frank Gallardo 1648 Lake Shore Dr Kingwood Tx 77339

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April 8, 1999
Lake Houston Flood Study
Public Meeting

mailing list

W C BLAYNEY –

√ Tom Childers — 2239 Tangle Lake Ln KW 7733[illegible]

√ Jim + Sue Fowler — 2611 Royal Circle Kingwood 77339

√ Beth Austin — 1511 Hidden Hill, 77339 Forest Cove

√ Mary Howell — 1400 Buttercup 77339

√ Terry Thompson — 5219 Maple Terrace Kw 77345

√ Tim Bates — 19506 Spoonwood Dr Hum 77346

√ Wilson Sparks — P.O. Box 3126 Humble 77347

Lake Houston Flood Study

Public Meeting 4/8/99

SIGN-IN LIST

Sharon Fleke 1210 Cypress Ln. 281 356 4201

Marilyn Taylor 2107 Seven Maples 281 360-7182

Bob & Audrey Borchardt 26869 Palace Pines 281 359 8093

Ram Weedon 20206 Belleau Wood Dr. 77338 281-852-8288

Mitsy Stumpf 3506 Lakelane Dr 77338 281-852-8333

Maritee Martin 5914 Elmwood Hill Ln 77345 281-360-2546

Barry [illegible] 2925 Briar Park Hou. Tx 713-782-0042

Wayne & Wanda McCann 2922 River Bend 281-358-3409

Robert F. [illegible] 19311 [illegible]wood Ct. Humble Tx 281-852-3949

Shawn Wagganer 23480 Ivy Ridge Porter 281 354-4150

✓ Bill Gates 4519 Elmstone Ct Kingwood 281-360 [illegible]

✓ Norma Payne 1914 Lazy Grove Kingwood 77339

✓ Daryl Porter 3414 Upperlake Humble 281 852 1657

Lila Foster 3206 Sunny Knoll 281 358 2224

Frank & Betty Ayer 26488 Lori Ln Porter, TX 281-358-3685

✓ Ed Rainey 3138 Lake Crescent Dr, K/W 281-354-6612

✓ May Murphy 3327 Southshore Humb. 281-852-0587

✓ Phil Ruziska 2010 Wind Creek Dr, Kingwood 281-360-7991

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

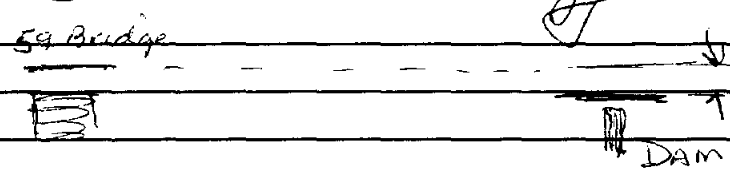
Name: M/rs J. C. WEISINGER
Mailing Address: 6 FOREST SHORES DR 77339
Street Address: ______
(if not the same as mailing address)
City: KINGWOOD TX Zip: 77339
Phone: (281) 358-7885 Fax: (281) 358-7255
Organization or Subdivision: Kingwood LAKES

Would you like to make a Public Statement?
☒ Yes ☒ No
question only

If yes, whom do you represent?
☒ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:
1) During the 1994 flood what was the maximum elevation of water going over the Lake Houston dam.
2) What is the elevation of the top of the dam
3) When the water going over the dam was maximum what was the elevation of the water at the R.R track near Hwy 59.



gradient from Hwy 59 to dam.

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: JAIN BOYER
Mailing Address: 3138 LAKE CRESCENT
Street Address: ~~KINGWOOD, TEXAS 77339~~
(if not the same as mailing address)
City: KINGWOOD, TX Zip: 77339
Phone: 281-358-6612 (h) Fax: 281-358-0694
Organization or Subdivision: KINGWOOD LAKES

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions:
(1) HAS ANY MEASUREMENT BEEN DONE ON SUBSIDENCE? IS THERE ANY EVIDENCE THAT THIS MAY BE CONTRIBUTING TO THE BLOCK?
(2) IT SEEMS THAT ANY DREDGING OPERATIONS WOULD BE AT BEST SHORT-TERM, SINCE THE SEDIMENT LOAD AT CYPRESS CREEK IS VERY HIGH, WON'T IT JUST KEEP RE-SILTING & AND RE-ACCUMULATING? HOW LONG WOULD IT BE BEFORE RE-DREDGING WERE REQUIRED?
(3) AS A LONGER-TERM SOLUTION, ~~COULD~~ WHAT WOULD BE THE COST OF CONVERTING LAKE HOUSTON DAM TO A FLOOD CONTROL DAM? THE IDEA IS:
(1) ALLOW MORE FLOW-THRU ~~OF~~ AT DAM DURING FLOOD TIMES
(2) FACILITATE FLUSHING OF SEDIMENT DOWN TO ~~GO~~ THE BAY

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: DAVID FONSECA

Mailing Address: 3211 WHITE BLOSSOM

Street Address: ______
(if not the same as mailing address)

City: HUMBLE Zip: 77336

Phone: 281-812-6683 Fax: ______

Organization or Subdivision: ______

Would you like to make a Public Statement?

☒ Yes ☐ No

QUESTION

If yes, whom do you represent?

☒ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☐ Yes ☐ No

Comments/Questions:
WHO CONTROLS THE WATER LEVEL IN LAKE CONROE AND WHY HAS IT CHANGED IN RECENT YEARS

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Marilee Martin

Mailing Address: 5914 Elmwood Hill Ln.

Street Address: ____________
(if not the same as mailing address)

City: Kingwood   Zip: 77345

Phone: 281-360-2546   Fax: ____________

Organization or Subdivision: Kingwood

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: Where can I review a copy of the preliminary report?
I would like to get a list of the studies done earlier re: River flooding
When costs are quantified in the study are you also weighing/quantifying the benefits of the option (ie, buyout costs, decreased land values, tax role issues, highway reconstruction areas).
Why are requirements for water runoff in Montgomery County addressed in this study? Runoff - both quantity and speed are issues.

Could someone please call me to answer these questions

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Joe & Lynda Turner
Mailing Address:
Street Address: 2006 SHADY BRANCH
(if not the same as mailing address)
City: KINGWOOD Zip: 77339
Phone: 281-359-4507 Fax: 281-359-7887
Organization or Subdivision: TRAILWOOD - KINGWOOD

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: (1) The Kingwood F.FA Ag Barns flooded in 1994 & 1998 with approx. 5 ft. of water. Is there the possibility of a buy-out of this school property? If not, is there any grant money available to be used to move to a new location.
(2) How can a developer build houses in an area that has flooded in 1994 & 1998? Is there no law to keep this from happening? This looks like a waste of tax money, to do a future buy-out. The houses are being built in Kingwood off of the south end of Woodland Hills Dr.

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: MICHAEL R. EBERLE
Mailing Address: P.O. BOX 1897 HUMBLE, TX 77347
Street Address: 21768 E. KNOX DR. PORTER, TX 77365
(if not the same as mailing address)

City: ______ Zip: ______

Phone: 281-358-3609 Fax: 281-354-8294

Organization or Subdivision: LAKESIDE SUBD AND OAK LANE AC. PORTER

Would you like to make a Public Statement?
☑ Yes ☐ No

If yes, whom do you represent?
☑ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions:
1. What will happen to the Lakeside property not bought out & in the 1994 flood way?
2. Why can't Bens Branch be opened up to recall its natural drainage to the river?

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Susan Towne

Mailing Address: 2611 Royal Circle Kingwood 77339

Street Address: ______________________
(if not the same as mailing address)

City: ______________ Zip: ______________

Phone: 281-359-3201 Fax: ______________

Organization or Subdivision: Kings Forest

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☒ Self ☐ Other ______________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:
When do you anticipate your analysis will be complete & work on the project(s) will actually begin?

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: MARIAN BURROWS

Mailing Address: 1700 MAGNOLIA LANE

Street Address: ______________________
(if not the same as mailing address)

City: KINGWOOD TX. Zip: 77339-3483

Phone: (281) 358-3033 Fax: ______________

Organization or Subdivision: Forest Cove Property Owners association

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☑ Self ☐ Other ______________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: How can city of Houston, allow builders, such as Ron Holley - to build a large development - in a flood way? In the 94 flood + the Oct 98 flood, where he is building off of Hamblen Rd. in Forest Cove, → down near River Grove Park. in K.W. as well as Woodlyn Hill subdivision, where both of these areas flooded. New homes are being built in flood prone areas on Hamblen Rd - The wrought iron fence was flattened all the way down Hamblen Rd - that outlined Deer Ridge Subdivision - The water was so strong. The same thing will happen in his (Holley's) Newest area Water got up to 5-6 feet in that area - where the New 2 story homes are being built, the bottom floor is going to flood - I have seen the silt + [illegible] on the trees. I + we do not want to keep -

4-8-1999

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: ROY LEE SCHULTZ
Mailing Address: 10102 CANTERTROT DR.
Street Address: ______
(if not the same as mailing address)
City: HUMBLE, TEXAS Zip: 77338-2202
Phone: 281-446-2308 WORK-281-376-6202
Organization or Subdivision: NORTHSHIRE = HUMBLE

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: HAVING LIVED ALONG THE CYPRESS CREEK BANKS - FOR 25 YEARS THEN IN ~~NORTH SHIRE~~ NORTHSHIRE - IN HUMBLE SINCE = JUNE 1, 1973. I PLEAD THAT OUR 'UNIFIED EFFORTS AND COMMON INTEREST TO MAINTANE AND IMPROVE' OUR QUALITY OF LIVE IN THIS REGION. WILL GO FORWARD TO SECURE FUNDING TO FIND SOLUTIONS, TO PROBLEMS OF WHICH THIS STUDY HAS REVEALED.

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Paul Blevins

Mailing Address: 2514 Pine Bend KW 77339

Street Address: ____________
(if not the same as mailing address)

City: KW Zip: 77339

Phone: 2813588765 Fax: ____________

Organization or Subdivision: KW Lakes

Would you like to make a Public Statement?

☐ Yes ☐ No

If yes, whom do you represent?

☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?

☑ Yes ☐ No

Comments/Questions: Our house flooded 30" in 94 and we are interested in all info concerning this subject

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: ______________________

Mailing Address: ______________________

Street Address: ______________________
(if not the same as mailing address)

City: ____________ Zip: ____________

Phone: ____________ Fax: ____________

Organization or Subdivision: ______________________

Would you like to make a Public Statement?

☐ Yes ☐ No

If yes, whom do you represent?

☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?

☐ Yes ☐ No

Comments/Questions: ______________________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Phil Ruziska

Mailing Address: 2010 Wind Creek Drive

Street Address: ____________________
(if not the same as mailing address)

City: Kingwood Zip: 77345

Phone: 281-360-7991 Fax: ____________________

Organization or Subdivision: Fosters Mill

Would you like to make a Public Statement?
- [x] Yes
- [ ] No

If yes, whom do you represent?
- [x] Self
- [ ] Other ____________________ *(please specify)*

Would you like to receive future notices regarding this project?
- [x] Yes
- [ ] No

Comments/Questions: Scope of Study is too limited - disappointing
It doesn't address flooding downstream of
Lake Houston Parkway. It appears that
so-called "solutions" proposed would, if anything
worsen the flooding along shoreline of Lake
Houston downstream of Lake Houston Parkway.

Could consider dredging FM 1960 Bridge crossing, etc.

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: MICHAEL A. RIENER
Mailing Address: 1615 LOFTY MAPLE TRAIL
Street Address: ____________
(if not the same as mailing address)
City: KINGWOOD Zip: 77345
Phone: 281-360-7429 Fax: ____________
Organization or Subdivision: ____________

Would you like to make a Public Statement?
▯ Yes ▮ No

If yes, whom do you represent?
▯ Self ▯ Other ____________
(please specify)

Would you like to receive future notices regarding this project?
▮ Yes ▯ No

Comments/Questions:
THIS PROJECT IS 10 YEARS TOO LATE
THE CITY OF HOUSTON HAS BEEN TOO SLOW IN GETTING THIS KNOWN ISSUE ADDRESSED.

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: MARILYN TAYLOR
Mailing Address: 2107 SEVEN MAPLES
Street Address: ~~KINGWOOD~~
(if not the same as mailing address)
City: KINGWOOD Zip: 77345
Phone: 281 360-7182 Fax: 281 361-6420
Organization or Subdivision:

Would you like to make a Public Statement?
☐ Yes ☑ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions: On Parks Board of Kingwood. Very concerned about returning flooding not only in our parks, but in residential areas. As a CA Board member in an area that had 3 houses flooded in 1994 - Very concerned with remediation and future of the river basin.

Please keep me informed on any further information on this study

Marilyn Taylor

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: J. R. & Gloria Bertrand

Mailing Address: 20042 Olds Dr.

Street Address: ______
(if not the same as mailing address)

City: Porter, TX. Zip: 77365

Phone: 281-358-8814 Fax: ______

Organization or Subdivision: River Club Estates

Would you like to make a Public Statement?
▯ Yes ▯ No

If yes, whom do you represent?
▯ Self ▯ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
▯ Yes ▯ No

Comments/Questions: I know the River need to be Cleaned, But we also have a Big concern about the Sand Pitts that is being dug near our homes. We feel like that could also help cause us to flood.

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Dr + Mrs James H Phelan

Mailing Address: 1530 Scenic Shore Dr ~~Kingwood TX 77345~~

Street Address: ______
(if not the same as mailing address)

City: KINGWOOD Zip: 77345

Phone: 281 361 4910 Fax: 281 357 7104

Organization or Subdivision: KINGS POINT - COVE

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
■ Yes ☐ No

Comments/Questions: Experience has shown that it is impossible to contain Mother Nature. Floods will happen. Since they can't be prevented, they need to be planned for. We need to provide non-destructive places for excess water to GO. Where + how can we provide for escape routes for excess water?

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Beth L. Austin
Mailing Address: 1511 Hidden Hill Circle (Forest Cove)
Street Address: ____________
(if not the same as mailing address)
City: Kingwood Zip: 77339
Phone: 281 358 3624 Fax: 281 358-7159
Organization or Subdivision: FOREST COVE

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☒ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: I would still like a Buy Out - We've lived in Forest Cove for 31 years. Only flooded in '94. Missed it by 18" in '98. Things look promising to be flooded again in future.

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: James and Susan Ramsey
Mailing Address: P.O. Box 1328 Humble Tex 77347
Street Address: 26611 Riverview Dr. Porter Tex 77365
(if not the same as mailing address)

City: ____________ Zip: ____________
Phone: 281-3583832 Fax: ____________
Organization or Subdivision: River Ridge - River View Subdivision

Would you like to make a Public Statement?
▯ Yes ▮ No

If yes, whom do you represent?
▯ Self ▯ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
▮ Yes ▯ No

Comments/Questions: My home has been flooded twice and I am very interested in information concerning any study or final decision.

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Mitsy L. Stumpf
Mailing Address: 3506 Lakelane Dr.
Street Address: ________
(if not the same as mailing address)
City: Humble Zip: 77338
Phone: 281-812-8493-w H Fax: 281-852-8333
Organization or Subdivision: Belleau Woods

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: (1) Can we get a copy of the slides that John Saavedra presentation?

(2) Can we get a copy of the minutes from this meeting?

Please send to above address.
Thanks

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: RAY ANDERSON

Mailing Address: 2819 GOLDEN LEAF DR

Street Address: ______
(if not the same as mailing address)

City: KINGWOOD Zip: 77339

Phone: 281-359-3744 Fax: ______

Organization or Subdivision: ______

Would you like to make a Public Statement?

☐ Yes ☒ No

If yes, whom do you represent?

☒ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☒ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: A. N. M. GELDENS
Mailing Address: 4545 KINGWOOD DR APT. #2002
Street Address: ______
(if not the same as mailing address)
City: KINGWOOD Zip: 77345
Phone: 281-360-7598 Fax: 281-360-7598
Organization or Subdivision: NONE

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☒ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: DONALD DAVID dxdavi@freewweb.com

Mailing Address: PO Box 97

Street Address: ______
(if not the same as mailing address)

City: Humble TX Zip: 77347-0097

Phone: 713-552-6688 Fax: 713-552-6630

Organization or Subdivision: H.C. MUD 152

Would you like to make a Public Statement?

☐ Yes ■ No

If yes, whom do you represent?

☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

■ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Michael S. Sullivan

Mailing Address: PO Box 339 Channelview TX 77530

Street Address: ____________________
(if not the same as mailing address)

City: ____________ Zip: ____________

Phone: 281-452-6200 Fax: 281-452-5112.

Organization or Subdivision: ____________________

Would you like to make a Public Statement?
☒ Yes ☐ No

If yes, whom do you represent?
☒ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: ____________________

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: URSULA MORRIS

Mailing Address: 3010 Lake Crescent

Street Address: ______________________
(if not the same as mailing address)

City: Kingwood, TX   Zip: 77339

Phone: 281-358-7986   Fax: 281-358-6142

Organization or Subdivision: Kingwood Lakes

Would you like to make a Public Statement?

☐ Yes   ☒ No

If yes, whom do you represent?

☒ Self   ☐ Other ______________________ *(please specify)*

Would you like to receive future notices regarding this project?

☒ Yes   ☐ No

Comments/Questions: ______________________

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: JEAN A WAldROP

Mailing Address: 3210 SUNNY Knoll Ct

Street Address: KINGWOOD, TX 77339
(if not the same as mailing address)

City: ______ Zip: ______

Phone: 281-358-5188 Fax: 281-358-6142

Organization or Subdivision: HOMEOWNER - KINGWOOD LAKES

Would you like to make a Public Statement?
▯ Yes ☑ No

If yes, whom do you represent?
▯ Self ▯ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes ▯ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Larry G. Smith
Mailing Address: PO 6887
Street Address: 4106 Flint Creek Dr.
(if not the same as mailing address)
City: Kingwood Zip: 77339
Phone: 281-360-5114 Fax: 281-358-5605
Organization or Subdivision: Elm Grove

Would you like to make a Public Statement?
☑ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other Mc Lelar EHCI Corp. Energy & Water Conservation Corp.
(please specify)

Would you like to receive future notices regarding this project?
☑ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Kent & Nita Lee
Mailing Address: 3115 Riviera Ln
Street Address: ~~Humble Tx 77338~~
(if not the same as mailing address)
City: Humble Tx Zip: 77338
Phone: 281-852-1738 Fax:
Organization or Subdivision: Belleau Woods

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:

TX
US,
1OEA

Phone
713-881-3700

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: CHARLES P. CORRIERE
Mailing Address: 3423 SOUTHSHORE DR.
Street Address: SAME
(if not the same as mailing address)
City: HUMBLE, TX Zip: 77338
Phone: 281-852-7073 Fax:
Organization or Subdivision: BELLEAU WOODS

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ______ (please specify)

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Kerry + Pam Woodson

Mailing Address: 20206 Belleau Wood Dr

Street Address: ____________________
(if not the same as mailing address)

City: Humble   Zip: 77338

Phone: 281-852-8288   Fax: ____________

Organization or Subdivision: Belleau Wood

Would you like to make a Public Statement?
☐ Yes   ☑ No

If yes, whom do you represent?
☐ Self   ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☑ Yes   ☐ No

Comments/Questions: ____________________

annual public August in august 1999

Survey due by end of month

REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

web sight
W HCOEN-CC
HARRIS
US
, Shaw OUM
713-881-310
713-881-3100

Attendance Record

Name: DELMA LEE DEFORD
Mailing Address: 10211 ELMBEND CT.
Street Address: 10211 ELM BEND CT
(if not the same as mailing address)
City: HUMBLE, TEXAS Zip: 773382212
Phone: 281-4466977 Fax:
Organization or Subdivision: NORTHSHIRE

Would you like to make a Public Statement?
☐ Yes ? ☐ No

If yes, whom do you represent?
☒ Self AND FAMILY ☒ Other DAVID LEE DEFORD-SR *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: David Tuck

Mailing Address: 199 San Simeon PL, Vallejo, CA 94591

Street Address: 1227 Hamblen Rd
(if not the same as mailing address)

City: ______ Zip: ______

Phone: ______ Fax: ______

Organization or Subdivision: Forest Cove

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☒ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: Wyllys Taylor Cooper
Mailing Address: 2102 North Shore
Street Address:
(if not the same as mailing address)
City: Kingwood Zip: 77339-4111
Phone: 281-358-8254 Fax:
Organization or Subdivision:

Would you like to make a Public Statement?
☒ Yes ☐ No

If yes, whom do you represent?
☒ Self ☐ Other ________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: David Woerner

same { Mailing Address: 5507 Cedar Bay Drive

Street Address: Kingwood Texas 77345
(if ~~not the same as mailing address~~)

City: ______ Zip: ______

Phone: 281 360 9590 Fax: 281 821 7100

~~Organization~~ or Subdivision: Kings Point Sec 2

Would you like to make a Public Statement?

☐ Yes ☒ No

If yes, whom do you represent?

☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☒ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, April 8, 1999
Kingwood College (Teaching Theater)

Attendance Record

Name: W. KURT HILARIDES
Mailing Address: 1526 HAMBLEN
Street Address: ____________
(if not the same as mailing address)
City: HUMBLE Zip: 77339
Phone: 281.358.5365 Fax: 358.7341
Organization or Subdivision: FOREST COVE

Would you like to make a Public Statement?
☒ Yes ☐ No

If yes, whom do you represent?
☒ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: COMMENTS WILL BE SUBMITTED

San Jacinto River Flooding Questions
W. Kurt Hilarides
1526 Hamblen Rd.
Humble, TX
281.358.5365
igt@vonl.com

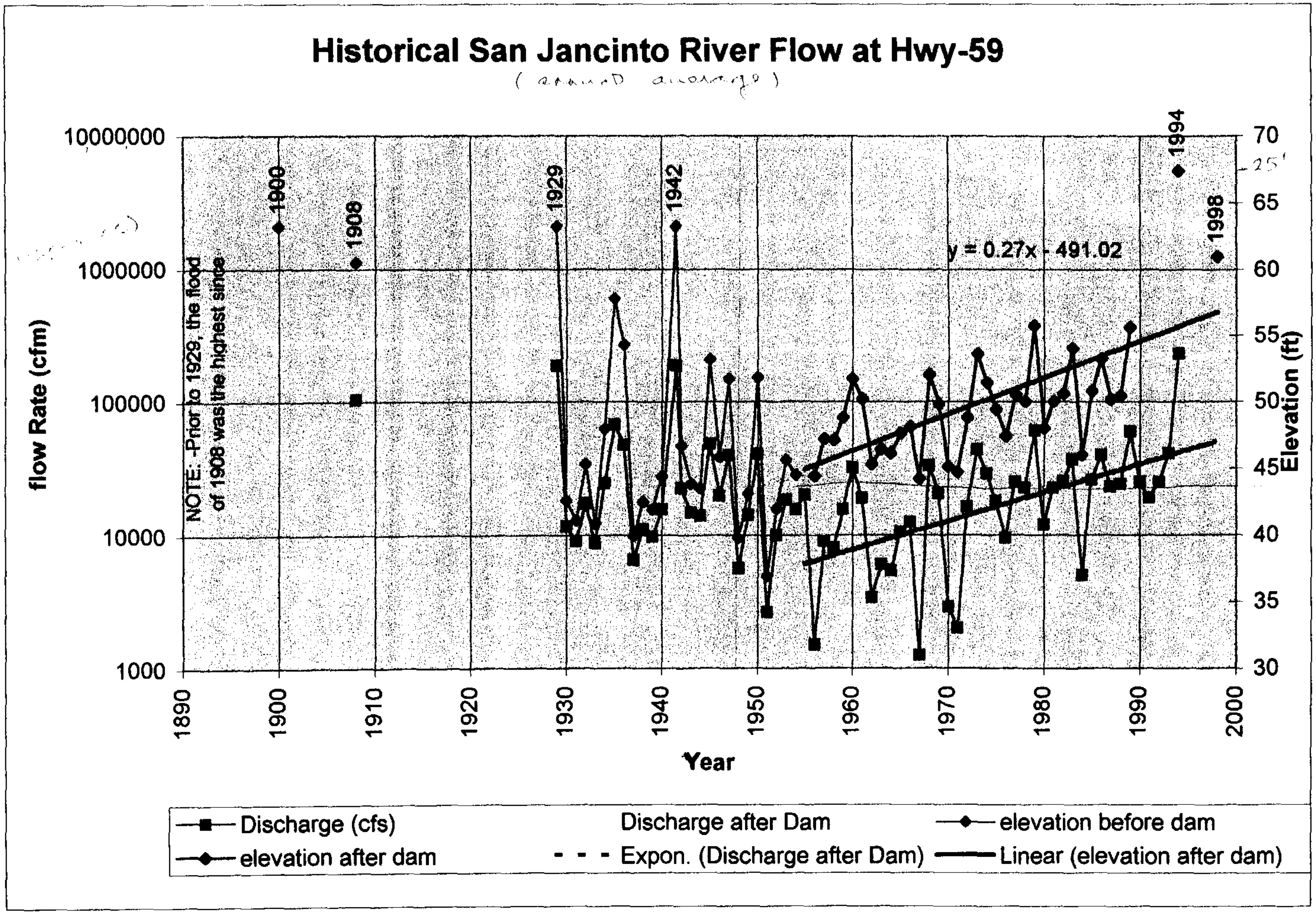
A graph of annual flood elevation versus time shows that the average annual flood has been increasing at a rate of over three inches per year since the dam was installed in 1954. This appears to be caused by increased discharge rates (the rating curve for the river has not changed significantly above the river bank). There does not appear to be any correlative increase in rainfall. So it appears that the increase in discharge rates, and corresponding flood elevation is due to improved drainage upstream in the areas that have been developed over this period of time. This improved drainage causes more rapid runoff, and gradually increasing discharge. This is not a reversible process and will probably continue as long as the rates of. development upstream continue. Is there a better explanation for this trend, or can we expect this trend to continue?

It has been suggested that flooding might be alleviated by one of several remediation methods.
1. Opening the Lake Houston dam before and during flooding .
2. Opening the Lake Conroe dam before flooding occurs, thereby reducing the peak discharge requirements during floods
3. Dredging of the river

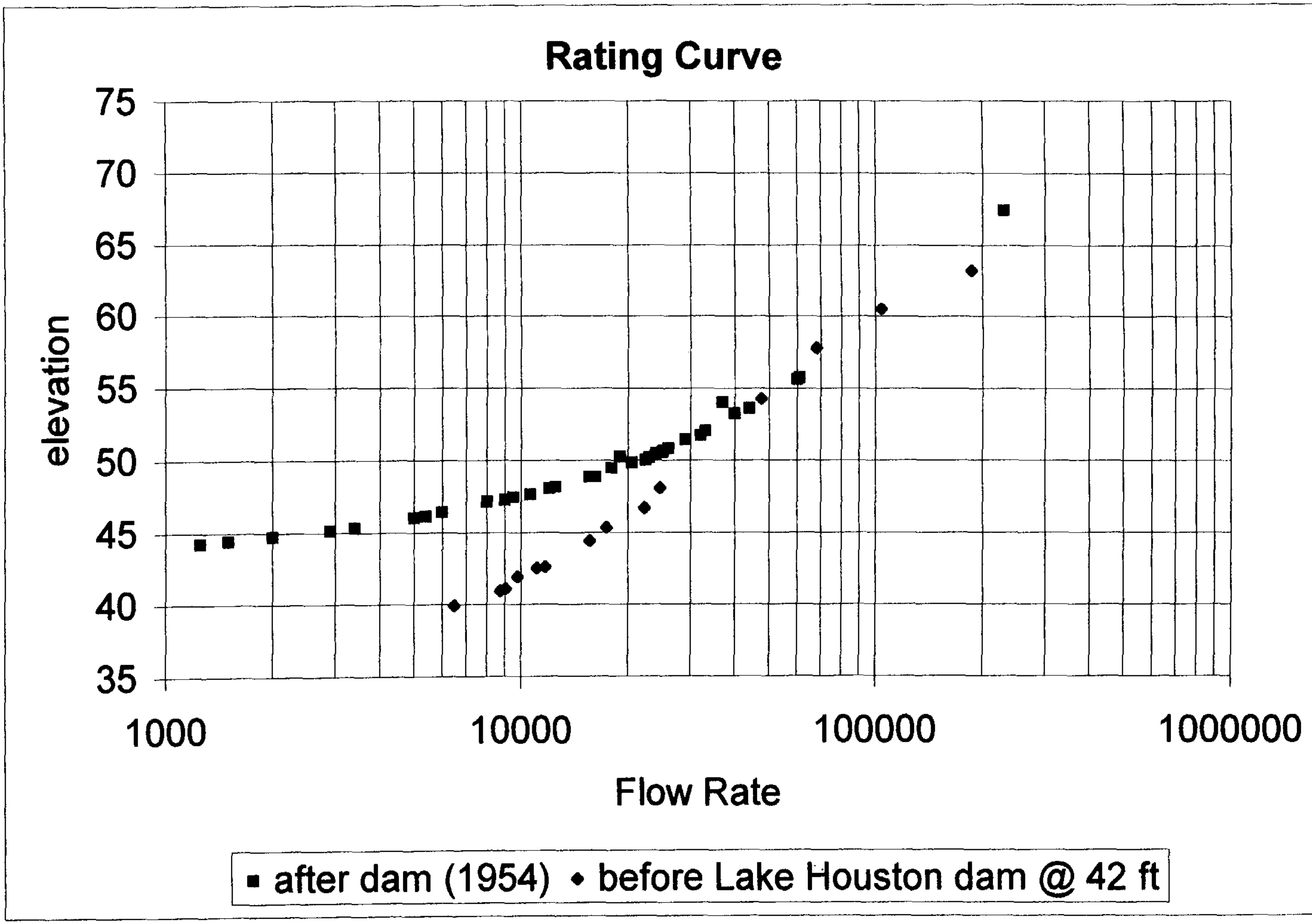
Are any of these viable?

Please consider that:
1. Although the rating curve showed higher floods during low discharge before the dam, the pre and post dam rating curves converge at 50,000 cfs, showing that elimination the dam has little impact for serious floods.
2. Lake Conroe contributes only a small percentage of the total discharge into Lake Houston.
3. Cross sectional areas during floods are equal to dredging depths in excess of 50'.

Are you considering producing real time predictive models that would provide homeowners with flood crest level predictions based upon rainfall and upstream flow rates, so that we can make better decisions on flood preparations?

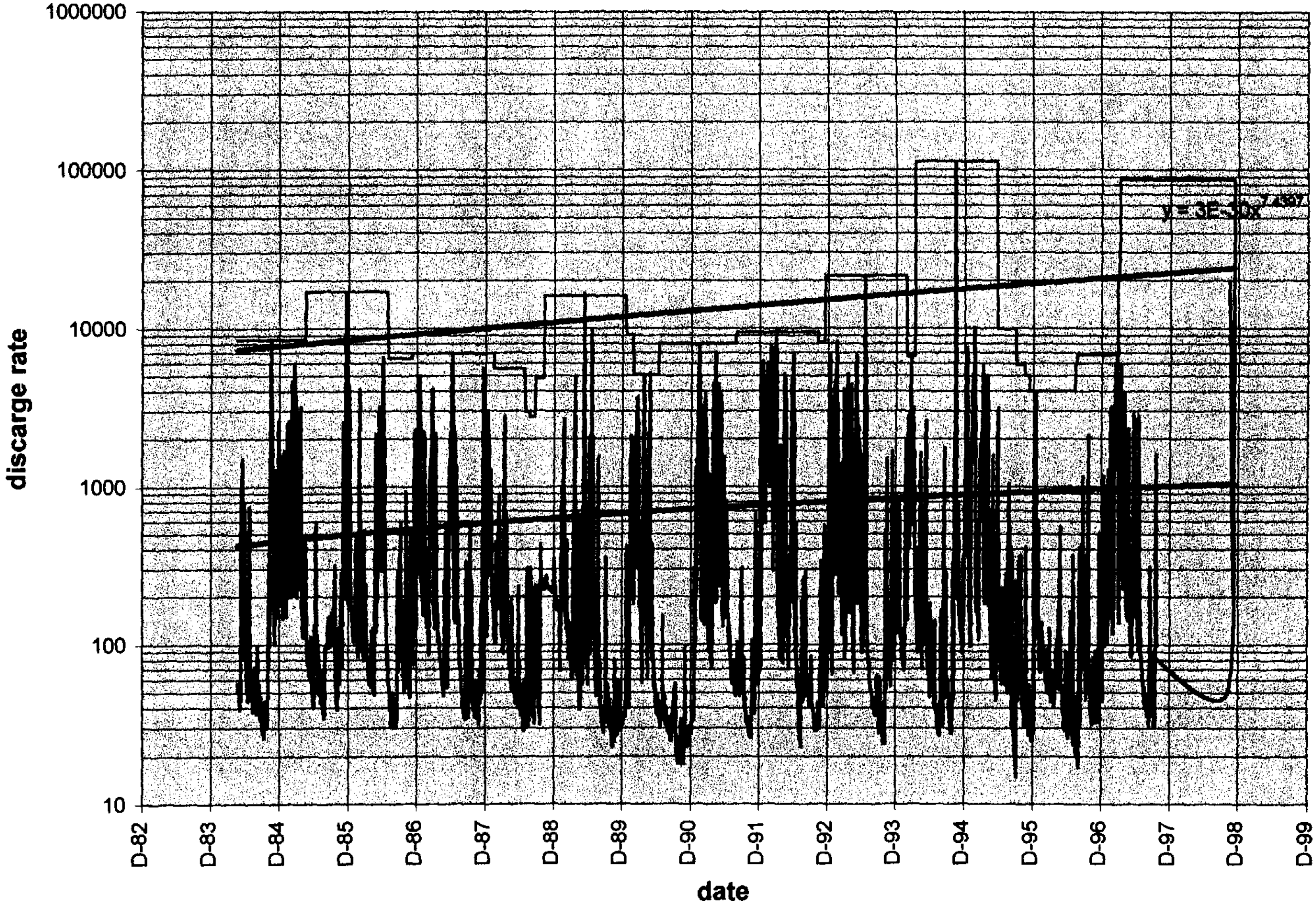


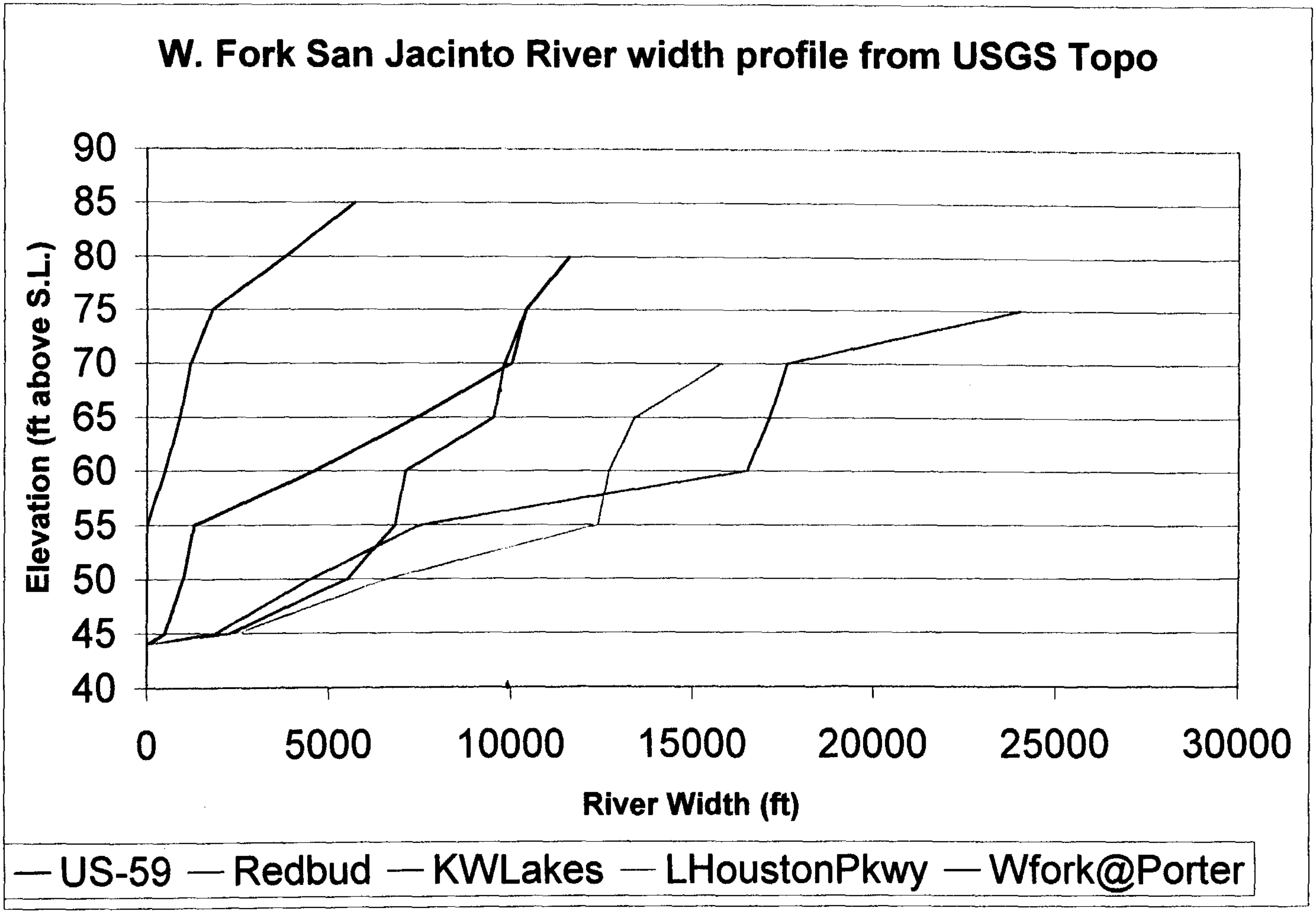
Historical San Jancinto River Flow at Hwy-59
flow Rate (cfm)
Elevation (ft)
Year
10000000
1000000
100000
10000
1000
70
65
60
55
50
45
40
35
30
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
1900
1908
1929
1942
1994
1998
y = 0.27x - 491.02
NOTE: -Prior to 1929, the flood of 1908 was the highest since
Discharge (cfs)
Discharge after Dam
elevation before dam
elevation after dam
Expon. (Discharge after Dam)
Linear (elevation after dam)

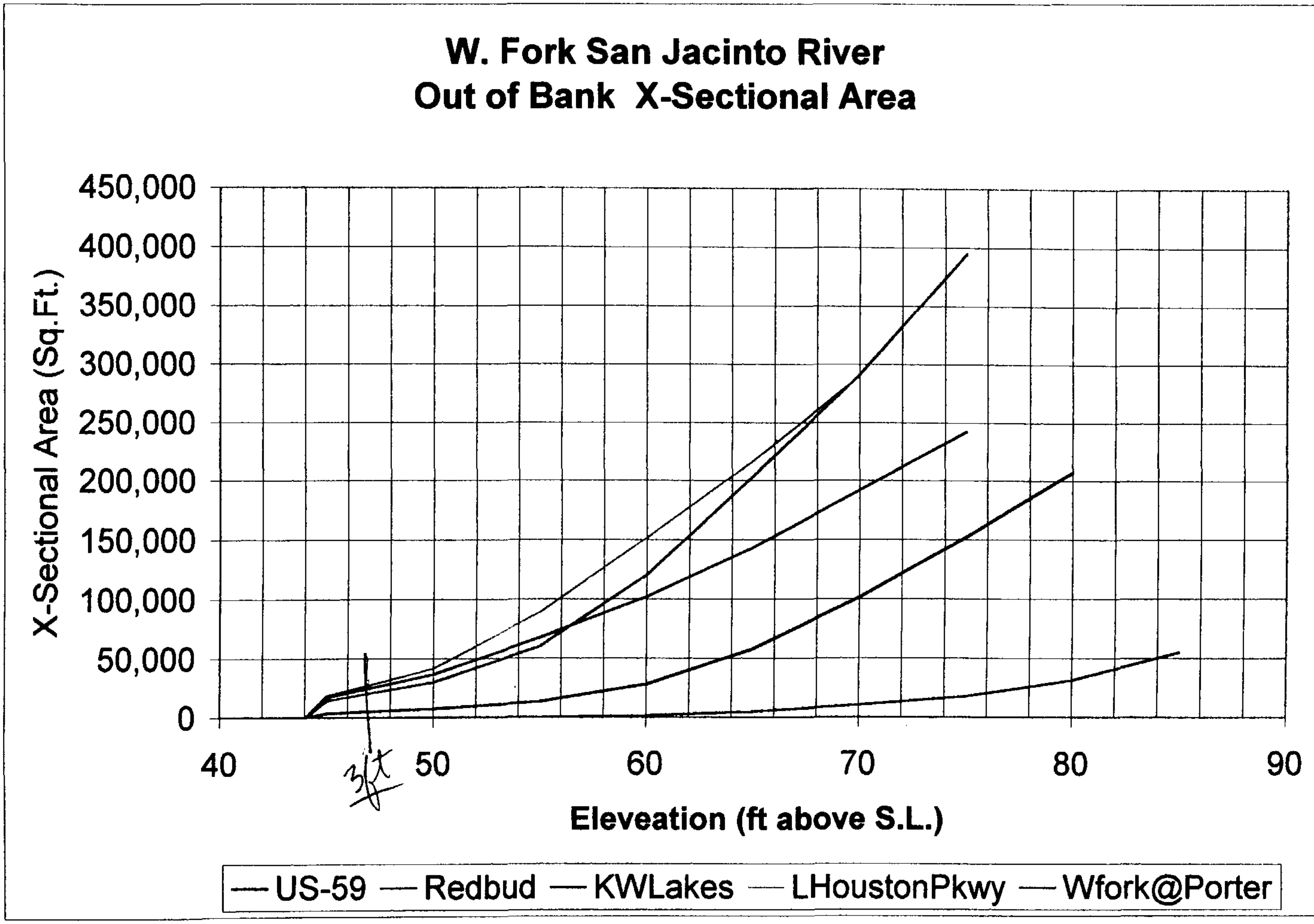


Rating Curve
75
70
65
60
55
50
45
40
35
elevation
1000
10000
100000
1000000
Flow Rate
▪ after dam (1954) ◆ before Lake Houston dam @ 42 ft

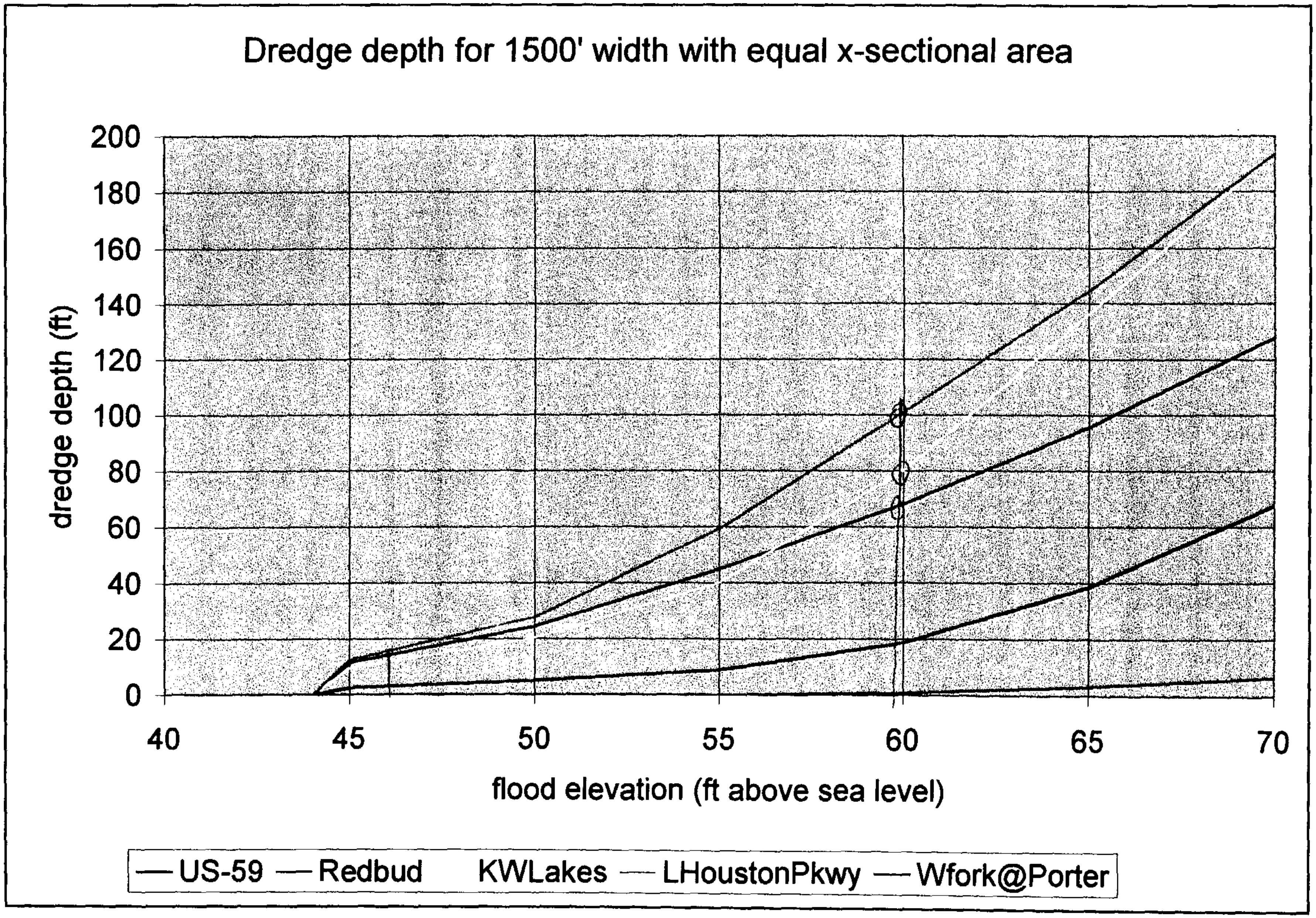
W. Fork San Jacinto River near Porter




W. Fork San Jacinto River width profile from USGS Topo
90
85
80
75
70
65
60
55
50
45
40
Elevation (ft above S.L.)
0
5000
10000
15000
20000
25000
30000
River Width (ft)
US-59
Redbud
KWLakes
LHoustonPkwy
Wfork@Porter



W. Fork San Jacinto River
Out of Bank X-Sectional Area
X-Sectional Area (Sq.Ft.)
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
40
50
60
70
80
90
3ft
Eleveation (ft above S.L.)
US-59
Redbud
KWLakes
LHoustonPkwy
Wfork@Porter



Dredge depth for 1500' width with equal x-sectional area
dredge depth (ft)
200
180
160
140
120
100
80
60
40
20
0
40
45
50
55
60
65
70
flood elevation (ft above sea level)
US-59
Redbud
KWLakes
LHoustonPkwy
Wfork@Porter

3138 Lake Crescent Dr.
Kingwood, TX 77339
28 April 1999

Mr. John Saavedra
Project Manager
Brown and Root Services
9900 West Park, Suite 107B
Houston, TX 77063

Dear Mr. Saavedra:

I attended the flood control meeting held at Kingwood College on April 8. Your report was quite thorough and delivered some very useful information. I did not get a chance to speak at the meeting, so I wanted to pass along to you some comments based on my personal experience.

As you pointed out in your briefing, a bottleneck has developed in the San Jacinto River which has changed the flow pattern and causes backup of water during heavy rains into areas of Kingwood which, prior to 1994 when the bottleneck formed, had not flooded.

I live on Kingwood Lake, on an arm of this artificial lake that contains a drainage channel from upper Kingwood. My house is about a mile from and well above the level of the San Jacinto river, something I carefully checked prior to buying. Theoretically my slab is a foot above what used to be the hundred year flood plain. Prior to 1994 during extremely heavy rains, even though the lake overflowed its banks, the water maintained a continuous flow draining through a system of channels and spillways down to the San Jacinto River and thence to Lake Houston. Most importantly, no homes on the lake were flooded. In the approximately twenty years Kingwood had been in existence prior to 1994, Kingwood Lake had never flooded any homes.

In 1994 this changed. During that flood, and with heavy rains since then, the flow past my house does not continue as it used to. Instead, the water backs up quickly from Lake Houston and the San Jacinto River filling Kingwood Lake causing it to overflow. An additional indication that something has changed is that three times in the past year the Kingwood Country Club golf courses have been inundated, as they were in the flood of 1994, even though less rain fell in these recent storms. The 1994 flood's heavy silting apparently raised the level of both the river bed and the lake bed, and left enormous sand dunes in the river bed and sand spits in the lake. This has significantly changed the drainage out of Kingwood. I feel certain that the silting in Lake Houston also contributes to the flooding along the

Trinity River above the lake.

If you have not yet done so, I would urge you to get the Kingwood Country Club to let you go out on the Island Course, along the #6 fairway and green, and the #16 tee box. From these vantage points you can see the dunes and submerged bars lining the river as well as tree trunks and limbs protruding in the channel. These were not there prior to the flood of 1994. The first time after that flood I played the Island Course, I and those I was with were shocked at the visible change. It is a much more graphic picture than aerial photos. If you need a contact at the club to do this, please let me know.

Since 1994, these dunes have become overgrown with vegetation and are becoming fixed in position as the river attempts to form a new bank, and effectively has. I feel that this bottleneck is the primary cause of the change in flow, although I expect the river upstream is in pretty much the same condition.

In your report, you listed removal by dredging of this bottleneck and clearing the river up to the Highway 59 bridge as one of the options for alleviating the flooding. I feel this is the only effective solution to this recurring problem.

Unfortunately, this was the most expensive option. I have lived on the fringes of Houston (and now due to annexation, in it) for thirty-two years. During that time, over and again, I have seen city councils and Harris County officials opt for the cheapest and least effective solution to any number of problems, never having the money to do the job right, but always finding the money to do it over at a greater cost than if it was done right in the first place.

During my time here, my home has been through three, one-hundred year floods, two in Seabrook in 1979 and the 1994 flood in Kingwood. Kingwood was the only one in which my house was flooded. In Seabrook I lived about a half mile from Galveston Bay into which the water ran off even though twenty-six inches of rain fell in twenty-four hours. To those who did flood, the response, which I hear every time we get another hundred year flood, was that when that much rain falls there is nothing that can be done. Not so.

My sister lived for fifteen years near the flood controlled part of White Oak bayou, where a deep and wide artificial channel has been constructed through the center of Houston. She never flooded. It was to her house we evacuated in 1994. Upstream from where she lived, the non-flood controlled part of White Oak Bayou floods regularly, as it did this past year. Hardly a year passes that some part of Houston does not experience a "hundred year flood." For the fourth largest city in the country, flood control in Houston is deplorable.

As was pointed out in the meeting, the problem is not how much water is or is not released at dams. What was not mentioned is the weather phenomenon in this semi-tropical area that is often the problem: training, as it is called, of thunderstorms. These are lines of storms that form parallel to the upper Texas coast and move slowly from southwest to northeast, moving like a train of railroad cars over the same area and inundating it. This does not even count other heavy-rain phenomena indigent to this area such as tropical waves, tropical depressions, tropical storms, and hurricanes,

Development of subdivisions and shopping centers upstream is not going to stop. Cutting of timber which could absorb water upstream is not going to stop. The training and tropical storms are not going to stop. What must be done is find a way to get these periodic massive rainfalls down the watersheds, through Lake Houston, and into those large natural holding tanks called Galveston Bay and the Gulf of Mexico. This means flood control on a scale not envisioned by Houston or Harris County.

I realize you have no control over what may be done, and are in effect only the messenger. However, since you are intimately involved in a project that is critical to the future of Houston and Harris County, I feel that it is important to give you my comments.

Respectfully,

Ed Rainey

Ed Rainey

Ph: 281-358-6612
FAX: 281-358-0694
email: edraineysr@comwerx.net

Edgewater Park
C/O John Farrish
22000 Loop 494
Kingwood, TX 77339
281-358-4756

February 26, 1999

Brown & Root
9900 Westpark
Suite 107B
Houston, TX 77063

Attn: Mr. John J. Saavedra, P.E.

Dear Mr. Saavedra,

I would like to take this opportunity to follow up on our conversation on February 13, 1999

At that time, we discussed the possibility for my property (located at Hwy 59 N. at the San Jacinto River Crossing and Hamblen Rd.) to be considered in your pilot program to relocate sand from the San Jacinto River Basin onto adjacent properties.

Many property owners along this basin feel the relocation of these materials would help replace what the river has taken over the years through flooding and erosion.

In addition, the benefit to homeowners of less flooding due to the increased depth the waterway would also enhance the eco-systems of our river and lake. The safety of all watersports such as boating, skiing, jet-skis, etc. would be greatly increased.

For all the stated reasons, I believe your project would be worthwhile and beneficial effort to enhance life and property along the San Jacinto River.

Thank you for your time and consideration.

Sincerely,

John H. Farrish

Penny Bowers
20142 Belleau Wood Drive
Humble, TX 77338
281-852-8215, fax 281-852-8427

Fax

To:	John J. Saavedra, P.E., Brown & Root Services	**From:**	Penny Bowers
Fax:	713-260-3225	**Pages:**	1
Phone:		**Date:**	04/09/99
Re:	April 8, 1999 Meeting for Regional Flood Protection Study	**CC:**	Mr. Robin Green, P.E., Chief Engineer City of Houston

• John,

I want to commend you on an excellent presentation last night. Brown & Root was very informative, and it is good to know that they are possible solutions to a very persistent problem. My only wish is that the wheels of democracy could turn faster!

Is it possible for you to fax me copies of the slides presented last night on Silt Removal, Food Plain Reduction, Disposal of the Silt, Other Flood Control Options, as well as the Develop Project Features and Rough Cost Estimates? I think these would be most helpful as I and others in our community contact our government officials regarding the flooding.

Also, could you give me a contact name and phone number for the Texas Water Development Board? I feel that our community must give them our imput if this project is to continue.

Please remember to contact me for future meetings. Again, congratulations on a job well done.

Penny Bowers

Public Meeting - June 13, 2000

PUBLIC MEETING NOTICE

REGIONAL FLOOD PROTECTION STUDY
FOR A LAKE HOUSTON FLOOD PROGRAM

SPONSORED BY	**DATE/LOCATION**
TEXAS WATER DEVELOPMENT BOARD	**JUNE 13, 2000**
CITY OF HOUSTON	KINGWOOD COLLEGE
HARRIS COUNTY FLOOD CONTROL DISTRICT	(PERFORMING ART THEATER)
SAN JACINTO RIVER AUTHORITY	20,000 KINGWOOD DRIVE
MONTGOMERY COUNTY	(WEST OF US 59)

PURPOSE: This public meeting is to present result of the Lake Houston Flood Study and provide a forum for informal comments to the Lake Houston Flood Study Project Team. Formal statements may also be submitted during the session which begins at 7:00 p.m.

AGENDA

Public Meeting: 7:00 p.m. - 8:30 p.m.

Introductory Remarks:	Humble Area Chamber of Commerce
Project Findings and Conclusions	Brown and Root, Services (Project Consultant)
Public Comments:	Five Minutes Maximum per Speaker

BACKGROUND:

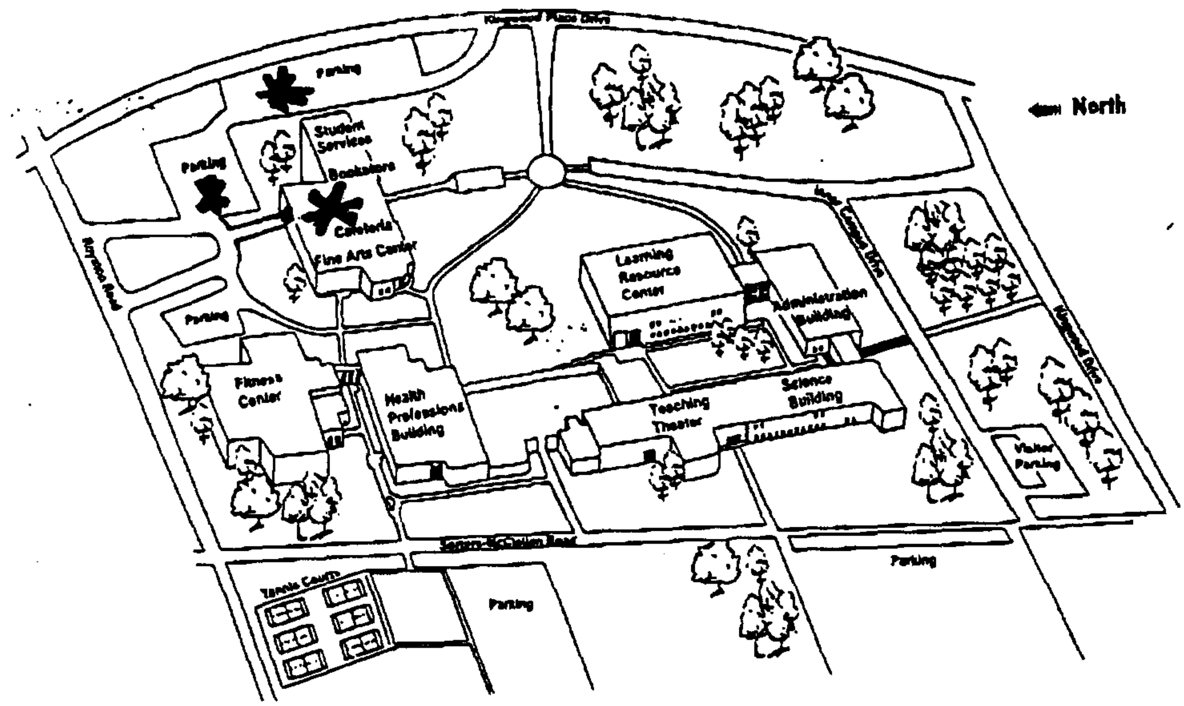
Lake Houston, completed in 1954, is a major water source for the City of Houston and the surrounding region. The age of the reservoir, record floods in recent years, and increased urbanization has caused concerns related to the flooding problems along the West Fork of the San Jacinto River upstream from Lake Houston. Future development in the watershed is currently governed by multiple overlapping jurisdictions among a number of different government groups and agencies. After every major rainstorm, there are new deposits of sedimentation along the channel and in the Lake. The regulatory floodplains, as currently designated, need to be re-evaluated and the source and alternative solutions to the sedimentation and flooding problems in the upstream areas need to be studied. These issues require a regional approach as outlined for this Study.

On October 17, 1996 the Texas Water Development Board (TWDB) approved a planning grant application from the City of Houston for a Regional Flood Protection Planning Study. The Study is jointly sponsored by the City of Houston, Harris County Flood Control District, Montgomery County and the San Jacinto River Authority. The joint sponsorship agreements are in place and the Project Consultant is under contract as of June 1997 to perform the work. As a result, a current survey of the channel condition was conducted in mid-1999. At the conclusion of this study, sedimentation impact, hydraulic analyses, and feasible solutions to manage potential flood control measures are evaluated and reported.

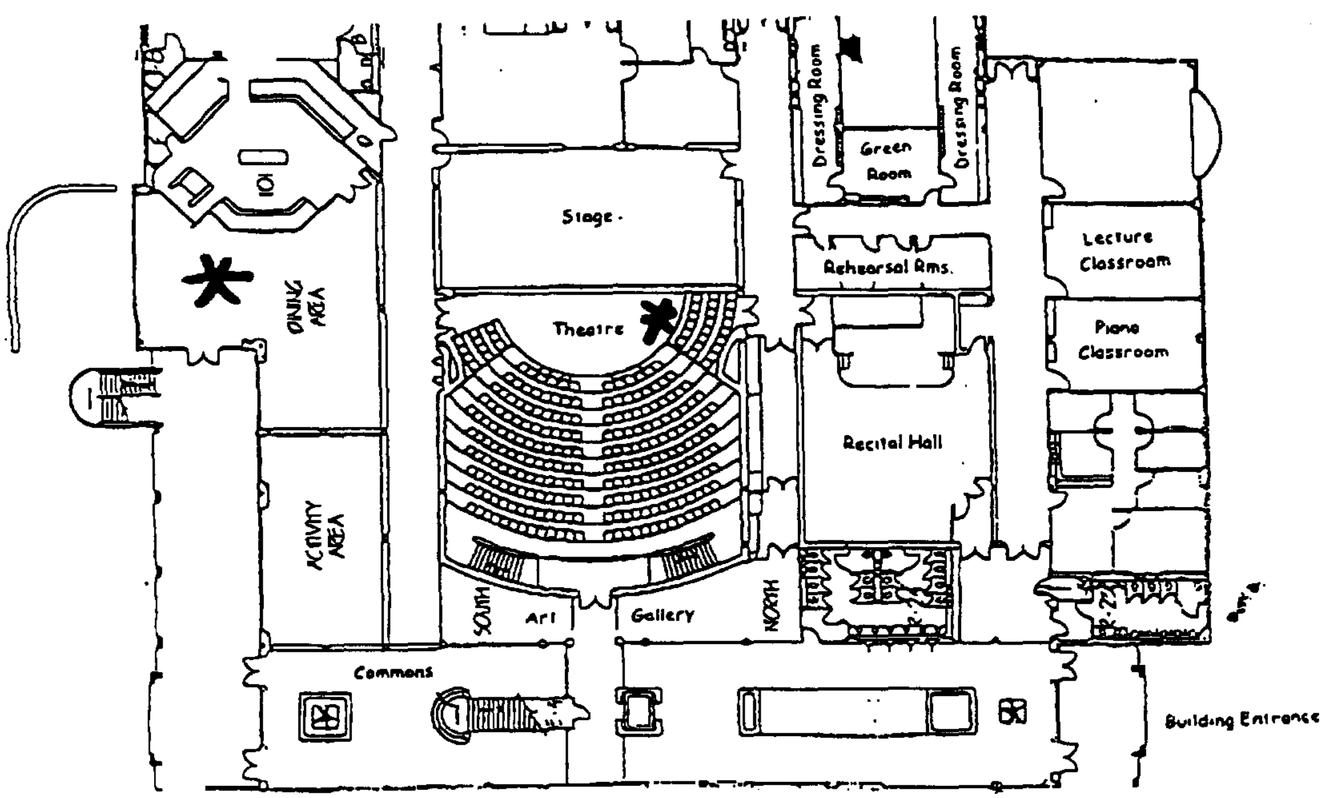
Directions to Kingwood College from Downtown Houston

Kingwood College is approximately 25 miles northeast of downtown Houston via U.S. Highway 59. Take Kingwood Drive exit off U.S. 59 north; turn left on Kingwood Drive and cross bridge over Highway 59.

Travel approximately 1/4 mile and turn right on Kingwood Place Dr. The entrance for Fine Arts Facility parking will be on the left approximately 1/8 mile, at the Kingwood College sign.



Fine Arts Facility



6/13/2000

SIGN-IN SHEET (LAKE HOUSTON) 1/5

NAME	ADDRESS	PHONE
Norman Scholes	400 Randal Way #200 Spring, TX 77388	281 350 7027
Jerry Campbell	24003 Rafter Three, Hockley, TX 77447	281 371 7068
Pat Hodges	1105 Desirable Huffman, Tx	281-324 2046
Pamela Rocch - Harris Co. Pct. Four	22540 Aldine Westfield Spring TX 77373	(281) 353-8100
Tammie Calvert	Observer Newspapers	281 3592799
Dan Jezek	3326 Hickory Brook K-wood	360-3599
John Williams	St. Rep. Joe Crabb	281 359-1270
Laurent Schevalz	C.M. Gordon Quan	713-247-2013
Frank Johnson	Hallett Materials Porter TX.	281-354-2215
J.R. & Gloria Bertrand	20042 Olds Dr. Porter TX	281-358-8814
Wayne Castleberry	3218 Riviera Humble TX	281-852-1400
Dennis Johnston	20634 Kenswick Drive Humble 77338	281-446-8588
Libby & JC Weisinger	6 Forest Shores Dr Kingwood	281 358-7885
John Harris	5506 Oak Cove KW 77345	281-360-3753
Jon Lierosky	PO Box 2789 Houston 77252	
Michael Beathard	910 St. Andrews Rd KW 77339	
Wm. J. Groeschel	2315 Pine Bend Dr. KW 77339	281-358-0309
Suzanne West	511 Shadyglade Hou 77090	281-440-7161
Mark W. Ellis	21826 Walnut Kingwood 77339	2813585367
Pat Ellis	21826 Walnut Kingwood	2813585367
Ray Kagh	2206 Halton St Kingwood	2813602826
Ken Shebleh	HCFCD	~~281~~ 713 684 407[illegible]
Scott Sawyer	6335 Gulfton Houston	713-777-5337
Roger Hill	2118 Woodland Vly Dr Kingwood	281-358-9699
Betty Hill	" " " "	"
Chip Chapman	1522 Lakeshore Kgwd	358-2884
[illegible]	[illegible] Pine [illegible] Kingwood 77339	358-4574

6/13/2000

19 SIGN-IN SHEET (LAKE HOUSTON) 2/5

NAME	ADDRESS	PHONE
Jeannette White	962 Del Norte H/TX 77018	713 686 2072
Lin and Sue Ramsey	26611 Riverview Porter	281 358 3832
DAVID C TAYLOR	2179 LAKE VILLAGE KINGWOOD	281-364-4074
PILAR POLHAMUS	3126 ROYAL CRESCENT DR. K. Lakes	(281) 312-1230
MIKE DENNY, HARRIS CO. PCT 4,	22540 ALDINE WESTFIELD RD., SPRING, TX 77373	(281) 353-8424
HOWARD PITMAN KFCA	2911 ROYAL CIRCLE DR KINGWOOD TX 77339	281 358-6930
HEATHER Montgomery for Congressman Brady	200 Riverpointe	936-441-5700
Gary Mahoney	2609 Crossvine The Woodlands	281-3472224
JOE STONJA	2006 PLEASANT CREEK DR. KINGWOOD	(281) 360-5549
CHARLES & SANDY FAUBION	3103 ROYAL CRESCENT - KINGWOOD	(281) 358-3024
Clay Haynes	HCFCD Houston, TX	
Rick Dickson	City of Houston	281-361-9550
Addie Wiseman - Council Member Rob Todd		~~28~~ 713-247-2008
Barry Rought	6614 Emerald Oak Ct Humble	281-852-0537
ROBERT & ROSEMARY WIPKE	19311 ALINAWOOD Ct. " TX.	(281) 852-3909
David S ...	611 WALKER	(7) 837-0440
ROY LEE SCHULTZ	10102 CANTERTROT DR HUMBLE	281-446-2308
Annett Vickery	2104 North Shore Dr	281 3596111
DEBBIE MALONE	19220 LAKESHIRE Humble	281-852-6131

6/13/2000

5 SIGN-IN SHEET (LAKE HOUSTON) 3/5

NAME	ADDRESS	PHONE
Ray Burnan	8103 Malard Crest	281 8521137
Jean Waldrop	3210 Sunnyknoll	281 3585188
Sandi Nizzi	1849 Kingwood D	281-358-8881
Vicki Flake	1111 Forest Cove Kingwood	281-357-2210
Bert Laverty	2310 Lake Village Dr, Kingwood	281-358-4189

TOTAL 105 COUNT

10/13/2000

+ SIGN-IN SHEET (LAKE HOUSTON) 4/5

NAME	ADDRESS	PHONE
Steve Brack	1431 Palomino Lane 77339	281 358-8285
C.E. Fidler	3814 Wildwood Ridge 77339	281-358-3612
Pat Lewis	2503 Golden Pond 77345	281-360-1491

Dick Judge FOR R.W. Hope STATE Rep DIST. 16

6/13/2000

24 SIGN-IN SHEET (LAKE HOUSTON) 5/5

NAME	ADDRESS	PHONE
Nicki & Justin Berndt	8327 Amber Cove Dr.	281-852-2066
Jeanne McGill	3122 Royal Crescent	281 358-3468
N. Alton	20422 Deltawood Dr	281-812-0117
Leonard Igrason	28614 Lochleven Ct Huffman 77336	281-324-3101
Charles Davidson	3206 Riviera Ln. Humble TX 77338	281-852-3736
James Baker	P.O. Box 1627 Humble Tx 77396	
Joy M Gowen	1721 Magnolia Ln Kingwood TX 77339	ph 281-358-3742
[illegible]	611 Walker Houston TX PWE	713-837-0002
Vera & Dennis Claunch	2222 Northshore KW, TX 77339	281-358-3333
Sharon Flake	1210 Cypress Ln. 77339	281 358 4201
David Saha	9900 NW Fwy 77092	713 684 4000
Jarrett & DeeAnn Green	21811 Walnut KW 77339	281-312-4328
Lee & C Blayney	21819 Sweet Bay Humble 77339	281 358 3413
David Woerner	5507 Cedar Bay Dr Kingwood 77345	281 360 9590
Lumsden	2907 Aspen Creek Ct. "	281 360 6150
J. Eckley	2423 Kingsforest	281-358-295
Naomi Stair	3219 White Blossom Ln, Humble, TX 77338	281-852-7625
Beverly Erdmann	4819 Pine Garden Kingwood, TX.	281-360-4026
Frank Gallardo	1618 Lakeshore Dr Kingwood TX 77339	
Chuck Settle	611 Walker Houston TX 77002	(713) 837-0452
Nila Nelson	1310 Palmetto Lane Kingwood, TX 77339	281/358-7645
Ron / Holley	4811 [illegible] Humble	812 2700
John Ellor	2006 Crystal River Kingwood	281-360-1878
Phillip Stika	40 Kingwood C.C. 1700 Lake Kingwood Trail KW TX 77339	281-358-217

6/13/2000

20 SIGN-IN SHEET (LAKE HOUSTON)

NAME	ADDRESS	PHONE
Michael Sullivan	POB 339 Channelview TX 77530	
Jim Adams	POB 329 Conroe TX 77305	
REED EICHELBERGER	" " "	
OWEN PARKER	5406 UPPER LAKE HUMBLE	281-540-1014
Chris Green	3507 green Timbers Humble	2813199711
Mike Byers	Humble/Kingwood	
Jim Harding	Kingwood	
Dean + Carol Ongman (Northshore Subd)	2302 Northshore Kingwood, TX 77339	281-359-1953
~~Betty Stedman~~	~~" 2157 Lake Point, Humble 773~~	
DAVID M. WHITE	3051 CREEK MANOR KINGWOOD 77339	281-360-2466
Capt L.E. Shiflet	2927 EAGLE CRK DR	281-358-00 361-
KEN FOWLER	4400 Memorial Dr #2235 Houston, TX 77007	713.502.7946
JOE GARDELLA	3119 ROYAL CRESCENT Kingwood, TX 77339	281-358-4258
JOSEPH MAZZARELLA	1611 LOFTY MAPLE TR. KINGWOOD, TX 77345	281-360-7990
RICHARD P. McGUCKEN	3414 EVERGREEN GLADE DR KINGWOOD 77339-2221	281-358-7684
Jackie Juneman	423 Forest Cove Dr. Kingwood, TX 77339	281 359-5913
Frank + Betty Agee	26488 Lori Ln, Porter, Tx 77365	281-358-3685
Dan E. Shott	2102 Northshore Dr, Kingwood 77339	281 312-4380
Norma Jan	29003 S Plum Creek Trail Spring 77386	
Gordon Landwermeyer	1122 Klamath Houston TX 77090	
Joe Crabb	20319 Arrow Cove Humble 77346	
Oscar Bierman	11315 Dogwood Humble 77338	
Reid K Mrsny	~~3~~ 2007 Windsong, Crosby, TX 77532	
RAY ANDERSON	2819 GOLDEN LEAF KW 77339	
Charles K + Juanita Lee	3115 Riviera Humble 77338	
Vera Nukaza	18915 KELTURN Humble 77346	

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: Roger & Betty Hill

Mailing Address: 2118 Woodland Vly Dr.

Street Address: Same
(if not the same as mailing address)

City: Kingwood Zip: 77339

Phone: 281-358-9699 Fax:

Organization or Subdivision: Trailwood Village

Would you like to make a Public Statement?

▯ Yes ▯ No

If yes, whom do you represent?

▯ Self ▯ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☑ Yes ▯ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: Sharon Flake
Mailing Address: 1210 Cypress Ln
Street Address: Same
(if not the same as mailing address)
City: Kingwood Zip: 77339
Phone: 281-358 4201 Fax:
Organization or Subdivision: Forest Cove

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: Jo Ann McDonald
Mailing Address: 1320 Palmetto Lane
Street Address: Same
(if not the same as mailing address)
City: Kingwood Zip: 77339
Phone: 281 358-3776 Fax:
Organization or Subdivision: Forest Cove

Would you like to make a Public Statement?
☐ Yes ☐ No

If yes, whom do you represent?
☐ Self ☐ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
■ Yes ☐ No

Comments/Questions:

Regional Flood Protection Study for a Lake Houston Watershed Flood Program

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: RUTH & RAY KOZA

Mailing Address: 2806 HALTON COURT

Street Address: ______
(if not the same as mailing address)

City: KINGWOOD, TX Zip: 77345-5416

Phone: (281) 360-7876 Fax: ______

Organization or Subdivision: ENCLAVE KINGS CROSSING

Would you like to make a Public Statement?

☐ Yes ☐ No

If yes, whom do you represent?

☐ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☒ Yes ☐ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College **(PERFORMING ART THEATER)**

Attendance Record

Name: NORMAN SCHOLES
Mailing Address: 400 RANDAL WAY Su. 200, Spring TX 77388
Street Address: ______
(if not the same as mailing address)
City: ~~Sto~~ Spring TX Zip: 77385
Phone: 281 350 7027 Fax: 281 350 7035
Organization or Subdivision: Alexander Engineering, Inc.

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☒ Other W/HCFCD *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: Great presentation of a difficult subject!

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: ROY LEE SCHULTZ

Mailing Address: 10102 CANTERTROT DR.

Street Address: HUMBLE TEXAS 77338-2202
(if not the same as mailing address)

City: HUMBLE Zip: 77338-2202

Phone: 281-446-2308 Fax: N. A.

Organization or Subdivision: NORTHSHIRE = IN-HUMBLE
281-446-2308

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☐ Self ☐ Other ______________
(please specify)

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: HAPPY = FOR THIS ALL ENCOMPOSING EFFORT:
THANKS!!!
ROY

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College **(PERFORMING ART THEATER)**

Attendance Record

Name: MARIAN BURROWS
Mailing Address: 1700 MAGNOLIA LN.
Street Address: KINGWOOD, TEXAS 77339-3483
(if not the same as mailing address)

City: ______________________ Zip: ______________________

Phone: ______________________ Fax: ______________________

Organization or Subdivision: FOREST COVE PROPERTY OWNERS ASSOCIATION

Would you like to make a Public Statement?
▯ Yes X No

If yes, whom do you represent?
▯ Self ▯ Other ______________________ *(please specify)*

Would you like to receive future notices regarding this project?
X Yes ▯ No

Comments/Questions: DO Something Quick!

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: [illegible]

Mailing Address: 3115 Riviera Ln

Street Address: Same
(if not the same as mailing address)

City: Humble Zip: 77338

Phone: 281-8521738 Fax:

Organization or Subdivision: Belleau Woods.

Would you like to make a Public Statement?

▯ Yes ☒ No

If yes, whom do you represent?

▯ Self ▯ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☒ Yes ▯ No

Comments/Questions:

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: Juanita Lee
Mailing Address: 3166 Riviera Dr
Street Address: ______
(if not the same as mailing address)
City: Humble   Zip: 77338
Phone: 281-852-1738   Fax: ______
Organization or Subdivision: Belleau Wood

Would you like to make a Public Statement?
☐ Yes   ☒ No

If yes, whom do you represent?
☐ Self   ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes   ☐ No

Comments/Questions: I feel we are not be told all the truth about the studie

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: BARRY CAMPBELL

Mailing Address: 24003 RAFTER THREE DR.

Street Address:
(if not the same as mailing address)

City: HOCKLEY Zip: 77447-9211

Phone: (281) 371-7068 Fax:

Organization or Subdivision: NORTHWEST FREEWAY M.U.D.

Would you like to make a Public Statement?

☐ Yes ■ No

If yes, whom do you represent?

☐ Self ☐ Other ____________
(please specify)

Would you like to receive future notices regarding this project?

■ Yes ☐ No

Comments/Questions: PLEASE SEND ME A FINAL PRINT OF THE CHANNELING PROJECT, WHEN AVAILABLE.

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: BEVERLY ERDMANN
Mailing Address: 4819 PINE GARDEN
Street Address: ____________________
(if not the same as mailing address)
City: KINGWOOD Zip: 77345
Phone: 281-360-4026 Fax: ____________
Organization or Subdivision: FOREST MILLS ESTATES

Would you like to make a Public Statement?
▯ Yes ▯ No

If yes, whom do you represent?
▯ Self ▯ Other ____________ *(please specify)*

Would you like to receive future notices regarding this project?
X Yes ▯ No

Comments/Questions: ____________________

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**

Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: Gordon Landwermeyer

Mailing Address: 1122 Klamath Lane

Street Address: ______

(if not the same as mailing address)

City: Houston, TX Zip: 77090

Phone: 281-444-2333 Fax: 281 444 2333 (phone first)

e-mail: tgland@houston.rr.com

Organization or Subdivision: Westador MUD

Would you like to make a Public Statement?

▯ Yes ☒ No

If yes, whom do you represent?

▯ Self ▯ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☒ Yes ▯ No

Comments/Questions: ______

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: David Woerner

Mailing Address: 5507 Cedar Bay Drive

~~Street Address~~: Kingwood Texas 77345
(if not the same as mailing address)

City: ______ Zip: ______

Phone: ______ Fax: ______

Organization or Subdivision: ______

Would you like to make a Public Statement?
☐ Yes ☒ No

If yes, whom do you represent?
☒ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?
☒ Yes ☐ No

Comments/Questions: very fine presentation
Good speaker excellent graphics

REGIONAL FLOOD PROTECTION STUDY FOR A LAKE HOUSTON WATERSHED FLOOD PROGRAM

Public Meeting, **JUNE 13, 2000**
Kingwood College **(PERFORMING ART THEATER)**

Attendance Record

Name: RAY ANDERSON

Mailing Address: 2819 GOLDEN LEAF Rd

Street Address: ______
(if not the same as mailing address)

City: KINGWOOD Zip: 77339

Phone: 281-359-7744 Fax: ______

Organization or Subdivision: ______

Would you like to make a Public Statement?

☑ Yes ☐ No

If yes, whom do you represent?

☑ Self ☐ Other ______ *(please specify)*

Would you like to receive future notices regarding this project?

☑ Yes ☐ No

Comments/Questions: ______

Ray Anderson
2819 Golden Leaf Drive
Kingwood, Texas 77339-1995
Tel. 281-359-3744
E-mail rayfran@flash.net

Regional Flood Protection Study - Kingwood College June 13, 2000

Thank you for the opportunity to express my comments regarding the risk of continued flooding in the Kingwood area.

The 1994 flood wreaked havoc in the area. Many of my friends lost homes, home furnishings and automobiles to the rising waters from the San Jacinto River. Silt and mud infiltrated everything it touched. Many lives were devastated.

I realize that many factors were responsible for this major flood, and that solutions can be costly. However, we must do all we can to prevent a recurrence of this magnitude and insure that human lives are not in danger.

From a layman's prospective the water flowing downstream to Lake Houston carries soil and sand, lining the bottom of the river channel. The buildup of these heavier than water substances create deltas that widen the river that flood adjacent land. Kingwood residents spent almost $137,000 in 1999 to dredge a small area in the San Jacinto River at River Grove Park to open up a silted-in boat dock. Even with this outlay only vessels with shallow draft can negotiate the river to its terminus at Lake Houston.

Earlier this year when drought conditions existed, one could walk across the San Jacinto on the sand bars created from the sediment washed downstream. If back loaders were employed to cart off much of this material, it would have helped alleviate future flooding problems. We know that building construction both up the river and locally have severely limited the ability of the surrounding land to absorb rainfall. The runoff previously feeding forest and grasslands now enters the streams and rivers leading to Lake Houston. I am sure that the increased silting has diminished the capacity of Lake Houston. Dredging part of the lake and the San Jacinto River from Highway 59 east is necessary.

For the past few years, while the problems continue to be with us, nothing concrete has been done. Study after study has focused on solutions to mitigate the threat. We what we need now is to have an organization created, with taxing authority, representing all the interested governmental organizations to manage a formal Flood Mitigation Commission. I feel that residents in this area would favor a bond issue specifically addressing long term solutions. This organization's charter should be to get the job done promptly, otherwise we will continue to face potential disastrous floods.

Again, I wish to thank the sponsors of this program for their dedication to the problem. I hope that the result will be a solution that the residents of the area deserve and that the taxpayers can handle.

Appendix G   Response to Written Comments provided by Project Sponsors

July 6, 2000

Mr. Charles Settle, P.E.
Assistant Director
City of Houston
611 Walker
Houston, Texas 77002

Re: Flood Protection Planning Contract Between the City of Houston (City) and the Texas Water Development Board (Board), Contract No. 97-483-219, Review of the Revised Draft Final Report

Dear Mr. Settle:

Staff members of the Texas Water Development Board have completed a review of the draft responses to comments submitted to the City from the Board on the revised draft report under TWDB Contract No. 97-483-219. Board staff finds the responses to be acceptable and offers no additional comments to the revised draft report. As stated in the above referenced contract, the City will consider incorporating comments on the draft final report, as provided in the letter dated May 11, 2000 (Attachment 1) from the EXECUTIVE ADMINISTRATOR and other commentors, into the final report. The City must include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final report.

The Board looks forward to receiving one (1) unbound camera-ready original and nine (9) bound double-sided copies of the Final Report on this planning project. Please contact Mr. Gilbert Ward Rebuck, the Board's designated Contract Manager, at (512) 463-6418 if you have any questions regarding this matter.

Sincerely,

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

Enclosures

cc: John H.C. Kuo, P.E.
Gilbert Ward

BROWN & ROOT SERVICES

9900 WESTPARK DRIVE
HOUSTON, TEXAS 77063-5169

Facsimile Cover Sheet

TO: **City of Houston**
Attn: Chuck Settle, P.E./
David Huang, P.E.
Fax: 713-837-0464

Texas Water Development Board
Attn: Gilbert R. Ward, C.P.G.
Fax: 512-936-0889

Harris County Flood Control District
Attn: Ken Sheblak, P.E.
Fax: 713-684-4102

TO: **San Jacinto River Authority**
Attn: Jim Adams, P.E.
Fax: 409-588-3043

Montgomery County
Attn: Mike Beitler, P.E.
Fax: 409-539-7802

CC: David Parkhill, P.E. (B&R Services)

FROM: John Kuo, P.E.
B&R Services
713-260-3111 (ph); 713-260-3225 (fax)

DATE: July 3, 2000

RE: New/Added Section – Final Report
Lake Houston Flood Protection Study
TWDB Contract No. 97-483-219

PAGE: 9 (total including cover page)

Comments:

To project sponsors,

In response to the review comments by the Texas Water Development Board (May 11, 2000), Brown & Root Services is transmitting in this fax additional report sections to be included in the final report for the above referenced project. Specifically, these added sections should provide additional information to clarify/address comments related to the scope of work issues per Tasks 2.1 (2), 2.1 (3), 3.2, and 4.0 of the SOW. We are confident that by providing these added sections, we have fully satisfied the scope of work requirements for this study.

We are currently incorporating these new sections along with other minor revisions on comments received from all project sponsors into the Final Report. In addition, a specific response to comment section will be included in the Final Report. We plan to have the final report completed and issued by July 17th. If you should have any question, please notify us immediately.

6/30

Regional Flood Protection Study for Lake Houston Water Flood Program
(New/Added Sections)

1.4.3 Hydraulic Analysis per 1999 Channel Cross Sections

……

C. Limitations (New Section)

The 1999 HEC2 flood model was compared with observations and measurements of the known high water data from the 1994 (October) and 1998 (October and November) floods. Due to very limited flood gauge data available within the study area, actual flood elevation data were obtained at a few accessible locations along the West Fork channel such as at the US 59 bridge, the Lake Houston Parkway bridge, and the FM 1960 bridge. For comparison, the output of the HEC2 models from the original FEMA model and the 1999 updated model were used to evaluate actual versus modeled flood data. The data comparisons are summarized as follows.

	Water Surface Elevation (1973 Datum adjustment)			
	US 59 Bridge	Parkway Bridge	1960 Bridge	Spillway
FEMA Model ('70s)				
50-yr Flood	62.23	50.21	48.70	48.70
100-yr Flood	65.12	51.47	49.70	49.70
Updated Model (1999)				
50-yr Flood	62.16	50.64	49.04[6]	48.70
100-yr Flood	64.41	52.00	50.24[6]	49.70
HCOEM[1] Gauge Data				
Oct-94	66.8	no gauge	no gauge	52.78
Oct-98[2]	55.38	no gauge	no gauge	48.51
Nov-98[2]	60.45	no gauge	no gauge	50.55
Field Observation				
Oct-98	62.35	50.50	50.40	48.15
Nov-98	57.85	49.00	48.40	50.11
High Water Mark[3]				
Oct-1994	-	56.2[5]	-	-
Summer 1998	53.51[4]	47.53[5]	-	-
Fall 1998	59.55[4]	51.99/52.02[5]	-	-

Note:
1 Harris County Office of Emergency Management (HCOEM) gauge reading
2 Data adjusted for datum change
3 Surveyed data (1999)
4 Based on marks located d/s of US 59 Bridge at Edgewood Park
5 Based on marks located u/s of Parkway Bridge in Kingwood Country Club
6 Based on TWDB 1994 (Lake Houston) cross section data

Data comparisons suggest that correlation between the modeled water surface elevations and the actual flood data are inconclusive with variation at different locations being highly dependent on the assumed flood (flow) conditions. This variation is in part limited by the few available flood data (flow and elevation) for comparison and also potentially by the limitations of the computer model.

It shall also be noted that the updated HEC2 model (1999) was computed using cross-section data at the original FEMA section locations. It appears that some of the original FEMA section locations may not be well-suited to represent channel flow conditions. To verify the potential impact due to the change of cross-section locations, preliminary analyses were conducted by adding new cross-sections or by using relocated cross-sections based on the aerial photogrammetric survey data. Results of the modified sections suggested that the WSEL's for 100-year flood may show additional increases of approximately 1.0 to 2.0 feet greater than the current model at some critical locations. Due to the limited scope of this study, the overall impact of the revised cross-sections to the modeled water surface should be considered in future studies.

2.3.2 Sediment Handling and Disposal

.....

- Wetland creation and enhancement (New Section)

The use of dredged material for wetland creation and enhancement offers a potentially feasible alternative to other off-site or upland disposal options where practicable. This alternative is often attractive, especially when other disposal options are constrained by public opinion and/or regulations or limited by availability of disposal sites. In addition, this alternative may be necessary when restoration of wetland habitats or mitigation of wetland impacts is required. To attain the maximum credit for wetland creation, wetlands should be created in upland areas or other areas currently not jurisdictional under section 404 of the Clean Water Act, or by enhancement of existing low quality wetland areas. However, in order to place dredged materials in the floodplain, further hydraulic analyses will be required to ensure no impact to the existing flood conditions.

For this study, there is limited opportunity for creation of potential wetland sites due to the highly fluctuating channel flows and the unstable nature of the sediment deposits in the floodplain area. However, it is possible that some of the old, existing sand and gravel pits in the area may be considered for wetland enhancement. These pits are often deep enough to intercept groundwater and may be economically desirable to support habitat development. Placement of dredged material in these areas may transform these areas of low habitat value into areas of much greater habitat value by converting these deeply incised, relatively deep water areas into shallow water habitats more easily accessed by terrestrial organisms. Sand and gravel pits in lower elevations within the floodplain would likely be better sites for wetland creation since these would likely be in areas with shallower water tables and would receive more frequent inundation by flood events. Where no sand or gravel pits exist, dredged material could be used to create gently sloping berms that could intercept and pond water flowing down hillsides and in small drainages.

Placement of dredged material in existing wetlands, including poor quality wetlands would likely not benefit these wetlands unless this material was used to impede the flow of water through or increase the depth of water in these areas, thereby increasing their value.

2.3.3 Environmental and Regulatory Issues (New Section)

The expected environmental issues associated with sediment removal and disposal operations may include:

- Impact of water quality such as increases in turbidity and resuspension of contaminated sediments due to dredging operation;
- Impact of surface water discharge and return water quality especially for upland disposal of dredged material;
- Impact of the existing wetlands, vegetation and habitats resulting from the handling and disposal of dredged materials.

In general, it is believed that water quality impact due to dredging operation may only be considered a limited, local or temporary effect. Erosion of the current channel banks or the existing sediment beds could result in greater impacts to water quality than those from dredging operations. Impact due to contaminated sediment should be non-existent since no contamination was detected from samples taken from Lake Houston. The impacts of surface water discharge and return water quality for upland disposal option will require the implementation of Storm Water Pollution Prevention Plan and an appropriate discharge permit from the Texas Natural Resource Conservation Commission. For dredged material handling and disposal, the impacts may result in the loss or disturbance of vegetation, habitat and wetlands in the area. However, it is expected that the impacts may be limited to the low-quality, shallow water and sand bar areas if only suitable sediment removal or disposal options are considered.

Under current regulations, dredging in a wetland or other water of the United States that is not navigable does not require authorization or permitting under Section 404 of the Clean Water Act and, therefore, no regulation or mitigation is expected from the U.S. Army Corps of Engineers. However, any placement of dredged material in a wetland or other water of the United States will likely trigger the permit with the Corps. The Texas Parks and Wildlife Department may require mitigation of wetlands impacted by dredging if State funds are involved in the work. Additionally, any activity on site will require reviews by related agencies for potential existence or impact of the cultural resources, threatened and endangered species, and the Texas Coastal Management Program. For this study, detailed environmental and regulatory issues are further discussed in Section 3.2.3 for the selected project alternatives.

3.3 Implementation Outlines for Project Alternatives (New Section)

This section provides a preliminary outline for implementing the selected project alternatives regarding specific institutional or governmental agency issues, additional engineering or feasibility studies, regulatory permits, environmental studies, and expected construction schedules. Due to the similar nature of the dredging work, implementation outlines for Alternatives I, II, and III are grouped together.

3.3.1 Alternative I, II, and III - Channel Improvement, Area Dredging, or Sediment Basins

- Authority - The City of Houston or Harris County with interagency support by HCFCD, Montgomery County, and SJRA

- Funding - Predominately local funding which may be from public funds or establishing new financial mechanism such as tax or usage/service fee

- Additional Studies - Project-specific dredge material handling and disposal study

- Regulatory Requirements -
  - Flood Plain Ordinance (City of Houston) or Flood Plain Management Policy (Harris County)
  - Section 11.144 of Texas Water Code for Commission approval of channel modification work (TNRCC)
  - Section 401 Certification for return water quality (TNRCC)
  - Section 404 Permit for placement of fills or dredged material in a waterway (USCOE)
  - Section 106 of National Historic Preservation Act review of archeological sites (THC)
  - Endangered Species (USFWS and TPWD)
  - Texas Coastal Management Program
  - TPDES (formerly NPDES) for construction activities affecting more than five acres. (Note: Under Phase II of the NPDES, activities affecting between 1 and 5 acres will be regulated. The interim Phase II regulations will be effective August 7, 2001.)

- Environmental Studies - None expected; however, if application of the NEPA is required (due to federal funding or Section 404 permit), Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required.

- Cost - $29.4 million for Alternative I Channel Improvement d/s West Fork

$21.3 million for Alternative IIA Dredging Area A
$8.9 million for Alternative IIB Dredging Area C
$13.3 million for Alternative IIC Dredging Area D
$13-$22 million for Alternative III On-Channel Sediment Basin (Area A or D)

- Construction Schedule - 13 months for Alternative I
  10 months for Alternative IIA
  4 months for Alternative IIB
  6 months for Alternative IIC
  6 to 10 months for Alternative III
  Each alternative also requires a minimum of 3 to 4 months for bidding and area preparation

- Long-Term Maintenance - All alternatives will require maintenance dredging to manage the continuing sediment load

3.3.2 Other Alternative - Off-Channel Sediment Basins (Diversion) of West Fork Channel

- Authority - The City of Houston, Harris County, and Montgomery County with assistance of HCFCD

- Funding - Local funding and joint participation by local sandpit operators

- Additional Studies - Feasibility study for site-specific basin utilization and channel division
  Preliminary engineering design for off-channel sediment basin

- Regulatory Requirements - Sand and Gravel Pit Permit (TPWD)
  Flood Plain Ordinance (City of Houston) or Flood Plain Management Policy (Harris County)
  Section 11.144 of Texas Water Code for Commission approval of channel diversion work (TNRCC)
  Section 401 Certification for return water quality (TNRCC)
  Section 404 Permit for placement of fills or dredged material in a waterway (USCOE)
  Section 106 of National Historic Preservation Act review of archeological sites (THC)
  Endangered Species (USFWS and TPWD)
  Texas Coastal Management Program
  TPDES (formerly NPDES) for construction activities more than five-acre area (Note: Under Phase II of the NPDES, activities affecting

between 1 and 5 acres will be regulated. The interim Phase II regulations will be effective August 7, 2001.)

- Environmental Studies - None expected; however, channel diversion and/or off-channel sandpit site may require delineation of wetland issues
- Cost - To be determined
- Construction Schedule - To be determined
- Long-Term Maintenance - Can be achieved by regular dredging by the sandpit operator

3.3.3 Alternative IV - Floodplain Buyout (Non-Structural)

- Authority - The City of Houston, Harris County, and Montgomery County with assistance of HCFCD
- Funding - May be initiated by federal funding with local cost sharing and be implemented in phases based on availability of funds and priority of buyouts; local public funds will be required for final demolition and future maintenance
- Additional Studies - Overall implementation plan for floodplain buyouts; target buyout subdivisions include Lakeside, Riverside Oilfield, Riverside Crest, Forest Cove, Belleau Wood, and Northshore
- Regulatory Requirements - National Flood Insurance Program
- Environmental Studies - None required
- Cost - $22 million for total purchase of all existing structures within the floodplain
- Schedule - In phases based on funding availability
- Long-Term Maintenance - Buyout area may be converted to natural setting or recreation/parkland facilities

4.0 Public/Agency Participation (New Section)

During the course of this study, three public meetings were held to discuss various aspects and findings of the study and to provide a forum for comments by interested individuals and organizations. The public meetings were held at the Kingwood College on August 28, 1997, April 8, 1998, and June 13, 2000. These meetings were scheduled in accordance with three key project phases such as upon initial project startup, at the completion of the problem analysis, and at the completion of the study. Copies of the public meeting records, comment letters received from the public, and responses to key issues raised at the meetings or during the study are included in Appendix F.

Upon completion of the study, a draft executive summary was also prepared and distributed to the key local officials and/or the interested state and U.S. congressional representatives for information and comment. These public officials include:

Houston Council Member Rob Todd (District E)
Houston Council Member Carroll Robinson (At Large Position 5)
Harris County Commissioner El Franco Lee (Precinct 1)
Harris County Commissioner Jerry Eversole (Precinct 4)
State Senator Jon Lindsay
State Senator David Bernson
State Representative Joe Crabb
State Representative Ruben W. Hope
U.S. Congress Member Kevin Brady

It shall also be noted that during the study, valuable assistance, information, and input were received from the project sponsors, namely the City of Houston, the Texas Water Development Board, the Harris County Flood Control District, Montgomery County, and the San Jacinto River Authority. During the study, two interim draft reports were issued upon completion of the phase I problem analysis and the phase II project alternatives for review and comment by the project sponsors. As a result, various verbal and written comments were received. All comments received were considered in the preparation of this final report. For reference, Appendix G provides specific responses to written comments received from the project sponsors.

TEXAS WATER DEVELOPMENT BOARD

May 11, 2000

Mr. Charles Settle, P.E.
Assistant Director
City of Houston
611 Walker
Houston, Texas 77002

Re: Flood Protection Planning Contract Between the City of Houston (City) and the Texas Water Development Board (Board), TWDB Contract No. 97-483-219, Review of Revised Draft Final Report "Regional Flood Protection Study for Lake Houston Watershed Flood Program (Task I Interim Report)"

Dear Mr. Settle:

Staff members of the Texas Water Development Board have completed a review of the revised draft report under TWDB Contract No. 97-483-219 and offer comments shown in Attachments A and B.

However, Tasks 2.1 and 3.2 of the Scope of Work have not been adequately addressed in the revised Draft Final Report and as submitted does not meet contractual requirements. Therefore, please submit this section for review prior to delivery of the Final Report.

After review comments have been transmitted to the City regarding the above referenced item, the City will consider incorporating all comments from the EXECUTIVE ADMINISTRATOR and other commentors on the draft final report into the Final Report.

Please contact Mr. Gilbert Ward, the Board's designated Contract Manager, at (512) 463-6418, if you have any questions about the Board's comments.

Sincerely,

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

cc: John H.C. Kuo, P.E., Brown & Root, Inc.
Gilbert Ward, TWDB

ATTACHMENT A
TEXAS WATER DEVELOPMENT BOARD

Review Comments: City of Houston
Contract No. 97-483-219

The comments are divided into three categories: those pertaining to the project Scope of Work, an update of previous comments transmitted in our January 11, 2000 letter (Attachment 1) to the City and additional comments.

A. Scope of Work

Overall the report presents a solid engineering analysis, with well-supported recommendations that can serve as a basis for a future project(s). However the report as organized does not adequately cover all items in the scope of work (SOW), particularly those areas related to implementation.

On the subject of silt removal and disposal, the report mentions possible recreational use of land reclaimed in the flood plain but does not address wetland creation/enhancement opportunities as specified in Task 2.1 (2) in the SOW. The report should identify candidate sites for wetlands or conduct a search and to document that such sites do not exist or are not available. Task 2.1 (3) specifies expected environmental and regulatory impacts associated with each disposal option. These impacts are not adequately addressed.

Section 3.2 of the report provides a very generalized discussion of overall implementation issues rather than a more detailed conceptual discussion of the more "promising alternatives" as specified in 3.2 of the SOW. The outlines of regulatory permits and environmental studies and of institutional or governmental agency issues should be more specific and should be updated.

B. Update of Previous Comments

Comments provided in Attachment A. Comments 1,3,5,8 and 9 are relative minor at this point or no longer apply. However, Comments 2,4,6 and 7 should be revised as follows:

2. Page 1, next to last line, (HCFCD) should be inserted after Harris County Flood Control District.

4. Page 4, second and fourth complete paragraphs seemingly are inconsistent. The last line of the second paragraph calculates an elevation adjustment of 3.4 feet for the 1994 TWDB data, whereas the last sentence of the fourth paragraph uses 3.5 feet for the elevation adjustment.
   Page 21, first complete paragraph uses a value of 3.4 feet. The Contractor either should revise or explain the difference. Also the reference to Section 1.2, Subsidence should be 1.2.2, Subsidence.

6. Page 13, Historic Sediment Loads, contains a footnote that TDWR (1982) data was excluded without explanation.
   In Table 1-3, the estimates based on the Universal Soil Loss Equation (USLE) were considerably higher than the other estimates. The Contractor should state why the USLE

estimates were unacceptably high and thus explain why the TWDR estimates were excluded.

7. Citations are often incomplete. Please provide an appropriate citation and list of references (bibliography) at the end of the report.

A. Additional Comments

1. Provide executive summary.

2. The report would benefit from a comprehensive editorial review to correct spelling, incomplete sentences, missing articles and the incorrect use of gerunds.

3. Most of the page numbers in the Table of Contents are incorrect.

4. Section 2.2 General Evaluation appears in the text but is not included in the Table of Contents.

5. There are inconsistencies between the titles listed in the List of Figures and the actual titles of the following figures: 1-2, 1-4-2, 1-6-1, 1-6-2, 3-2, 3-3. 3-4, 3-5, 3-6, 3-7, and 3-8. There are also inconsistencies between the section titles listed in the table of contents and the text in Chapter 2.

6. The USGS gage no. was included in the title of Figure 1-4-2, Cypress Creek near Westfield site but not for the other sites.

7. The titles for Figures 1-5-2 and 1-6-2 should be Cypress Creek near Westfield.

8. Figure 1-3 is difficult to read.

9. The email address on page 54 should be updated to www.glo.state.tx.us/coastal/cmp.html.

10. Information on NPDES on page 54 should be updated.

11. The reference to 31TAC368 on page 27 should be revised as the rule was approved August 1998.

12. Figure 1-4-1 gives two relationships, one for 1974 and after and another for 1974 and prior. The explanation on page 11 discussed sediment trapping by Lake Conroe. It should be stated that Lake Conroe was completed in 1973.

13. Please explain why discharges for the period 1865 - 1994 are given on page 19, what the significance of that period of time is, and how the values were developed.

14. Should the last line on page 23 reference the floodplain of the San Jacinto River?

15. As acknowledged by the Contractor, Chapter 4.0 and most of the appendices were not provided for review. Please provide this information.

ATTACHMENT B

Texas Natural Resource Conservation Commission
Review Comments: City of Houston
TWDB Contract No. 97-483-219

1. An Application for Approval of Reclamation Project need not be filed with the Texas Natural Resource Conservation Commission for the referenced proposal. It was determined from our review that the proposed project, since it is in the City of Houston, needs to be permitted by the City. The City of Houston by virtue of its participation in the National Flood Insurance Program, and in accordance with Section 16.236 (d) (3&4) of the Texas Water Code, has approval authority for the project. If the City has not already done so, they should insure that the proposed construction is documented and permitted in accordance with their Flood Hazard Prevention Ordinance. This documentation should also be submitted by the City to the Federal Emergency Management Agency to obtain a Letter of Map Revision (LOMR) of Houston's Flood Insurance Rate Map.

2. The technical content of the referenced report is based on acceptable hydrological and hydraulic methods and is complete. Therefore, the merits of the proposed project can be evaluated from the report.

Response To Comments - Lake Houston Study

ATTACHMENT A
TEXAS WATER DEVELOPMENT BOARD

Review Comments: City of Houston
Contract No. 97-483-219

The comments are divided into three categories: those pertaining to the project Scope of Work, an update of previous comments transmitted in our January 11, 2000 letter (Attachment 1) to the City and additional comments.

A. Scope of Work

Overall the report presents a solid engineering analysis, with well-supported recommendations that can serve as a basis for a future project(s). However the report as organized does not adequately cover all items in the scope of work (SOW), particularly those areas related to implementation.

On the subject of silt removal and disposal, the report mentions possible recreational use of land reclaimed in the flood plain but does not address wetland creation/enhancement opportunities as specified in Task 2.1 (2) in the SOW. The report should identify candidate sites for wetlands or conduct a search and to document that such sites do not exist or are not available. Task 2.1 (3) specifies expected environmental and regulatory impacts associated with each disposal option. These impacts are not adequately addressed.

Section 3.2 of the report provides a very generalized discussion of overall implementation issues rather than a more detailed conceptual discussion of the more "promising alternatives" as specified in 3.2 of the SOW. The outlines of regulatory permits and environmental studies and of institutional or governmental agency issues should be more specific and should be updated.

Response: ***Sections 2.3.2, 2.3.3, and 3.3 have been updated or added to provide additional information per Tasks 2.1(2), 2.1(3), and 3.2.***

B. Update of Previous Comments

Comments provided in Attachment A. Comments 1,3,5,8 and 9 are relative minor at this point or no longer apply. However, Comments 2,4,6 and 7 should be revised as follows:

2. Page 1, next to last line, (HCFCD) should be inserted after Harris County Flood Control District.

Response: ***The change has been made (see page 1).***

4. Page 4, second and fourth complete paragraphs seemingly are inconsistent. The last line of the second paragraph calculates an elevation adjustment of 3.4 feet for the 1994 TWDB data, whereas the last sentence of the fourth paragraph uses 3.5 feet for the elevation adjustment.
Page 21, first complete paragraph uses a value of 3.4 feet. The Contractor either should revise or explain the difference. Also the reference to Section 1.2, Subsidence should be 1.2.2, Subsidence.

Response: *A subsidence adjustment of 3.4 feet should be used for this study. The change has been made (see pages 4 and 21).*

6. Page 13, Historic Sediment Loads, contains a footnote that TDWR (1982) data was excluded without explanation.
   In Table 1-3, the estimates based on the Universal Soil Loss Equation (USLE) were considerably higher than the other estimates. The Contractor should state why the USLE estimates were unacceptably high and thus explain why the TWDR estimates were excluded.

Response: *The TDWR data was adopted from the Erosion and Sedimentation Report (1982) which concluded average annual sediment rates by yield-point area and were reported in a rough, estimated form of tons/acre. Clearly, total sediment values as computed for the related tributary basin were much higher than other comparable data. Due to limited information provided in the report, not enough details can be used to verify the validity of these exceptionally high sediment data. For comparison purpose, it was excluded from the study.*

7. Citations are often incomplete. Please provide an appropriate citation and list of references (bibliography) at the end of the report.

Response: *The corrected reference list has been made/updated (see the end of the report).*

<u>A. Additional Comments</u>

1. Provide executive summary.

Response: *The project Executive Summary has been added.*

2. The report would benefit from a comprehensive editorial review to correct spelling, incomplete sentences, missing articles and the incorrect use of gerunds.

Response: *The related corrections have been made.*

3. Most of the page numbers in the Table of Contents are incorrect.

Response: *The corrected page numbers and table of contents have been updated.*

4. Section 2.2 General Evaluation appears in the text but is not included in the Table of Contents.

Response: *See previous response.*

5. There are inconsistencies between the titles listed in the List of Figures and the actual titles of the following figures: 1-2, 1-4-2, 1-6-1, 1-6-2, 3-2, 3-3. 3-4, 3-5, 3-6, 3-7, and 3-8. There are also inconsistencies between the section titles listed in the table of contents and the text in Chapter 2.

Response: ***The changes have been made and the table of contents has been updated.***

6. The USGS gage no. was included in the title of Figure 1-4-2, Cypress Creek near Westfield site but not for the other sites.

Response: ***The USGS station no. for Spring Creek has been added to related figure(s).***

7. The titles for Figures 1-5-2 and 1-6-2 should be Cypress Creek near Westfield.

Response: ***The changes have been made.***

8. Figure 1-3 is difficult to read.

Response: ***Figures 1-1 and 1-3 will be shown in color for Final Report.***

9. The email address on page 54 should be updated to www.glo.state.tx.us/coastal/cmp.html.

Response: ***The website address for the Texas Coastal Management Program has been updated. (see page 59)***

10. Information on NPDES on page 54 should be updated.

Response: ***Information on TPDES (formerly NPDES) has been updated in Final Report. (see pages 31 and 59)***

11. The reference to 31TAC368 on page 27 should be revised as the rule was approved August 1998.

Response: ***The change has been made. (see page 29)***

12. Figure 1-4-1 gives two relationships, one for 1974 and after and another for 1974 and prior. The explanation on page 11 discussed sediment trapping by Lake Conroe. It should be stated that Lake Conroe was completed in 1973.

Response: ***A note is added to Figure 1-4-1 to clarify the distinction of the two curves was due to the construction of Lake Conroe in 1973.***

13. Please explain why discharges for the period 1865 - 1994 are given on page 19, what the significance of that period of time is, and how the values were developed.

Response: ***The information was adopted from a report by RUST Lichliter/Jameson (1995) for flood frequency analysis due to the 1994 flood. It was briefly indicated in the report that the historic flood data obtained in the early 1930's from local residents concluded that there were two major floods since 1865 with peak flows of 187,000*** *cfs in 1900 and 1929. As a result, historic flood data for the period 1865-1994 were considered. No other details were given how the values were developed.*

14. Should the last line on page 23 reference the floodplain of the San Jacinto River?

Response: ***The floodplain of the San Jacinto River has been referenced. (see page 26)***

15. As acknowledged by the Contractor, Chapter 4.0 and most of the appendices were not provided for review. Please provide this information.

Response: ***All related appendices and Section 4.0 have been provided in Final Report.***

ATTACHMENT B

Texas Natural Resource Conservation Commission
Review Comments: City of Houston
TWDB Contract No. 97-483-219

1. An Application for Approval of Reclamation Project need not be filed with the Texas Natural Resource Conservation Commission for the referenced proposal. It was determined from our review that the proposed project, since it is in the City of Houston, needs to be permitted by the City. The City of Houston by virtue of its participation in the National Flood Insurance Program, and in accordance with Section 16.236 (d) (3&4) of the Texas Water Code, has approval authority for the project. If the City has not already done so, they should insure that the proposed construction is documented and permitted in accordance with their Flood Hazard Prevention Ordinance. This documentation should also be submitted by the City to the Federal Emergency Management Agency to obtain a Letter of Map Revision (LOMR) of Houston's Flood Insurance Rate Map.

Response: ***Comment is consistent with permit requirements stated in report (section 3.2.3). No action is required.***

2. The technical content of the referenced report is based on acceptable hydrological and hydraulic methods and is complete. Therefore, the merits of the proposed project can be evaluated from the report.

Response: ***No action is required.***