

Regional Flood Protection Study

For

Lake Houston Watershed Flood Program

(Final Report)

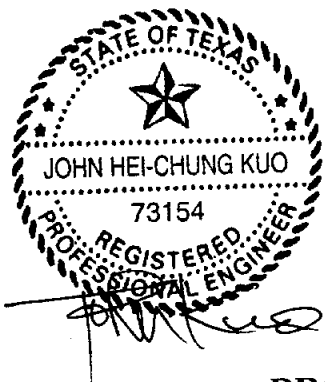
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WATER
GRANTS MANAGEMENT

for

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



PREPARED BY



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Regional Flood Protection Study Lake Houston Watershed Flood Program

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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 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 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/ft³, 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 CONTROL 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 - Off-channel sediment basins (to be studied)

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 administered 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.

Permit Requirements

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
<u>Subsidence (1954-1995)</u>	<u>- 3.5 ft</u>
Spillway Elev. (1995)	+40.3 ft (MSL)
1994 TWDB Spillway Elev. (Assumed)	+44.5 ft
<u>1995 Spillway MSL</u>	<u>+40.3 ft</u>
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	<u>Basin Area mile²</u>	<u>Susp. Sed. mg/l</u>	<u>TSS ton/yr</u>	<u>Sand (%) Bed/Susp. Sed.</u>
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 mi²)

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 mile². 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⁾ Mile ²	Annual Sediment Load, Tons (1979)		Sed. Delivered ⁽³⁾
		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 mi²)

(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 10⁶ kg/yr (1980) to 194 x 10⁶ kg/yr (1990), a 22% increase. Predicted increases in TSS loads and their distribution for Lake Houston and related tributaries are:

Tributary	<u>TSS Loads (1980)</u>	<u>TSS Loads (1990)</u>	<u>Percent Total</u>
	<u>kg/yr x10³ (ton/yr)</u>	<u>kg/yr x10³ (ton/yr)</u>	<u>(1990)</u>
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	<u>TSS Loads kg/yr x10⁶ (ton/yr)</u>		
	<u>High Flow Year</u>	<u>Avg. Flow Year</u>	<u>Low Flow Year</u>
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/ft³ (Ref: Ambersen Report)

(2) Distribution of Volume Losses

<u>Ranges/Location</u>	<u>Volume Loss</u>			
	<u>Subsidence</u>		<u>Sedimentation</u>	
	<u>acre-feet</u>	<u>%</u>	<u>acre-feet</u>	<u>%</u>
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
<u>TOTAL</u>	<u>18,719</u>	<u>100</u>	<u>9,092</u>	<u>100</u>

(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:

<u>Basin</u>	<u>Area mile²</u>	<u>Avg. Flow cfs</u>	<u>TSS mg/l</u>	<u>TSS Mean kg/yrx10⁶ (ton/yr)</u>
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)
<u>TOTAL</u>	<u>2,243</u>			<u>139.1 (155,000)</u>

Results of the SWMM for nonpoint source sediment loading are:

<u>Basin</u>	<u>TSS Load kg/yrx10⁶ (ton/yr)</u>			
	<u>Yr 1990</u>	<u>% Total</u>	<u>Yr 2040</u>	<u>50-Yr Increase</u>
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%
<u>TOTAL</u>	<u>162.6</u>	<u>100%</u>	<u>189.7</u>	<u>17%</u>
	(179,000)		(209,000)	

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:

<u>Basin⁽¹⁾</u>	<u>Area</u> <u>Mile²</u>	<u>Annual Sediment Load, Tons (1990)</u>		
		<u>Total Land</u> <u>Erosion</u>	<u>Tot Channel</u> <u>Erosion</u>	<u>Total</u> <u>Delivered⁽²⁾</u>
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:

<u>Basin</u>	<u>Sediment Delivered (Tons/year)</u>		<u>This Study</u>
	<u>Previous Studies</u>		
	<u>Range⁽¹⁾</u>	<u>Mean⁽²⁾</u>	
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	-
<u>Luce Bayou</u>	<u>5,000-22,000</u>	<u>9,000</u>	<u>-</u>
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:

<u>Basin</u>	<u>Anticipated Sediment Loads (Tons/year)</u>		}	25%
	<u>Range⁽¹⁾</u>	<u>Percent Total</u>		
Cypress Creek	70,000-160,000	39-45 %	}	25%
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 %		
Caney Creek	10,000-15,000	6-4%		
Peach Creek	10,000-25,000	6-7%		
<u>Luce Bayou</u>	<u>10,000-20,000</u>	<u>5-6%</u>		
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/ft³ (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:

<u>Material</u>	<u>Retail* (\$/yd³)</u>
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 yd³ = 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 (m³). 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 205.58 feet (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 Splendor, 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 the 1999 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.

<u>Stream/Feature</u>	<u>Manning's "n" Value</u>	
	<u>Channel</u>	<u>Flood Plain</u>
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.

	<u>Water Surface Elevation (1973 Datum adjustment)</u>			
	<u>US 59 Bridge</u>	<u>Parkway Bridge</u>	<u>1960 Bridge</u>	<u>Spillway</u>
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/ft³, 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 (yd³/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 yd³/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 - Off-channel sediment basins (to be studied)

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 HCFCFCD 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 (*Macrochelys 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 melanoleucus 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 mitigate 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. YRS	HEC-2 (1)	HEC-2(2)	Diff	HEC-2 (3)	Diff(1)	Diff(2)	HEC-2 (4)	Diff(1)	Diff(2)
FEMA	Above Dam		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)		5 HEC-2 TWDB (1994)	
			CWSEL Ft.	Area Sq. Ft.	CWSEL Ft.	Area Sq. Ft.
@A Range Line 1		10	46.30	237,348	46.30	237,465
	0.47 miles	50	48.70	260,263	48.71	260,613
		100	49.70	269,882	49.71	270,306
		500	52.70	299,130	52.72	299,678
@B Range Line 2		10	46.30	173,350	46.3	204,454
	1.11 miles	50	48.70	193,567	48.71	224,740
		100	49.70	202,028	49.72	233,285
		500	52.70	230,275	52.74	261,830
@C Range Line 3		10	46.30	160,066	46.31	175,184
	1.99 miles	50	48.70	177,520	48.73	192,957
		100	49.70	184,870	49.75	200,469
		500	52.70	207,316	52.79	223,248
@D Range Line 4		10	46.30	163,455	46.31	168,544
	2.40 miles	50	48.70	180,588	48.74	186,149
		100	49.70	187,768	49.77	193,617
		500	52.70	209,437	52.83	216,071
@E Range Line 5		10	46.30	96,688	46.31	109,376
	2.65 miles	50	48.70	111,902	48.74	125,036
		100	49.70	118,279	49.76	131,687
		500	52.70	137,596	52.83	151,612
@F Range Line 6		10	46.30	144,242	46.34	140,325
	3.95 miles	50	48.70	158,141	48.82	154,888
		100	49.70	163,961	49.89	161,230
		500	52.70	181,575	53.06	180,085
@G Range Line 7		10	46.30	119,823	46.34	144,933
	4.39 miles	50	48.70	137,119	48.84	163,297
		100	49.70	144,357	49.92	171,325
		500	52.70	166,361	53.12	195,170
@H Range Line 8		10	46.30	114,550	46.36	108,276
	5.32 miles	50	48.70	127,099	48.88	121,849
		100	49.70	132,408	49.99	127,868
		500	52.70	148,749	53.24	145,891
@I Range Line 9		10	46.30	102,936	46.37	85,793
	5.78 miles	50	48.70	112,702	48.91	96,825
		100	49.70	116,826	50.04	101,691
		500	52.70	129,515	53.31	116,091
*@K Range Line 10		10	46.30	132,656	46.40	142,096
	6.35 miles	50	48.70	153,285	49.01	165,161
		100	49.70	161,935	50.20	175,778
		500	52.70	188,138	53.75	207,589
@L Range Line 11		10	46.30	146,767	46.41	142,311
	6.99 miles	50	48.70	166,510	49.04	164,578
		100	49.70	174,929	50.25	174,891
		500	52.70	201,556	53.83	207,489
**@M Range Line 12		10	46.30	56,497	46.41	45,666
	7.40 miles	50	48.70	62,363	49.04	51,844
		100	49.70	64,829	50.24	54,719
		500	52.70	72,803	53.80	64,451
@O Range Line 13		10	46.30	153,515	46.49	115,037
	8.67 miles	50	48.70	174,302	49.29	139,736
		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 1978	Bedient 1980 (Phase I)	TDWR 1982	Bedient 1983 (Phase II)	Soil Loss (1980)	TC&B, 1983 Lk. Bot. Profile ⁽¹⁾⁽²⁾	WMM (1990)	EH&A, 1993 (Draft) 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		15,300	18,700	16,000	17,000	7,800		
Caney Creek	217	6,390	13,800	70,000 total	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 mi²	-	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/ft³ (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

Occurrence Range	Normalized Occurrence %		Daily Discharge per Occurrence (cfs)	Suspended-Sediment Load (tons/day)				
	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			59,722	44,738
				(tons/year) ---->				

⁽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

Occurrence Range	Normalized Occurrence %		Daily Discharge per Occurrence (cfs)	Suspended-Sediment Load (tons/day)	
	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 FEMA	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)
	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 survey 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			Ratio of Stream-flow to 100-yr flood
			Year	Stage (ft. above datum)	Stream-flow ¹ (cfs)	Stage (ft. above datum)	Stream-flow ¹ (cfs)		
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)				1994 Flood
		10-year	50-year	100-year	500-year	
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) 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
@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. IIEC-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) SECNO	Flood Freq Yrs	Discharge (cfs) Q	WSEL CWSEL	vel in left bank VLOB	vel in right bank VRQB	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
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
@J	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
@K	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
@L	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
@M	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. 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
SECNO											
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											
11.48	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	95,557	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
11.66	50	127,200	62.15	0.0	0.0	5.2	24,625	1,490	0.0	0.0	100.0
11.66	100	167,500	64.38	0.0	0.0	6.0	27,963	1,501	0.0	0.0	100.0
11.66	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											
11.97	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 I-9.
 FLOOD PROFILE COMPARISON -
 WEST FORK SAN JACINTO RIVER
 WITH REVISED STARTING CONDITIONS FROM REACH 2

LOCATION FEMA	MILES Above Dam	FLOOD FREQUENCY YRS	3	4	6	7	8	9	10
			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	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

<u>Sediment Removal Configurations/Options</u>	<u>Channel Configurations</u>	<u>Level of Sediment Removal</u> (10 ⁶ yd ³)	<u>Flood Level Reduction</u> (<u>max</u>) (feet)	<u>Floodplain Top Width Reduction</u> (<u>max</u>) (feet)	<u>Floodplain Reduction</u> 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
	Bottom elev. at 30 ft	1.2	0.43 @ Sec. D ²	510	29
Area Dredging C – SW of Lake Houston Pkwy Bridge (RM 12.2)	new 200 ft channel bottom with flowline elev. at 27 ft	1.0	0.26 @ Sec. D ²	320	18
	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.

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

Flood Control Options	Flood Control Improvement ¹	General Cost ²	Constructability 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 1999 vs FEMA	Flood Level Reduction, feet			
		Base FEMA	1999 Survey		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

<u>Work Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
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)**

<u>Work Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
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				<hr/> \$18,266,000
Contingencies (10%)				\$1,830,000
Engineering (10%)				\$1,830,000
TOTAL ESTIMATED COST				<hr/> \$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)**

<u>Work Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
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				<hr/> \$7,390,000
Contingencies (10%)				\$740,000
Engineering (10%)				\$740,000
TOTAL ESTIMATED COST				<hr/> \$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)**

<u>Work Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
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				<hr/> \$11,044,000
Contingencies (10%)				\$1,100,000
Engineering (10%)				\$1,100,000
TOTAL ESTIMATED COST				<hr/> \$13,244,000

* assume no additional cost for dredged material disposal

Table 3-6 - Summary Buyout Status

Subdivision	Total # Lot¹	# Lot Bought	# Known Vac. Lot	# Remaining	Avg. Appraisal Value²
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)**

<u>Work Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
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

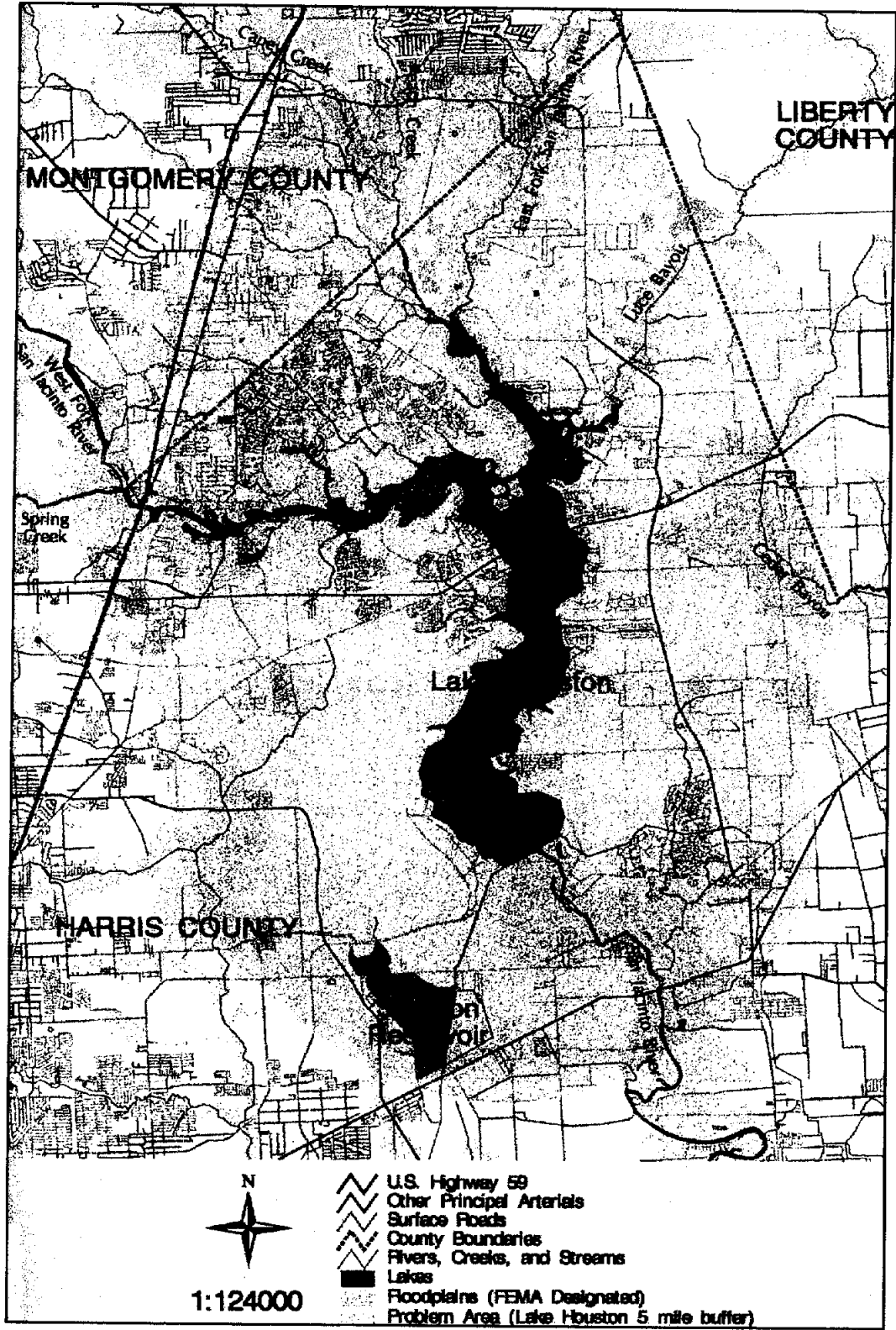


Figure 1-1. Project Location

Lake Houston

Cross-Section Locations

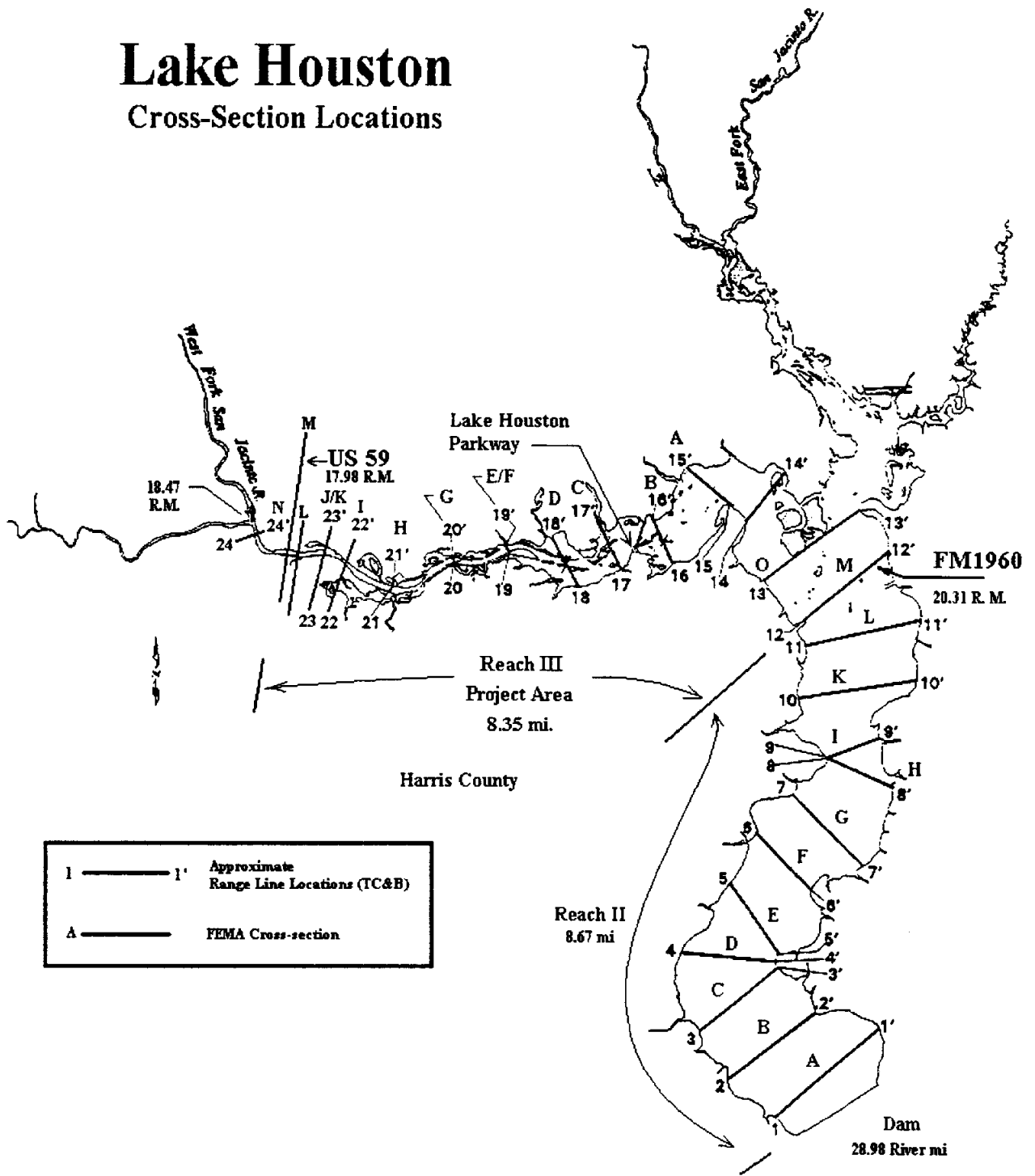


Figure 1-2. Floodplain Cross-Section Locations

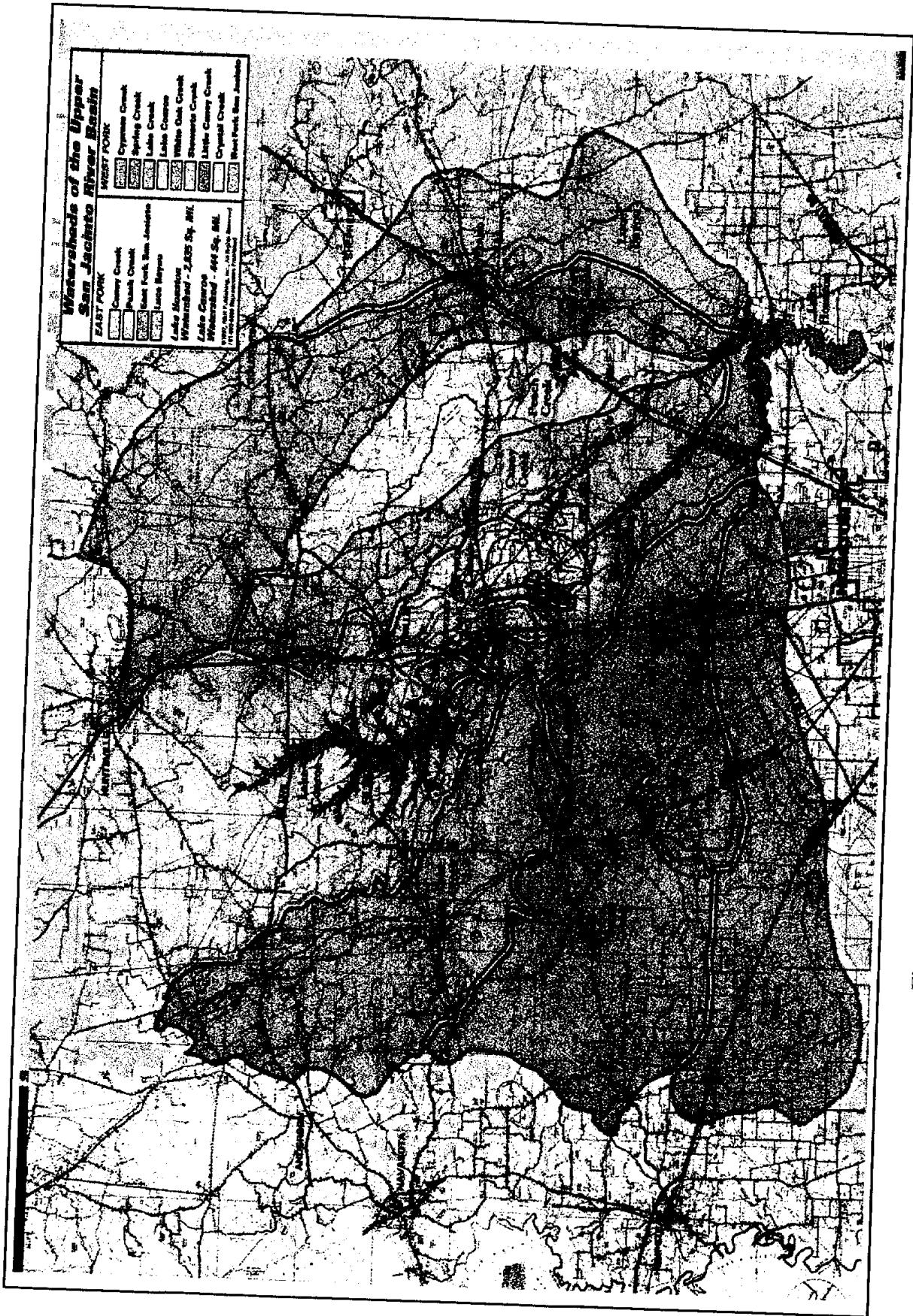
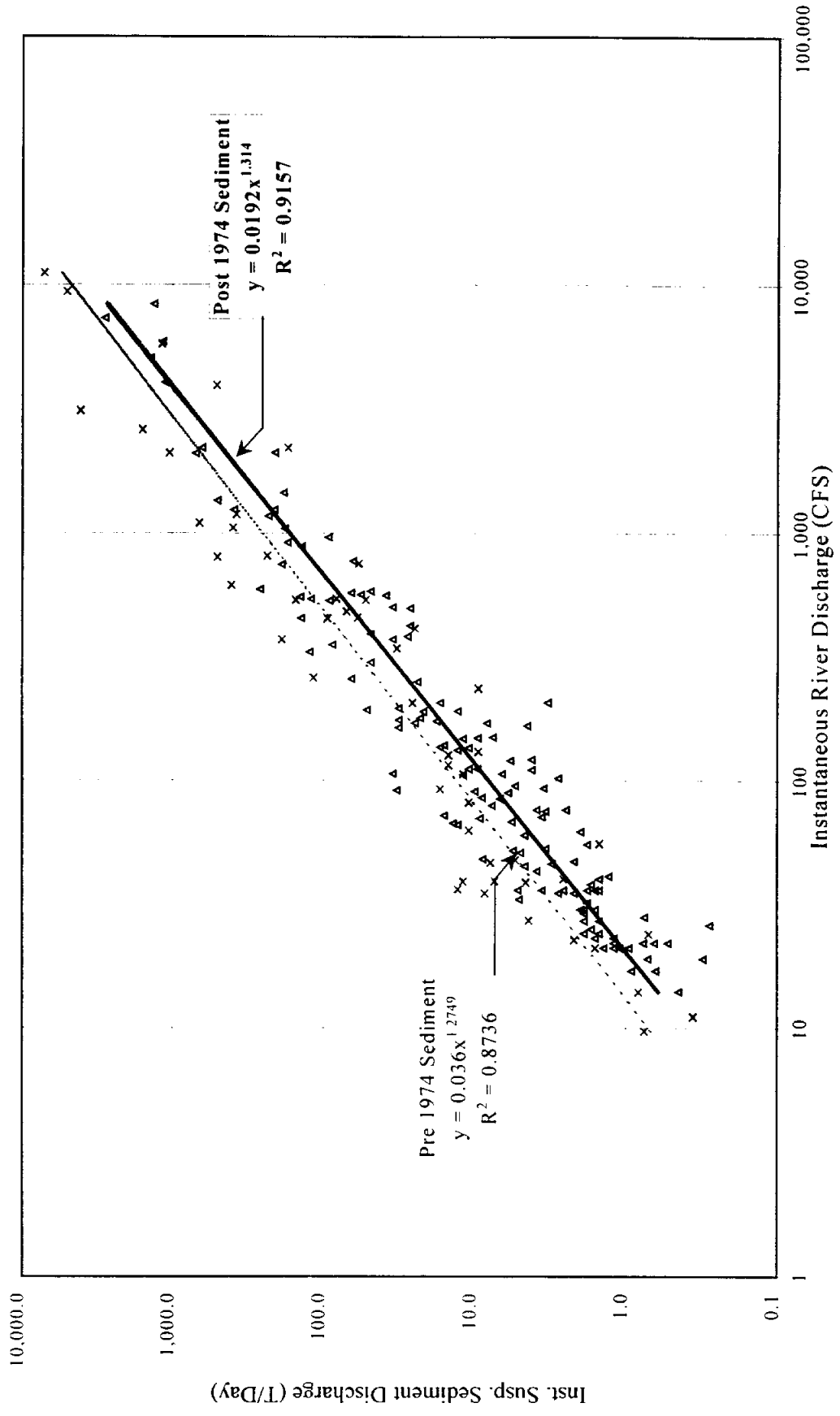


Figure 1-3. Watersheds of the Upper San Jacinto River Basin

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)

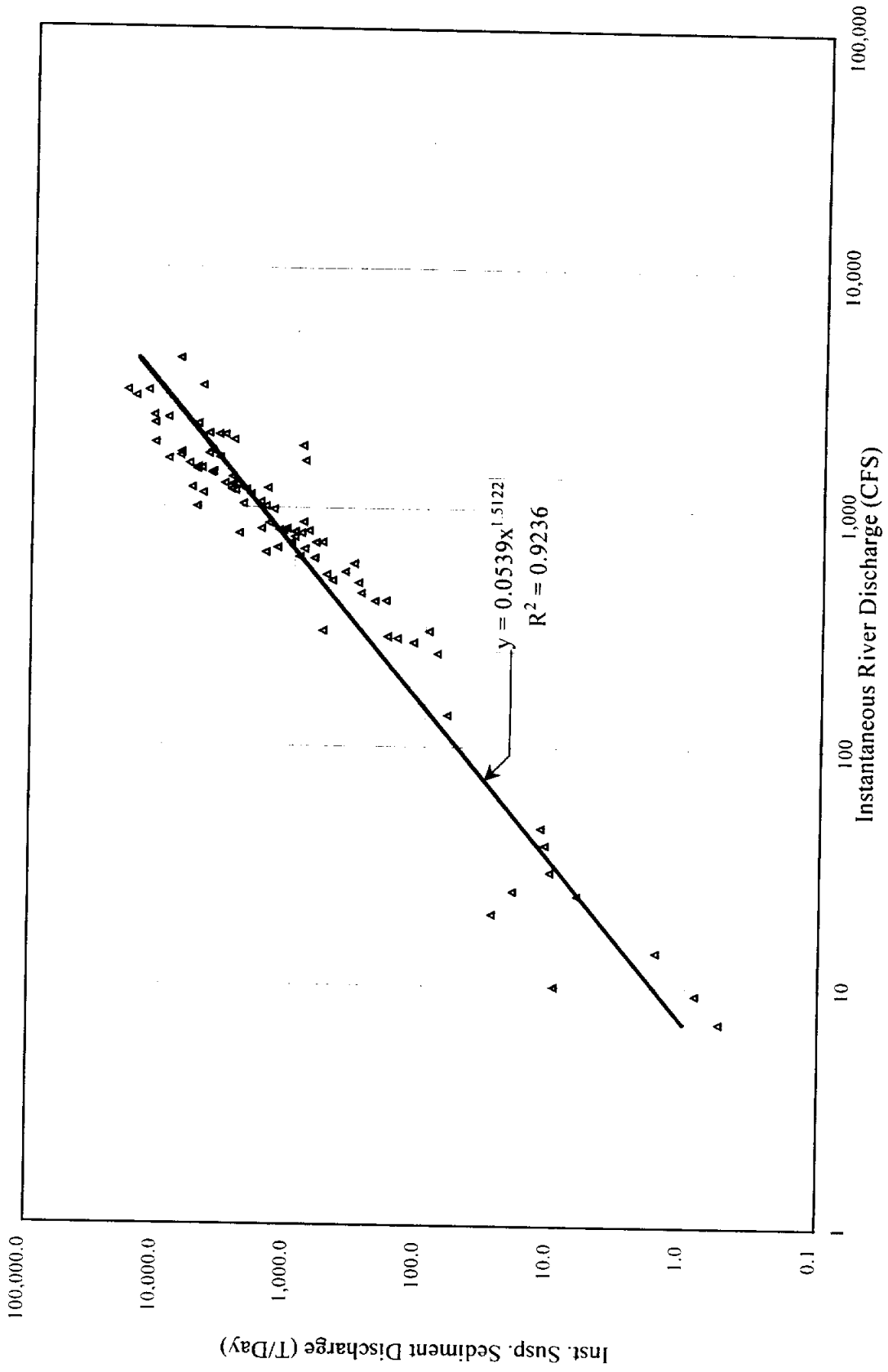


Figure 1-5-1. Flow Occurrence Curve, West Fork San Jacinto River near Conroe, TX

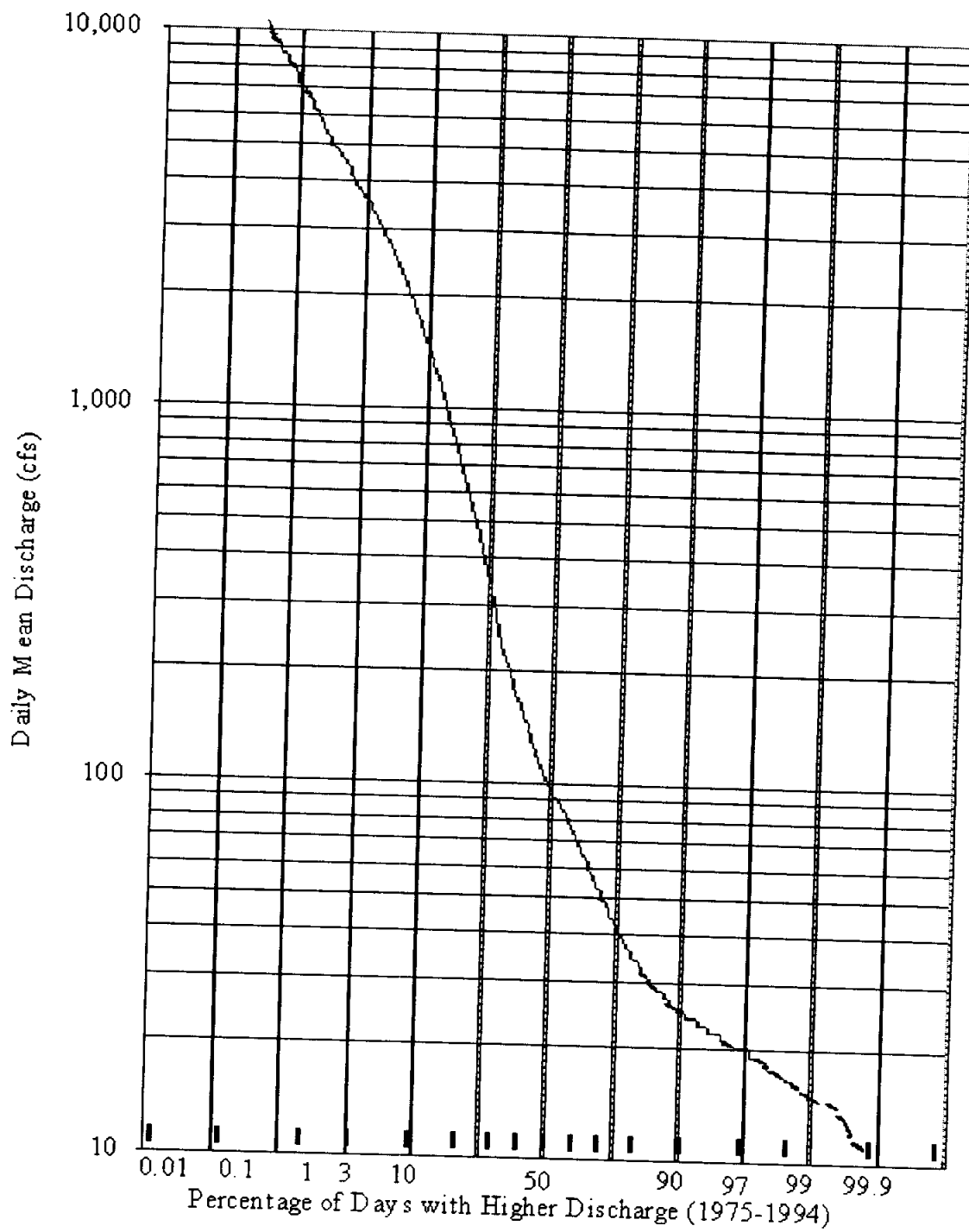


Figure 1-5-2. Flow Occurrence Curve, Cypress Creek, near Westfield, Tx

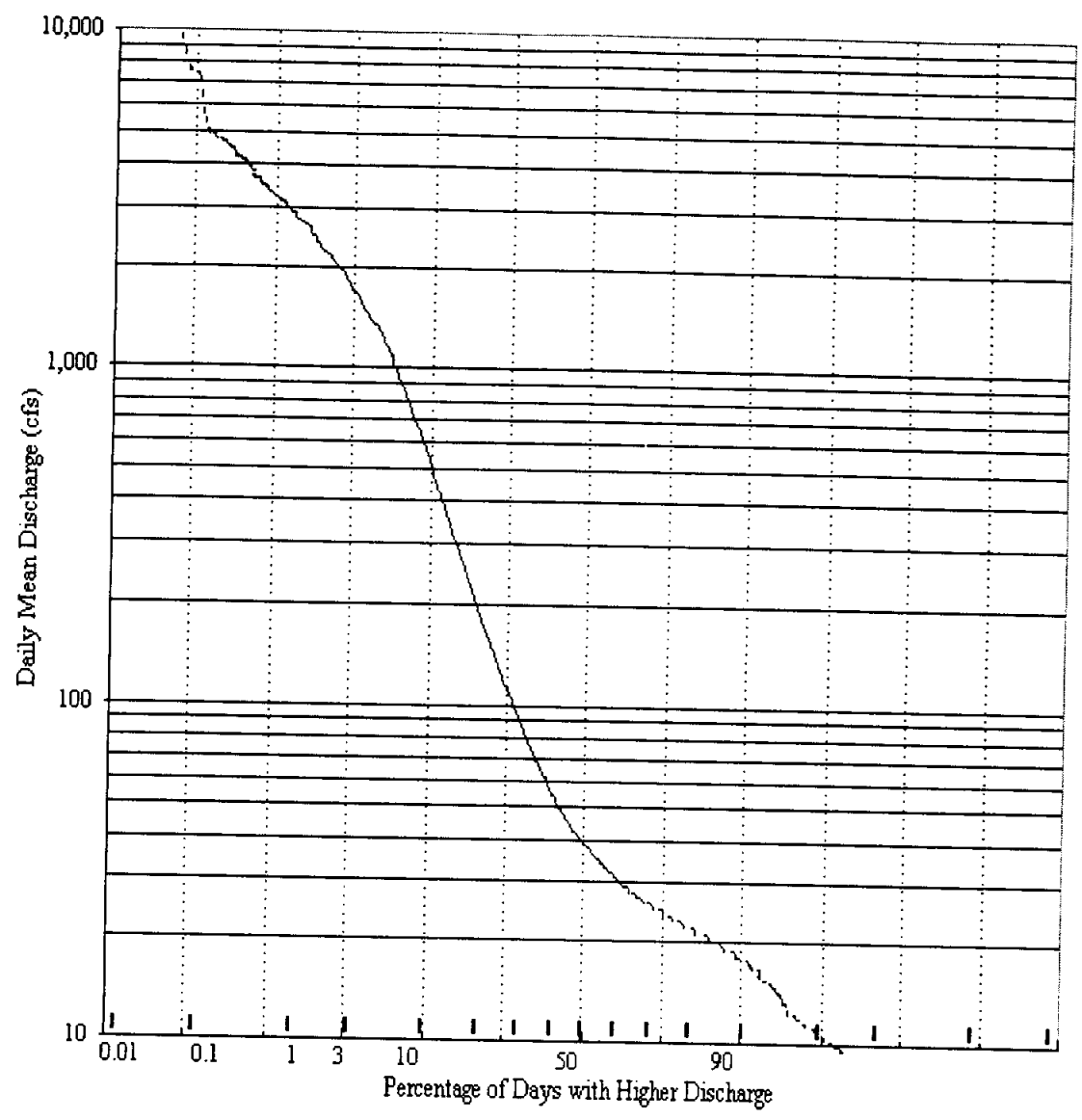
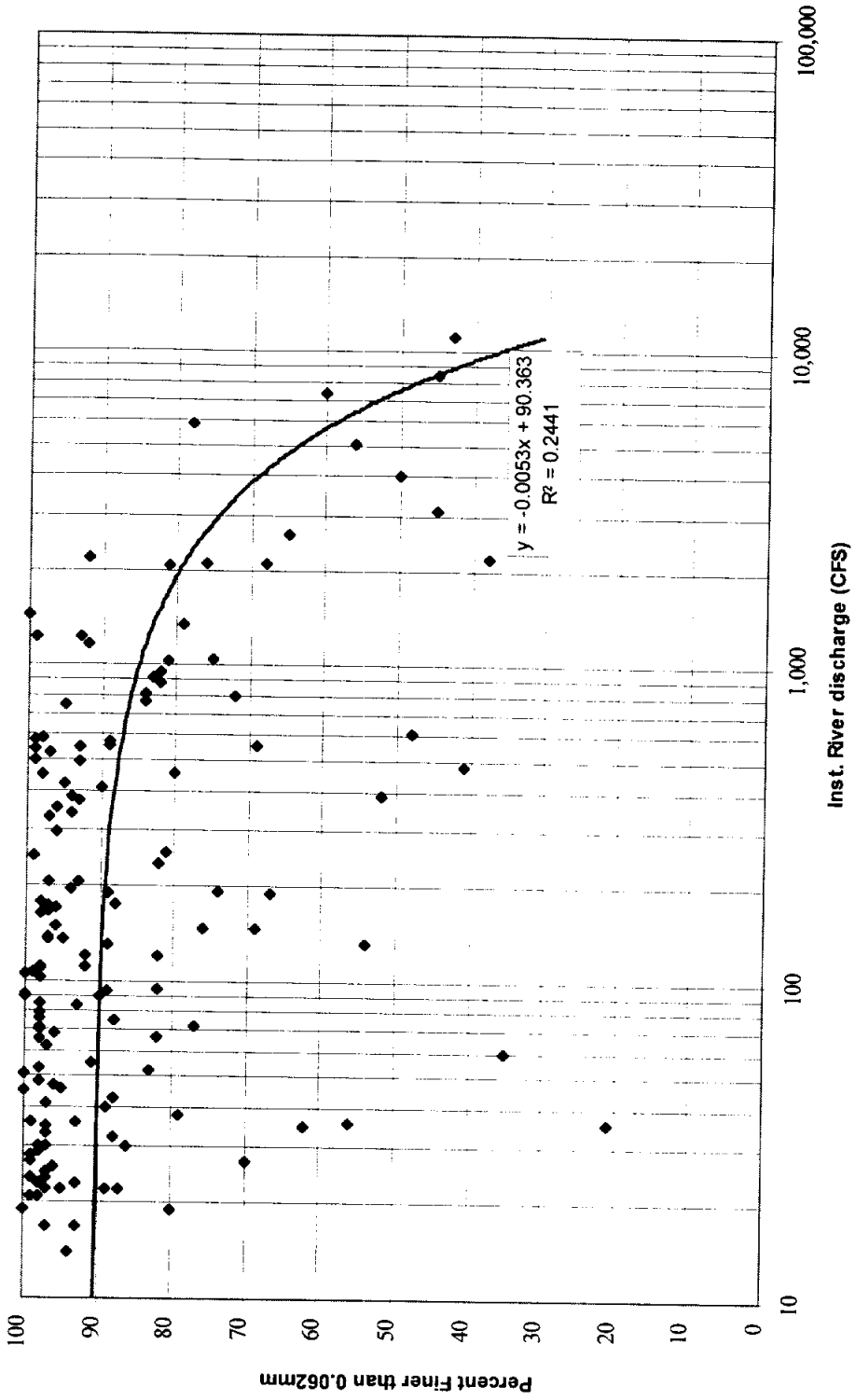
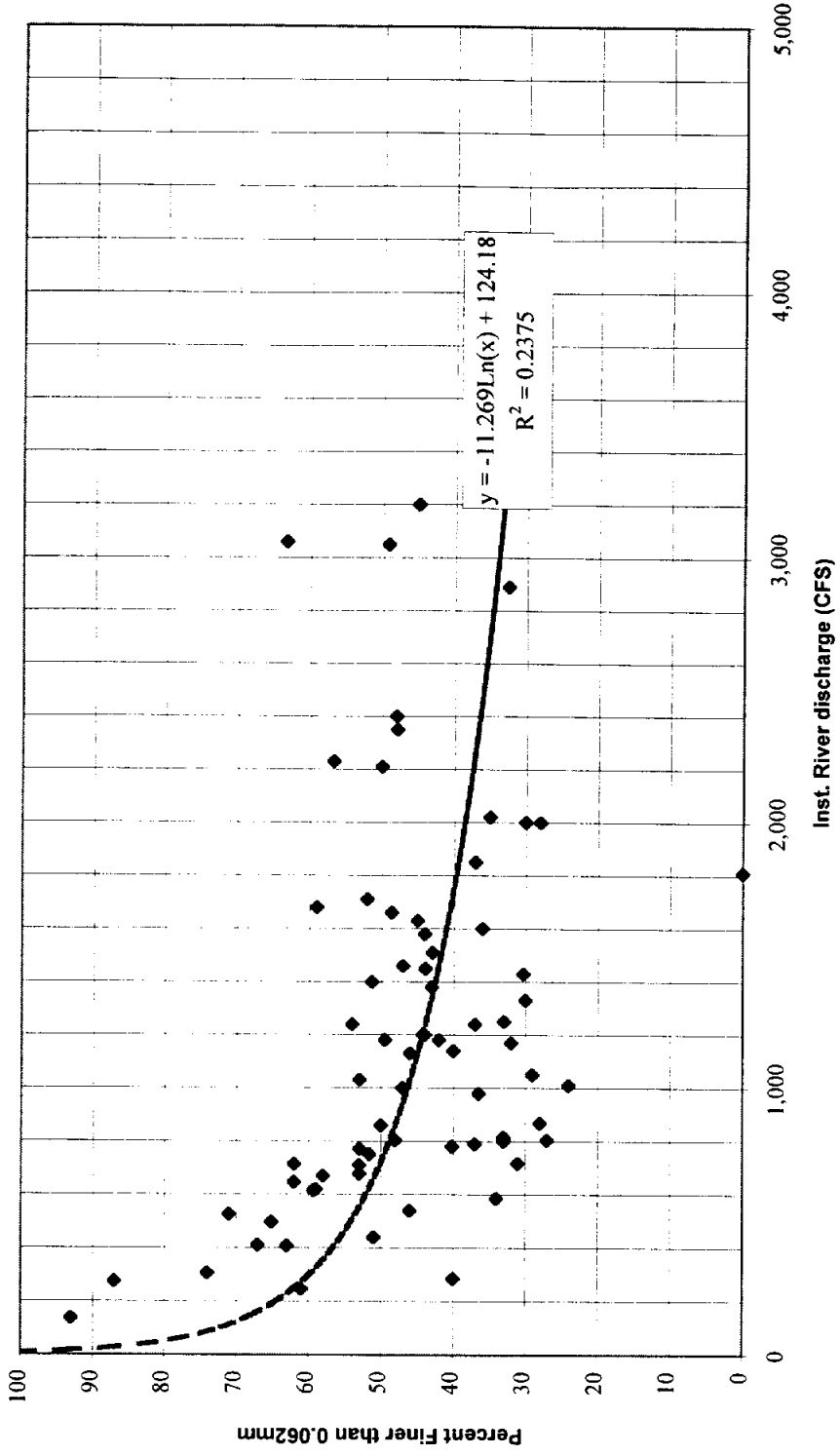


Figure 1-6-1. Percent of Fines in Suspended Sediment, West Fork San Jacinto River near Conroe, Tx



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

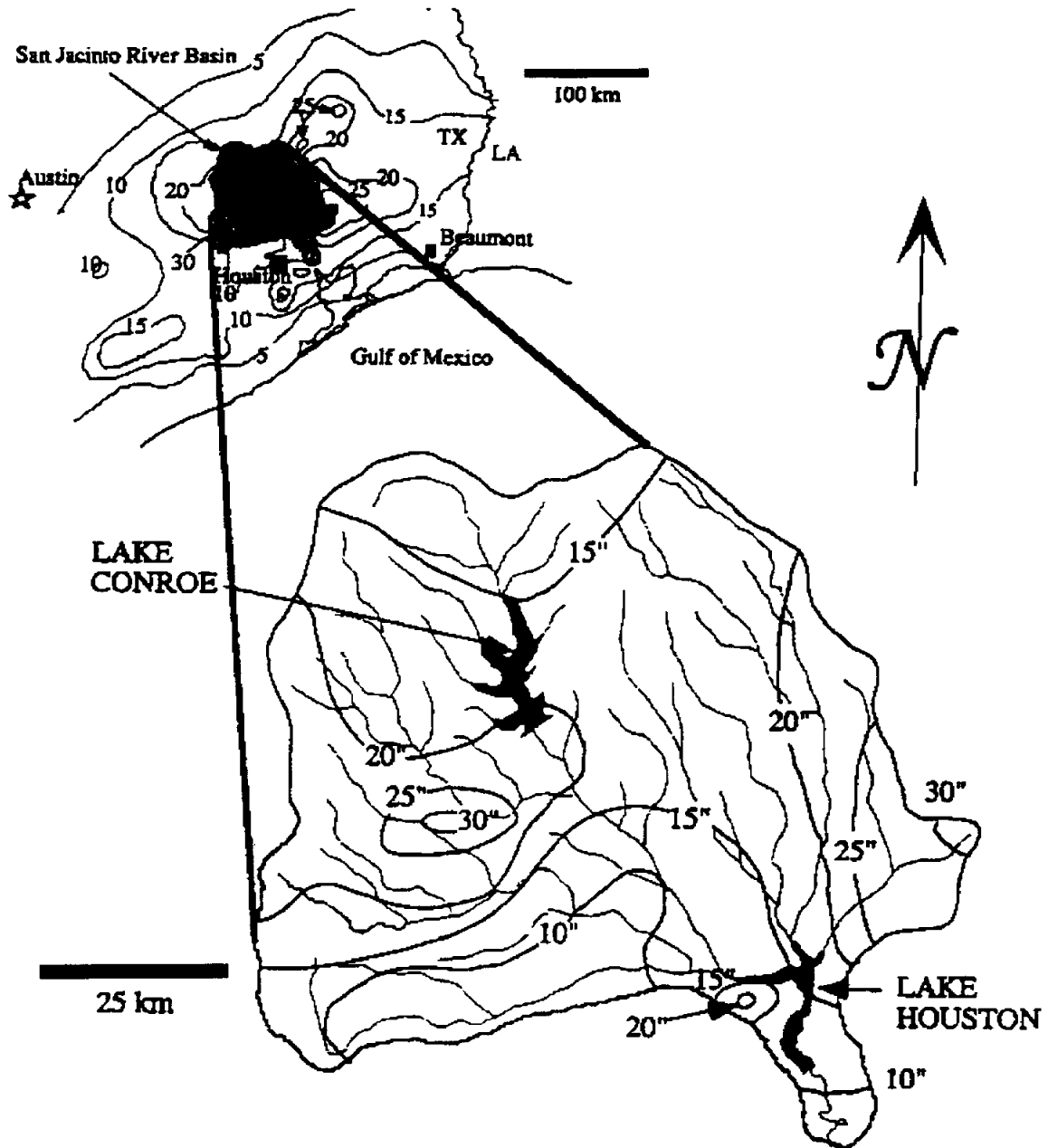


Figure 1-8. 10-Yr Flood Profiles (FEMA vs 1999 Survey)
West Fork San Jacinto River

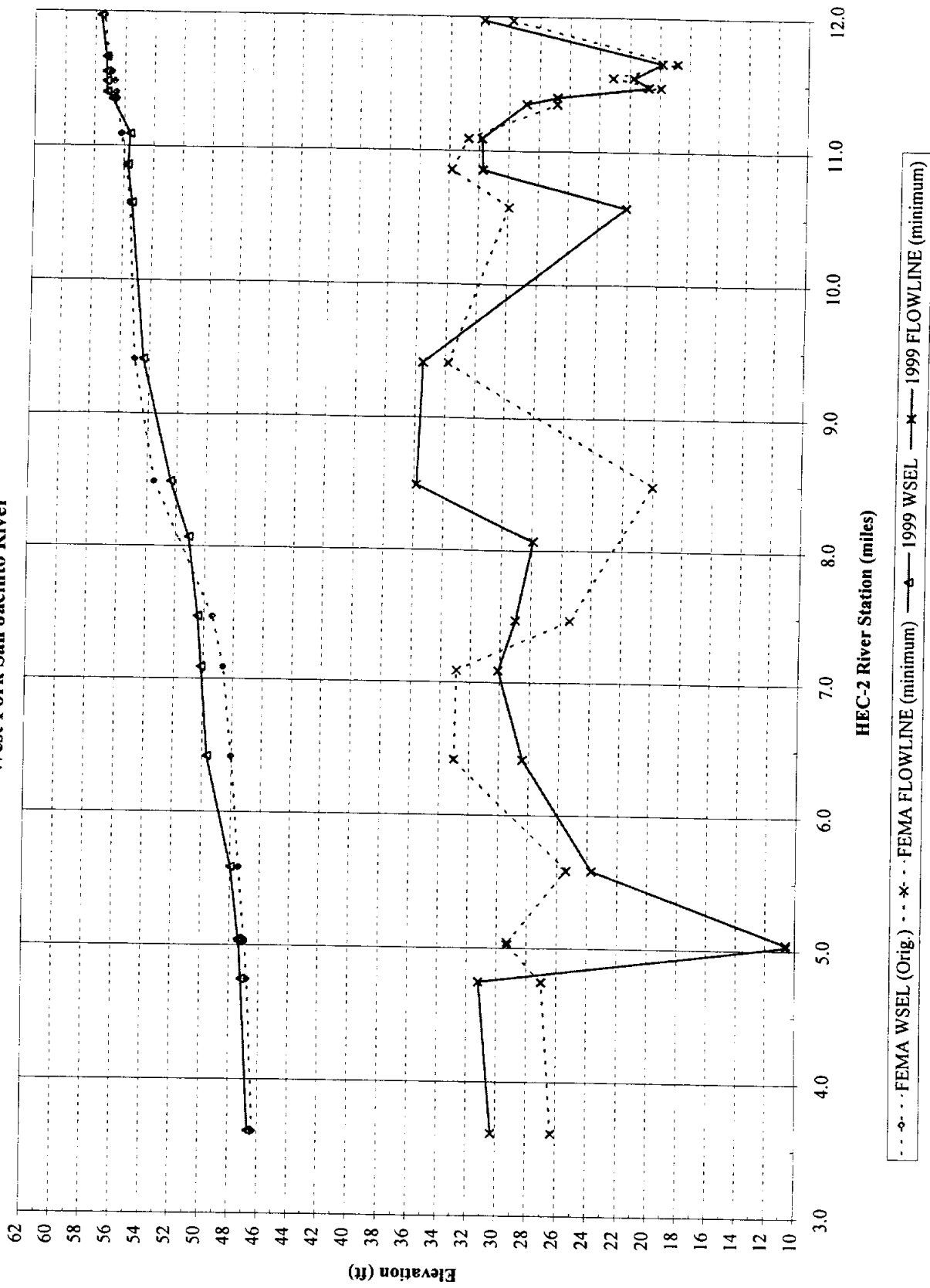
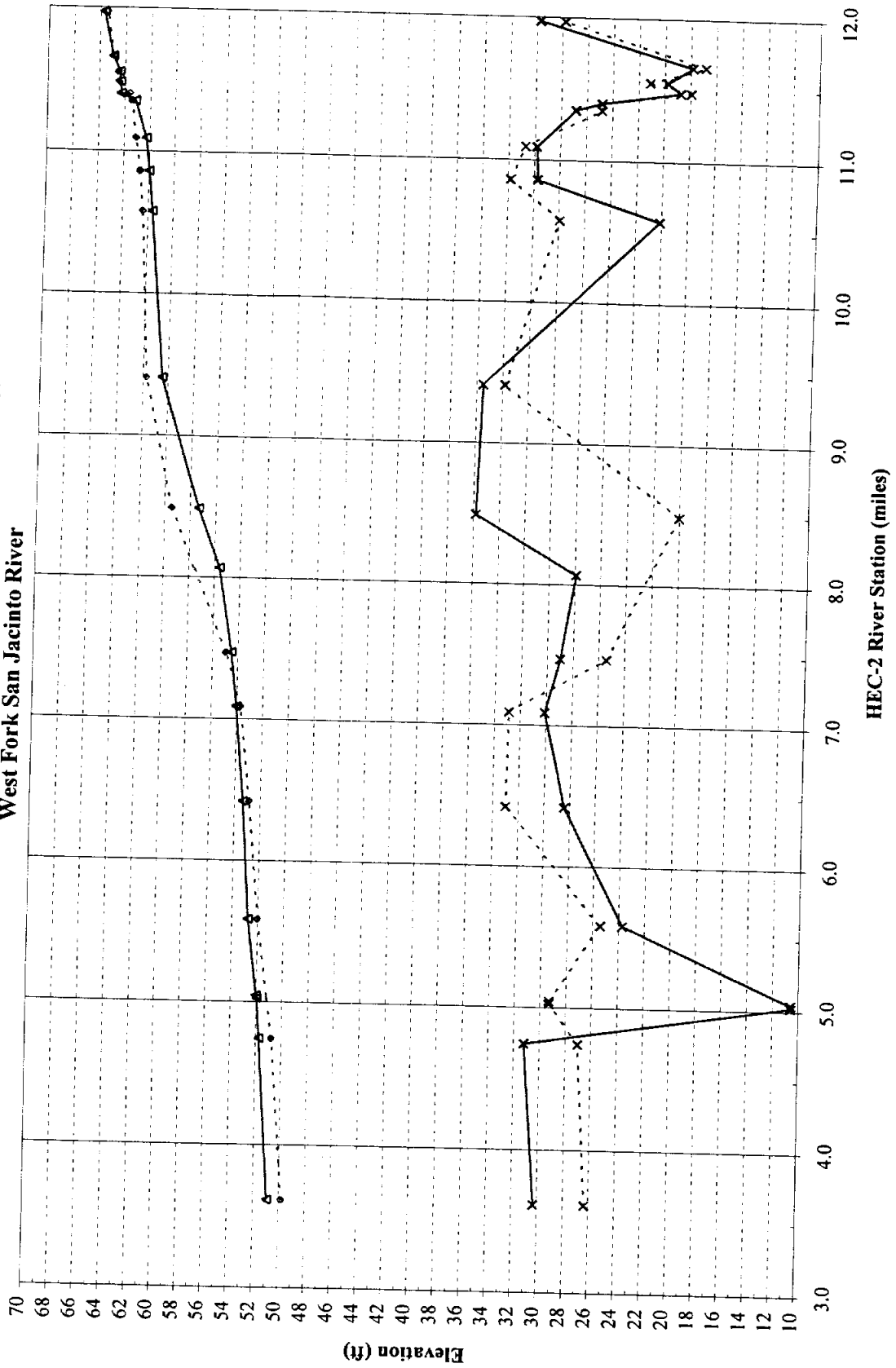


Figure 1-9. 100-Yr Flood Profiles (FEMA vs 1999 Survey)
West Fork San Jacinto River



- - ♦ - - FEMA WSEL (Orig.) * * * * FEMA FLOWLINE (minimum) — □ — 1999 WSEL — * — 1999 FLOWLINE (minimum)

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

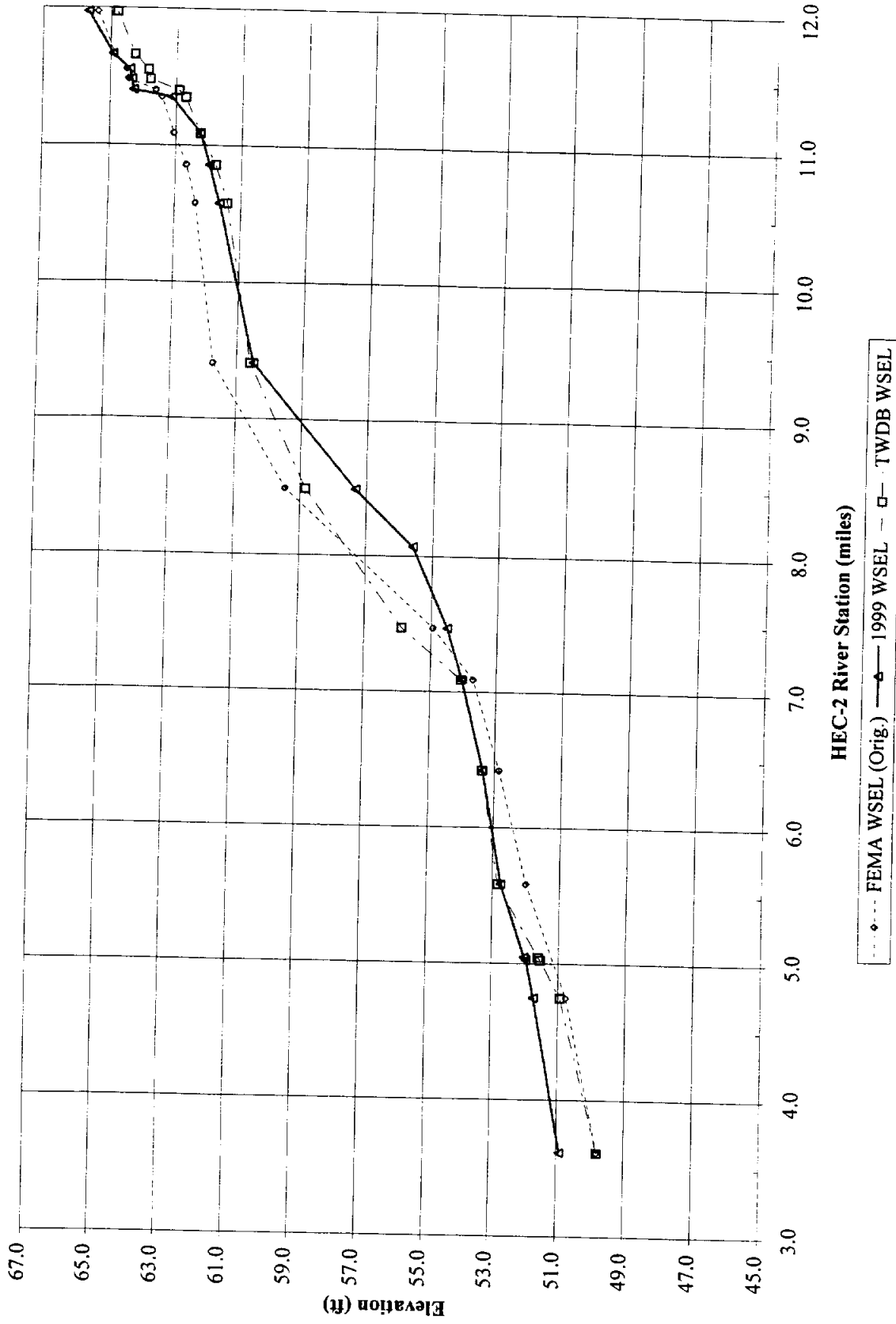


Figure 2-1 - General Site Plan for Various Sediment Removal Options

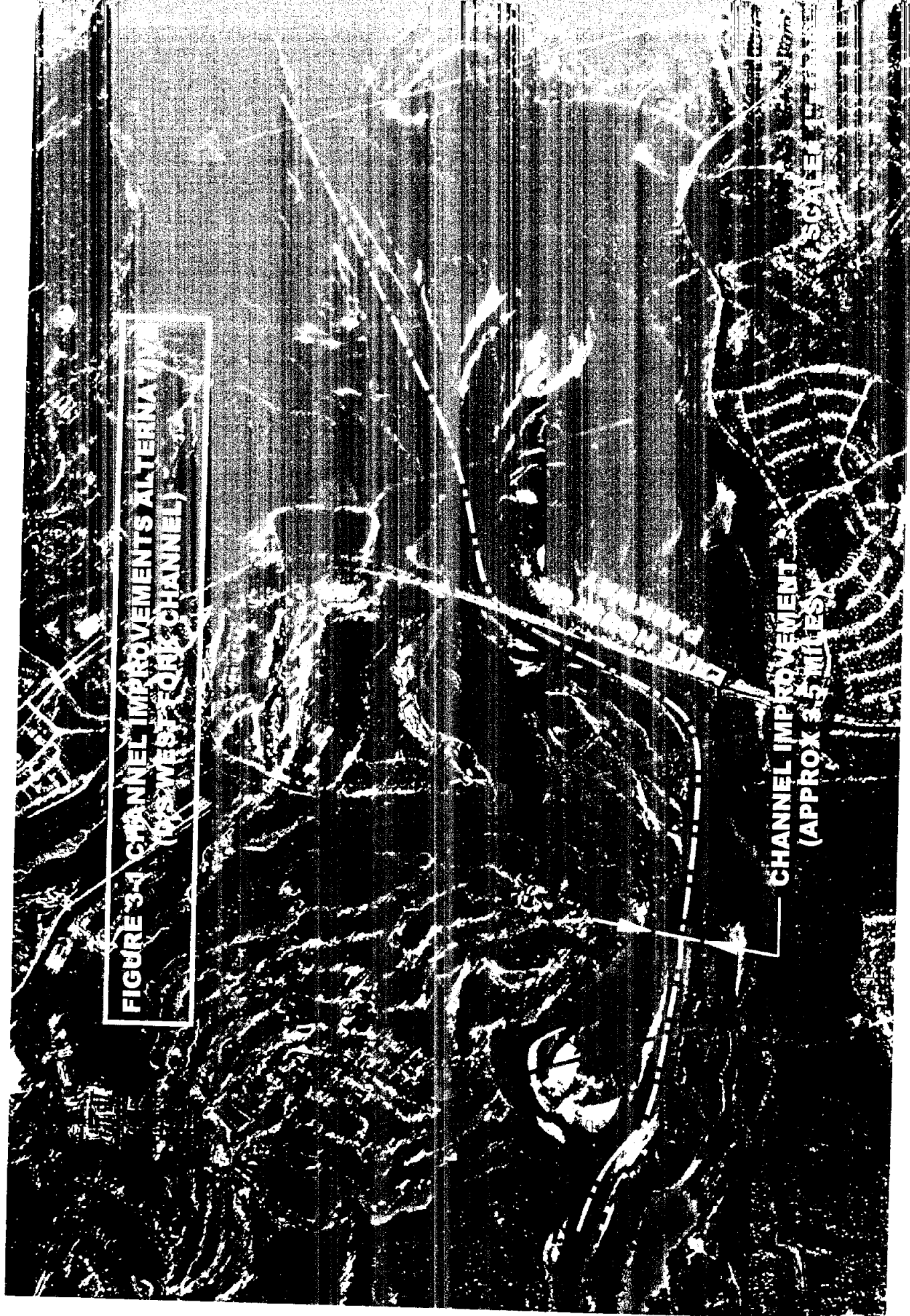


Brown & Root

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

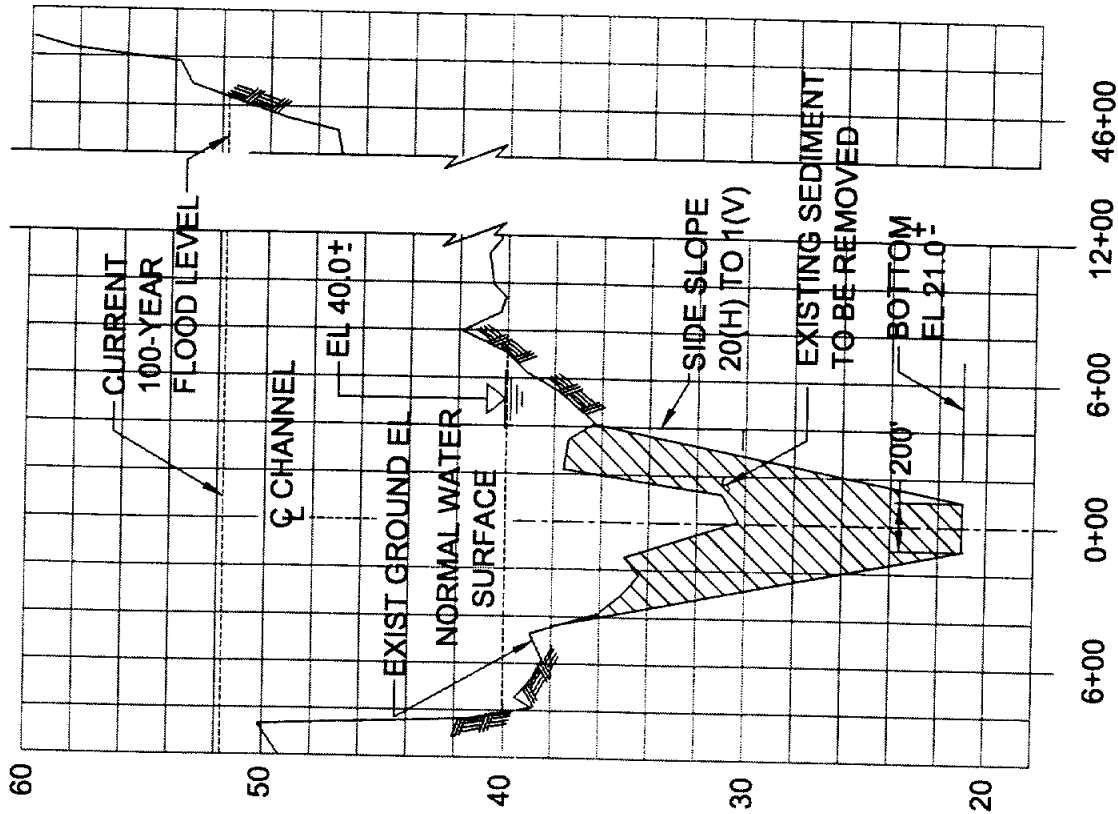
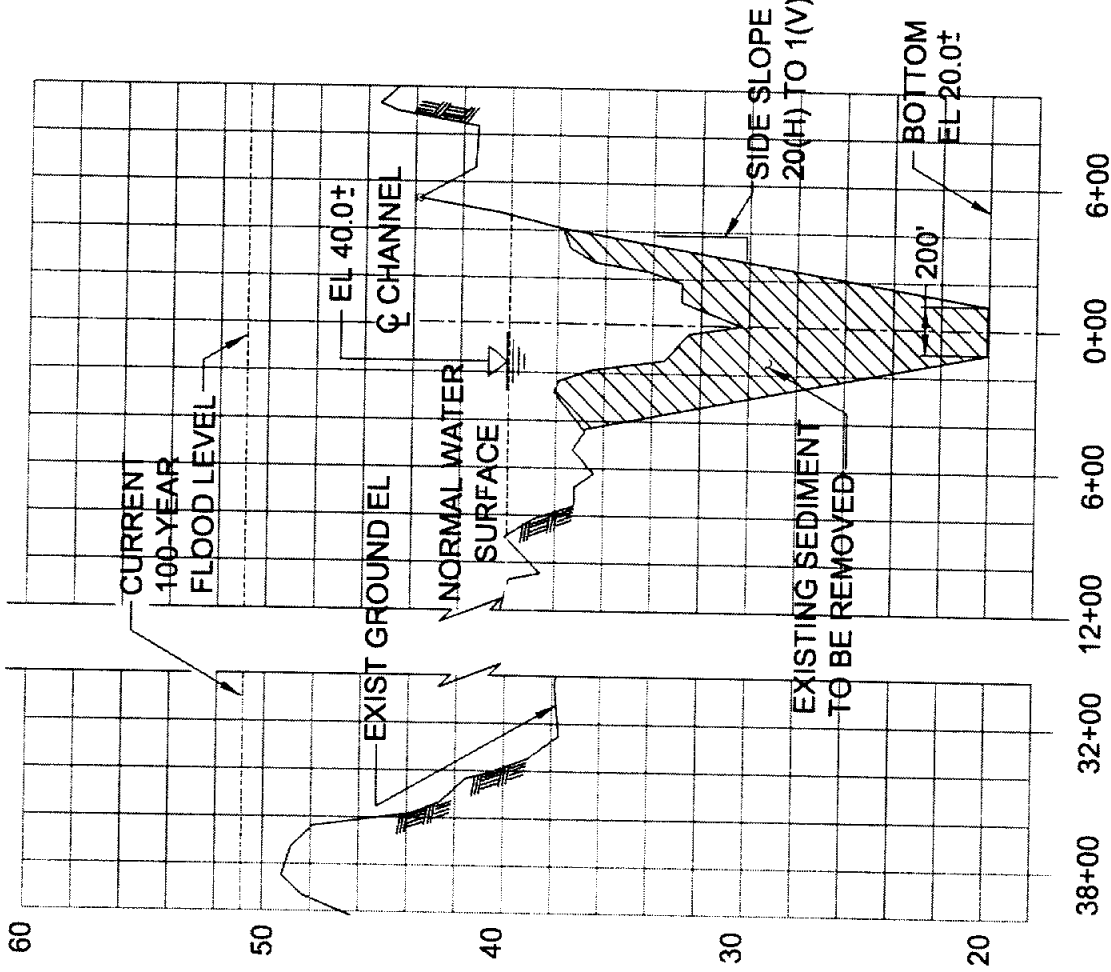


**FIGURE 3-1 CHANNEL IMPROVEMENTS ALTERNATIVE
(WEST FORK CHANNEL)**



**CHANNEL IMPROVEMENT
(APPROX 3.5 MILES)**

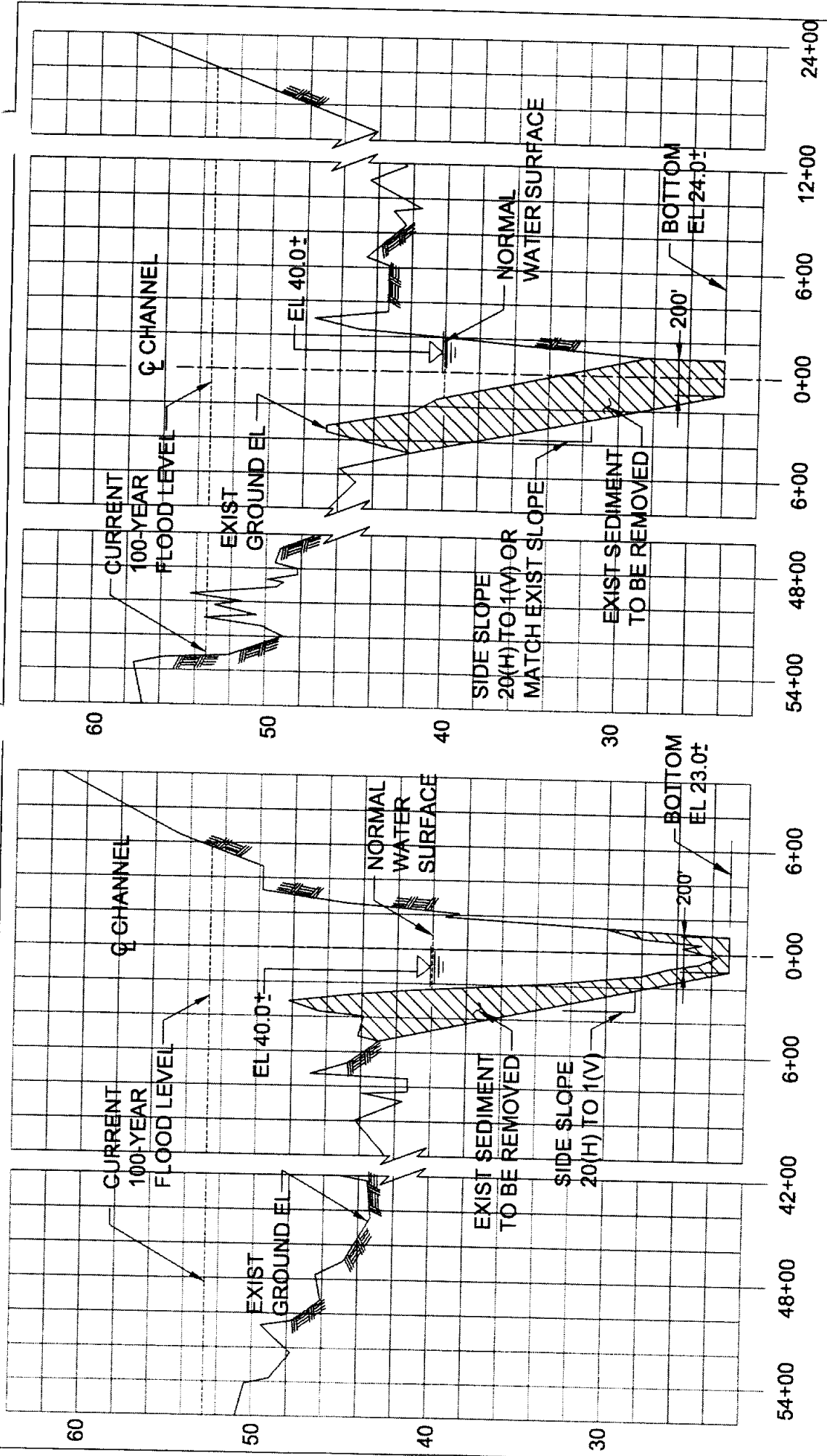
SCALE 1" = 1 MILE



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

FIGURE 3-2- CHANNEL IMPROVEMENT ALTERNATIVE

DOWNSTREAM WEST FORK



CROSS-SECTION C
(FEMA LOC 5.585)

CROSS-SECTION D
(FEMA LOC 6.42)

FIGURE 3-3 -CHANNEL IMPROVEMENT ALTERNATIVE SCALE= 1"=80' (H)
1"=8' (V)

DOWNSTREAM WEST FORK

**FIGURE 3-4 AREA DREDGING ALTERNATIVE
(ON WEST FORK CHANNEL)**



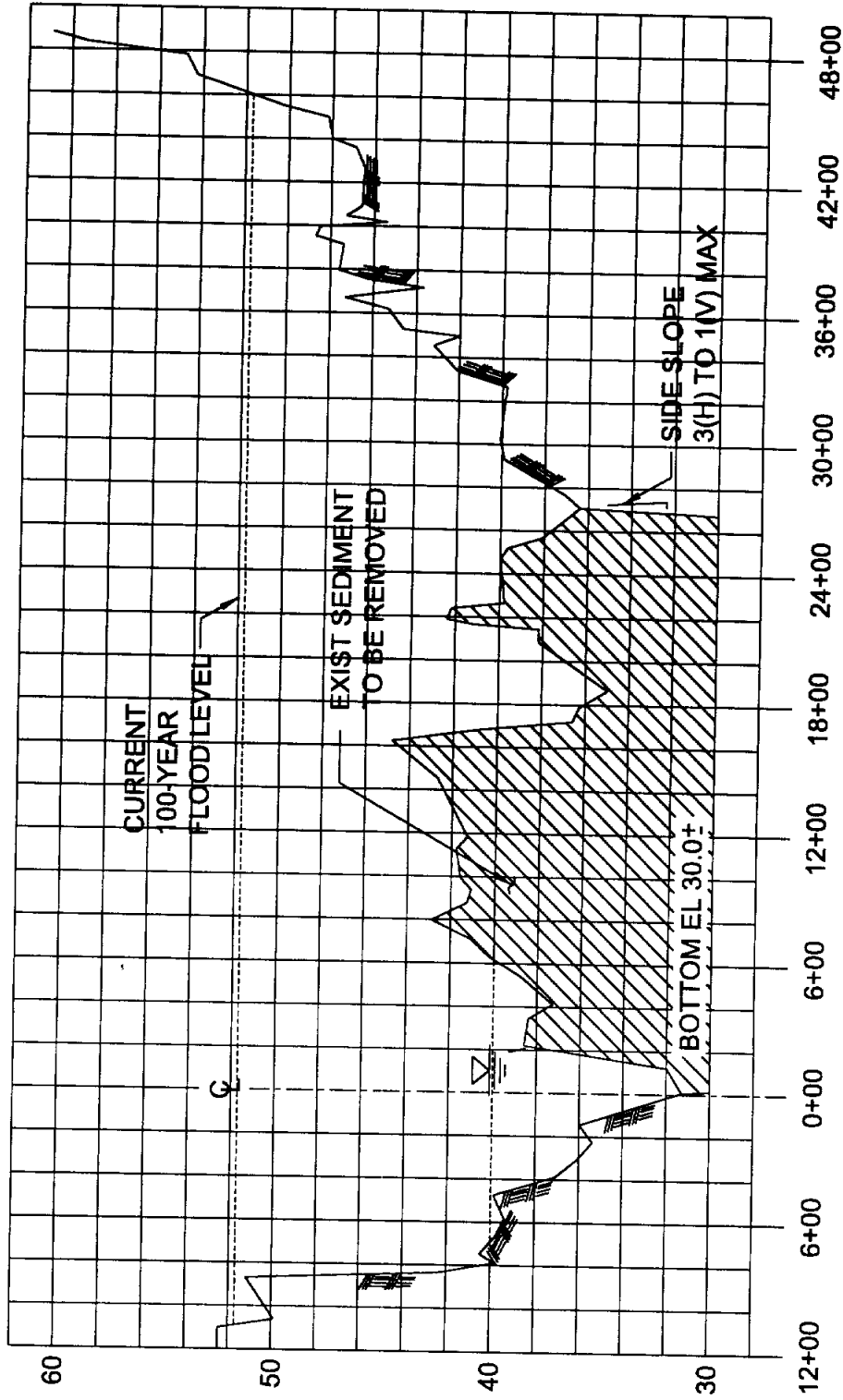


FIGURE 3-5 -AREA DREDGING A @ CROSS-SECTION B SCALE= 1"=800'(H)
1"=8'(V)
(D/S LAKE HOUSTON PARKWAY, RM 11.3)

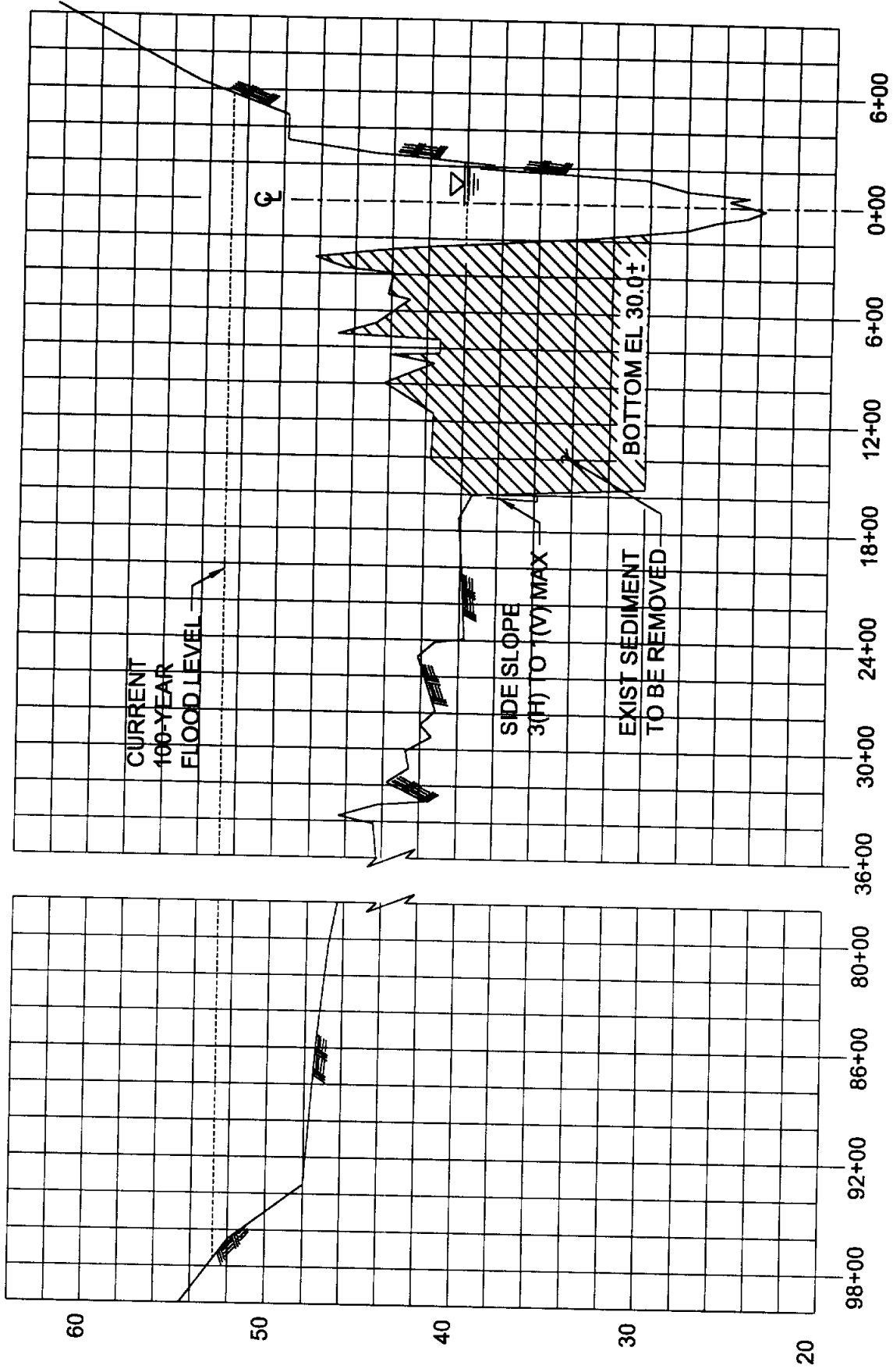


FIGURE 3-6 - AREA DREDGING C @ CROSS-SECTION C
(SW OF LAKE HOUSTON PARKWAY BRIDGE, RM 12.2)

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

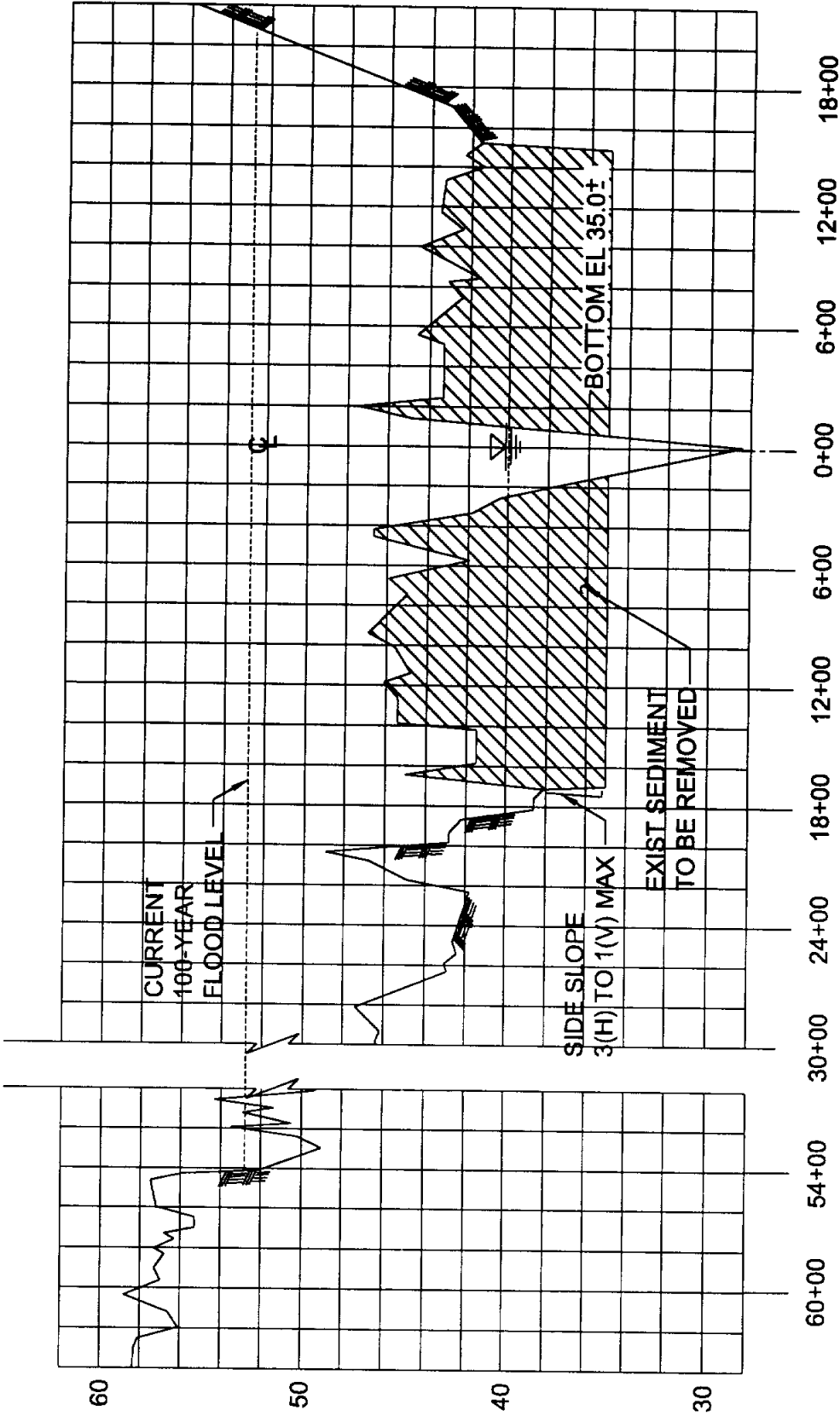


FIGURE 3-7 -AREA DREDGING D @ CROSS-SECTION D SCALE= 1"=800' (H)
1"=8'(V)
(S OF KINGWOOD COUNTRY CLUB, RM 12.9)

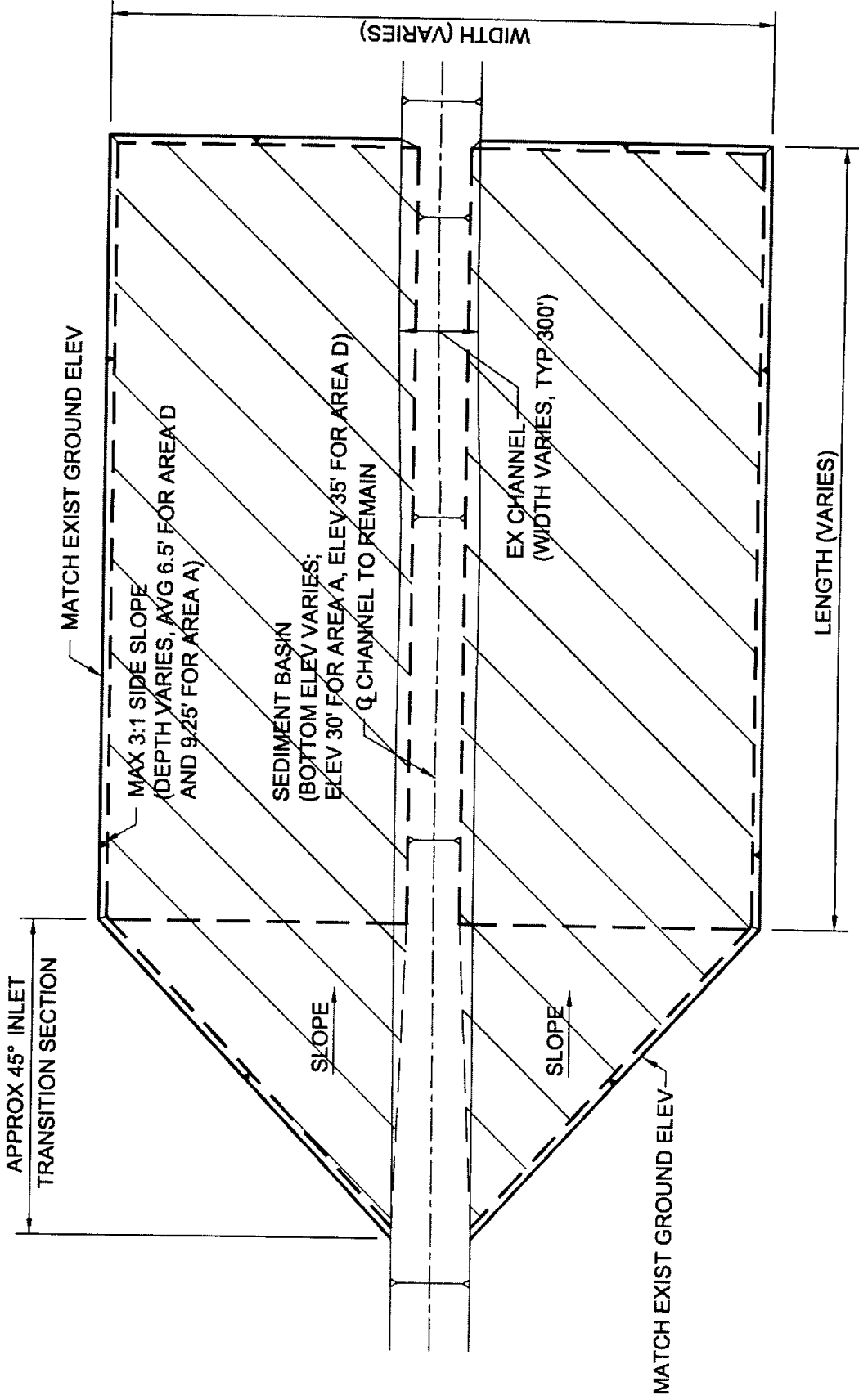


FIGURE 3-8 - TYPICAL ON-CHANNEL SEDIMENT BASIN

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 DIAM. % FINER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM. % FINER THAN 0.5mm	SEDIMENT SUSPENDED (MGL)	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 DAJM. % FINDER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM % FINER THAN 0.5mm	SEDIMENT SUSPENDEDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDEDED (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

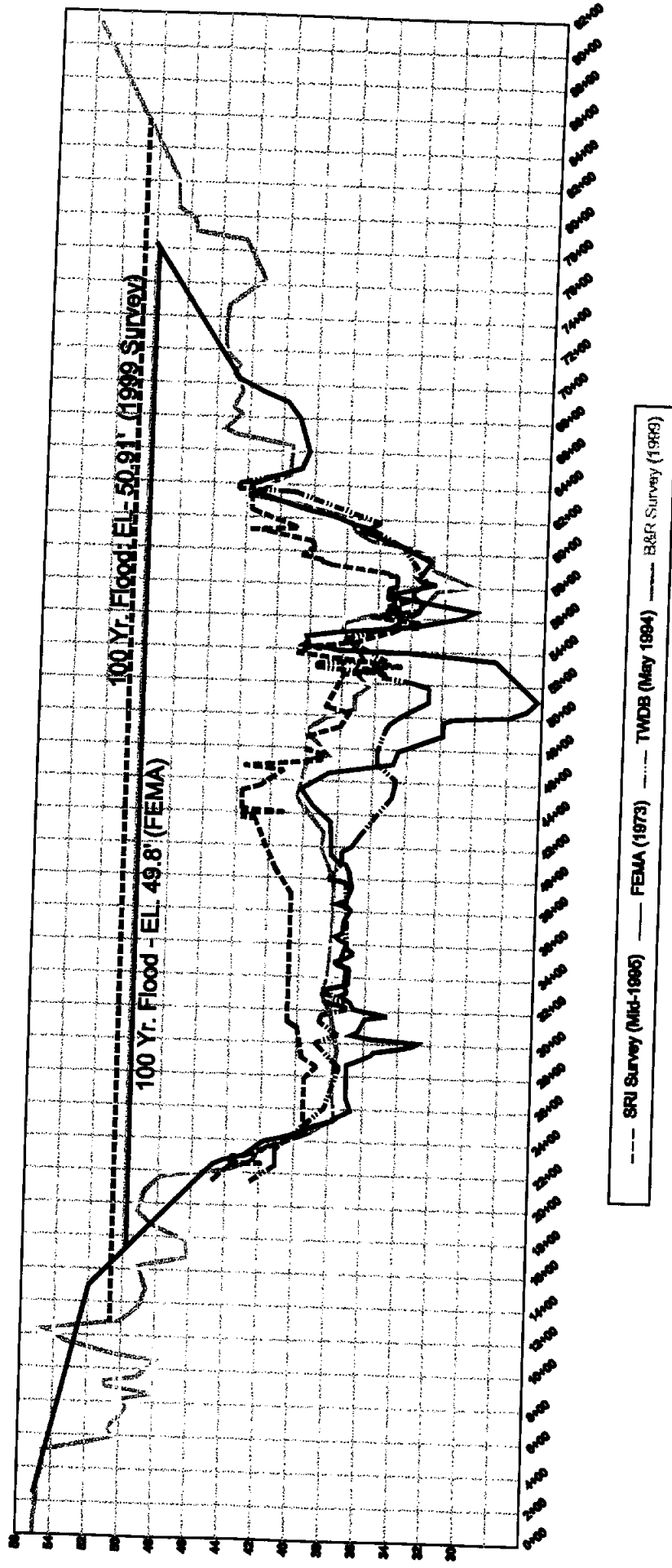
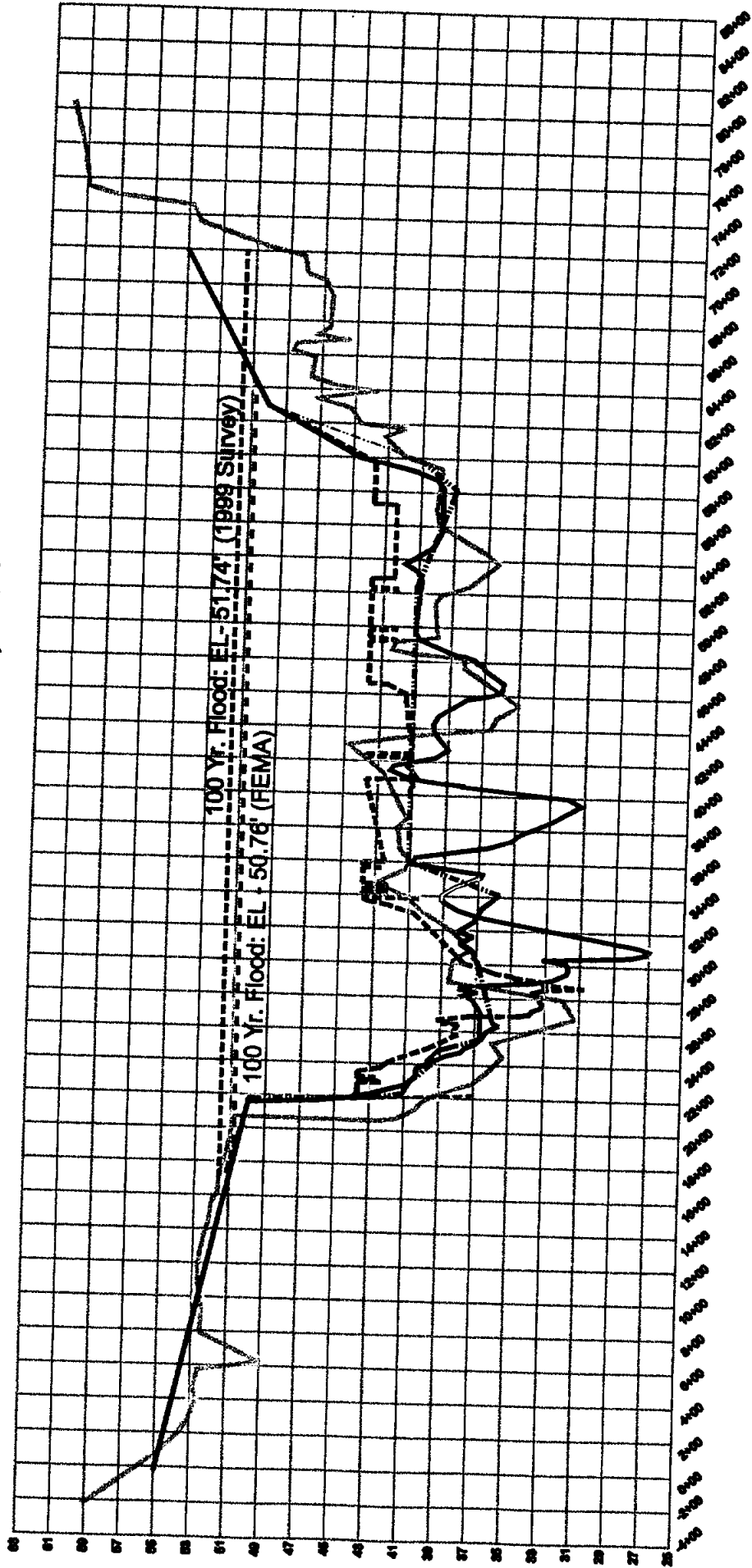
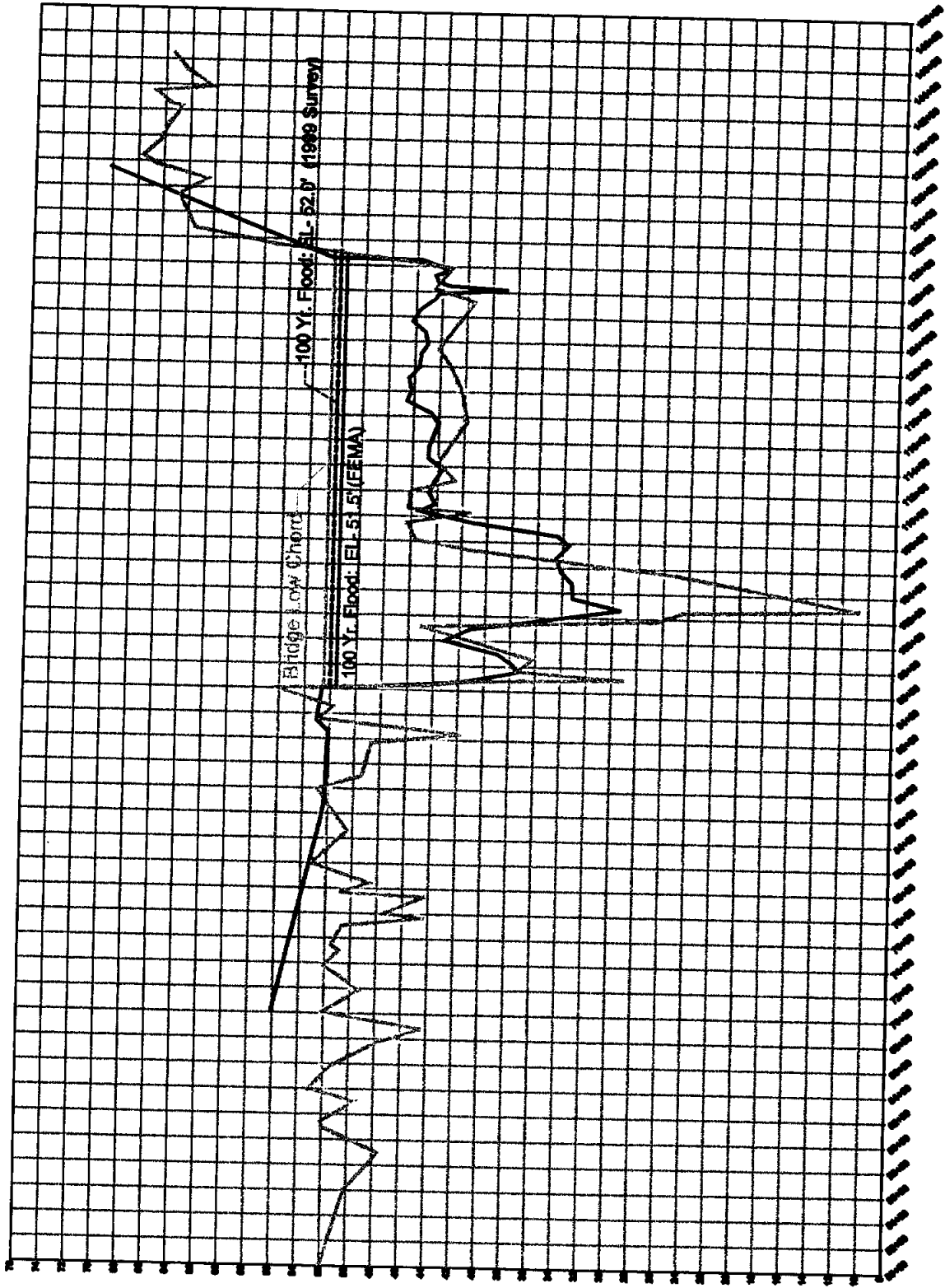


EXHIBIT 2
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 4.75 MI, Line B



----- SRI Survey (Mid-1886) — FEMA (1973) -·-·- TWDB (May 1994) - - - B&R Survey (1898)

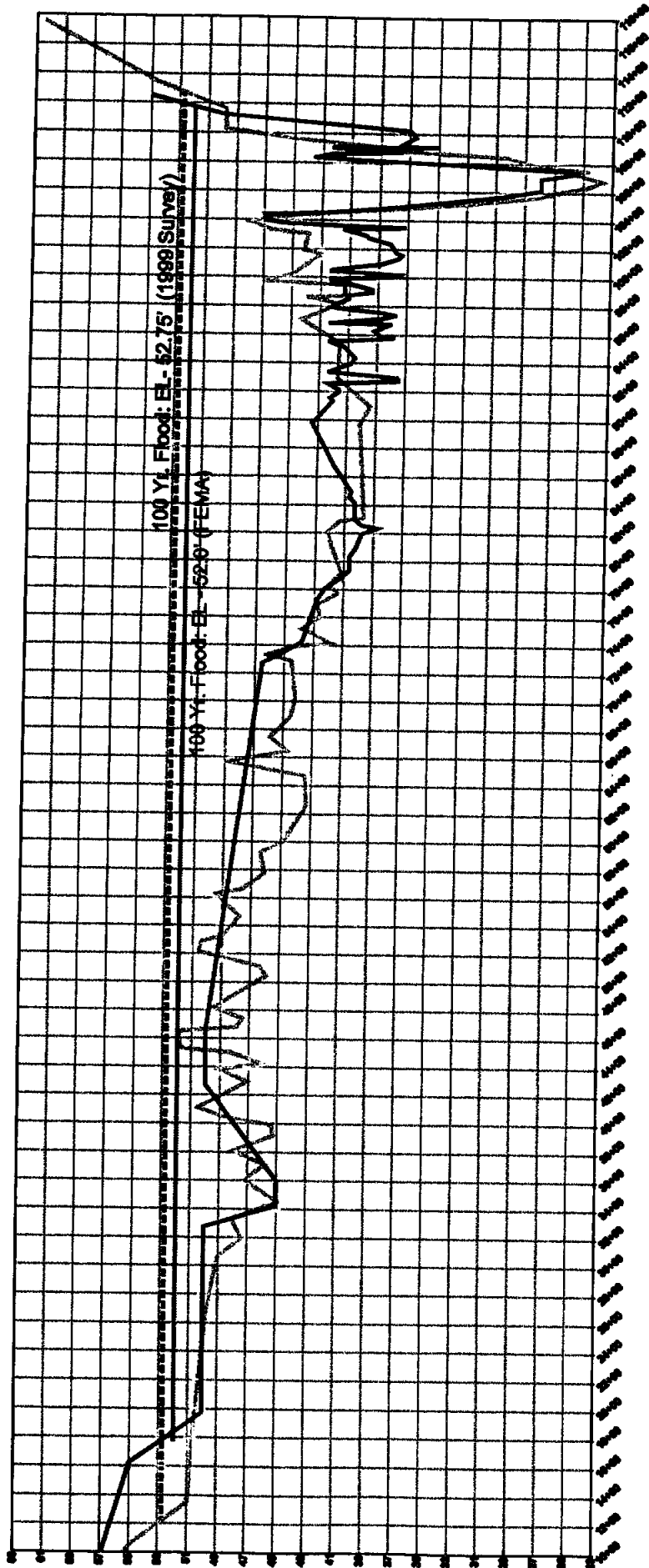
EXHIBIT 3
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 5.037 MI, Bridge Lake Houston Parkway



— FEMA (1973)
- - - DGR Survey (1990)

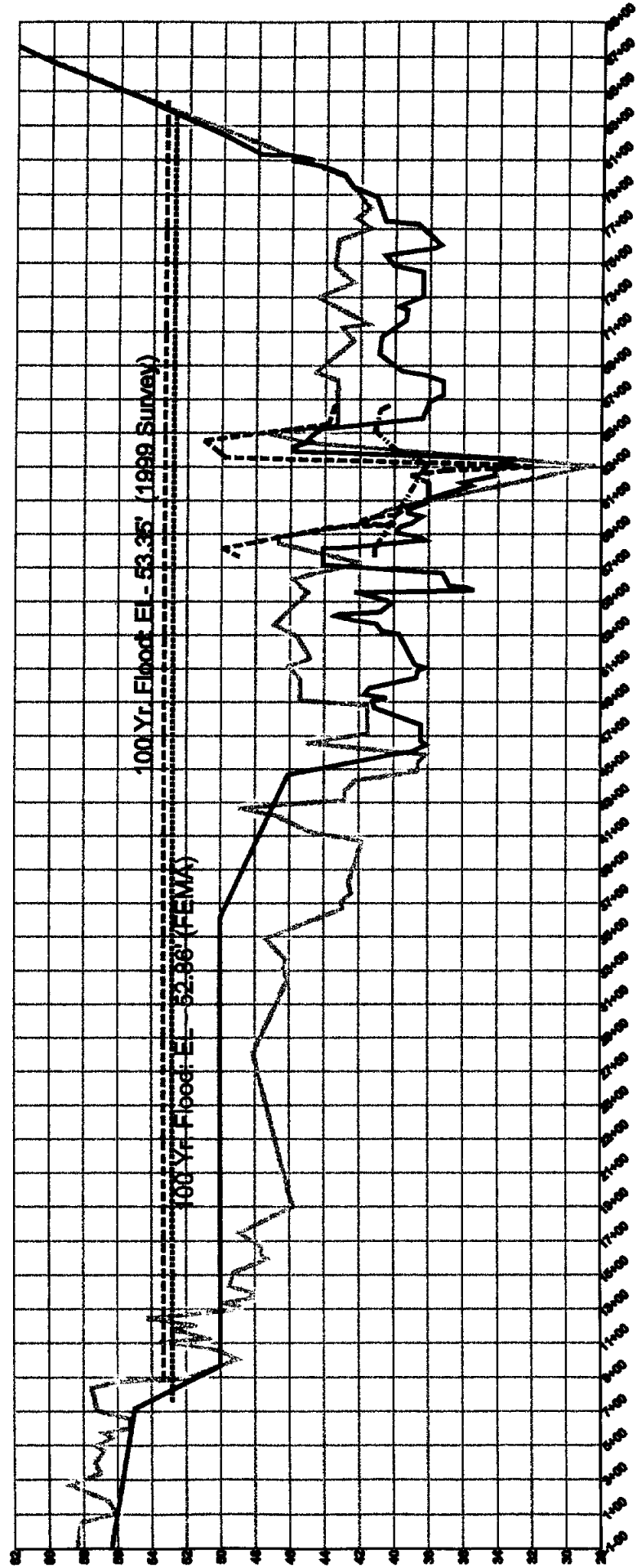
EXHIBIT 4

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 5.585 Mi, Line C



— FEMA (1973) - - - - - B&R Survey (1999)

EXHIBIT 5
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 6.42 MI, Line D



- - - SRI Survey (Mid-1985) ——— FEMA (1973) ····· TWDB (May 1994) - · - · B&R Survey (1999)

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

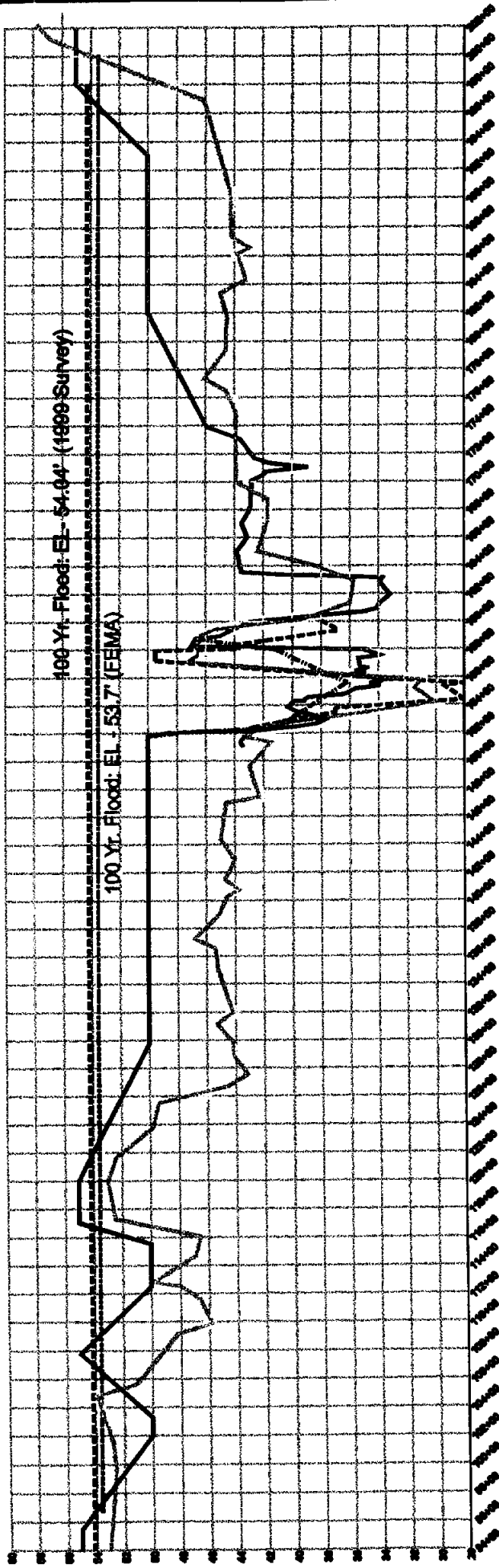
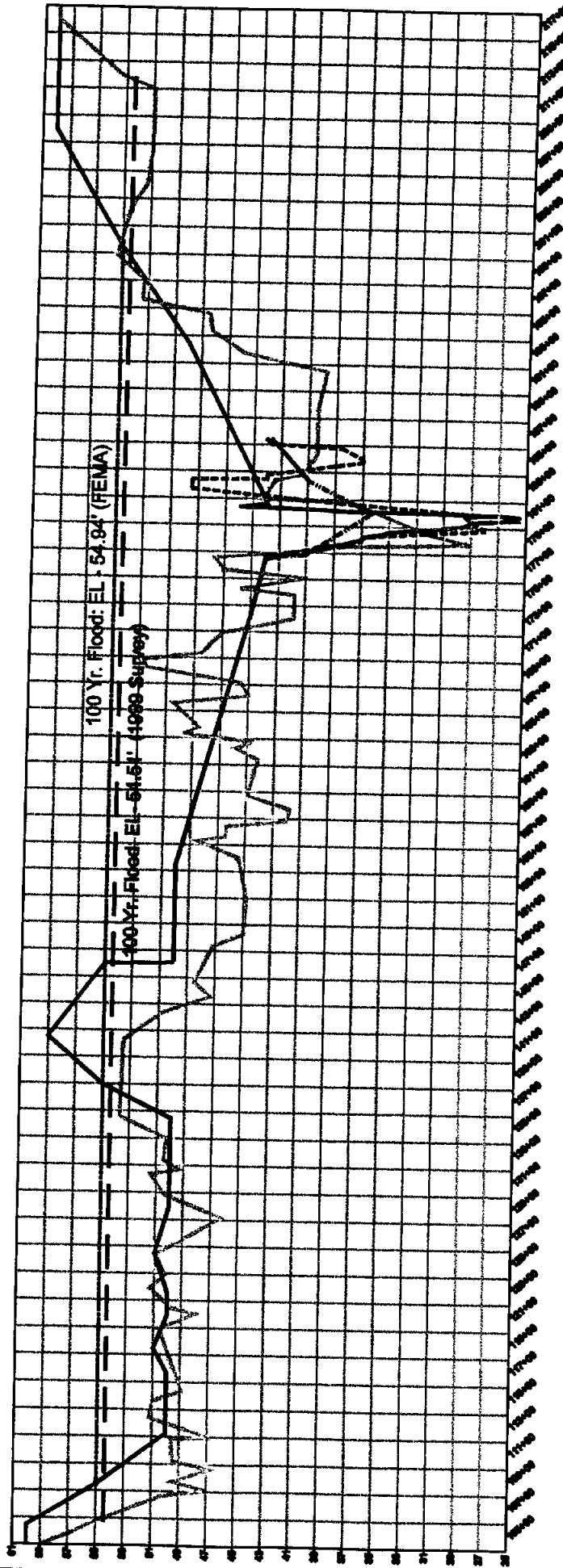


EXHIBIT 7
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 7.47 MI, Line F



- - - - 8th Survey (M&P-1986) - - - - FEMA (1973) - - - - TWDS (May 1984) - - - - B&R Survey (1989)
 - - - - 100 Yr. Flood: EL. 54.84' (1984) - - - - 100 Yr. Flood: EL. 54.61' (1989 Survey)

EXHIBIT 8

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 8.49 MI, Line G

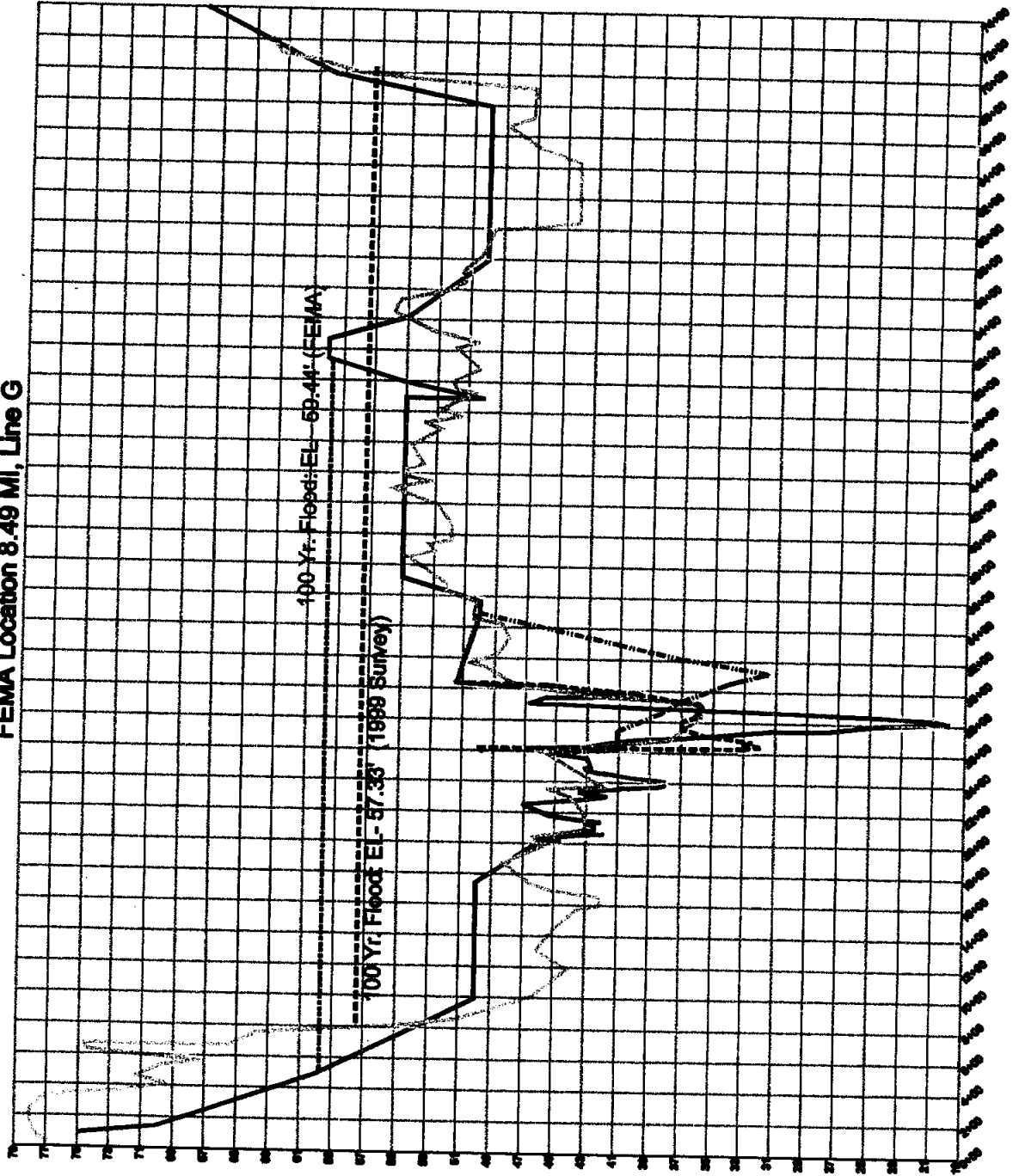


EXHIBIT 9
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 9.410 MI, Line H

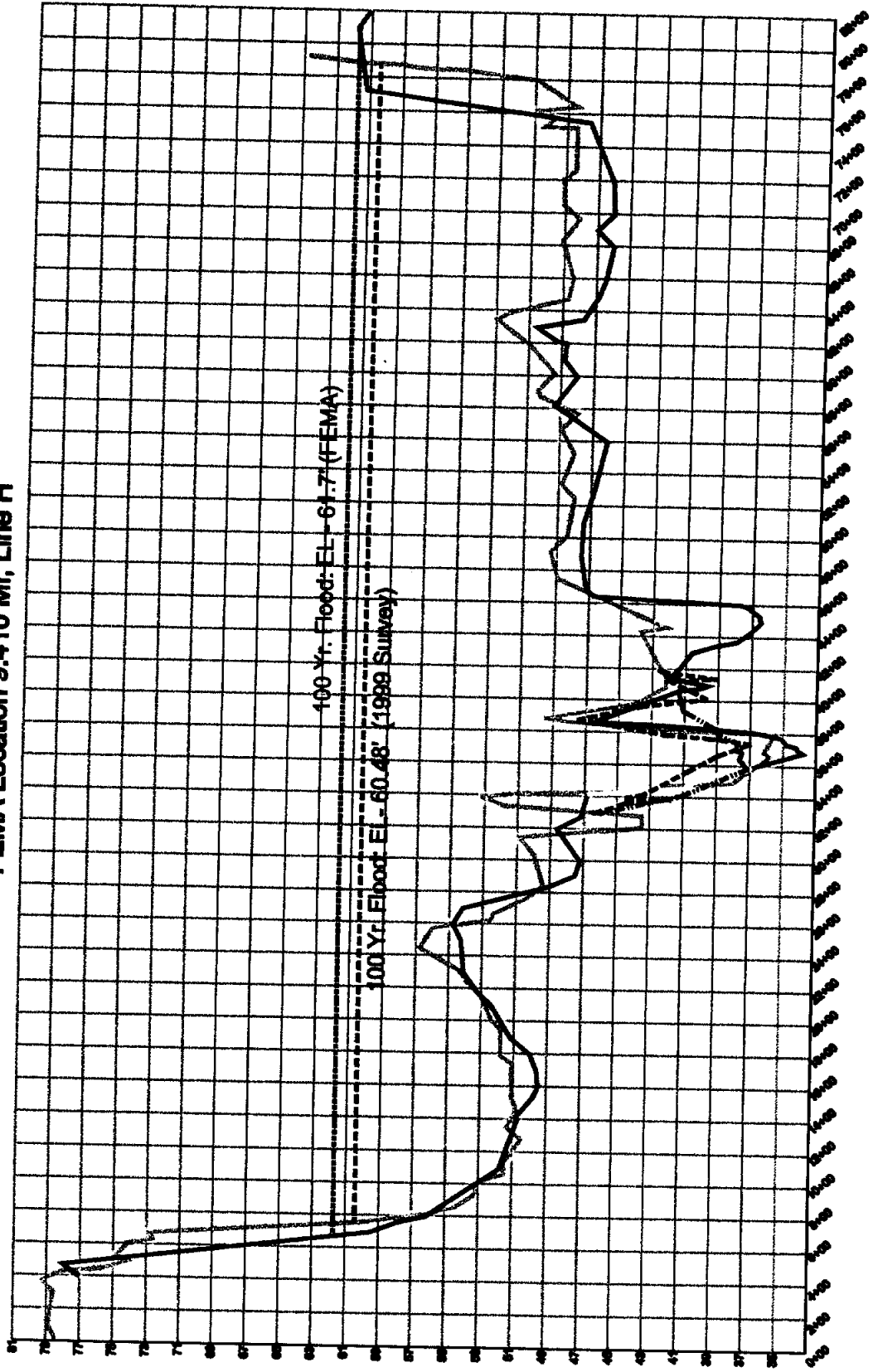
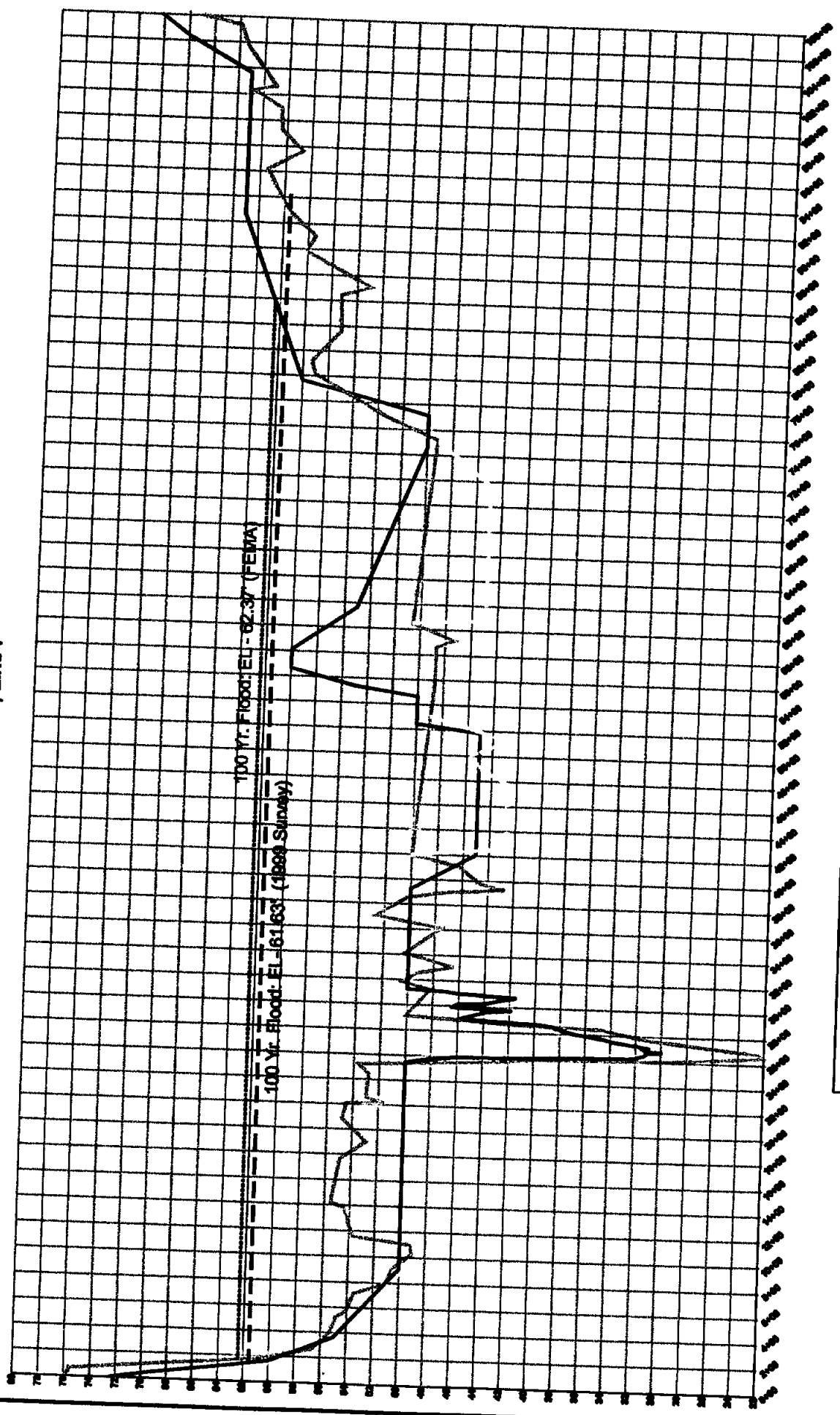


EXHIBIT 10
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 10.58 MI, Line 1

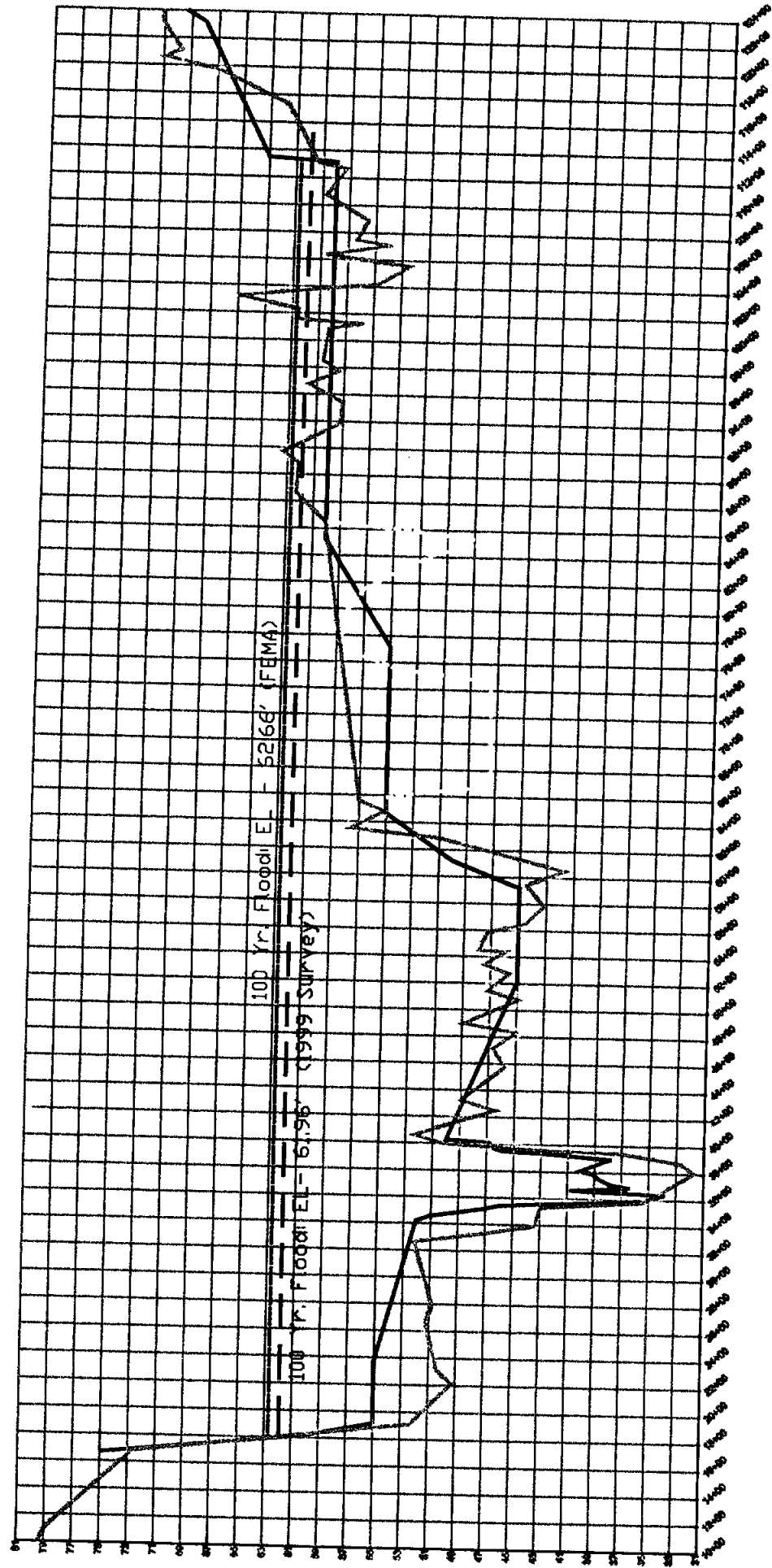


— FEMA (1973)
- - - - - B&S Survey (1969)

EXHIBIT 11

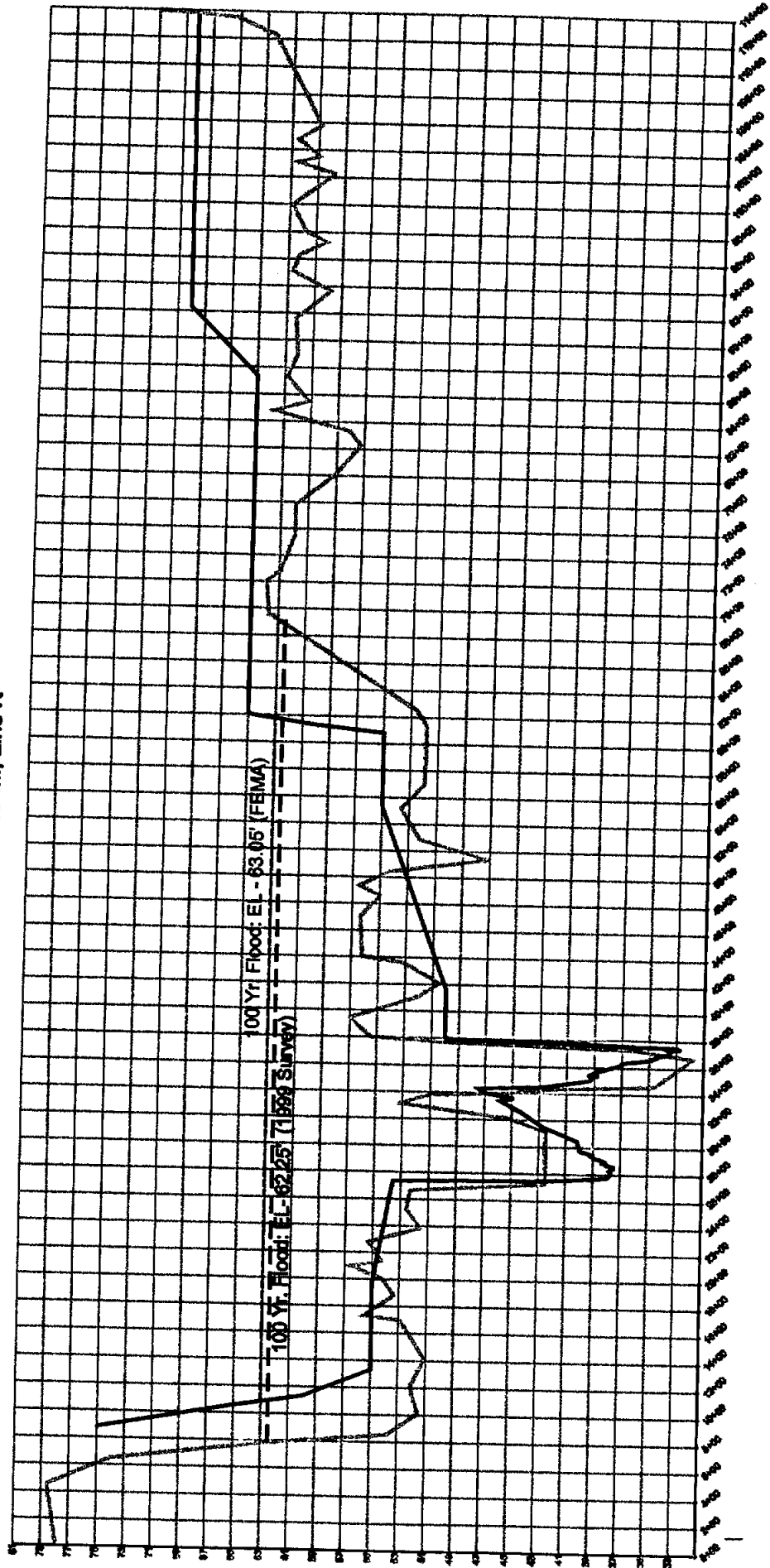
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 10.86 MI, Line J



— FEMA (1973) - - - FEMA Survey (1999)

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



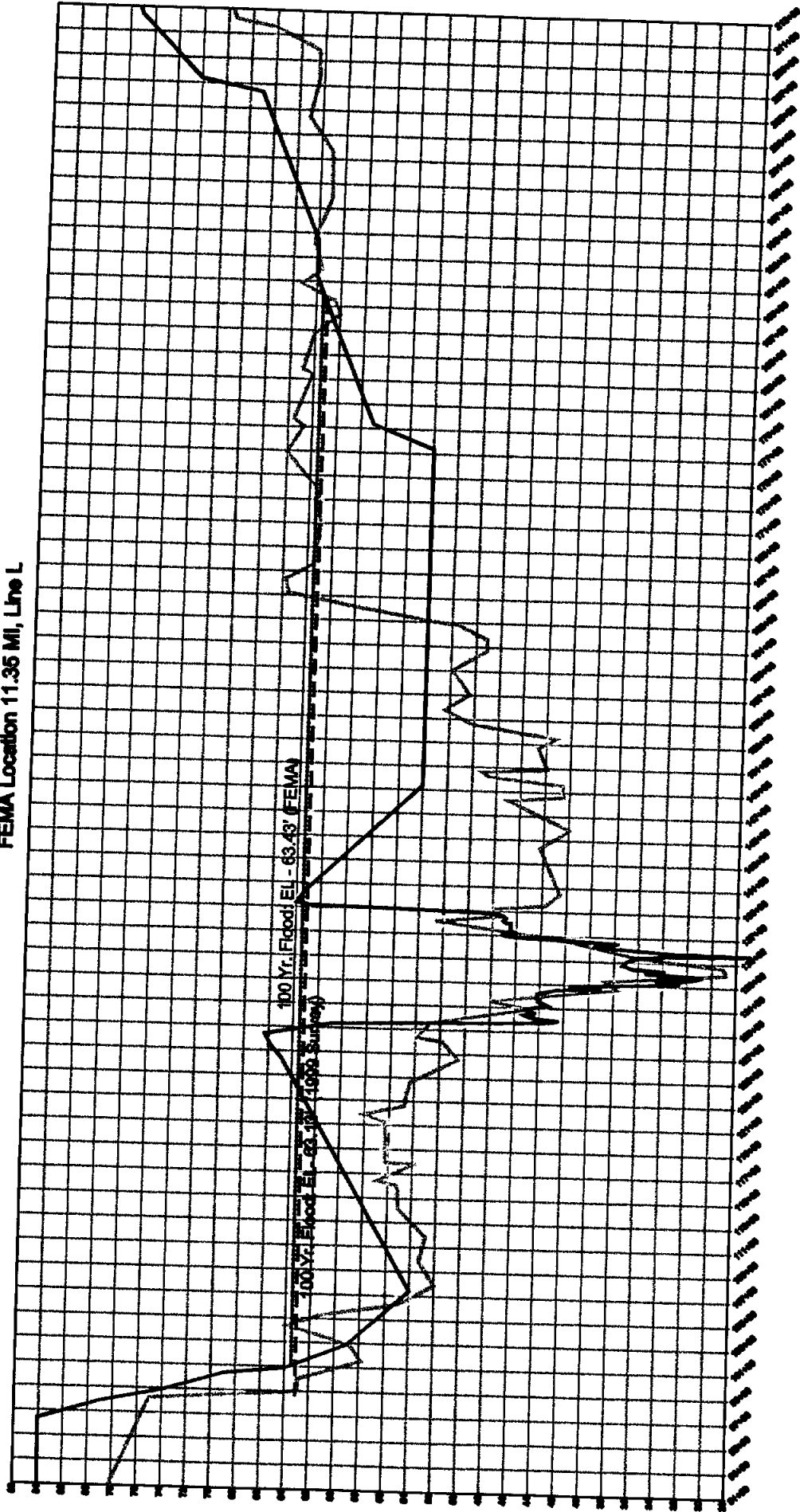
— FEMA (1973)

--- N&R Survey (1999)

EXHIBIT 13

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.35 MI, Line L



— FEMA (1973) - - - - S&R Survey (1965)

EXHIBIT 14
Analysis of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 11.48 MI, Line M

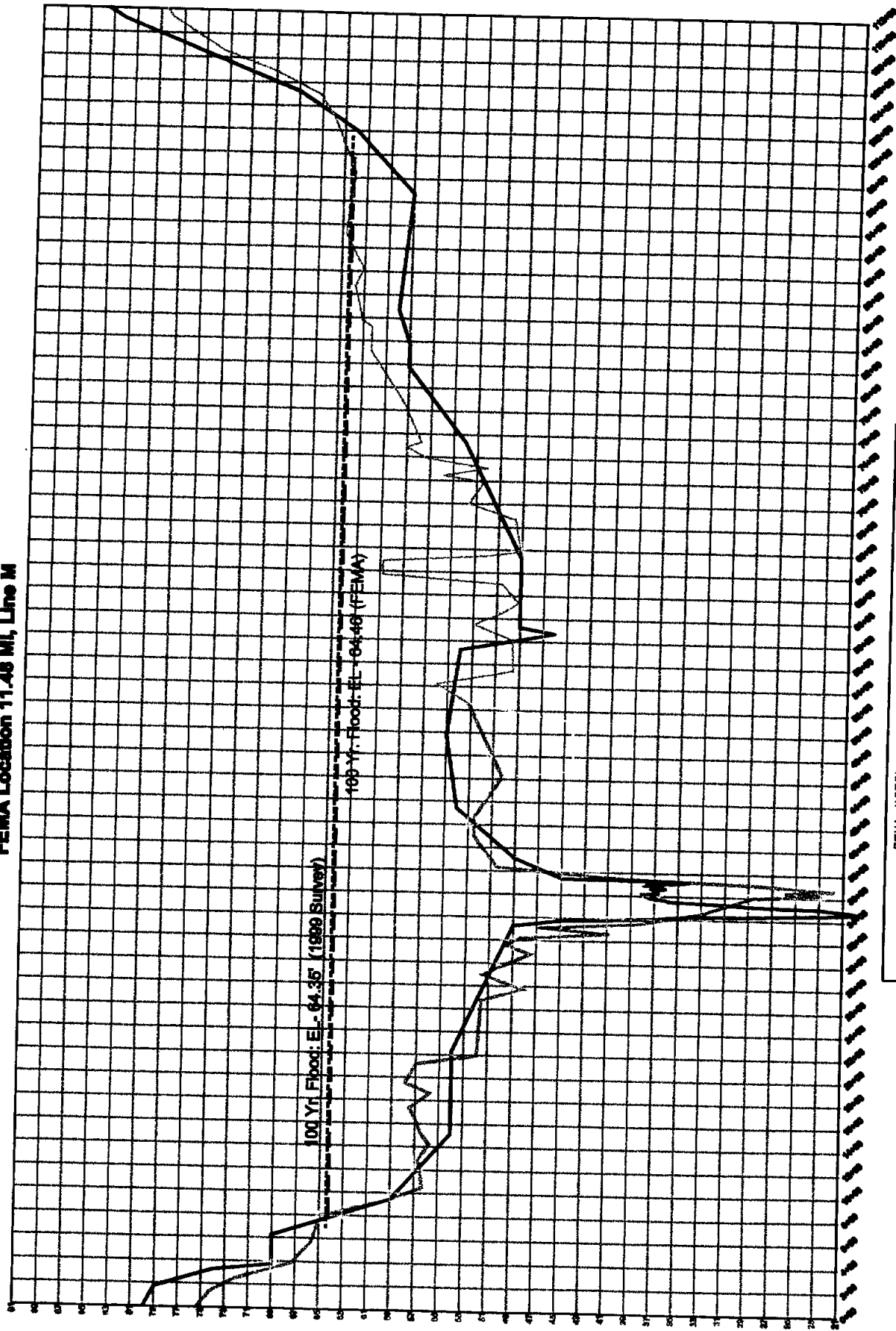
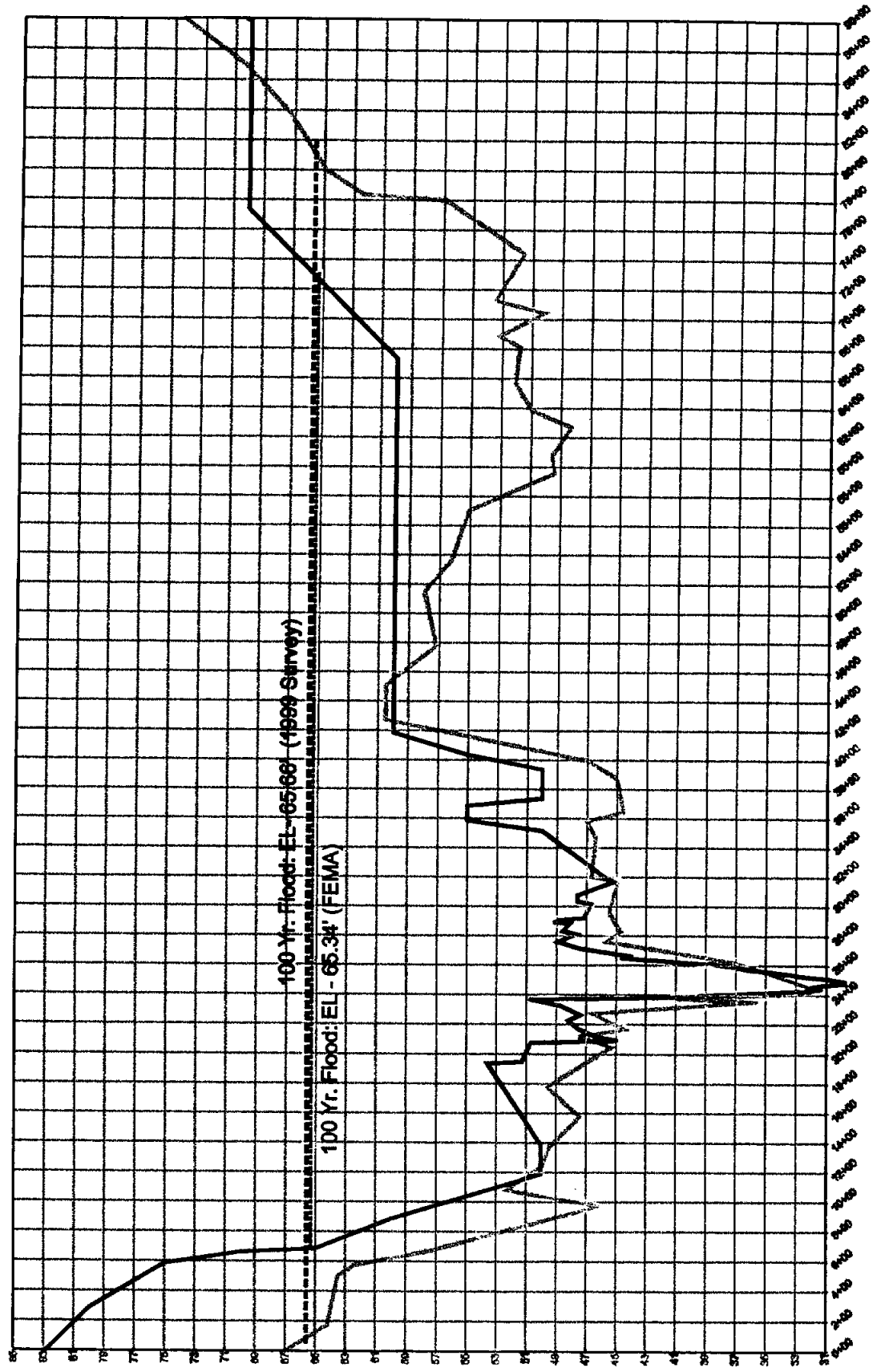


EXHIBIT 15

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



— FEMA (1973) - - - - - B&R Survey (1999)

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 *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * RUN DATE 14MAR00 TIME 19:02:53 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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X X X X X X X X
X X X X X X
XXXXXXXX XXXX X XXXXX XXXXX
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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&B 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 Encroachments 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

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						

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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

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

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
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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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
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		

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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
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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
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			

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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 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

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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

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SECNO	DEPTH	CWSEL	CRIS	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

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

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SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISWS	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

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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

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

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SECNO	DEPTH	CWSEL	CRISWS	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
.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

ELENC= 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

SECNO	DEPTH	CWSEL	CRISW	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

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	IPLT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	0	-1							

SECNO	DEPTH	CWSEL	CRISW	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

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SECNO	DEPTH	CWSEL	CRWS	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

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SECNO	DEPTH	CWSEL	CRISW	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

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SECNO	DEPTH	CWSEL	CRISW	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	CRISW	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	CRISW	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

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SECNO	DEPTH	CWSEL	CRISW	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
.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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SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	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.

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

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID	ELLC	ELTRD	WEIRLN
.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
 ELENCN= 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
 ELENCN= 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

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	CRISW	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	XLOBR	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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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

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
.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	CRISW	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 from 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

1

14MAR00 19:02:53

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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

CCHV= .100 CEHV= .300
*SECNO 3.615

3470 ENCROACHMENT STATIONS= 1232.0 8990.0 TYPE= 1 TARGET= -1232.040
ELENCL= 54.70 ELENCR= 10000.00
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 CWSSEL 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	

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SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV	
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV	
TIME	VLOB	VCH	VROB	XLN	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	
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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

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	CRISW	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
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

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SECNO	DEPTH	CWSEL	CRISW	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
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

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SECNO DEPTH CWSEL CRIWS WSELK EG HV HL GLOSS 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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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

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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

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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

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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

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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	1143031.00
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

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
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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	43311.63114830.20		
*	5.046	1.00	.00	10.60	328820.00	57.05	.00	57.41	2.31	4.99	97640.33216481.70		
*	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	75558.88117640.60		
5.585	2847.00	.00	.00	23.70	326970.00	57.86	.00	58.03	2.07	5.41	128717.80227276.30		
*	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	63568.08124651.70		
6.420	4409.00	.00	.00	28.40	324160.00	58.36	.00	58.53	1.55	4.48	103255.10260639.20		
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	79784.26101980.40		
7.090	3538.00	.00	.00	30.10	321910.00	58.93	.00	59.17	2.63	5.22	147194.50198624.20		
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	129913.60179159.60		
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	101223.30124868.10	
*	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	74607.59104332.60	
*	9.410	4858.00	.00	.00	35.50	314100.00	65.82	.00	66.14	3.02	7.55	117228.60180780.60	
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	89822.48100222.00		
10.580	6177.00	.00	.00	22.10	309220.00	67.04	.00	67.47	3.08	7.72	144446.10176265.10		
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	75225.93109936.30		
10.860	1478.00	.00	.00	31.70	310160.00	67.36	.00	67.89	2.89	7.73	127798.40182367.10		

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	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	109540.20136563.60	
*	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	76574.88113202.20	
	11.350	1373.00	.00	.00	28.84	307570.00	68.55	.00	69.07	2.86	7.58	124445.10181875.80	
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	121277.70173132.60	

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

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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

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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

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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

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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

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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 *
 ENGINEERS *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * *
 * RUN DATE 28FEB00 TIME 09:37:31 *
 * *

 * U.S. ARMY CORPS OF
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D
 * *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104

LK HOUR2.oh2 for Reach 2 - Lake Houston (TWDB 1995 Data; with add'tl section data u/s 1960 from TWDB lake survey database via internet)

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X X XXXXXXXX XXXXX XXXXX
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 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 I PLOT 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

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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						

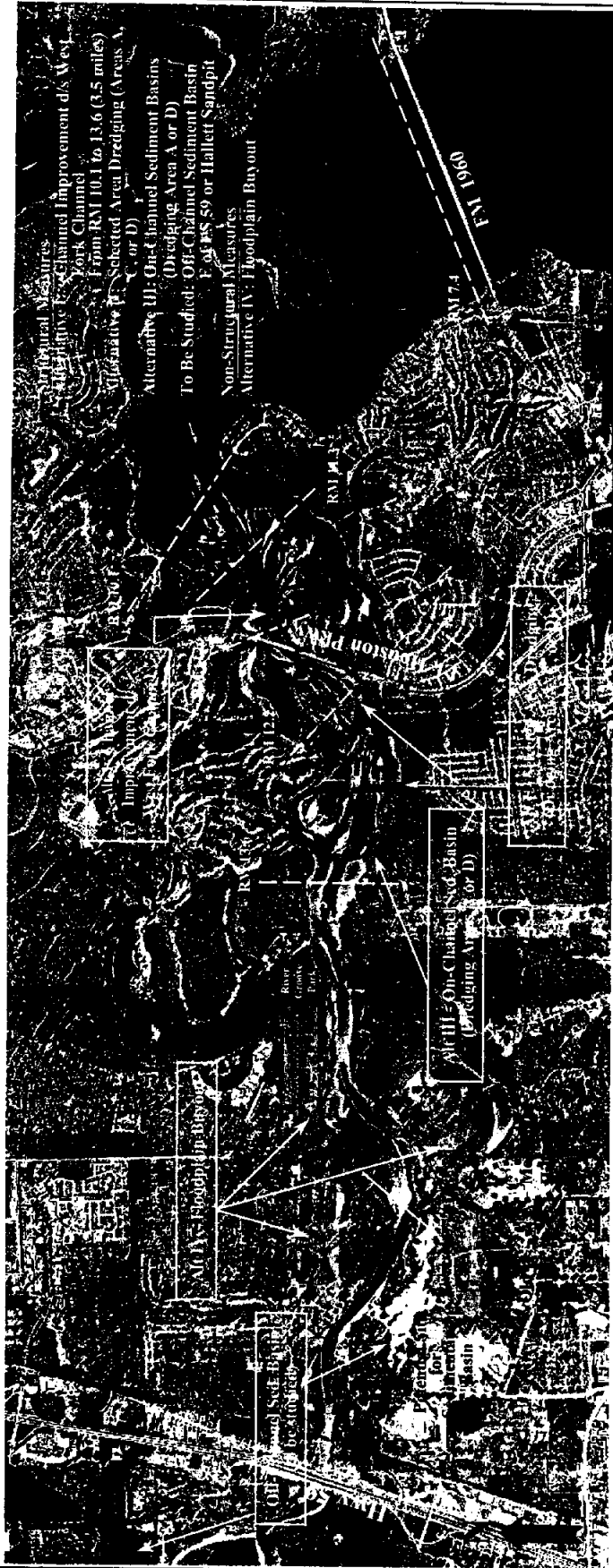
NC	.12	.12	.03	.1	.3					
QT	6	82516	180193	246064	409784	246064	246064			
X1	.47	62	20000	29500	2000	1000	2428			
GR	55	19790	50	19900	40.6	20000	24.6	20300	20.6	20560
GR	25.6	21050	23.1	21460	24.1	21625	19.7	21875	21.3	23075
GR	18.3	23500	19.6	23750	15.9	24000	18.6	24125	16.6	24250
GR	18.8	24450	12.4	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

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

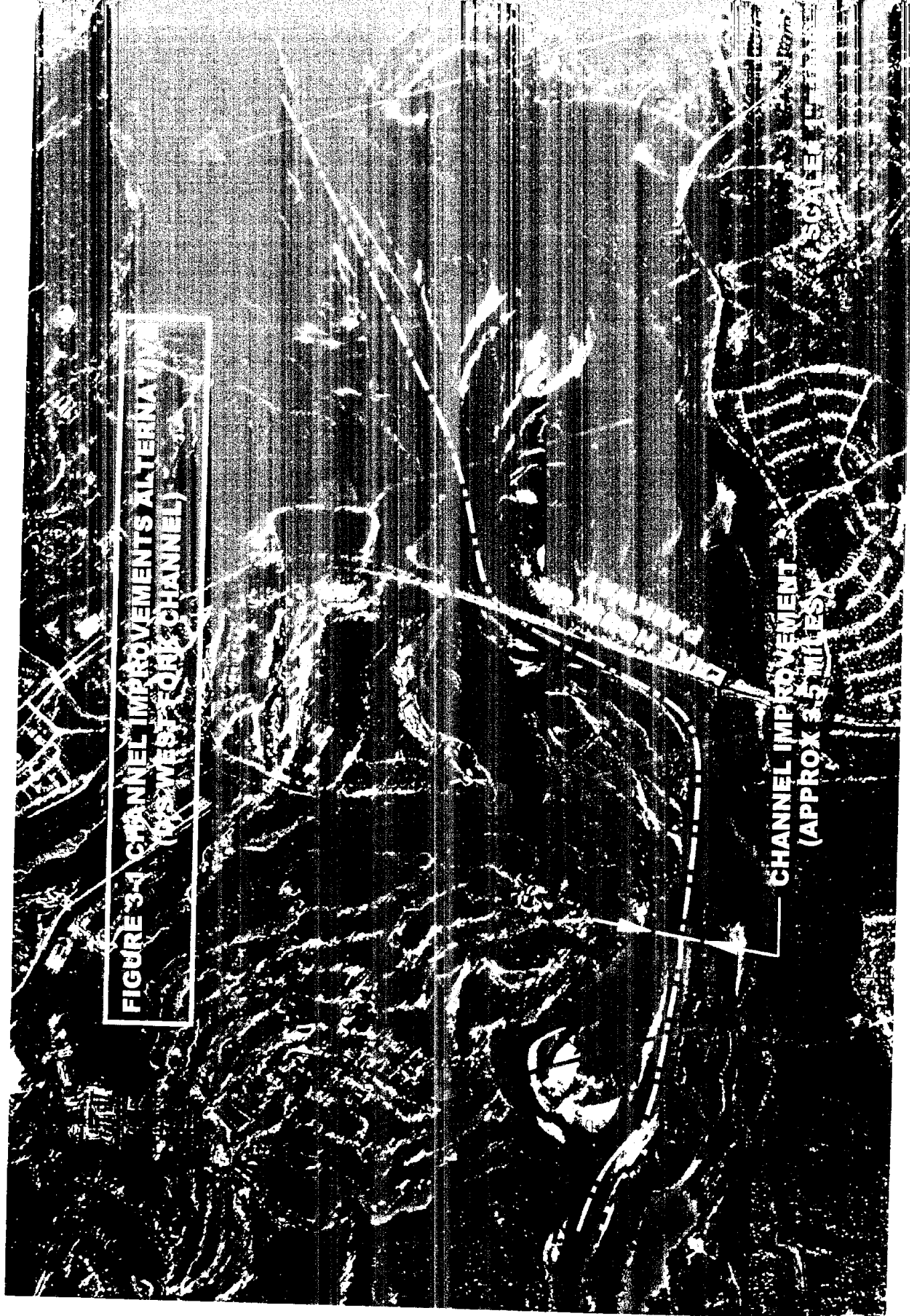


Brown & Root

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



**FIGURE 3-1 CHANNEL IMPROVEMENTS ALTERNATIVE
(WEST FORK CHANNEL)**



**CHANNEL IMPROVEMENT
(APPROX 3.5 MILES)**

SCALE 1" = 1 MILE

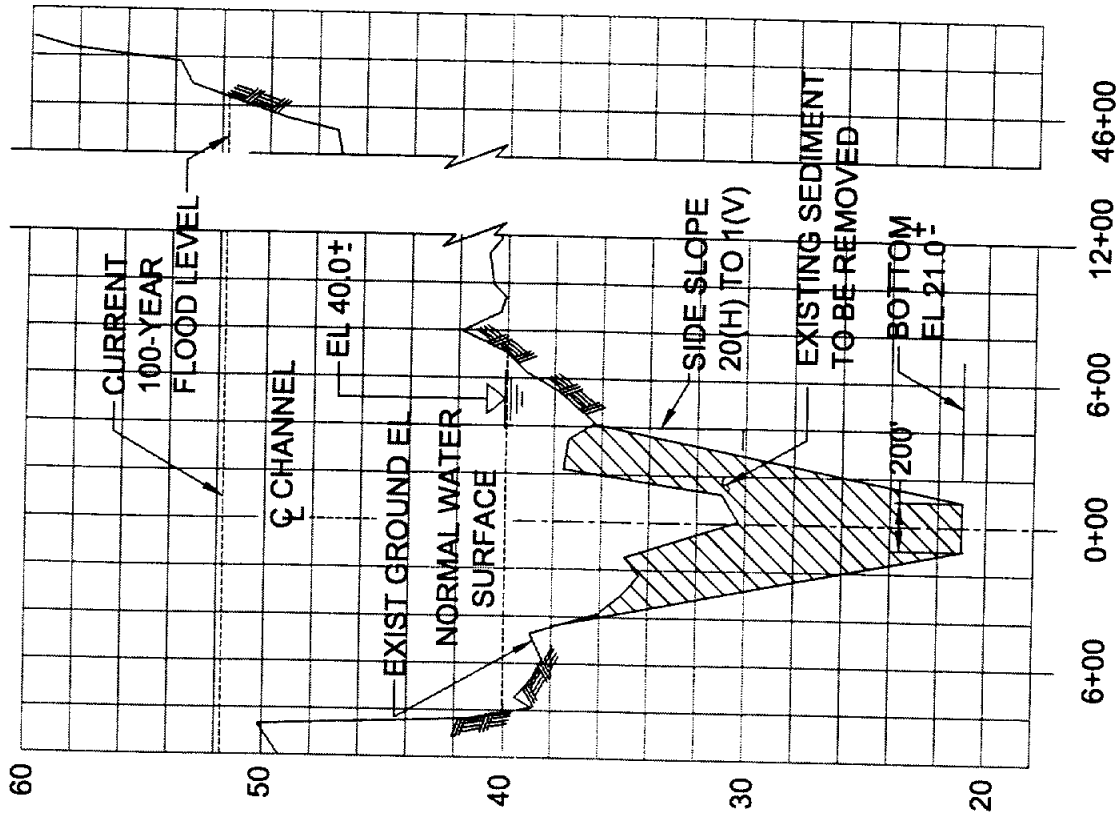
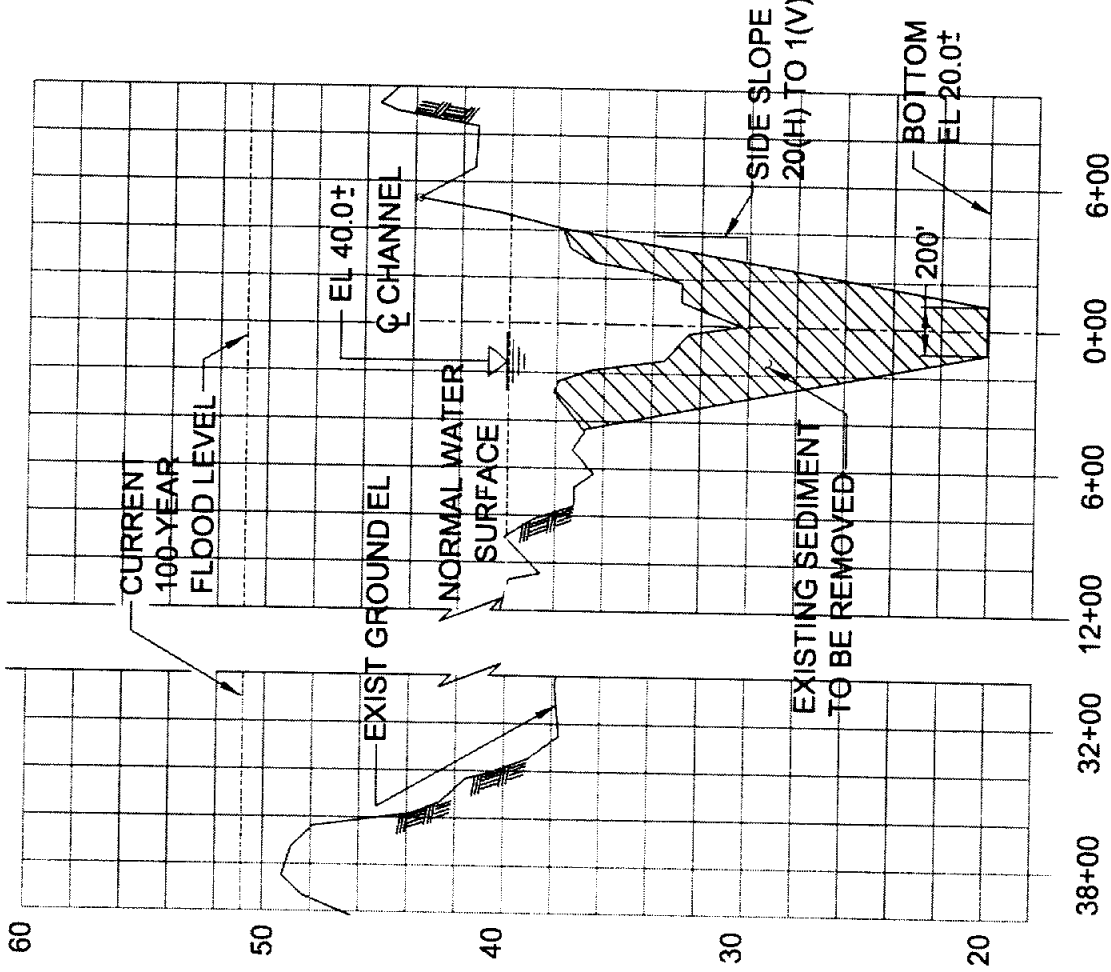
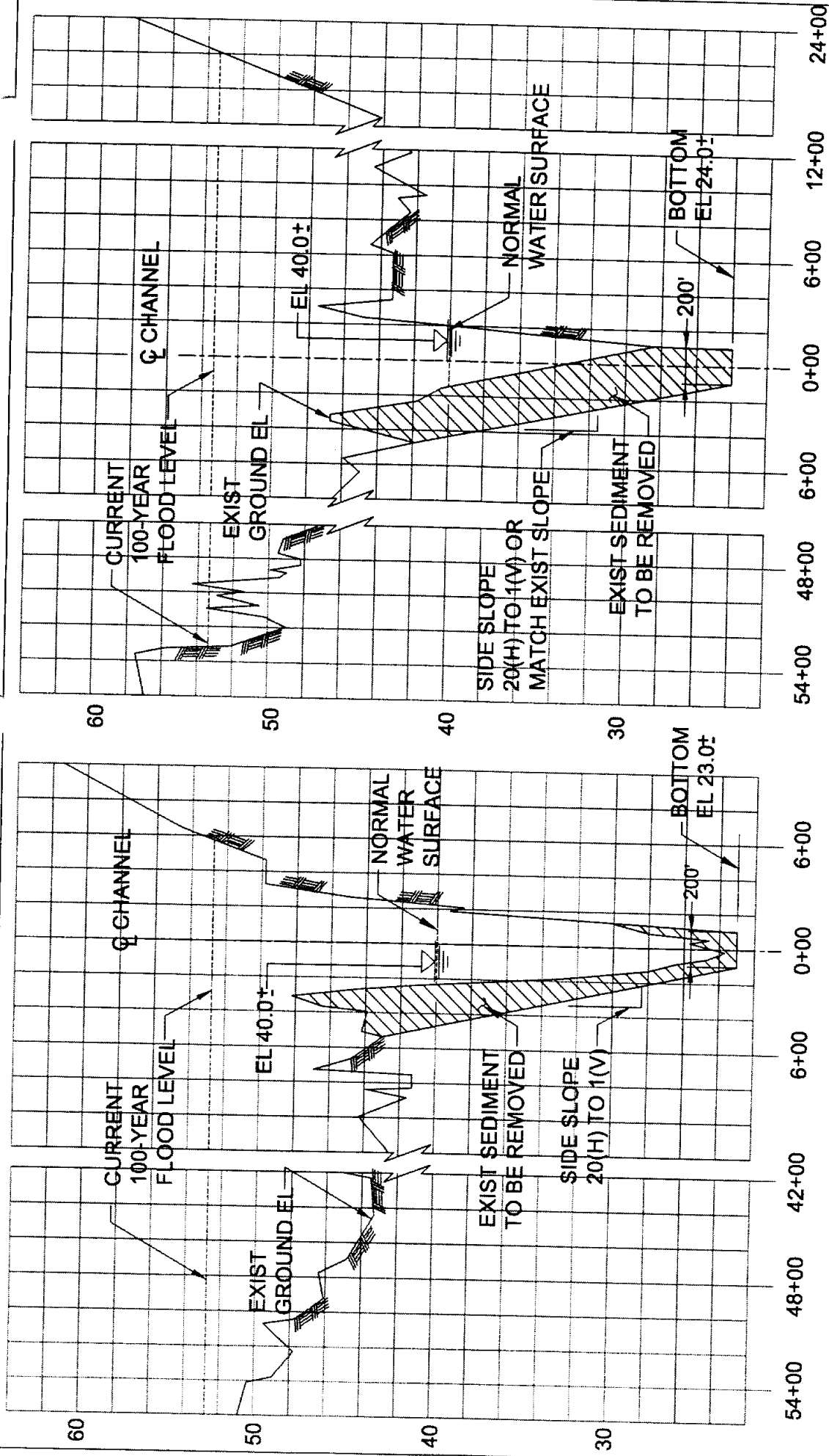


FIGURE 3-2- CHANNEL IMPROVEMENT ALTERNATIVE
DOWNSTREAM WEST FORK
SCALE= 1"=80' (H)
1"=8' (V)



CROSS-SECTION C
(FEMA LOC 5.585)

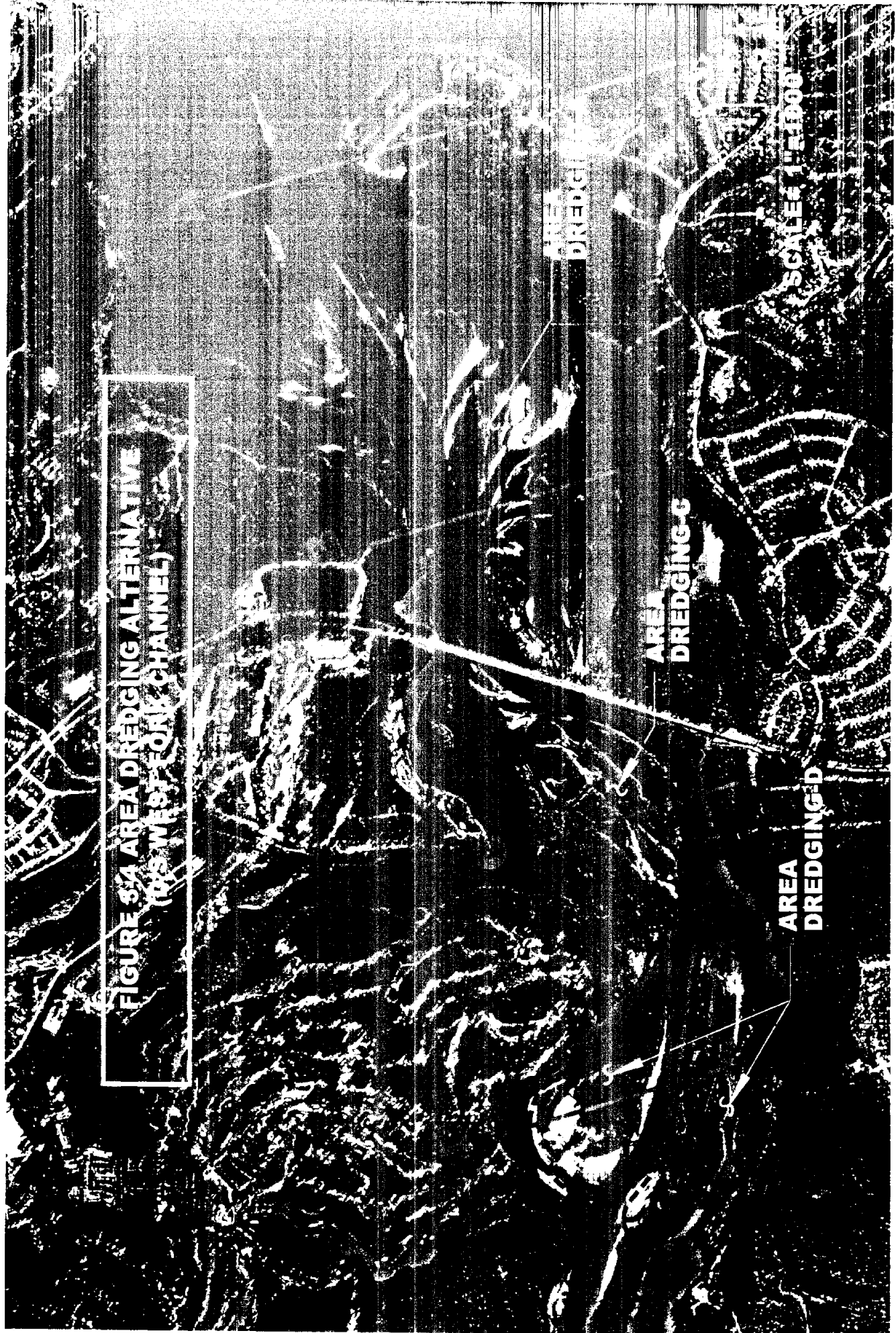
CROSS-SECTION D
(FEMA LOC 6.42)

FIGURE 3-3 -CHANNEL IMPROVEMENT ALTERNATIVE

SCALE= 1"=80' (H)
1"=8' (V)

DOWNSTREAM WEST FORK

**FIGURE 3-4 AREA DREDGING ALTERNATIVE
(ON WEST FORK CHANNEL)**



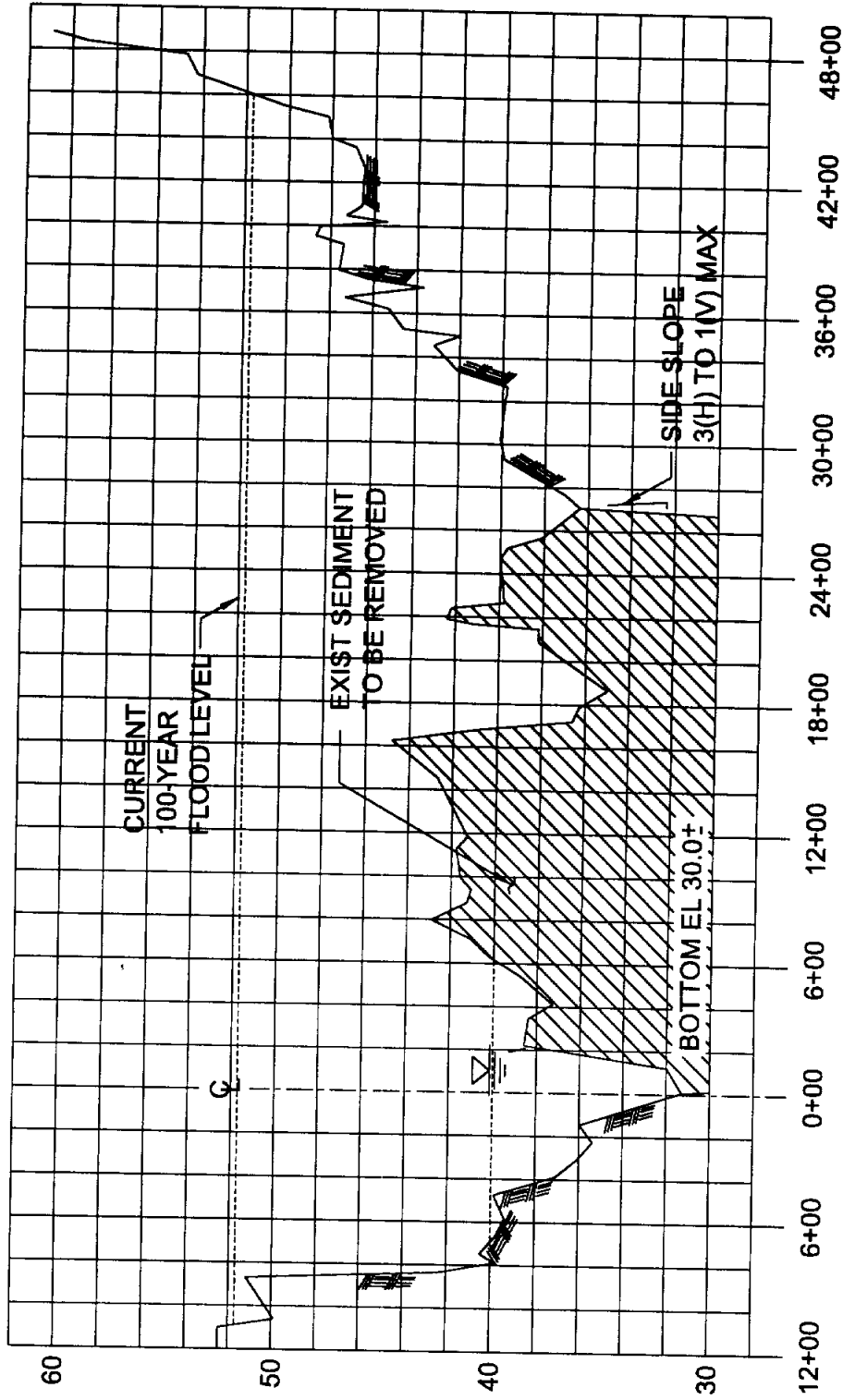


FIGURE 3-5 - AREA DREDGING A @ CROSS-SECTION B SCALE= 1"=800'(H) 1"=8'(V)
(D/S LAKE HOUSTON PARKWAY, RM 11.3)

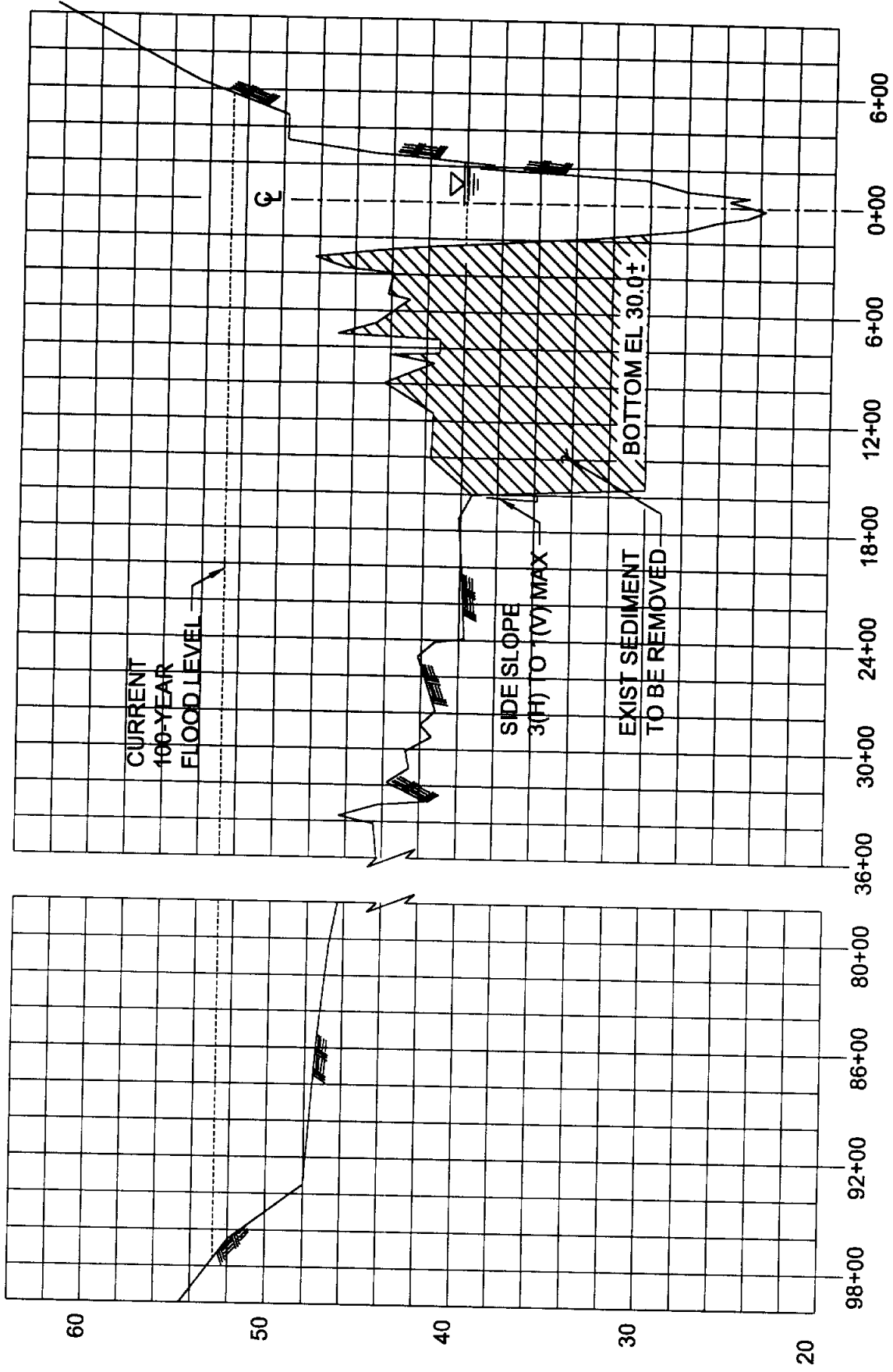


FIGURE 3-6 - AREA DREDGING C @ CROSS-SECTION C

(SW OF LAKE HOUSTON PARKWAY BRIDGE, RM 12.2)

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

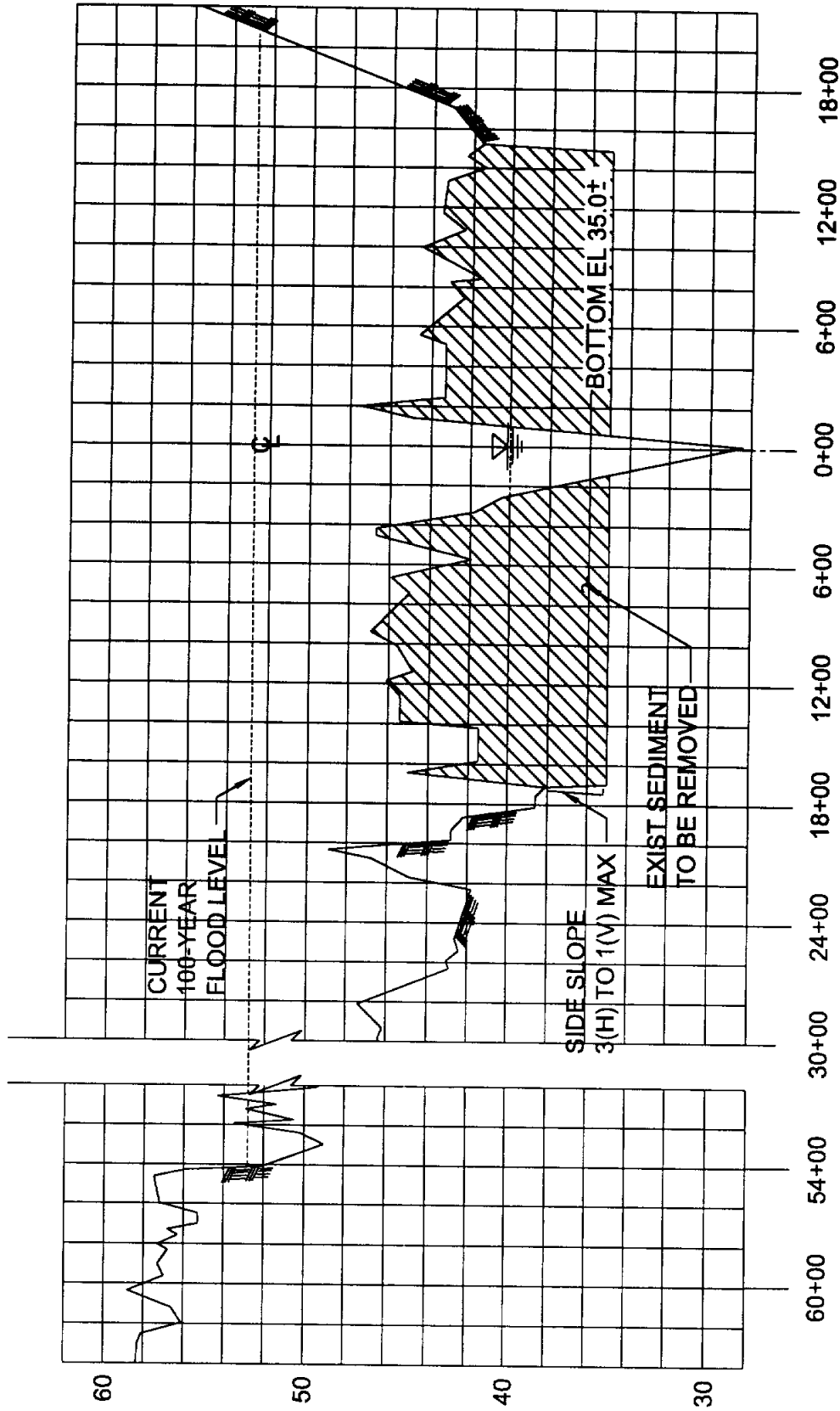


FIGURE 3-7 -AREA DREDGING D @ CROSS-SECTION D SCALE= 1"=800' (H)
1"=8'(V)
(S OF KINGWOOD COUNTRY CLUB, RM 12.9)

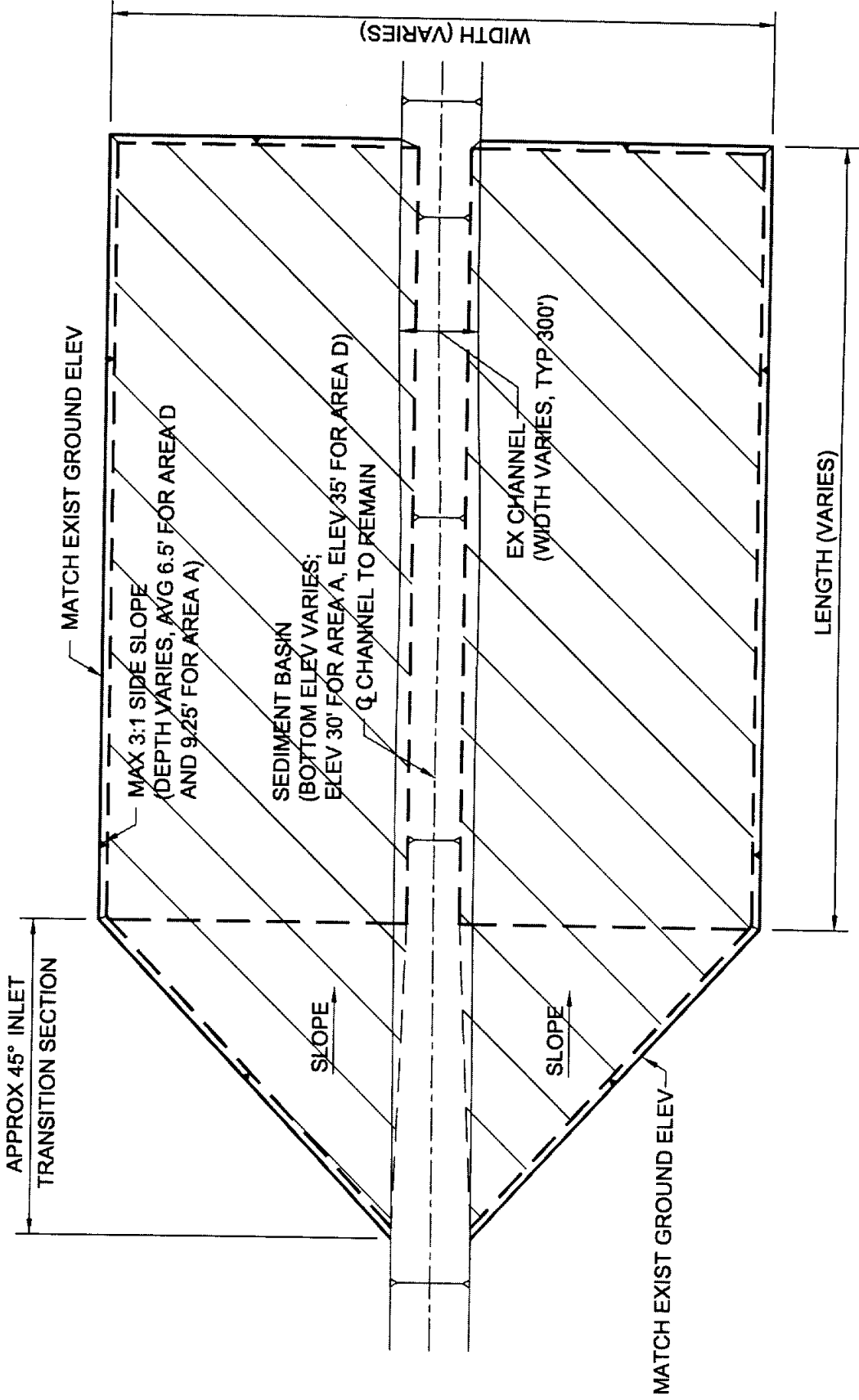


FIGURE 3-8 - TYPICAL ON-CHANNEL SEDIMENT BASIN

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 DIAM. % FINER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM. % FINER THAN 0.5mm	SEDIMENT SUSPENDED (MGL)	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 DAJM. % FINDER THAN 0.125mm	SED. SIEVE DIAM. % FINER THAN 0.25mm	SED. SIEVE DIAM % FINER THAN 0.5mm	SEDIMENT SUSPENDEDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDEDED (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

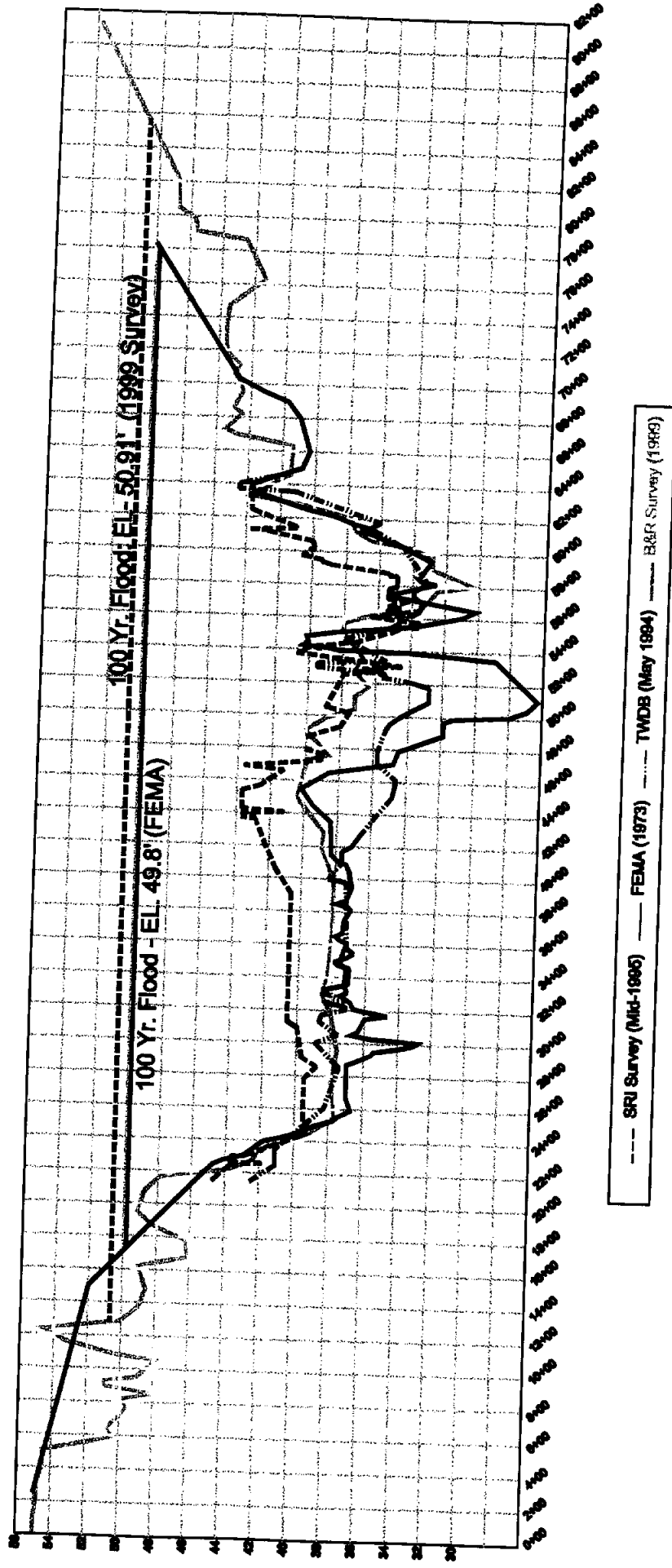
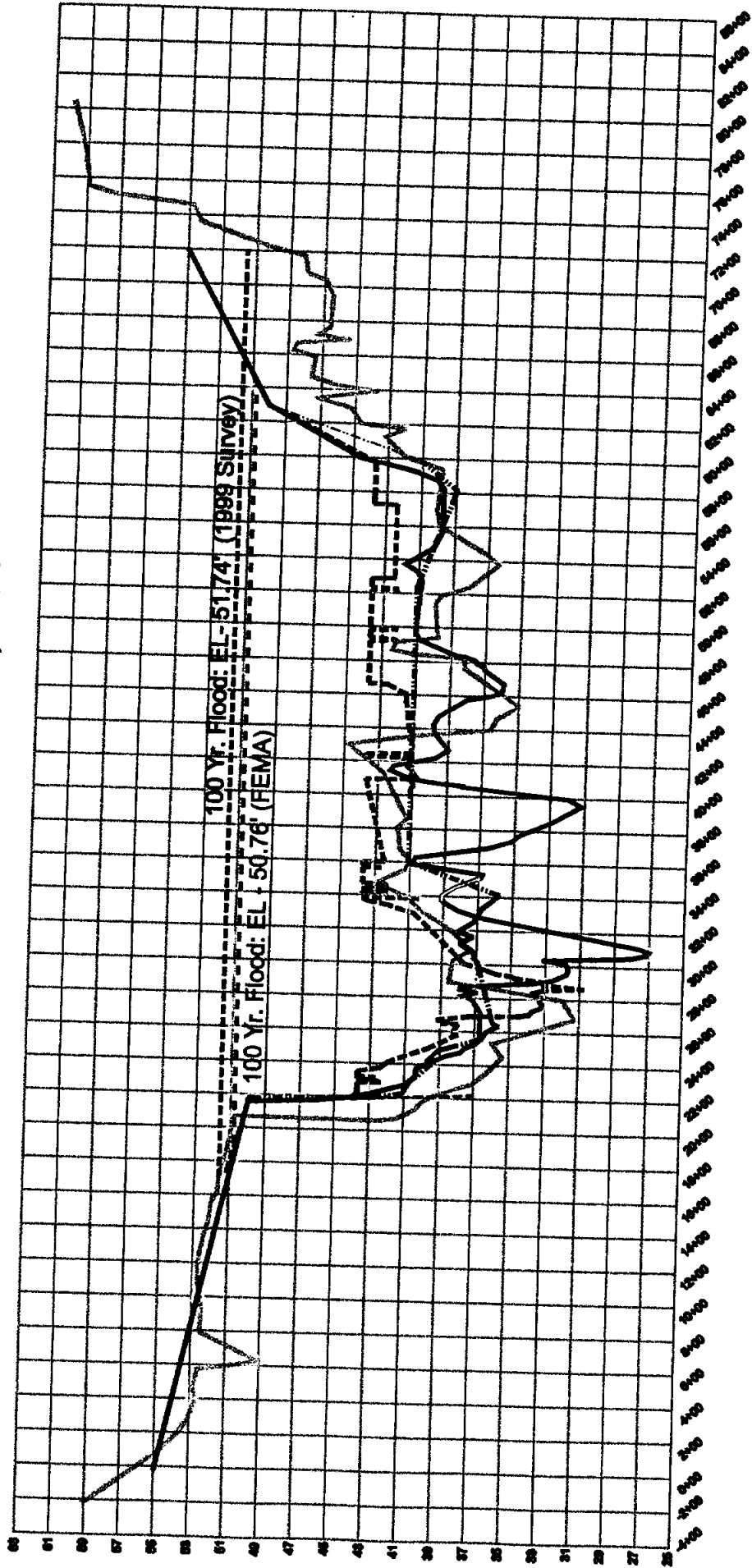
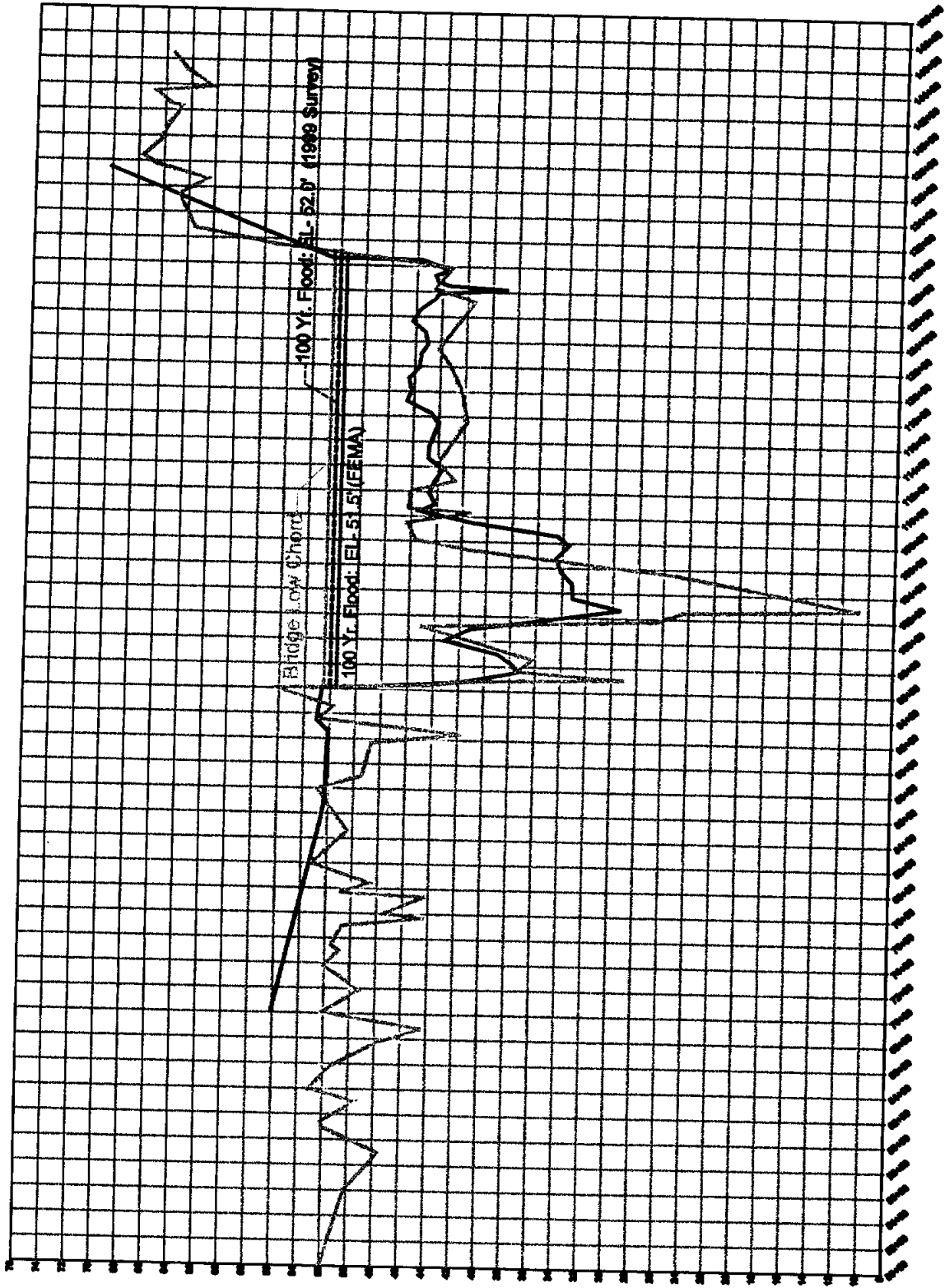


EXHIBIT 2
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 4.75 MI, Line B



----- SRI Survey (Mid-1886) ——— FEMA (1973) - · - · - TWDB (May 1994) ——— B&R Survey (1898)

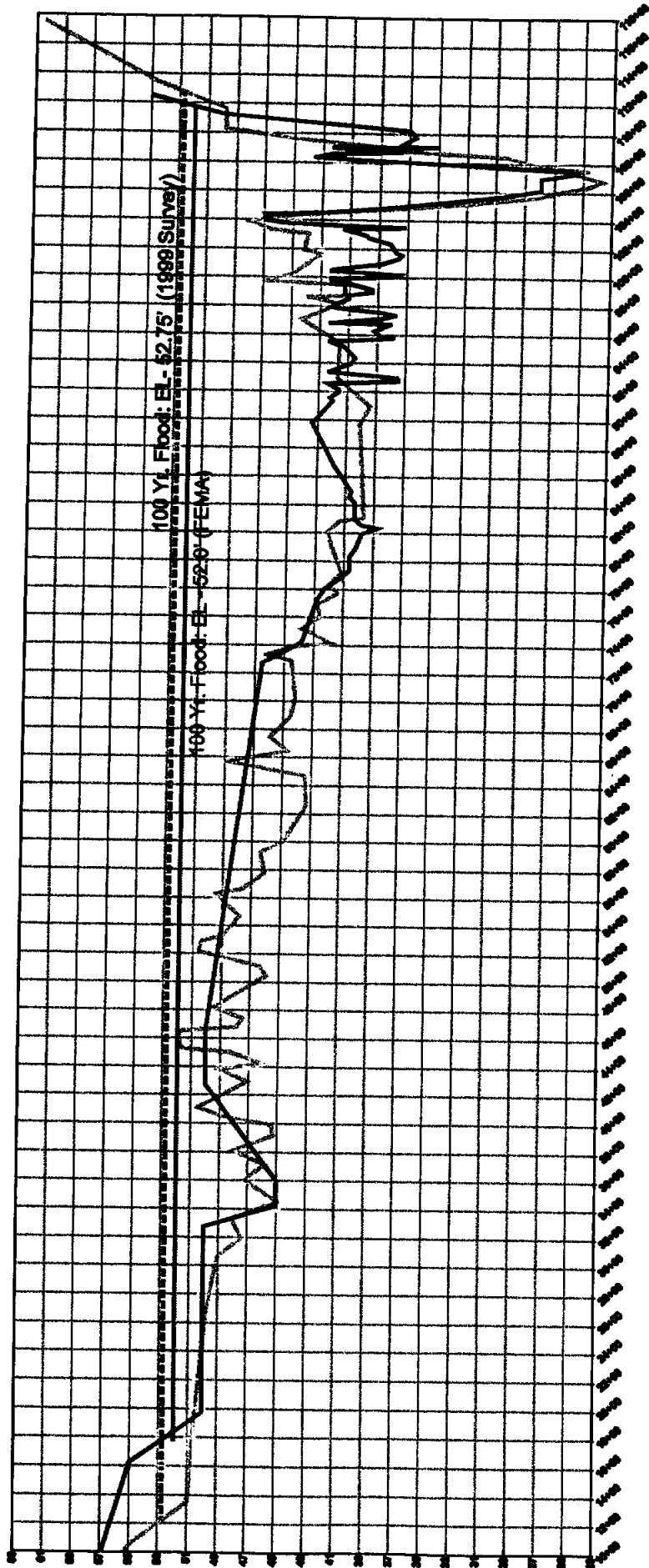
EXHIBIT 3
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 5.037 MI, Bridge Lake Houston Parkway



— FEMA (1973)
- - - DGR Survey (1990)

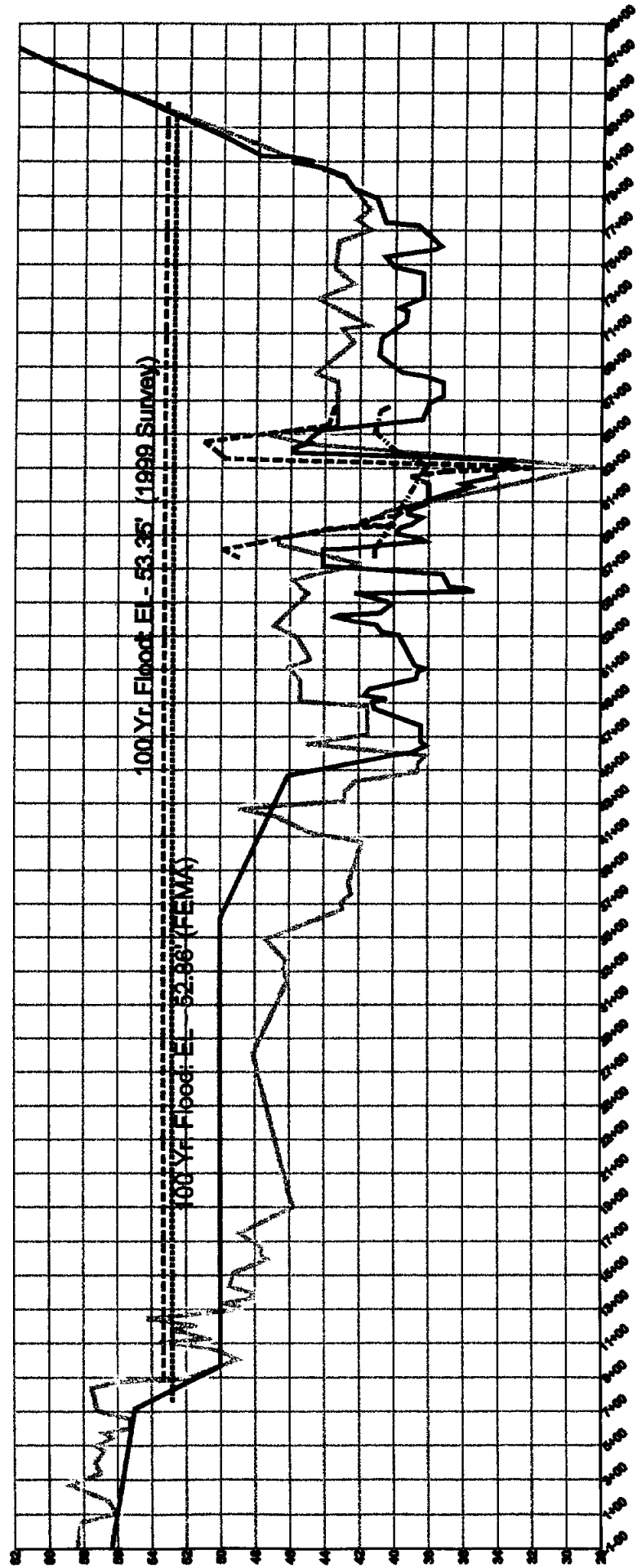
EXHIBIT 4

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 5.585 Mi, Line C



— FEMA (1973) - - - - - B&R Survey (1999)

EXHIBIT 5
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 6.42 MI, Line D



--- SRI Survey (Mid-1995) - - - FEMA (1973) - - - TWDB (May 1994) - - - B&R Survey (1999)

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

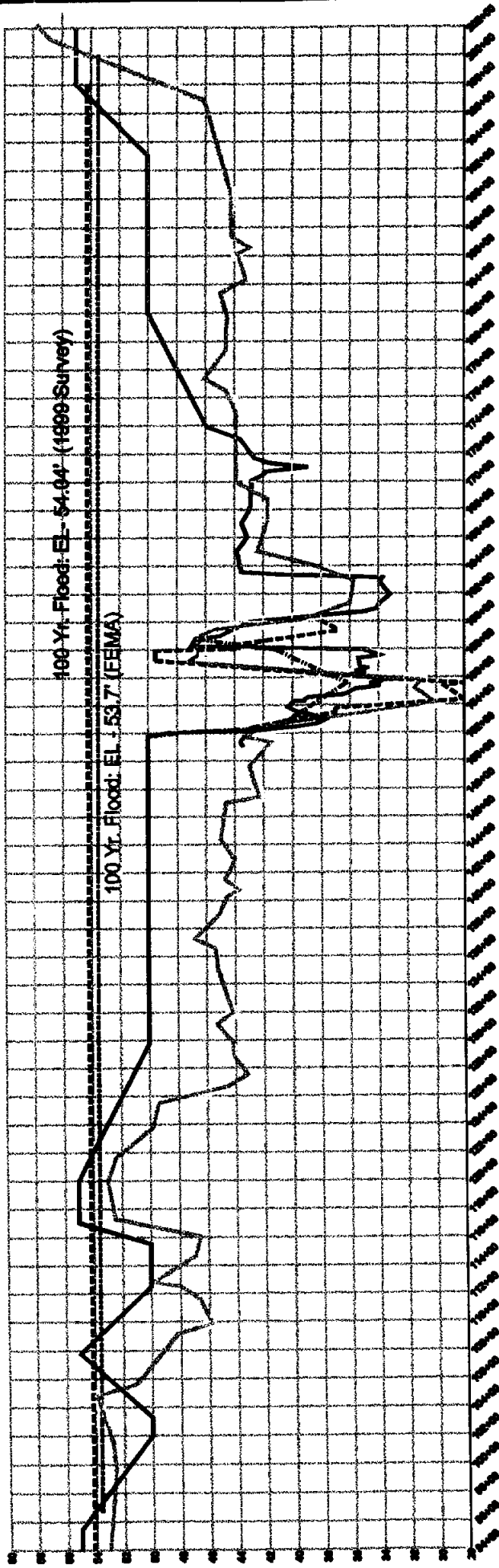
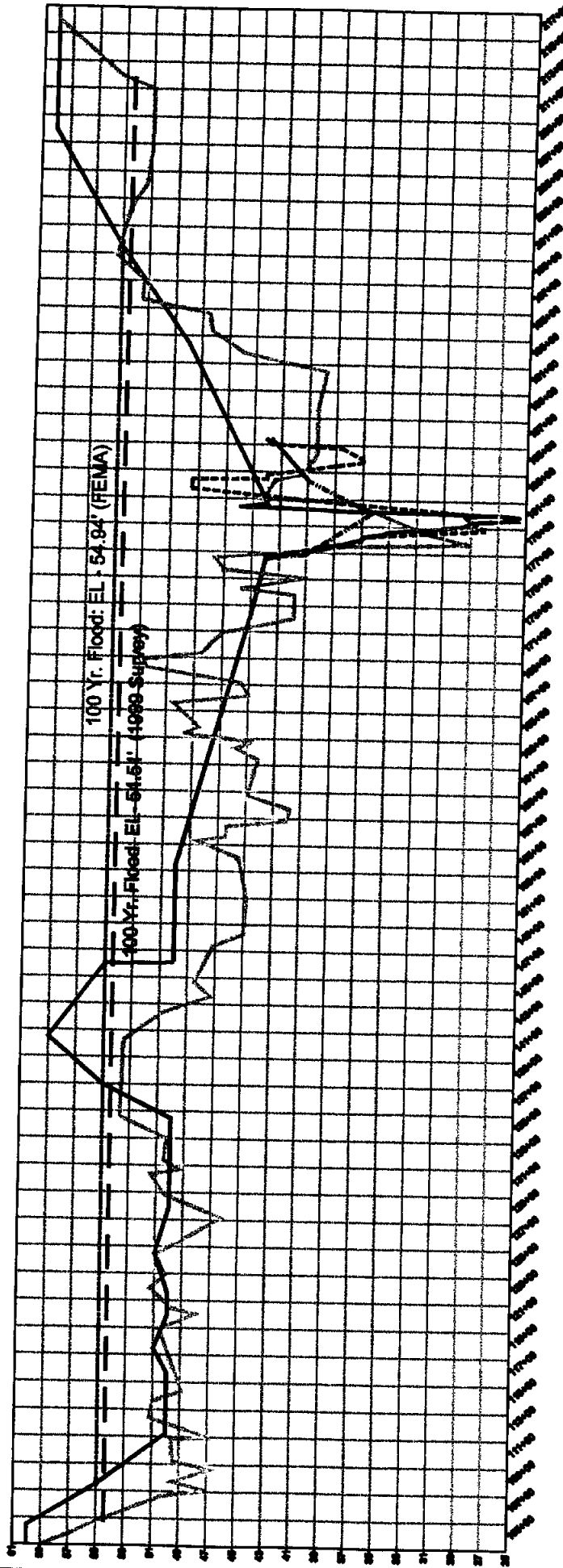


EXHIBIT 7
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 7.47 MI, Line F



--- 8th Survey (M&I-1906) - - - FEMA (1973) - - - TWDS (May 1984) - - - B&R Survey (1989)

EXHIBIT 8

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 8.49 MI, Line G

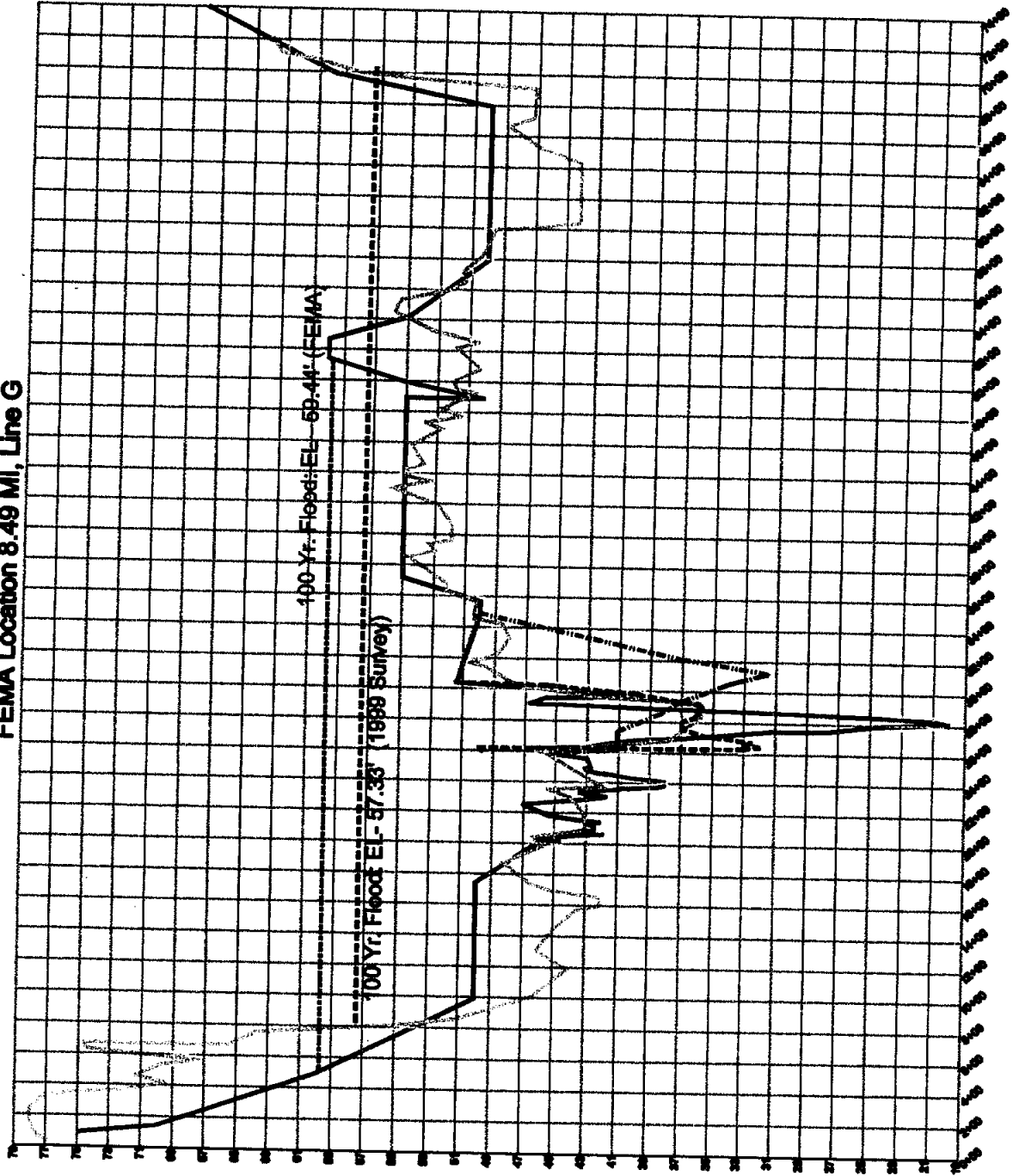
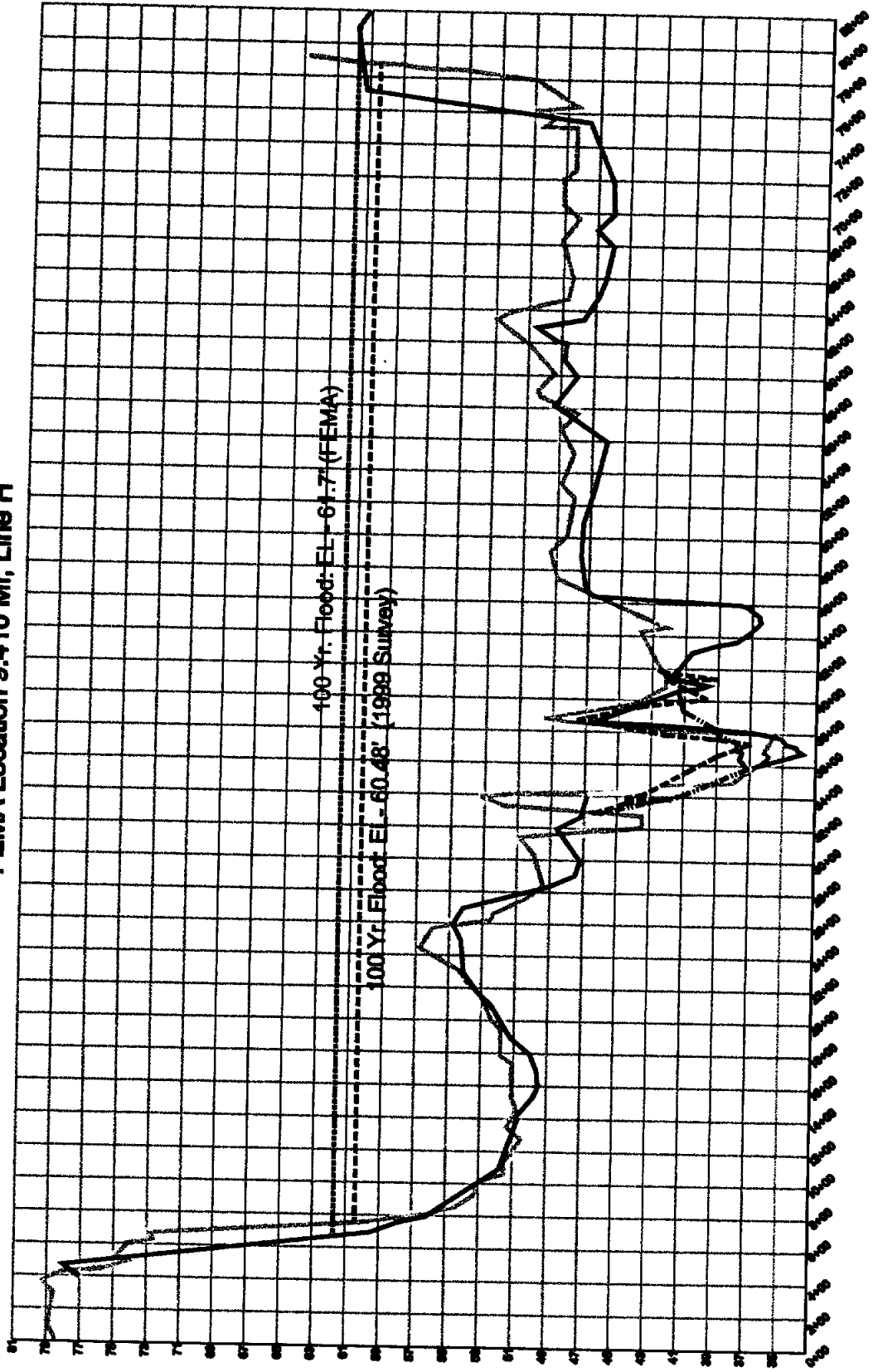
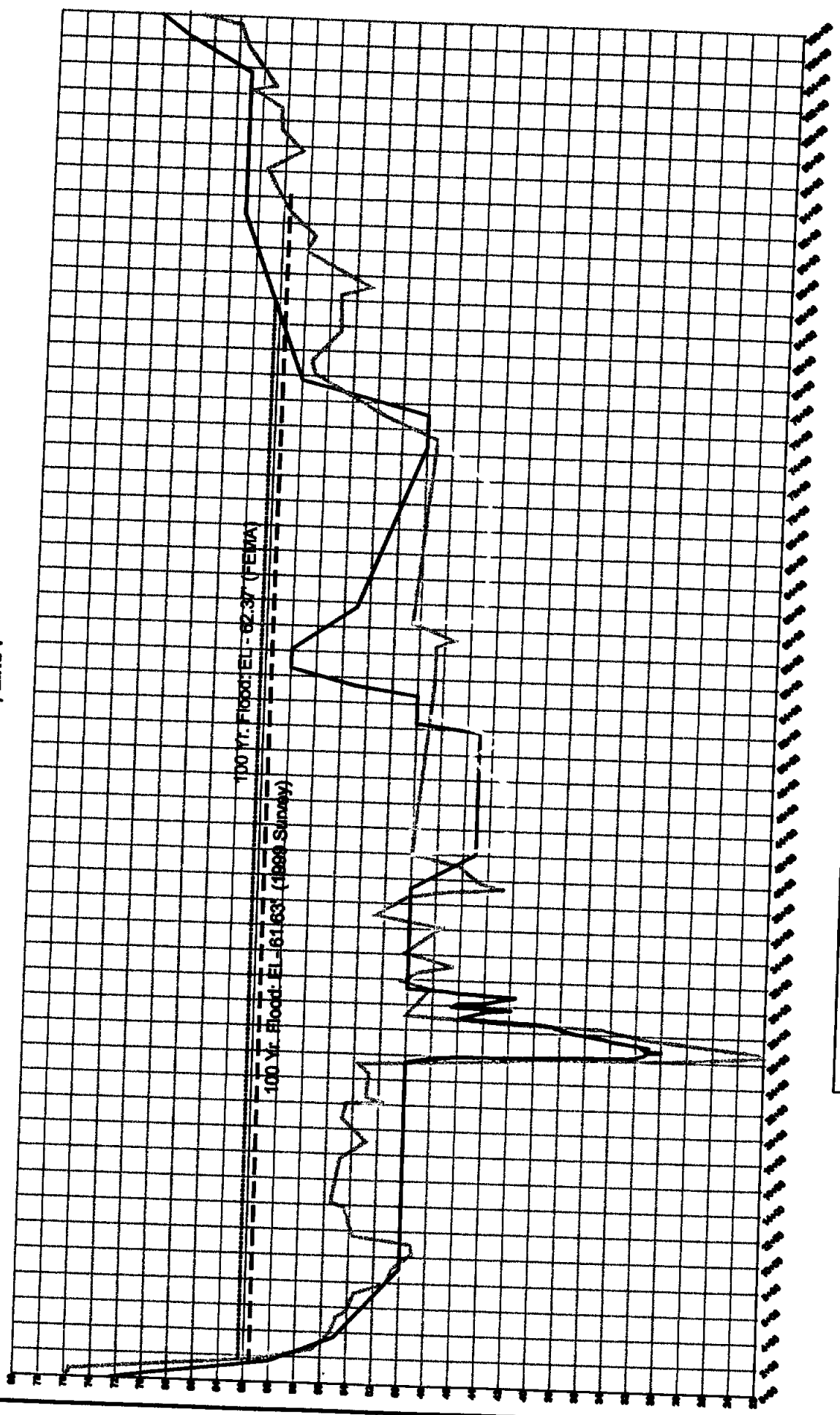


EXHIBIT 9
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 9.410 MI, Line H



--- SRI Survey (Mid-1995) — TWDB (May 1994) - - - FEMA (1973) - - - B&R Survey (1999)

EXHIBIT 10
Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 10.58 MI, Line 1

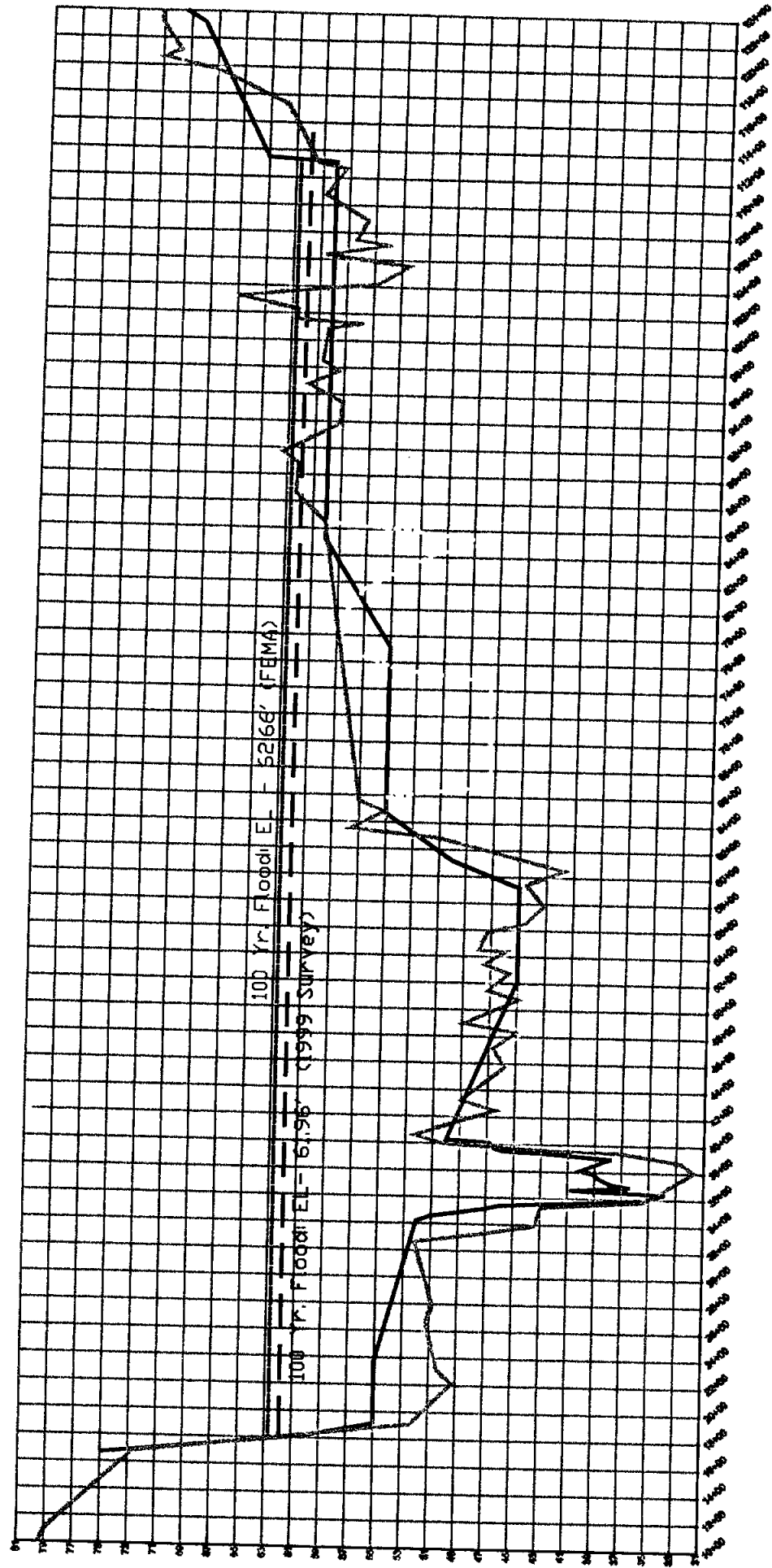


— FEMA (1973)
--- B&E Survey (1960)

EXHIBIT 11

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 10.86 MI, Line J



— FEMA (1973) - - - - - FEMA Survey (1999)

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

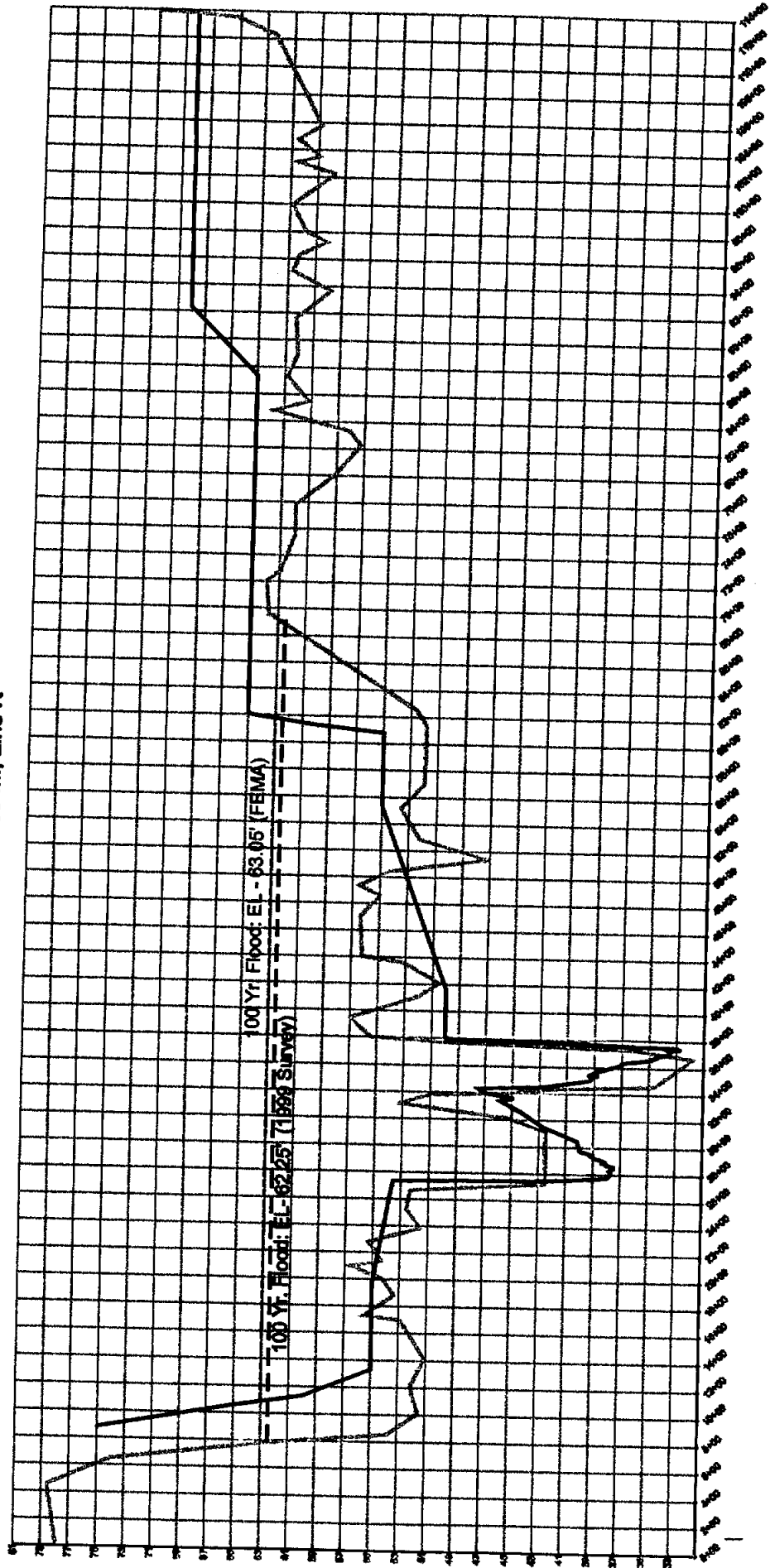
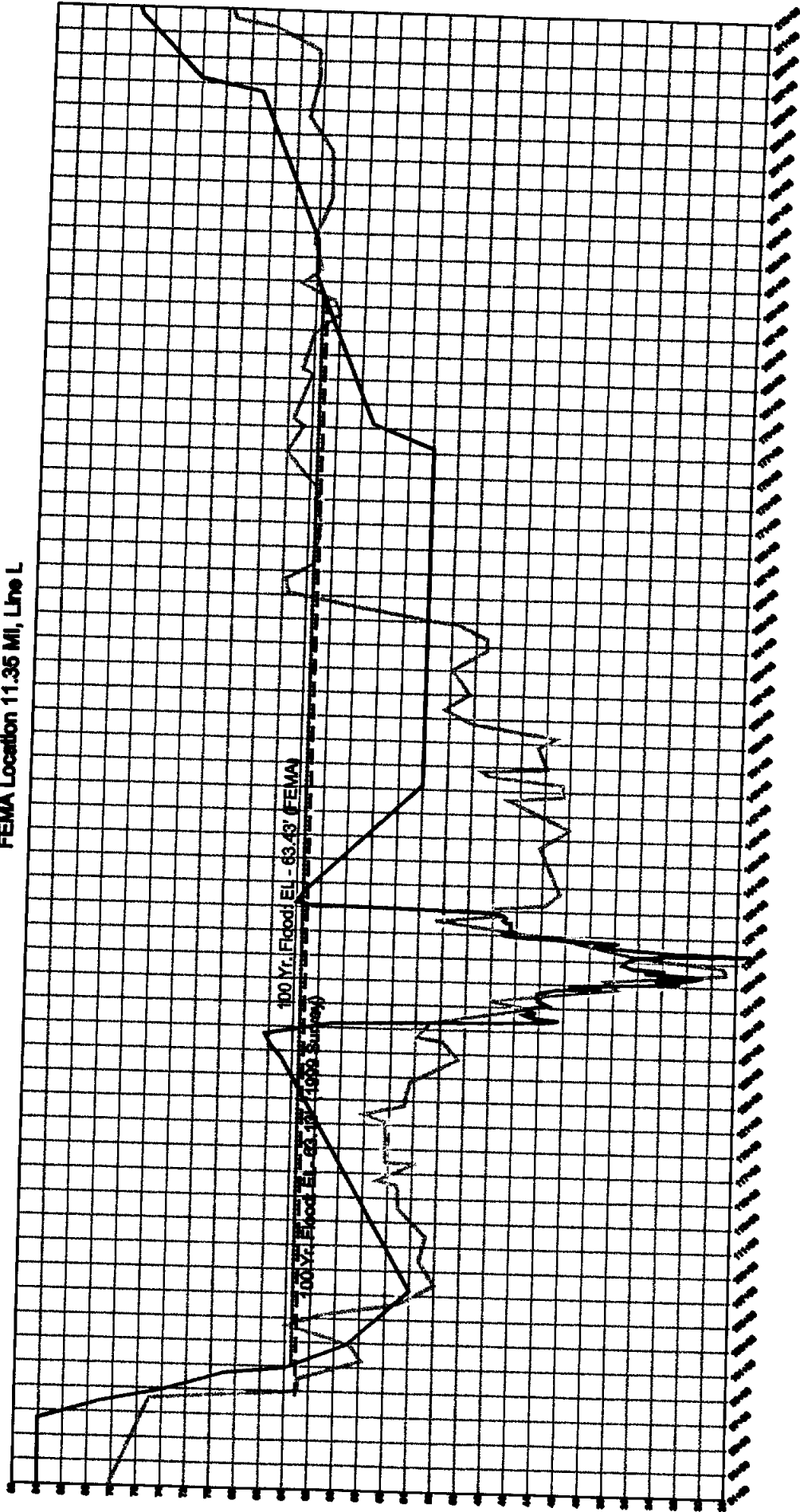


EXHIBIT 13

Analyses of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency

FEMA Location 11.35 MI, Line L



— FEMA (1973) - - - - S&R Survey (1965)

EXHIBIT 14
Analysis of Sedimentation Effects on FEMA Regulatory 100 Yr. Frequency
FEMA Location 11.48 MI, Line M

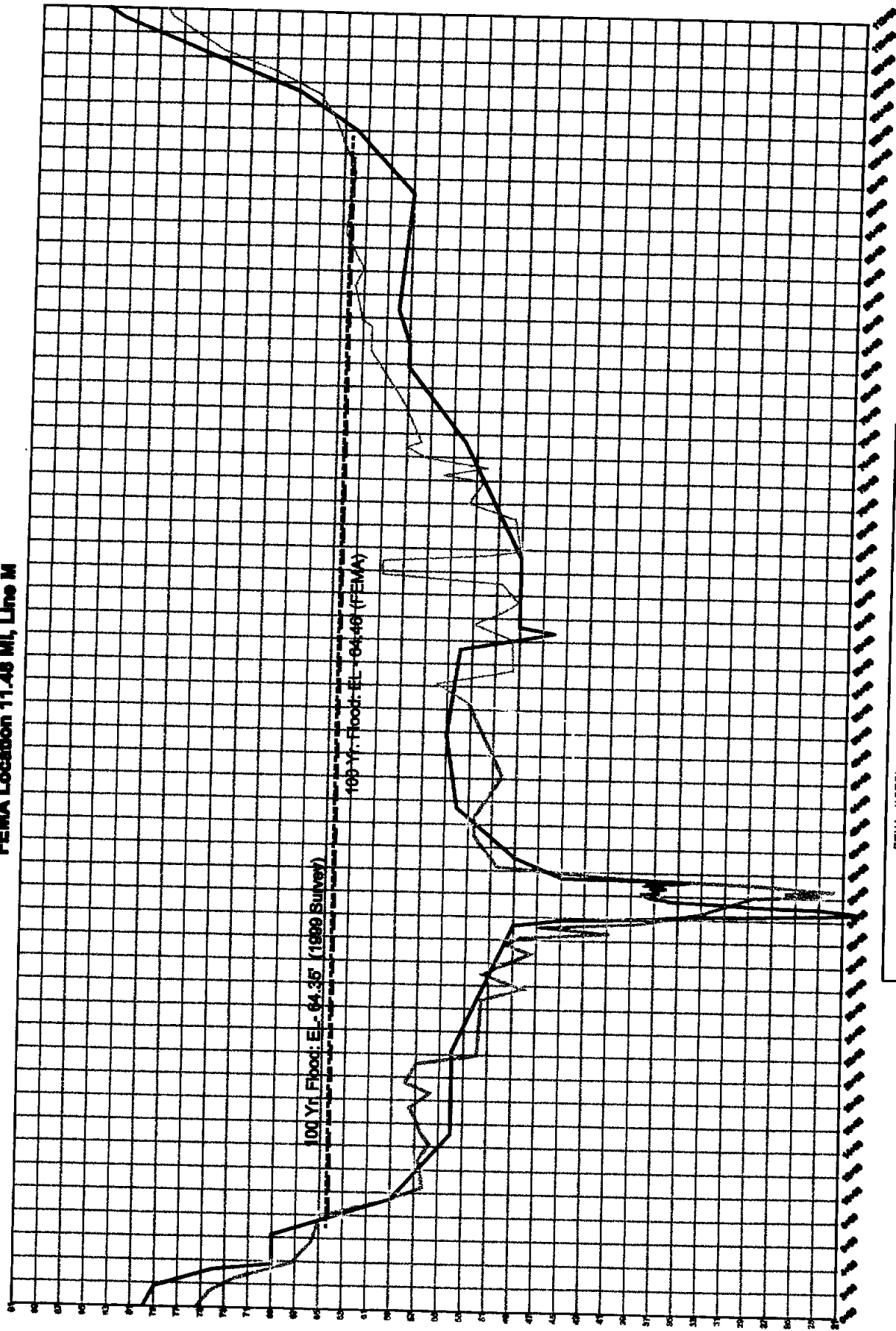
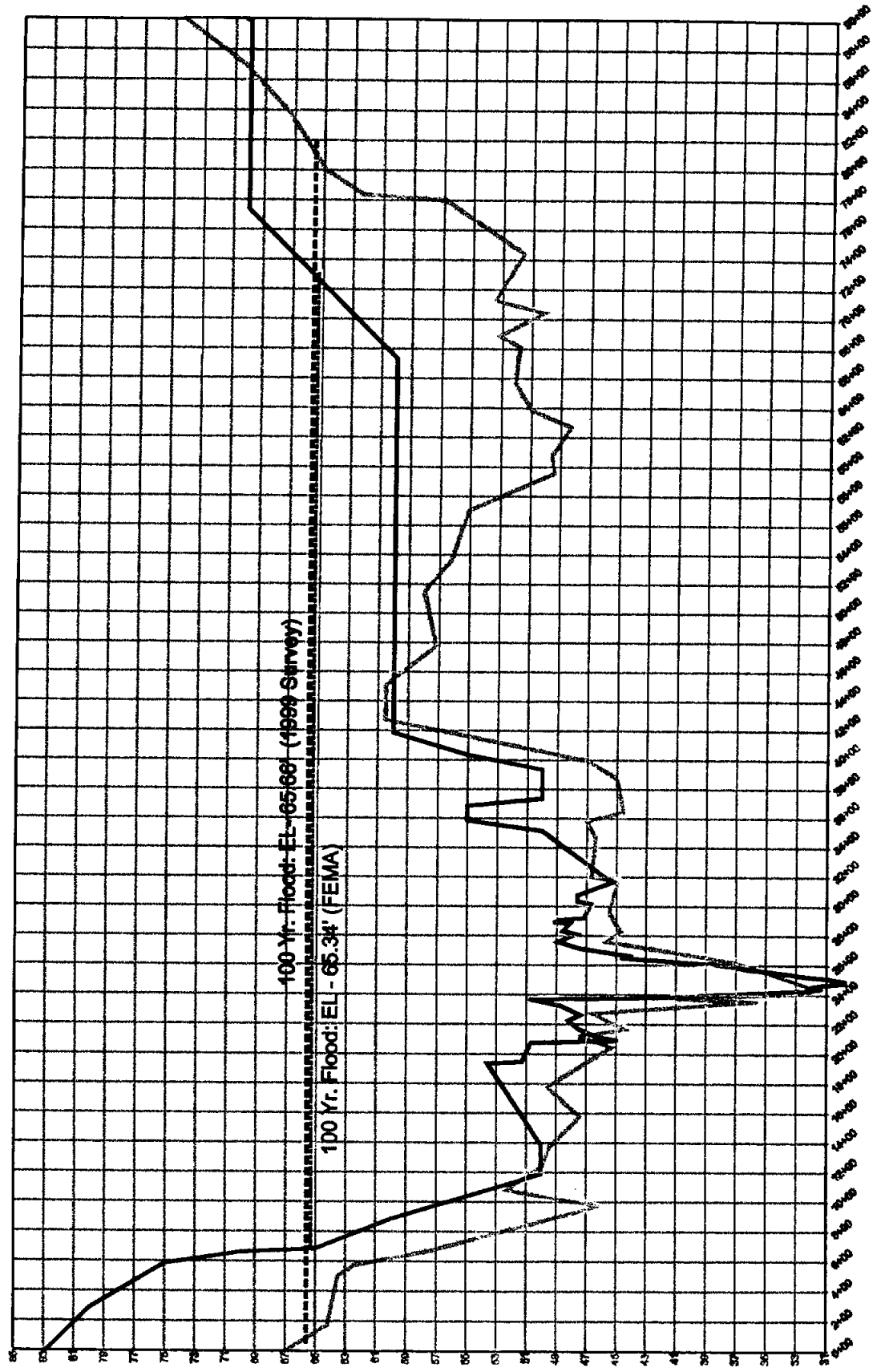


EXHIBIT 15

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 *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * RUN DATE 14MAR00 TIME 19:02:53 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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 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&B 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 Encroachments 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		

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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

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					

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						

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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

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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PAGE 6

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
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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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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PAGE 8

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
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		

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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
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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
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			

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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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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

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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

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SECNO	DEPTH	CWSEL	CRISW	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

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

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SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISWS	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

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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

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

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SECNO	DEPTH	CWSEL	CRISWS	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
.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

ELENCN= 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

SECNO	DEPTH	CWSEL	CRISW	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

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	IPLT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
2	0	-1								

SECNO	DEPTH	CWSEL	CRISW	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

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SECNO	DEPTH	CWSEL	CRWS	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

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SECNO	DEPTH	CWSEL	CRISW	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

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SECNO	DEPTH	CWSEL	CRISW	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	CRISW	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	CRISW	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

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SECNO	DEPTH	CWSEL	CRISW	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
.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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SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	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.

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

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID	ELLC	ELTRD	WEIRLN
.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
 ELENC= 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
 ELENC= 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

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	CRISW	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	XLOBR	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	CRISWS	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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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

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
.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	CRISW	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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PAGE 46

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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PAGE 47

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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PAGE 48

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 3.615

3470 ENCROACHMENT STATIONS= 1232.0 8990.0 TYPE= 1 TARGET= -1232.040
ELENCL= 54.70 ELENCR= 10000.00
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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PAGE 49

SECNO DEPTH CWSSEL 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	

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SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV	
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV	
TIME	VLOB	VCH	VROB	XLN	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	
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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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PAGE 51

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

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	CRISW	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
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

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SECNO	DEPTH	CWSEL	CRISW	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
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

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SECNO DEPTH CWSEL CRIWS WSELK EG HV HL GLOSS 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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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

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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

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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

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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

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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	1143031.00
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

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
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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	43311.63114830.20		
*	5.046	1.00	.00	10.60	328820.00	57.05	.00	57.41	2.31	4.99	97640.33216481.70		
*	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	75558.88117640.60		
5.585	2847.00	.00	.00	23.70	326970.00	57.86	.00	58.03	2.07	5.41	128717.80227276.30		
*	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	63568.08124651.70		
6.420	4409.00	.00	.00	28.40	324160.00	58.36	.00	58.53	1.55	4.48	103255.10260639.20		
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	79784.26101980.40		
7.090	3538.00	.00	.00	30.10	321910.00	58.93	.00	59.17	2.63	5.22	147194.50198624.20		
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	129913.60179159.60		
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	101223.30124868.10	
*	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	74607.59104332.60	
*	9.410	4858.00	.00	.00	35.50	314100.00	65.82	.00	66.14	3.02	7.55	117228.60180780.60	
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	89822.48100222.00		
10.580	6177.00	.00	.00	22.10	309220.00	67.04	.00	67.47	3.08	7.72	144446.10176265.10		
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	75225.93109936.30		
10.860	1478.00	.00	.00	31.70	310160.00	67.36	.00	67.89	2.89	7.73	127798.40182367.10		

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	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	109540.20136563.60	
*	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	76574.88113202.20	
	11.350	1373.00	.00	.00	28.84	307570.00	68.55	.00	69.07	2.86	7.58	124445.10181875.80	
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	121277.70173132.60	

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

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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

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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

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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

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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

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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 *
 ENGINEERS *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * *
 * RUN DATE 28FEB00 TIME 09:37:31 *
 * *

 * U.S. ARMY CORPS OF
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D
 * *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104

LK HOUR2.oh2 for Reach 2 – Lake Houston (TWDB 1995 Data; with add'tl section data u/s 1960 from TWDB lake survey database via internet)

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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 I PLOT 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

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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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PAGE 2

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

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

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

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

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

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

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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

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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

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	CRISW	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.

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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	CRISW	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	CRISWS	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

.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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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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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

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PAGE 15

SECNO	DEPTH	CWSEL	CRISWS	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	20055.96
.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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PAGE 16

SECNO	DEPTH	CWSEL	CRISW	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	.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	CRISW	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

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

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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PAGE 20

SECNO	DEPTH	CWSEL	CRISW	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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PAGE 21

SECNO	DEPTH	CWSEL	CRISWS	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
.00	48.99	.01	0.	180107.	100542.	100518.	51.90	56.30

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.30 ELREA= 56.30

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PAGE 22

SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISW	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	CRISW	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	CRISWS	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

.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 CWSSEL 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

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SECNO	DEPTH	CWSEL	CRIBS	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

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SECNO	DEPTH	CWSEL	CRWS	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

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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

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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	CRISW	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	CRISW	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	VRQB	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
53.70	53.59	.03	0.	408417.	100542.	100518.	51.90	56.30	0.
AREA									

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

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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= 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

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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	.0	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

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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	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

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SECNO	DEPTH	CWSEL	CRIS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VR0B	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

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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

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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

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	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

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SECNO	VOL	AREA	CWSEL
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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

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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 *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * RUN DATE 29FEB00 TIME 11:00:21 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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PAGE 1

THIS RUN EXECUTED 29FEB00 11:00:21

 HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

~~CIMP 200 FT~~ (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

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PAGE 2

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
1

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PAGE 3

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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PAGE 4

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

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

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				

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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

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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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

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			

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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

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	
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	
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

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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

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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
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	
BT	27	16200.0	68.99	0.0	17200.0	64.77	0.0	17500.0	63.51	0.0
BT	18300.0	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	20903.0	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	26274.0	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	
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

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	CRISWS	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.

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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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SECNO	DEPTH	CWSEL	CRISW	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

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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 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

*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	CRISW	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

.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	CRISWS	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

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

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	CRISW	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

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

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	CRISWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	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
65.31	64.91	.06	0.	167500.	32375.	30545.	63.08	69.07	0.
AREA									

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

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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	43211.88114644.40
5.585	2847.00	.00	.00	23.00	172610.00	52.25	.00	52.42	1.82	4.45	74406.30127847.90
6.420	4409.00	.00	.00	24.00	171900.00	52.77	.00	52.94	1.41	4.49	65254.12144528.00
* 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	74094.76103449.90
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	74888.40109415.30

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRISWS	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	76363.00112828.20	
* 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	83422.42125525.20	
11.480	370.00	.00	.00	20.73	167560.00	64.32	.00	64.62	1.42	5.48	98807.96140541.00	
11.550	370.00	.00	.00	21.73	167500.00	64.38	.00	64.69	1.63	5.64	94277.55131089.30	
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	102324.80129365.50	
11.970	2118.00	.00	.00	31.72	167140.00	65.63	.00	65.86	1.49	5.42	108991.00137144.80	

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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

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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

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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

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		

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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

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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

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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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
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							
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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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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PAGE 8

QT	4	62850	129130	168330	309220					
NC	.1	.12	.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

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		

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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

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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
GR	85.00	28450.0	90.00	28700.0	90.50	28900.0	0.00	0.00		

SB	1.25	2.31	2.60	0.0	50	46	32375	20	24.1	24.1
NC	.120	.120	.035	.3	.5				0.00	0
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	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	CRIVS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XLN	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

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SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISWS	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	CRISW	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

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SECNO	DEPTH	CWSEL	CRWS	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

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SECNO	DEPTH	CWSEL	CRISW	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

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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 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.

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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 64.34 .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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SECNO DEPTH CWSSEL 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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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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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

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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

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PAGE 25

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

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Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71149409.40	
* 4.745	5966.00	.00	.00	30.00	173330.00	51.39	.00	51.47	.44	2.25	79710.34259895.80	
* 5.026	1482.00	.00	.00	10.60	173080.00	51.45	.00	51.73	2.65	4.19	41314.24106310.00	
5.027	1.00	58.25	52.50	10.60	173080.00	51.48	.00	51.73	2.61	4.06	42667.32107053.70	
5.034	47.00	58.25	52.50	10.60	173080.00	51.49	.00	51.75	2.61	4.05	42708.54107216.70	
5.035	1.00	.00	.00	10.60	173080.00	51.48	.00	51.75	2.62	4.18	41437.87106830.20	
5.037	8.00	.00	.00	10.60	173080.00	51.48	.00	51.76	2.63	4.18	41417.55106744.60	
5.038	1.00	58.25	52.50	10.60	173080.00	51.51	.00	51.76	2.60	4.05	42765.09107440.50	
5.045	47.00	58.25	52.50	10.60	173080.00	51.52	.00	51.77	2.59	4.04	42806.04107602.70	
5.046	1.00	.00	.00	10.60	173080.00	51.51	.00	51.78	2.61	4.17	41520.42107178.00	
5.585	2847.00	.00	.00	23.70	172610.00	52.34	.00	52.49	2.45	4.80	71379.88110232.30	
6.420	4409.00	.00	.00	28.40	171900.00	53.02	.00	53.17	2.15	4.28	61093.07117350.50	
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	74352.37103892.80	
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	75057.51109676.20	
* 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	76469.08113015.40	
* 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	83516.47125695.20	

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	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	98951.96140732.80	
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.70	1.61	5.61	95225.19131867.60	

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

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Starting from 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

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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

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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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

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

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

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

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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

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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

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	CRISW	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 .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	CRISW	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
-------	-------	-------	-----	-----	-------	-----	-----	-----	-------

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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PAGE 12

SECNO	DEPTH	CWSEL	CRIS	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

.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

1

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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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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	CRISW	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	20055.96
.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	CRISW	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	.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

1

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SECNO	DEPTH	CWSEL	CRISW	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

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

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	CRISW	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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SECNO	DEPTH	CWSEL	CRISWS	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
.00	48.99	.01	0.	180107.	100542.	100518.	51.90	56.30

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 56.30 ELREA= 56.30

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SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISW	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	CRISW	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	CRISWS	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

.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 CWSSEL 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

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SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRWS	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

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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

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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	CRISW	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	CRISW	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

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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

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	.0	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

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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	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	CRISWS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VR0B	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

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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

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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

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	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

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SECNO	VOL	AREA	CWSEL
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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

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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 *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * RUN DATE 29FEB00 TIME 11:00:21 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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PAGE 1

THIS RUN EXECUTED 29FEB00 11:00:21

 HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

~~CIMP 200 FT~~ (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

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PAGE 2

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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PAGE 3

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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PAGE 4

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

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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PAGE 6

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

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				

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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

GR 45 11328 45.5 11905 48.6 12029 46.4 12059 42 12180
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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

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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

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			

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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

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	
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	
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

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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

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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
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	
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	
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

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	CRISWS	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.

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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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SECNO	DEPTH	CWSEL	CRISW	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

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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 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

*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	CRISW	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

.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	CRISWS	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

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

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	CRISW	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

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

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	CRISWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	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
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

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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	43211.88114644.40
5.585	2847.00	.00	.00	23.00	172610.00	52.25	.00	52.42	1.82	4.45	74406.30127847.90
6.420	4409.00	.00	.00	24.00	171900.00	52.77	.00	52.94	1.41	4.49	65254.12144528.00
* 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	74094.76103449.90
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	74888.40109415.30

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRISWS	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	76363.00112828.20	
* 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	83422.42125525.20	
11.480	370.00	.00	.00	20.73	167560.00	64.32	.00	64.62	1.42	5.48	98807.96140541.00	
11.550	370.00	.00	.00	21.73	167500.00	64.38	.00	64.69	1.63	5.64	94277.55131089.30	
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	102324.80129365.50	
11.970	2118.00	.00	.00	31.72	167140.00	65.63	.00	65.86	1.49	5.42	108991.00137144.80	

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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

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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

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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

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		

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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

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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

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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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
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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PAGE 6

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

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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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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PAGE 8

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

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		

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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

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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
GR	85.00	28450.0	90.00	28700.0	90.50	28900.0	0.00	0.00		

SB	1.25	2.31	2.60	0.0	50	46	32375	20	24.1	24.1
NC	.120	.120	.035	.3	.5				0.00	0
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	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	CRISWS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XLN	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

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SECNO	DEPTH	CWSEL	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISWS	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	CRISW	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

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SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XLN	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

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SECNO	DEPTH	CWSEL	CRISW	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

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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 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.

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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 64.34 .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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SECNO DEPTH CWSSEL 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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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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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

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PAGE 25

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

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PAGE 25

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

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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	67334.71149409.40	
* 4.745	5966.00	.00	.00	30.00	173330.00	51.39	.00	51.47	.44	2.25	79710.34259895.80	
* 5.026	1482.00	.00	.00	10.60	173080.00	51.45	.00	51.73	2.65	4.19	41314.24106310.00	
5.027	1.00	58.25	52.50	10.60	173080.00	51.48	.00	51.73	2.61	4.06	42667.32107053.70	
5.034	47.00	58.25	52.50	10.60	173080.00	51.49	.00	51.75	2.61	4.05	42708.54107216.70	
5.035	1.00	.00	.00	10.60	173080.00	51.48	.00	51.75	2.62	4.18	41437.87106830.20	
5.037	8.00	.00	.00	10.60	173080.00	51.48	.00	51.76	2.63	4.18	41417.55106744.60	
5.038	1.00	58.25	52.50	10.60	173080.00	51.51	.00	51.76	2.60	4.05	42765.09107440.50	
5.045	47.00	58.25	52.50	10.60	173080.00	51.52	.00	51.77	2.59	4.04	42806.04107602.70	
5.046	1.00	.00	.00	10.60	173080.00	51.51	.00	51.78	2.61	4.17	41520.42107178.00	
5.585	2847.00	.00	.00	23.70	172610.00	52.34	.00	52.49	2.45	4.80	71379.88110232.30	
6.420	4409.00	.00	.00	28.40	171900.00	53.02	.00	53.17	2.15	4.28	61093.07117350.50	
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	74352.37103892.80	
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	75057.51109676.20	
* 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	76469.08113015.40	
* 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	83516.47125695.20	

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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	98951.96140732.80	
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.70	1.61	5.61	95225.19131867.60	

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

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Starting from 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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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

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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)

 * HEC-2 WATER SURFACE PROFILES *
 * Version 4.6.2; May 1991 *
 * RUN DATE 28FEB00 TIME 09:47:58 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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PAGE 1

THIS RUN EXECUTED 28FEB00 09:47:58

 HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

DREDGING AREA B (R.M. 11.6 @ LK HOUSTON BRIDGE) TO RISE 26.0'

- T1 CF-0033 BROWN & ROOT SERVICES, 2/25/2000
- T2 Lake Houston HEC-2 MODEL, REACH 3 ~~3.615 TO 3.615~~
- 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

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		

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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

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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					

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 BRIDGE @ 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

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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

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

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PAGE 6

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								

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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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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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	
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
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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	
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
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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
GR	85.00	28450.0	90.00	28700.0	90.50	28900.0	0.00	0.00		

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

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	CRISWS	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	CRISWS	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

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SECNO	DEPTH	CWSEL	CRISW	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 BRIDGE @ 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

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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 25.45 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

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SECNO	DEPTH	CWSEL	CRISWS	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

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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 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.

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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
167560.0 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

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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= .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

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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

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

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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

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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

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Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71149409.40	
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21143031.00	
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80114001.30	
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10113789.00	
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91114058.80	
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65114454.10	
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01114382.20	
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07114128.10	
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28114395.70	
5.046	1.00	.00	.00	10.60	173080.00	52.08	.00	52.27	1.48	3.51	49262.80142377.30	
5.585	2847.00	.00	.00	23.70	172610.00	52.64	.00	52.79	2.23	4.63	74456.21115665.50	
6.420	4409.00	.00	.00	28.40	171900.00	53.26	.00	53.40	1.96	4.14	62906.47122683.00	
7.090	3538.00	.00	.00	30.10	171320.00	53.98	.00	54.16	2.88	4.31	79015.70100896.00	
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	74536.32104209.70	
10.580	6177.00	.00	.00	22.10	168330.00	61.63	.00	61.97	2.83	6.37	89751.87100130.40	
10.860	1478.00	.00	.00	31.70	168090.00	61.95	.00	62.32	2.34	6.02	75178.76109863.50	
* 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	76545.25113149.90	
* 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	83584.23125817.70	

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PAGE 27

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	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	99055.14140870.30	

11.550	370.00	.00	.00	21.73	167500.00	64.40	.00	64.71	1.61	5.61	95320.30131997.60
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	102570.90129680.00
11.970	2118.00	.00	.00	31.72	167140.00	65.65	.00	65.88	1.48	5.41	109182.30137437.60

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PAGE 28

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

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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

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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 *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * RUN DATE 28FEB00 TIME 09:48:49 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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PAGE 1

THIS RUN EXECUTED 28FEB00 09:48:49

 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 ~~XXXXXXXXXX~~
 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

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		

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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

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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

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						

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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

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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PAGE 6

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
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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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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PAGE 8

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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PAGE 9

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

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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
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
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			
X3	10		1998.35	56.86						-1
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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
GR	85.00	28450.0	90.00	28700.0	90.50	28900.0	0.00	0.00		

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	0.00	0.0	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

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	CRISW	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	CRISW	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

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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

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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= 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

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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 = 2.30

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

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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 = .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

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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= 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

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SECNO	DEPTH	CWSEL	CRISWS	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

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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

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

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THIS RUN EXECUTED 28FEB00 09:48:50

 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
10054.690	.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

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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

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Starting form river mile

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRISWS	EG	10*KS	VCH	AREA	.01K
3.615	.00	.00	.00	30.30	174300.00	50.91	.00	51.06	1.36	3.21	67334.71149409.40	
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21143031.00	
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80114001.30	
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10113789.00	
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91114058.80	
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65114454.10	
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01114382.20	
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07114128.10	
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28114395.70	
5.046	1.00	.00	.00	10.60	173080.00	52.02	.00	52.27	2.27	4.00	43311.63114830.20	
* 5.585	2847.00	.00	.00	23.70	172610.00	52.46	.00	52.57	.67	2.98	90560.10211605.80	
* 6.420	4409.00	.00	.00	28.40	171900.00	52.92	.00	53.08	2.22	4.33	60430.54115425.90	
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	74283.16103773.70	
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	75012.01109606.00	
* 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	76440.58112965.10	
* 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	83491.20125649.60	

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRISWS	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	98913.01140680.90
11.550	370.00	.00	.00	21.73	167500.00	64.39	.00	64.69	1.61	5.61	95189.52131818.90
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	102427.40129496.60
11.970	2118.00	.00	.00	31.72	167140.00	65.64	.00	65.87	1.48	5.42	109070.80137266.90

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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

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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

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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

 * HEC-2 WATER SURFACE PROFILES *
 *
 * Version 4.6.2; May 1991 *
 *
 * RUN DATE 28FEB00 TIME 09:51:26 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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X X XXXXXXXX XXXXX XXXXX
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PAGE 1

THIS RUN EXECUTED 28FEB00 09:51:26

 HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

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 from 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

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		

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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

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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					

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						

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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

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 SECTION 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			

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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PAGE 8

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
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	11162.72
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		

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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
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	
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	22500.0
GR	55.00	23000.0	50.00	23400.0	50.00	23450.0	55.00	23700.0	55.00	24950.0
GR	60.00	25700.0	65.00	25900.0	70.00	27700.0	75.00	27900.0	80.00	28150.0
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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	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	CRISW	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	CRISW	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

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SECNO	DEPTH	CWSEL	CRWS	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

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

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SECNO	DEPTH	CWSEL	CRISW	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

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

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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 = 2.30

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

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

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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

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

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SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XLN	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

SPECIAL BRIDGE

SB XK XKOR COFQ RLEN 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

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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

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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THIS RUN EXECUTED 28FEB00 09:51:26

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
10054.690	.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

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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

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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	67334.71149409.40	
4.745	5966.00	.00	.00	31.20	173330.00	51.74	.00	51.90	1.47	3.21	56844.21143031.00	
5.026	1482.00	.00	.00	10.60	173080.00	51.97	.00	52.22	2.31	4.01	43119.80114001.30	
5.027	1.00	58.25	52.50	10.60	173080.00	51.99	.00	52.23	2.31	3.90	44353.10113789.00	
5.034	47.00	58.25	52.50	10.60	173080.00	52.00	.00	52.24	2.30	3.90	44419.91114058.80	
5.035	1.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.00	43224.65114454.10	
5.037	8.00	.00	.00	10.60	173080.00	52.00	.00	52.25	2.29	4.01	43208.01114382.20	
5.038	1.00	58.25	52.50	10.60	173080.00	52.02	.00	52.25	2.30	3.89	44437.07114128.10	
5.045	47.00	58.25	52.50	10.60	173080.00	52.03	.00	52.26	2.29	3.89	44503.28114395.70	
5.046	1.00	.00	.00	10.60	173080.00	52.02	.00	52.27	2.27	4.00	43311.63114830.20	
5.585	2847.00	.00	.00	23.70	172610.00	52.75	.00	52.89	2.15	4.58	75558.88117640.60	
* 6.420	4409.00	.00	.00	28.40	171900.00	53.17	.00	53.27	.76	3.03	87624.09196714.30	
* 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	74315.35103829.10	
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	75033.15109638.60	
* 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	76453.79112988.40	
* 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	83502.93125670.80	

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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

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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

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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

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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



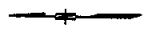
LEGEND

- FLOODWAY BOUNDARY (EXISTING)
- - - 100 YR FLOOD PLAN BOUNDARY (EXISTING)
- · · 500 YR FLOOD PLAN BOUNDARY (EXISTING)
- ▨ APPROX BOUNDARY OF REVISED 100 YR FLOOD PLAN (1999 SURVEY)
- ▨ POTENTIAL AREA IMPACTED BY REVISED FLOODPLAN BOUNDARY (1999 SURVEY)

Brown & Root Services



Eng'd by Halliburton Tech Services, Inc



0 1000 2000 3000
SCALE IN FEET

REVISED FLOODPLAN 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.

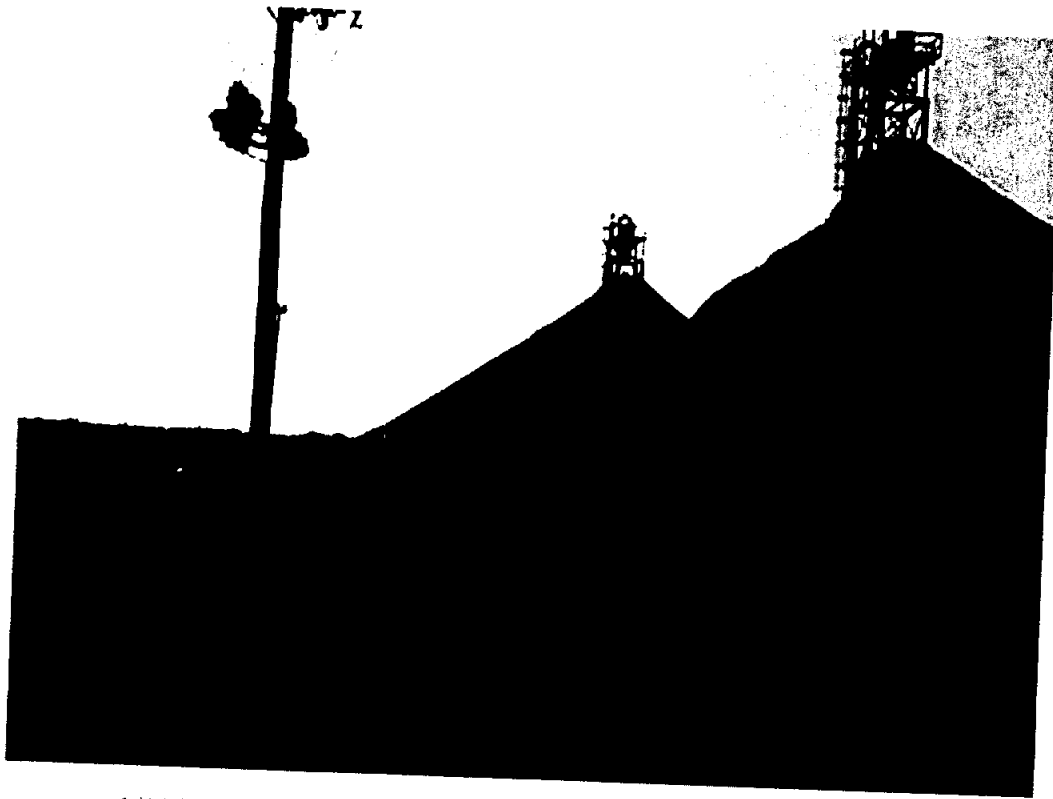
Cc: Project File (CF-0033)
John Saavedra
Bill Espey
David Parkhill
John Kuo



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 our 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

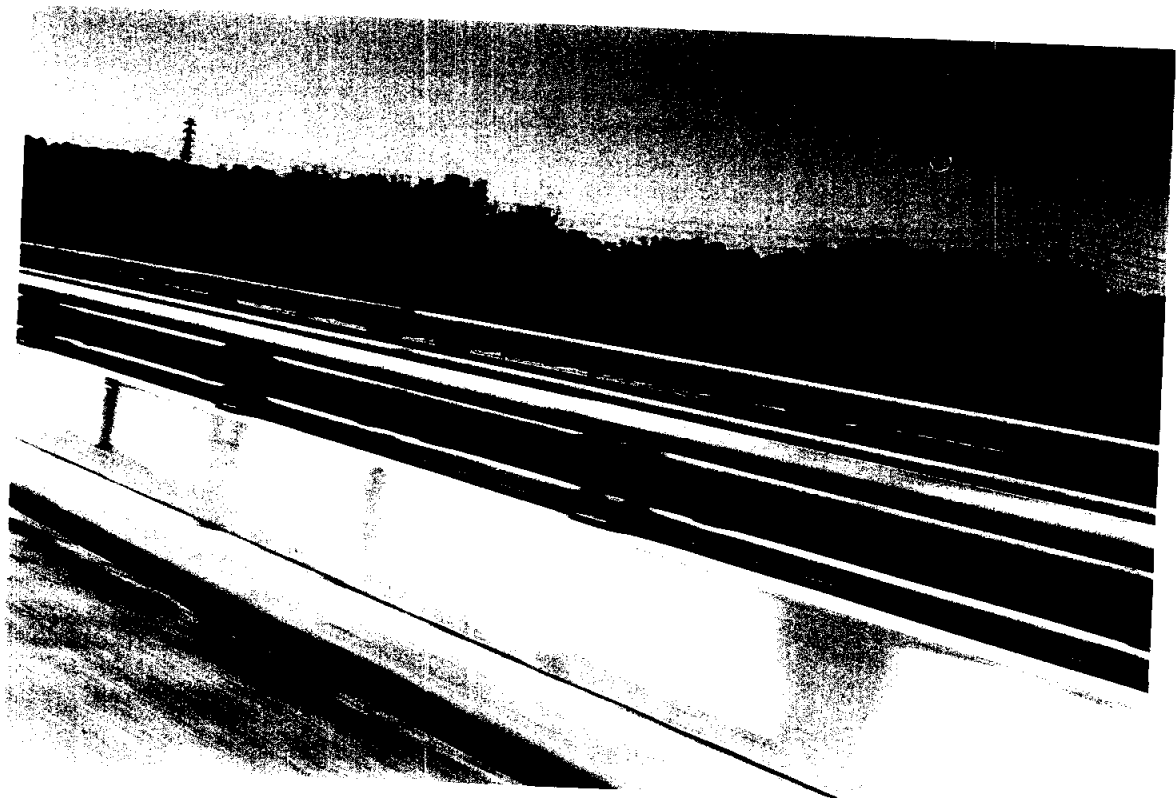
	<p>Corps would claim jurisdiction over the site. The presence of abandoned drill pipe indicates that old oil deposits likely underlie these pits. Genoa's dredging plan is to dredge about a total of 1 millions yards of sand on site. They are currently building a new processing plant on site.</p>	
<p>Don Schneider Site (DDS) 281-540-6610</p>	<p>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.</p> <p>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.</p>	<p>Photos 2-24 and 3-1 through 3-4</p>
<p>Barto Watson Sand Pit 281-446-2459</p>	<p>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.</p>	



1-1 118 acre tract by soccer fields. North of channel. Area has been clearcut, 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).



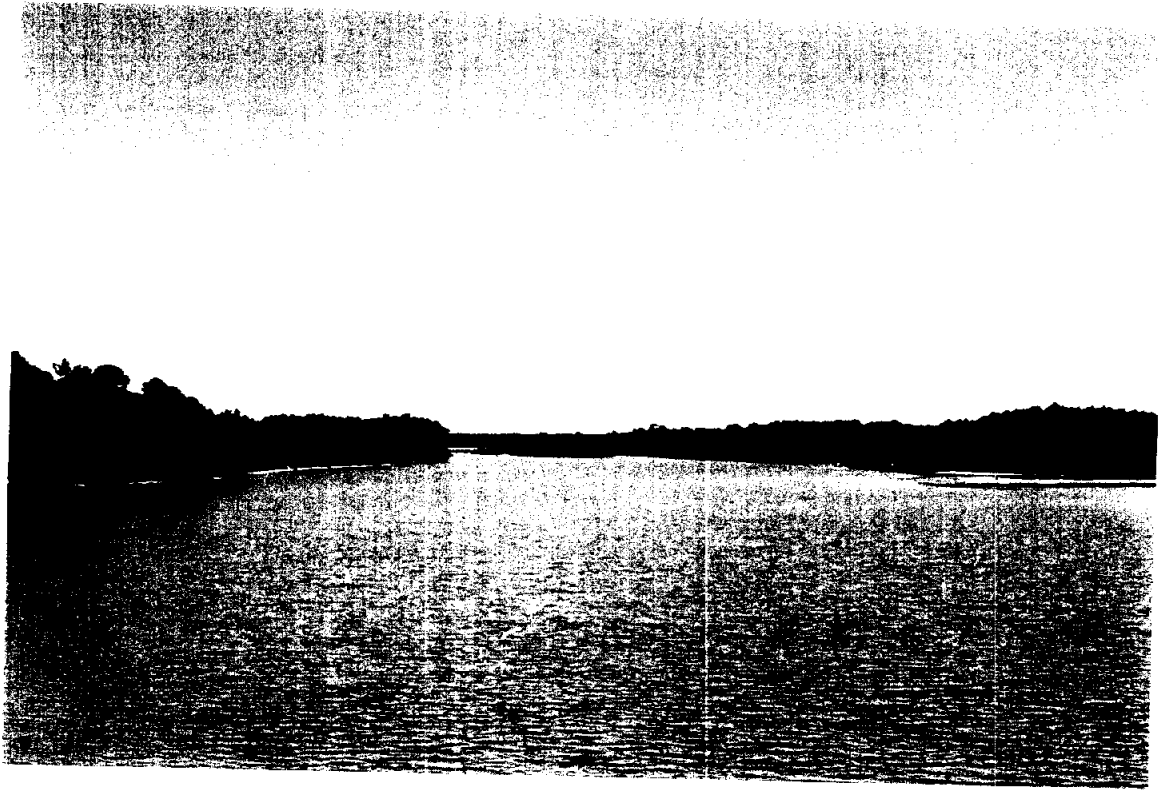
1-14 Downstream of Lake Houston Parkway (South side of River). View is to WSW at upstream end of large, shallow embayment. Area is wet when lake is up.



1-15 Island of sediment in channel at north Lake Houston Parkway bridge. View is downstream from north end of bridge.



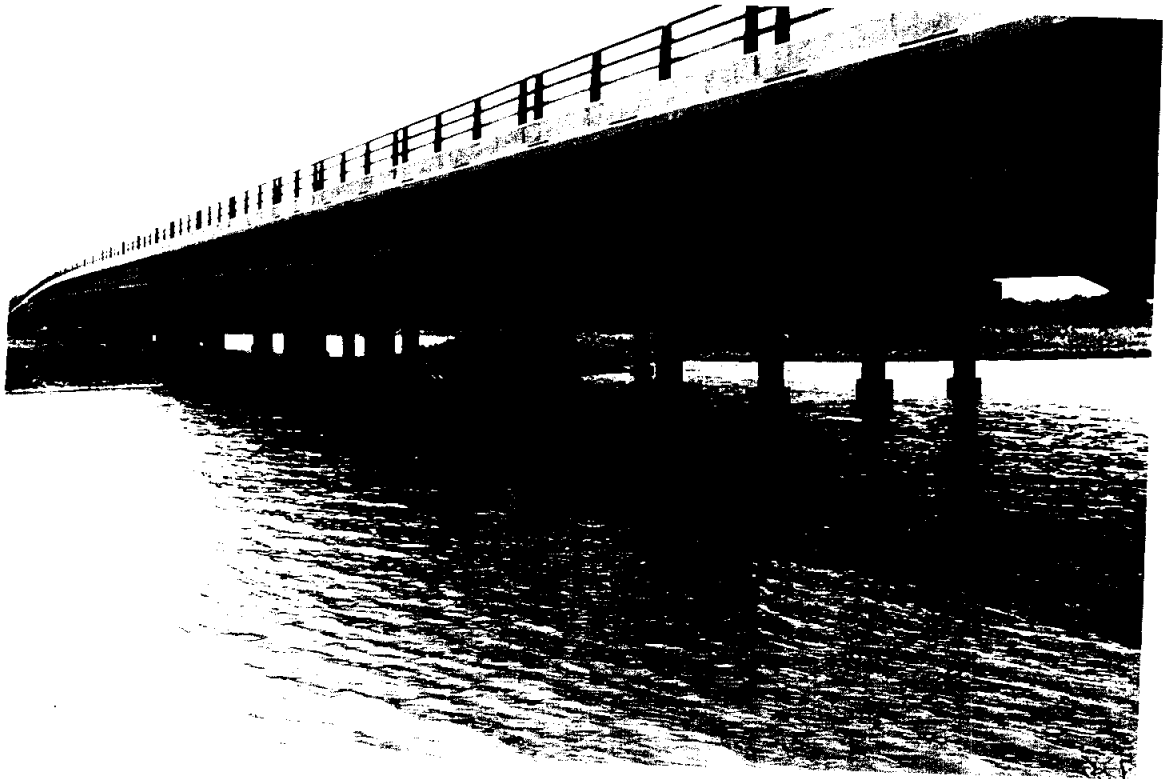
1-16 Photo 1 of 3 photo panorama. View is down stream from east side, north end of Lake Houston Parkway. Water in picture is portion of main channel, W. Fork San Jacinto.



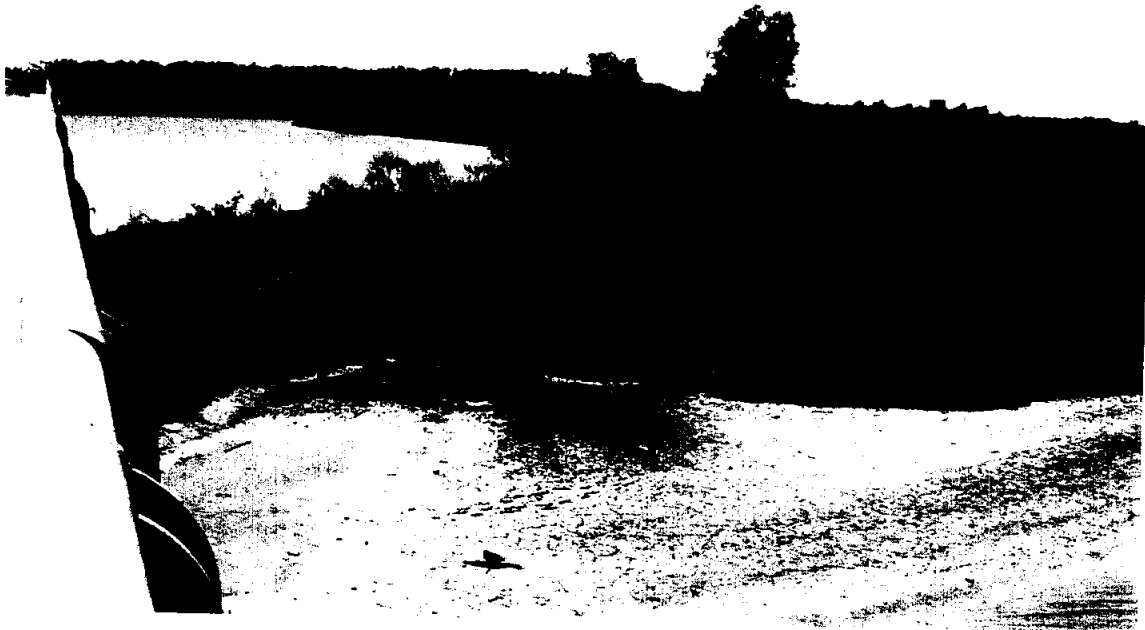
1-17 Photo 2 of 3 Photo panorama. View is downstream from east Side of north Lake Houston Parkway at main channel, W. Fork San Jacinto River.



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.



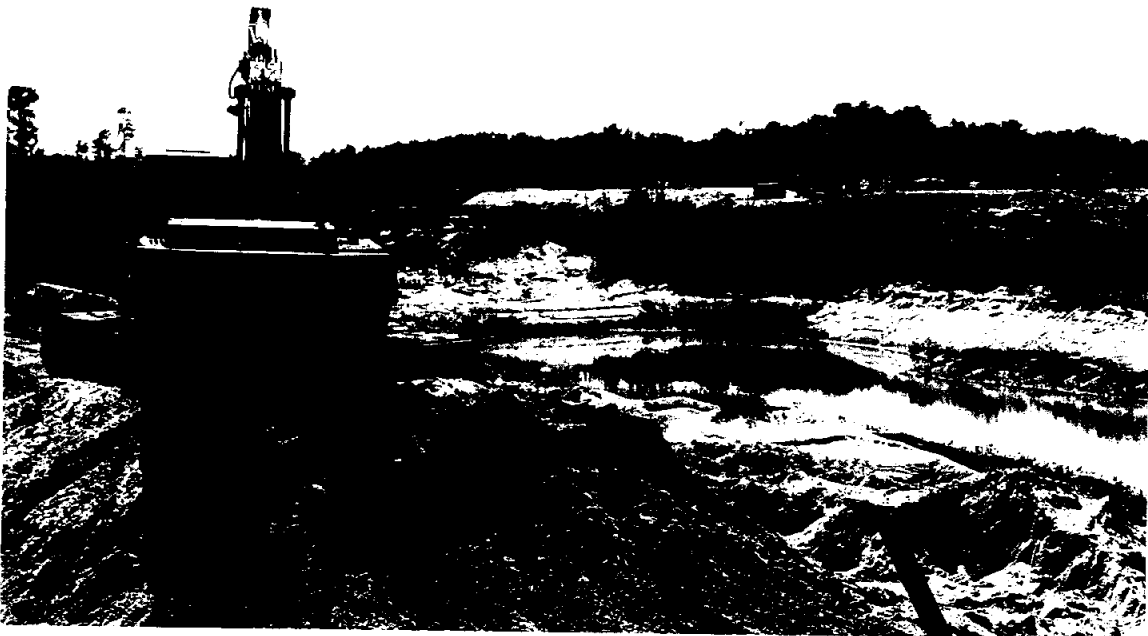
2-4 Photo 2 of 4 photo panorama. View is to WSW from west side of Lake Houston Parkway bridge.
Note flock of Roseate Spoonbills on bar in center right of photo.



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.



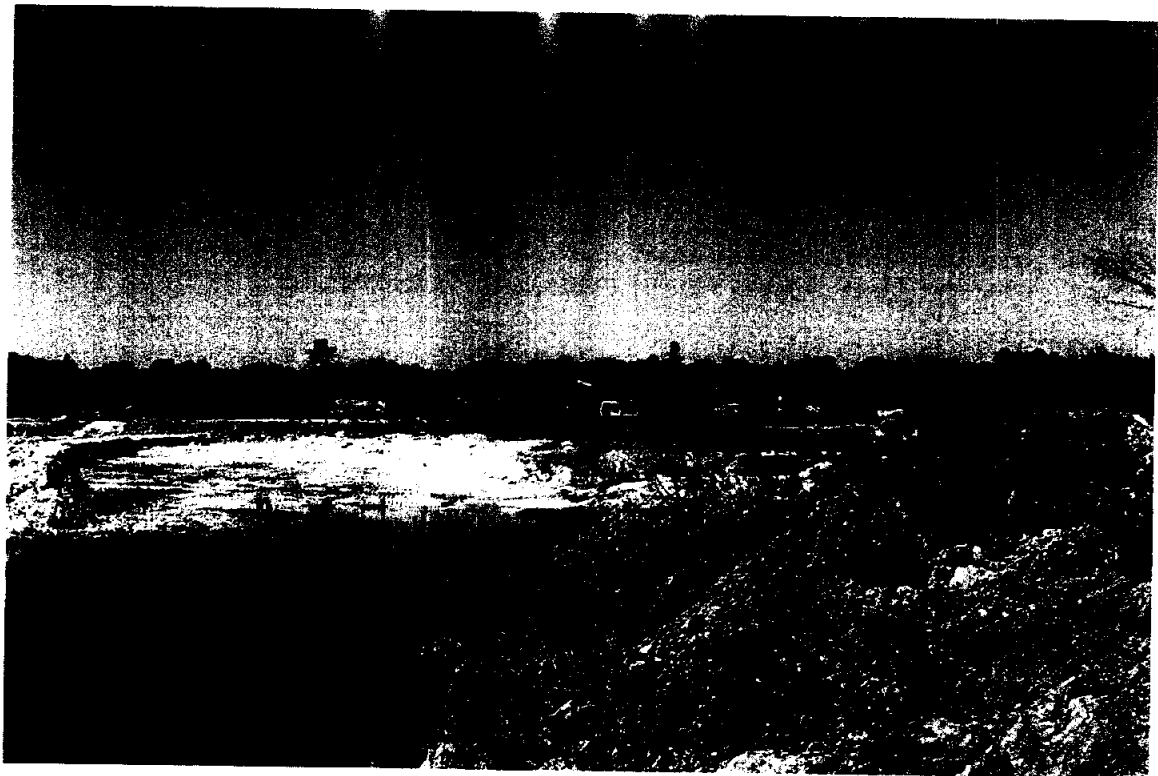
2-13 Photo 1 of 4 photo panorama. View is to west of HIM property.



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



March 8, 2000

Mr. Dan Gise
Brown & Root Services
9900 Westpark Drive
Houston, TX 77063-5169

COMMISSIONERS

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SAN ANTONIO

PERRY R. BASS
CHAIRMAN-EMERITUS
FT. WORTH

ANDREW SANSON
EXECUTIVE DIRECTOR

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**

*To manage and
conserve the natural
and cultural resources
of Texas for the use and
enjoyment of present
and future generations.*

Mr. Dan Gise
Lake Houston Flood Study
Page 2

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,

A handwritten signature in black ink that reads "Sandra J. Birnbaum". The signature is written in a cursive style with a long horizontal flourish at the end.

Sandra J. Birnbaum, Environmental Data Technician
Wildlife Diversity Program, Wildlife Division

Enclosures

HARRIS COUNTY

	Federal Status	State Status
*** AMPHIBIANS ***		
Houston Toad (<i>Bufo houstonensis</i>) – 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 (<i>Falco peregrinus anatum</i>) - potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon (<i>Falco peregrinus tundrius</i>) - due to similar field characteristics, treat all Peregrine Falcons as federal listed Endangered; potential migrant	DL	T
Attwater's Greater Prairie-chicken (<i>Tympanuchus cupido attwateri</i>) - 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 (<i>Haliaeetus leucocephalus</i>) - 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 (<i>Laterallus jamaicensis</i>) – 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 <i>Salicornia</i>		
Brown Pelican (<i>Pelecanus occidentalis</i>) - largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Henslow's Sparrow (<i>Ammodramus henslowii</i>) - 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 (<i>Charadrius montanus</i>) - shortgrass plains and plowed fields (bare, dirt fields); primarily insectivorous; winter resident in this area	PT	
Piping Plover (<i>Charadrius melodus</i>) – wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
Reddish Egret (<i>Egretta rufescens</i>) – 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 (<i>Charadrius alexandrinus</i>) - wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
⤵ Swallow-tailed Kite (<i>Elanoides forficatus</i>) - 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 (<i>Plegadis chihi</i>) – 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 (<i>Buteo albicaudatus</i>) - near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed		T

savanna-chaparral; breeding March-May
Whooping Crane (*Grus americana*) - potential migrant

Federal
 Status

LE

State
 Status

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 ***

? 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 ***

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 ***

→ Alligator Snapping Turtle (*Macrolemys 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 kempi*) - 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 (<i>Phrynosoma cornutum</i>) - 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 (<i>Crotalus horridus</i>) - 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 *****

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

	Federal Status	State Status
*** BIRDS ***		
American Peregrine Falcon (<i>Falco peregrinus anatum</i>) - potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon (<i>Falco peregrinus tundrius</i>) - due to similar field characteristics, treat all Peregrine Falcons as federal listed Endangered; potential migrant	DL	T
Bachman's Sparrow (<i>Aimophila aestivalis</i>) - 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 (<i>Haliaeetus leucocephalus</i>) - 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 (<i>Ammodramus henslowii</i>) - 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 (<i>Picoides borealis</i>) - cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, & loblolly	LE	E
White-faced Ibis (<i>Plegadis chihi</i>) - 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 (<i>Mycteria americana</i>) - 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 ***		
? Creek Chubsucker (<i>Erimyzon oblongus</i>) - 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 (<i>Polyodon spathula</i>) - 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 ***		
Plains Spotted Skunk (<i>Spilogale putorius interrupta</i>) - catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie		
→ Rafinesque's Big-Eared Bat (<i>Corynorhinus rafinesquii</i>) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		T
↪ Southeastern Myotis (<i>Myotis austroriparius</i>) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		

Federal Status State Status

***** REPTILES *****

- **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 *****

- **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
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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

NAME: HALIAEETUS LEUCOCEPHALUS

COMMON NAME: BALD EAGLE

OTHER NAME:

FEDERAL STATUS: LT-PDL

GLOBAL RANK: G4

IDENTIFIED: Y

COUNTY: Harris

STATE STATUS: T

STATE RANK: S3B, S3N

SENSITIVITY: Y

TRACK: Y

USGS TOPO MAPS:

CROSBY

HUFFMAN

MOONSHINE HILL

HARMASTON

TOPO QUAD:

2909581

3009511

3009512

2909582

MARGIN #:

2

1

5

5

ELEMENT OCCURRENCE NUMBER: 059

PRECISION: M

OCCURRENCE RANK:

SURVEY COMMENTS:

DATE LAST OBSERVED: 1999

DATE FIRST OBSERVED: 1990

DATE SURVEYED:

MANAGED AREAS:

CONTAINED:

DIRECTIONS:

LAKE HOUSTON

DESCRIPTION:

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.

NPDES
FORM



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

Issuance 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 storm 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: _____

If you are filing as a co-permittee, enter 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: _____

Please See Instructions Before Completing This Form

NPDES
FORMUnited 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 InformationNPDES 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 Discharges 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) 831-3230.

RECEIVED

MAR - 3 1999



Brown & Root USFWS ClearLake ES

Services

9900 Westpark Drive (77063-5169) / Post Office Box 3 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.

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

App: Edith Erfling

Date: April 1, 1999

for Carlos E. Loza
Project leader, Clear Lake ES Field Office
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 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
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. LAWRENCE 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,

A handwritten signature in cursive script, appearing to read "William A. Martin".

for
F. Lawrence Oaks, State Historic Preservation Officer

FLO/wam

Enclosure

Memorandum

To: John Saavedra
CC: John Kuo
From: Dan Gise
Date: 05/05/99
Re: Diversion of San Jacinto River for silt removal

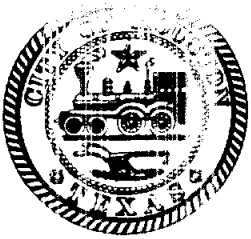
I spoke with Kerry Stanley of the US Army Corps of Engineers at approximately 2:00 PM on May 3, regarding rerouting the West Fork of the San Jacinto River through an existing sandpit as a means of removing sediment from the River. The sandpit is located several miles upstream of US 59. Kerry informed 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

CITY COUNCIL MEMBERS: Bruce Tatro Michael J. Yarbrough Martha J. Wong Jew Don Boney, Jr. Rob Todd Ray F. Driscoll Jean Kelley Felix Fraga
John E. Castillo Annise D. Parker Joe Roach Orlando Sanchez Chris Bell Carroll G. Robinson CITY CONTROLLER: Sylvia R. Garcia

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

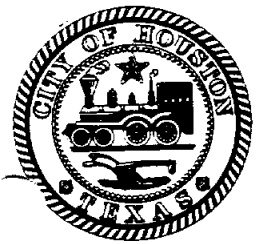
FAP:REH:HJ:js

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.

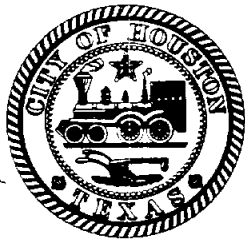
Very truly yours,

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)

Carl Westerson
713-627-3200 11/25
(Bussat ... Houston Works/...)



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. 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.

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.

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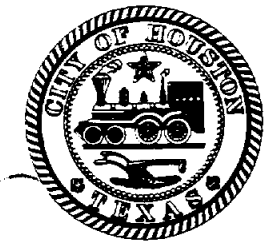
Very truly yours,

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

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. 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
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

97091-2 (M 7-4)

Department of
Public Works
City of Houston

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:

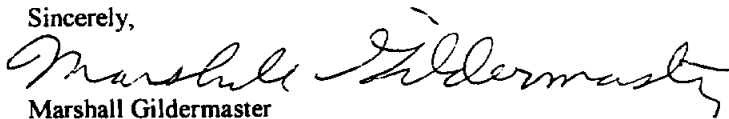
Gravel Pit No. 1 N 30 ° 09.474' W 95 ° 22.531' GPS Point # 42

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

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 Jacinto 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

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.

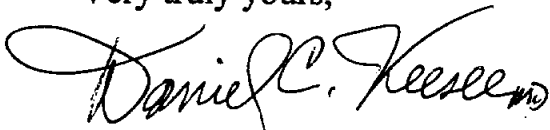
The snagging and over bank clearing of the San Jacinto River does not have to be performed from River Basin starting at Galveston to Lake Conroe but mainly from Lake Houston to Lake Conroe. Experts have told us this is true because, from Lake Houston down to Galveston, the River Basin is wide enough 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, M.D.
President, TFCC



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.

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) WELCOME (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 INTRODUCTORY REMARKS

MR. FREDERICK A. PERRENOT, P.E.

DEPUTY DIRECTOR, PUBLIC UTILITIES

CITY OF HOUSTON

7:15 PM PROJECT DESCRIPTION

MR. JOHN J. SAAVEDRA, P.E.

PROJECT MANAGER, BROWN & ROOT, INC.

7:30 PM PUBLIC COMMENTS

MR. FREDERICK A. PERRENOT, P.E.

8:30 PM ADJOURN (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) INTRODUCTION OF INDIVIDUALS

(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)

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

COORDINATE 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.



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 permanent 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 mi²; above Lake Conroe: 440 mi²). He also provided a handout of material regarding the October 1994 flood releases.

Meeting was adjourned.



*Kingwood:
15 names in
addresses to
be added to
the label for
that & tickets
emitted
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 Jockey)

Mailing Address: #8 N. Main

Street Address: _____
(if not the same as mailing address)

City: Knood 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: 358-5909
Organization or Subdivision: Forest Cove Prog. 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., Pd 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.P.
(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 Datz
Mailing Address: 300 PO 120069
Street Address: 5767 WOODWAY
(if not the same as mailing address)
City: Houston Zip: 77257
Phone: 267-2955 Fax: 267-2110
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 RAINY
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 Gulton #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 ST # 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. PORTENOT
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: ~~409 430~~ 676 4613 Fax: 676 4679
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: Courte, Tx Zip: 77356
Phone: 409/588-1111 Fax: 409/588-3093
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

Flood Study

- 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 #
✓ Tom J. Shvedort	B&R	713-260-3244
✓ RAY ANDERSON	819 GOLDEN LEAF KW 77539	281-359-3745
Vicki Flake	1111 Forest Cove	281-358-2210
Sallye Korman	1721 Mustang	281-358-1845
Marian Burrows	1700 Magnolia Ln.	281-358-3033
Bud Taylor	CUFTD	713-247-2008
JUSTIN BERNDT	MASECITA	281-852-2066
TONY GELOENS	4545 KINGW. DR #2002	281-360-7598
MIKE MATHENA	400 RANDAL WAY #200	281-350-7027
Robert William	3838 IV Smith Houston 1117310	281-447-1600
OWEN H. PARKER	5406 UPPER LAKE DR, Humble	281-452-2102
Ed Shackelford	22540 ALBINE WESTFIELD	281-358-8100
Barry Brock	102 Granberry Humble.	281-446-2327
MARIC J. MARTIN	114 W. HIGGINS	281-446-3861
DAVID C. LOWE	810 KINGWOOD DRIVE	281-358-2111
J.R. & Gloria Bertone	20042 OLDS Drive	281-358-8814
Elliott Winton	30014 Russell Dr	281-358-1504
✓ Michael S. Sullivan	PO BOX 339 Channelview TX 77530	
Joe & Yvonne Turner	2004 Shady Branch Klu	77339
✓ JoAnn McDonald	1320 Palmetto Lane Kingwood, TX	281-358-3700
SWIRLEY'S, AL EGGLESTON	1331 Hickory Ln. Forest Cove	281-358-352
Vera Myer	18915 Key Turn. - #46 -	
Debbie Malone	19220 LAKESHIRE Dist #46	
John & Milla	1420 Spicewood Lane	281-358-3265
Henry Boyle	17086 Clenagle Dr	409 273-4697
Millie Cox	25 Swan Court	409 273-4675
Jean & Ralph McLeod	1221 Battercup	281-358-3801
CHARLES F. Settle	City of Houston	(713) 837-0451

- JAMES BAILEY 3838 N. SAM Houston PKY E, Suite 295 Houston 281-442-5300
- Pammy Bowers 20142 Belleau Wood Dr. Humble 281-852-8215
- Ross Blain 7502 Pinehollow Dr. Humble 281-319-4600
- ✓ Oscar Bigman 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 CASTRO 3903 VALLEY HAVEN Kingwood TX 77339
- ~~Judi Arboogast Kingwood Observer~~
- ~~ROY LEE SCHULTZ NORTHSHIRE - RESIDENT~~
- ✓ A.G. Peter Hingjosa 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 77388
- ~~John Roy 3138 Lake Concord Kingwood, TX~~
- ~~Amanda West Register Newspapers~~
- ✓ Ron APPLESBY 1218 Chestnut Ridge Kingwood
- ✓ Jerry + Diane Marsh 18683 Clover Path Porter TX 77365
- David Woerner 5507 Cedar Bay Dr Kingwood 77345
- ✓ Phillip P STIKA 1700 LAKE Kingwood Tal. 1' TX 77339
- ✓ Frank Gallardo 1648 Lake Shore Dr Kingwood TX 77339

April 8, 1999
Lake Houston Flood Study
Public Meeting

mail list

W C BLAXNEY -

- ✓ Tom Childers 2239 Tangle Lake Dr Kew 77339
- ✓ Jim + Sue Fawcett 2611 Royal Circle Kingwood 77339
- ✓ Beth Austin 1511 Hidden Hill, 77339 FOREST COVE
- ✓ Mary Howell 1400 Buttway 77339
- ✓ Terry Chapman 5219 Maple Terrace Kew 77340
- ✓ Tim Bates 19506 Spoonwood Dr Hum 77341
- ✓ Wilson Sparks P.O. Box 3124 Humble 77347

Lake Houston Flood Study

Public Meeting 4/8/99

SIGN-IN LIST

Sharon Fleke 1910 Cypress Ln. 281 356 4201
Marilyn Ayler 2107 Swentynylo 281 360-7182
~~Ed & Anne Richard 26869 Palacelms 281 359 8093~~
~~Ron Jordan 20206 Belleau Wood Dr. 281-852-8258~~
Mitsy Stumpf 3506 Lakeland Dr ⁷⁷³³⁸ 281-852-8333
Marilee Martin 5914 Elmwood Hill Ln 77345 281-360-2546
Barry Swenick 2925 Briar Park N.W. 713-782-0042
Wayne & Wanda McCom 2922 River Bend 281-358-3409
~~Robert & Stephanie 19311 Alderwood Ct. Humble, TX 281-852-3949~~
Shirley Waggoner 23480 Ivy Ridge Pkwy 281-354-4150
✓ Bill Gatz 4519 Elmstone Ct Kingwood 281-360-8300
✓ Norma Payne 1914 Lazy Grove Kingwood 77339
✓ Daryl Porter 3414 Upperlake Humble 281 852 1697
Lela Foster 3206 Sunny Knoll 281 358 2224
Frank & Betty Ayer 26488 Lodi Ln. Porter, TX 281-358-3685
✓ Ed Rainey 3138 Lake Crescent Dr, K/W 281-358-6612
✓ May Murphy 3327 Southshore Humble 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

^{M/MS}
Name: 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?

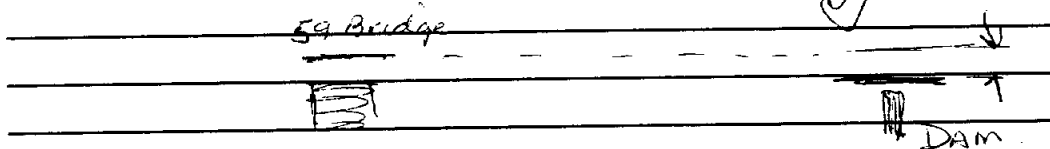
Self Other _____
(please specify)

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: JAWN 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, WOULD IT JUST
KEEP RE-SILTING? AND RE-ACCUMULATING?
HOW LONG WOULD IT BE BEFORE RE-DREDGING WERE
REQUIRED?
- ③ AS A LONGER-TERM SOLUTION, ~~WHAT~~ WHAT WOULD BE
THE COST OF CONVERTING LAKE HOUSTON DAM TO A
FLOOD CONTROL DAM? THE IDEA IS:
① ALLOW MORE FLOW-THRU OF A 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

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 rate 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.P.A 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 77349
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: LAKE SIDE SUBO AND OAK LAKE 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. Willing Cant. 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 projects 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 Lon Holley - to build a
large development - in a flood way? In
the 94 flood + the Oct 98 flood, where he
is building off of Hambleton Rd. in Forest Cove,
as well as Woodlyn Hill subdivision, where
both of these areas flooded. New homes
are being built in flood prone areas
on Hambleton Rd - The wrought iron fence was
flattened all the way down Hambleton Rd -
that outland 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 +
rocks on the trees. I hope we do not want to keep -

down near
Ringer's
Park.
in K.L.

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: NORTH SHIRE = 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 MAINTAIN 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 RW 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: Tommy Anderson

Mailing Address: Kingwood College

Street Address: _____

(if not the same as mailing address)

City: Kingwood

Zip: 75132

Phone: 281-525-1234

Fax: 281-525-1234

Organization or Subdivision: Kingwood College

Would you like to make a Public Statement?

Yes

No

If yes, whom do you represent?

Self

Other Kingwood College
(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?

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: scope of study is too limited - ^{disappointing} ~~disappointing~~
It doesn't address flooding downstream of
Lake Houston Parkway. It appears that
so-called "solution" proposal would, if anything
worsen the flooding along shorelines 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. RIEVER
Mailing Address: 1615 LOFTY MAPLE TRAIL
Street Address: _____
(if not the same as mailing address)
City: KINGWOOD Zip: 77395
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 recurring
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 Pits 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: Janice Anderson 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 decisions.

**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 Lakeland Dr
Street Address: _____
(if not the same as mailing address)
City: Wumble Zip: 77338
Phone: 281-812-3423-w 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 Laureda presented?

② Can we get a copy of the minutes from this meeting?

Please send to above address?

Mark

**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: 281-358-5608
Organization or Subdivision: Elm Grove

Would you like to make a Public Statement?

Yes No

If yes, whom do you represent?

Self

Other

M. Blair E HCI Corp.
(please specify)

Would you like to receive future notices regarding this project?

Yes

No

Energy &
Water Conservation
Corp.

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
1000

~~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 SOUTASHORE 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 Bellwood Dr
Street Address: _____
(if not the same as mailing address)
City: Humble Zip: 77338
Phone: 281-852-8088 Fax: _____
Organization or Subdivision: Bella 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: _____

And 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

Attendance Record

Name: DELMA LEE DEFORD

Mailing Address: 10211 ELM BEND 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: NORTH SHIRE

W HCOEN-CC
HARRIS
US
Shannon JM
713-881-310
713-881-3100

Would you like to make a Public Statement?

Yes ? No

If yes, whom do you represent?

Self Other DAVID LEE DEFORD-SR
AND FAMILY (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: Wyllis 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 HAMBLEEN

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?

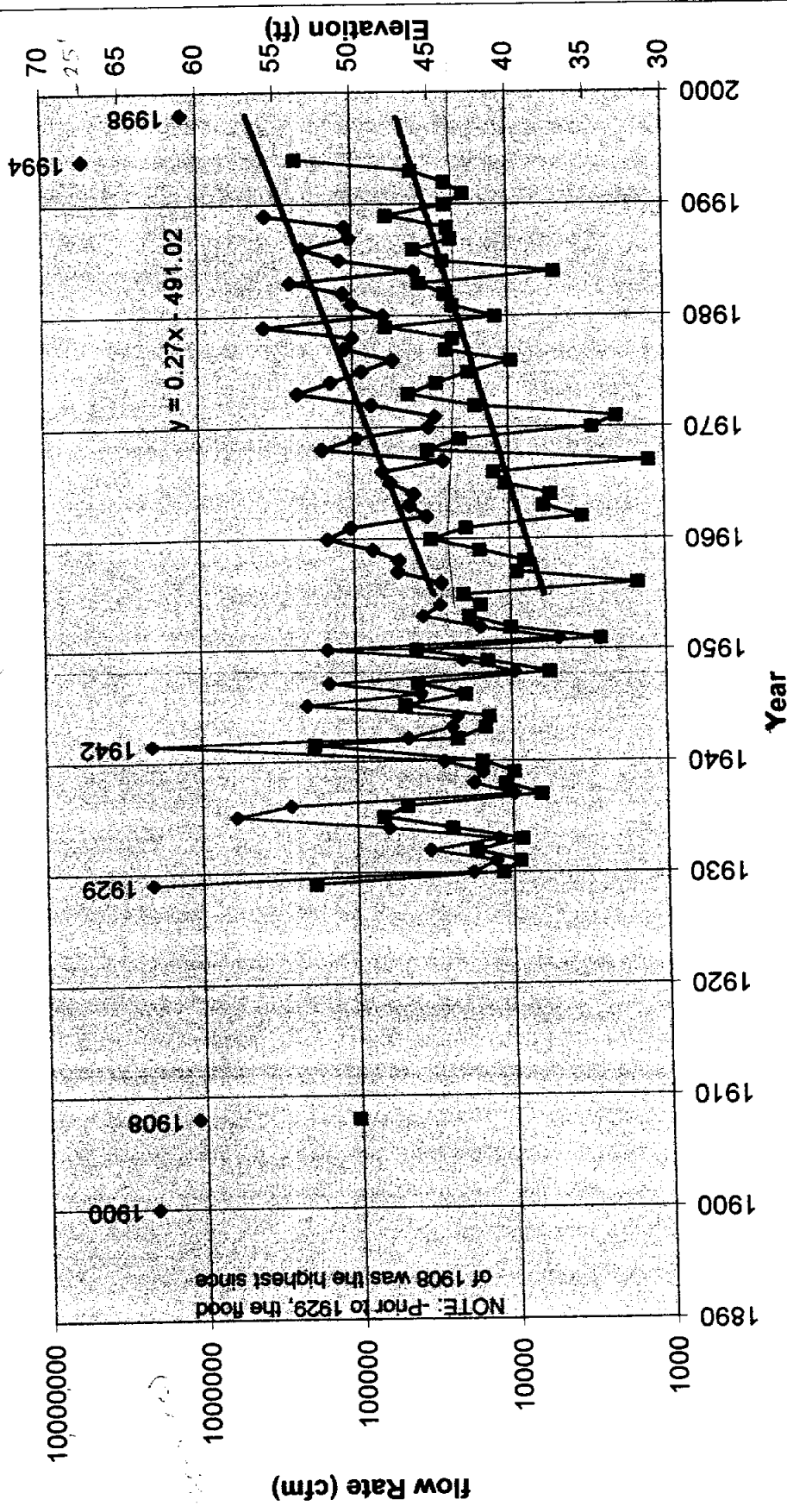
Please consider that:

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?

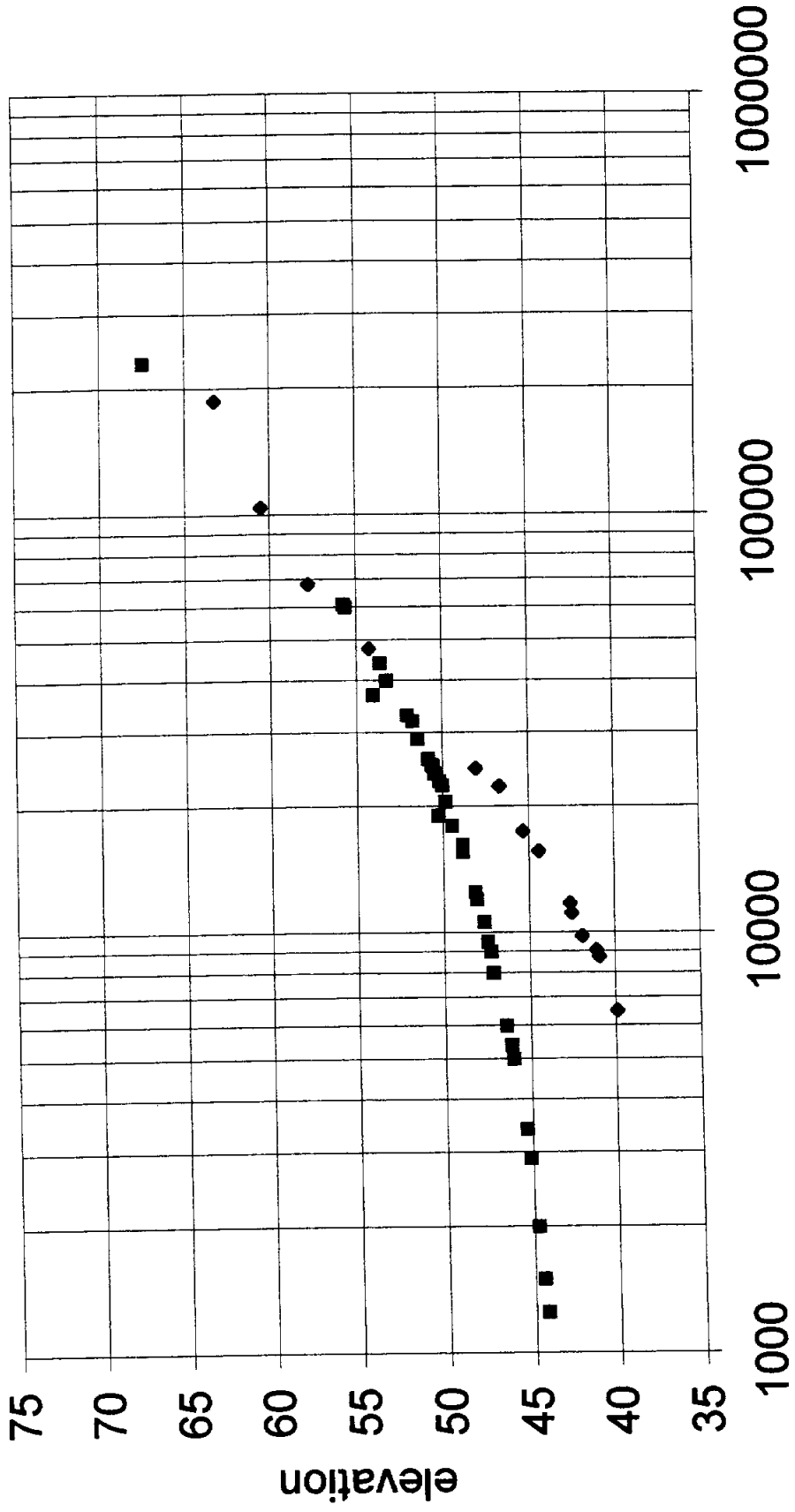
Historical San Jancinto River Flow at Hwy-59

(around discharge)



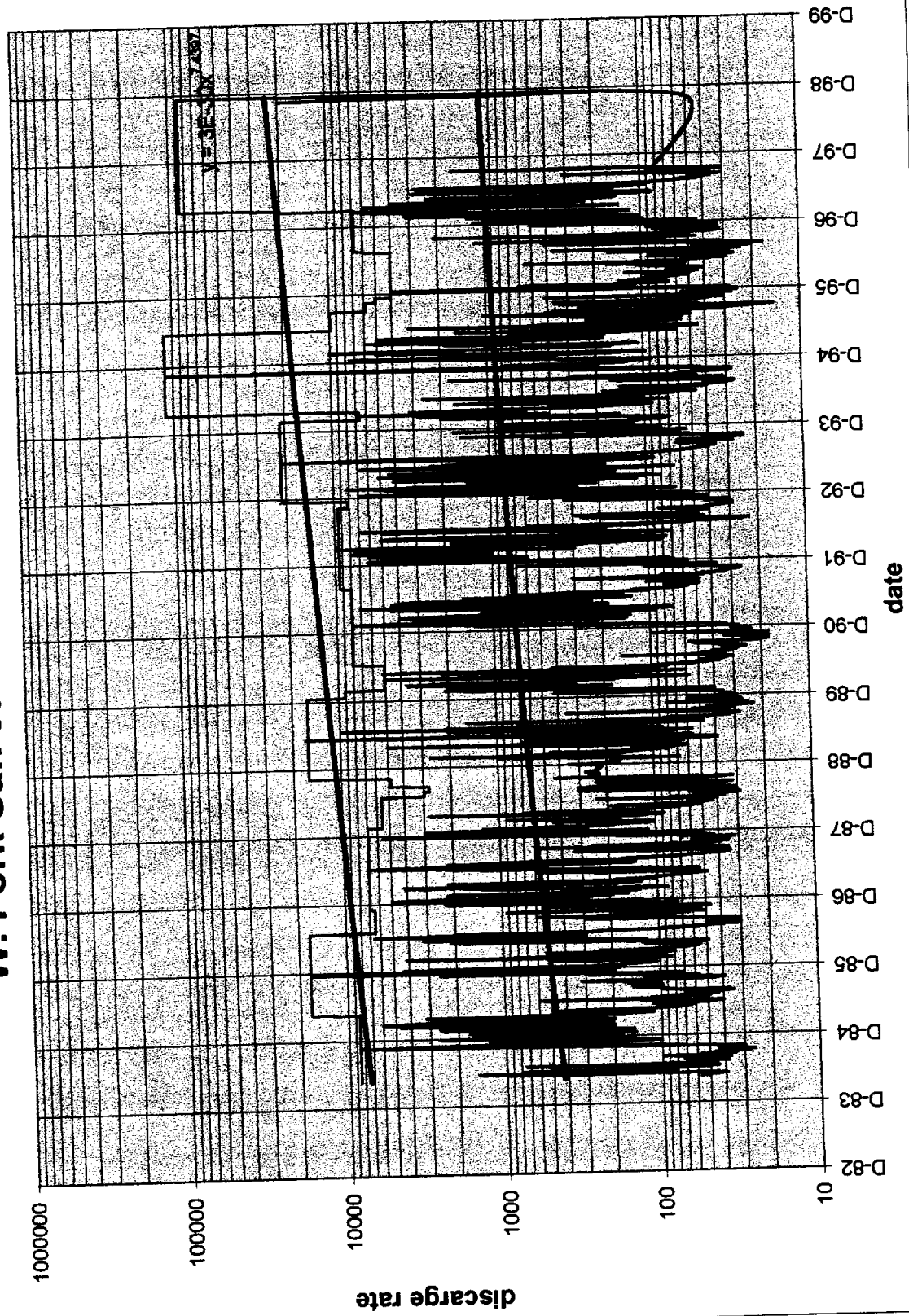
- Discharge (cfs) after dam
- ◆ elevation after dam
- ◆ Discharge after Dam
- ◆ elevation before dam
- - - Expon. (Discharge after Dam)
- Linear (elevation after dam)

Rating Curve

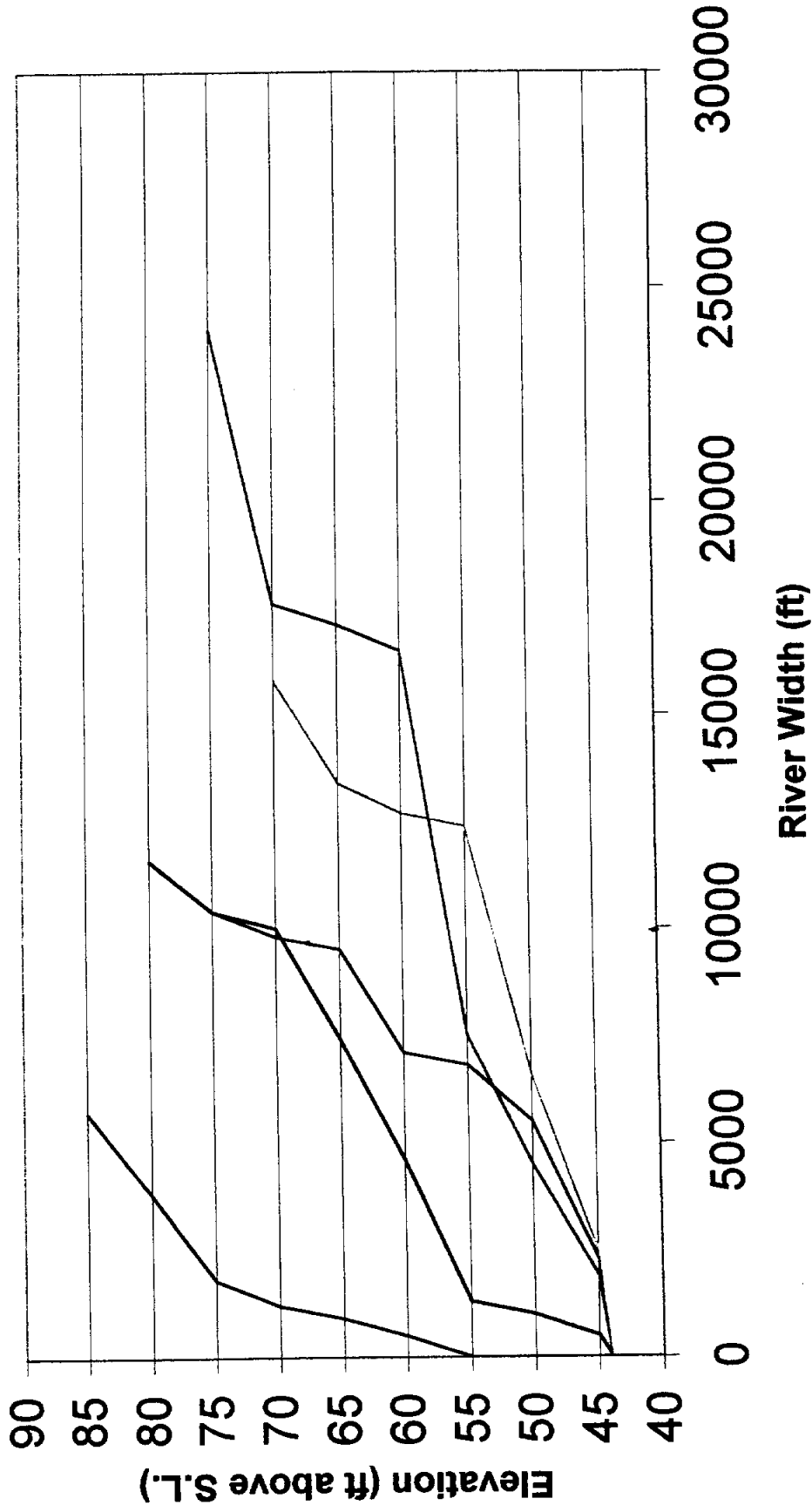


■ after dam (1954) ♦ before dam

W. Fork San Jacinto River near Porter

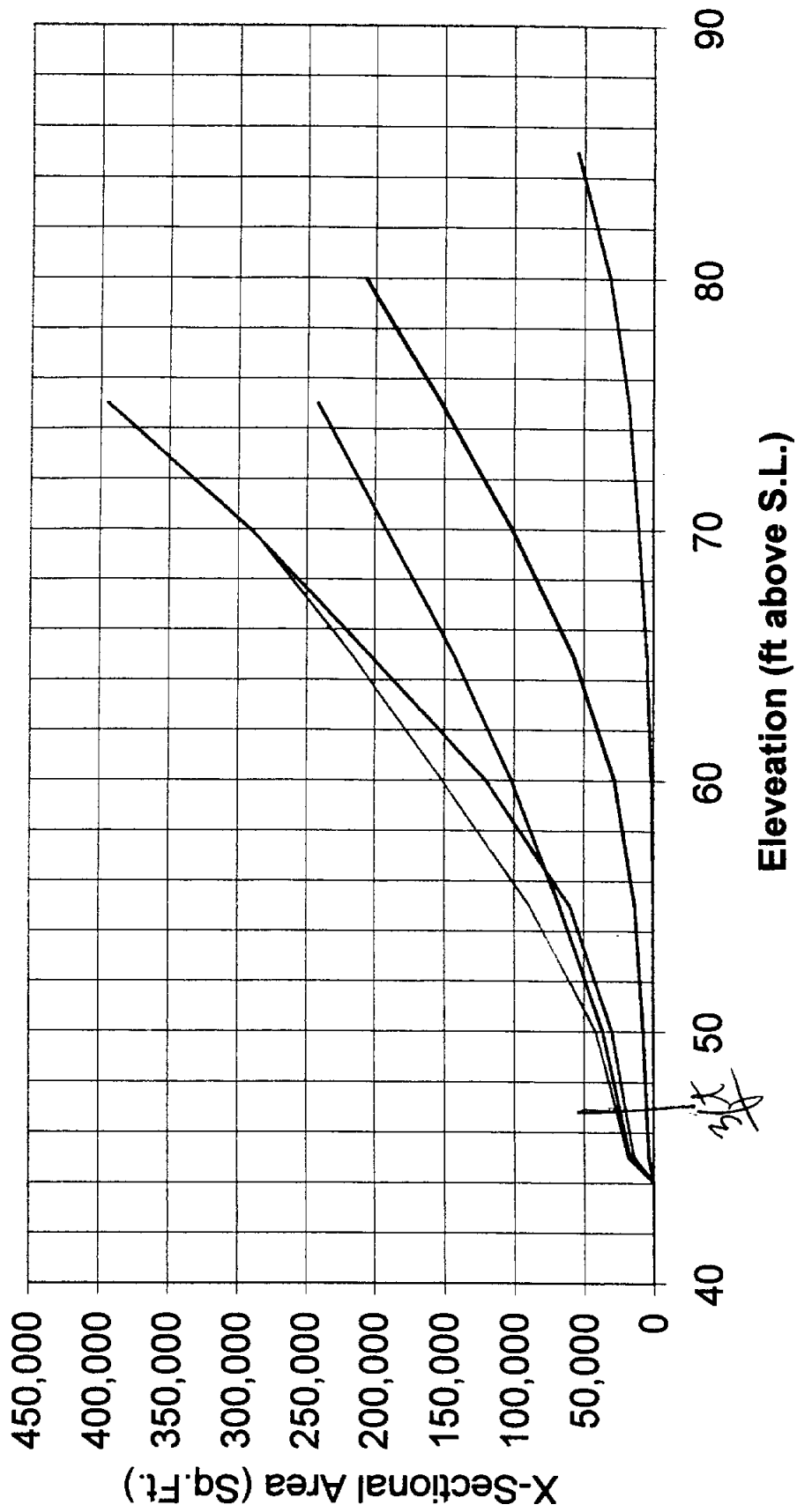


W. Fork San Jacinto River width profile from USGS Topo



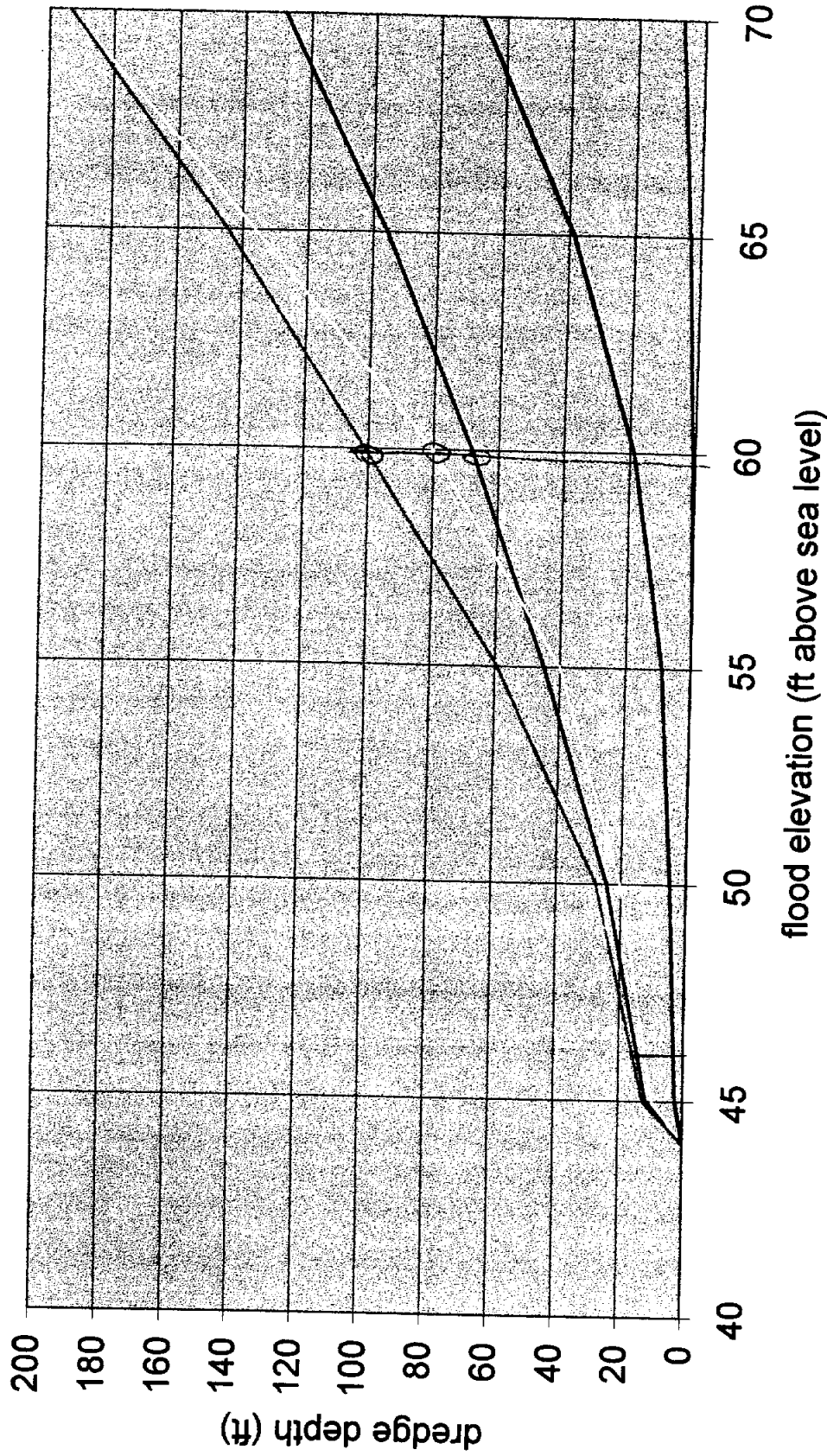
— US-59 — Redbud — KW Lakes — LHoustonPkwy — Wfork@Porter

W. Fork San Jacinto River Out of Bank X-Sectional Area



— US-59 — Redbud — KWLakes — LHoustonPkwy — Wfork@Porter

Dredge depth for 1500' width with equal x-sectional area



— 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.

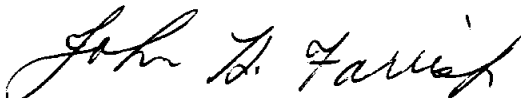
Many property owners along this basin feel the relocation of these materials would help replace what the river has taken over the years through flooding and erosion.

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 input 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

TEXAS WATER DEVELOPMENT BOARD
CITY OF HOUSTON
HARRIS COUNTY FLOOD CONTROL DISTRICT
SAN JACINTO RIVER AUTHORITY
MONTGOMERY COUNTY

DATE/LOCATION

JUNE 13, 2000
KINGWOOD COLLEGE
(PERFORMING ART THEATER)
20,000 KINGWOOD DRIVE
(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:

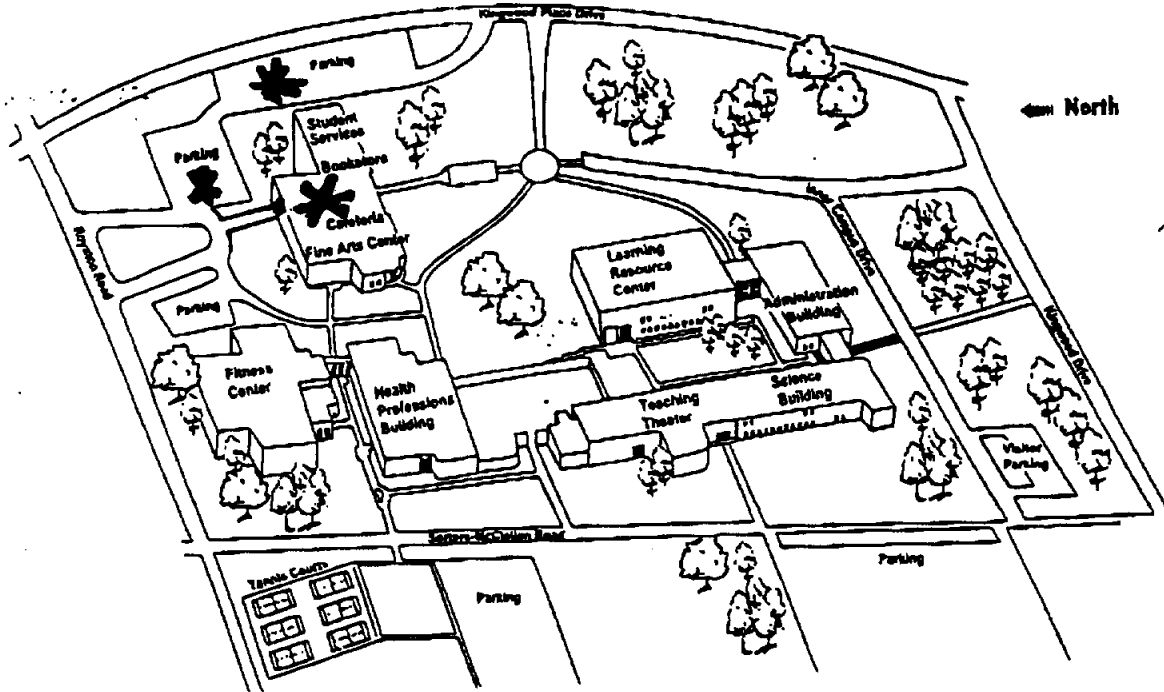
Lake Houston, completed in 1954, is a major water source for the City of Houston and the surrounding region. The age of the reservoir, record floods in recent years, and increased urbanization has caused concerns related to the flooding problems along the West Fork of the San Jacinto River upstream from 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.

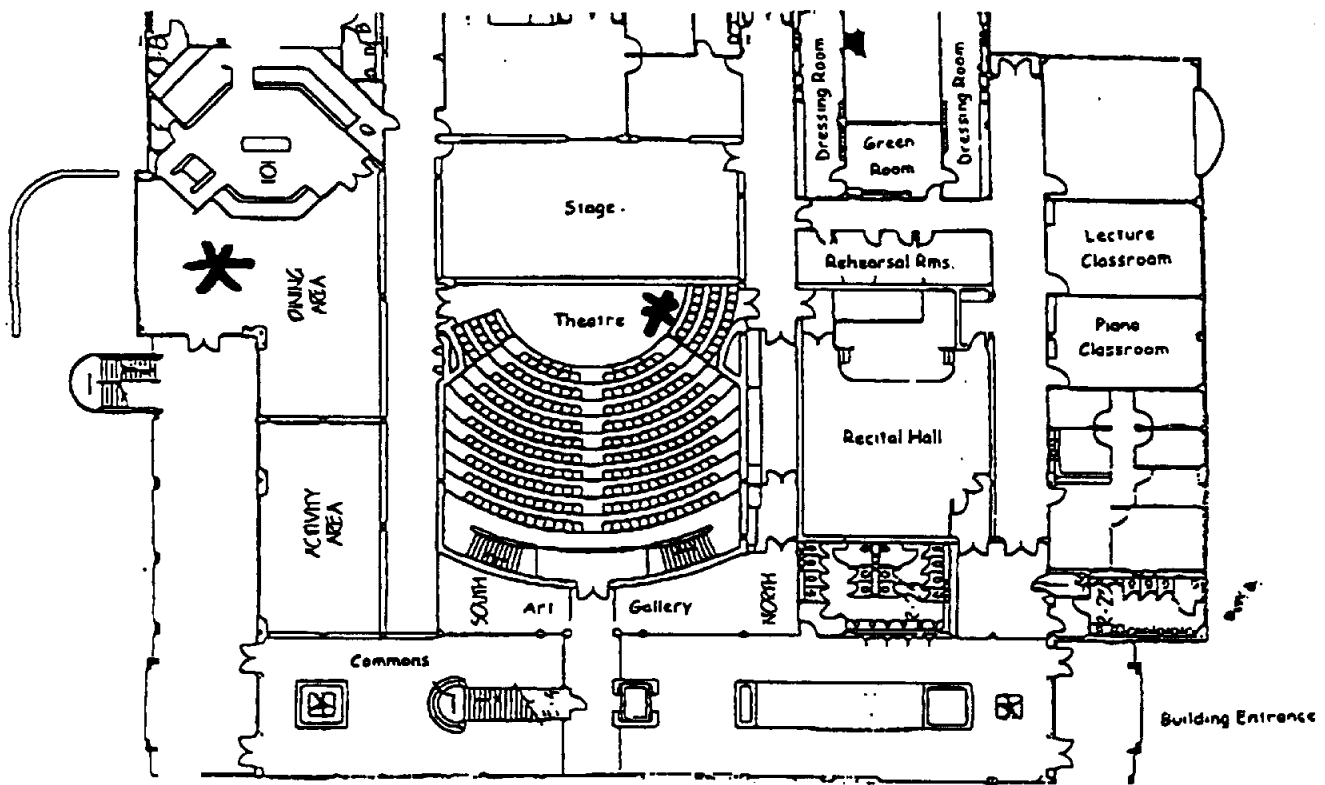
Directions to Kingwood College from Downtown Houston

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

#	ADDRESS	PHONE
ORLANDO SCHOLLES	400 RANDAL WAY #200 Spring, TX 77388	281 350 7027
MARY CAMPBELL	24003 RAFTER THREE, HACKLEY, TX 77447	281 371 7068
Pat Hodges	1105 Desirable Huffman, IA	281-324 2046
MELA ROCCH - HARRIS CO. PT. FOUR	22540 ALDINE WESTFIELD SPRING TX 77373	(281) 353-4100
Maria Calvert	Observer Newspapers	281 3592799
Dan Jezek	3326 Hickory Brook K-wood	360-3599
JOHN WILLIAMS	ST. REP. JOE CRABB	281 359-1270
Laurent Scherak	C.M. Gordon Queen Porter	713-247-2013
Frank Johnson	Hallett Materials TX.	281-354-2215
J.R. & Gloria Bertrand	20042 Olds Dr. Porter TX	281-358-8814
LYNN CASTLEBERRY	3218 RIVERDALE HUNBLE TX	281-852-1400
DENNIS JOHNSTON	20634 KENSWICK DRIVE HUNBLE 77338	281-446-8588
Libby & JO Weisinger	6 Forest Shores Dr Kingwood	281 358-7885
John Harris	5506 Oak Cove KW 77345	281-360-3753
JON LINDSEY	PO Box 2783 HOUSTON 77252	
MICHAEL BEATHARD	910 St. Andrews Rd KW 77339	
WM. J. GROESCHEL	2315 Pine Bend Dr, KW 77339	281-358-0309
Angamel West	511 Shadyblade Hou 77090	281-440-7161
Mark W. Ellis	21826 WALNUT KINGWOOD 77339	281 358 5367
Pat Ellis	21826 WALNUT KINGWOOD	281 358 5367
Ray Kayh	2806 HALTON ST KINGWOOD	281 360 7826
Ken Sheblak	HCFCD	713 684 4071
Scott Saenger	6335 Gullfin Houston	713-777-5337
ZOGER HILL	2118 Woodlands Vly Dr Kingwood	281-358-9699
Betty Hill	" " "	"
Chip Chipman	1522 Lakeshore Kingwood	358-2884
"	2100 DINE PK KINGWOOD 77339	358-4574

6/13/2000

19 SIGN - ZN SHEET (LAKE HOUSTON) 2/5

NAME	ADDRESS	PHONE
Jeannette White	962 Dilworth H/17	77018 713 686 2672
Don and Sue Ramsey	26611 Riverview Forter	281 3583 832
DAVID CTAYLOR	2179 LAKE VILLAGE	KINGWOOD 281-364-4074
MILAR POLHAMUS	3126 ROYAL CRESCENT DR. K. LAKES	(281) 312-1230
MIKE DUNN, INCUS Co. PCT 4,	22510 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 MONTGOMERY	2609 Crossvine The Woodlands	281-3472224
JOE STONJA	2006 PLEASANT CREEK DR. KINGWOOD	(281) 360-5549
HARLES & 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 For Todd	281-717-247-2008
Barry Rought	604 Emerald Crest Humble	281-852-0557
ROBERT & ROSEMARY WIPKE	19311 ALIWOOD CT. " TX,	(281) 852-3909
David S. Jones	611 Wacker	(7) 837-0440
ROY LEE SCHULTZ	2 10102 CANTERTROT DR	HUMBLE = 281-446-2302
Quell Viehey	2104 North Shore Dr	281 359 6111
Debbie MALONE	19220 Lakeshree Humble	281-852-6131

5 SIGN-IN SHEET (LAKE HOUSTON) 3/5

NAME	ADDRESS	PHONE
Ray Burman	8102 Malard Crest	281 8521177
Jan Waldrop	3210 Sunnyknell	281 3585188
Sandi Nizzi	1849 Kingwood	281-358-8889
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

4 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	281-356-3612
Dat Lewis	2503 Golden Pond 77345	281-360-1491
Dick Judge	FOR R.W. Hoop	STATE Rep DIST. 16

24

SIGN-IN SHEET (LAKE HOUSTON)

6/13/2000

NAME

ADDRESS

PHONE

S/S

NAME	ADDRESS	PHONE
Nicki & Justin Berndt	8327 Amber Cove Dr.	281-852-2066
Jeanne McGill	3122 Royal Crescent	281-358-3468
N. Anton	20422 DELTAWOOD	281-912-0117
Leonard Igrason	58614 Lochleuan Ct Humble 77336	281-324-3101
Charles Davidson	3206 RIVIERA LANE Humble TX 77338	281-852-3736
James Baker	PO BOX 1627 Humble TX 77396	
Joy McGowan	1721 Magnolia Ln Kingwood, TX 77339	
Walter	611 WALKER Houston TX 77002	(713) 837-0002
Tom & Susan Clenden	2222 NORTHSIDE KW, TX 77339	281-358-3333
Sharon Fick	1210 Lyndra Dr. 77339	281-358-4201
David Saha	9900 New Fwy 77092	713 644 4000
Janet & DeAnn Green	21811 WALNUT KW 77339	281-312-4328
W.C. Blaney	21819 SWEET BAY Humble 77339	281-358-3413
David Woerner	5507 Cedar Bay Dr Kingwood 77345	281-360-9590
Tim & Susan	2907 Aspen Creek Ct. "	281-360-6150
J. Eckley	2423 Kingsforest	281-358-2950
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 77338	
Chuck Settle	611 Walker Houston TX 77002	(713) 837-0452
Nila Nelson	1310 Palmetto Lane Kingwood, TX 77339	281/358-7645
Ron / January	4811 Pauline Dr Humble	812 2700
John Ellok	2006 Crystal River Kingwood	281-360-1878
Phillip Stitt	40 Kingswood Ct. 1700 Lake Kingwood Park, Kingwood TX 77339	281-358-217

20

6/13/2000

S(KEN) - Z(N) 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	281-319-9711
MIKE BYERS	Humble/Kingwood	
Jim Harding	KINGWOOD	
Dean + Carol Ongman	(Northshore Subd) 2302 Northshore Kingwood, TX 77339	281-359-1953
Betty Stedman	" 21514 Lake Point, Humble TX	
DAVID M. WHITE	3051 CREEK MANOR KINGWOOD 77339	281-360-2466
Capt LE Sheffield	2927 EAGLE CREEK DR	281-361-358-00
KEN FOWLER	4400 Memorial Dr #2235 HOUSTON, TX 77007	713.502.7946
JOE GARDILLA	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 77339-2211	281-358-7684
Jackie Juneman	423 Forest Cove Dr Kingwood, TX 77339	281 358-5913
Frank + Betty Alger	26488 Lori Ln, Porter, TX 77065	281-358-3685
Dann + Shatt	2102 Northshore Dr, Kingwood 77339	281 312-4380
Maura Yan	29003 S Plum Creek Trm Spring 77386	
Gordon + Antwenn Meyer	1122 Klamath Houston TX 77090	
Joe Crabb	20319 Arrow Cove Humble TX	77346
Oscar Bierman	11315 Dogwood Humble 77330	
Reid + Mrsny	2007 Windsong, Crosby, TX 77532	
RAY ANDERSON	2819 GOLDEN LEAF KW 77339	
Charles K + Juanita Lee	3115 Revere Humble TX	77538
Vera KUMKAZA	18915 Keltarn 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: FROILWOOD 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: 1310 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: 281 358-3770 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: Spring TX Zip: 77388
Phone: 281 350 7027 Fax: 281 350 7035
Organization or Subdivision: Alexander Engine Services, Inc.

Would you like to make a Public Statement?

Yes No

If yes, whom do you represent?

Self Other CO/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
ENCLOSING 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 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: 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: ibet lu
Mailing Address: 3115 Riviera Ln
Street Address: Same
(if not the same as mailing address)
City: Humble 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: _____

**REGIONAL FLOOD PROTECTION STUDY FOR A
LAKE HOUSTON WATERSHED FLOOD PROGRAM**

Public Meeting, JUNE 13, 2000
Kingwood College (PERFORMING ART THEATER)

Attendance Record

Name: Guadalupe Lila

Mailing Address: 3115 Riviera Ln

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 studies

**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: 2403 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?

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 Landwehrmeyer

Mailing Address: 1122 Klamath Lane

Street Address: _____

City: Houston TX Zip: 77090
(if not the same as mailing address)

Phone: 281-444-2777 Fax: 281-444-2375 (phone first)

Organization or Subdivision: Westador MUD

email: gland@houston.tx.com

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



TEXAS WATER DEVELOPMENT BOARD

William B. Madden, *Chairman*
Jack Hunt, *Member*
Wales H. Madden, Jr., *Member*

Craig D. Pedersen
Executive Administrator

Noé Fernández, *Vice-Chairman*
William W. Meadows, *Member*
Kathleen Hartnett White, *Member*

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 Rebeck, the Board's designated Contract Manager, at (512) 463-6418 if you have any questions regarding this matter.

Sincerely,

A handwritten signature in cursive script that reads "Tommy Knowles".

Tommy Knowles, Ph.D., P.E.
Deputy Executive Administrator
Office of Planning

Enclosures

cc: John H.C. Kuo, P.E.
Gilbert Ward

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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

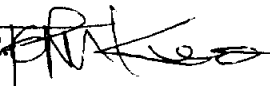
TO: San Jacinto River Authority
Attn: Jim Adams, P.E.
Fax: 409-588-3043

Texas Water Development Board
Attn: Gilbert R. Ward, C.P.G.
Fax: 512-936-0889

Montgomery County
Attn: Mike Beitler, P.E.
Fax: 409-539-7802

Harris County Flood Control District
Attn: Ken Sheblak, P.E.
Fax: 713-684-4102

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.

**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.

	<u>Water Surface Elevation (1973 Datum adjustment)</u>			
	<u>US 59 Bridge</u>	<u>Parkway Bridge</u>	<u>1960 Bridge</u>	<u>Spillway</u>
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 HCFC
- 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

William B. Madden, *Chairman*
Jack Hunt, *Member*
Wales H. Madden, Jr., *Member*

Craig D. Pedersen
Executive Administrator

Noé Fernández, *Vice-Chairman*
William W. Meadows, *Member*
Kathleen Hartnett White, *Member*

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:

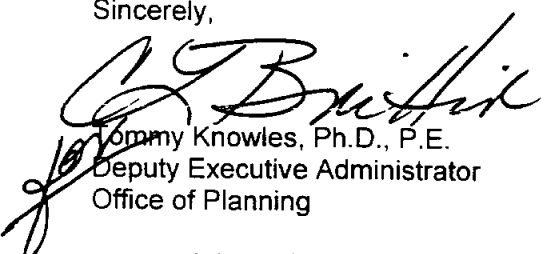
Staff members of the Texas Water Development Board have completed a review of the revised draft report under TWDB Contract No. 97-483-219 and offer comments shown in Attachments A and B.

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

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**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).*

A. Additional Comments

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.*